

Polling Data from Allen-Bradley PLC

Using Serial Protocol

APPLICATION NOTE

AUG-0045-00 2.2 en-US ENGLISH

Important User Information

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1 Preface

1.1 About This Document

This document explains in a few steps how the Flexy can poll data registers from an Allen-Bradley PLC based on DF1 or ABLOGIX serial protocols.

For additional related documentation and file downloads, please visit www.ewon.biz/support.

1.2 Document history

Version	Date	Description
1.0	2011-12-11	First release
2.0	2019-07-29	Changed: General update
2.1	2019-11-07	Changed: Configure the IO Server, p. 7
2.2	2021-05-31	Changed: Table in SLC500 Family, p. 17

1.3 Related Documents

Document	Author	Document ID
Polling Data from Allen-Bradley using Ethernet Protocol	HMS	AUG-0079-00
Ewon Flexy Base Units	HMS	IG-0014-00
FLA 3301 - Serial Ports Extension Card	HMS	IG-0016-00
Flexy Family Reference Guide	HMS	RG-0008-00

1.4 Trademark Information

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2 Objectives

The objective of this document is to explain how the Flexy can poll data registers out of one or more Allen-Bradley PLCs using DF1 or ABLOGIX.

Polling PLC data registers implies the following steps:

1. Link the Flexy with the PLC;
2. Configure the Flexy IO server;
3. Create tags in the Flexy;
4. Monitor tags.

3 Requirements

3.1 Hardware

To follow this guide, you need:

- ▶ A computer suitable to connect to the Ewon Flexy.
 - From a computer running a web-browser, you will configure the IO server in the Flexy to poll different types of PLC data registers.
 - You access the Flexy web server either by using (one of) its local LAN port(s) or by another type of access such as VPN IP address.
- ▶ An Allen-Bradley PLC: PLC5, SLC500, MicroLogix, CompactLogix, ControlLogix or FlexLogix.
 - Connection between the Ewon Flexy and the Allen-Bradley PLC must be done through serial protocol. The serial port could be on the base unit as in the Flexy 202 or on a Flexy extension card: FLA 3301 – 2 serial ports. For polling tags over Modbus TCP with an Ethernet connection, see “Polling Data from Allen-Bradley using Ethernet Protocol” from [Related Documents, p. 3](#).
 - The device will have its registers read by the tags configured in the IO server of the Flexy.

3.2 Software

3.2.1 eBuddy

The Flexy is configured through its web server. All you need is a standard web browser software such as Google Chrome® or Mozilla Firefox®.

Additionally, we suggest downloading the **eBuddy** utility on [our website](#).

This utility can list all the Ewon Flexy on your network and change the default IP address of a Flexy to match your LAN IP address range. With eBuddy you can also easily upgrade the firmware of your Flexy if required.

3.2.2 Ewon Flexy Firmware

The screenshots of this guide reflect firmware version 13.3s0, but you can expect the basic principles to remain the same in earlier/later versions.

A simple way to upgrade the Flexy firmware is to use eBuddy.

3.3 PLC Protocol Compatibility

The table below shows the protocols that are supported by the Flexy and, for each of those protocols, which IO server you need to use inside the Ewon Flexy to connect your Allen-Bradley PLC.

PLC Family	DF1 Protocol (RS232 link)	Flexy IO server
SLC500	Yes	DF1
MicroLogix	Yes	DF1
PLC5	Yes	DF1
CompactLogix	Yes	ABLOGIX
ControlLogix	Yes	ABLOGIX
FlexLogix	Yes	ABLOGIX

The DF1 IO server name does not mean that this server is limited to the DF1 protocol and associated serial link.

The DF1 IO server supports the EIP protocol of the listed PLC families as well.

4 Implementation Steps

4.1 Link the Flexy and the PLC

1. In the PLC configuration, the serial port must be configured in **DF1 Full Duplex** mode.
This is the standard setting for the PLC interface when used for programming maintenance.
2. Use the Allen-Bradley DF1 crossed serial cable (ref 1747-CP3) or equivalent to interconnect the Flexy with the PLC.
3. The serial port on the Flexy — base unit or extension card — must be in RS232 mode.

For the FLA 3301 – 2 Serial Ports Extension card:

- Port S2 is fixed RS232 mode.
- Port S1 is configurable with dip switches. The proper configuration is printed on the extension card to the left of the switches.

You must also configure the serial interface inside the Flexy:

1. Go to the Flexy web interface.
2. Browse to *Setup* ► *System* ► *Communication* ► *General* ► *Serial ports*.
3. Set the different serial ports you need according to the RS* protocol used by your PLC.

