BRMO 80 / ETH-IP

User Manual

Réf : **MU-BRMO 80-ETH-IP-1.8-EN**

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About this document

After a short presentation of the BRMO 80 family products, this document explains how to use a BRMO 80 / ETH-IP (EtherNet/IP version).

Document History

1.0 : first draft
1.1 : add annexes
1.2 : modify mode order
1.3 : add address information
1.4 : change product reference with new Ethernet connector (4 pins D coded M12)
1.5 : change R/W command format, add information about error status
1.6 : new I/O mapping organization, add control and status words
1.7 : add possibility to configured and manage only one RFID Reader in reader network
1.8 : add Add-On-Instruction for each mode

Glossary

CRC : Cyclical Redundancy Check
EAS : Electronic Article Surveillance
RTU : Remote Terminal Unit

Important User Information

Information in this document is not binding.
BALOGH Company reserves the right to modify our product in line with our policy of continuous product development.
BALOGH Company will not be responsible of possible consequences or errors due to worst use of the product. The use of this device must ensure that all the necessary steps have been taken to verify that the application meets all performance and safety requirements.

MODBUS is proprietary brand of Modicon, EtherNet/IP is managed by ODVA and CI.

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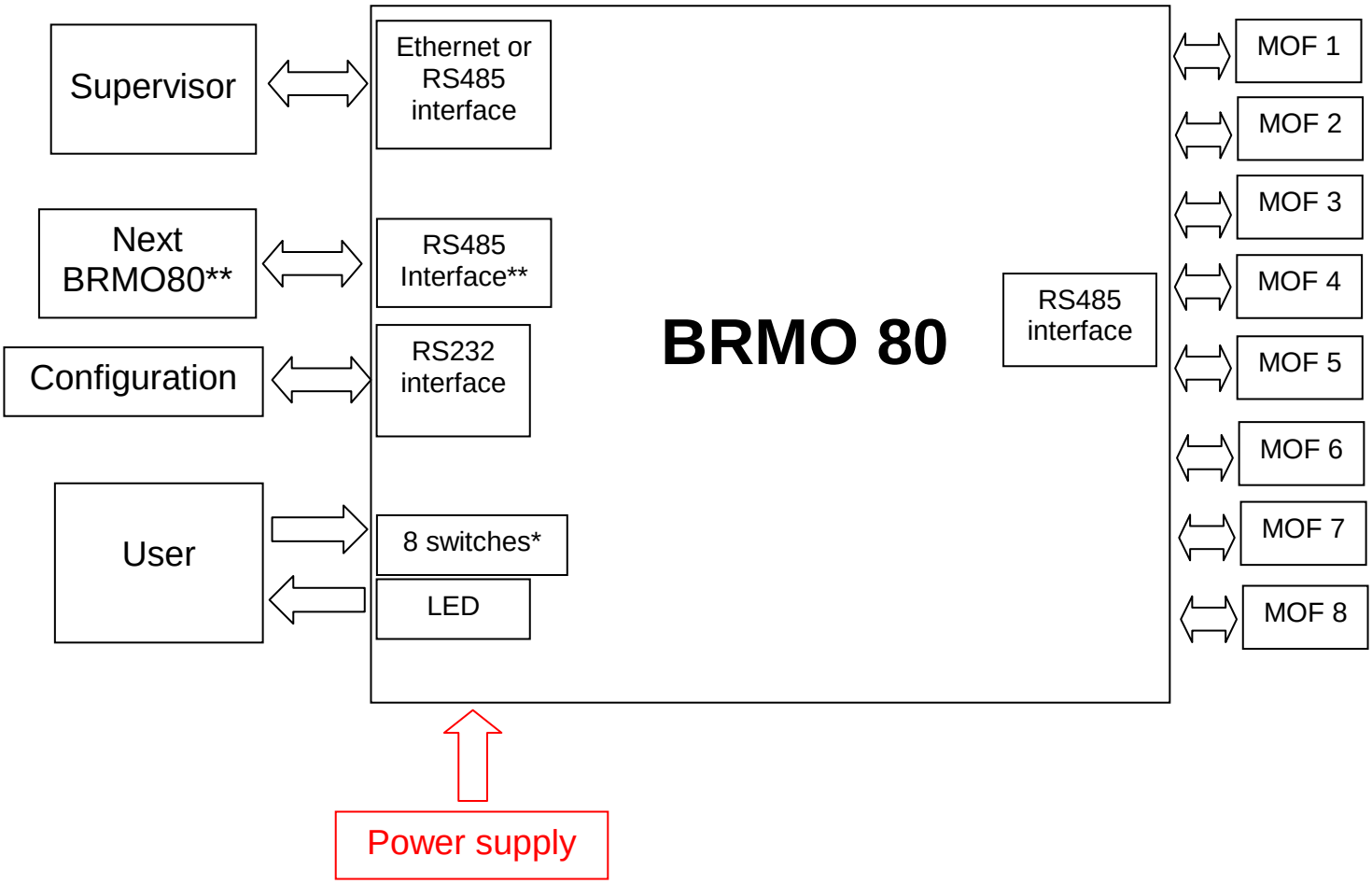
1 ABOUT THE BRMO 80 FAMILY

The BRMO 80 products are divided into 2 field bus applications:

1. Ethernet with Modbus-TCP and EtherNet/IP protocols
2. RS485 with Modbus RTU protocol

These 2 products offer high performance to dialog with multiple Balogh RFID readers (MOF).
Automatic identifications are ensured by these products.
The figure below illustrates the basic properties of the BRMO 80:



**Switches are only present on Ethernet version (IP addressing)*
***this interface to chain BRMO 80 is only available on RS485 version*

Supervisor: an automate application (PLC or PC) that sends commands and receives responses
Configuration: an RS232 host (PC with RS232) to read and /or change the devices configuration and alternately monitor DEBUG traces (debug trace software tool required)
User: user that changes switches (IP address) and observes status LED behavior
MOFs: RFID readers dialog with TAGs
Next BRMO 80: only in RS485 product, possibility to chain BRMO80 devices

The remainder of the document describes how to apply the BRMO 80 using EtherNet/IP as the mode of interface.

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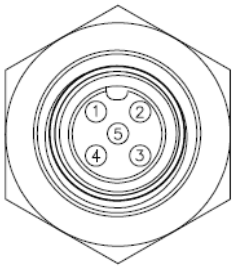
2 CONNECTION

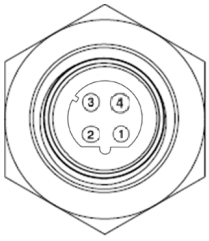
Connectors are based on M12 standard:

8 connectors M12 5 pins female for the 8 readers

Pin	RS485
1	+ 24V
2	A
3	B
4 et 5	0V



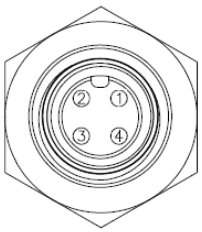
Connector M12 4 pins female **D coded** for Ethernet



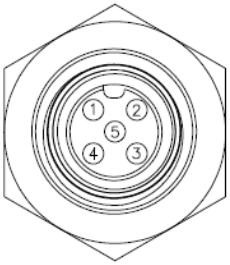
Pin	Ethernet
1	TD+
2	RD+
3	TD-
4	RD-

Connector M12 4 pins male for power supply

Pin	Power
1	+ 24V
2	NC
3	NC
4	0V



Connector M12 5 pins female for configuration



Pin	RS232
1	NC
2	Rx
3	Tx
4	0V
5	NC

LED

8 position DIP
(low byte IP address)

** NC = Not Connected*

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3 HARDWARE CONNECTIONS

3.1 POWER SUPPLY CONNECTION

This interface uses a M12 4 pins male connector to power the BRMO 80.

It is required to use a regulated 24 VDC power supply, applying +24VDC on pin 1 and 0 VDC on pin 4.

The maximum power consumption may vary with number of readers connected.

The next table presents the typical and maximum current consumption for each of the products that are used to create a BRMO reader network. A BRMO 80 interface, a MOF932 reader and/ or MOF100 reader depending upon your applications range requirements:

Consumption (mA) product	Typical	Maximal
BRMO 80	68	120
MOF932	105	120
MOF100	93	100

A BRMO 80 can drive from 1 to 8 RFID MOF readers. The next table presents the current (I) consumption in 4 different configurations, other combinations are possible:

Consumption (mA) per product combinations	Typical	Maximal
BRMO 80 with 2 MOF932	278	360
BRMO 80 with 8 MOF932	908	1080
BRMO 80 with 2 MOF100	254	320
BRMO 80 with 8 MOF100	812	920

Please Note !

