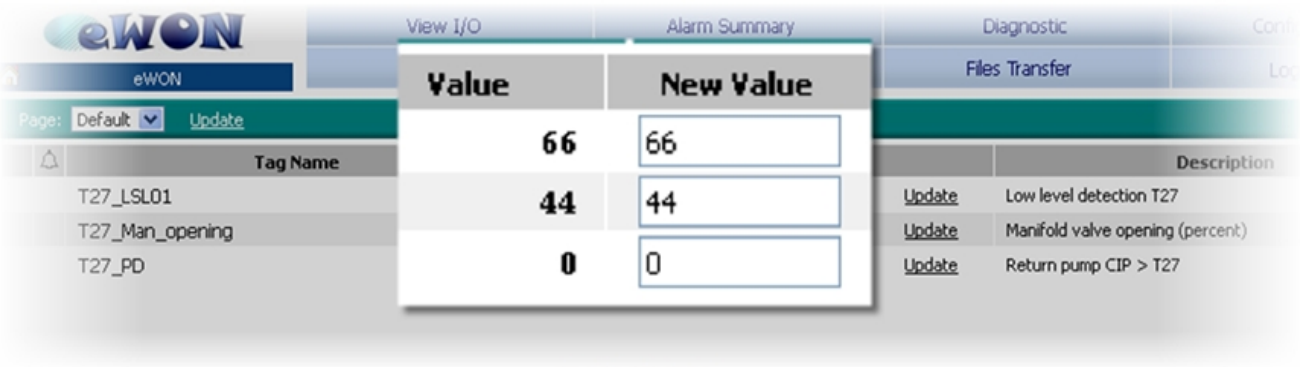
eWON Application User Guide

AUG 049 / Rev 1.0

Polling Data Registers from Siemens S7-200 PLC Series

S7-200 CPU 221

S7-200 CPU 224



S7-200 CPU 226

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1. Objective

The objective of this document is to explain how the eWON can poll data registers out of one or more PLCs.

Polling PLC data registers implies the following steps :

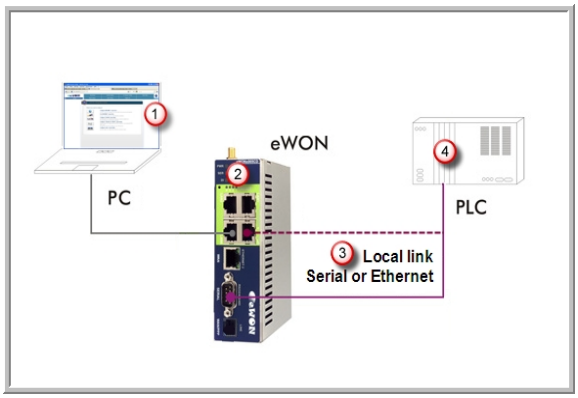
1. Linking the eWON with the PLC
2. Configuring the eWON IO Server
3. Creating tags in the eWON
4. Monitoring tags

Advanced explanations are indicated by this icon.

2. Hardware requirements

In order to follow this guide you'll need:

- PC suitable to connect to the eWON
- A Siemens PLC (S7-200)
- A suitable eWON



(1) From a computer running a web-browser, you will configure the IO Server in the eWON to poll different types of PLC data registers.

(2) Access to the eWON web server is done either by using (one of) its local LAN port(s) or by another type of access like VPN IP address, etc.

(3) Connection to the PLC can be either PPI or ISOTCP Ethernet depending on the available interfaces on the PLC

(4) The PPI or ISOTCP Ethernet connected PLC will have its registers read by the tags configured in the IO Server of the eWON.

The eWON features the S7200 IO Server that is dedicated to the S7-200 Series PLCs from Siemens. Since firmware 5.7, **all eWON types**, with serial port and with MPI port, are suited to communicate in both PPI modes (MonoMaster and MultiMaster). The standard serial port of the eWON must be configured in RS-485 (with the dipswitches) to communicate in PPI.

The ISOTCP (Ethernet) is available on all the eWON types.

The eWON ***always*** acts as MASTER.

Usage	eWON with **SERIAL** port (EWxxx0x)	eWON with **MPI** port (EWxxx6x)
MonoMaster eWON is the ONLY Master on the PPI network.	Yes	Yes since firmware 5.5
MultiMaster eWON is not the only Master on the PPI network. Other masters (HMI or PPI multimaster programming cables) may be present at the same time on the PPI bus.	Yes since firmware 5.7	Yes since firmware 5.5

Note: For MultiMaster use, an eWON with MPI is probably the best choice because it has higher performances to manage multi thread communication.

3. Software requirements

eWON configuration software:

The eWON is configured through its web server. All you need is a standard Web Browser software like Internet Explorer or Firefox.

Additionally we suggest downloading the **eBuddy** utility from our website http://support.ewon.biz/

This utility allows you to list all the eWONs on your network and to change the default IP address of an eWON to match your LAN IP address range. With eBuddy you can also easily upgrade the firmware or make a backup of your eWON (if required).

eWON Firmware Version

The screen-shots of this guide reflect firmware version 6.4 S2 (2012), but you can expect the basic principles to remain the same in earlier/later versions.

4. PLC protocol compatibility

The table below shows the Siemens protocols that are supported and, for each of those, which IO Server you need to use inside the eWON to connect your Siemens PLC.

4.1 eWON with MPI port

PLC-Family	MPI/Profibus protocols	PPI protocol (over MPI port)	Ethernet ISOTCP (Ethernet link)	EWON IO Server name
S7-300 (*)	YES	NO	YES	S73&400 (*)
S7-400 (*)	YES	NO	YES	S73&400 (*)
S7-1200 (*)	NO	NO	YES	S73&400 (*)
S7-200	NO	YES	YES	S7200

Table – MPI port device protocol compatibility

4.2 eWON with serial port

PLC-Family	MPI/Profibus protocols	PPI protocol (over serial link)	Ethernet ISOTCP (Ethernet link)	EWON IO Server name
S7-300 (*)	NO	NO	YES	S73&400 (*)
S7-400 (*)	NO	NO	YES	S73&400 (*)
S7-1200 (*)	NO	NO	YES	S73&400 (*)
S7-200	NO	YES	YES	S7200

