Quick Start

EtherNet/IP communication with Rockwell PLCs

Rev	Date	File Name
1.4	26/05/15	QuickStart_EtherNet/IP comm with Rockwell PLCs

Description

- **Product concerned:** All BradCommunications™ Products that allows an Industrial EtherNet/IP communication with Rockwell PLC.
  - The **applicom PC Network Interface Card**:
    The applicom PCNIC solution is based on a co-processor / intelligent card that is able to embed and execute the communication with PLCs for high performance.
    The reference concerned: PN# APP-ETH-PCU/PCIE, APP-ESR-PCU, APP-ESP-PCU/PCIE
  - The **Direct-Link PC Network Interface**:
    The Direct-Link PCNI solution is based on windows/ PC integrated Ethernet interface that executes the communication with PLCs at PC level for light application.
    The reference concerned: PN# DRL-ALL-SWx-y (for x and y reference check our catalogue)
  - The **applicomIO PC Network Interface Card**:
    The applicomIO PCNIC solution is based on a co-processor / intelligent card that is able to embed and execute the communication with PLCs for high performance.
    The reference concerned: PN# DRL-EIP-PCU/PCIE
- **Environment:** Quickstart realized with :
  - Windows XP SP2
- **Related documents:**
  - Product Help files, available on the CD from the documentation directory.
  - Technical Notes are on the CD from the Technote directory
- **Restriction:** None

Summary:

This Quickstart provides you the minimal step to start up an EtherNet/IP communication with a Rockwell PLC.
This Communication Quickstart completes the Product Quickstart that explains how to install and use the product you have. Please read first the Product Quickstart.

Note : According to the product (NIC, gateway, software driver) you use, the console configuration software may differ on few topics, but the communication configurations parameters will be identical.

Woodhead

1 Presentation of the EtherNet/IP messaging

1.1 Differences between the Logix 5000 messaging and PCCC messaging

All the Allen Bradley PLCs use the Ethernet/IP (EIP) messaging to communication on Ethernet medium. The older PLC genration, like PLC-5 and SLC-500, use the EIP PCCC messaging, while the ControLogix series uses the EIP Logix5000 messaging. Either messaging are based on a common EIP concept.

One important feature of the Logix5000 PLC family is the possibility to create and manage variables on the PLC only with symbolic names. This means that the user creates a variable on the PLC assigning it a symbolic name (valve1, for example) and no physical address is associated to this variable. In older PLC all variable were located in data tables at a specific mémory location (for example : N7:0). One difference in this 2 messaging PCCC and Logix5000 is so the access way to these 2 memory management.

The EIP Logix5000 and PCCC messaging are the classical methods to communicate between different Rockwell CPUs connected on Ethernet network. With these messaging you can exchange large amounts of data for visualisation purposes for example.

1.2 Rockwel PLC messaging support

Different Rockwell PLCs support different messaging. See the below table for a complete view:

Controller Family	PCCC Support	EIP Logix5000 support
ControLogix	YES(1)	YES
SLC-500	YES	NO
PLC-5	YES	NO
MicroLogix	YES(1)	YES
CompactLogix	YES(1)	YES
FlexLogix	YES(1)	YES

(1) The PCCC is not a native communication solution but can be used if a PCCC address is attributed to the variables created in the Logix5000 environment.

1.3 Using PCCC messaging with the applicom PCNIC.

The PCCC messaging with the applicom PCU2000ETH card (PN# APP-ETH-PCU) uses Rockwell proprietary functionalities that request to buy additionally the following driver key: APP-DRV-AB.
In others, the card shall have the CA0106 or CA0108. Please check it out with the PCKEY.exe tool available from the main applicom directory.
The Logix5000 messaging does not request this driver.

For more information about this topic see the FAQ chapter at the end of the note.

1.4 EtherNet/IP IO communication

EtherNet/IP IO messaging is another communication standard used for IO control purposes. With this messagings it is possible manage directly the I/Os present on the field with very high refresh rates.

With the PCU-ETHIO card (PN# DRL-EIO-PCU) in the Direct-Link applicomIO familly is also possible to use EIP to communicate with I/O modules, through their specific EDS file. Through this EDS file (provided by the I/O constructor), the card will be able to recognise, configure and communicate with every I/O module present on the network. For more information, please consult the **EtherNetIP.pdf** file in the applicomIO 2.3 documentation.

1.5 BradCommunication messaging support

For the BradCommunication solutions the compatibility is the follow:

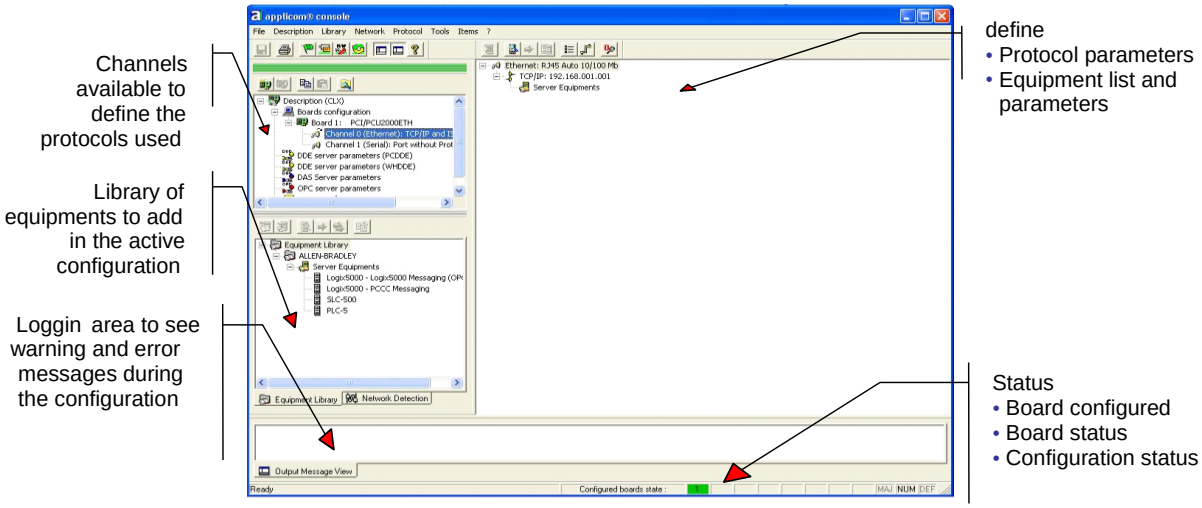
BradCommunication PN	PCCC Support	EIP Logix5000 support	EtherNet/IP IO support
APP-ETH-PCU	YES	YES(1)	NO
DRL-EIO-PCU	NO	NO	YES
DRL-ALL-SWx-y	YES	YES(1)	NO

