MODBUS IP

Help Rev: 2/12/04

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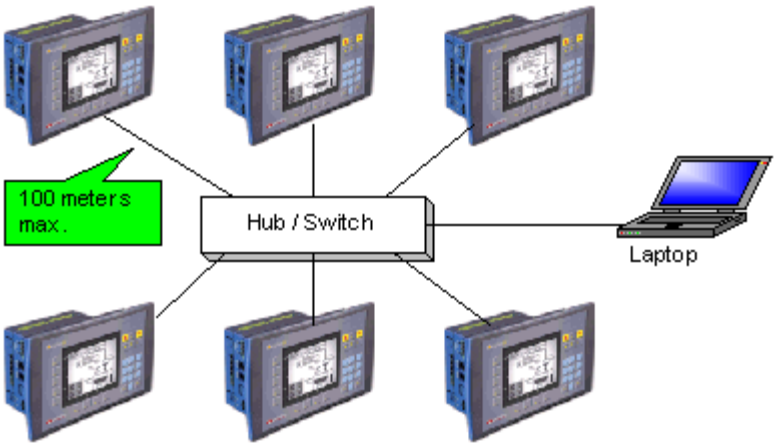
MODBUS IP

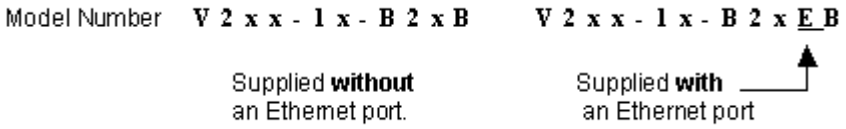
If your controller comprises an Ethernet card, you can use MODBUS IP commands with any connected device that supports the MODBUS protocol.

Within a MODBUS network, you can use standard MODBUS commands to read and write bit and register data; you can also read and write data to Vision controller Data Tables.

Any controller in the network may function as either master or slave via the controller's *Ethernet port*.
Ethernet uses *star topology.*



V2xx Vision OPLCs can be ordered with or without an Ethernet port. The Ethernet port enables you to implement communications via TCP/IP, such as MODBUS over TCP. To check if your Vision controller was supplied with an installed Ethernet port, first check the device's model number. In addition, note that the Ethernet port is an RJ-45-type port that is lined with metal.



Unitronics currently supports both TCP and UDP, as explained in the topic About Ethernet. This topic also contains general information about Ethernet, IP addressing, sockets, and ports.

Specific information on implementing Ethernet is provided in the topic Using Ethernet.

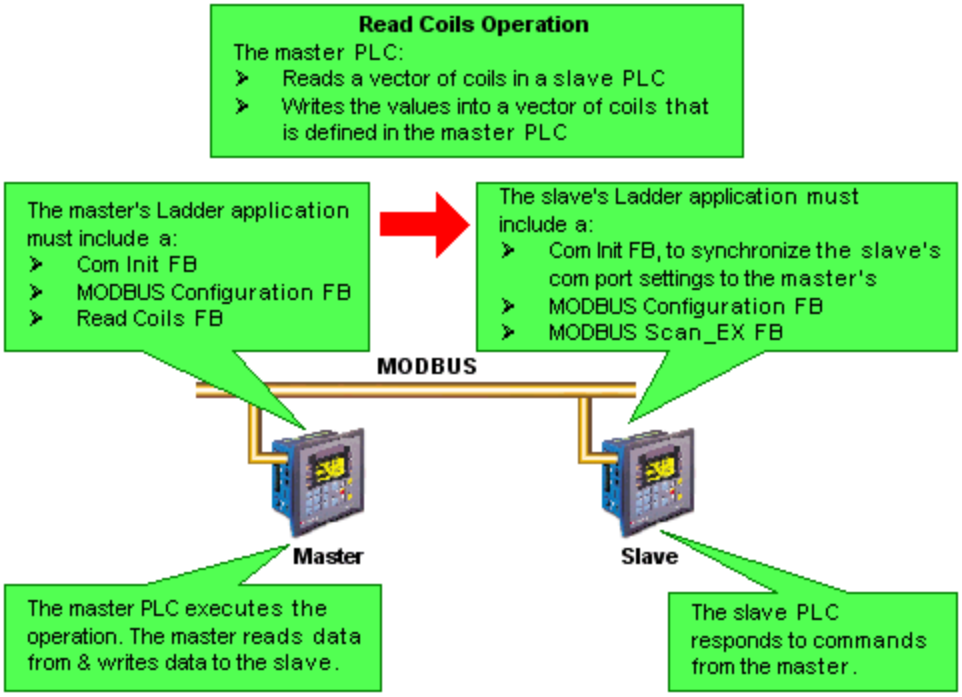
Using MODBUS

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

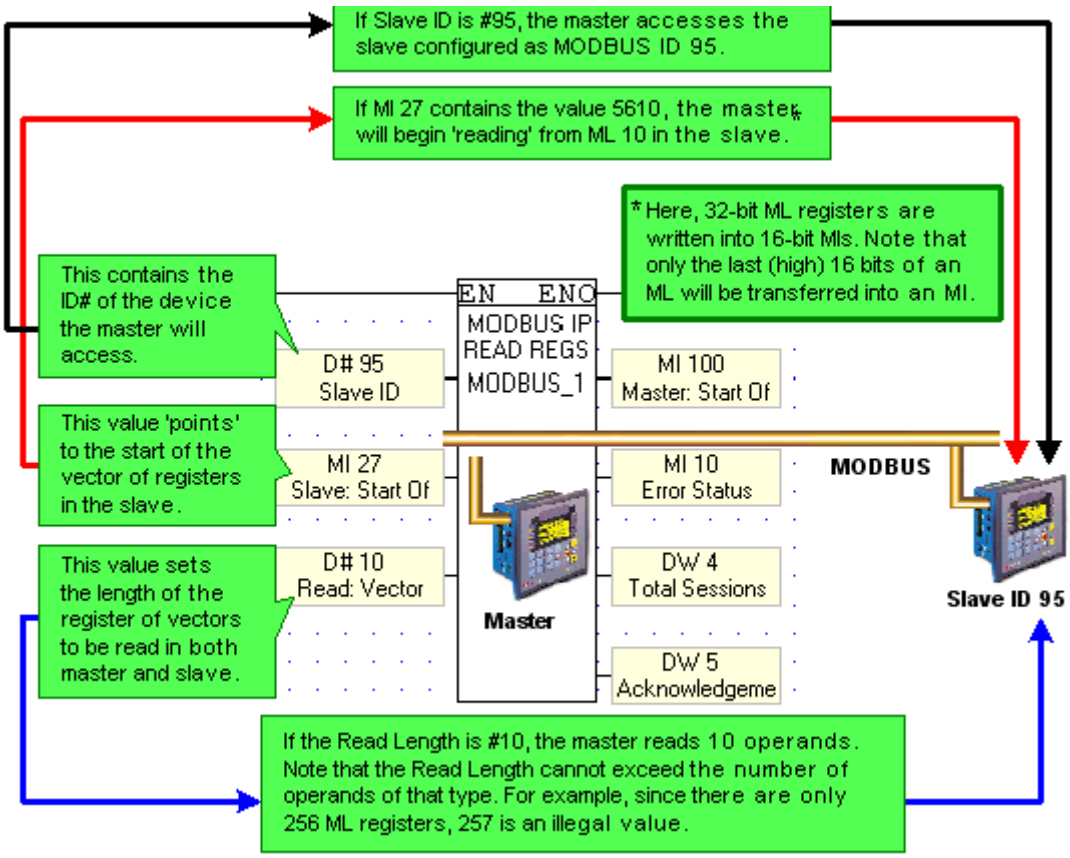
- Assign IP addresses to both master and slave devices. This is done by placing Ethernet Card Init FBs in the ladder application of both master and slave.
- Include at least 1 MODBUS Configuration FB in the ladder application of both master and slave.
- The condition that activates the Configuration 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.

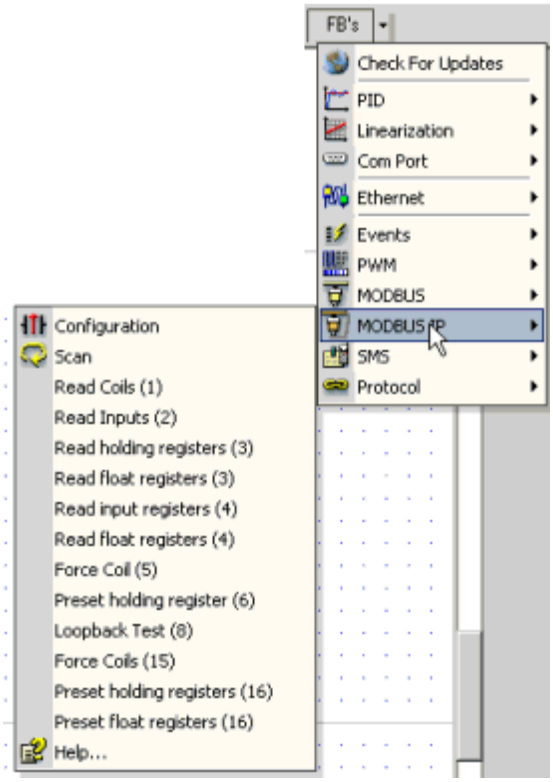


Note that the operand addresses in slave PLCs are indirect addresses (pointers).



FB Operations

MODBUS IP Operations are located on the *FBs menu*.