During initialization peaks of current will occur. A 1.5 A power supply or larger is strongly recommended to insure proper initialization. If the power supply is insufficient in current capacity the BRMO will not operate.

3.2 ETHERNET CONNECTION

Ethernet uses a M12 4 pins D coded female connector to be interface with the supervisor.
A standard 10/100 Mbps link can be used.

The Ethernet IP address can be configured via DIP switches (default address is 192.168.0.x) for the last digit (see 4.3 chapter to configure all LAN parameters).

The protocol is **EtherNet/IP** where all requests/responses are sent via **TCP/IP** (CIP explicit messaging) and **UDP/IP** (CIP implicit messaging) ports.

Differentiation between BRMO 80 products (on same network) are only done with their IP address.

EtherNet/IP device connection, configuration and data exchanges are described on chapter 5.

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3.3 CONFIGURATION

Configuration port is a M12 5 pins female connector.
The communication uses a standard RS232 link configured:

- at 9600 bauds
- with 8 bits data
- no parity
- 1 stop bit

3.4 MOF READERS

MOF RFID readers are connected via a M12 5 pins female connector.
The communication uses a standard RS485 link configured:

- at 57600 bauds
- with 8 bits data
- no parity
- 1 stop bit.

As reader dialogues with Modbus RTU protocol, each MOF reader must have a unique slave number from 1 to 8 (at maximum).

If for example only 5 readers are required for a configuration, they must be assigned slave numbers from 1 to 5.

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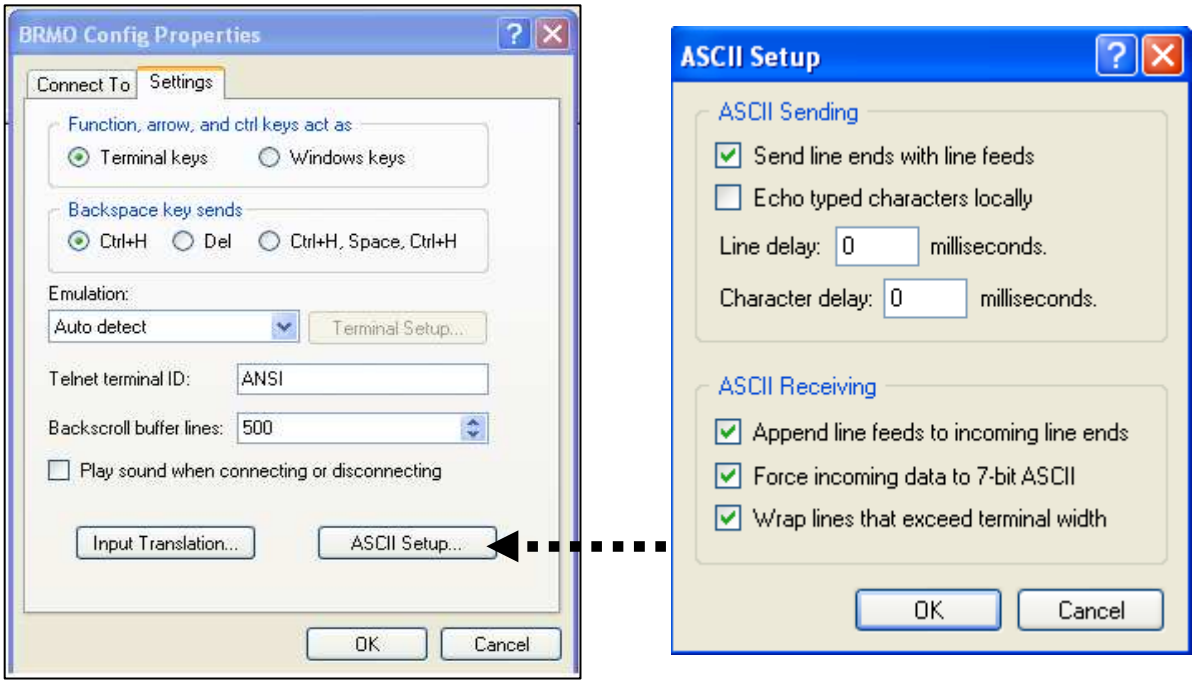
4 CONFIGURATION OF BRMO 80 / ETH-IP

To configure the device, user must ensure that the BRMO 80 is powered (led is green) and connected to a PC with a serial port com.

The entire configuration can be done with a Terminal.

4.1 HYPERTERMINAL CONNECTION

Launch HyperTerminal application in: Start->Programms->Accessory->Communication
Once the right port com selected, configure the ports parameters as shown in the screen captures below:



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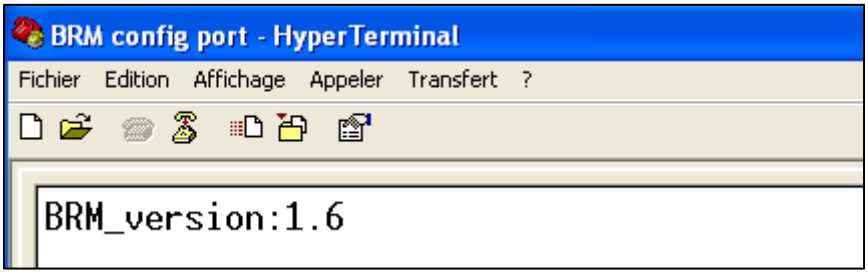
4.2 DIALOG COMMANDS

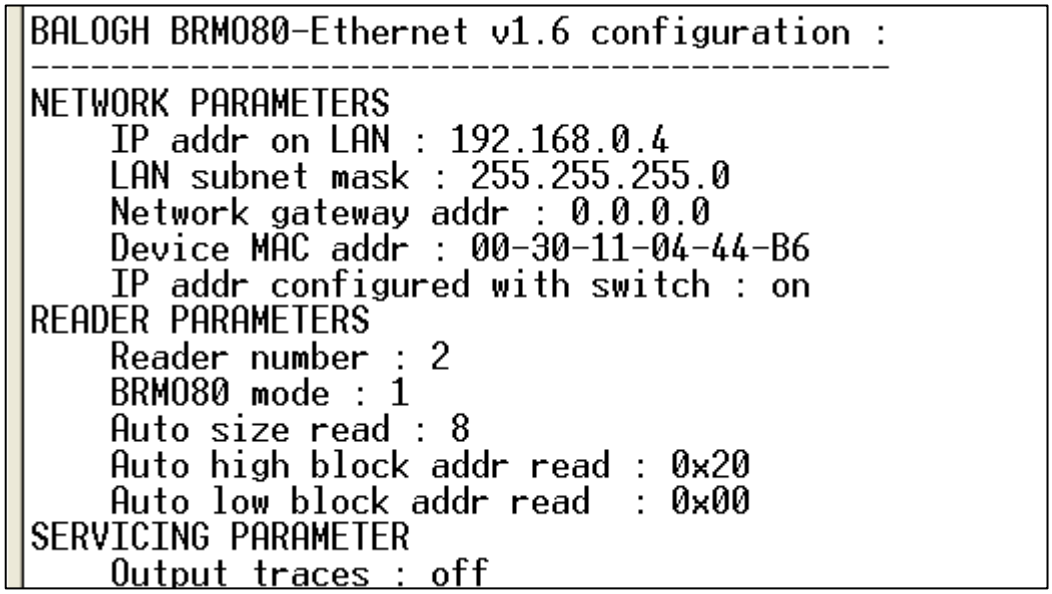
Once in Terminal Mode there are 2 commands that can be used to view the BRMO 80's configuration:

- type “v” to request the firmware version



In this example the version is 1.6.

- type “r” to request the current configuration of the BRMO 80



All these parameters are explained in the next chapter.

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4.3 CONFIGURATION PARAMETERS

Network parameters

- **IP address** : defines the current IP address on the LAN Ethernet
- **Subnet mask** : defines the current subnet mask
- **Gateway address** : defines the current gateway address
- **Device MAC address** : defines the product MAC address (cannot be changed)
- **IP addr configured with switch** : user can enable/disable the ability to use the DIP switches to configure last digit of IP address

MOF Reader parameters

- **Reader number**: defines the number of MOF RFID readers the BRMO 80 is configured to manage. This reader number must be between 1 and 8.
- **BRMO 80 mode** : defines the current mode of operation used by the BRMO 80 (see chapter 6 BRMO 80 modes). The number must be from 0 to 2.
- **Auto size read** : this size is given defined in byte and it is used when BRMO 80 is configured in an automatic mode. This parameter cannot be changed.