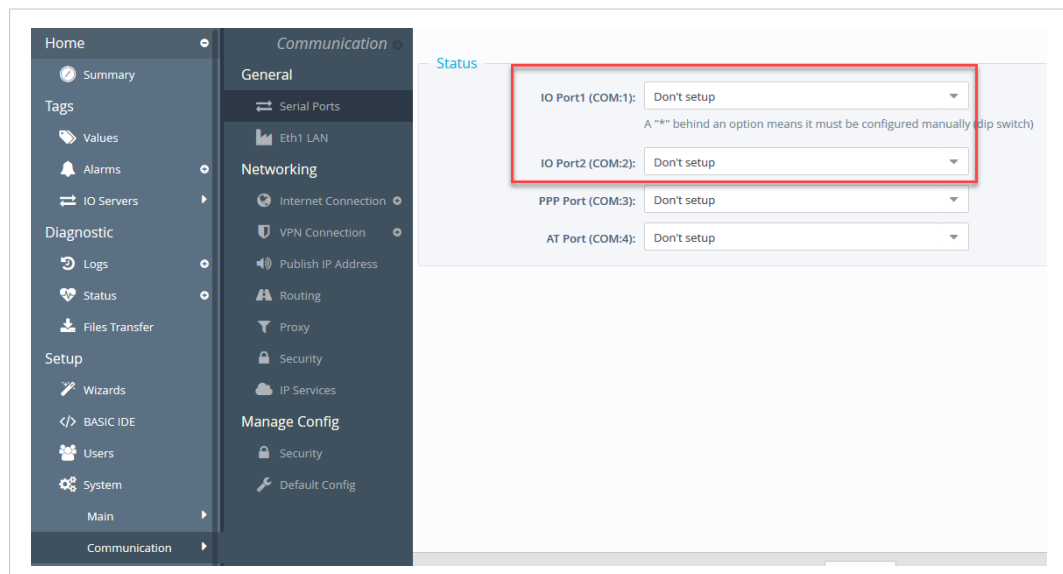


Fig. 1 Serial port configuration on Ewon Flexy web interface

The pinout for the serial port on the Flexy is available in the Installation Guides for the Flexy and for the FLA 3301 serial port extension card, depending if you use the serial port of the Flexy base unit or of the Flexy extension card. For more information, refer to [Related Documents, p. 3](#).

4.2 Configure the IO Server

1. Go to the Flexy's web interface.
2. Select the **IO Servers** menu option.

3. Select the **IO Server** corresponding to your PLC type:
 - **DF1** IO server for SLC500, MicroLogix, and PLC5 devices.
 - **ABLOGIX** IO server for CompactLogix, ControlLogix, and FlexLogix devices.