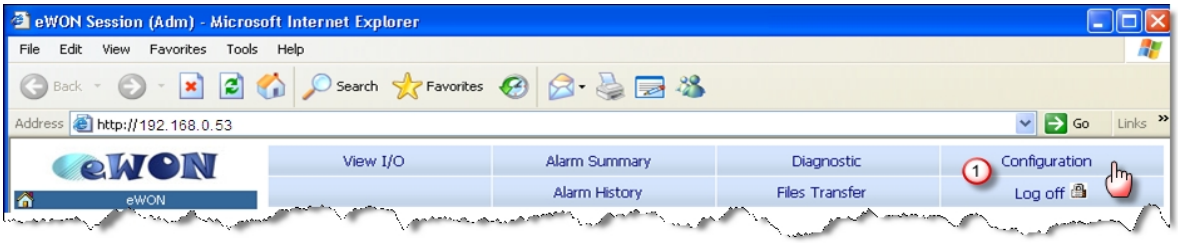
Table – Serial port device protocol compatibility

(*) Note that the S7-300, 400 & 1200 families are addressed in a separate guide (different IO Server and syntax). This guide has reference AUG-048 and is available here:
http://wiki.ewon.biz/Support/07_Documentations/AUG

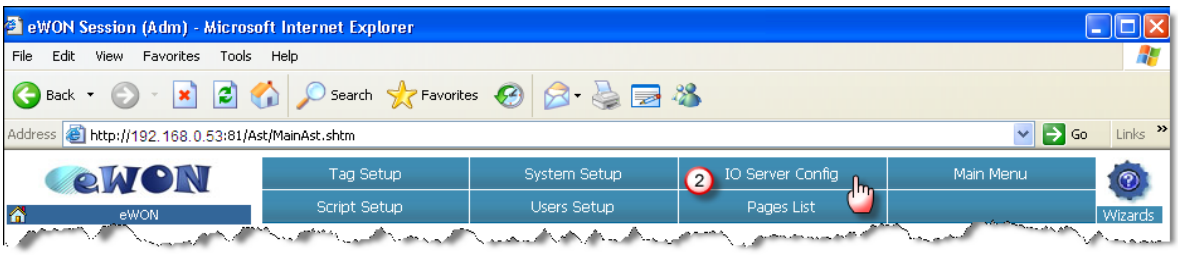
5. Implementation steps

5.1 Step 1 - Configuring the IO Server

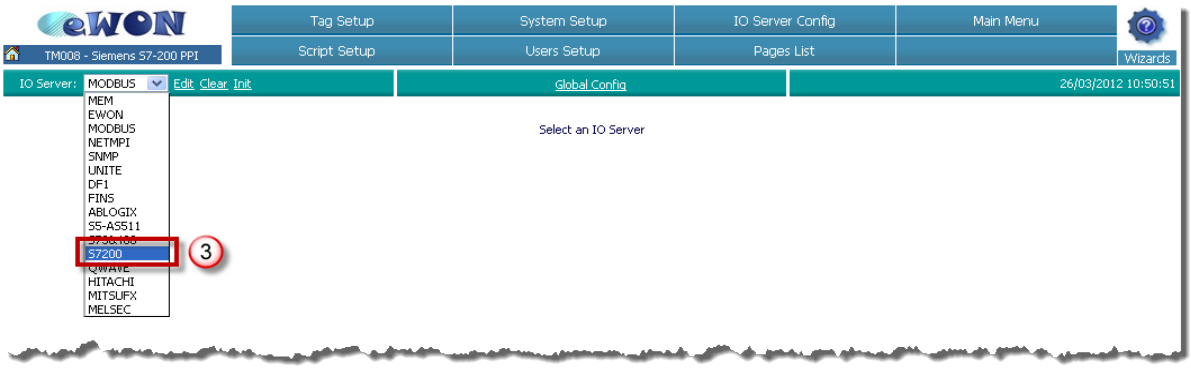
1. Go to the eWON Web page either using a point-to-point connection to the eWON LAN port or a VPN tunnel. Click on ***Configuration*** in the button bar.



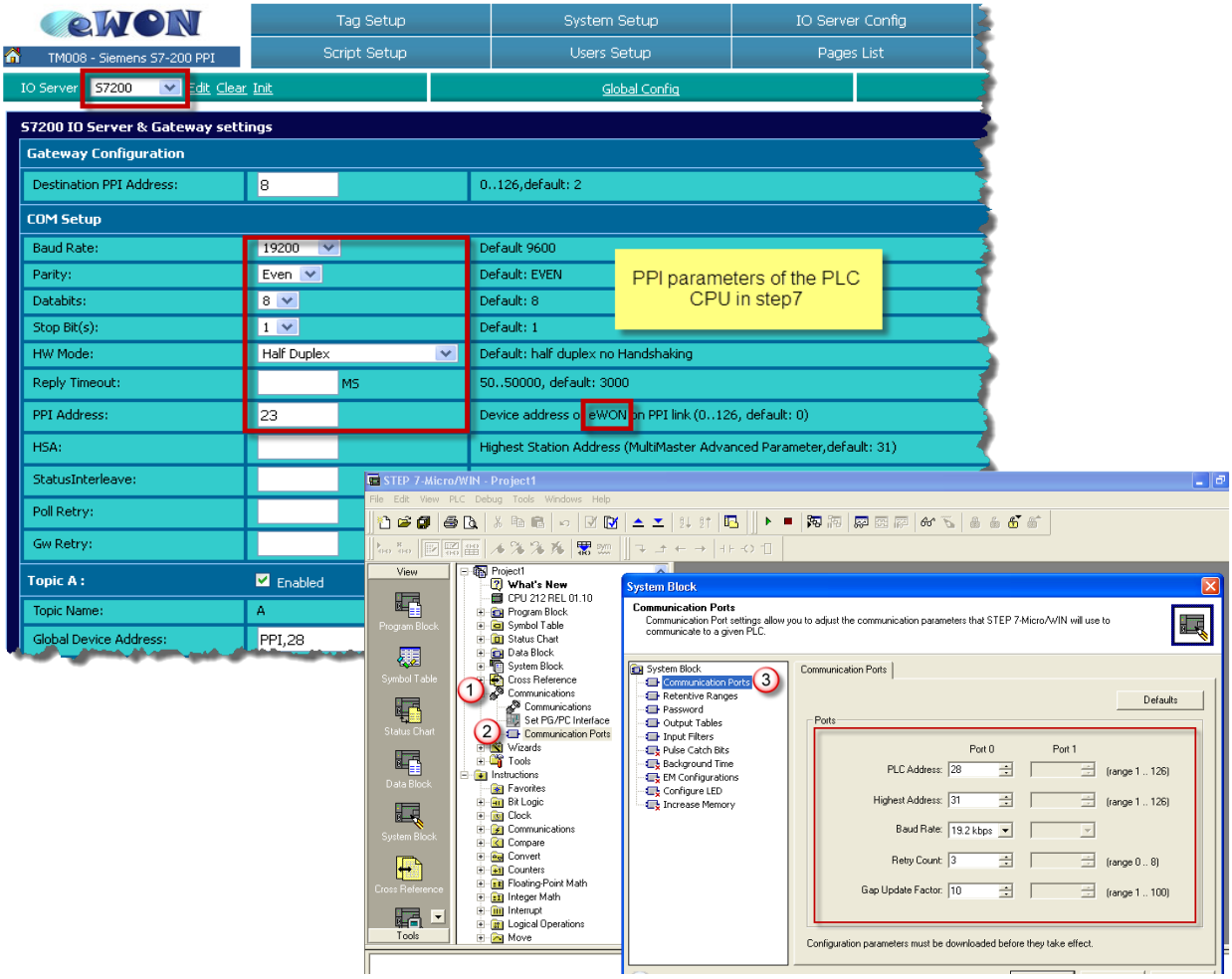
2. Open the eWON IO Server page by clicking the ***IOServer Config*** button.