- **Auto high block addr read**
- **Auto low block addr read** : These parameters define the Tag Starting Address used by the Automatic read mode, these 2 parameters cannot be dissociated. (explanations are given in chapter 6)

Servicing parameter

- **Output traces** : with this parameters user can enable/disable traces use to debug or trace activity in BRMO 80. This traces can be interpreted only with a specific Balogh tool.

To change configuration a specific text file must be sent with the Terminal to the BRMO 80.

The format of this file cannot be change, only value can be updated.
This format is:

IP addr on LAN : 192.168.0.144
LAN subnet mask : 255.255.255.0
Network gateway addr : 0.0.0.0
IP addr configured with switch : on
Reader number : 8
BRMO80 mode : 2
Auto high block addr read : 0x20
Auto low block addr read : 0x00
Output traces : off

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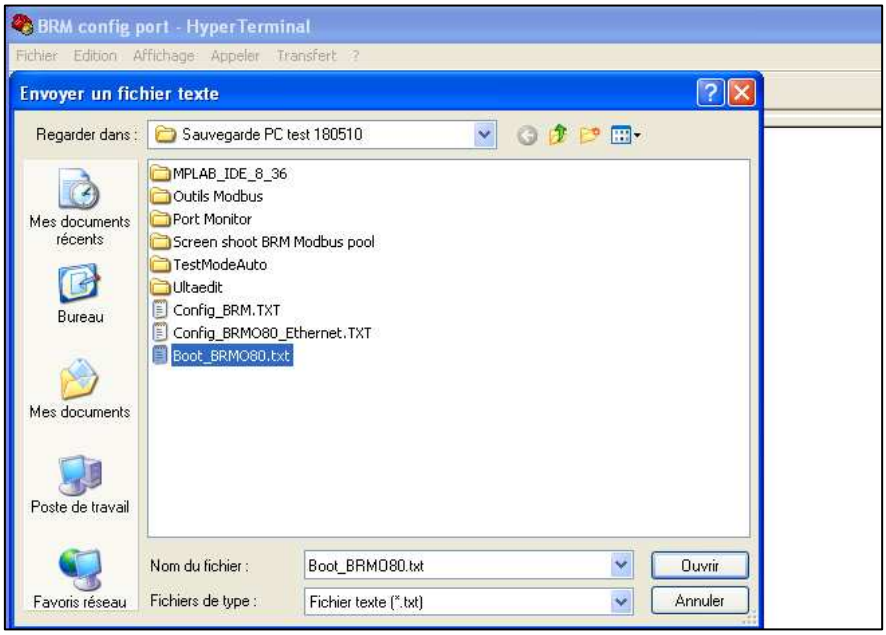
4.4 CHANGE CONFIGURATION

To send the configuration text file to the BRMO 80, HyperTerminal can be used.
In “Transfer->Send text file” menu choose the configuration file like in this example:



In this example the configuration is the one in the proceeding chapter.

Once the file is sent; the LED will blink for 5 seconds orange. This is the indication that the BRMO 80 has accepted the configuration file. After 5 seconds the BRMO 80 will restart.
To ensure that the configuration is received, a message must be display on Terminal:

```
Correct configuration => please wait until BRM restarts !
```

A simple read command can confirm that the new configuration is taken into account:

```
BALOGH BRMO80-Ethernet v1.6 configuration :
-------------------------------------------
NETWORK PARAMETERS
    IP addr on LAN : 192.168.0.4
    LAN subnet mask : 255.255.255.0
    Network gateway addr : 0.0.0.0
    Device MAC addr : 00-30-11-04-44-B6
    IP addr configured with switch : on
READER PARAMETERS
    Reader number : 8
    BRMO80 mode : 2
    Auto size read : 8
    Auto high block addr read : 0x20
    Auto low block addr read  : 0x00
SERVICING PARAMETER
    Output traces : off
```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Please note that in this example the last digit in IP address is set to 144. But when user receives back the configuration via Hyper Terminal the actual IP address is 4. This is due to the fact that the IP address configuration Switch parameter set to ON and therefore the BROM 80 will take its last byte for the IP Address from the DIP Switches on the front of the device (see the parameters IP address configured via switch).

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5 ETHERNET/IP CONNECTION AND EXCHANGE

So as to route a data connection between a supervisor and a BRMO 80 / ETH-IP, the process must follow the 2 main steps:

- The first is to open an EtherNet/IP connection, between supervisor (**client**) and BRM (**server**), with **ForwardOpen** request/response that contain all the parameters (transport class, production trigger, timing information, connection IDs …)
- The second, which consists of exchanging data objects, is explained below

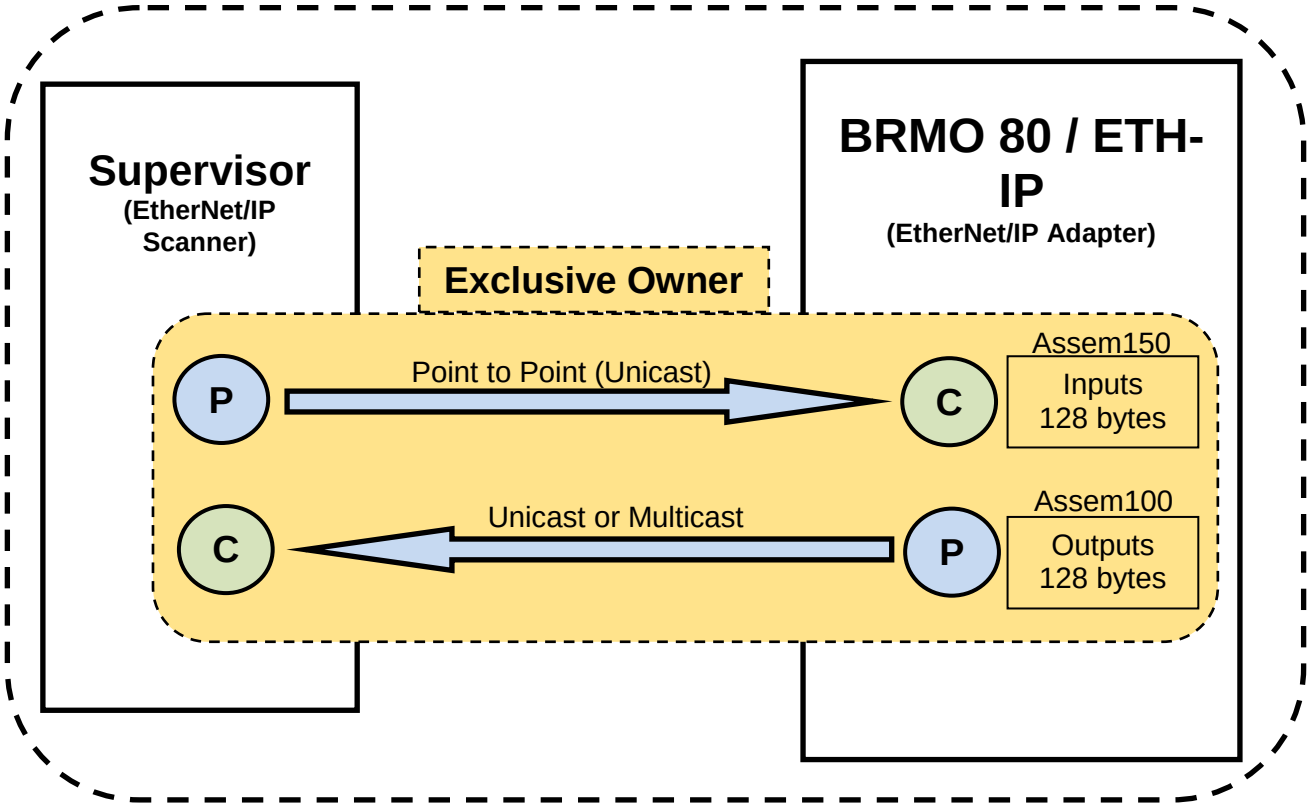
For each data direction between the supervisor and the BRMO 80 / ETH-IP, a 128 data bytes buffer length is used. Each buffer is represented by a specific CIP object (Assembly) with an instance (IDs).

The BRMO 80 / ETH-IP has the 2 objects:

- Assembly 100 (0x64) : output buffer (128 bytes)
- Assembly 150 (0x96) : input buffer (128 bytes)

To exchange these objects, the EtherNet/IP uses the **Producer (P)** and **Consumer (C)** model. Transfers are done in a defined connection type witch give exactly the behavior of the Producer and the Consumer.