(1) the messaging use is supported only over the OPC or DDE data servers, not via DLL functions

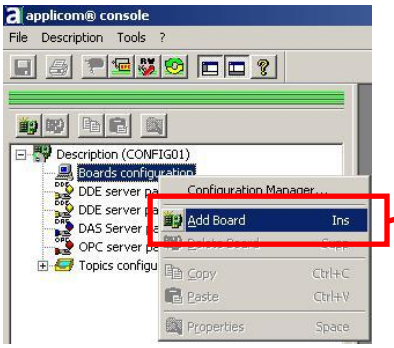
2 How to insert Rockwell PLC in the configuration tool

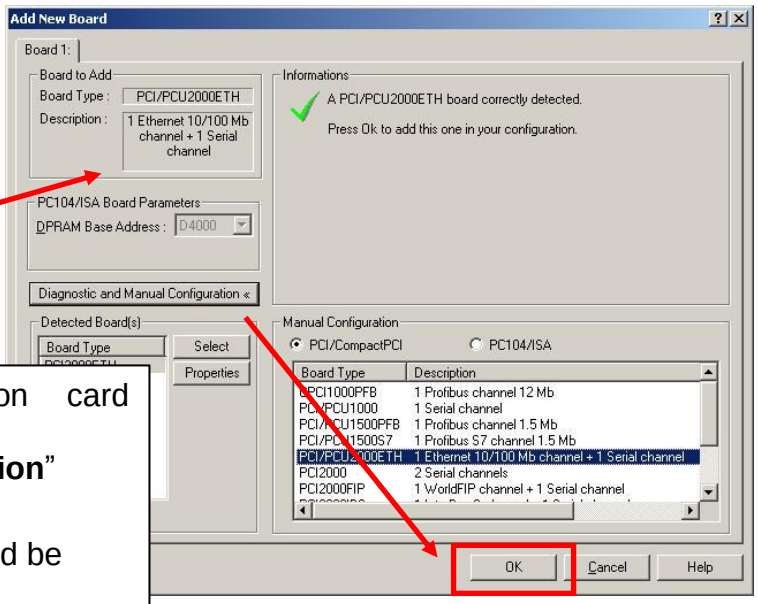
2.1 The Console description

To start the configuration Console click on the  button in the applicom directory:



2.2 Select and setup the communication interface





Specify the interface communication card installed on the PC.

- Right Click on "**Board configuration**"
- Select "**add board**" 
- The card installed in the PC should be automatically detected or select it manually from the list, click **OK**.

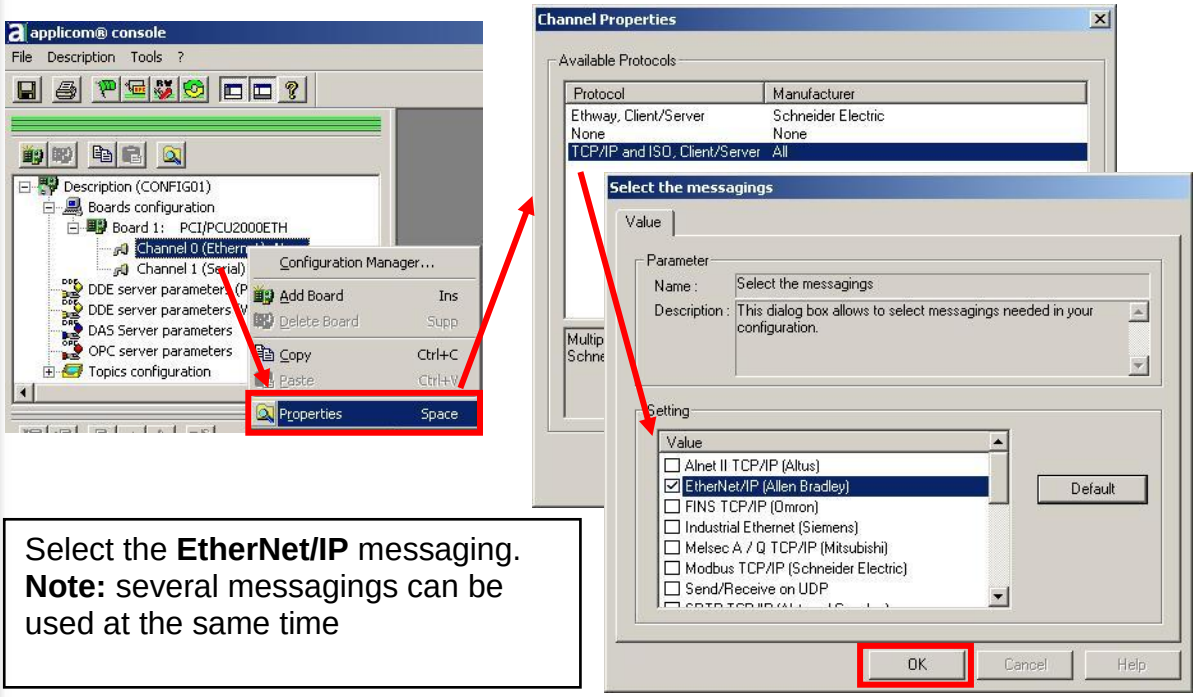
Note : this list can be different depending on the product you are using !