3. In the drop down field select the ***S7200*** IO Server



4. **A. eWON with serial port** (not MPI), set the ***Protocol Type***, ***Baud Rate***, ***Parity***, ***Reply Timeout***, and ***PPI Address*** corresponding to those actually configured in the PLC you want to communicate with.



Destination PPI Address: Not used, unless the eWON is used as ISOTCP-PPI gateway.

Baud Rate: 19,2 kBps, 187,5 kBps and 1,5 Mbps, etc...

> **Note**: If you communicate only with Ethernet-connected PLC(s) and do not use the serial link, then set the ***Baud Rate*** to ***Disabled*** and leave all other parameters in the ***COM Setup*** part as they are.

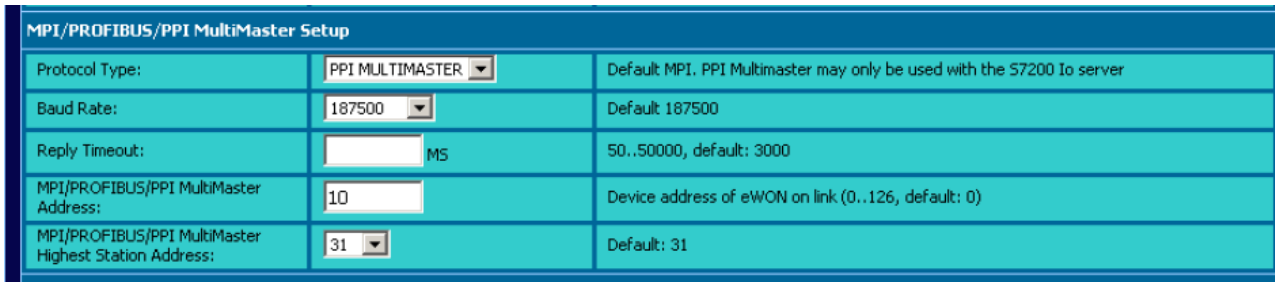
Hardware Mode: Half Duplex

Reply Timeout: The maximum time the eWON will wait for a valid PPI message response

PPI Address: The address of the eWON on the PPI network (0..126, default is 0)

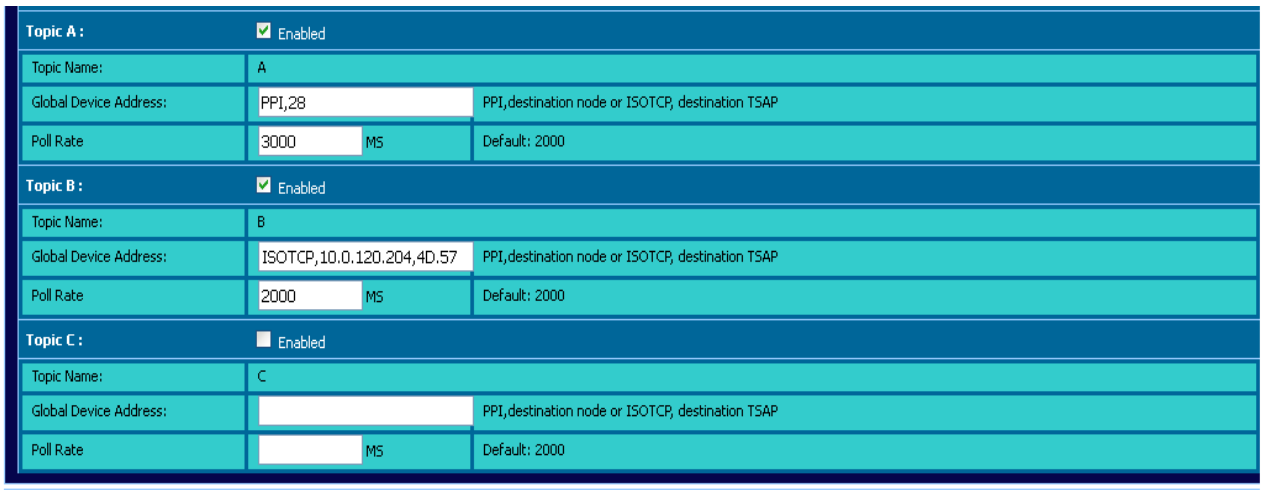
All other fields below: advanced MultiMaster parameters. These parameters have to be configured only if another master is hooked on the PPI network.

4. **B. For an eWON with MPI port**, the configuration fields are slightly different. You have to select the protocol ***PPI MULTIMASTER***. As the MPI port configuration is shared by the S7-200 and the S73&400 IO Servers, this combo box shows also the MPI & Profibus protocols *BUT they won't work with an S7-200*. PPI MultiMaster and MPI/Profibus are mutually exclusive. It is not possible to use the S7-200 and the S73&400 IO Servers on the MPI port at the same time.



5. To be able to poll data registers out of your PLC, you need to define and enable at least one ***Topic*** in the lower part of the IO Server configuration page. Topics are meant to allocate common properties to a group of tags (properties include ***Enable/Disable***, ***Global Device Address, and Poll Rate***).

The snapshot below shows 2 topics enabled/configured.