The schema below represents a connection between a supervisor (**Scanner**) and a BRMO 80 / ETH-IP (**Adapter**):



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Different connection types are accessible on the BRMO 80 / ETH-IP (Listen Only, Input Only, Unicast Target to Originator and Multicast Target to Originator). Here, the represented connection is the "**Exclusive Owner**" that is used to access to I/O data.

The connection type "**Exclusive Owner**" lets access to Adapter input buffer for only on Scanner. In the other direction, Adapter sends its output buffer in Unicast or Multicast depending upon the step of of the Target to Originator connection type.
The exchanges in 'Point to Point' and 'Multicast' are triggered by cyclic (10 to 3200ms) or Change of state types.

Differentiations between BRMO 80 products, on a same network, are only done with their IP address.

EDS file (Electronic Data Sheet) is given in annex 2. A configuration example between an EtherNet/IP Scanner (**EIPscan**) and a BRMO 80 / ETH-IP is presented in annex 3.

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6 MODES OF OPERATION

BRMO 80 has 3 different modes of operation:

- 0 : Command mode
- 1 : Full Master mode
- 2 : Full Master mode with Command mode

Command mode is the only mode where the BRMO operates “non automatic”, meaning that ***all*** of the BRMO 80's actions are managed by the the PLC program.

When operating the BRMO in either Full Master or Full Master with Command it is important to note that the data presented to the PLC will be mapped in a different fashion based upon the mode selected. Therefore the mode of operation of the BRMO 80 should be decided at design time because each mode will redefine the meaning and position of several of the data words within the I / O image. A full explanation of each modes mapping is explained in the next Chapter.

Command mode : supervisor can send read/write commands to each MOF reader through BRMO 80

Full Master mode : the BRMO 80 presents (sends) the entire automatic data table when a new activity is detected on a reader. Appearance / disappearance of a Tag and /or the detection of a new UID.

Full Master with Command mode : the BRMO 80 switches between the Full Master mode and the Command mode when read/write commands are initiate by the supervisor

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6.1 AUTO DATA MAPPING

Each of the automatic mode (1 and 2) presents all or a part of this table (each cell corresponded a byte):

Reader number 1	0	Read number LSB	Read number MSB	**Status byte 0**	**Status byte 1**	Byte 0 Sector or UID	Byte 1 Sector or UID	Byte 2 Sector or UID	Byte 3 Sector or UID	Byte 4 Sector or UID	Byte 5 Sector or UID	Byte 6 Sector or UID	Byte 7 Sector or UID
Reader number 2	0	Read number LSB	Read number MSB	**Status byte 0**	**Status byte 1**	Byte 0 Sector or UID	Byte 1 Sector or UID	Byte 2 Sector or UID	Byte 3 Sector or UID	Byte 4 Sector or UID	Byte 5 Sector or UID	Byte 6 Sector or UID	Byte 7 Sector or UID
Reader number 3	0	Read number LSB	Read number MSB	**Status byte 0**	**Status byte 1**	Byte 0 Sector or UID	Byte 1 Sector or UID	Byte 2 Sector or UID	Byte 3 Sector or UID	Byte 4 Sector or UID	Byte 5 Sector or UID	Byte 6 Sector or UID	Byte 7 Sector or UID
Reader number 4	0	Read number LSB	Read number MSB	**Status byte 0**	**Status byte 1**	Byte 0 Sector or UID	Byte 1 Sector or UID	Byte 2 Sector or UID	Byte 3 Sector or UID	Byte 4 Sector or UID	Byte 5 Sector or UID	Byte 6 Sector or UID	Byte 7 Sector or UID
Reader number 5	0	Read number LSB	Read number MSB	**Status byte 0**	**Status byte 1**	Byte 0 Sector or UID	Byte 1 Sector or UID	Byte 2 Sector or UID	Byte 3 Sector or UID	Byte 4 Sector or UID	Byte 5 Sector or UID	Byte 6 Sector or UID	Byte 7 Sector or UID
Reader number 6	0	Read number LSB	Read number MSB	**Status byte 0**	**Status byte 1**	Byte 0 Sector or UID	Byte 1 Sector or UID	Byte 2 Sector or UID	Byte 3 Sector or UID	Byte 4 Sector or UID	Byte 5 Sector or UID	Byte 6 Sector or UID	Byte 7 Sector or UID
Reader number 7	0	Read number LSB	Read number MSB	**Status byte 0**	**Status byte 1**	Byte 0 Sector or UID	Byte 1 Sector or UID	Byte 2 Sector or UID	Byte 3 Sector or UID	Byte 4 Sector or UID	Byte 5 Sector or UID	Byte 6 Sector or UID	Byte 7 Sector or UID
Reader number 8	0	Read number LSB	Read number MSB	**Status byte 0**	**Status byte 1**	Byte 0 Sector or UID	Byte 1 Sector or UID	Byte 2 Sector or UID	Byte 3 Sector or UID	Byte 4 Sector or UID	Byte 5 Sector or UID	Byte 6 Sector or UID	Byte 7 Sector or UID

Each MOF reader is represented by one line in this table. The size of the table depends of the number of MOF readers configured.

For each MOF reader, the information saved in this table is:

- The reader number
- A null byte use for padding
- 2 bytes representing the number of reads recorded at this reader
- 2 bytes representing status of the reader (See reader technical notice)
- 8 bytes of data automatically read when a TAG is present in front of a MOF reader

The 8 data bytes automatically retrieved can be:

- 8 memory bytes in the TAG with the data base address composed with the parameters “Auto high block addr read” and “Auto low block addr read” (see configuration parameters of the BRMO 80).
- the UID(unique identifier) of the TAG. The specific address 0x2000 is interpreted by the BRMO 80 as UID automatic data read.

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Read Number Field description

This field is increased by one each time a TAG is presented in front of a MOF reader, and the data is read.

RFID Reader status Field description

Reader status is represented with byte 5 (**Status byte 0**) and 6 (**Status byte 1**) of each entry (line) in the automatic read table.

The status byte 0 indicates general reader status. When no problems are detected this byte well have a value of 0.

Status byte 1 will indicate the presents of a TAG in front of reader field using Bit 0.
Status byte 1 also defines Bit 1 through Bit 7 as follows:

Bit 0 : TAG presence
Bit 1 : reserved
Bit 2 : New UID
Bit 3 : Valide UID
Bit 4 : reserved
Bit 5 : Reader interferences (future release)
Bit 6 : reserved
Bit 7 : Status validation

The next table presents the possible values in Hexadecimal format and their meanings:

Auto read type / **information**	**Automatic UID read**	**Automatic sector read**
Unconnected reader	0xDD00	0xDD00
Re-connected reader	0x0080	0x0080
Reader with never TAG access (when it boots)	0x0080	0x0080
TAG leaves the RFID field	0x0088 ou 0x008C (new TAG)	0x0088
TAG presents in RFID field	0x0089 Ou 0x008D (new TAG)	0x0089

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6.2 COMMAND MODE

In this mode the Supervisor (PLC or PC) can read and write directly each MOF monoblock.
Each monoblock connected to the BRMO 80 has a unique slave number (see protocol Modbus RTU and chapter 3.4).

The communication between the supervisor and the BRMO 80 / ETH-IP is done through the BRM Input and Output buffers (consult chapter 5).
These 2 buffers are composed of 64 integer size words that include the following data.

6.2.1 BRMO 80 / ETH-IP INPUT MAPPING

Word location	16 bit integer definition	High byte	Low byte							
I.Data.0	Module Control	*0x00* *(Not used)*	7	6	5	4	3	2	1	0
										RUN
I.Data.1	Frame Identifier	Frame Id High	Frame Id Low							
I.Data.2	Command parameters	Reader Number	Command Code							
I.Data.3	Command parameters	Address High	Address Low							
I.Data.4	Command parameters	Word number High	Word number Low							
I.Data.5	Data	Data word 0 High	Data word 0 Low							
I.Data.6	Data	Data word 1 High	Data word 1 Low							
....	**....**	**....**	**....**							
I.Data.59	Data	Data word 54 High	Data word 54 Low							
I.Data.60	Data	Data word 55 High	Data word 55 Low							
I.Data.61	*Not used*									
I.Data.62	*Not used*									
I.Data.63	*Not used*									

- **Module Control word** : setting the bit 0 (Run) True place the BRM module into Run mode.