Network Interface

2.3 Configure the protocol

Select the Ethernet Protocol you want to drive :

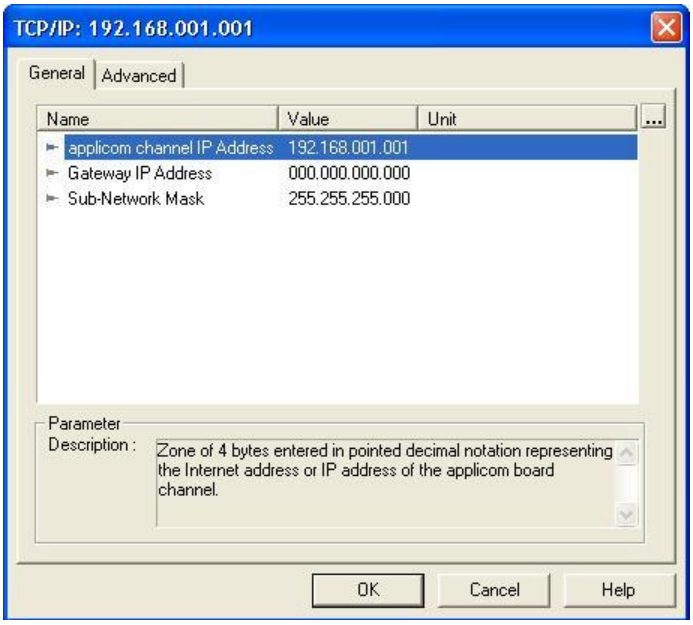
- Right click on **Channel 0 (Ethernet)** and **Properties** to select the messaging.



Select the **EtherNet/IP** messaging.
Note: several messagings can be used at the same time

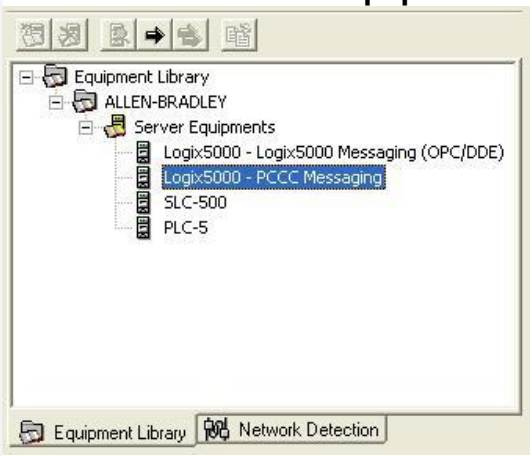
Configure now the Ethernet properties following the OK button click in the previous window, or by a double click on "**Ethernet**", in the right side of the Console:

Configure the IP address of the Ethernet communication interface.



Note : the DRL PCNI solution is using the computer IP address, use so the standard windows Network manager tools to change this IP address.

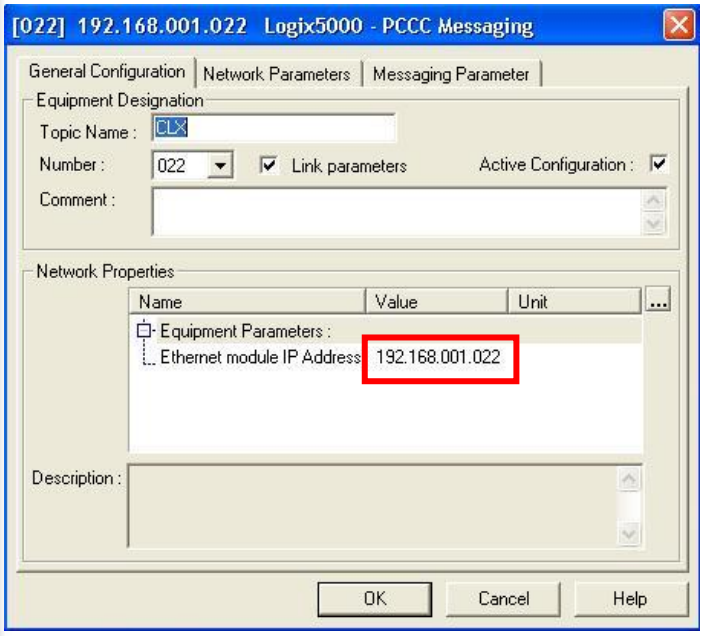
2.4 Add the equipments



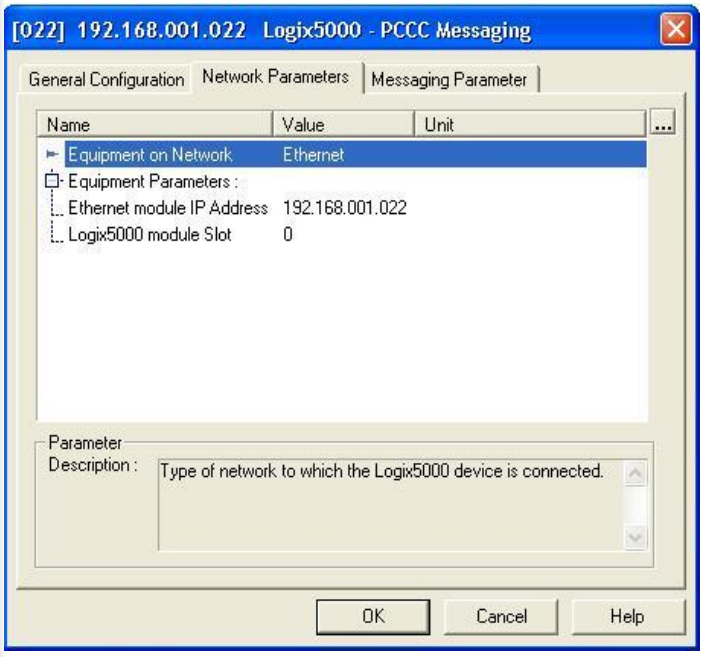
Insert from the Equipment Library the device type you want to communicate with.
Use the Drag & Drop method or the insert button

- PLC5 and SLC500 equipment will be using PCCC messaging.
- Logix5000 equipment can be accessed over the 2 different messaging. (Logix5000 messaging only accessible via OPC or DDE data server)

Configure now the equipment properties:



Topic Name: Equipment name that will be used in the Data Servers (OPC / DDE …) to access to this PLC
Number: Equipment Number that will be used in the DLL or in the various test and diagnostic tools to identify this equipment.
Link Parameters: Selected, this checkbox will link the different parameters to the Equipment value (here the last digit of the IP address)
Ethernet module IP address: Equipment IP Address to access to the remote equipment.