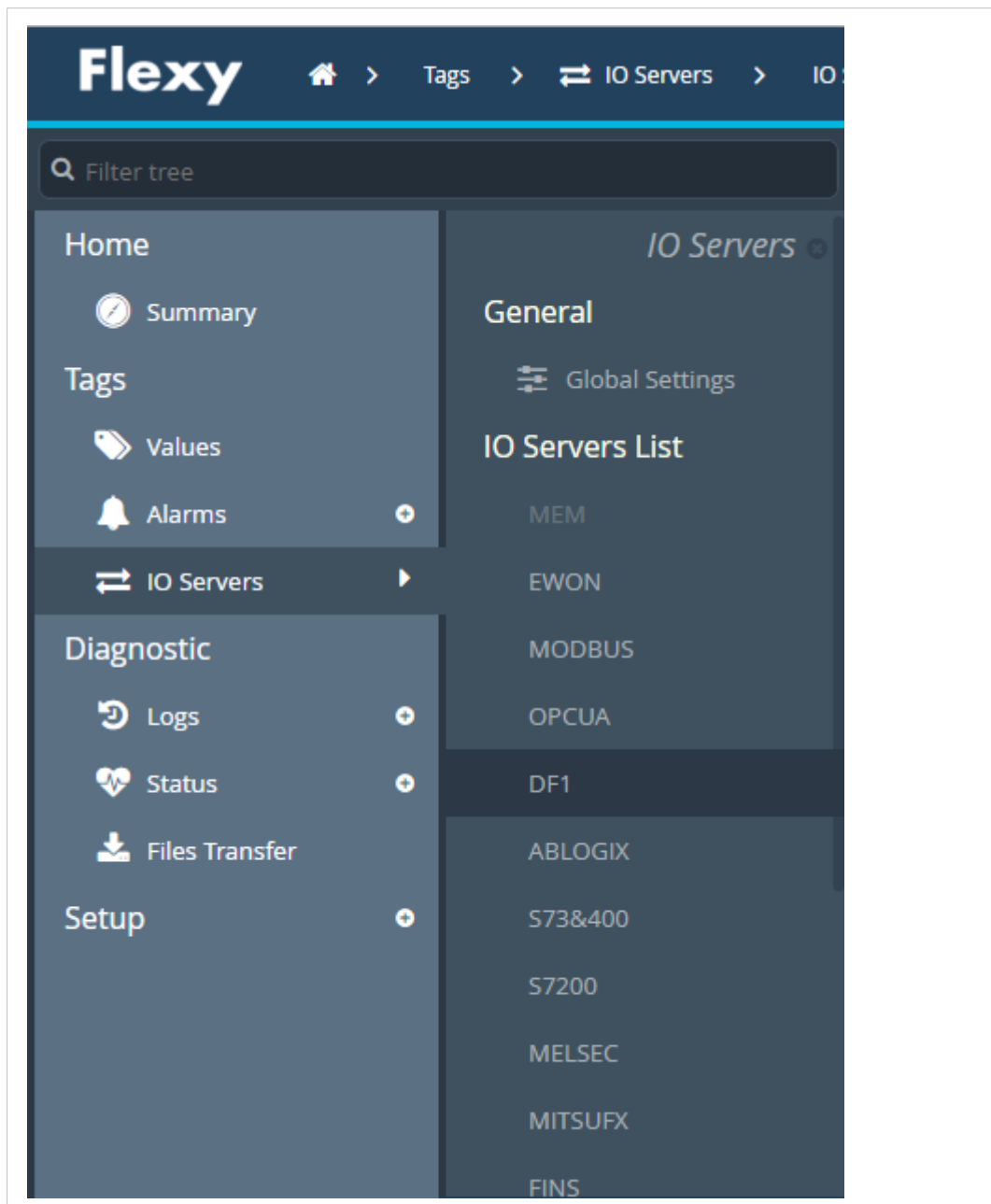


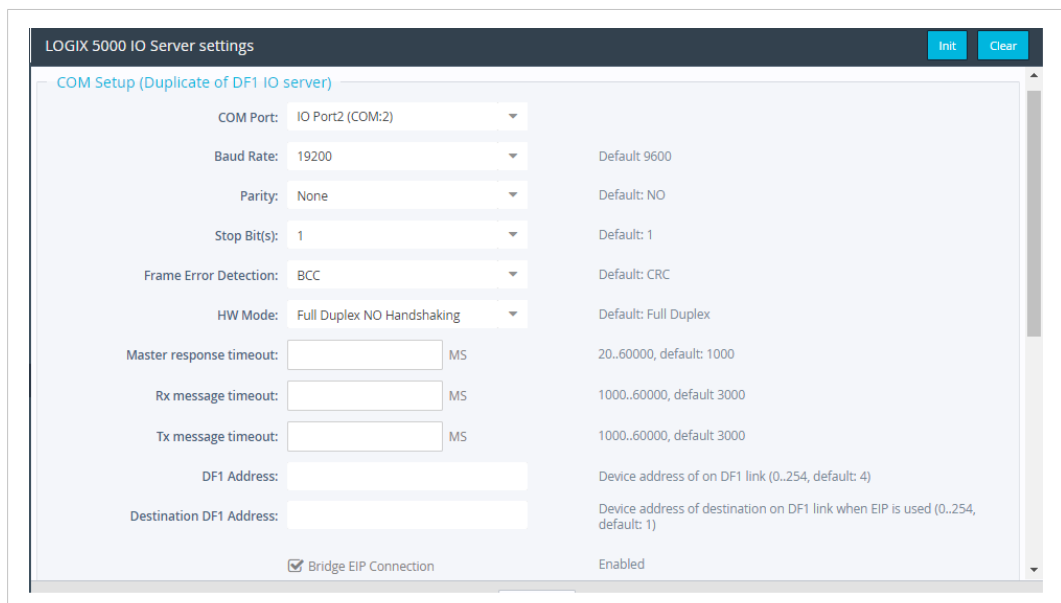
Fig. 2 IO server selection

4. Set the settings of the IO server with the parameters as defined in the PLC you want to poll:
 - a. Select the **COM port** to which the PLC is connected.

The COM port numbering depends on the Flexy model and the number of serial port extension cards installed in the Flexy:

- For a Flexy 205 with a single FLA 3301 (2 Serial Ports) extension card: port “S1” is **COM 1** and “S2” is **COM 2**.
- For other configurations, see the Installation Guides for your Flexy model and extension cards from the [Related Documents, p. 3](#).

- b. Set the **Baudrate**.
- c. Set the **Parity**.
- d. Set the **Stop Bit**.
- e. Set the **Frame Error detection**.
- f. Select **Full Duplex NO Handshaking** for **HW Mode**.