- **Frame Identifier word** : number of the active frame, acts as the command trigger. When a new frame number is written (#0), the command is executed (with command parameters).

- **Command parameter words** : these settings are applied by the BRM to execute the corresponding command
    - Reader number : the reader where will be executed the command
    - Command code : 0x03 for read, 0x10 for a write
    - Address : TAG address where read/write data
    - Word number : number of data words (TAG data length), **56 words** at maximum

- **Data words** : data written to a TAG (specific memory location dedicated for write command)

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6.2.2 BRMO 80 / ETH-IP OUTPUT MAPPING

Word location	16 bit integer definition	High byte	Low byte							
O.Data.0	Module Status	*0x00* *(Not used)*	7	6	5	4	3	2	1	0
			Comm. Proc.							R U N
O.Data.1	Frame Identifier	Frame Id High	Frame Id Low							
O.Data.2	Dynamic Status	*0x00* *(Not used)*	7	6	5	4	3	2	1	0
			Comm. Compl.		Tag Pres.	Gen. fault	Specific fault			
O.Data.3	Command parameters	Reader Number	Command Code							
O.Data.4	Command parameters	Address High	Address Low							
O.Data.5	Command parameters	Word number High	Word number Low							
O.Data.6	Data	Data word 0 High	Data word 0 Low							
O.Data.7	Data	Data word 1 High	Data word 1 Low							
....	**....**	**....**	**....**							
O.Data.60	Data	Data word 54 High	Data word 54 Low							
O.Data.61	Data	Data word 55 High	Data word 55 Low							
O.Data.62	*Not used*									
O.Data.63	*Not used*									

- **Module status word** : give the global status of the module
  - Run Enabled (bit 0) : echo of the Module Control Run bit
  - Command in progress (bit 7) : True (high) when a command is being processed by the BRM

- **Frame Identifier word** : echo of the Frame Identifier. This Field is updated once the command is completed.

- **Dynamic status word** : depicts the command execution status
  - Specific fault (bit 0-3) : specify the error when a command could not be processed. Consult next page for specific error description.
  - General fault (bit 4) : when a command can not be done, this bit is True (high). In this case read specific fault bits to have the exact meaning of the error.
  - Tag present (bit 5) : Set to one if a tag is present in front of the reader when the command was executed.
  - Command completed (bit 7) : the default state is True (high). When a command is accepted and in progress, this bit is low (False value). Once the command completed this bit is transition high (True).

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- **Command parameter words** : these settings are echo of the command parameter words once the command is executed.

- **Data words** : data read into a TAG (specific memory location dedicated for read command)

6.2.3 SPECIFIC FAULT CODES

The following table of fault codes is valid when the general fault bit of the dynamic status is set to one.

Specific error description	
Fault code	**Meaning**
0x01	Invalid data length
0x05	Internal statement fault
0x0A	Invalid command code
0x0B	Invalid TAG address requested
0x0C	Reader fault
0x0E	TAG memory fault
0x0F	TAG dialogue fault

BRMO 80 / ETH-IP restrictions are :

- data length can not exceed 56 words
- Through the BRMO 80 / ETH-IP, the supervisor can access TAG address from [0;0x3FFF]

6.2.4 OPERATIONAL DESCRIPTION

To read/write, the supervisor must follow specific steps:

1. **Active the BRM in setting run bit in Module Control Word**
2. **Write Command Parameter Words (and data for write command)**
3. **Set a Frame Identifier (this word acts as a trigger command)**
4. **Read BRM Module and Dynamic status words to know the command progression**
5. **For read command, copy read data once the command is done**

The next page gives the read command execution and the page after the write command execution.

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Command read execution sequence

Suppose the BRMO 80 / ETH-IP already in run mode.

Step 1

Superviser		BRM
Output image Load command parameters into a command request field in his output buffer.	**Load parameters** →	**Input buffer** Command parameters are set: reader number, command code, address…

Step 2

Superviser		BRM
Output image Load a new Frame Indentifier for requiring command execution.	**Send Frame Id** →	**Input buffer** Identify new frame Id word and launch command with parameters.

Step 3

Superviser		BRM
Input image Monitor the completed command bit (transition low) in Dynamic status word for command execution.	← **Status**	**Output buffer** Set dynamic status word to inform the command acceptation.

Step 4

Superviser		BRM
Input image Monitor the completed command bit (transition High) in Dynamic status word for command execution. In same reception the data requested are in specific data words.	← **Status and data**	**Output buffer** Set dynamic status word to inform the command completion and also set the data words: O.Data.6 O.Data.7 O.Data.8 O.Data.9 **…**

Read example with the EtherNet/IP scanner “EIPScan” is provided in annex 4.

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Command write execution sequence

Suppose the BRMO 80 / ETH-IP already in run mode.

Step 1

Superviser		BRM
Output image Load command parameters into a command request field in his output buffer. In same buffer load write data in specific data words.	**Load parameters and data** →	**Input buffer** Command parameters and data are set: reader number, command code, address…, data: I.Data.5 I.Data.6 I.Data.7 I.Data.8 **…**

Step 2

Superviser		BRM
Output image Load a new Frame Indentifier for requiring command execution.	**Send Frame Id** →	**Input buffer** Identify new frame Id word and launch command with parameters and data.

Step 3

Superviser		BRM
Input image Monitor the completed command bit (transition low) in Dynamic status word for command execution.	← **Status**	**Output buffer** Set dynamic status word to inform the command acceptation.

Step 4

Superviser		BRM
Input image Monitor the completed command bit (transition High) in Dynamic status word for command execution.	← **Status**	**Output buffer** Set dynamic status word to inform the command completion.

Write example with the EtherNet/IP scanner “EIPScan” is provided in annex 5.

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6.3 FULL MASTER MODE

In this mode, BRMO 80 / ETH-IP writes the full automatic data table (112 bytes length) each time a new activity has been detected on a MOF reader. Each time a TAG arrives in the field of a MOF reader or every time a TAG leaves the field of a MOF reader, the full table is updated and written into the BRMO80 / ETH-IP output buffer.

In this case none command can be answer by the supervisor. But supervisor can only receive the BRMO 80 / ETH-IP output buffer (Assem100) to get the actual state of the automatic reader table.

An example is given in annex 6.

6.4 FULL MASTER WITH COMMAND MODE

This is the default mode when BRMO 80 / ETH-IP first starts after production.

This mode presents the entire automatic reader table each time a new activity is detected in front of a reader. This behavior is similar to “full master” mode, but in this mode supervisor can send read/write command like in “Command” mode.

To differentiate automatic reader table and result of read/write commands, the frame identifier 0xFFFF is dedicated for the sending of automatic reader table.
In this case (automatic table sent) the command parameters send by the BRM is always at:

- Reader number 1
- Read response code 0x03
- 0xFFFF address
- Word length give the length of automatic data table (depends on reader number configured)

See annex 7 to have an example.

When a new read/write command is sent by the supervisor (see 6.2 chapter for command format) to the BRMO 80, the transparent mode is the active mode. In this case the automatic reader table is not presented to the BRMO output buffer.

To active again automatic reader table (Full Master mode), the supervisor must send the specific frame identifier 0xFFFF (to leave “Command” mode).

In response BRMO 80 / ETH-IP returns the automatic reader table and leave “Command” mode.

An example of this specific frame identifier sent with EIPScan is given in annex 8.

