Gateway for EIP - DF1 Allen-Bradley PLC

TN 23
ver 1_4_2
10/26/05

For all eWON supporting firmwares ver. 4.xx

1 Purpose

This application note describes how to set up a remote collaboration. A remote collaboration consists in configuring, programming or monitoring a PLC from a remote location, without the need of connecting directly the PC to the PLC. A remote collaboration therefore involves a TCP/IP connection and eventually a router, depending on the protocol used by the PLC.
In this document, we'll configure a complete remote collaboration system with a SLC5/03; the RSLogix 500 software and, of course, an eWON as a router. The SLC5/03 uses the DF1 protocol.
Three cases of remote collaboration will be treated:

- **A *direct connection to the eWON by Ethernet*.**
- **A *direct connection to the eWON using a phone line.* With this topology, the eWON IP address is known since it is established with your own PC at the PPP connection time.**
- **A *connection to the eWON using Internet and callback*. This kind of connection can be used with callback: we call the eWON and let ring a certain amount of time and we hang up. After a specified amount of time, the eWON connects to an ISP using its phone line. In this case, the eWON IP address is not known so that the eWON must publish it's address, by mail for instance. This document will start with the first topology, then, when this configuration is running, the changes needed for the second one will be described.**

The following graph shows the three network topologies:

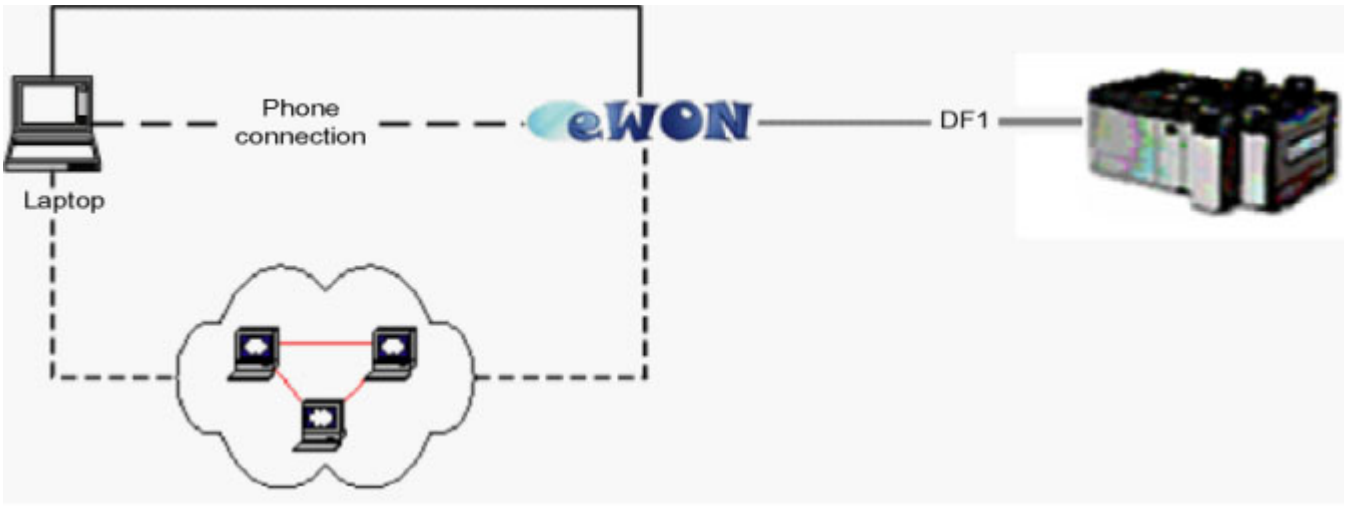


Figure 1: The three network topologies

This document describes the three topologies. A direct Ethernet connection will be used to describe the global setup. After this configuration is working, the changes for the phone and Internet topologies will be described.

In order to follow this Technical Note, you need:

- **An eWON 2001 or 4001 with a PSTN modem and a firmware release that supports the DF1 protocol**
- **A modem connected to your PC for direct phone connection with the eWON**
- **An Internet connection account both for your PC and for the eWON**
- **A SLC5/03 Allen Bradley PLC (or higher)**
- **A cable to directly connect the PLC to the PC such as a 1747-CP3 cable**
- **RSLogix 500 (in the example version 5.20 is used) and RSLinx (in the example version 2.41 is used).**

In this document, we use Windows XP, but any operating system supported by RSLogix can be used. We also assume the reader has some knowledge of the RSLogix software.

2 Configuration Steps Overview

Starting with an eWON 2001 or 4001 out of the box, this document will show how to set up a remote collaboration using several steps. The purpose of some of the steps is to test what has been set up so far. Those steps are therefore not absolutely necessary, but they can be really useful to localize a possible problem. The steps are:

- **Setting up a test program in the PLC using a direct DF1 connection between the PC and the PLC**
- **eWON DF1 configuration**
- **Set up a Tag to test the DF1 configuration**
- **Installing and configuring the Remote Collaboration**
- **Using the Remote Collaboration**

After each of the steps, a small test will be described to check that the step has been executed correctly.

3 PLC Configuration

We will put a small program in the PLC, so that we will be able to test the connection between the eWON and the PLC in the next section. To first set up the PLC, we will need a direct connection between the computer and the PLC. To do this, connect the PLC terminal port to the PC RS232 serial port (cable 1747-PC3 for instance). Once done, open RSLinx.

4 RSLinx Full Duplex Serial Driver Configuration

Inside RSLinx select: ***Communications***/***Configure Drivers***.
Among the available driver types, select ***RS-232 DF1 Devices*** and click the ***Add New*** button to get the following dialog box:

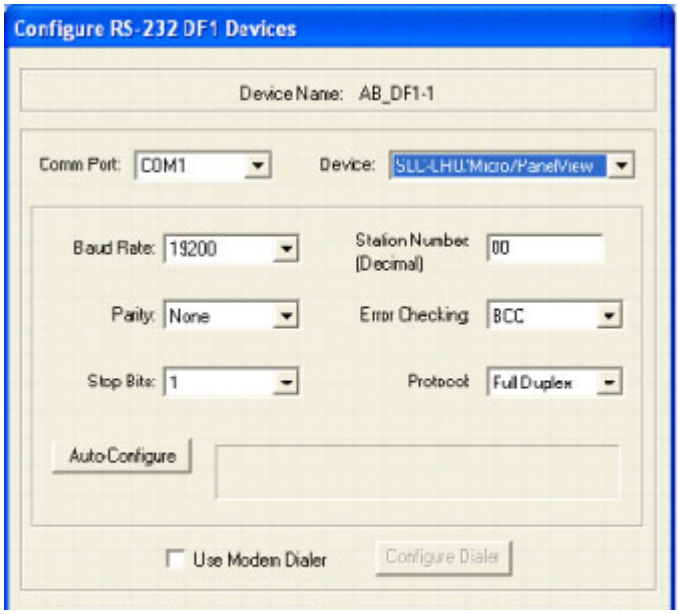


Figure 2: RS-232 DF1 device configuration

Set the DeviceType, Station Number and Comm Port with the values given in the previous screen window, set the protocol value to ***Full Duplex*** and click the ***Auto-Configure*** button.

“Auto configuration successful” should be displayed.

4.1 PLC Test program

Start the RSLogix 500 program and select ***Comms/WhoActiveGoOnline***.