Equipment on network: if your equipment is on a DH+ or a ControlNet network that you access over a CLX Rack set as Gateway you can enter here the additional parameter that will define the path to this device.
Logix5000 module Slot: Specifies the slot in the rack where the Logix5000 CPU module resides. (only for Logix5000 PLC)

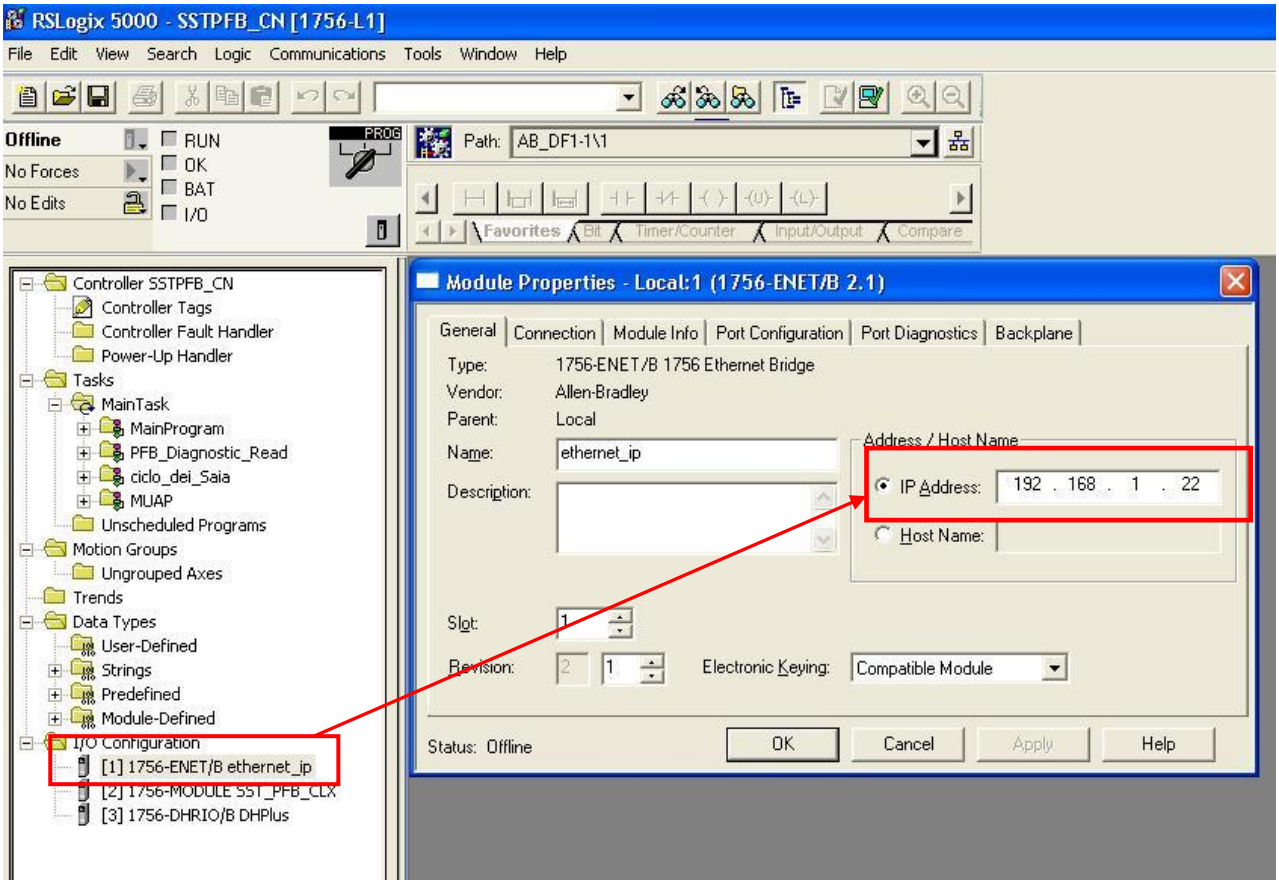
- in the Messaging Parameter tab) -
Max Number of simultaneous request: specifies how many requests will be executed at the same time between the card and the PLC. This will then define the number of connections that will be open with this PLC (check this in relation with the max number of connection supported by the PLC).

3 How to configure CLX Ethernet interface

3.1 CLX Ethernet Interface configuration with RSLogix5000

Open the ControLogix project with the RSLogix software.

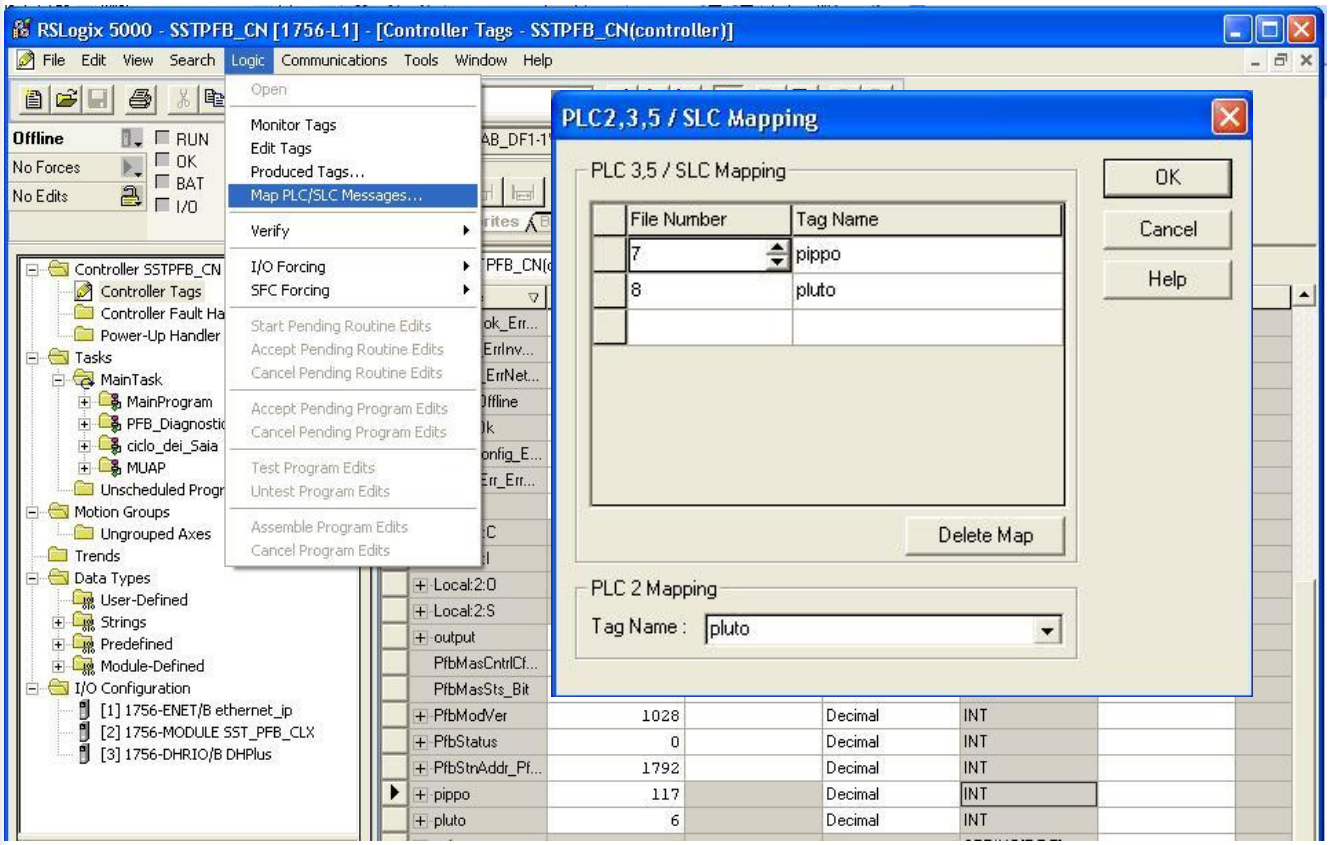
From the main windows, double click on Ethernet controller. Set the IP address in the General tab. All other Ethernet properties can stay as default.