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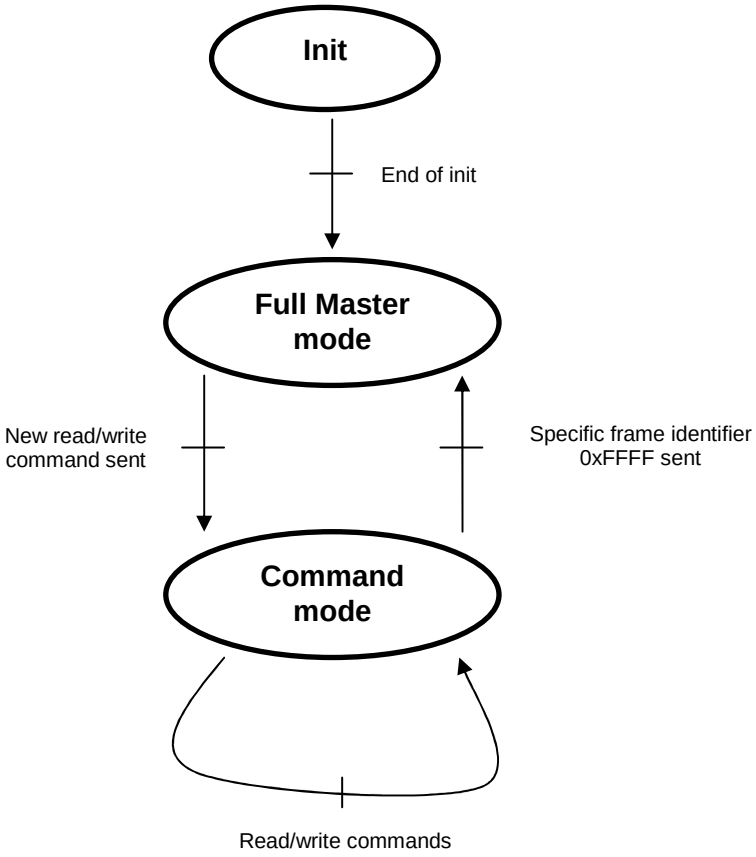
This state machine presents the management of the 2 modes mixed:



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7 ANNEXES

7.1 ANNEX 1: ASCII TABLE

décimal	octal	hexadécimal	caractère	décimal	octal	hexadécimal	caractère
0	00	0	NUL	64	100	40	@
1	001	01	SOH	65	101	41	A
2	002	02	STX	66	102	42	B
3	003	03	ETX	67	103	43	C
4	004	04	EOT	68	104	44	D
5	005	05	ENQ	69	105	45	E
6	006	06	ACK	70	106	46	F
7	007	07	BEL	71	107	47	G
8	010	08	BS	72	110	48	H
9	011	09	HT	73	111	49	I
10	012	0A	LF	74	112	4A	J
11	013	0B	VT	75	113	4B	K
12	014	0C	FF	76	114	4C	L
13	015	0D	CR	77	115	4D	M
14	016	0E	SOH	78	116	4E	N
15	017	0F	SI	79	117	4F	O
16	020	10	DLE	80	120	50	P
17	021	11	DC1	81	121	51	Q
18	022	12	DC2	82	122	52	R
19	023	13	DC3	83	123	53	S
20	024	14	DC4	84	124	54	T
21	025	15	NAK	85	125	55	U
22	026	16	SYN	86	126	56	V
23	027	17	ETB	87	127	57	W
24	030	18	CAN	88	130	58	X
25	031	19	EM	89	131	59	Y
26	032	1A	SUB	90	132	5A	Z
27	033	1B	ESC	91	133	5B	[
28	034	1C	FS	92	134	5C	\
29	035	1D	GS	93	135	5D	]
30	036	1E	RS	94	136	5E	^
31	037	1F	US	95	137	5F	_
32	040	20	SP	96	140	60	`
33	041	21	!	97	141	61	a
34	042	22	"	98	142	62	b
35	043	23	#	99	143	63	c
36	044	24	$	100	144	64	d
37	045	25	%	101	145	65	e
38	046	26	&	102	146	66	f
39	047	27		103	147	67	g
40	050	28	(	104	150	68	h
41	051	29	)	105	151	69	i
42	052	2A	*	106	152	6A	j
43	053	2B	+	107	153	6B	k
44	054	2C	,	108	154	6C	l
45	055	2D	-	109	155	6D	m
46	056	2E	.	110	156	6E	n
47	057	2F	/	111	157	6F	o
48	060	30	0	112	160	70	p
49	061	31	1	113	161	71	q
50	062	32	2	114	162	72	r
51	063	33	3	115	163	73	s
52	064	34	4	116	164	74	t
53	065	35	5	117	165	75	u
54	066	36	6	118	166	76	v
55	067	37	7	119	167	77	w
56	070	38	8	120	170	78	x
57	071	39	9	121	171	79	y
58	072	3A	:	122	172	7A	z
59	073	3B	;	123	173	7B	{
60	074	3C	<	124	174	7C	|
61	075	3D	=	125	175	7D	}
62	076	3E	>	126	176	7E	~
63	077	3F	?	127	177	7F	DEL

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7.2 ANNEX 2: BRMO 80 / ETH-IP EDS FILE

```
[File]
        DescText = "Anybus-IC EIP";
        CreateDate = 12-04-2002;
        CreateTime = 16:15:00;
        ModDate = 09-03-2008;
        ModTime = 09:00:00;
        Revision = 2.1;

[Device]
        VendCode = 90;
        VendName = "HMS Networks";
        ProdType = 12;
        ProdTypeStr = "Communications Adapter";
        ProdCode = 2;
        MajRev = 2;
        MinRev = 1;
        ProdName = "Anybus-IC EIP";
        Catalog = "Anybus-IC EIP";

[Device Classification]
        Class1 = EtherNetIP;

[Params]
        Param1 =
                0,              $ first field shall equal 0
                ,,              $ path size,path
                0x0000,             $ descriptor
                0xC7,               $ data type : 16-bit Unsigned Integer
                2,              $ data size in bytes
                "Output Size",          $ name
                "",             $ units
                "",             $ help string
                0,144,1,            $ min, max, default data values
                ,,,,            $ mult, dev, base, offset scaling not used
                ,,,,            $ mult, dev, base, offset link not used
                0;              $ decimal places not used

        Param2 =
                0,              $ first field shall equal 0
                ,,              $ path size,path
                0x0000,             $ descriptor
                0xC7,               $ data type : 16-bit Unsigned Integer
                2,              $ data size in bytes
                "Input Size",           $ name
                "",             $ units
                "",             $ help string
                0,144,1,            $ min, max, default data values
                ,,,,            $ mult, dev, base, offset scaling not used
                ,,,,            $ mult, dev, base, offset link not used
                0;              $ decimal places not used

        Param3 =
                0,              $ reserved, shall equal 0
                ,,              $ Link Path Size, Link Path
                0x0000,             $ Descriptor
```


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```
        0xC8,                $ Data Type
        4,                   $ Data Size in bytes
        "RPI Range",         $ name
        "",                  $ units
        "",                  $ help string
        10000,3200000,20000,    $ min, max, default data values
        ,,,,                 $ mult, div, base, offset scaling
        ,,,,                 $ mult, div, base, offset links
        0;                   $ decimal places

[Assembly]
    Revision = 2;

    Assem100 =
        "Input Data",
        ,
        144,
        0x0000,
        ,,
        1152,;

    Assem150 =
        "Output Data",
        ,
        144,
        0x0000,
        ,,
        1152,;


[Connection Manager]
    Connection1 =
        0x04030002,          $ trigger & transport
                        $  0-15  = supported transport classes (class 1)
                        $  16 = cyclic (1 = supported)
                        $  17 = change of state (1 = supported)
                        $  18 = on demand (0 = not supported)
                        $  19-23 = reserved (must be zero)
                        $  24-27 = exclusive owner
                        $  28-30 = reserved (must be zero)
                        $  31 = client 0 (don't care for classes 0 and 1)
        0x44640405,          $ point/multicast & priority & realtime format
                        $   0    = O=>T fixed (1 = supported)
                        $   1    = O=>T variable (0 = not supported)
                        $   2    = T=>O fixed (1 = supported)
                        $   3    = T=>O variable (0 = not supported)
                        $  4-7   = reserved (must be zero)
                        $  8-10  = O=>T header (4 byte run/idle)
                        $  11  = reserved (must be zero)
                        $  12-14 = T=>O header
                        $  15  = reserved (must be zero)
                        $  16-19 = O=>T point-to-point
                        $  20-23 = T=>O multicast
                        $  24-27 = O=>T scheduled
                        $  28-31 = T=>O scheduled
        Param3,Param1,Assem150, $ O=>T RPI,Size,Format
```


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```
    Param3,Param2,Assem100, $ T=>O RPI,Size,Format
    ,,                  $ config part 1 (dynamic assemblies)
    ,,                  $ config part 2 (module configuration)
    "Exclusive Owner",      $ connection name
    "",                 $ Help string
    "20 04 24 01 2C 96 2C 64";    $ exclusive output path

Connection2 =
    0x02030002,             $ 0-15    = supported transport classes
                    $ 16      = trigger: cyclic
                    $ 17      = trigger: change of state
                    $ 18      = trigger: application
                    $ 19-23   = trigger: reserved
                    $ 24      = transport type: listen-only
                    $ 25      = transport type: input-only
                    $ 26      = transport type: exclusive-owner
                    $ 27      = transport type: redundant-owner
                    $ 28-30   = reserved
                    $ 31      = Client = 0 / Server = 1
    0x44640305,             $ 0       = O->T fixed size supported
                    $ 1       = O->T variable size supported
                    $ 2       = T->O fixed size supported
                    $ 3       = T->O variable size supported
                    $ 4-5     = O->T number of bytes per slot (obsolete)
                    $ 6-7     = T->O number of bytes per slot (obsolete)
                    $ 8-10    = O->T Real time transfer format
                    $ 11      = reserved
                    $ 12-14   = T->O Real time transfer format
                    $ 15      = reserved
                    $ 16      = O->T connection type: NULL
                    $ 17      = O->T connection type: MULTICAST
                    $ 18      = O->T connection type: POINT2POINT
                    $ 19      = O->T connection type: reserved
                    $ 20      = T->O connection type: NULL
                    $ 21      = T->O connection type: MULTICAST
                    $ 22      = T->O connection type: POINT2POINT
                    $ 23      = T->O connection type: reserved
                    $ 24      = O->T priority: LOW
                    $ 25      = O->T priority: HIGH
                    $ 26      = O->T priority: SCHEDULED
                    $ 27      = O->T priority: reserved
                    $ 28      = T->O priority: LOW
                    $ 29      = T->O priority: HIGH
                    $ 30      = T->O priority: SCHEDULED
                    $ 31      = T->O priority: reserved
    Param3,0,,              $ O->T RPI, size, format
    Param3,Param2,Assem100, $ T->O RPI, size, format
    ,,                  $ config #1 size, format
    ,,                  $ config #2 size, format
    "Input Only",           $ Connection Name
    "",                 $ help string
    "20 04 24 01 2C C6 2C 64";    $ Path

Connection3 =
    0x01030002,             $ 0-15    = supported transport classes
                    $ 16      = trigger: cyclic
```