The information is downloaded from the PLC to the PC and a window such as follows appears:

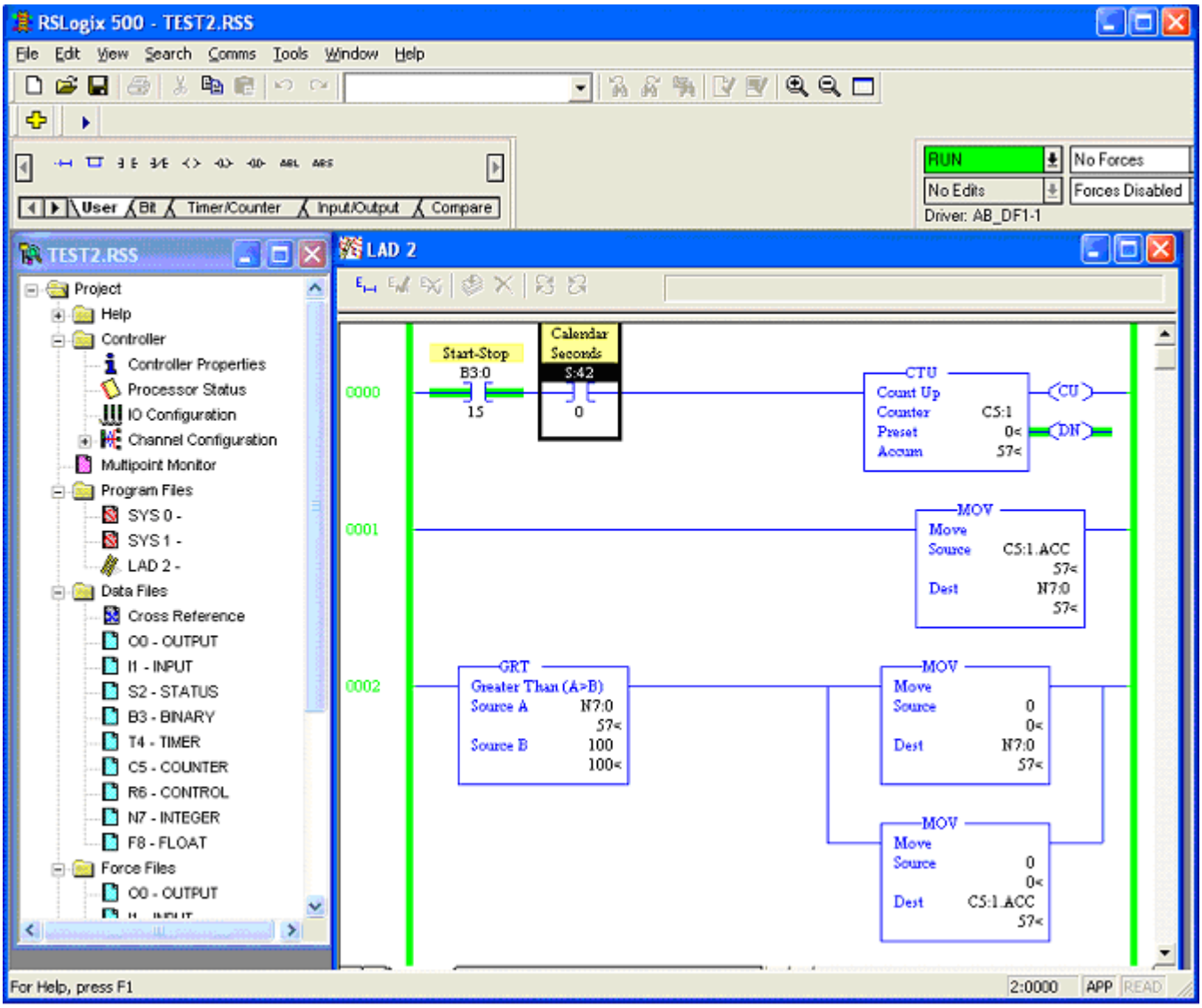


Figure 3: RsLogix at opening

If you already have a program installed in the PLC, save it.

Go OffLine (from the ***Comms*** menu) and create the following program (***File***/***Program Files*** - ***Select Program Files*** dialog box, select program of ***Type*** "LAD" with ***File*** number = 2: LAD2):

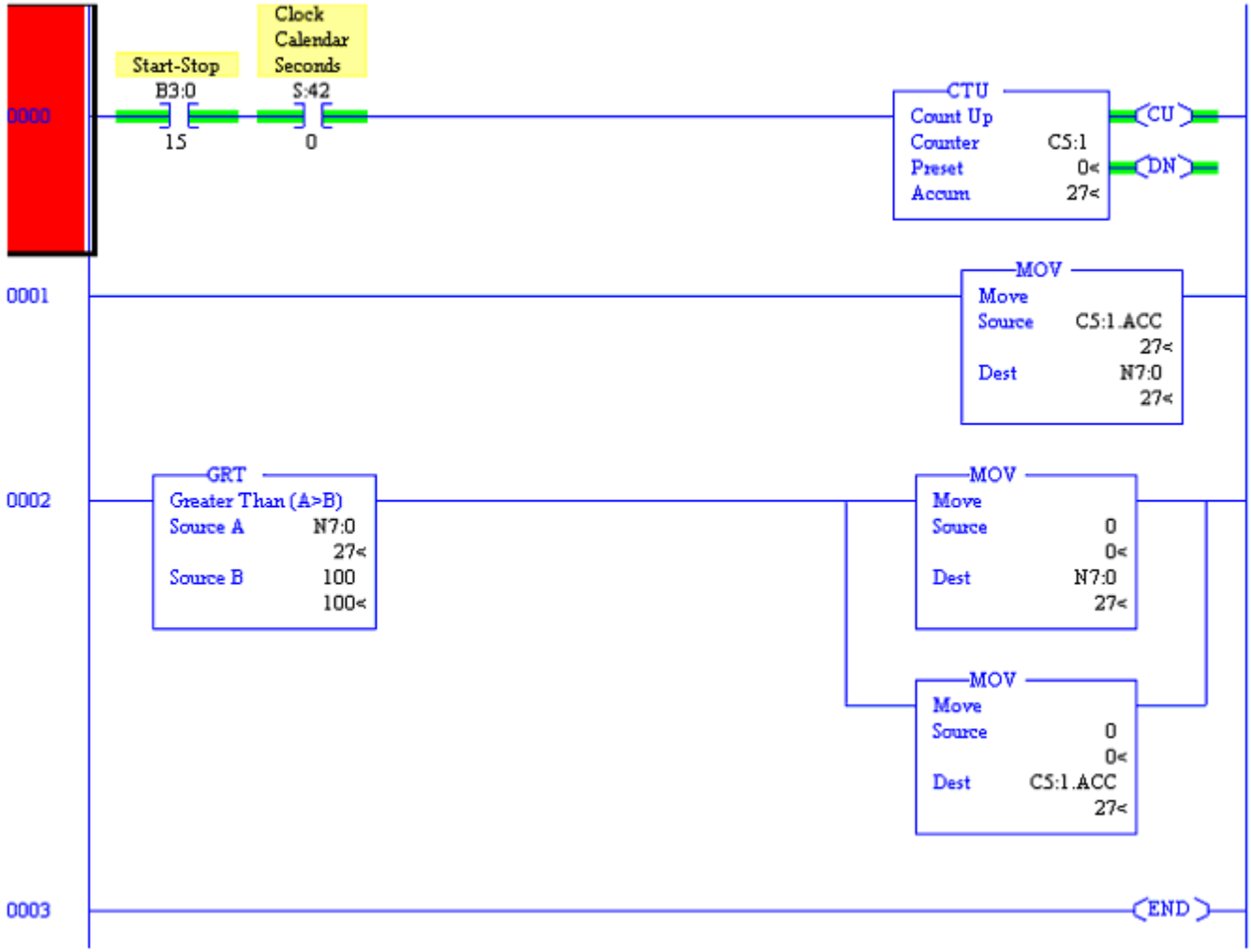


Figure 4: RSLogix - new program

Transfer the program from the PC to the PLC by selecting ***Comms***/***Download***.

5 eWON Configuration

5.1 eWON IP address configuration

In this section, we will show how to configure the eWON to access the PLC registers through an IO server configuration. The forwarding will be treated later.