Download all modifications in the PLC, clicking on the Offline button and select download, or alternatively choosing Communication → Download; now the PLC is ready to communicate.

3.2 Data mapping with RSLogix5000 for PCCC communication with CLX CPU

To use the PCCC messaging to communicate with the CLX (ControLogix) controller, you have to map the variables that you want to monitor in a PLC5/SLC format. This is the only way to communicate with a CLX PLC over the DLL access or with some BradCommunication products like the applicom Gateway.



In the PLC/SLC Mapping enter the file number and on the right side the corresponding variable name of the CLX Controller. The access can then be performed over a PCCC Syntax like N7:22

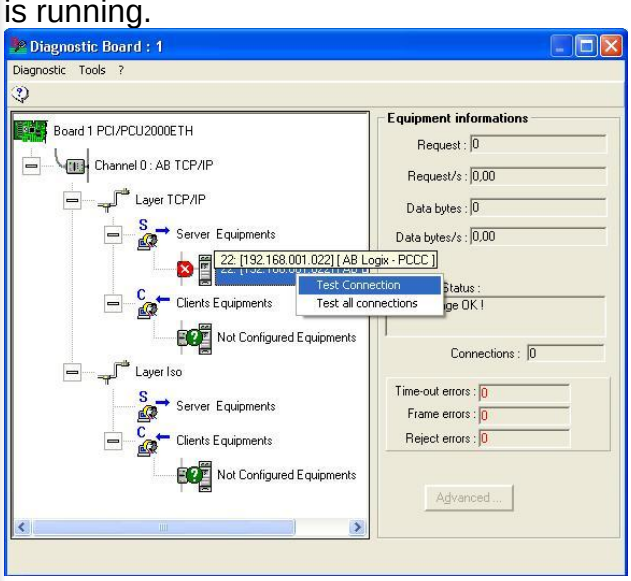
Important note: this operation can be performed only for **integer** and **floating** variables (and their respective arrays)

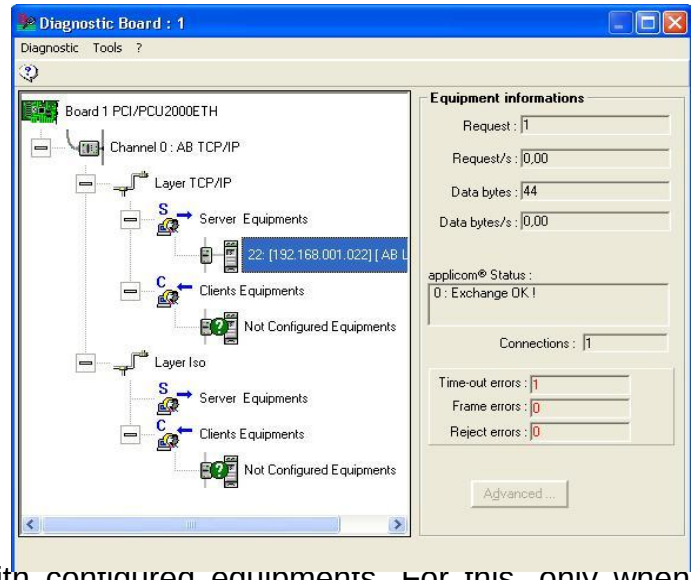
4 Check the communication with your equipments

Now the card and the PLC are ready to communicate together.