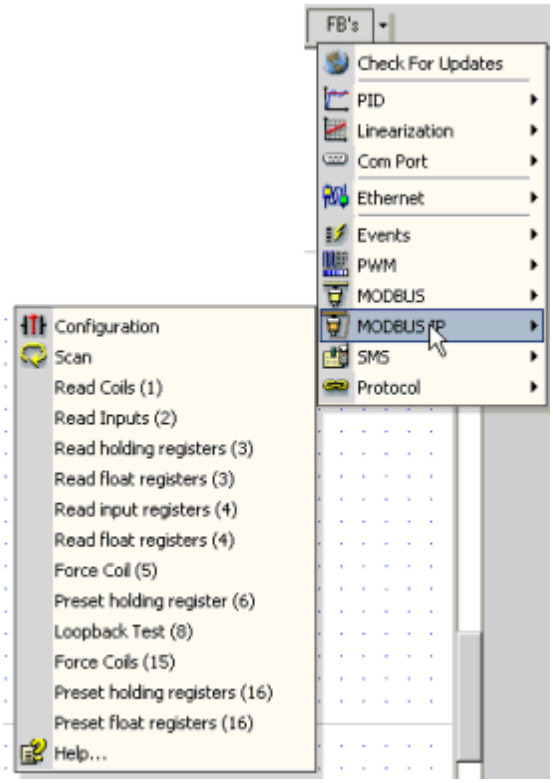
Examples

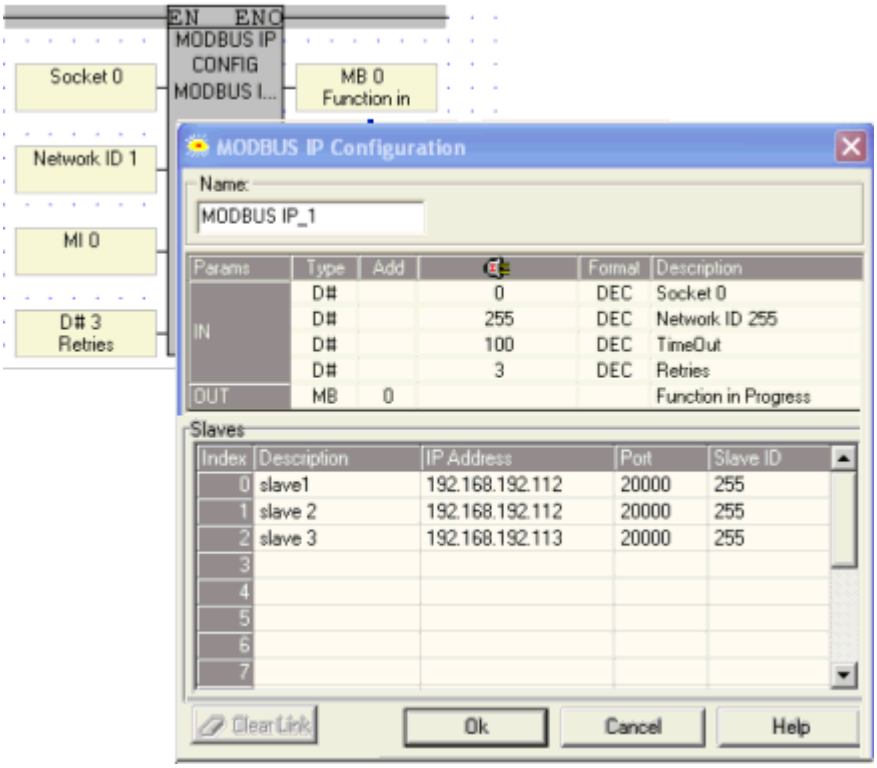
Sample applications may be found in the VisiLogic Examples folder. This folder contains field-tested VisiLogic (.vlp) sample applications. You can open this folder via the Help Menu.

The folder is typically located at: C:\ProgramFiles\Unitronics\VisiLogic\Examples\Verx.xx, where x.xx indicates the version of VisiLogic.

MODBUS: Configuration

A MODBUS Configuration FB must be included in both master and slave Ladder applications as shown below. MODBUS IP Operations are located on the *FBs menu*.





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 msecs; 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.

Note ♦ Indirectly addressed parameters in a MODBUS Configuration FB are only read when the Configuration is called. Since a Configuration is generally called as a power-up task, if, for example Retries has been indirectly addressed, and the linked MI is updated, the new value will **not** be read into the Configuration. The value will only be updated until the Configuration is called.

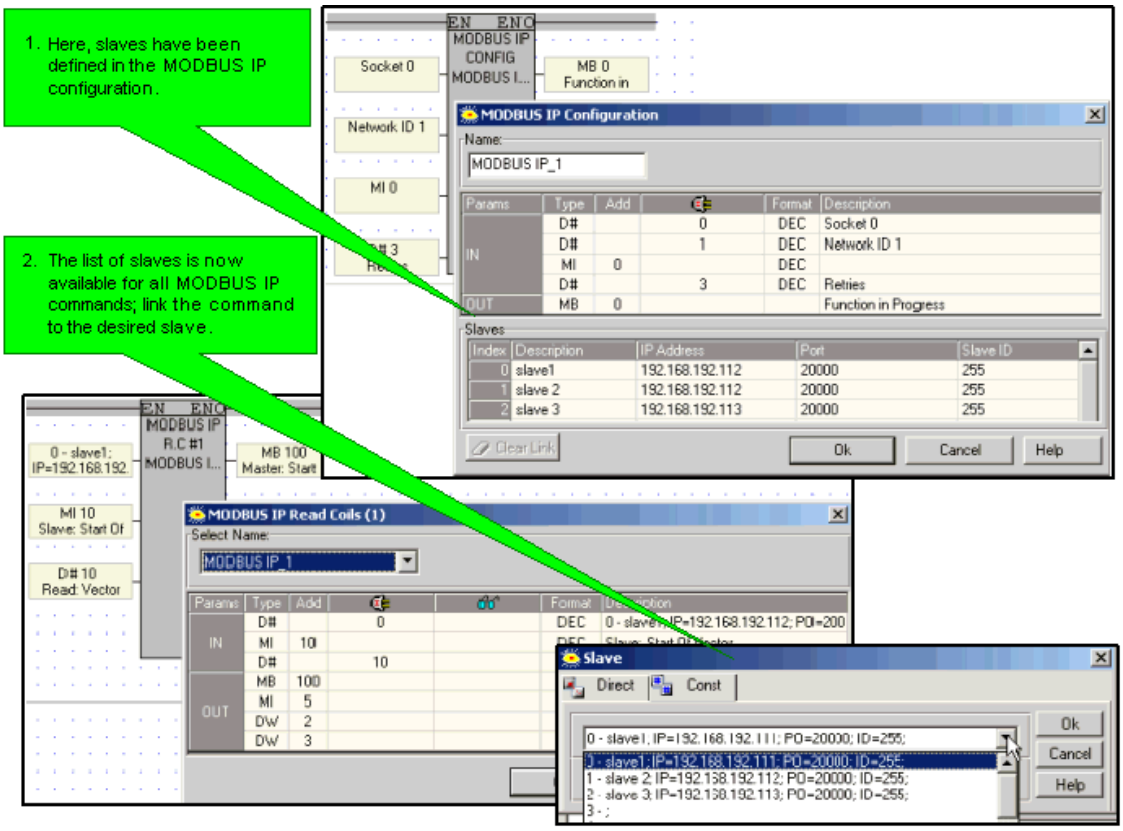
♦ While a master attempts to send a command, the Function In Progress bit is ON. The number of attempts that the master will make is the number in Retries +1, where '1' is the initial access attempt.

♦ When a master attempts to access a slave device, and the slave does not answer,- the Function In Progress bit will turn ON. This bit will remain on according to the following:

(the number of retries + 1) x (Time Out), where '1' is the initial access attempt. Note that the Time Out parameter is in units of 10 msec.

Vision Slaves

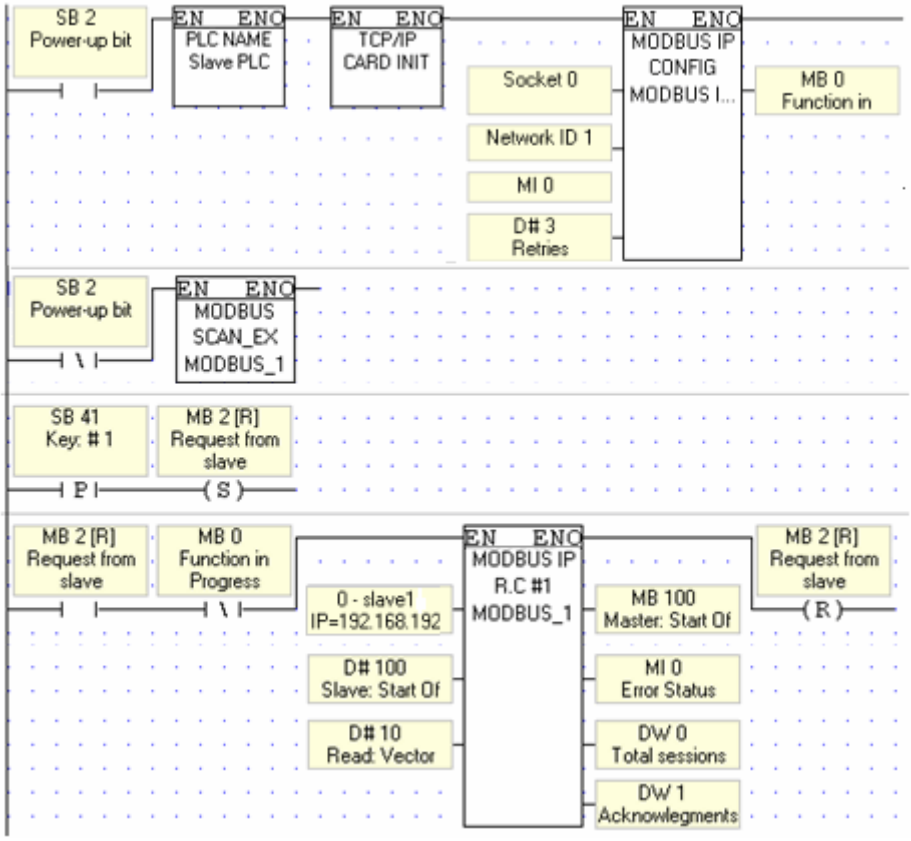
In order to access Vision Controllers as slave devices and implement MODBUS commands, you must enter the IP addresses of the slave devices in the MODBUS IP configuration. This means that you must first assign IP addresses to each slave. This is done via the Ethernet Card Init FB, which must be configured as described in the topic Using_Ethernet.



Note ♦ Slave IP addresses can also be linked to an MI vector, note that the vector is 4 MIs long. The low byte of each MI provides the number for an octet within the IP address.

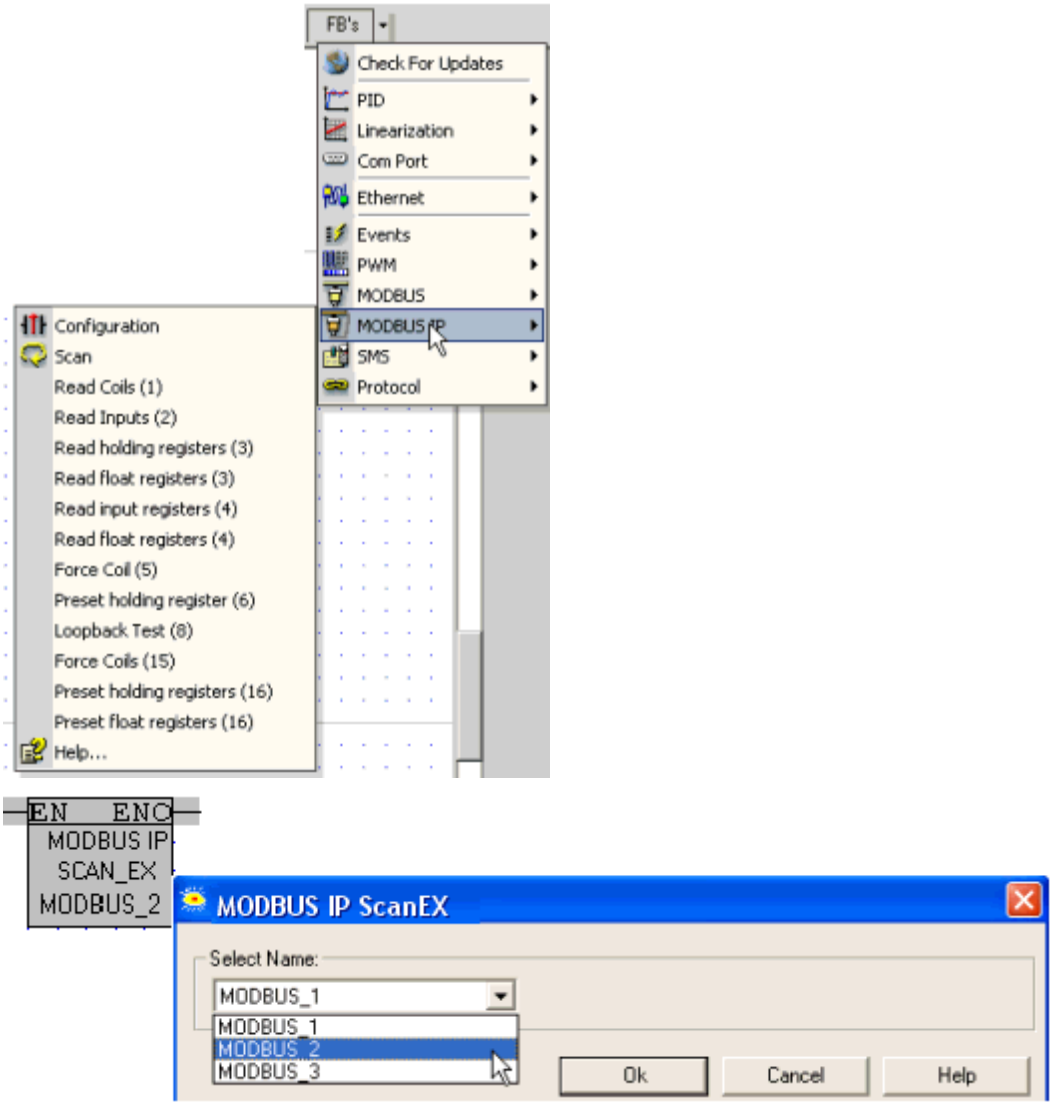
If, for example, the IP address is linked to MI 0, and the low bytes of MI 0 to MI 3 contain the values 192, 198, 192, 45, the IP address will be 192.198.192. 45.