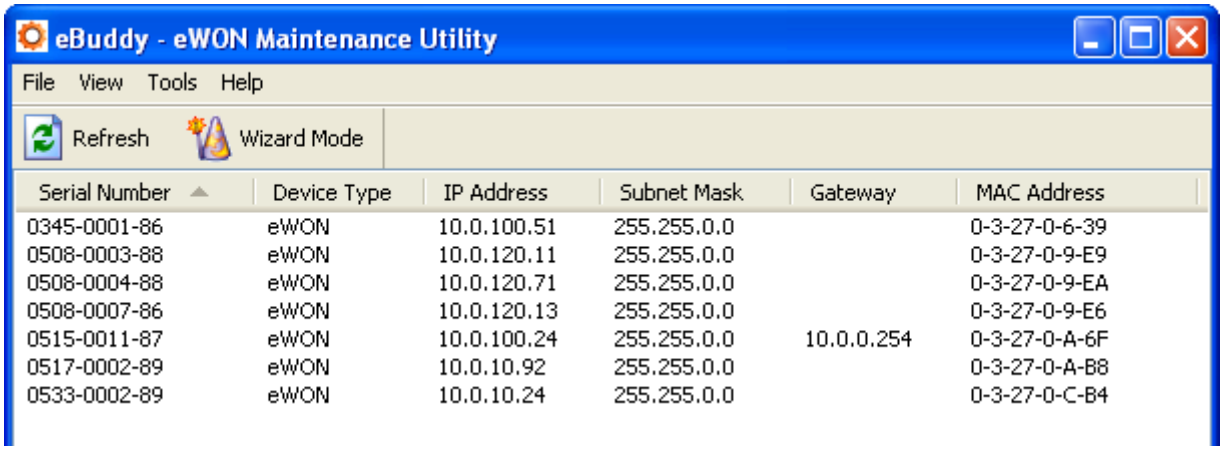
Setting the eWON IP Address

The eWON is configured through its web server*. Right out of the box, the eWON has “10.0.0.53” as IP address. You can find the eBuddy utility on the eWON web site (http://www.ewon.biz (Support/Download Software)). This utility allows to find an eWON on the network and to change its IP address to match your LAN IP adresses range.

** It is also possible to configure the eWON by dropping into it a file using an FTP client, but this is a more complex process that is explained in the eWON User Guide.*

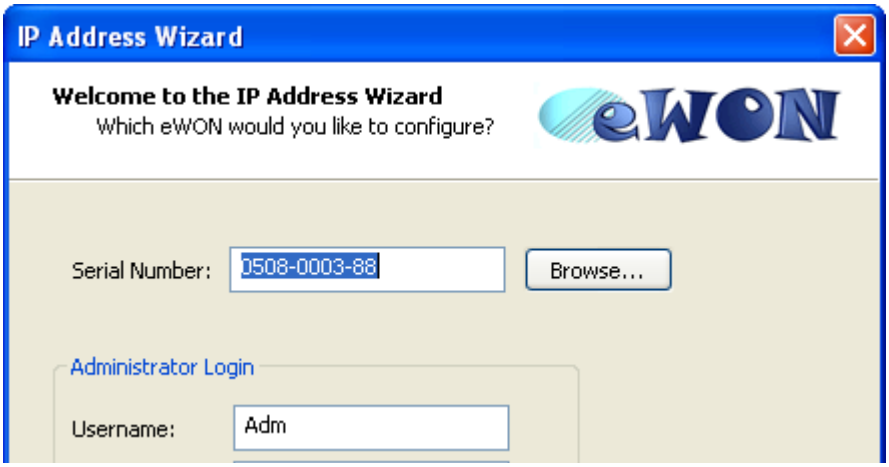
• Finding an eWON on the network with eBuddy

Launch eBuddy.exe and click CTRL+L to switch in list mode if not the case.
The list of the eWONs that are connected on the network then appears:

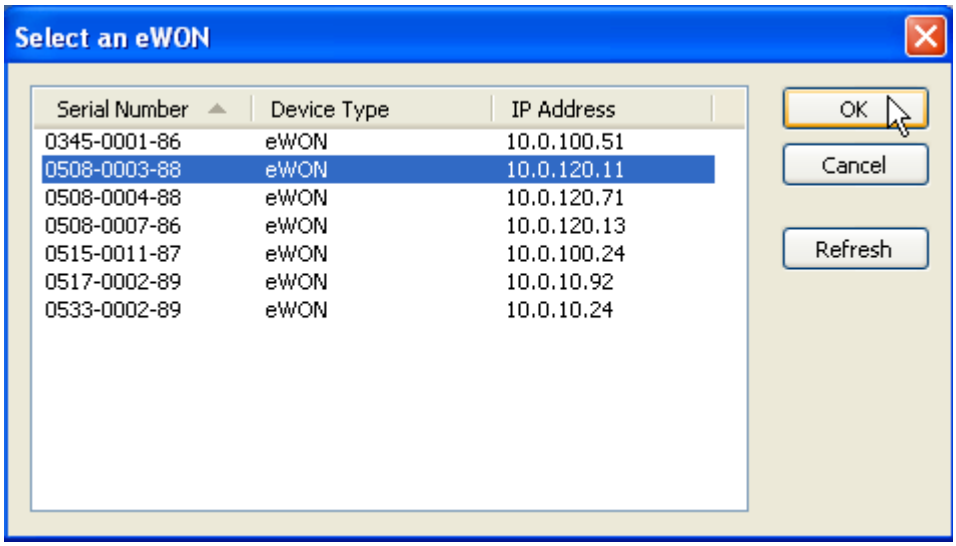


• Setting the IP address from an eWON

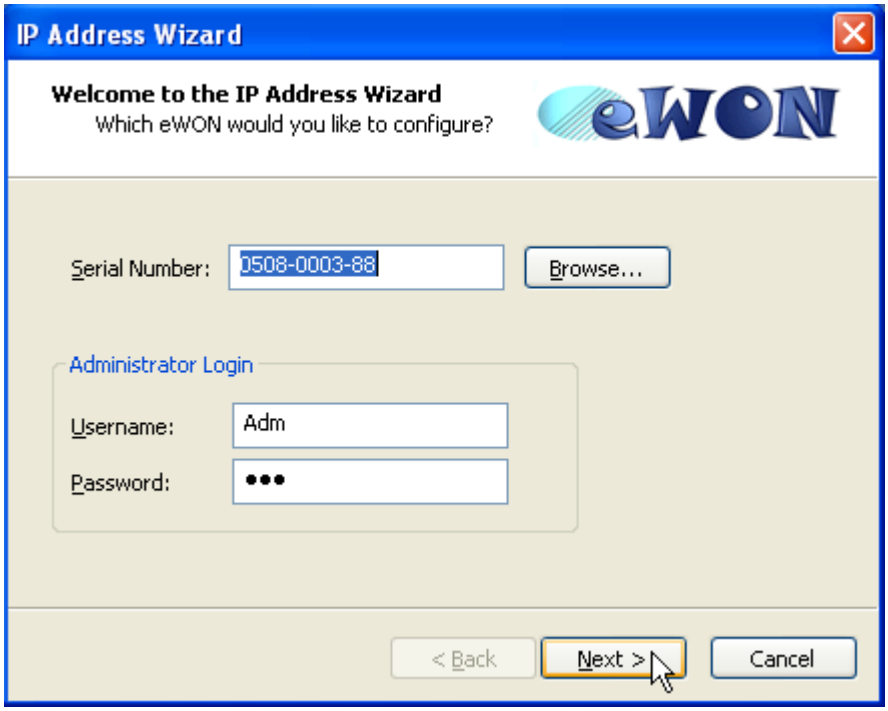
If the eWON you want to set the IP address is in the list, just right-click on it, and select ***Set IP Address*** in the contextual menu (if the eWON is not in the list, then right-click in the blank area under the list):