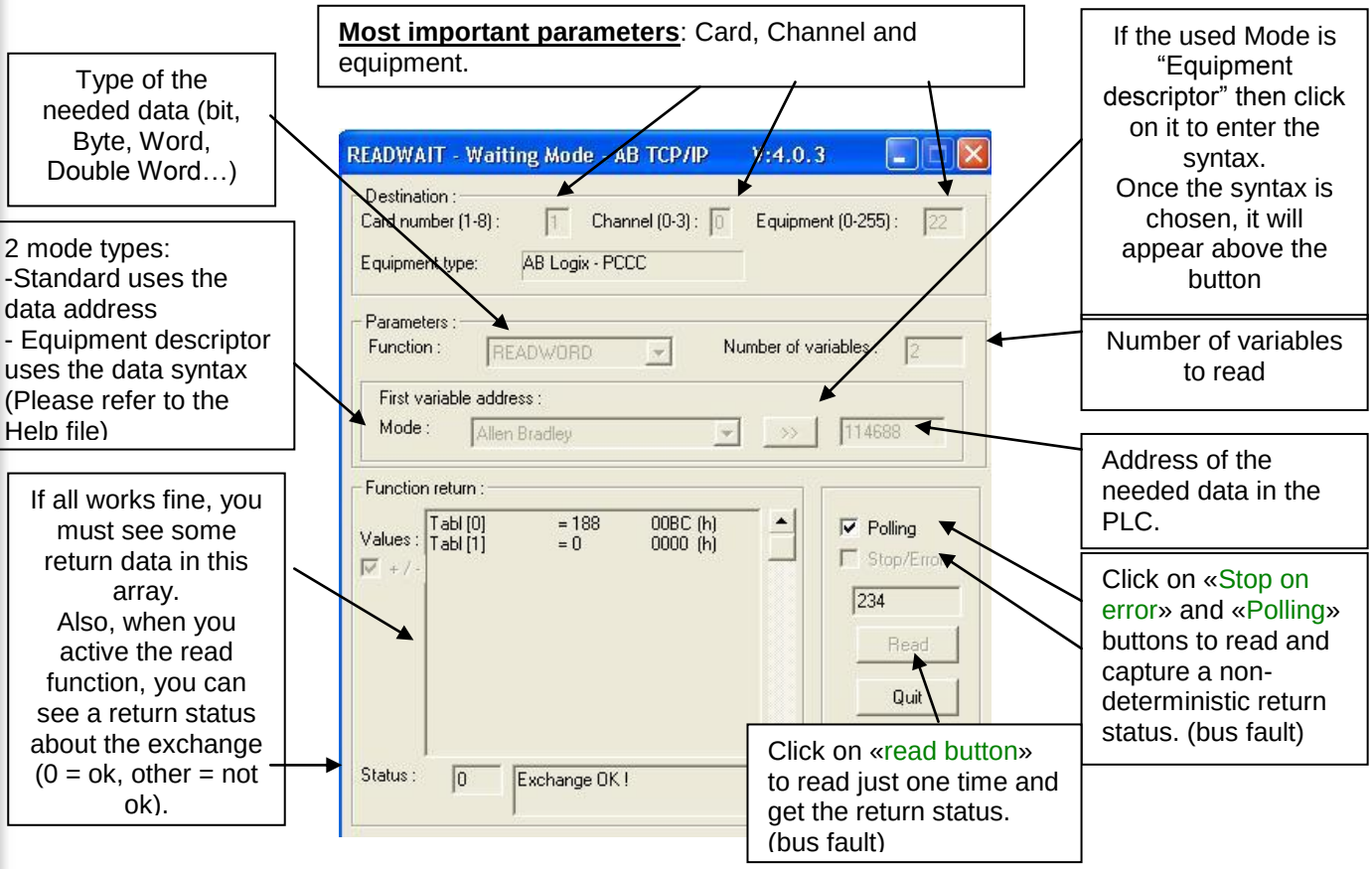
Initialize the communication solution with the following button in order to update the configuration in your card.

Use the following diagnostic tool in order to check if the connection with the remote PLC is running.





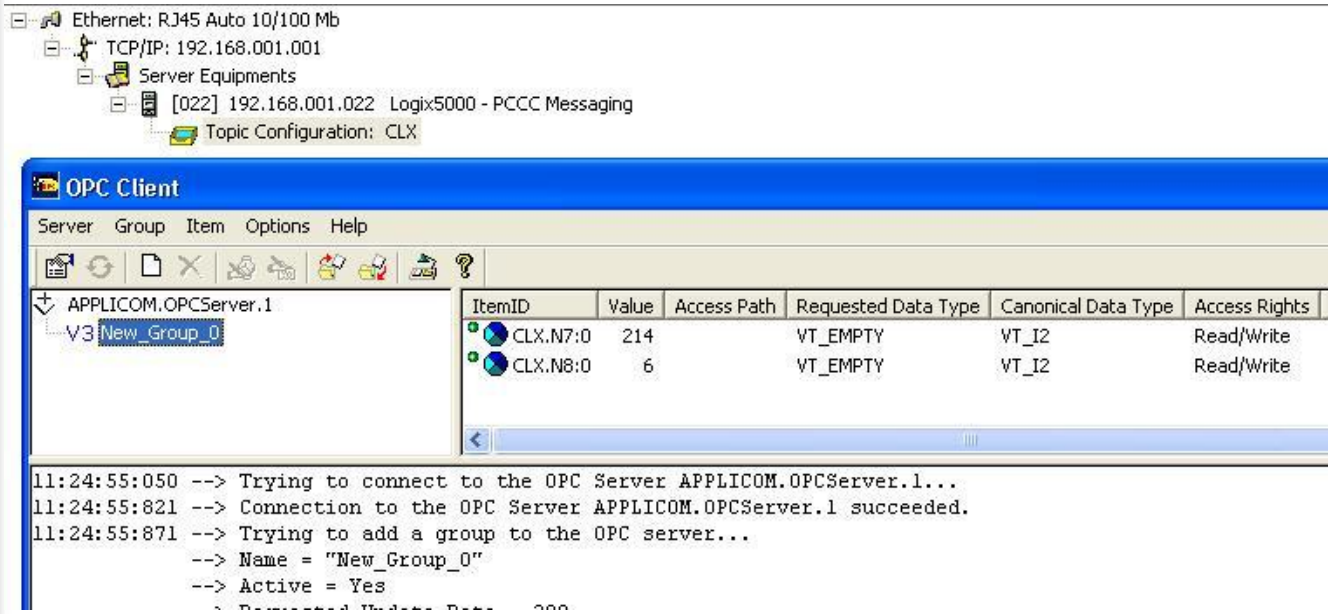
You can also check the communication with configured equipments. For this, only when you're using the PCCC messaging, use the ReadWait communication test tool that you can start from the configuration console. This next test is not valid for the EIP Logix5000 messaging, please refer to the next section (OPC connection).



5 Communication over Data Servers – Ex with OPC client

5.1 OPC Data access over PCCC messaging

You can also test the OPC Server communication over the OPC test Client provided as additional test tool. Start it from the configuration console and the connection to the OPC server is opened automatically. You just have to add in the group the items you want to test.