The Ladder application below enables the controller act as a MODBUS master and read coils in a slave PLC. The same PLC can also act as a slave, if a Scan_EX operation is included in the application.



MODBUS: ScanEX and Scan

Scan_EX enables a master device to access a slave PLC. MODBUS IP Operations are located on the *FBs menu*.



Note ♦ Scan_Ex is recommended for new applications.

About Scan and Scan_EX

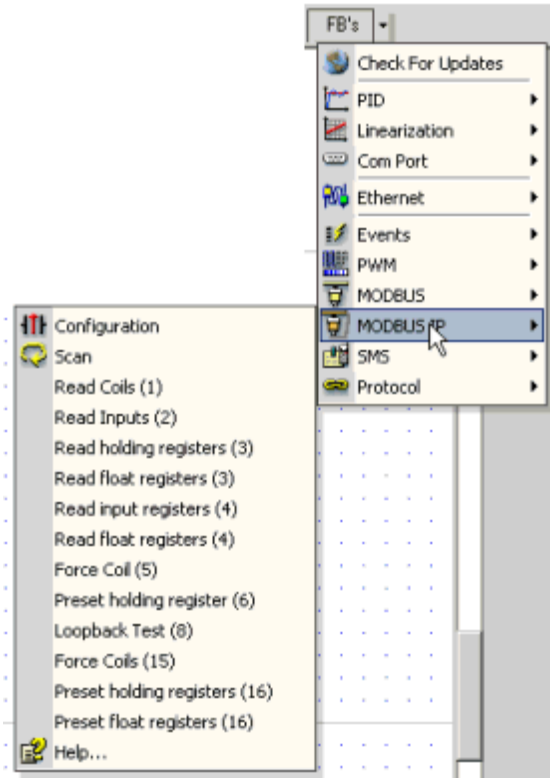
MODBUS Versions **previous to V2.01** offered only the **Scan** FB. Scan is still supported for older, working applications. When MODBUS operations accessed double registers (5100 addresses and higher), using odd addresses, such as 5101, there were incompatibility issues.

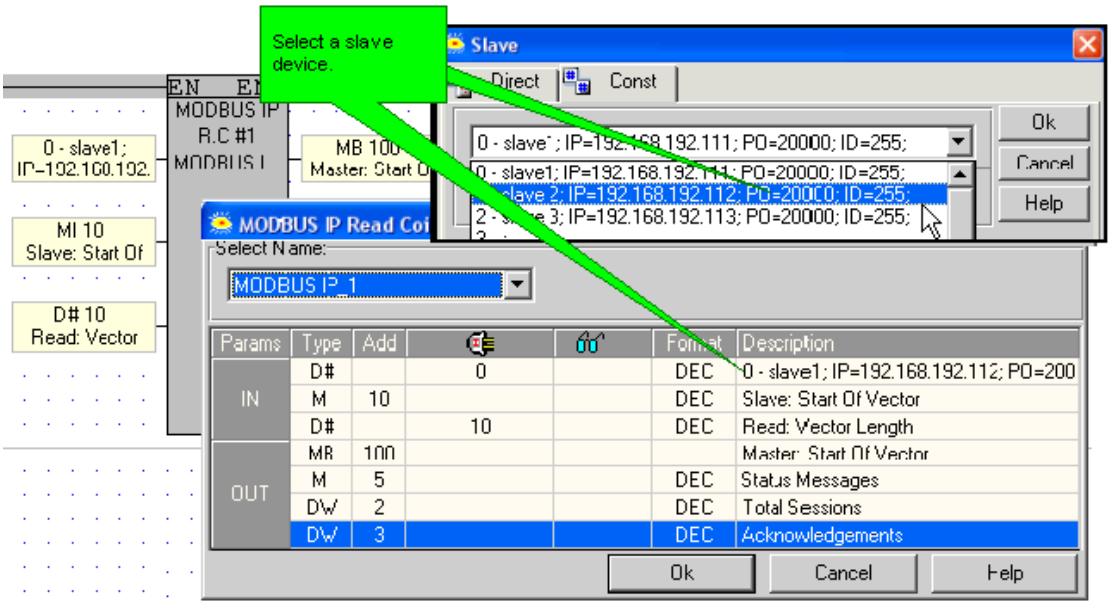
Scan_EX is recommended for new applications.

When ScanEX receives an input parameter in the 32-bit range (for example, 5100{ML}), it automatically takes double-register values.
If, for example, ScanEX receives a Read Register(6) request for **510<u>0</u>**, it returns the values in 5100 **and** 5101. If, however, ScanEX receives Read Register(6) request for **510<u>1</u>**, it returns Status Message #2-- since 5101 provides the 'high' bytes of the 32-bit register, it is not a legal address.

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. MODBUS IP Operations are located on the *FBs menu*.



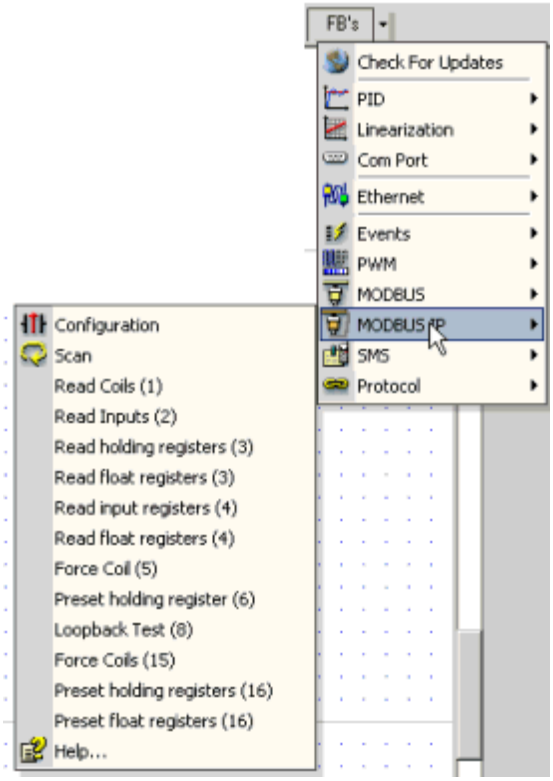


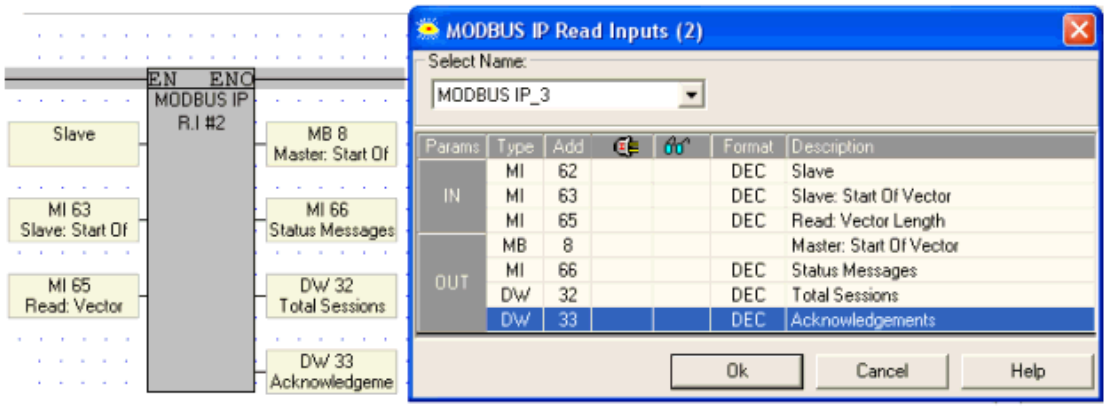
Parameter	Type	Function
Slave ID	Constant or MI	The IP address of the slave device containing the coils to be read (data source).
Slave: Start of	Constant,	The start of the vector of coils to be read (data source).

Vector	MI, ML, or DW	**Note** ♦ Check topic Slave Address Tables.
Read: Vector Length	Constant or MI	The vector length. **Note** ♦ A MODBUS command cannot read/write more than 1900 bit operands at one time. In addition, 0 is not a legal length.
Master: Start of Vector	MB	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands.
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands.
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. MODBUS IP Operations are located on the *FBs menu*.

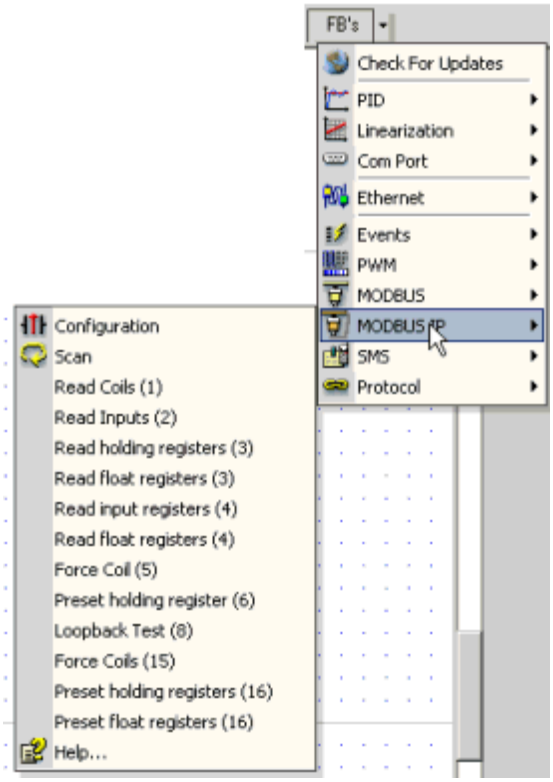


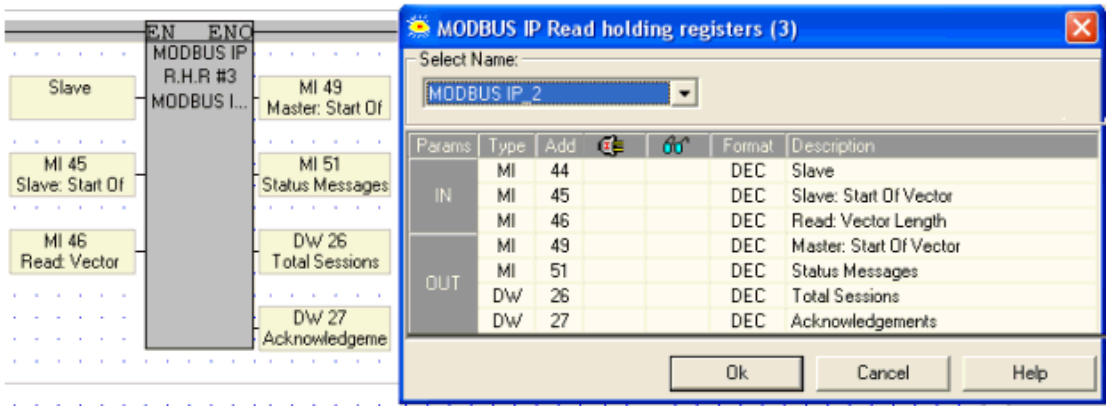


Parameter	Type	Function
Slave ID	Constant or MI	The IP address of the slave device containing the inputs to be read (data source).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of inputs to be read (data source). **Note** ♦ Check topic Slave Address Tables.
Read: Vector Length	Constant or MI	The vector length. **Note** ♦ A MODBUS command cannot read/write more than 1900 bit operands at one time. In addition, 0 is not a legal 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).
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands.
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. MODBUS IP Operations are located on the *FBs menu*.



