

## 12.0 I/O Read and Write Instructions

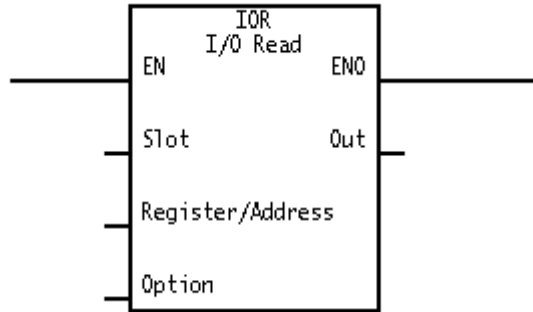
Use the I/O Read and I/O Write instructions to send information to and receive information from I/O modules. These instructions are particularly useful for reading data from and writing data to non-Reliance I/O modules that are only byte-accessible or to any modules that have not been configured.

The supported parameters are:

- simple integers and double integers
- integer and double integer constants
- element of an integer or double integer array

See the input and output parameter descriptions for each instruction for specific information.

## 12.1 I/O Read (IOR)



Use the I/O Read instruction to get information from I/O modules. This instruction is useful for reading data from:

- non-Reliance I/O modules that are only byte-accessible
- any modules that have not been configured in the rack configurator

Use the I/O Read instruction to read a:

- byte - This is used for modules that support only 8-bit addressing.
- double byte - This should only be used for non-Reliance modules that contain 16-bit data but only support 8-bit Multibus access.
- integer (16-bits)
- double integer (32-bits)

While the enable bit is true, the Processor reads the I/O data you specified from the location you specified. The data is stored in Out.

### 12.1.1 Input Parameters for the I/O Read Instruction

This table lists the inputs for the I/O Read instruction and the variable type and the data type/range that each input supports.

Parameter	Description	Variable Type	Data/Type Range
EN	While this input is true, the instruction executes. When this input is false, the instruction is not executed and ENO is false.	Connect a Boolean input or output.	
Slot	Enter the slot number of the AutoMax rack in which the I/O module resides. If you are using the Address input, you cannot enter a slot number.	<ul style="list-style-type: none"><li>• simple</li><li>• constant</li><li>• element of an array</li></ul>	integer (4-15)
Register/	Enter the 16-bit register number to be accessed in the selected slot within the AutoMax rack. The slot and register information define the location of the data.		integer or double integer (0 to 32767 [7FFFH])

Parameter	Description	Variable Type	Data/Type Range
Address	<p>Enter the address of the location that contains the data you want to read. Use this input when you must read a byte from an “odd” address. If you enter an address, the slot input is ignored.</p> <p>You must calculate the address using this information.</p> <ul style="list-style-type: none"> <li>● For a module that follows AutoMax conventions, choose the base address based on the slot that the module occupies and add an offset equal to the register * 2. See “Listing of Base Addresses for Each Slot in the AutoMax Chassis,” section 12.3.</li> <li>● For a non-Reliance module, choose the address that corresponds to the location of the information on the module.</li> </ul>	<ul style="list-style-type: none"> <li>● simple</li> <li>● constant</li> <li>● element of an array</li> </ul>	integer or double integer (0240000 to 2FFFFH)
Option	Define the amount of I/O data you want to read by entering an option number that corresponds to the amount of data you want. See Defining the Amount of I/O Data to Read.		integer (1 to 4)

### 12.1.2 Output Parameters for the I/O Read Instruction

This table lists the outputs for the I/O Read instruction and the variable type and data type/range that each output supports.

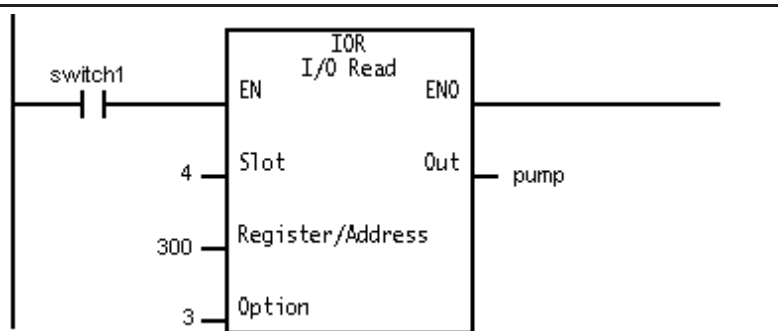
Parameter	Description	Variable Type	Data/Type Range
ENO	Use this output as the input to another instruction for easily chaining multiple instructions. This output follows the state of EN unless an error occurs.	Connect a contact, coil, or Boolean input of another instruction.	
Out	This parameter contains the requested data.	<ul style="list-style-type: none"><li>• simple</li><li>• element of an array</li></ul>	<ul style="list-style-type: none"><li>• integer</li><li>• double integer</li><li>• timer (<i>name</i>.TPreset and <i>name</i>.Elapsed)</li><li>• counter (<i>name</i>.CPreset and <i>name</i>.Current)</li></ul>