Note: You might conclude the eWON cannot connect to more than 3 PLCs from the fact there are 3 topics (A, B and C). If you need to poll tags on more than 3 PLCs, refer to the Knowledge Base page of our Wiki here:
http://wiki.ewon.biz/Support/06_Knowledge_Base/
type ***How to reach more than 3 PLCs*** in the search field.

6. In **Poll Rate**, you can define the refresh rate in ms (milliseconds) applicable to all data registers that will be included in this topic. If you leave this field blank, the default value applied will be 2000 ms (2 seconds). The polling rate specified here applies to all tags associated with this topic. If you have tags that need to be refreshed at a different rate, enable and configure multiple topics.

7. The ***Global Device Address*** is the address of the PLC to be polled.
Examples of Global Device Addresses are given in the tables below:

PPI-link

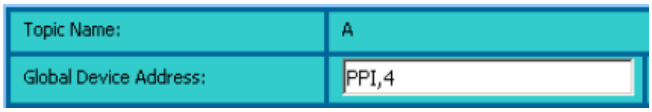
Syntax to use	PPI
`PPI,PPI node address`	***node address:*** PPI node address of the PLC Example:  Reach by PPI the PLC with the node address 4

Table – PPI-link device address syntax

ISOTCP-link

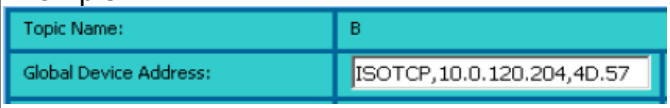
Syntax to use	ISOTCP
`ISOTCP,IP address,CalledTSAP`	***IP address*** : IP address of the PLC (ex: 10.0.120.204) ***Called TSAP (*)*** : Transport Service Access Point For the S7-200 family, you can use the Called TSAP **4D.57** which is the default TSAP for Step7 Micro/WIN connection. Example:  Reach by ISOTCP the PLC at IP 10.0.120.204 with the TSAP 4D.57

Table - ISOTCP device address syntax

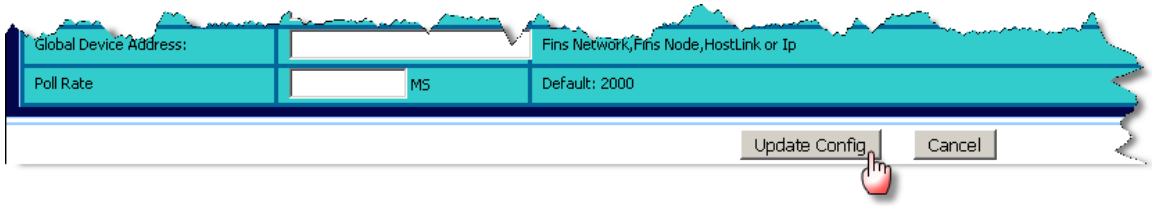
(*) for Called TSAP:

- If you do not use the default TSAP 4D.57 and specify your own connection in the S7-200, be sure to:

  - use the same TSAP for the Server and the Client (ex: Local TSAP:12.00, Remote TSAP:12.00)

  - Check the "Enable the Keep Alive function for this connection" feature for this connection otherwise the eWON will not be able to poll the device after a connection lost due to the eWON reboot.

8. Save your settings by clicking on ***Update Config***.

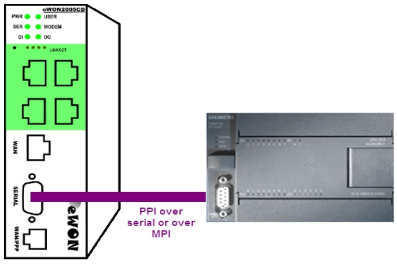


5.2 Step 2 - Linking the PLC with the eWON

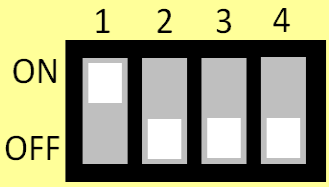
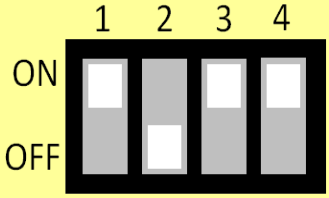
5.2.1 Introduction

The eWON can be connected to the PLC either using a serial connection supporting PPI, an MPI connection supporting PPI or an Ethernet connection supporting ISOTCP. The eWON can be connected to PLCs both in PPI and ISOTCP simultaneously.

5.2.2 PPI link



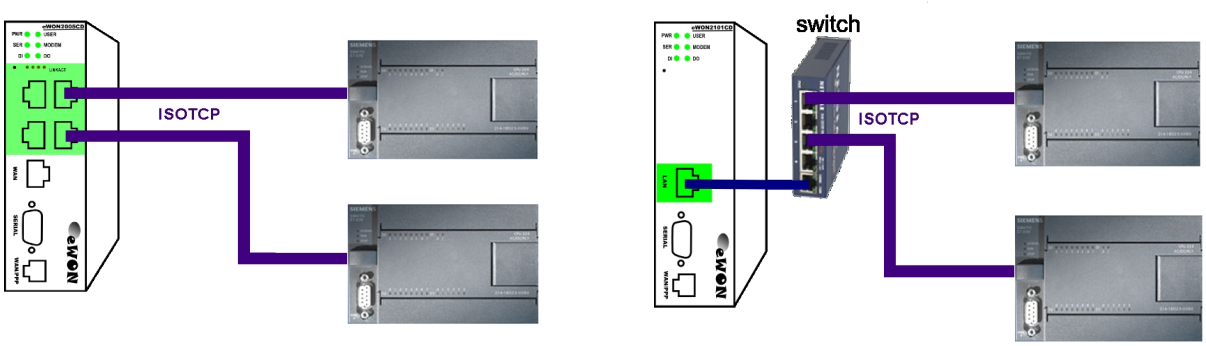
1. Link the PLC with the eWON using one of the Siemens standard PPI cables or equivalent described in § 9 Appendix 2 – PPI cables.
2. Make sure the position of the dip switches is OK:
   eWON with serial-port: positions have to be for RS422, RS485-link

Dip switch positions	Serial mode
	*RS422, RS485* ***without** polarization and termination resistors*
	*RS422, RS485* ***with** polarization (680 Ω) and termination (120 Ω) resistors*

eWON with MPI-port: this device has no dip switches

5.2.3 ISOTCP Ethernet link

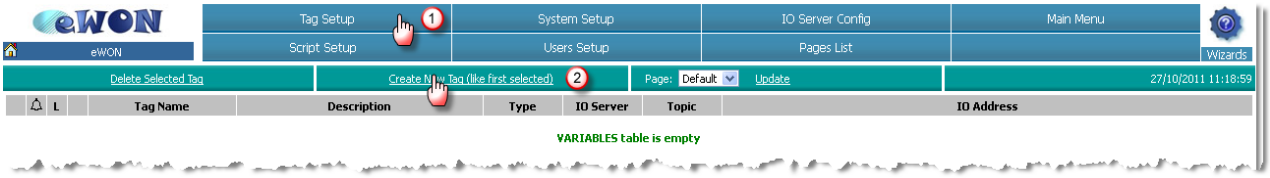
Link the LAN interface of the eWON with the Ethernet card of the PLC and make sure that the eWON LAN IP address is in the same range as the PLC IP address. Use eBuddy to change the eWON LAN IP address if it is not within the same range as the PLC.