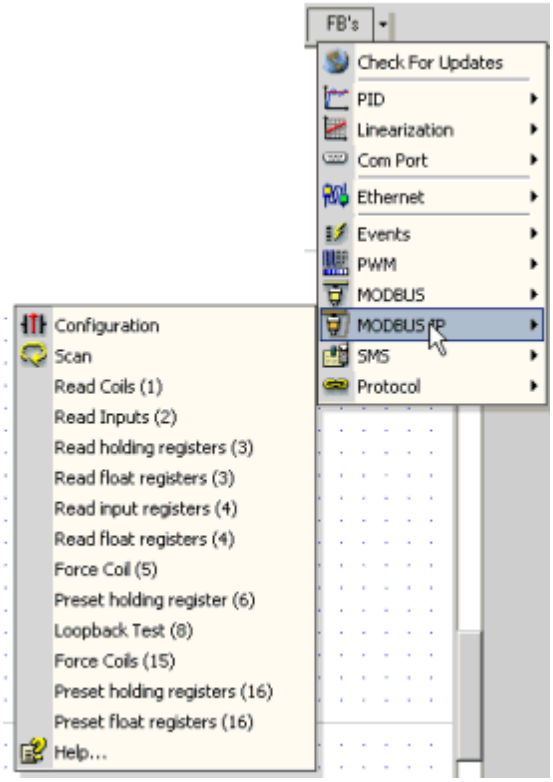


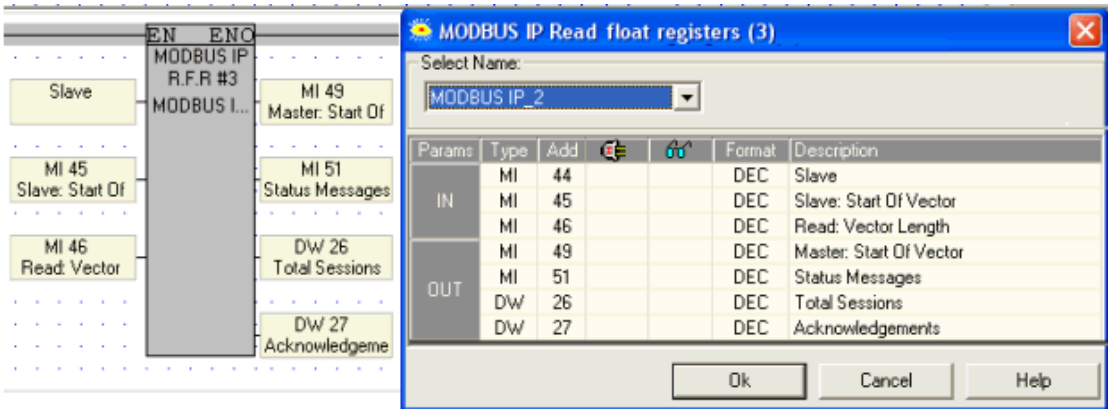
Parameter	Type	Function
Slave ID	Constant or MI	The IP address of the device containing the registers to be read (data source).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of registers to be read (data source). **Note** ♦ Check topic Slave Address Tables.
Read: Vector Length	Constant, MI, ML, or DW	The vector length **Note** ♦ A MODBUS command cannot read more than 124 16-bit integers, 62 double registers, or 64 float registers at one time. In addition, 0 is not a legal length. ♦ If, within the Slave: Start of Vector parameter, the selected register type is a **32-bit double register** (slave addresses 5100 and greater)the preset vector length must be doubled as well. If, for example: - Slave: Start of Vector parameter is set to 6300, and - You wish to preset 4 registers, for a total of 16 bytes

		- You must set the Preset Vector length to 8. Note that this means that, in these cases, the Preset: Vector Length parameter will always be an even number.
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).
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands.
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. MODBUS IP Operations are located on the *FBs menu*.

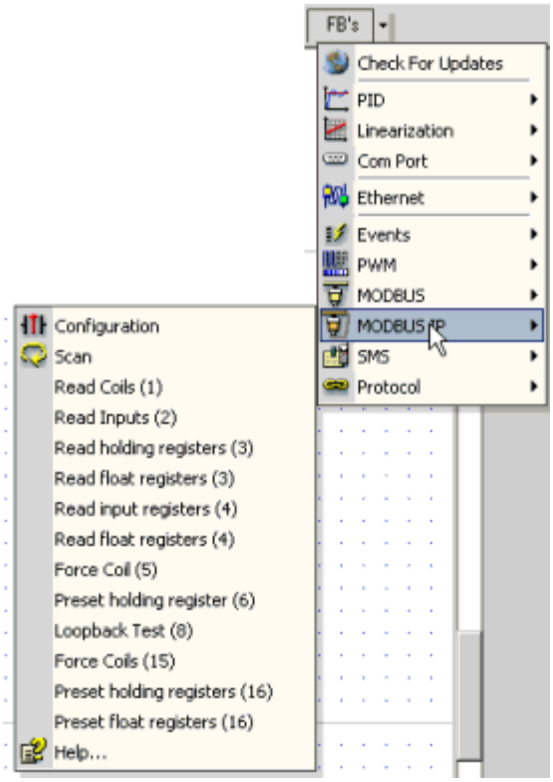


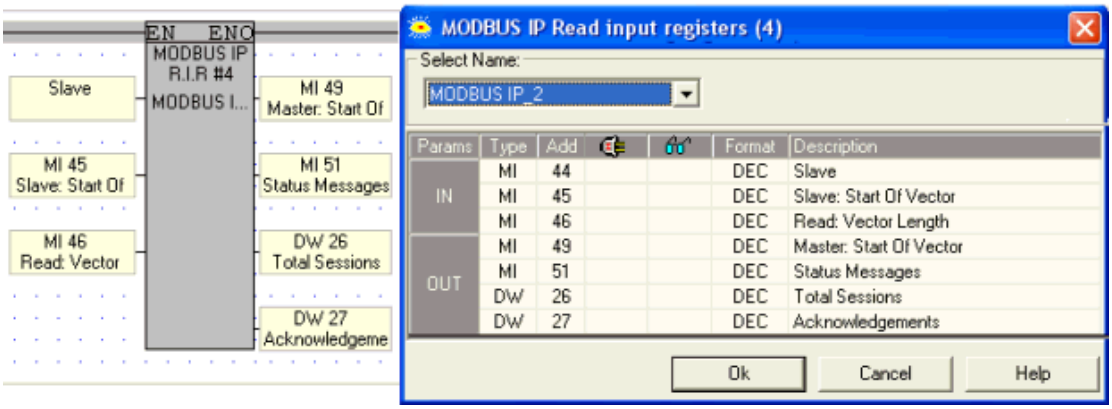


Parameter	Type	Function
Slave ID	Constant or MI	The IP address of the device containing the registers to be read (data source).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of registers to be read (data source). **Note** ♦ Check topic Slave Address Tables.
Read: Vector Length	Constant, MI, ML, or DW	The vector length **Note** ♦ A MODBUS command cannot read more than 124 16-bit integers, 62 double registers, or 64 float registers at one time. In addition, 0 is not a legal length. ♦ If, within the Slave: Start of Vector parameter, the selected register type is a **32-bit double register** (slave addresses 5100 and greater)the preset vector length must be doubled as well. If, for example: - Slave: Start of Vector parameter is set to 6300, and - You wish to preset 4 registers, for a total of 16 bytes - You must set the Preset Vector length to 8. Note that this means that, in these cases, the Preset: Vector Length parameter will always be an even number.
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).
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands.
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. MODBUS IP Operations are located on the *FBs menu*.



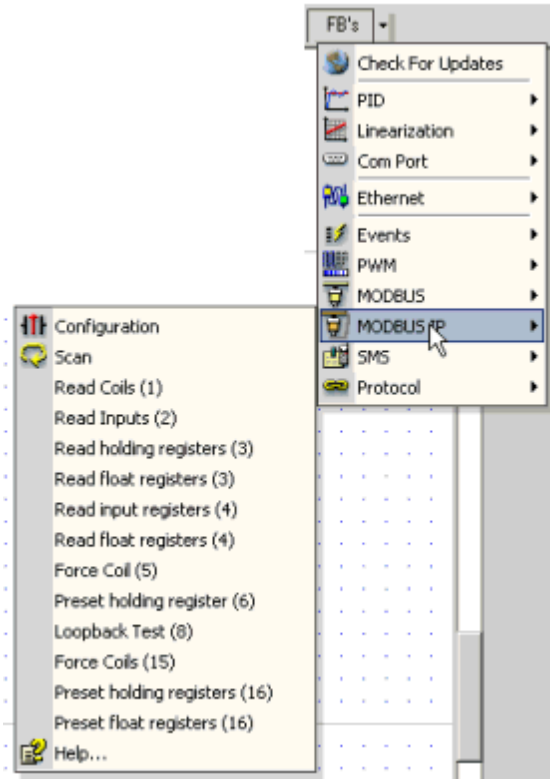


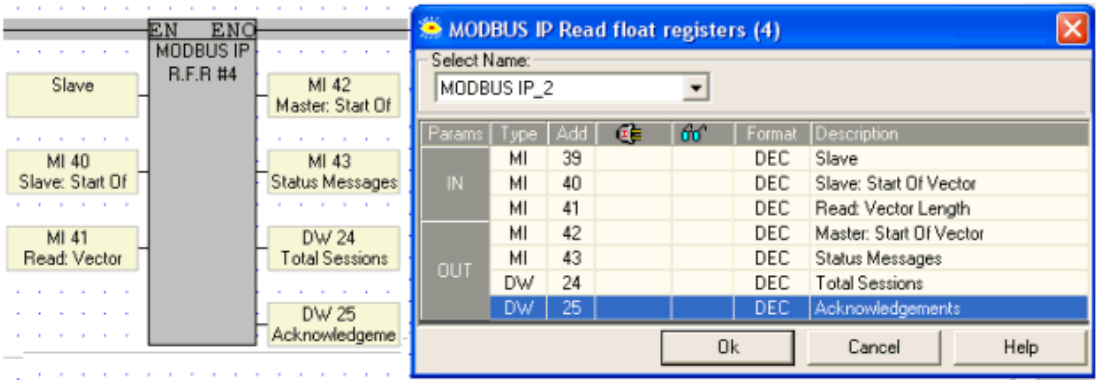
Parameter	Type	Function
Slave ID	Constant or MI	The IP address of the device containing the registers to be read (data source).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of registers to be read (data source). **Note** ♦ Check topic Slave Address Tables.
Read: Vector Length	Constant, MI, ML, or DW	The vector length **Note** ♦ A MODBUS command cannot read more than 124 16-bit integers, 62 double registers, or 64 float registers at one time. In addition, 0 is not a legal length. ♦ If, within the Slave: Start of Vector parameter, the selected register type is a **32-bit double register** (slave addresses 5100 and greater)the preset vector length must be doubled as well. If, for example: - Slave: Start of Vector parameter is set to 6300, and - You wish to preset 4 registers, for a total of 16 bytes

		- You must set the Preset Vector length to 8. Note that this means that, in these cases, the Preset: Vector Length parameter will always be an even number.
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).
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands.
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 (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. MODBUS IP Operations are located on the *FBs menu*.