### 12.1.3 Defining the Amount of I/O Data to Read

To read:	In the Option field, enter:	In the Register/address field, enter:	Result:
byte	1	data's location	a byte is read
double byte <i>Note: Only use this option to read data from modules that only support an 8-bit Multibus access.</i>	2	data's location	The low byte is read first and then the high byte.
integer (16-bits) <i>Note: Use this option to read data from modules that support AutoMax addressing and data conventions.</i>	3	data's location as an even address	A 16-bit word is read from the designated address.
double integer (32-bits)	4	data's location as an even address	A 32-bit word is read from the designated address in this order: <ul style="list-style-type: none"><li>• MS 16-bit word</li><li>• LS 16-bit word</li></ul>

#### 12.1.4 Example of an I/O Read Instruction

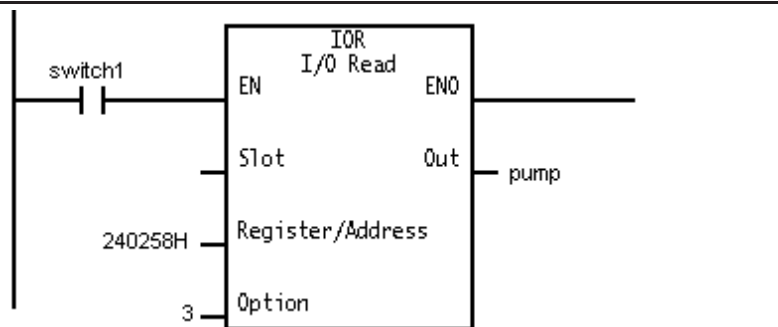
When *switch1* is true, the instruction reads one word of data from register 300 of the I/O module in slot 4 of the AutoMax rack. This data is placed in the variable *pump*.



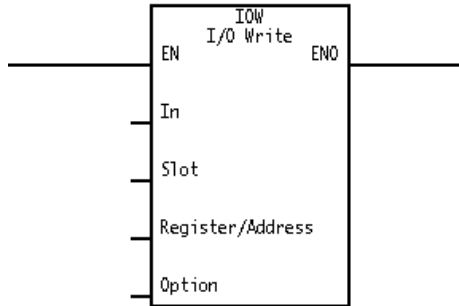
If you were to use an address instead of a slot and register location, the example would look like the instruction below. The Address of 240258H is derived by this formula:

**base register address of slot 4 + 2  
× the register number**

Consequently,  $240000H + 2(300) = 240258H$ .



## 12.2 I/O Write (IOW)



Use the I/O Write instruction to send information to I/O modules. This instruction is particularly useful for writing data to:

- non-Reliance I/O modules that are only byte-accessible
- any modules that have not been configured

Use the I/O Write instruction to write a:

- byte — This is used for modules that support only 8-bit addressing
- double byte — This should only be used for non-Reliance modules that contain 16-bit data but only support 8-bit Multibus accesses
- integer (16-bits)
- double integer (32-bits)

When EN becomes true, the Processor writes the amount of I/O data you specified in the location you specified.

## 12.2.1 Input Parameters for the I/O Write Instruction

This table lists the inputs for the IOW instruction and the variable type and data type/range that each input supports.

Parameter	Description	Variable Type	Data/Type Range
EN	While this input is true, the instruction executes. When this input is false, the instruction is not executed and ENO is false.	Connect a Boolean input or an output.	
Slot	Enter the slot number of the AutoMax rack in which the I/O module resides. If you are entering an Address input, you cannot enter a slot number.	<ul style="list-style-type: none"><li>• simple</li><li>• constant</li><li>• element of an array</li></ul>	integer (4-15)
Register/	Enter the 16-bit register number to be accessed in the selected slot within the AutoMax rack. The slot and register information define the location of the data.		integer or double integer (0 to 32757 [7FFFH])

Parameter	Description	Variable Type	Data/Type Range
Address	<p>Enter the address of the location where you want to write data. If you enter an address, the slot input is ignored. You must calculate the address using this information:</p> <p>For a module that follows AutoMax conventions, choose the base address based on the slot that the module occupies and add an offset equal to the register * 2. (See the Listing of Base Addresses for Each Slot in the AutoMax Chassis)</p> <p>For a non-Reliance module, choose the address that corresponds to the location of the information on the module.</p>	<ul style="list-style-type: none"> <li>● simple</li> <li>● constant</li> <li>● element of an array</li> </ul>	integer or double integer (0240000 to 2FFFFFFH)
Option	Define the amount of I/O data you want to write by entering an option number that corresponds to the amount of data you want. See Defining the Amount of I/O Data to Write.		integer (1-4)

### 12.2.2 Output Parameters for the I/O Write Instruction

This table lists the outputs for the IOW instruction and the variable type that each output supports. To use ENO, connect it to a contact, coil, or Boolean input of another instruction.