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```
                    $ 17     = trigger: change of state
                    $ 18     = trigger: application
                    $ 19-23  = trigger: reserved
                    $ 24     = transport type: listen-only
                    $ 25     = transport type: input-only
                    $ 26     = transport type: exclusive-owner
                    $ 27     = transport type: redundant-owner
                    $ 28-30  = reserved
                    $ 31     = Client = 0 / Server = 1
        0x44240305,         $ 0      = O->T fixed size supported
                    $ 1      = O->T variable size supported
                    $ 2      = T->O fixed size supported
                    $ 3      = T->O variable size supported
                    $ 4-5    = O->T number of bytes per slot (obsolete)
                    $ 6-7    = T->O number of bytes per slot (obsolete)
                    $ 8-10   = O->T Real time transfer format
                    $ 11     = reserved
                    $ 12-14  = T->O Real time transfer format
                    $ 15     = reserved
                    $ 16     = O->T connection type: NULL
                    $ 17     = O->T connection type: MULTICAST
                    $ 18     = O->T connection type: POINT2POINT
                    $ 19     = O->T connection type: reserved
                    $ 20     = T->O connection type: NULL
                    $ 21     = T->O connection type: MULTICAST
                    $ 22     = T->O connection type: POINT2POINT
                    $ 23     = T->O connection type: reserved
                    $ 24     = O->T priority: LOW
                    $ 25     = O->T priority: HIGH
                    $ 26     = O->T priority: SCHEDULED
                    $ 27     = O->T priority: reserved
                    $ 28     = T->O priority: LOW
                    $ 29     = T->O priority: HIGH
                    $ 30     = T->O priority: SCHEDULED
                    $ 31     = T->O priority: reserved
        Param3,0,,          $ O->T RPI, size, format
        Param3,Param2,Assem100, $ T->O RPI, size, format
        ,,                  $ config #1 size, format
        ,,                  $ config #2 size, format
        "Listen Only",      $ Connection Name
        "",                 $ help string
        "20 04 24 01 2C C7 2C 64";    $ Path