The screenshot displays the 'LOGIX 5000 IO Server settings' window, specifically the 'COM Setup (Duplicate of DF1 IO server)' section. The settings are as follows:

Parameter	Value	Default
COM Port	IO Port2 (COM:2)	
Baud Rate	19200	9600
Parity	None	NO
Stop Bit(s)	1	1
Frame Error Detection	BCC	CRC
HW Mode	Full Duplex NO Handshaking	Full Duplex
Master response timeout	[] MS	20..60000, default: 1000
Rx message timeout	[] MS	1000..60000, default: 3000
Tx message timeout	[] MS	1000..60000, default: 3000
DF1 Address	[]	Device address of on DF1 link (0..254, default: 4)
Destination DF1 Address	[]	Device address of destination on DF1 link when EIP is used (0..254, default: 1)
Bridge EIP Connection	<input checked="" type="checkbox"/>	Enabled

Fig. 3 DF1 IO server settings

5. Enable at least one **Topic** to be able to poll data registers — called tags — out of your PLC. Topics are meant to allocate common properties to a group of tags. Properties include *Enable/Disable* polling, *Poll Rate*, and *Global Device Address*.
 - a. Enter a valid address in the **Global Device Address** as per the table below.

PLC Family	Flexy IO server	Address syntax for DF1 protocol (serial link)
SLC500	DF1	1
MicroLogix	DF1	1
PLC5	DF1	PLC5-1
CompactLogix	ABLOGIX	1
ControlLogix	ABLOGIX	1
FlexLogix	ABLOGIX	1

Even though there are only three topics, the Flexy can support polling from more than three PLCs on the same IO server.

To poll from more than three PLCs, do not specify the device address in the topic. Instead, include the device address as part of the tag address – when configuring the tag itself – as described later in this document.

When entering a device address, a helper appears to indicate if the address uses a valid syntax for this IO server. An address using a valid syntax is displayed in green and an invalid syntax in red.

- b. Define the refresh rate in ms (milliseconds) inside the **Poll Rate** which is applicable to all.

The poll rate is the refresh rate in ms (milliseconds) applicable to all data registers that is included in this topic. If you leave this field blank, the default value applied will be 2000 ms (2 seconds).

If you have tags that need to be refreshed at different rates, enable and configure multiple topics.

6. Click on **Update** to save your settings.

4.3 Create Tags in the Flexy

1. Select the **Values** option from the Tags menu.
2. Switch the “Mode” to **Setup**.

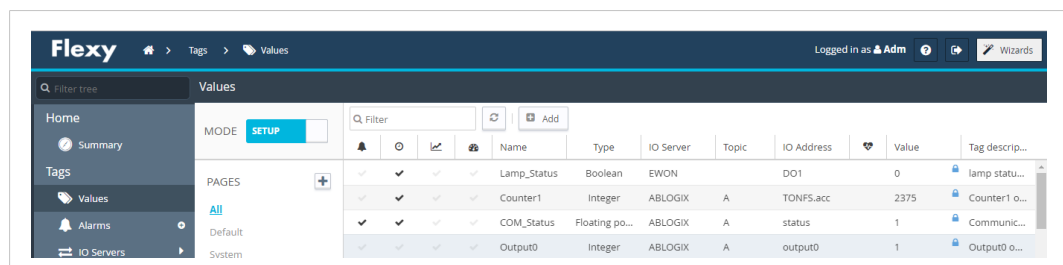


Fig. 4 Tag setup

3. Click the **Add** button to open the tag configuration window.

4. Enter the **parameters of the tag** you want to create:
 - a. Enter a **Tag Name**.
Free text, no spaces, no symbols -, =, %, \$, @, # etc.
 - b. Enter a **Description**.
Free text.
 - c. Select **DF1** or **ABLOGIX** as IO server depending on the product family of the relevant PLC.
 - d. Enter a **Topic Name**: A, B or C.
The topic must have been configured in the IO server page (see [Configure the IO Server, p. 7](#)).
 - e. Enter the **PLC register** in the “Address” field which will be polled from the PLC.
As the address is entered, a tag helper appears to help properly format the tag address.
Typical examples addresses:

DF1 IO server	ABLOGIX IO server
N7:1	myvar
B3:4	PROGRAM:myprog.myvar
T4.ACC	myvar/4
F8:10	mytable[6]

If you enter a wrong address syntax, the tag creation will be rejected and an error message will be displayed.

For more information on data register ID syntax, see [Allen-Bradley Tag Address Syntax, p. 17](#).

Create a new Tag

Identification

Tag Name: MyTag Page: Default

Tag Description: This tag represents the #

I/O Server Setup

Server Name: ABLOGIX Topic Name: A

Address: letUp/4

Type: [.] Continue to: PLC address

eWON value = IO Server Value * 1 + 0

Fig. 5 Tag setup 2

- f. **Type:** The data type of the tag such as *Floating Point* or *Boolean*.