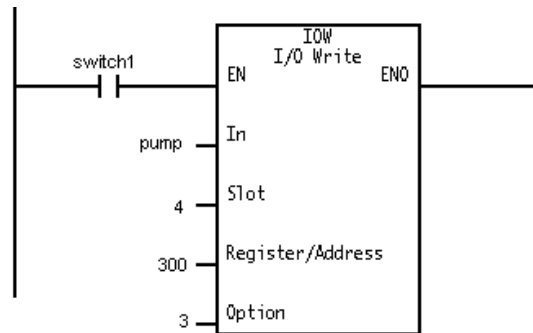
Parameter	Description
EN	Use this output as the input to another instruction for easily chaining multiple instructions. This output follows the state of EN unless an error occurs.

### 12.2.3 Defining the Amount of I/O Data to Write

To write:	In the Option field, enter:	In the Register/ address field, enter:	Result:
byte	1	data's location	a byte is written
double byte <i>Note: Use this option to write data to modules that only support an 8-bit Multibus access.</i>	2	data's location	The low byte is written first and then the high byte.
integer (16-bits) <i>Note: Use this option to write data from modules that support AutoMax addressing and data conventions.</i>	3	data's location as an even address	A 16-bit word is written from the designated address.
double integer (32-bits)	4	data's location as an even address	A 32-bit word is written from the designated address in this order: <ul style="list-style-type: none"><li>• MS 16-bit word</li><li>• LS 16-bit word</li></ul>

## 12.2.4 Example of an I/O Write Instruction

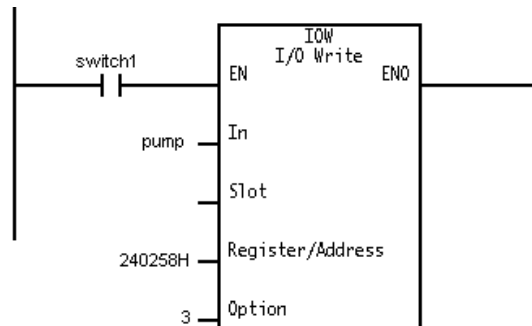
When *switch1* becomes true, the instruction writes one word of data from the variable *pump* to register 300 of the I/O module in slot 4 of the AutoMax rack.



If you were to use an address instead of a slot and register location, the example would look like the instruction below. The Address of 240258H is derived by this formula:

**base register address of slot 4 + 2  
× the register number**

Consequently,  $240000H + 2(300) = 240258H$ .



## 12.3 Listing of Base Addresses for Each Supported Slot in the AutoMax Chassis

Slot	Hex Address Range	Slot	Hex Address Range
4	240000 to 24FFFF	10	2A0000 to 2AFFFF
5	250000 to 25FFFF	11	2B0000 to 2BFFFF
6	260000 to 26FFFF	12	2C0000 to 2CFFFF
7	270000 to 27FFFF	13	2D0000 to 2DFFFF
8	280000 to 28FFFF	14	2E0000 to 2EFFFF
9	290000 to 29FFFF	15	2F0000 to 2FFFFF

## 12.4 Errors Caused by the I/O Read and I/O Write Instructions

This section describes the possible errors for I/O read and I/O write instructions.

If this error occurs:	Then:	Do the following:
<ul style="list-style-type: none"> <li>● An illegal slot number of an IOR or IOW is selected</li> <li>● An illegal register of an IOR or IOW is selected</li> </ul>	ENO is set according to ERROR_ENO, and nothing is written to Out.	Correct the slot and register or address parameters used in the instruction.
An illegal option of an IOR or IOW instruction is selected.	ENO is set according to ERROR_ENO, and nothing is written to Out.	Correct the number in the option field. The valid range is 1-4.
The array index is negative	ENO is set according to ERROR_ENO, and element zero of the variable will be used for the instruction's operation.	Specify a valid array element.
The array index is too large	ENO is set according to ERROR_ENO, and element zero of the variable will be used for the instruction's operation.	Specify a valid array element.
(I/O Read Only) The result is larger than what Out's data type supports	ENO is set according to ERROR_ENO, and Out contains the largest signed value allowed for the data type being used.	Specify the variable in Out to be a double integer.