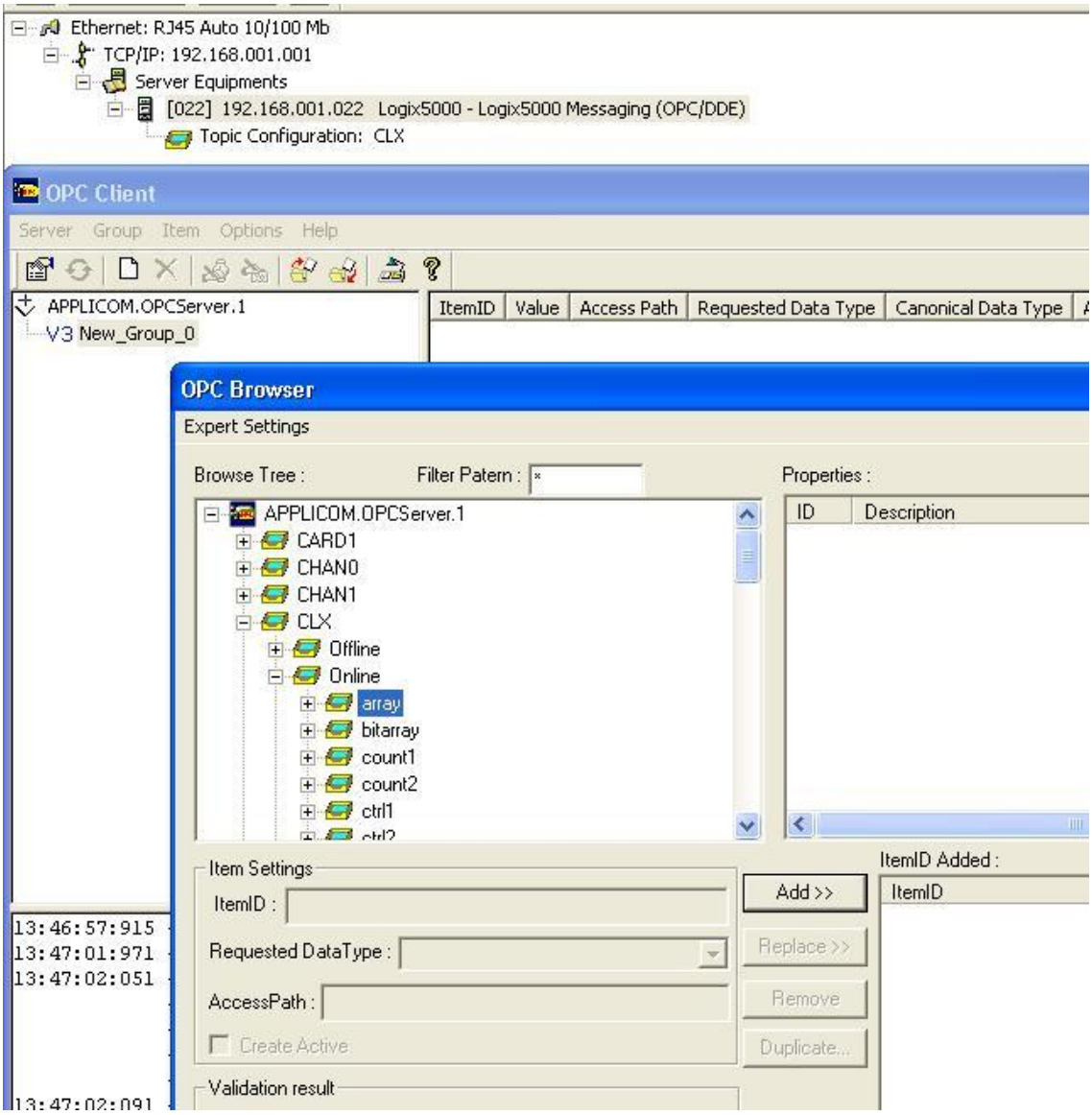
To add items to read on the network you can reference to the following PCCC syntax table:

	Unitary mode	Table Mode, Matrix Mode	Access
Input bits (PLC)	I:y/z	I:y/z_n, I:y/z_n_l	Read
Output bits (PLC)	O:y/z	O:y/z_n, O:y/z_n_l	Read /Write
Input bits (SLC)	I:m.y/z	I:m.y/z_n, I:m.y/z_n_l	Read
Output bits (SLC)	O:m.y/z	O:m.y/z_n, O:m.y/z_n_l	Read /Write
Bits	Bx/w or Bx:y/z	Bx/w_n, Bx/w_n_l or Bx:y/z_n, Bx:y/z_n_l	Read /Write
Input words (PLC)	I:y	I:y_n, I:y_n_l	Read
Output words (PLC)	O:y	O:y_n, O:y_n_l	Read /Write
Input words (SLC)	I:m.y	I:m.y_n, I:m.y_n_l	Read
Output words (SLC)	O:m.y	O:m.y_n, O:m.y_n_l	Read /Write
Words	Nx:y	Nx:y_n, Nx:y_n_l	Read /Write
Bits in the words	Nx:y.b or Nx:y/b		Read /Write
ASCII string in the words		M_Nx:y_n	Read /Write
Double words	Dx:y	Dx:y_n, Dx:y_n_l	Read /Write
Floating words	Fx:y	Fx:y_n, Fx:y_n_l	Read /Write
Timers			
Current value	Tx:y.ACC		Read / Write
Preset	Tx:y.PRE		Read / Write
Time Base	Tx:y.TB		Read
Enabled	Tx:y/EN		Read
Timer Timing	Tx:y/TT		Read
Done	Tx:y/DN		Read
Counters			
Current value	Cx:y.ACC		Read / Write
Preset	Cx:y.PRE		Read / Write
Counter Up enabled	Cx:y/CU		Read
Counter Down enabled	Cx:y/CD		Read
Done	Cx:y/DN		Read
Overflow	Cx:y/OV		Read
Underflow	Cx:y/UN		Read

5.2 OPC Data access over EIP Logix5000 messaging

If you are using the EIP Logix5000 messaging, opening the OPC client, you have the possibility to see all the variables configured in the PLC, in offline or in online mode.

- In online mode the CLX CPU is scanned and all available tagname are displayed. Select them from the online section (The CLX PLC has to be connected) (see below).
- In offline mode the OPC server is not connected to the PLC, but provides you a list of tag that you have imported over a L5K project. For futher help about the offline mode see **AbTcp.pdf** in the online documentation.