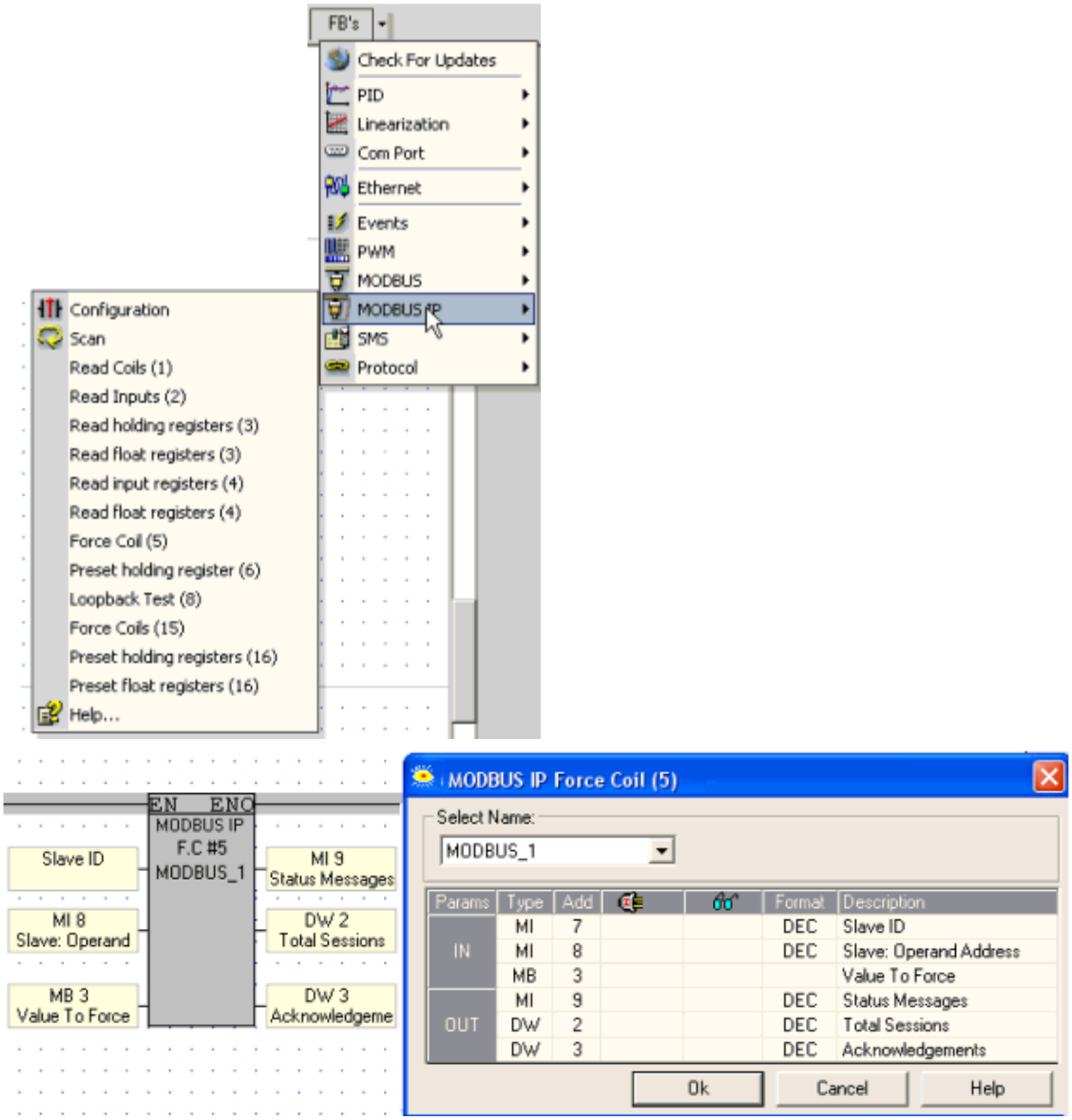




Parameter	Type	Function
Slave ID	Constant or MI	The IP address of the device containing the registers to be read (data source).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of registers to be read (data source). **Note** ♦ Check topic Slave Address Tables. ♦ If, within the Slave: Start of Vector parameter, the selected register type is a **32-bit double register** (slave addresses 5100 and greater)the preset vector length must be doubled as well. If, for example: - Slave: Start of Vector parameter is set to 6300, and - You wish to preset 4 registers, for a total of 16 bytes - You must set the Preset Vector length to 8. Note that this means that, in these cases, the Preset: Vector Length parameter will always be an even number.
Read: Vector Length	Constant, MI, ML, or DW	The vector length **Note** ♦ A MODBUS command cannot read more than 124 16-bit integers, 62 double registers, or 64 float registers at one time. In addition, 0 is not a legal 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).
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands.
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. MODBUS IP Operations are located on the *FBs menu*.

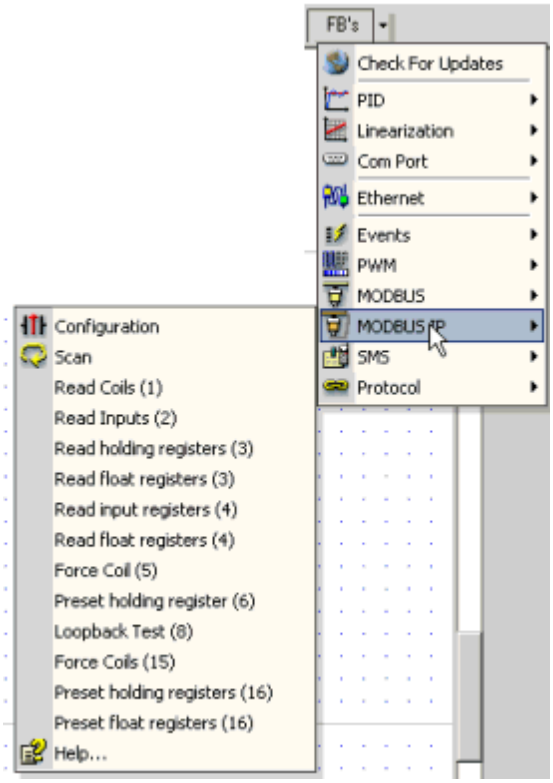


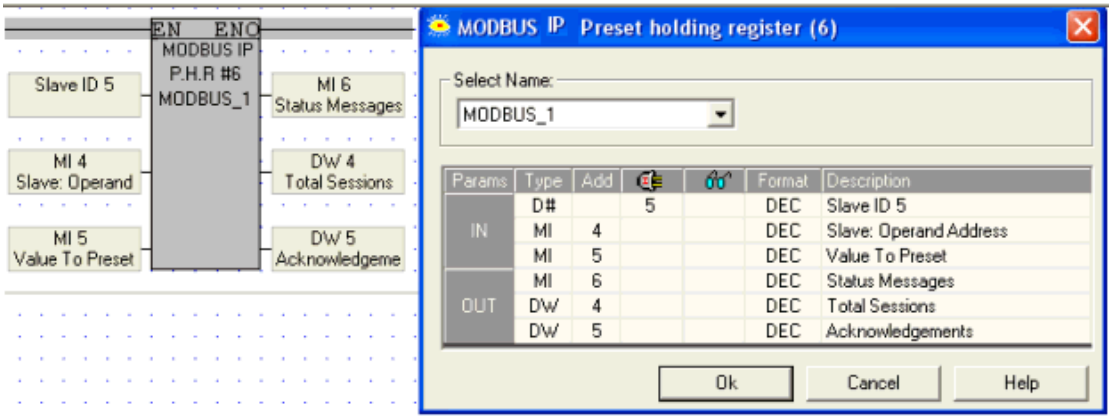
Parameter	Type	Function
Slave ID	Constant or MI	The IP address of the device containing the coil to be forced (data source).
Slave Address	Constant, MI, ML, or DW	The address of the coil to be forced (data target). **Note** ♦ Check topic Slave Address Tables.
Value to Force	M, SB, I, O,T	This MB is located in the master PLC; this MB contains the **status** to be forced (data source). If, for example, the status of this MB is OFF, the status of the coil in the slave will be forced to OFF. **Note** ♦ A MODBUS command cannot read/write more than 1900 bit operands at one time. In addition, 0 is not a legal length.
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands
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. MODBUS IP Operations are located on the *FBs menu*.



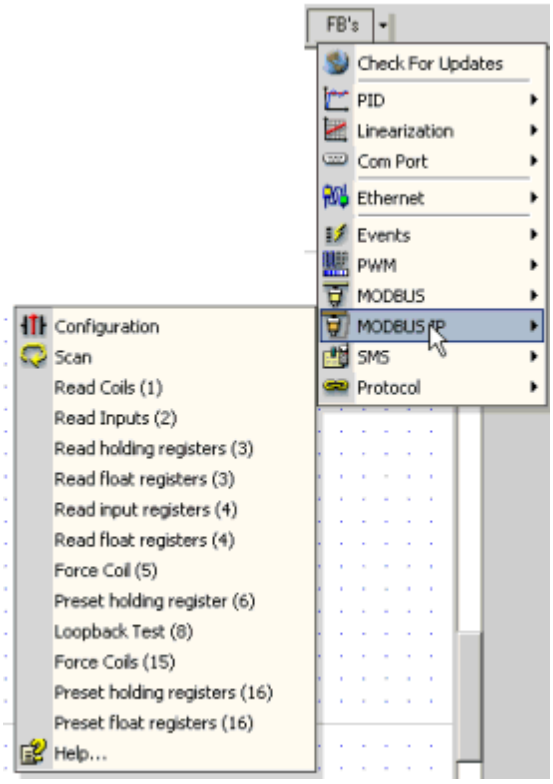


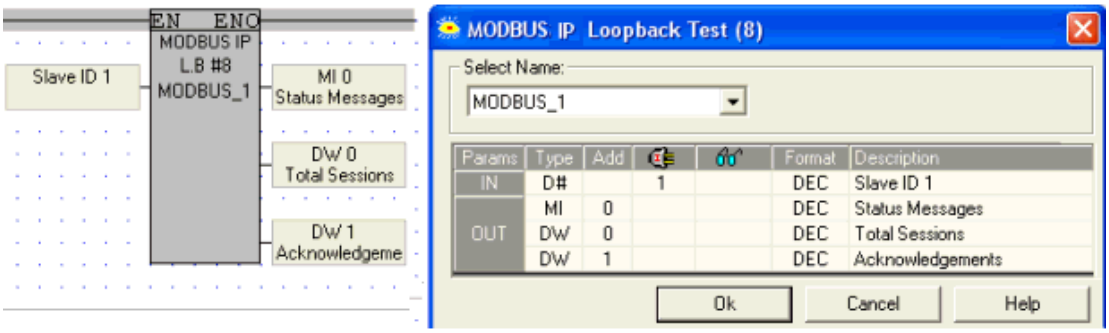
Parameter	Type	Function
Slave ID	Constant or MI	The IP address of the device containing the register to be preset (target).