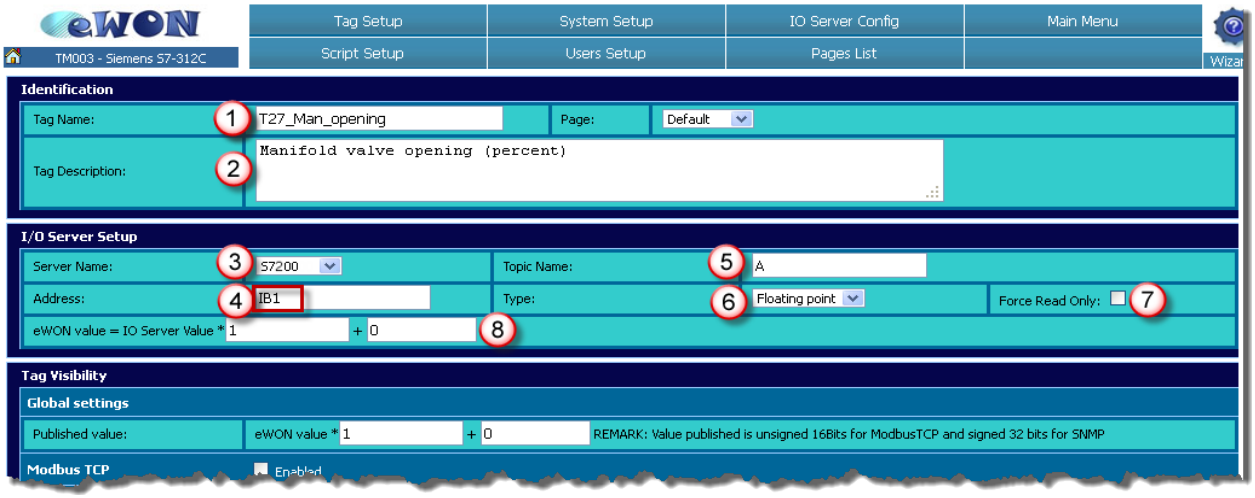
Note: The eWON types with 4 LAN ports (2005CD or 4005CD) can be connected to the Ethernet port of the PLC directly. The eWON types with a single LAN port (2101CD or 4101CD) need to be connected with a **crossed cable** (single PLC) or an **external switch** (multiple PLCs) as the eWON LAN port does not have auto-sense. However, if the PLC features an auto-sense Ethernet port, either a straight or crossed cable can be used.

5.3 Step 3 - Creating tags in the eWON

1. Go back to the configuration menu and select ***Tag Setup***. If you are starting from scratch, the list of tags should be empty.



2. Select ***Create New Tag*** to open the tag configuration window and enter the parameters of the tag you want to create.



1. Enter a ***Tag Name*** – free text, no spaces, no symbols (-, =, %, $, @, # etc.)
2. Enter a ***Description*** – free text (optional)
3. Select ***S7200*** as IO server
4. In the ***Address*** field, enter the PLC register to be polled in the PLC.

Note: The register configured in the eWON must exist in the PLC. If you enter a wrong address (syntax problem) the tag will be rejected (an error message will be displayed). For error messages see next point.

Examples:

Address	Pointing to
MW4	the Word at address 4 (in bytes) in the Internal Memory
HCL1	the High Speed Counter number 1, read it as Signed Word
AQW5	the Word at address 5 (in bytes) in the Analog Inputs zone
IB3	the Byte at address 3 (in bytes) in the Discrete Output zone
I5#2	the bit 2 from the Byte (read 'Bit access modifer' note below) at address 5 in the Discrete Inputs zone

⑤ Enter a ***Topic Name:*** A, B or C. The topic must have been configured in the IO server page (see § 5.1 Step 1 - Configuring the IO Server).

⑥ ***Type***: DataType of the tag allows you to select under which format the eWON will store and display the variable of the tag (Floating Point, Boolean, Integer, Dword or Automatic). All tags are stored on 4 bytes. The default ***Automatic*** option lets the eWON decide the format depending on the IO Server register/modifier type.

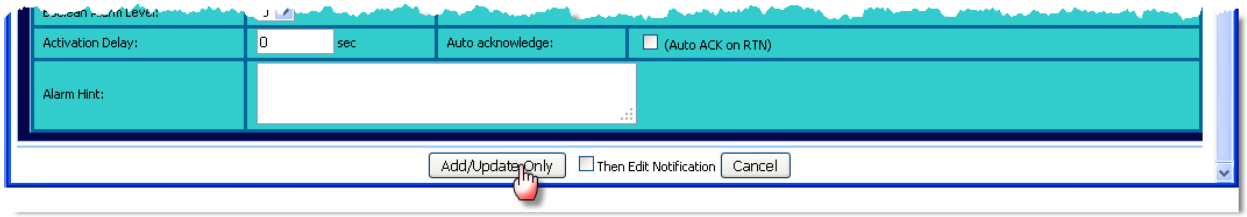
The remaining fields are usually left with their default value:

⑦ ***Force Read Only***: Unchecked is the default. When it is checked, users will not be able to write a value by using the ***Update*** command in the ***View IO page***. However, the tag remains read/write for commands written in the embedded BASIC program.