The **Automatic** option lets the Flexy decide the format depending on the IO server register/modifier type.

5. [Optional] The remaining fields are mostly left with their default value:

- **Force Read Only:** Unchecked is the default.

When it is checked, users will not be able to change a value in **View** mode on the **Values** page.



The tag remains read/write for commands written in the embedded BASIC script program or on custom webpages.

- **Ewon value:** Defaults are **1+0*.

This field applies a **scale factor** and an **offset** to the raw value coming from the IO server.

The scale factor and offset are float values. Negative values are accepted.

$TAGval = IOSERVERval * scale\ factor + offset.$

6. Click the **Add** button when your tag configuration is complete.

If everything is OK the new tag appears in the tag list.

You can repeat the same sequence for any other tags. If you need to create new tags that have almost the same properties as an existing tag in the list, select the source tag and click the **Add as selected** option.

All properties of the existing tag will be copied in the new tag creation wizard. Copied properties include the tag name. Since the tag name must be unique, make sure you change the name of the new tag.

It is the first selected tag that will be copied if more than one single tag is selected in the list.

4.4 Monitor Tags

You can change the mode to **View** to monitor tags values and their status.

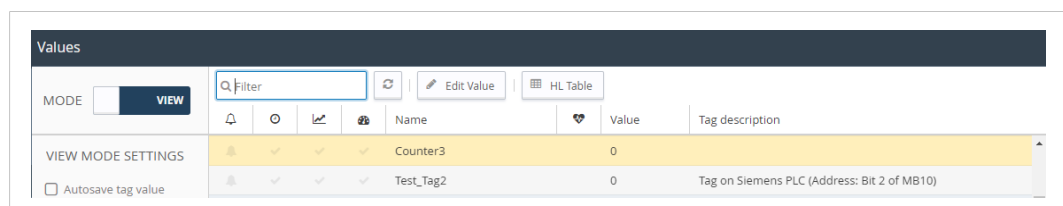


Fig. 6 Monitor tags

This page shows the tags and their last polled values as well as alarm information and logging information for tags with alarming and logging enabled.

The page refreshes automatically at the rate set on the bottom of the page.

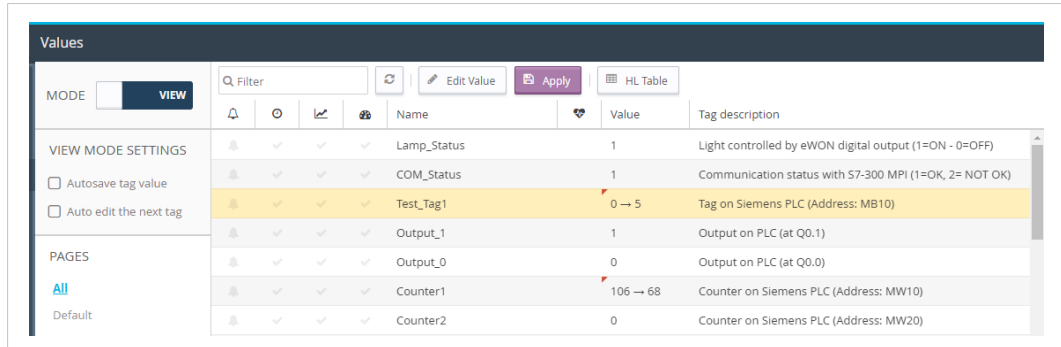
On this page, you can sort, filter, and search for tags to easily find specific tags.

Information about configuring additional tag features is available in the *Flexy Family Reference Guide*, see [Related Documents, p. 3](#).

You can change the value of tags that are configured as read/write (unless the box *Force Read Only* was ticked in the tag creation wizard).

To change the value of a tag:

1. Select the tag and press the **Edit Value** button, or double click its current value.
2. Enter the new value.
3. Click the **Apply** button to update all of the edited tags.



The screenshot shows a web interface titled "Values" with a table of tags. The table has columns for Name, Value, and Tag description. The "Test_Tag1" row is highlighted in yellow, indicating it is selected for editing. The "Value" column for "Test_Tag1" shows "0 → 5". The "Apply" button is visible in the top right corner of the interface.

MODE	VIEW	Filter	Edit Value	Apply	HL Table	Name	Value	Tag description
VIEW MODE SETTINGS						Lamp_Status	1	Light controlled by eWON digital output (1=ON - 0=OFF)
<input type="checkbox"/> Autosave tag value						COM_Status	1	Communication status with S7-300 MPI (1=OK, 2= NOT OK)
<input type="checkbox"/> Auto edit the next tag						Test_Tag1	0 → 5	Tag on Siemens PLC (Address: MB10)
PAGES						Output_1	1	Output on PLC (at Q0.1)
All						Output_0	0	Output on PLC (at Q0.0)
Default						Counter1	106 → 68	Counter on Siemens PLC (Address: MW10)
						Counter2	0	Counter on Siemens PLC (Address: MW20)

Fig. 7 Edit a tag

By clicking the **Apply** button, the Flexy sends the new values to the registers of the PLC. Since the value displayed in the value column is the last value read from the PLC, the new value will not appear until the next poll takes place.