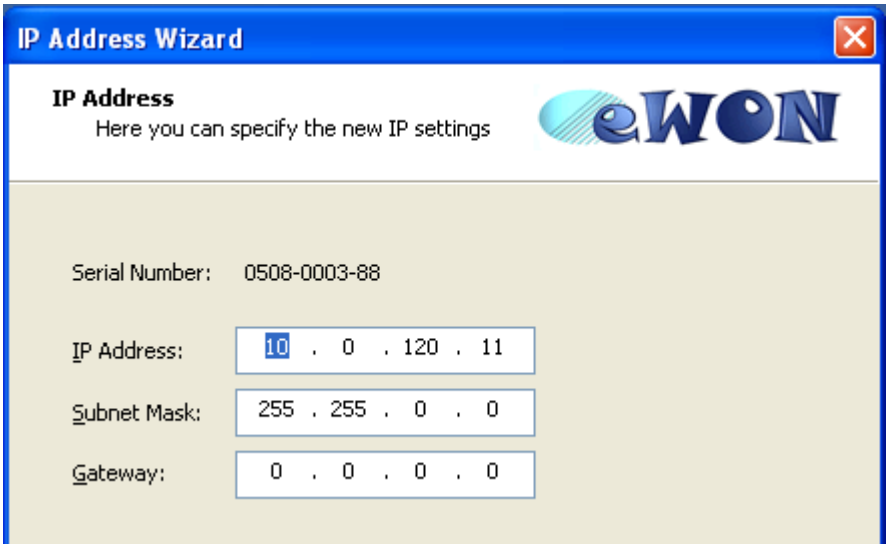
Enter the eWON serial number in the ***Serial Number*** field if not yet done, or click on the ***Browse*** button.
In this case, the dialog box below then displays:



Select the eWON of which IP address you want to modify and click ***OK***.
You then come back to the previous wizard page, in which you must then enter the ***Username*** and ***Password*** fields that are required to connect to the eWON:

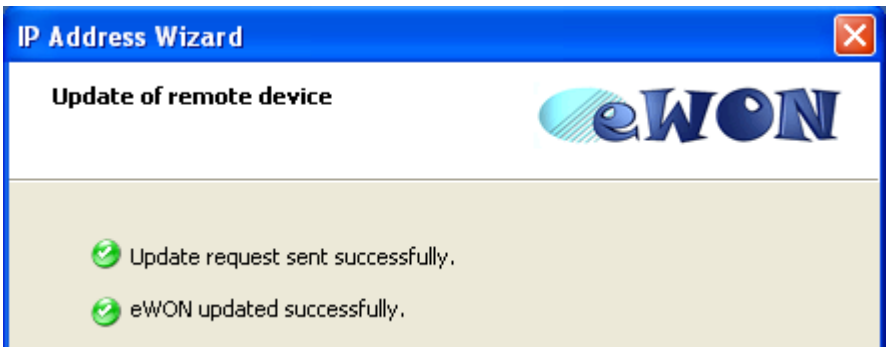


Then click on ***Next*** and set the ***IP Address*** and ***Subnet Mask***:



Then click on ***Next*** again to launch the update and wait for the eWON to reboot:

When done, click on ***Finish*** to exit from the IP Address Wizard.



Now your eWON should appear in the eBuddy list with the new informations you have entered.

Testing the eWON IP Address

To test that the IP address has been assigned successfully, open a command prompt and ping the eWON.

• Open a DOS command prompt and enter "ping <address>

where <address> must be replaced by the newly assigned address.

If the address has been correctly assigned, you should see the Ethernet led of the eWON blinking and the following screen:

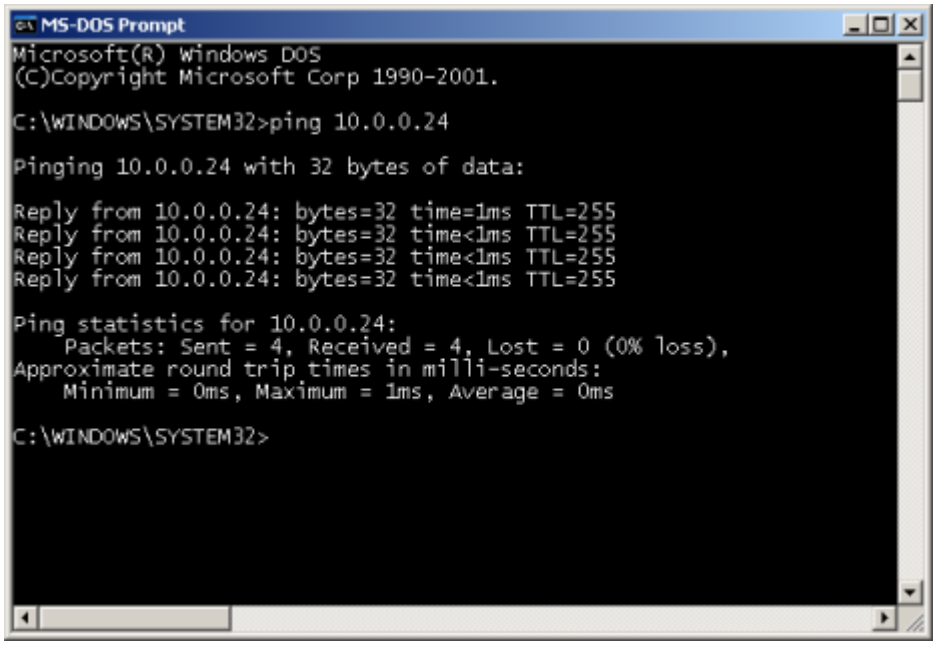


Figure 5: Pinging the eWON

If, instead of a response time, you get a "request timeout" message, there is a problem and the steps must be reviewed.

5.2 eWON Web Site

We have assigned an IP address to the eWON, so we can reach its HTTP server to configure it.
Open a Web browser and type the address you assigned to the eWON in the address bar (10.0.0.29 in that case).

The following login page then appears:

Figure 6: eWON login page

A preconfigured **adm** user exists to allow the first configuration*.

`User name` ← **`adm`**

`Password` ← **`adm`**

Then click on ***Enter***. The following page appears:

** The default password of the adm login **MUST** be changed for obvious security reasons. Refer to the User Guide to get explanations on how to change a user password.*

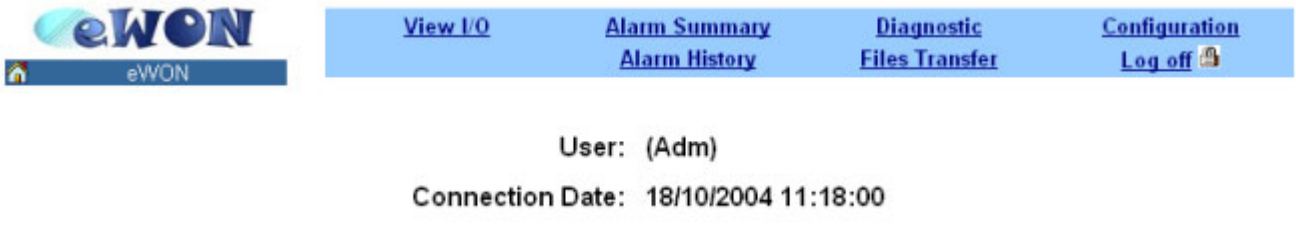


Figure 7: eWON main page

5.3 DF1 IO Server

Now that we have access to the eWON web site, we will configure the eWON to connect to a DF1 PLC.
The eWON embeds what is called **IO Servers**. Those servers are responsible of collecting the data on the network and make them available for further usage. Once the eWON can interact with the PLC, the variables of the PLC will be available as **Tags**.