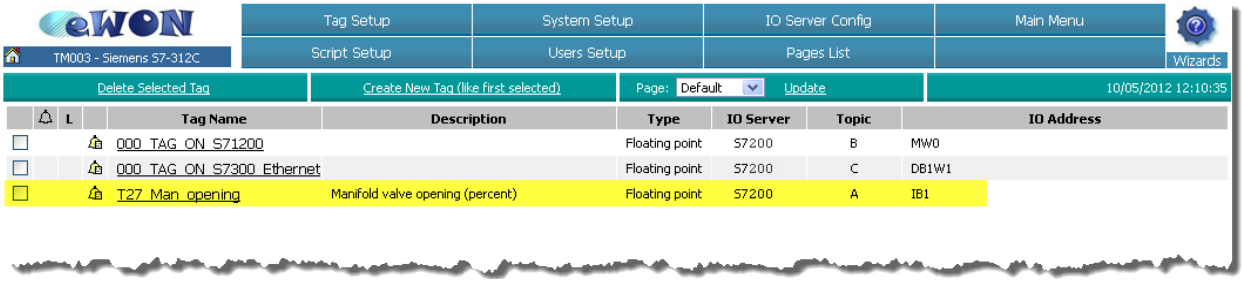
⑧ ***eWON value***: Defaults are *1+0. Applies a ***scale factor*** and an ***offset*** to the raw value coming from the IO server. The scale factor and offset are float values. Negative values are accepted.

```
TAGval = IOSERVERval * scale factor + offset.
```

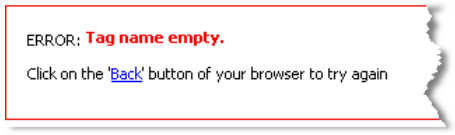
3. Click on the ***Add/Update Only*** button when your tag configuration is complete



4. If everything is OK, your new tag appears in the tag list:



If not, here are a couple of examples of error messages that can appear:



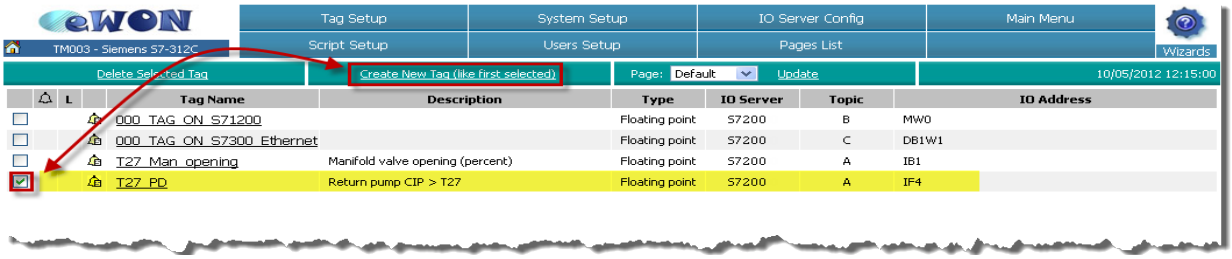
Tag name empty: check tag name field and type name in it.

Invalid character in tag name: check name for spaces and invalid characters.

Invalid IO name for tag: check tag address syntax.

Invalid topic name for tag*: Topic must be A, B or C. Any other value will be rejected.*

5. Repeat the same sequence from point 1 for the other tags you need to create.
6. If you need to create new tags that have almost the same properties as an existing tag in the list, then check the box next to the source tag before clicking on the ***Create New Tag (like first selected)*** link.

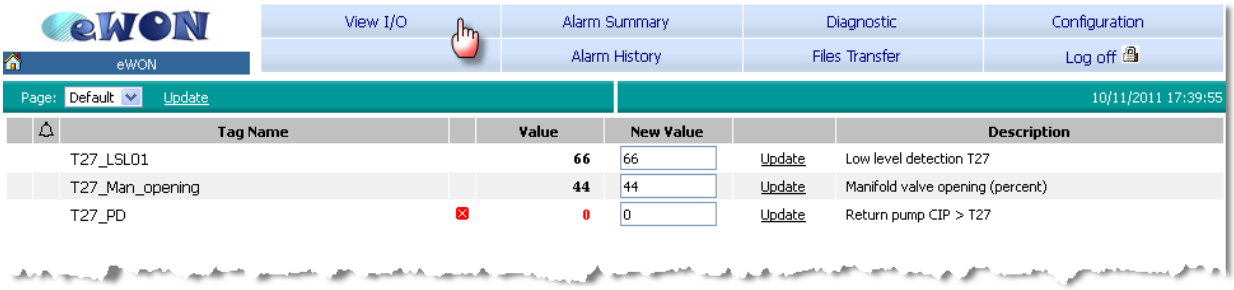


All (*) properties of the existing tag will be copied in the new tag creation wizard. It is the first selected tag that will be copied if more than one tag is selected in the list.

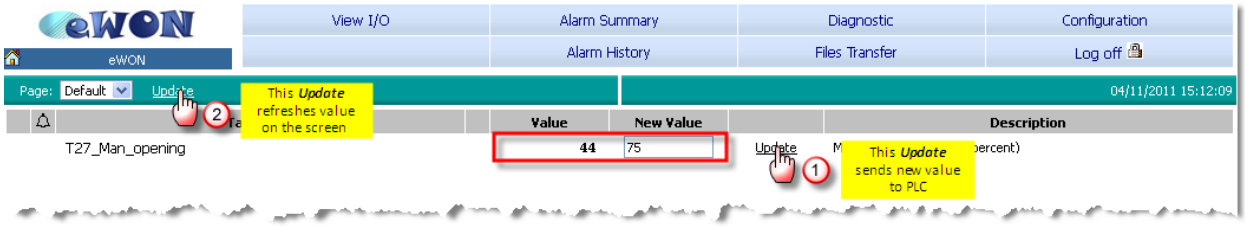
(*) Copied properties include the ***Tag Name.*** Since the Tag Name must be unique, make sure you change the name of the new tag.

6. Step 4. Monitoring tags

1. Go to the ***View I/O*** page from the ***Main Menu*** to check tag values and status.

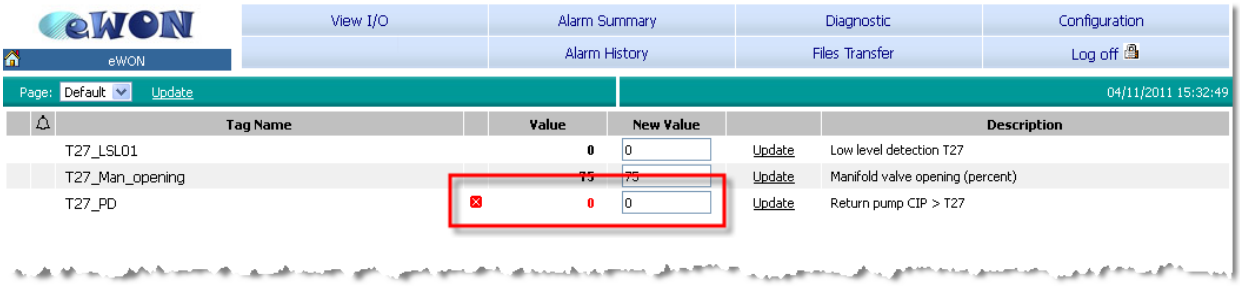


2. You can change the value of tags that are configured as read/write unless the box ***Force Read Only*** was ticked in the tag creation wizard. To change the value edit the ***New Value*** field and click on the ***Update*** ① link as shown below.