Slave: Operand Address	Constant, MI, ML, or DW	The address of the register to be preset (target). **Note** ♦ Check topic Slave Address Tables
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 Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands
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. MODBUS IP Operations are located on the *FBs menu*.

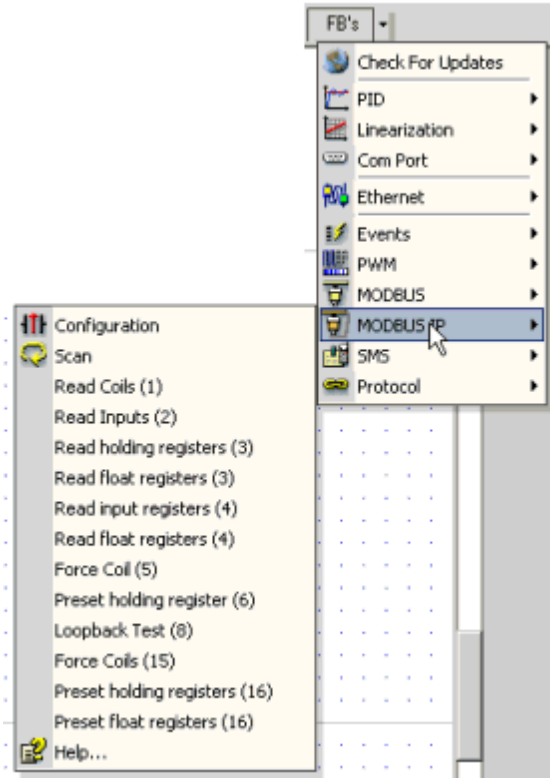


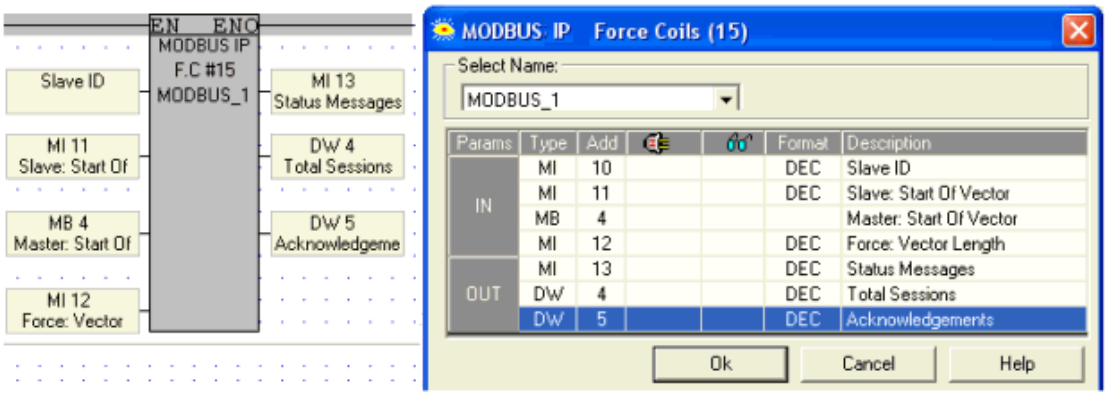


Parameter	Type	Function
Slave ID	Constant or MI	The IP address of the device to be checked.
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. 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. MODBUS IP Operations are located on the *FBs menu*.

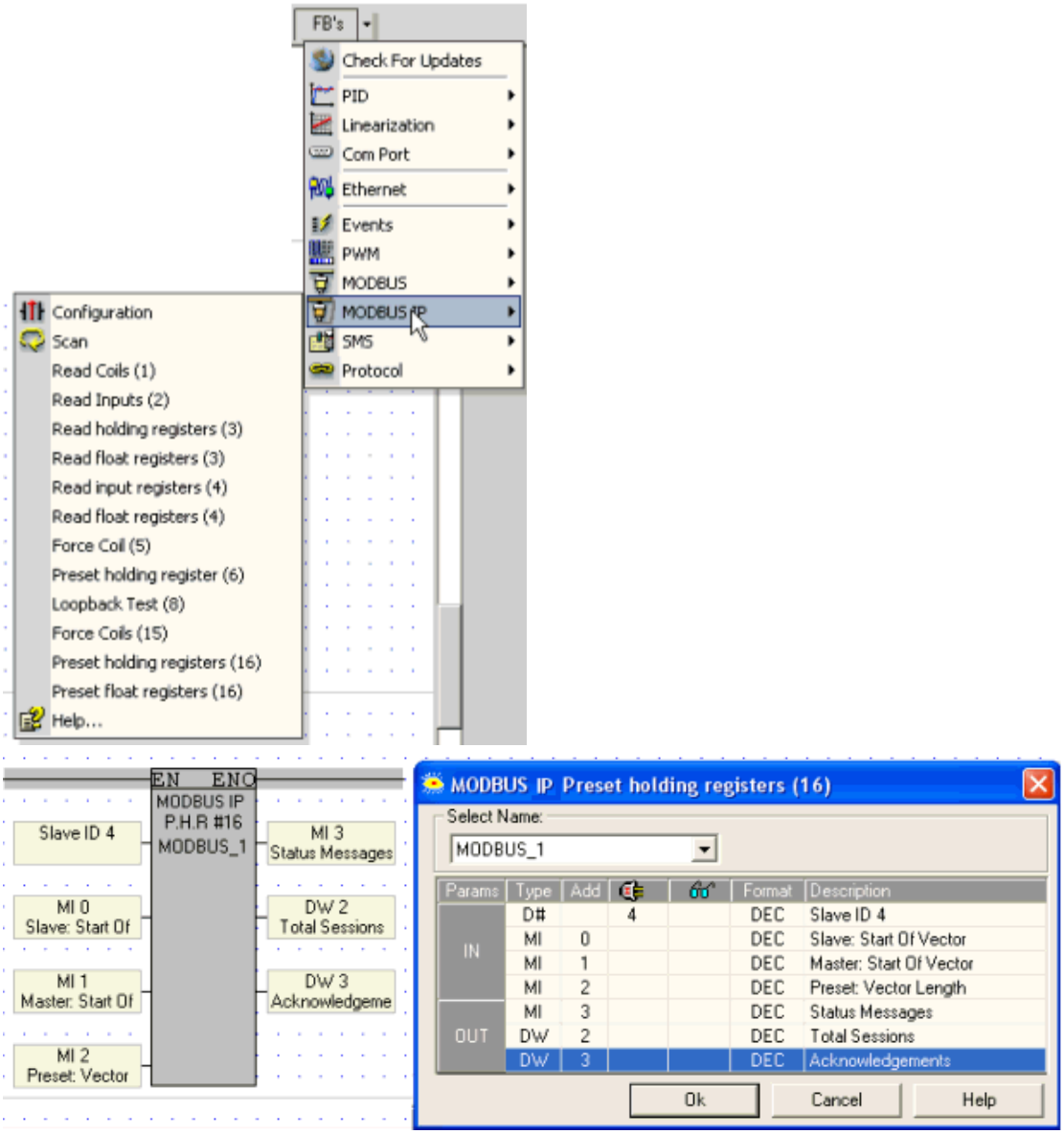




Parameter	Type	Function
Slave ID	Constant or MI	The IP address of the slave device containing the coils to be forced (target).
Slave:Start of Vector	Constant, MI, ML, or DW	The start of the vector of coils to be forced (data target). **Note** ♦ Check topic Slave Address Tables.
Master: Start of Vector	MI, SB, I, O,T	This is the start of a vector of MBs that will contain the coils' status in the master (data source).
Force: Vector Length	Constant or MI	The vector length. **Note** ♦ A MODBUS command cannot read/write more than 1900 bit operands at one time. In addition, 0 is not a legal length.
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands
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. MODBUS IP Operations are located on the *FBs menu*.

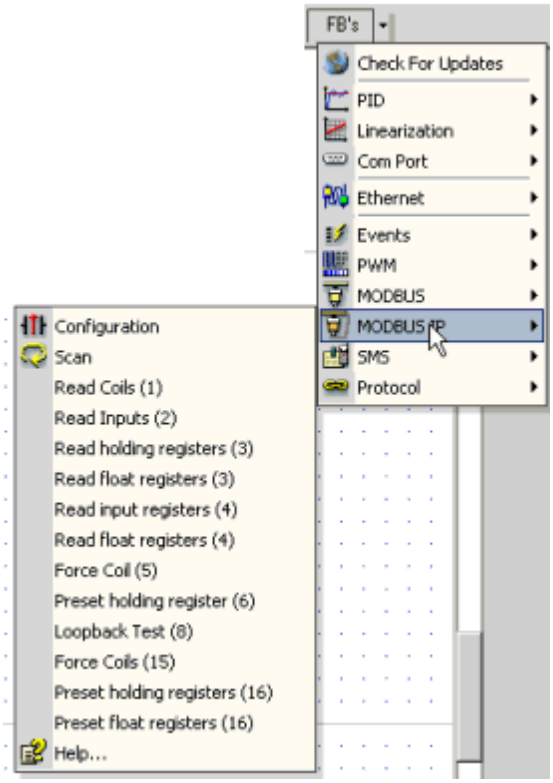


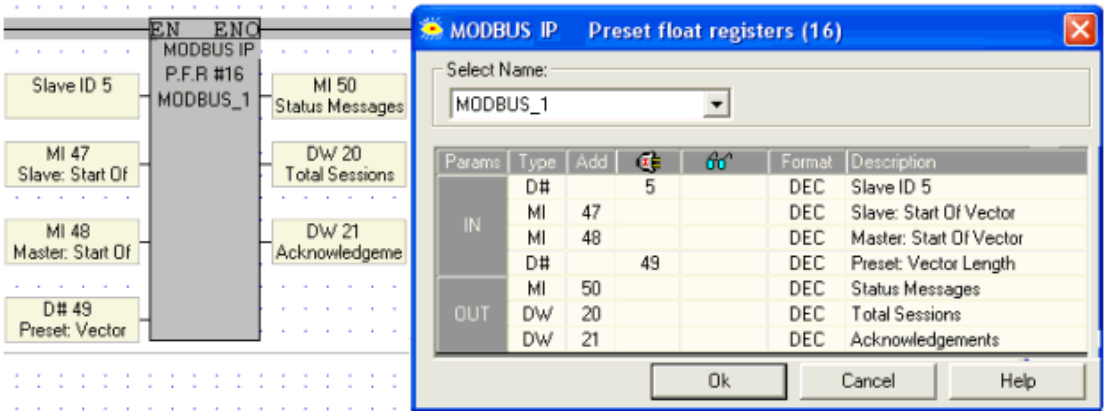
Parameter	Type	Function
Slave ID	Constant or MI	The IP address of the device containing the registers to be preset (target).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of registers to be preset (target). **Note** ♦ Check topic Slave Address Tables.
Master: Start of Vector	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. **Note** ♦ A MODBUS command cannot read more than 124 16-bit integers, 62 double registers, or 64 float registers at one time. In addition, 0 is not a legal length. ♦ If, within the Slave: Start of Vector parameter, the selected register type is

		a **32-bit double register** (slave addresses 5100 and greater)the preset vector length must be doubled as well. If, for example: - Slave: Start of Vector parameter is set to 6300, and - You wish to preset 4 registers, for a total of 16 bytes - You must set the Preset Vector length to 8. Note that this means that, in these cases, the Preset: Vector Length parameter will always be an even number.
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands.
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. MODBUS IP Operations are located on the *FBs menu*.