- **The IO servers are configured by accessing a specific web page that you can reach by clicking on the link *IO Server Config* from the eWON configuration navigation bar.**
- **Set *DF1* in the *IO Server* scrollist**
- **Set *DF1* in the IO Server drop down box**

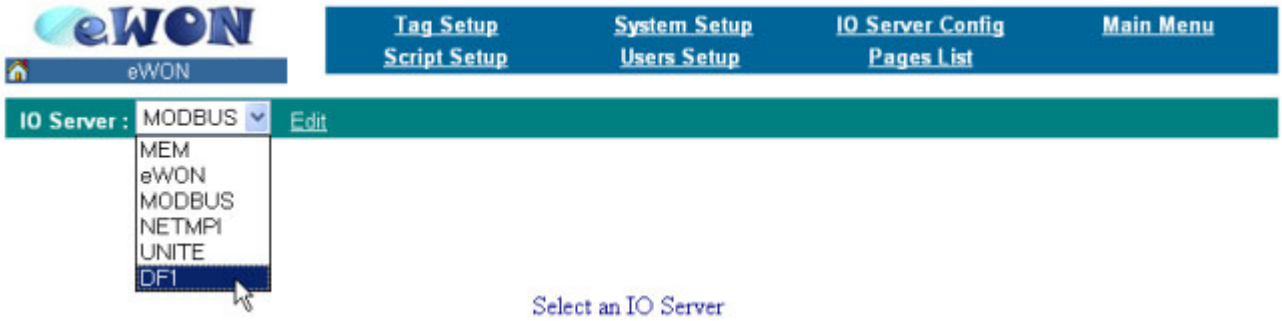


Figure 8: O Server config page

Don't forget to set the eWON on RS-232 mode with the correct dip-switches configuration (all switches must be OFF):

The following web page appears:

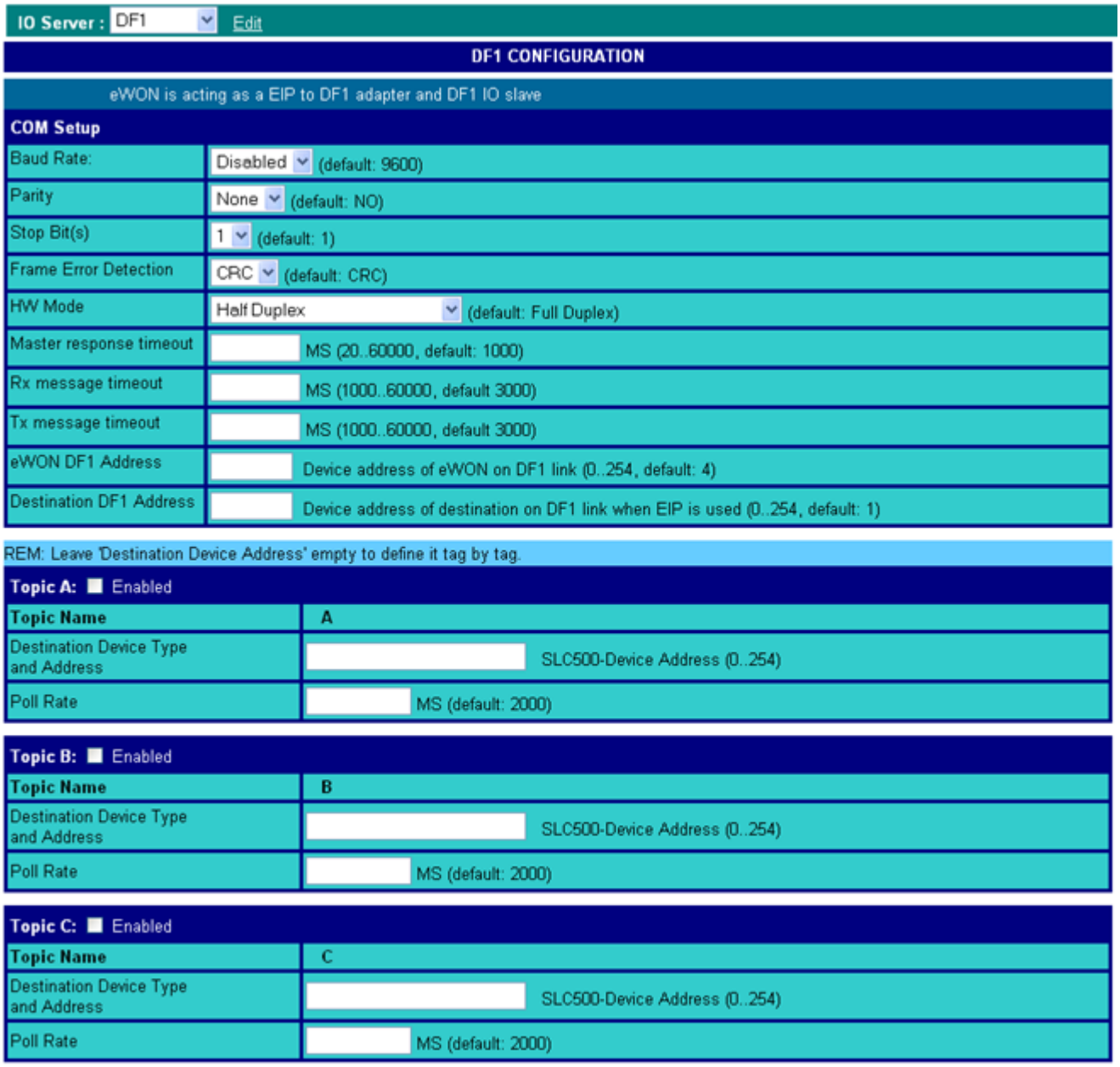


Figure 9: DF1 IO server setup page

- **Set the baud rate, parity, stop bits, Frame Error detection, and HW mode with the values negotiated by RSLinx during the AutoConfigure step**
- **Check the *Enabled* box for topic A**
- **Set the global device address of topic A to SLC500-X where X is the SourceID retrieved from RSLogix 500 (Channel Configuration).**
- **Set the poll rate of topic A to 1000**
- **Update Config**

5.4 Checking the DF1 connection

We will now create a Tag to read a variable of the PLC.
The creation of a Tag is done in the ***Tag Setup*** page:

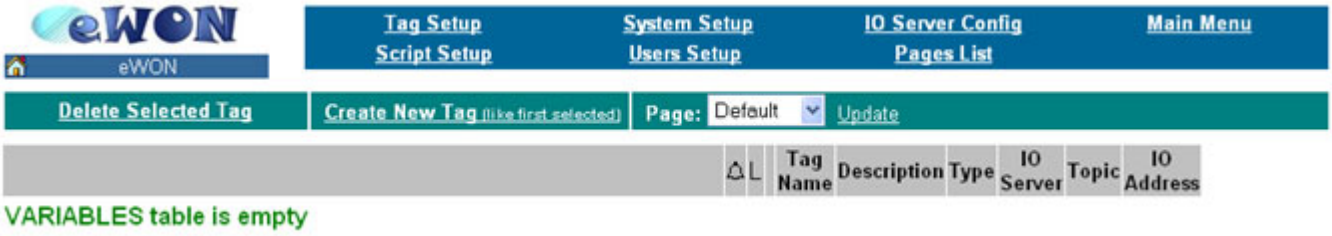


Figure 10: Tag Setup home

• Click on *Create New Tag*
The Tag edition page appears. The page is composed of six parts used to configure the Tag name and description, the Tag IO server, the Tag visibility, the Tag alarm, the Tag historical logging* and the Tag real-time logging*.
In this tutorial, we will only care about the Tag name and IO server.
* eWON® 4001 only.