Note: Clicking this ***Update*** ① link sets the new value in the register of the PLC. The value will actually be returned with the next poll. In addition, you need to instruct your browser to refresh the value shown on the screen by clicking the ***Update*** ② link.

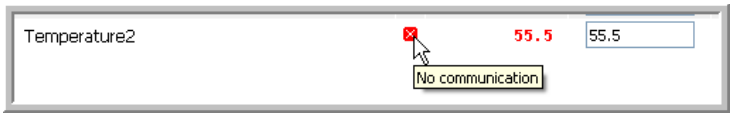
Tags in error appear with a red icon as shown below:



Please refer to § 7 Troubleshooting tags in error if this appears.

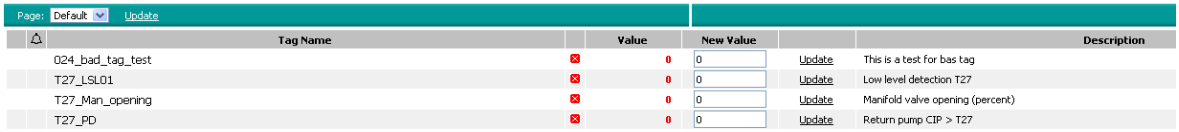
7. Troubleshooting tags in error

A tag value displayed in red in the ***View IO*** page indicates that the ***quality*** for this value is considered as ***bad***. When the quality of the tag is *bad,* a red icon is displayed in the column between the tag's name and the tag's value. 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 as shown below:



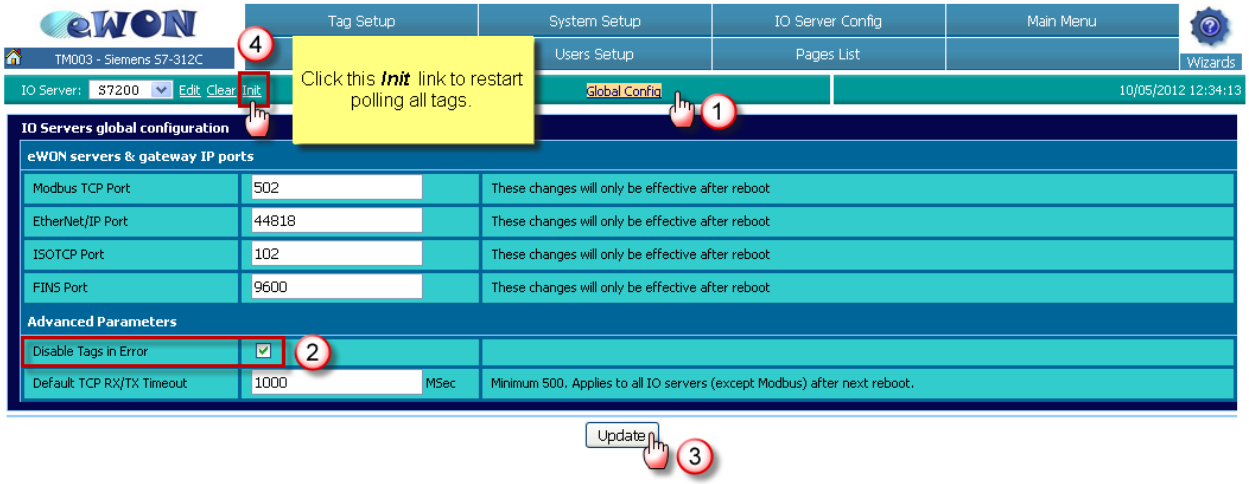
or:

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

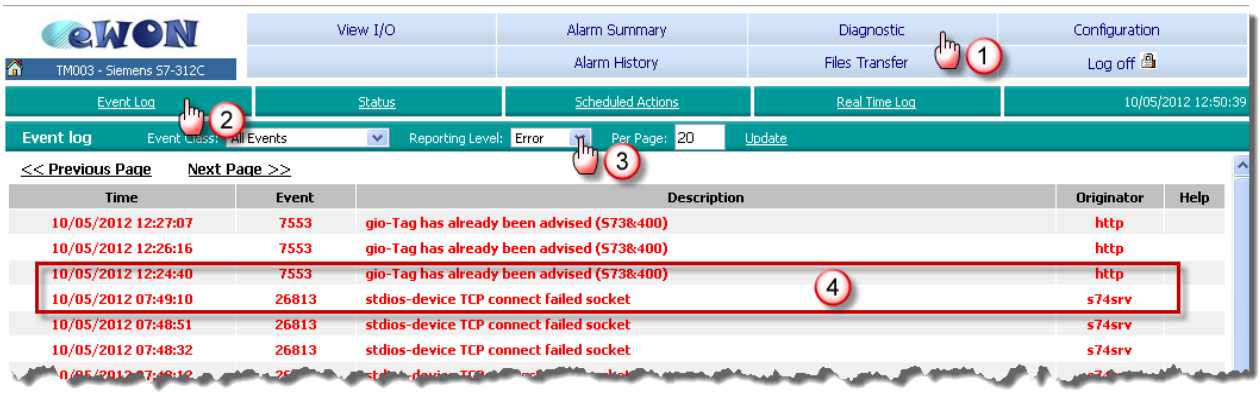


During commissioning or maintenance, you may want to isolate the *truly bad* tag from the others. Therefore, you have to disable the polling of tags in error. This can be done in the ***IO Server*** > ***Global Config*** parameters as shown below:

The relevant tag will no longer be polled and it will no longer be included in a group (and hence it will not affect other tags). Remind yourself to **uncheck this box** and initialize the IO Server, by clicking the ***Init*** link as shown above, as soon as you have completed your commissioning or maintenance task.