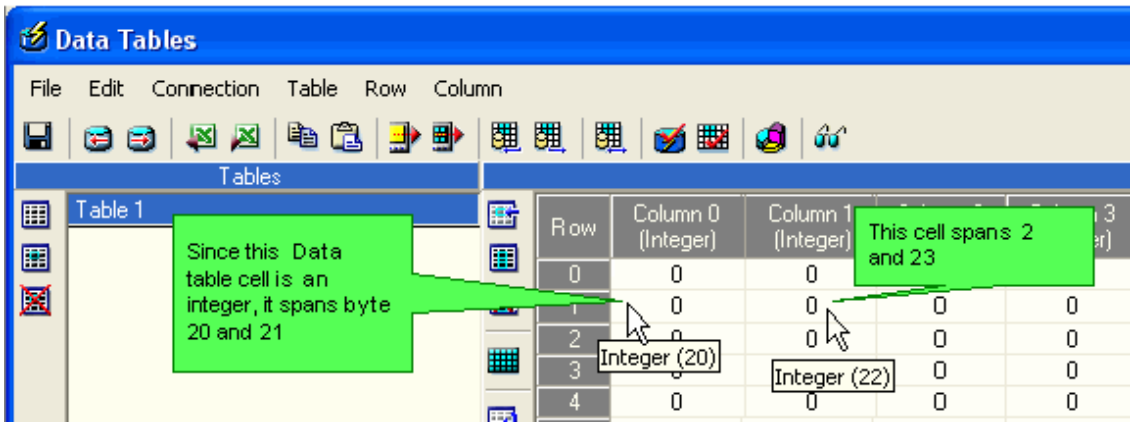
Parameter	Type	Function
Slave ID	Constant or MI	The IP address of the device containing the register to be preset (target).
Slave: Start of Vector	Constant, MI, ML, or DW	The address of the register to be preset (target). **Note** ♦ Check topic Slave Address Tables.
Master: Start of Vector	MI, SI, ML, 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.
Preset: Vector Length	Constant, MI, ML, or DW	The length of the vector of registers in both master and slave. **Note** ♦ A MODBUS command cannot read more than 124 16-bit integers, 62 double registers, or 64 float registers at one time. In addition, 0 is not a legal length. ♦ If, within the Slave: Start of Vector parameter, the selected register type is a **32-bit double register** (slave addresses 5100 and greater)the preset vector length must be doubled as well. If, for example: - Slave: Start of Vector parameter is set to 6300, and - You wish to preset 4 registers, for a total of 16 bytes - You must set the Preset Vector length to 8. Note that this means that, in these cases, the Preset: Vector Length parameter will always be an even number.
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Operands.
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/Write from Data Tables

Use these commands to access the bytes in Vision data tables **without** reference to table structure.

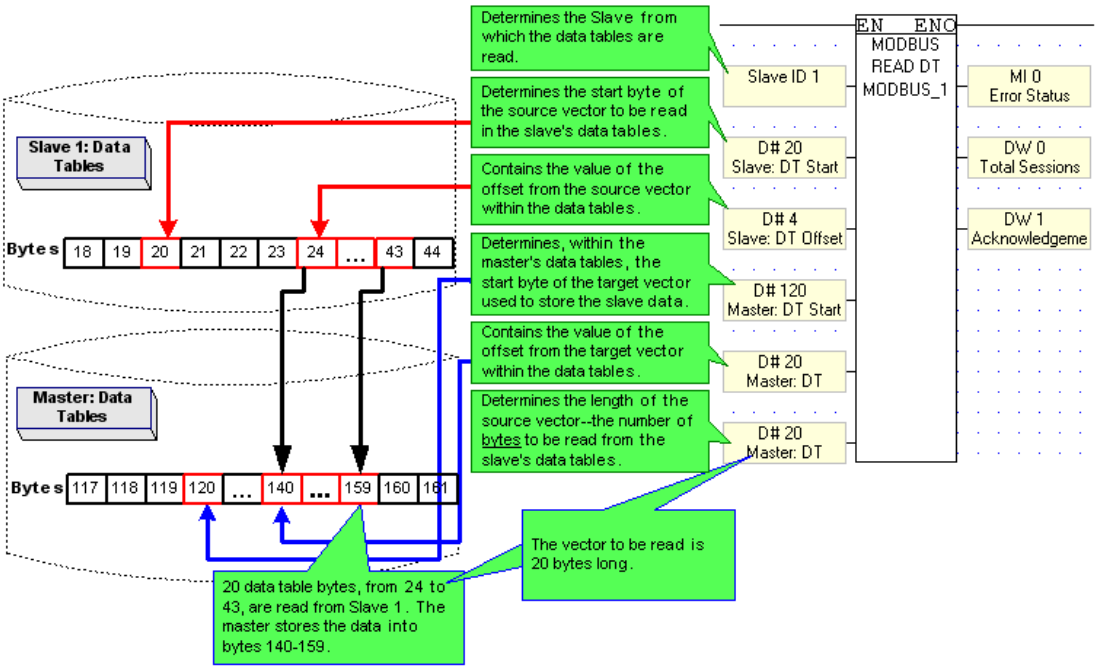
To determine the byte number of a data table cell, hold the cursor over the data table cell. A Tooltip opens, displaying the byte number.

Note ♦ A MODBUS command cannot read/write more than 242 DT bytes at one time.
In addition, 0 is not a legal length.



Read from Data Table

Below, a MODBUS master reads data tables in Slave ID 1. Bytes 24-43 are read from Slave 1 into bytes 140-159 in the master's data tables.

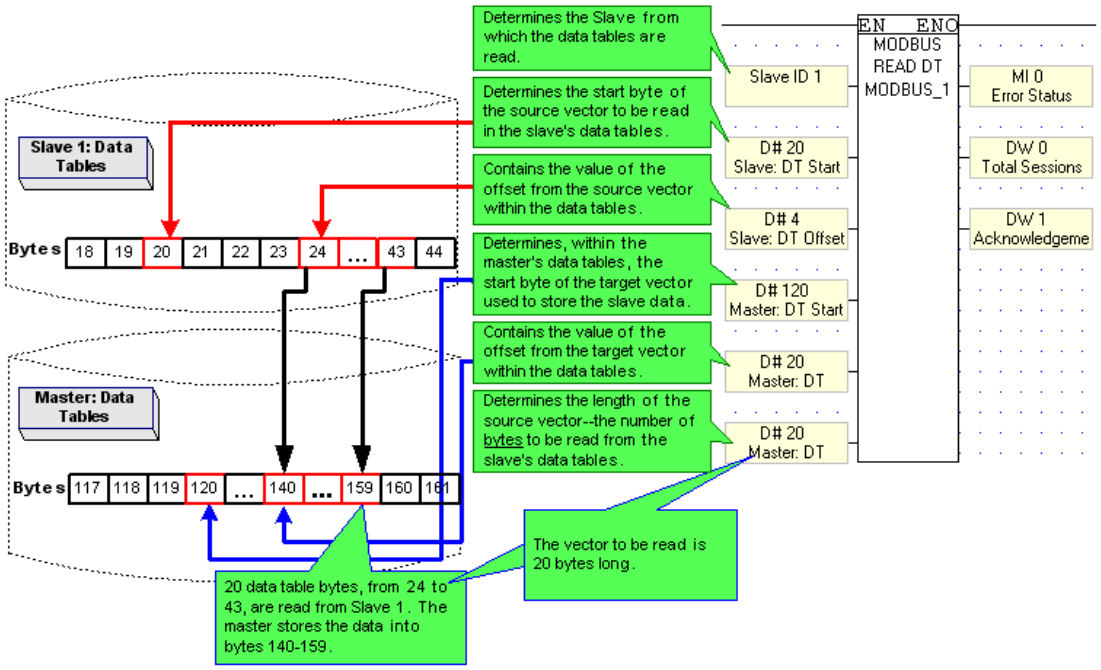


Parameter	Type	Function
Slave ID	Constant or MI	The ID of the slave device containing the coils to be read (data source).
Slave: DT Start of Vector	Constant, MI, ML, or DW	The start of the vector of bytes to be read (data source).
Slave: DT Offset in Vector	Constant, MI, ML, or DW	Offset from the Slave: DT Start of Vector
Master: DT Start of Vector	Constant, MI, ML, or DW	This is the start of a vector of bytes that will contain the data read from the slave.
Master: DT Offset	Constant,	Offset from the Master: DT Start of Vector

in Vector	MI, ML, or DW	
Read: DT Vector Length	Constant or MI	The vector length. **Note ♦** A MODBUS command cannot read/write more than 242 DT bytes at one time. In addition, 0 is not a legal length.
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Messages.
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.

Write to Data Table

Below, a MODBUS master writes to data tables in Slave ID 1. Bytes 140-159 are written from the master into bytes 24-43 in the slave's data tables.



Parameter	Type	Function
Slave ID	Constant or MI	The ID of the slave device to which the data will be written (data target).
Slave: DT Start of Vector	Constant, MI, ML, or DW	The start of the vector of bytes to be written into (data target).
Slave: DT Offset in Vector	Constant, MI, ML, or DW	Offset from the Slave: DT Start of Vector
Master: DT Start of Vector	Constant, MI, ML, or DW	This is the start of a vector of bytes, in the master, that will contain the data to be written to the slave (data source)
Master: DT Offset	Constant,	Offset from the Master: DT Start of Vector

in Vector	MI, ML, or DW	
Read: DT Vector Length	Constant or MI	The vector length. **Note** ♦ A MODBUS command cannot read/write more than 242 DT bytes at one time. In addition, 0 is not a legal length.
Status Messages	MI	Shows a message number. To check status and diagnose errors, check the MODBUS Status Messages.
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