For the EIP Logix5000 communication over DDE or SuiteLink interfaces, use the WHDDE server (and not the usual PCDDE).

Note: if any problem appears during the connection to the OPC server refers to the OPC documentation and technotes.

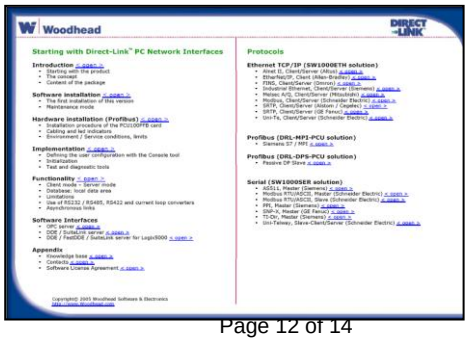
6 Communication Troubleshooting / FAQ

6.1 My communication status is different than 0

If the return status about the exchange is different than zero, it means that the communication to the S7 PLC is not established. Here some common status:

33 55	**Communication Time-out** means that the PLC does not respond to the request we sent. Can be related to a cable that is disconnected, or broken. Can be a wrong IP address or a PLC that is not ready to run or badly configured. Please check your network wiring, switches, hubs, IP address and configuration of the remote PLC, configuration set in the communication solution…
49	**Queue time-out fault** means that the request could not be sent due to lack of resources (no communication channels available). This time corresponds to 4 times the value of the time-out for the requests being processed. Can be a related to a connection request when the CPU does not have anymore free connections available. Each PLC is limited in the number of connection available. Increase the value of the « time-out for requests being processed » If you have selected more then one request simultaneously, it can be that your PLC has not enough ressources to manage all configured connections. Reduce this value to 1 or increase the maximum number of simultaneous requests on the targeted device.
70	**Communication Terminated by the remote Equipment** means that the CPU has stop an Ethernet connection or does not accept the connection. Can be a PLC CPU that is OFF. Please check that the CPU is started and in RUN mode, check the Slot of the CPU in the CLX rack. Check your network wiring, switches, hubs… Can be related to the wrong messaging that you're trying to use (for example configuring an equipment that communicates only in PCCC messaging in EIP Logix5000 one). Modify the configuration to meet the requirements.

To know the meaning of status not indicated above, refer to the documentation of the **EtherNet/IP** protocol chapter ***Functions return Status***



6.2 Do I have the PCCC driver key installed ?

The applicom PCU2000ETH board (PN#: APP-ETH-PCU) will have the CA0106 or CA0108 AB driver key installed on the card if the Driver Licence is order in the same time as the key.
A AB Driver Key can also be order separately refering to the Serial Number of an applicom PCU2000ETH card and installed thanks the PCKEY.EXE tool.

If you try to use the PCCC protocol without the AB Driver Key CA106 the status of the communication request end up with a status 59 (“Protection Key Missing”)

6.3 Can I download a CLX Program and monitor data at the same time ?

At start of the EIP Logix5000 communication with a CLX PLC the items located in the PLC are uploaded and can be selected in order to be updated.
If you change the CLX PLC program, the variable list of the PLC may have changed and monitoring of the data may not be valid anymore.

We suggest strongly to stop the EIP Logix5000 communication before each CLX Program update !

6.4 Can my BradCommunication solution configure my Allen Bradley PLC ?

The Direct-Link PCNI PN# DRL-ALL-SWx is based on a standard computer Ethernet Interface. This Direct-Link PCNI solution does not include a software interface to be linked to the RS Logix Software but it can cohabit on the computer Ethernet interface with a standard RS Linx Ethernet configuration driver.

The applicom PCNIC PN# APP-ETH-PCU does also not provide any specific driver for the RS Logix Software. But this card can also emulates a standard Ethernet interface for the computer and so can be used in relation with the RS Linx Ethernet configuration driver.

6.5 Can I communicate at the same time with other Rockwell PLCs ?

Yes, if you have different Rockwell PLCs connected on the same network, you can configure them with eiher messaging (PCCC and EIP Logix5000), regarding the single PLC characteristics. For example you can communicate with some ControLogix in EIP Logix5000 messaging, and with some SLC or PLC5 in PCCC one.

In the same manner, you can access to PLCs connected on ControlNet or DH+ networks, through a ControLogix connected on the Ethernet network (see section 2.4).

6.6 Can I communicate at the same time with Siemens, Schneider, … PLCs ?

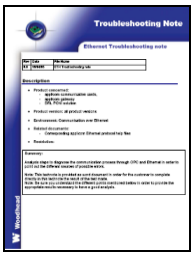
Yes, the different BradCommunication solutions allows you to use simultaneously all messagings. Depending on your configuration, the solution will use the appropriate protocol to send request to the PLC.
The supported messagings are :

- EtherNet/IP, Client (Allen-Bradley)
- FINS, Client/Server (Omron)
- Industrial Ethernet, Client/Server (Siemens)
- Melsec A/Q, Client/Server (Mitsubishi)

- Modbus, Client/Server (Schneider Electric)
- SRTP, Client/Server (Alstom / Cegelec)
- SRTP, Client/Server (GE Fanuc)
- Uni-Te, Client/Server (Schneider Electric)

6.7 Where can I get further information about these topics ?

- More information about the Industrial Ethernet communication in the help file ***AbTcp.pdf***
- More information about the Product general configuration in the help file ***Implementation.pdf***



- More information about the setup of the BradCommunication Product in the **Quickstart**
- More information about the specific topics in relation with the BradCommunication Products in various **Technotes** and **Quicknotes**.

Available on the Product CD-Rom under the Technote Directory

6.8 Where can I get further Techsupport help ?

The first contact for Techsupport help is your local BradCommunication supplier !
If you bougth your communication solution directly by Woodhead, please refer to the **contact.pdf** document in the list of help files in order to find the Woodhead office close to your location.

Please ensure also that you have the following information readily available before calling for Technical Support:

- Card type and serial number
- Computer's make, model and hardware configuration (other cards installed)
- Operating system type and version
- Details of the problem you are experiencing: firmware module type and version, target network and circumstances that may have caused the problem