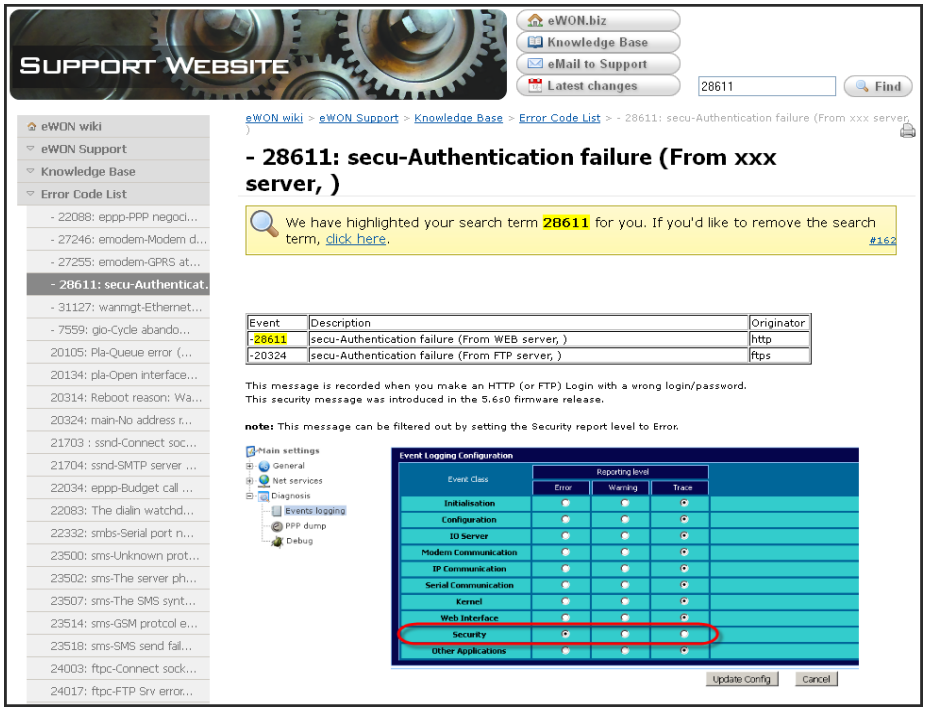
To get more information about the nature of the error and the sequence of events before and after the error occurred you can check the events appearing in the ***Event Log***. The ***Event Log*** ② is accessed through the ***Main Menu, Diagnostic*** ① **.**



In the case of a communication error, check the cabling and dip switch settings (serial link).

To find the explanation of a particular error message, refer to the Knowledge Base document in our WIKI (or type the error code in the Find field) :

http://wiki.ewon.biz/Support/06_Knowledge_Base/Z_Error_Code



Example: Results on search error code 28611**.**

8. Appendix 1 – Syntax of S7-200 tag addresses

8.1 General tag address format

```
<Memory Type><Modifier><address>
```

8.2 Memory types

Memory Type	Description	Acceptable Modifiers	Address
M	Internal memory	B, C, **W**, S, D, L, F	Byte offset
SM	Special memory	B, C, **W**, S, D, L, F	Byte offset
V	Variable memory	B, C, **W**, S, D, L, F	Byte offset
C	Counter	**W**, S	Object number
HC	High Speed Counter	D, **L**	Object number
T	Timer	D, **L**	Object number
AI	Analog Inputs	**W**, S	Byte offset
AQ	Analog Outputs	**W**, S	Byte offset
I	Discrete Inputs	B, C, **W**, S, D, L, F	Byte offset
Q	Discrete Outputs	B, C, **W**, S, D, L, F	Byte offset

Important: All addresses are always in BYTES (except for Counters and Timer that are objects).

Note: If no modifier is included, the modifier-type in bold will be used.

8.3 Modifiers

Modifier	Modifier type	Value range	Automatic tag type
B	Byte	0...255	DWord
C	signed Byte	-128...127	Integer
W	Word	0...65535	DWord
S	signed Word	-32768...32767	Integer
D	DWord	0...4294967296 (**)	DWord
L	signed DWord	-2147483648... 2147483647 (**)	Integer
F	Float	+/- 3.4e38	Float

(**) Important: to avoid loss of precision due to integer to float conversion, choose the right storage DataType for your Tag(s).

8.4 Examples

Address	Pointing to
MW4	the Word at address 4 (in bytes) in the Internal Memory
HCL1	the High Speed Counter number 1, read it as Signed Word
AQW5	the Word at address 5 (in bytes) in the Analog Output zone
IB3	the Byte at address 3 (in bytes) in the Discrete Inputs zone
I5#2	the bit 2 from the Byte (read 'Bit access modifer' note below) at address 5 in the Discrete Inputs zone

Table – Examples of register addresses for S7-200

8.5 Bit access modifier

For Memory Types **M, SM, V, I** and **Q,** it is possible to access a single bit.

A `[#x]` must be appended to the ***Value Name***.

As the address refers to a starting byte, the Bit index goes only from 0 to 7. No other Modifier than B is allowed.

The syntax can be used for reading Bits and for writing them as well.

Examples:

Valid: AQ10#5 is OK because it represents bit 5 of Byte 10 in the Analog Output zone

Invalid: IW5#2 is wrong because there is a Modifier

I5#10 is wrong because the Bit number is greater than 7

8.6 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 ValueName is composed of:

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

Possible values of the Status tags:

Status Value	Corresponds to
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

Table – Tag status value meaning

• You can define a status Tag for each PLC used.

9. Appendix 2 – PPI cables

9.1 Standard serial eWON

You can use a standard straight RS485 cable with the following pinout:

eWON	S7-200
DB9-Female	DB9-Male
pin 3	pin 3
pin 5	pin 5 (or pin 2)
pin 8	pin 8

You can also use a standard Siemens MPI/Profibus cable 6ES7901-0BF00-0AA0 or equivalent **but it requires an additional DB9 female/female mini-gender changer** to connect on an eWON featuring a standard serial port.

9.2 eWON with MPI port

To make a PPI link between an eWON with MPI-port and a S7-200 PLC, you can use a standard Siemens MPI/Profibus cable.

A standard Siemens references is 6ES7901-0BF00-0AA0.

There are compatible cables available on the market, but they do not necessarily have all of the same features such as switchable termination resistors.

eWON offers a compatible, unshielded cable:

P/N EW40912 - SUBD9/SUBD9 cable for Siemens S7, Length: 2 meter

Max baudrate is 1.5 MBit/s.

Revision history

Revision Level	Date	Description
1.0	22/06/12	First issue

Document build number: *26*

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