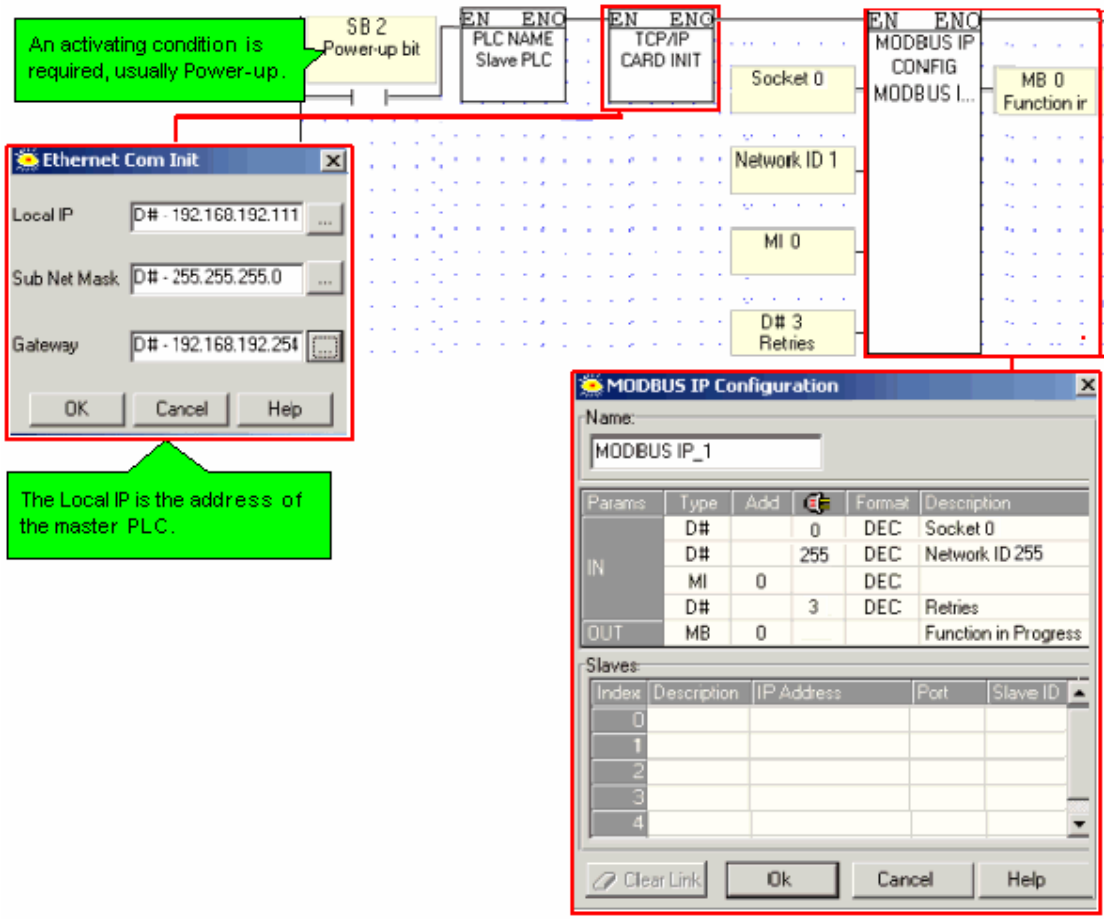
The Ladder section below shows what elements are necessary to enable a master device to read from a slave. Note that the MODBUS Scan operation should **not** be performed during the initial program scan.

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

The slave PLC Ladder application must include the elements shown below.

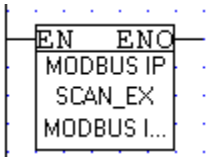
Step 1: Initializing the Ethernet card and configuring MODBUS

Note that all slave devices must be assigned ID number 255.



Step 2: Scan

To enable the master PLC to access the slave, include a MODBUS Scan FB in the slave's application.



Slave Addressing

Slave Address Tables

Coils		MODBUS Command Number	
Pointer Value From:	Operand type	Read	Write
0000	MB 0-2999	#01 Read Coils	#15 Force Coils

3000	SB	#15 Force Coils
4000	I (read-only)	Read-only
5000	O	#15 Force Coils
6000	T(read-only)	Read-only
7000	C(read-only)	Read-only
8000	MB 3000-4095	

Note ♦ Note that in order to access MBs 3000-4095, you address as follows: to access MB 3012, request slave address 8012.

Registers			**MODBUS Command Number**	
Pointer Value From:	Operand type	Register size	Read	Write
0000	MI	16 bit	# 03 Read Holding Registers	# 16 Preset Holding Registers
4000	SI	16 bit		
5100	ML	32 bit		
6100	SL	32 bit		
6300	MDW	32 bit		
6700	SDW	32 bit		
6900	Timer preset	32 bit		
7200	Timer current	32 bit		
7500	Counter	16 bit		

7700	MF 0	32 bit

Examples

The examples below show that:

- MODBUS addressing systems start at 1.
- Vision addressing start at 0.

Bit Operands

Read a 10-bit vector of inputs in a slave Vision controller, starting at Input 20, via Read Coils (MODBUS COMMAND #1)

- Vision PLC as the MODBUS master
  In VisiLogic's Read Coils FB, set the Slave: Start of Vector parameter to 4020, and the Read: Vector Length parameter to 10. Within the slave Vision controller, VisiLogic will read I 20 - I 29.
- SCADA as the MODBUS master
  In the SCADA application, set the Slave: Start of Vector parameter to 34021(30001 + 4000 + 20), and the Read: Vector Length to 10, enabling the Master device to read I 20 - I 29 within the slave Vision controller.

Write a 3-bit vector of outputs in a slave Vision controller, starting at Output 8, via Force Coils (MODBUS COMMAND #15)

- Vision PLC as the MODBUS master
  In VisiLogic's Force Coils FB, set the Slave: Start of Vector parameter to 5008, and the Read: Vector Length parameter to 3. Within the slave Vision controller, VisiLogic will write to O 8 - O 10.
- SCADA as the MODBUS master
  In the SCADA application, set the Slave: Start of Vector parameter to 35009 (30001 + 5000 + 8) and the Read: Vector Length parameter to 3, enabling the Master device to write to O 8 - O 10 within the slave Vision controller.

Registers

Read a 9-register long vector of **16-bit integers** in a slave Vision controller, starting at MI 32, via Read Holding Registers (MODBUS COMMAND #03)

- Vision PLC as the MODBUS master
  In VisiLogic's Read Holding Registers FB, set the Slave: Start of Vector parameter to 32, and the Read: Vector Length parameter to 9. Within the slave Vision controller, VisiLogic will read MI 32 - MI 41.
- SCADA as the MODBUS master
  In the SCADA application, set the Slave: Start of Vector parameter to 40033 (40001 + 0000 + 3), and the Read: Vector Length parameter to 9, enabling the Master device to read MI 32 - MI 41 within the slave Vision controller.

Note

- If, within the Slave: Start of Vector parameter, the selected register type is a **32-bit double register** (slave addresses 5100 and greater)the preset vector length must be **doubled** as well.
  If, for example in the VisiLogic Preset Holding Registers FB:

- Slave: Start of Vector parameter is set to 6300, and
- You wish to preset 4 registers, for a total of 16 bytes
- You must set the Preset Vector length to 8.

Note that this means that, in these cases, the Preset: Vector Length parameter will always be an even number.

Read a 9-register long vector of **32 -bit integers** in a slave Vision controller, starting at SL 32, via Preset Holding Registers (MODBUS COMMAND #16)

- Vision PLC as the MODBUS master
  In VisiLogic's Preset Holding Registers FB, set the Slave: Preset Vector parameter to 6132, and the Read: Vector Length parameter to 18 (2x9, in order to fit the 32-bit SL registers). Within the slave Vision controller, VisiLogic will read SL 32 - SL 41.
- SCADA as the MODBUS master
  In the SCADA application, set the Slave: Start of Vector parameter to 406133, and the Read: Vector Length parameter to 18, enabling the Master device to read SL 32 - SL 41 within the slave Vision controller.

Write a 6-register long vector of **16-bit integers** in a slave Vision controller, starting at MI 32, via Preset Holding Registers (MODBUS COMMAND #16)

- Vision PLC as the MODBUS master
  In VisiLogic's Preset Holding Registers FB, set the Slave: Start of Vector parameter to 32, and the Preset: Vector Length parameter to 6. Within the slave Vision controller, VisiLogic will write to MI 32 - MI 37.
- SCADA as the MODBUS master
  In the SCADA application, set the Slave: Start of Vector parameter to 40033, and the Read: Vector Length parameter to 6,enabling the Master device to write to MI 32 - MI 37 within the slave Vision controller.

MODBUS Status Operands

All of the Status operands linked to MODBUS FBs should be assigned Power-up Values; bits should be reset, and registers initialized to 0.

MODBUS: Configuration FB Status Operand
All MODBUS operations run through a MODBUS configuration placed in the master device's program.

Function in Progress	MB	Turns ON when:	Turns OFF when
Shows status of master's **MODBUS Configuration**		• A master Vision initiates MODBUS communication. • Remains ON during the MODBUS session.	• The **MODBUS: Configuration** is activated. • An answer is received from a slave. • The TimeOut defined in the **Configuration** is exceeded. • Certain Status Messages are given

MODBUS Operation Status Operands
When you place MODBUS operations in your application (Force, Read, Preset, and Loopback commands), you link the operands below. These show the status of MODBUS sessions.

Status Shows status of master's data requests and the replies the master receives from the slaves	**MI**	• Automatically initialized to 0 when MODBUS operation is activated. • Updated at the end of each attempt to communicate via MODBUS. • Indicates status of **MODBUS** communications, according to the table below. Note that the current value always shows the most **recent** status.

#	Status Message
0	**Status OK**
1	**Unknown Command Number** This is received from the slave device.
2	**Illegal Data Address** • Master: an invalid address is found by the master before a data request is sent to a slave. This may result, for example, when an MI is used to provide vector length. • Slave: The slave notifies the master that the data request command includes invalid addresses. • Slave--ScanEX: When ScanEX receives an input parameter in the 32-bit range (for example, 5100{ML}), it automatically takes double-register values. If, for example, ScanEX receives a Read Register(6) request for **5100**, it returns the values in 5100 **and** 5101. If, however, ScanEX receives Read Register(6) request for **5101**, it returns Error #2-- since 5101 provides the 'high' bytes of the 32-bit register, it is not a legal address.
3	**Slave to Master: Illegal Data Type Quantity** Number of operands requested by user exceeds the maximum **Note ♦** A MODBUS command cannot read more than 124 16-bit integers, 62 double registers, 62 float registers, or 1900 bit operands at one time. In addition, 0 is not a legal vector length.
4	**Master--Time Out** The amount of time the master will attempt to establish a MODBUS session
5	**No Communication** The MODBUS session cannot be established.
Note ♦ Messages 4 & 5. **TimeOut** and **Number of Retries** are defined in the **Configuration**. A Retry is an attempt to establish a MODBUS session. If, for example, TimeOut is defined as 2 seconds, and number of Retries as 3: - the controller will try to establish the session once, and will continue to try for 2 seconds. - If the first attempt fails, the **Status Message value will be 4**, Master TimeOut. -The controller will try twice more, for a total of 3 retries over 6 seconds. - If all attempts fail, the **Status Message value will be 5**. -If any attempt succeeds, the Status Message will be 0.	
* 6	**Master-slave data incorrectly synchronized**
* 7	**Master-slave data incorrectly synchronized**

8	**Master to application: Illegal Data Type Quantity** Number of operands requested by user exceeds the maximum permitted for that FB operation in the master. **Note ♦** A MODBUS command cannot read more than 124 16-bit integers, 62 double registers, 62 float registers, or 1900 bit operands at one time. In addition, 0 is not a legal vector length.
9	**Slave ID Mismatch** The Slave ID master sends a command to a slave unit whose IP, as defined in the Configuration, does not match the slaves's index number.
*** 11**	**Master-slave data incorrectly synchronized**

* Messages 6, 7, and 11mean that the master has found incompatible elements in the data sent between master and slave.

Total Sessions	DW	This is the total number of times the master PLC attempts to access the slave device, whether the attempt is successful or not, including Retries. Note that this is a simple incremental counter. • This must be initialized by the user, by storing 0 into the selected DW.
Acknowledgements	DW	This is the number of times the slave device answers. • This must be initialized by the user, by storing 0 into the selected DW.

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