5 Troubleshoot Tags in Error

A tag value displayed with a red icon in the *Quality/Status* column indicates that the quality for this value is considered as *bad*.

The screenshot shows a table titled 'Values' with columns for Name, Value, and Tag description. The 'Counter3' tag has a value of 0 and a red error icon in the Quality/Status column. The other tags, 'Counter2' and 'Counter1', have values of 0 and 191 respectively and no error icons.

Name	Value	Tag description
Counter3	0	
Counter2	0	Counter on Siemens PLC (Address: MW20)
Counter1	191	Counter on Siemens PLC (Address: MW10)

Fig. 8 Tag error

As long as the quality of the displayed value is *good*, no icon appears in this column.

More information about the nature of the problem can be obtained by placing the mouse cursor on the icon.

The screenshot shows the 'Values' table with a tooltip over the red error icon for the 'eWON_104_Tag1' tag. The tooltip displays the text 'No communication'.

Name	Value	Unit	Tag description
eWON_100_Tag1	100	No unit	
eWON_102_Tag1	102	No unit	
eWON_103_Tag1	103	No unit	
eWON_101_Tag1	101	No unit	
eWON_104_Tag1	No communication	unit	
eWON_105_Tag1	105	No unit	

Fig. 9 Tag error with description

To get more information about the nature of the error and the sequence of events before and after the error occurred, you can check the events appearing in the *Event Log*.

The screenshot shows the 'Event Logs' table with columns for Time, Event, Description, and Originator. It lists several error events related to 'smbs-Connect socket failed' and 'mbsios-Tag disabled'.

Time	Event	Description	Originator
13/06/2019 21:37:50	22307	smbs-Connect socket failed	mbsio
13/06/2019 21:37:47	22307	smbs-Connect socket failed	mbsio
13/06/2019 21:37:19	-22503	mbsios-Tag disabled (Nb Tag: 1)	http

Fig. 10 MODBUS IO server — Error logs

5.1 False Positive

A single tag in error (*truly bad*) can cause a number of other (*good*) tags to appear in error as well because tag requests and responses are grouped in one single *envelope* for communication optimization purposes. The whole group is then affected with the same error status.

During commissioning or maintenance, you may want to isolate the *truly bad* tag from the others. Therefore, you have to disable the polling of tags in error.

This can be done in the *IO Server* ► *Global Settings* parameters.

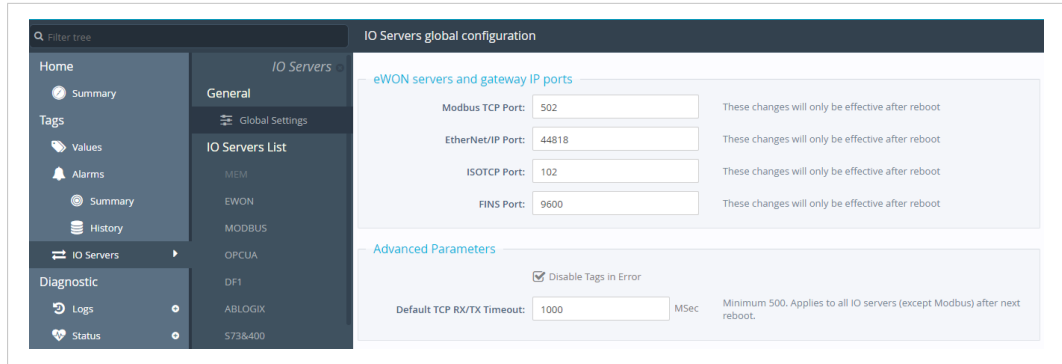


Fig. 11 Disable tags in error

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A Allen-Bradley Tag Address Syntax

A.1 SLC500 Family

A.1.1 Syntax

The general tag address format is as follows:

```
X[file]:element [.field] [/bit]
```

where:

X	Identifies the file type
file	File number, must be 0-255 decimal.
element	Element number within the file.
field	Used only for <i>Counter</i> , <i>Timer</i> and <i>Control</i> files
bit	Valid for all types except <i>Floating</i> .