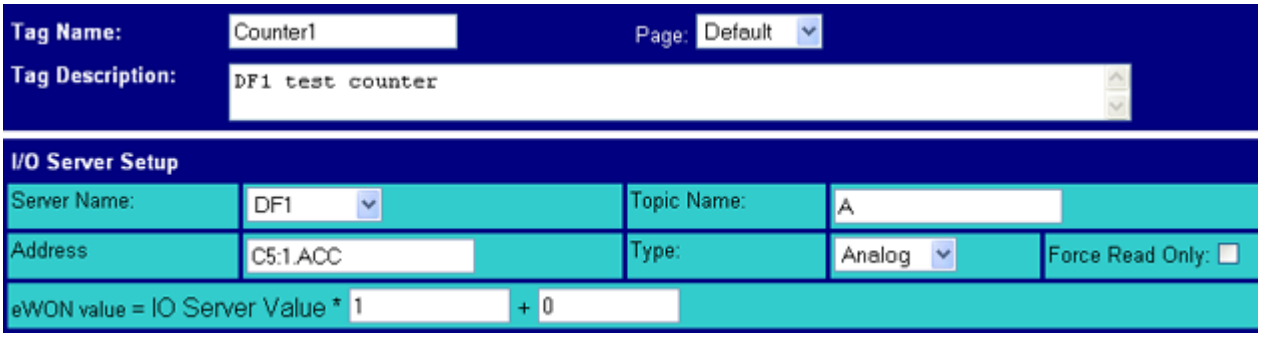


Figure 11: Creating a DF1 counter Tag

• Set the Tag name to "Counter1"
• Set the page to "Default"
• Set the Tag description to "DF1 test counter"
• Set the server name to *DF1*
• Set the topic name to "A"
• Set the address to "C5:1.ACC"
• Set the type to *Analog*
• Let the eWON value to "1" and "0"
• Click *Add/Update Only*

You come back to the eWON Tag setup page:

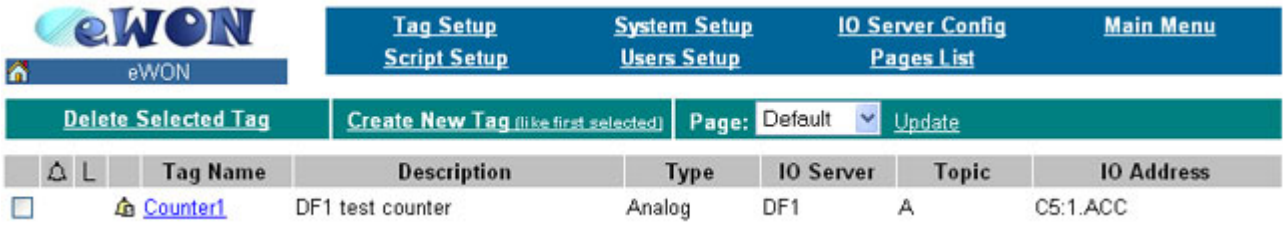


Figure 12: Counter Tag created

Now that we have a Tag, we will check it's value, by selecting ***Main Menu***/***View I/O***:

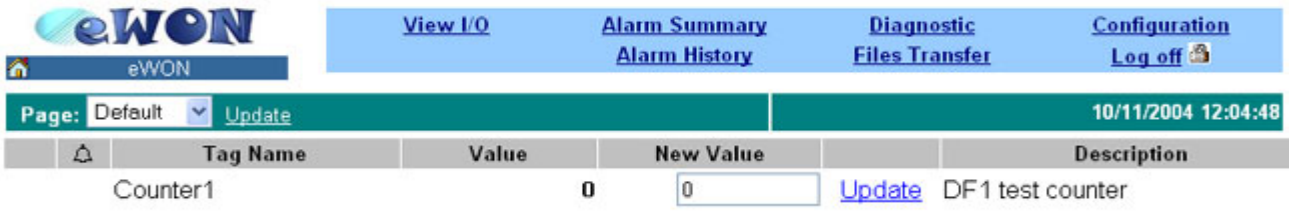


Figure 13: View I/O page

Connect the PLC to the eWON using the 1747-CP3 cable (see chapter 1747-CP3 cable between eWON and SLC-500 - pinout on page 20). The serial link led should blink very quickly.
Click ***Update*** at one second of interval. You should see the Tag value increasing.

6 EIP

The next step in the configuration is to set up the eWON and RSLogix to use EIP. The eWON needs to provide EIP to DF1 relay. The RSLogix 500 software needs to use the RSLinx Ethernet devices driver instead of a direct DF1 driver to reach the PLC.
The relay principle can be described as follows:

- **The RSLogix 500 software sends a request using the RSLinx Ethernet devices driver installed on the PC**
- **The request is sent through TCP/IP with a destination address set to the eWON IP address**
- **The eWON detects the IP address is its own address, set the PLC DF1 address and forwards the packet on the DF1 serial link; the PLC then answers the eWON which forwards the answer to the PC IP address**

6.1 eWON EIP Configuration

We need to assign the eWON a DF1 destination address, i.e. the address of the target PLC
This is done from the IO Server setup page.

- **Go back to the DF1 setup page (*Main Menu*/*IO Server Config*/*DF1*)**
- **Change the DF1 Destination Address to X where X is the SourceID retrieved from RSLogix 500 (*Project*/ Controller/*Channel Configuration* from the Project panel tree)**
- **Save the configuration**

6.2 RSLinx Ethernet Device Driver Configuration

Inside RSLinx select: ***Communications*/*Configure Drivers***.
Among the available driver types select ***Ethernet devices*** and click the ***Add New*** button.
A window asking you to choose the driver name will appear. Select the default name by clicking on OK. You now get the following dialog box:

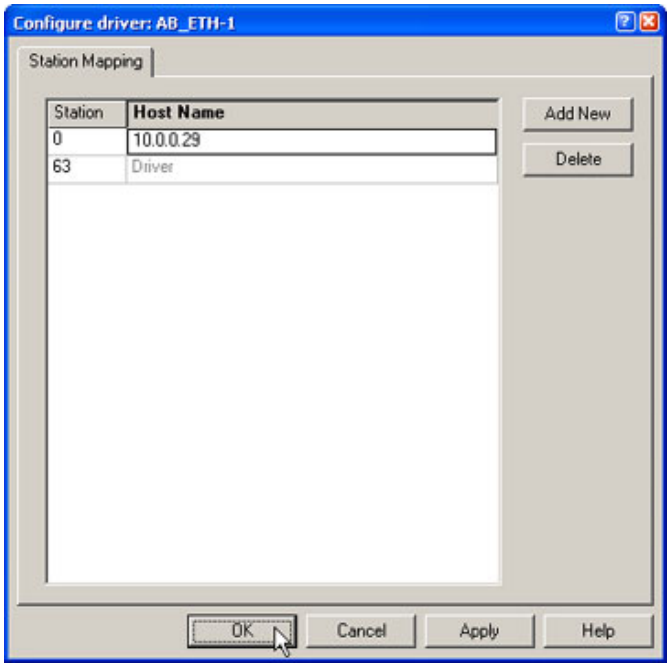


Figure 14: EIP driver configuration dialog box

Fill-in the host name with the eWON IP address assigned earlier in the section Setting the eWON IP Address and press OK.

7 Remote Collaboration

Finally, we will use the just set up connection to upload the program from the PLC to the RSLogix 500 software:
- **Open RSLogix**
- **select Comms->WhoActiveGoOnline**
- **select AB_ETH1, Ethernet**
- **Press OK**

7.1 Remote Collaboration with Direct Phone Connection

In this section, we will set up a remote collaboration using a PPP link established between the PC and the eWON. Some changes are needed in the eWON to act as a PPP server and possibly on the PC (to set up the correct routing tables).