The table below summarizes the valid file types, the default file number for each type and the fields allowed:

X	File Type	Default File Nb	Fields	Tag format in Flexy
O	Output	0		DWord
I	Input	1		DWord
S	Status	2		DWord
B	Binary	3		DWord
T	Timer	4	.PRE, .ACC, .EN, .TT, .DN	DWord
C	Counter	5	.PRE, .ACC, .CU, .CD, .DN, .OV, .UN, .UA	DWord
R	Control	6	.LEN, .POS, .EN, .DN, .ER, .UL, .IN, .FD	DWord
N	Integer	7		DWord
F	Floating	8		Floating point
A	ASCII	None		DWord
ST	String	None		String
L	Long Word	None		DWord

The tag format is the one defined by the Flexy if it was configured as **Automatic**, see [Create Tags in the Flexy, p. 10](#):

- DWord: an unsigned 32 bits integer.
- Floating point: IEEE single precision float representation.

A.1.2 Typical Examples

Item type	Address to use in Ewon Flexy	Description
Integer File Items	N7:10	Integer N7:10
	N7:10/14	Bit 14 of Integer N7:10
Output File Items	O:1.0	Output 1, element 0
	O:1.0/5	Bit 5 of Output 1, element 0
Input File Items	I:1.0	Input 1, element 0

Item type	Address to use in Ewon Flexy	Description
	I:1.0/5	Input 1, element 0, bit 5
Status File Items	S2:42	Seconds info of PLC
	S2:10/2	Forces enabled on PLC
Binary File Items	B3:5/1	Bit 1 of element 5
Timer File Items	T4:1.ACC	Accumulator of timer T4:1
	T4:1.PRE	Preset of timer T4:1
Counter File Items	C5:2.ACC	Accumulator of counter C5:2
	C5:2.PRE	Preset of counter C5:2
Control File Items	C6:1.LEN	Len of control file C6:1
	C6:1.POS	POS of control file C6:1
Floating File Items	F8:5	Floating point F8:5

A.2 ContoLogix Family

A.2.1 Controller Tags

The controller tag address format is as follows:

```
<SymbolicTagName> [/bit]
```

To read the controller tags, use the **Symbolic Tag Name** created inside the controller tag section of your PLC:

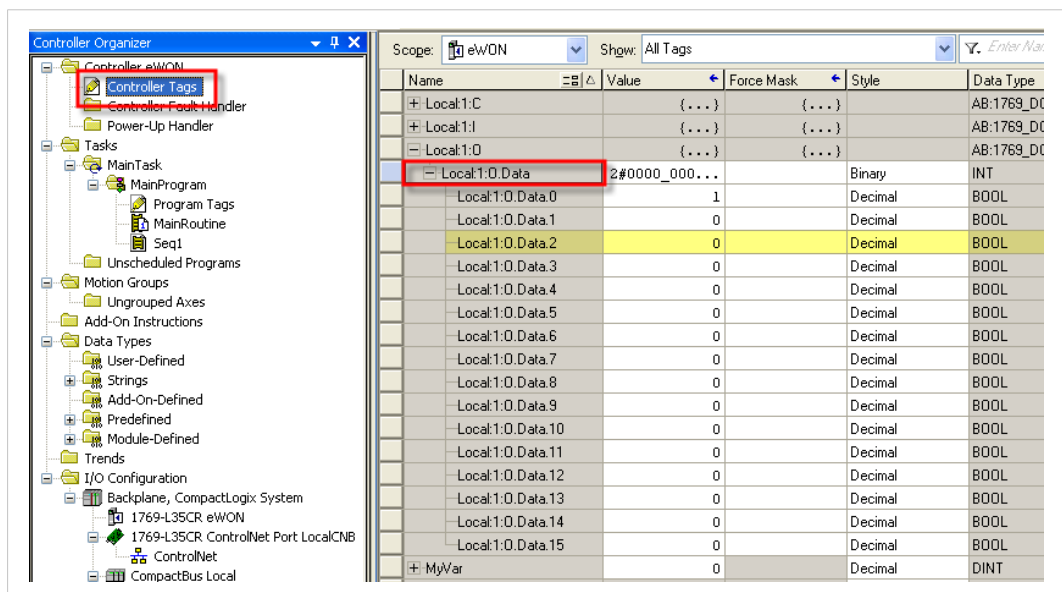


Fig. 12 Controller Tags

To read an array of a controller tag:

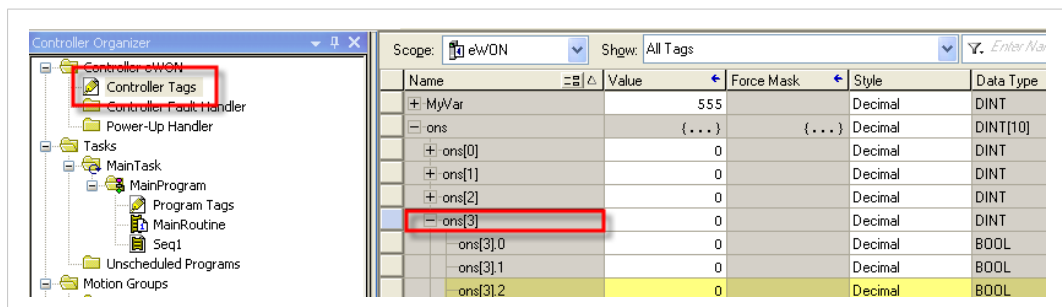


Fig. 13 Controller Tags — Read an array

To read a timer, control or counter of a controller tag:

<SymbolicTagName>.acc (or .ctl or .pre)

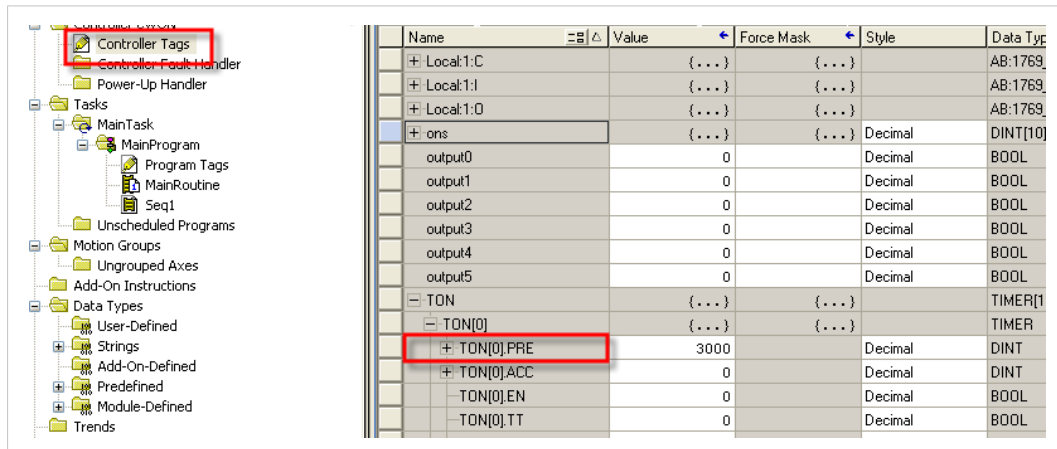


Fig. 14 Controller Tags — Read a timer, control or counter

Typical Examples

Item type	Address to use in Ewon Flexy	Description
Local:1:O	Local:1:O.Data	Local IO module 1:O
	Local:1:O.Data/2	Bit 2 of Local IO module 1:O
ons	ons[3]	3d element of INT Array
	ons[3]/2	Bit 2 of 3d element of INT Array Note .2 replaced by /2 while Ewon does not support . before a number
TON	TON[0].PRE	Preset of Timer TON[0]
Myvar	Myvar	DINT

A.2.2 Program Tags

The program tag address format is as follows:

PROGRAM:ProgName.]SymbolicTagName

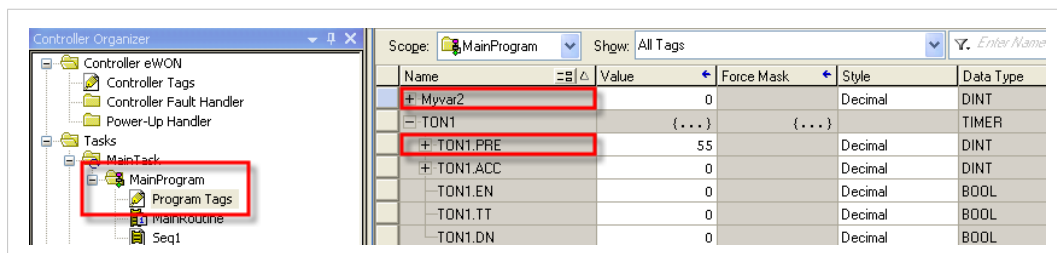


Fig. 15 Program Tags

Typical Examples

Item type	Address to use in Ewon Flexy	Description
Myvar2	PROGRAM:MainProgram.Myvar2	tag Myvar2 inside MainProgram
	PROGRAM:MainProgram.Myvar2/4	bit 4 of tag Myvar2 inside MainProgram
TON1	PROGRAM:MainProgram.TON1.PRE	preset of Timer TON1 inside MainProgram

A.3 Status Register

The status tag is a special tag that returns information about the current state of the communication for a given device.

The status tag address syntax is as follows:

```
Status[Global Device Address]
```

You can define a status tag for each PLC used.

If you use the status address, the tag must be configured as an analog data type such as floating point or integer.

Status value	Description
0	Communication not initialized: Status UNKNOWN. If no tag is polled on that device address, the communication status is unknown.
1	Communication OK
2	Communication NOT OK

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