7.2 eWON PPP Configuration

The eWON PPP configuration is reached on the eWON web site (starting from the main page, see above) following the link:
- ***Configuration*/*System Setup*/*Communication*/*Dial Up (PPP)***

The sections ***Global Dialup Config*** and ***Incoming Calls Config*** from this page contain every information we need:

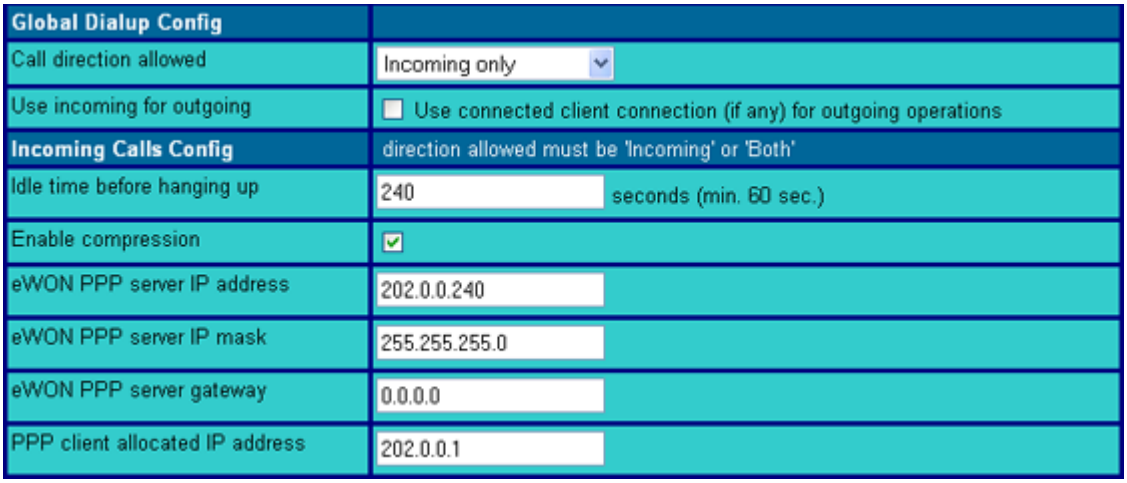


Figure 15: Global and Incoming Calls Config Dialup settings

- **Set the Call direction allowed to Incoming Only**
- **Set the PPP server IP address to 202.0.0.240**
- **Set the PPP server IP mask to 255.255.255.0**
- **Set the PPP server gateway to 0.0.0.0 (no packet forwarding to another network)**
- **Set the PPP client allocated IP address 202.0.0.1**
- **Click *Update Dialup Setup***

7.3 RSLinx Ethernet Devices Driver Configuration

The IP address of the remote host must be set to the eWON PPP server IP address (on the previous figure, this is 202.0.0.240).

- **Open RSLinx**
- **Select *Communications*/*Configure Drivers***
- **Select "AB-ETH-1 A-B Ethernet"**
- **Select *Configure***
- **Change the IP address on the remote host to "202.0.0.240"**
- **Click *OK***

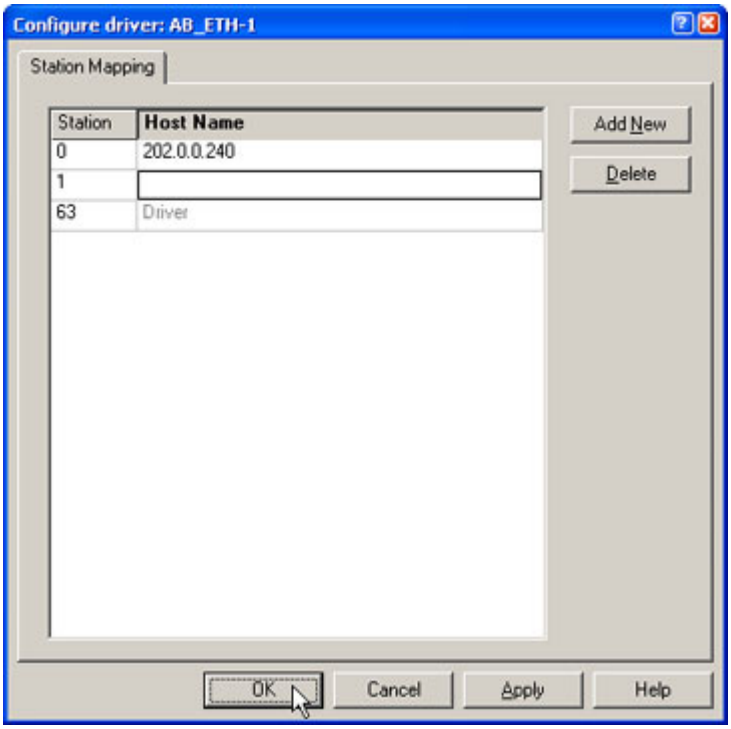


Figure 16: Setting the Host address to the eWON PPP IP address

7.4 Starting the Remote Collaboration

- **Call the eWON with the username "adm" and the password "adm" and wait for the connection to be established, this step can take some time.**

To test the connection, you can ping the eWON at its address: **202.0.0.240**

- **Open RSLogix**
- **select *Comms*/*WhoActiveGoOnline***
- **select "AB_ETH1, Ethernet"**
- **Click *OK***

The PLC is now accessible as if you were directly connected to it.

8 Remote Collaboration through Internet

In the previous section, the IP address of the eWON was known at connection time. If the eWON is used with callback to connect to Internet, the IP address allocated to the eWON is assigned by the ISP and is usually different at each connection. We must therefore ask the eWON to publish its IP address after it has been assigned by the ISP, so that we can configure the RSLinx Ethernet devices driver to use that address.

8.1 ISP Configuration

The ISP phone number, login and password must be configured to allow the eWON to connect to Internet. This is done in the ***Dial Up (PPP)*** section we have already seen before:

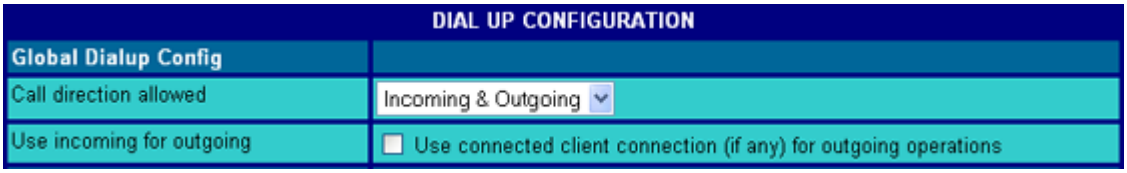


Figure 17: Allowing the outgoing calls

• Set the Call direction allowed to *Incoming and Outgoing*

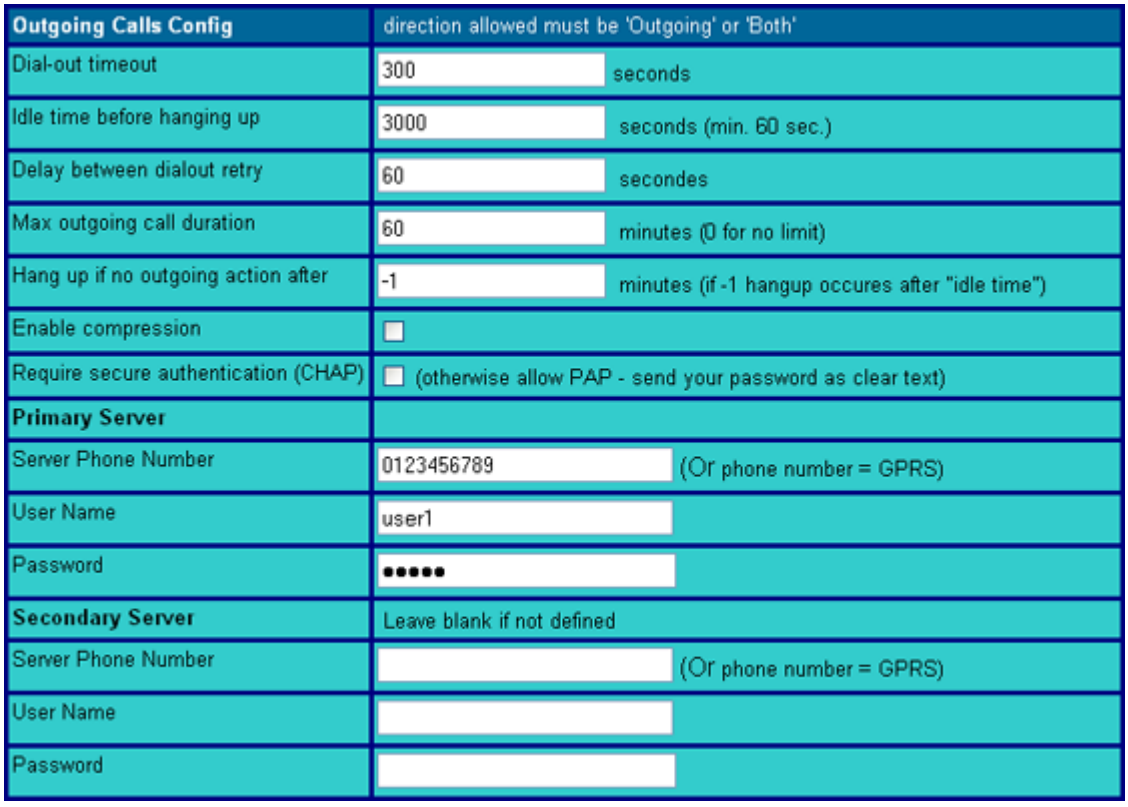


Figure 18: Setting Primary PPP Server

• Enter the *Server Phone number*, *User Name* and *Password* provided by your ISP for the *Primary Server*
• Let the *Secondary Server* fields empty
Depending on your ISP, other parameters such as enabling compression or allowing CHAP could be necessary.

8.2 PPP IP Address Publishing

We will use the easiest way to publish an IP address: by Email. Prior to do this, we need to configure a SMTP server and an address where to the server can send the information.

The SMTP server configuration is found in the main setup from the eWON (***Configuration***/***System Setup***/***General***/***General***). The only section of interest is the ***Email Config*** one:

EMAIL Config	Configure Mail Transfert	
SMTP Server Address:	smtp.provider.net	Usually something like smtp.domain.com or mail.domain.com (can be an IP address)
SMTP Server Port:	25	The default value is 25. It must only be changed in very special cases.
EMail "From" User name :	user@provider.net	this will be used to send eMails, it must be compatible with your account name on the SMTP server.

Figure 19: SMTP Server Setup

- **Enter the STMP Server Address (can be an URL or an IP address)**
- **Enter the SMTP Server Port (25 is the default value, it does not usually have to be changed)**
- **Enter the "From" address that is compatible with your ISP account**
- **Click *Update Config* (a message appears telling your configuration has been saved successfully)**

The address publishing is a built-in facility of the eWON. The configuration of the Email address where to send the Email containing the address is therefore directly configured into the ***Callback*** section (***Communication***/***Callback***).

CALLBACK CONFIGURATION	
General Callback Config	
Callback **Enabled**	☑ ('Outgoing' calls must be enabled in Dialup configuration)
Callback delay	30 seconds
Wait for user login for	1200 seconds
Dialup account	Primary dialup server (User callback is valid only if 'On User's request mode is selected)
Select one callback method: RING or USER'S REQUEST	
Callback on RING	● Callback occurs when RING is detected
Number of RINGS	5 (minimum 2)
Plus number of RINGS then On Hook	10 (minimum 5)
Callback on USER'S REQUEST	○ User must log on and request callback
IP address publishing	
Publish IP address EMail	yourmail@firm.net (Empty means no address publishing by Email)
No-Ip Username (see http://no-ip.com)	

Figure 20: Callback Setup

- **Check the *Enabled* box**
- **Enter your Email address in the *Publish IP address Email* field**
- **Click *Update Callback Setup***

8.3 Starting the Remote Collaboration

- **Call the eWON and let ring four times, then hang up**
- **The eWON calls back the ISP, connects itself to Internet, and sends an email with its IP address**

You will receive an Email named “eWON CALLBACK” looking like the following one:

```
This Email has been generated automatically by
following a CALLBACK
eWON: eWON

*** EWON Description:

*** Online TCP/IP addresse
PPP:      http://62.4.145.128
```

Figure 21: Callback Email notification

We need to configure the RSLinx Ethernet Devices driver with the address we received in the Email (same procedure as described in chapter “RSLinx Ethernet Device Driver Configuration on page 14”.)

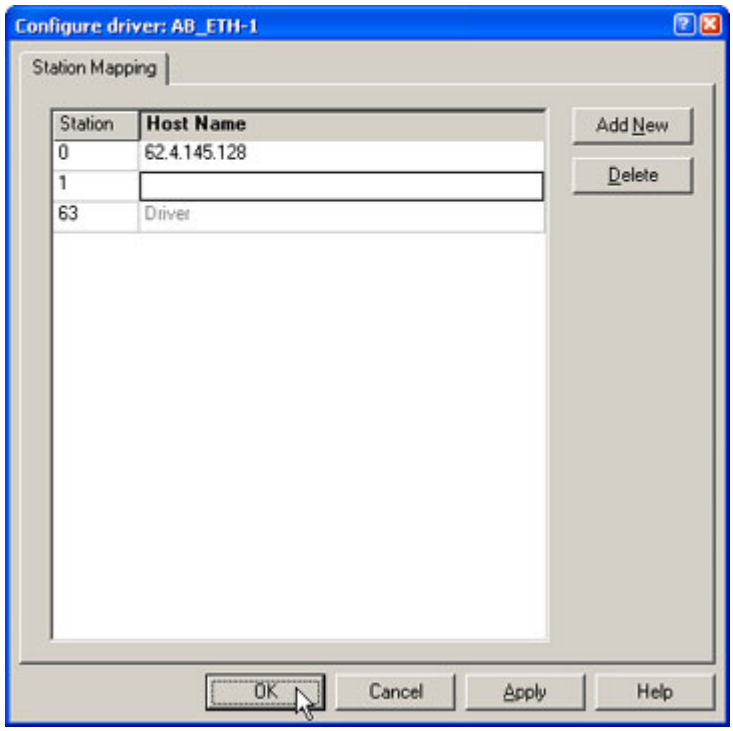


Figure 22: Setting RSLinx Device Host Name to the online TCP/IP address

- **Open RSLogix**
- **select *Comms/WhoActiveGoOnline***
- **select “AB_ETH1, Ethernet”**
- **Click *OK***

The PLC is now accessible as if you were directly connected to it.

9 Appendix

9.1 1747-CP3 cable between eWON and SLC-500 - pinout

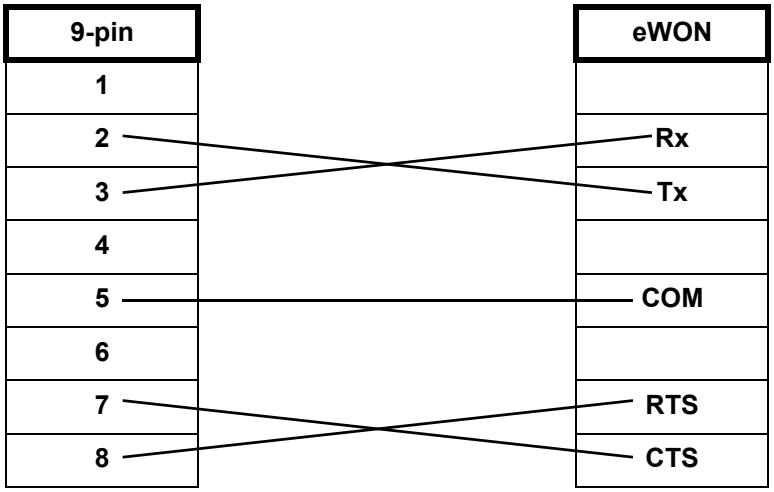


Table 1: 1747-CP3 cable pinout

The connectors are SUBD9 female at both sides.