[Capacity]
    MaxCIPConnections = 20;
    TSpec1 = TxRx, 1, 1000;
    TSpec2 = TxRx, 144, 1000;
```


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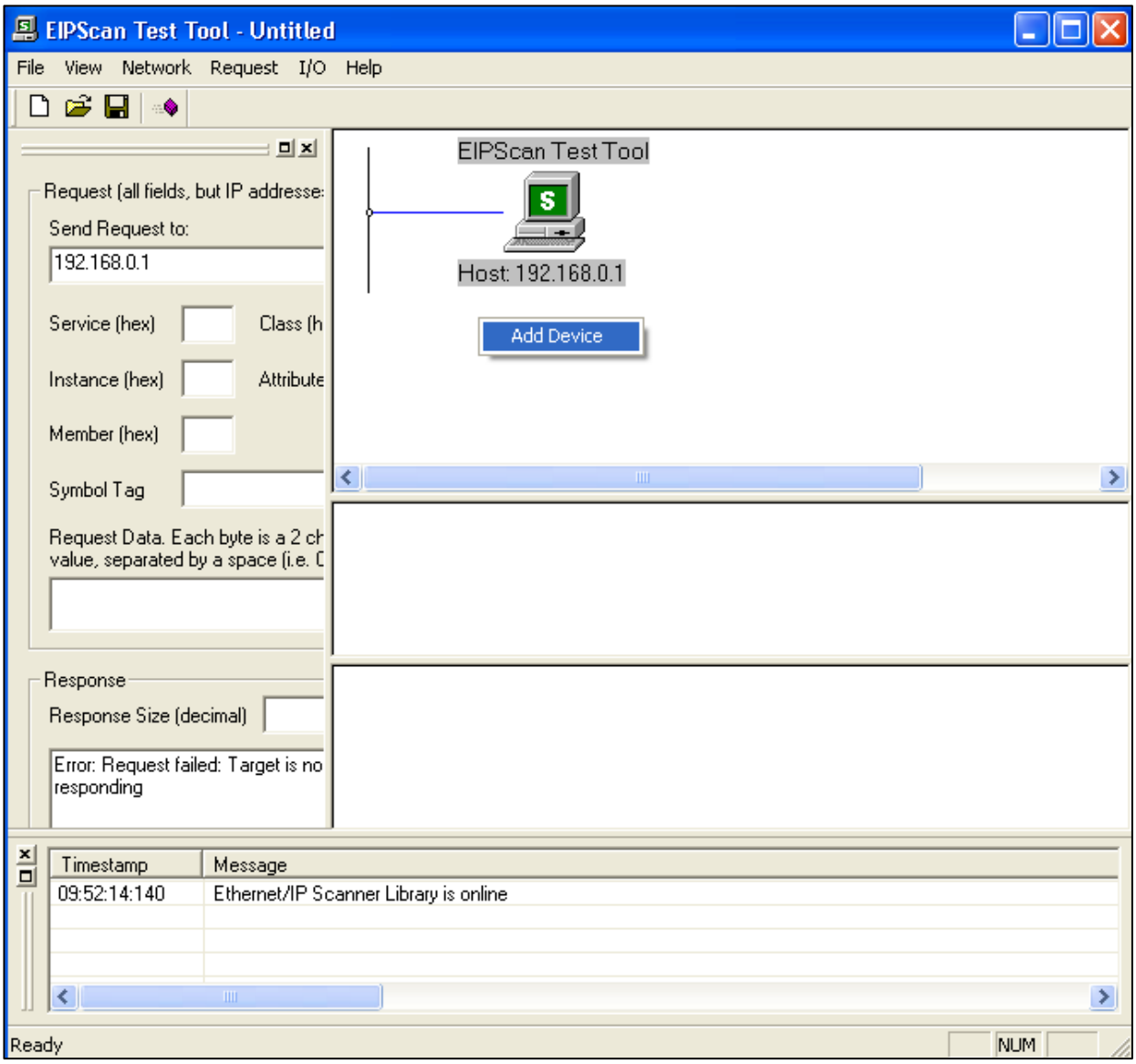
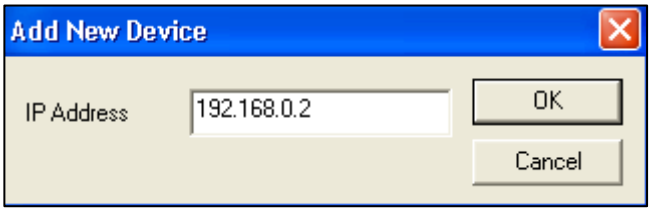
7.3 ANNEX 3: CONNECTION CONFIGURATION WITH EIPSCAN

When EIPScan is launched the following window appears:



Only the Scanner (emulated by the tool) is presented in the network. We must add devices (adapter). So as to add a BRMO 80 / ETH-IP, we must click (right) on the network window and choose the only menu that is « Add Device ».

At this time the BRM IP address is requested (in this example the value is 192.168.0.2):



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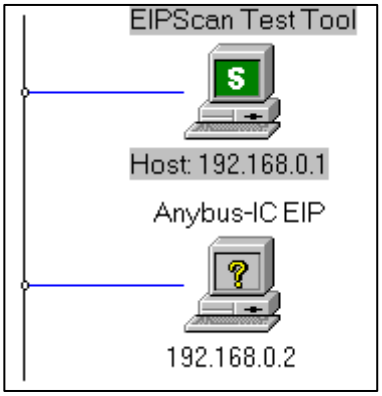
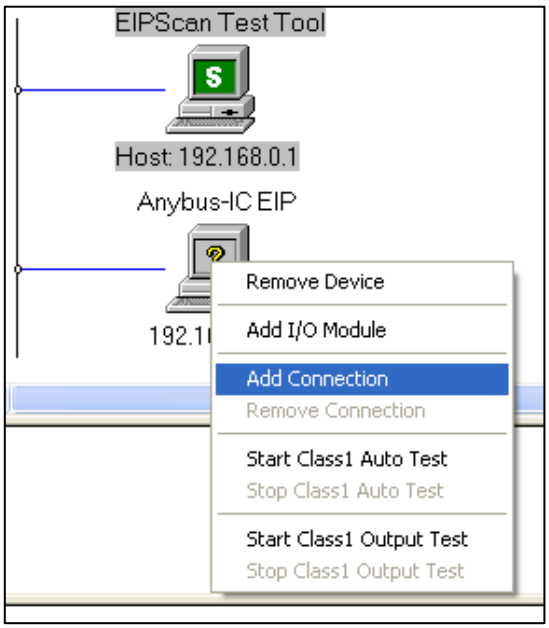
After that the device appears in the network:

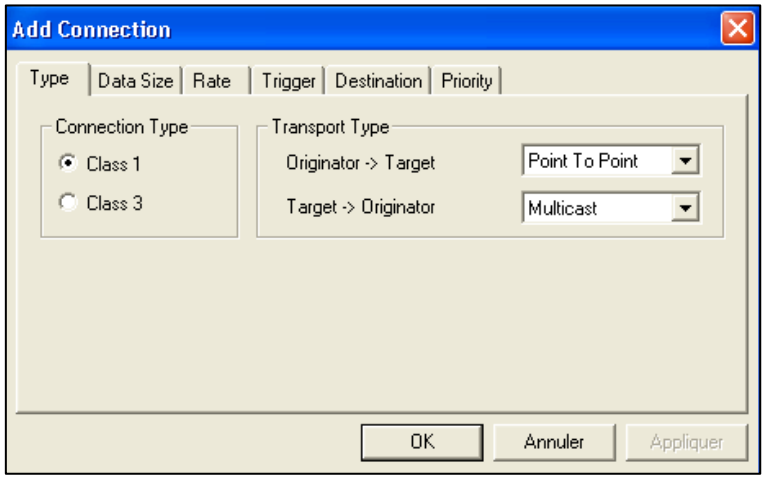


So as to communicate with the scanner, we must add and define a connection type (right click on device):



Choose « Add Connection ».

Now the configuration of the connection must have the BRM parameters (**Exclusive Owner** connection type):



Connection is class 1 with 'Point to Point' access for BRM inputs and 'Multicast' access for outputs.

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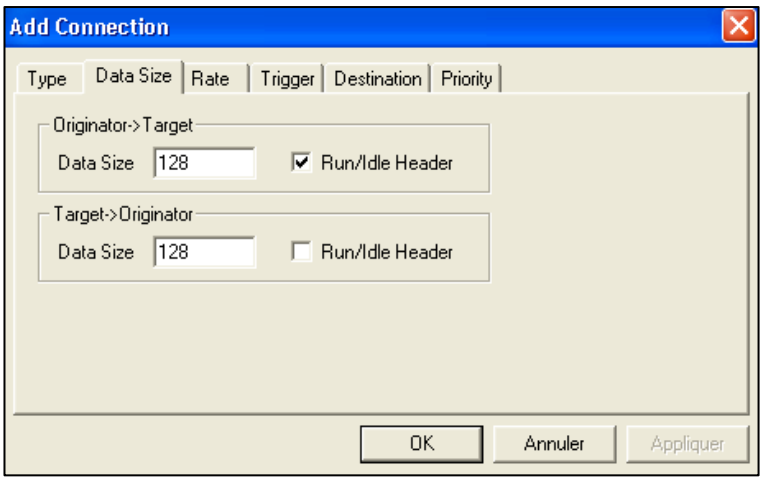
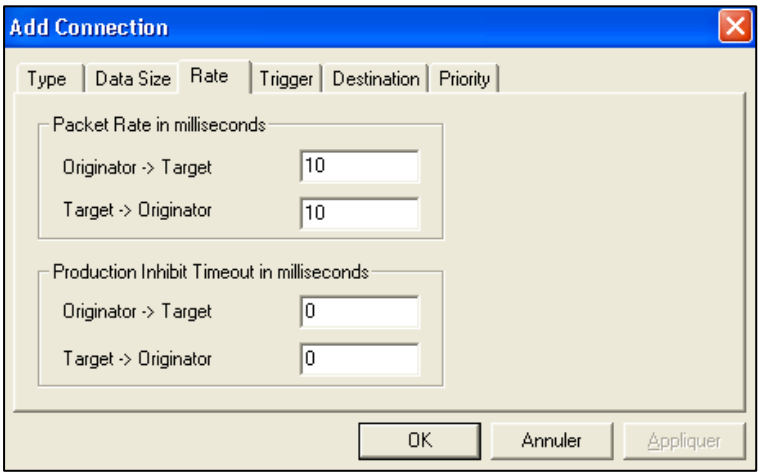
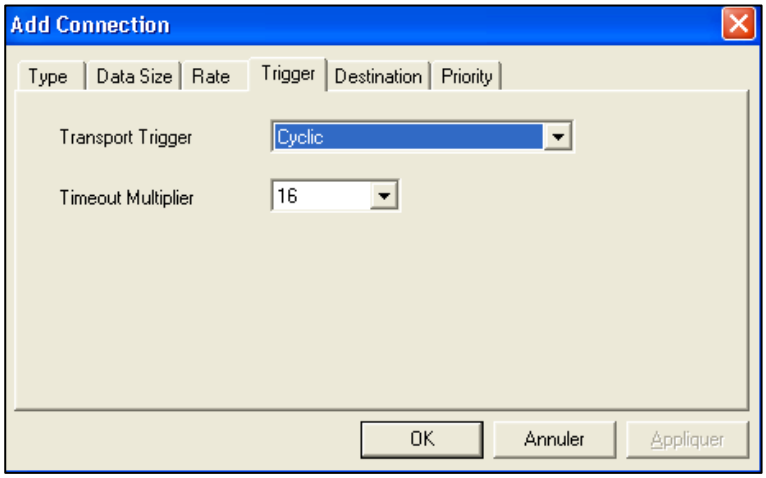


Data objects are 128 bytes length.



Data cyclic time must be set between 10 and 3200 ms. It is fixed at 10 ms.



Data trigger is cyclic.

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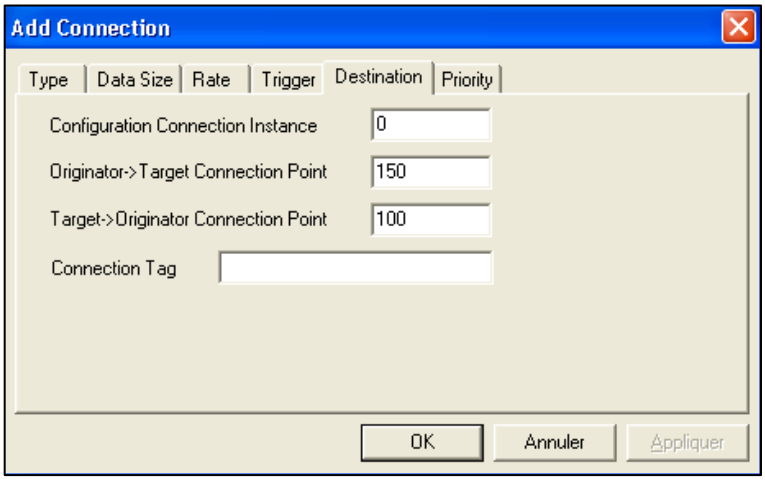
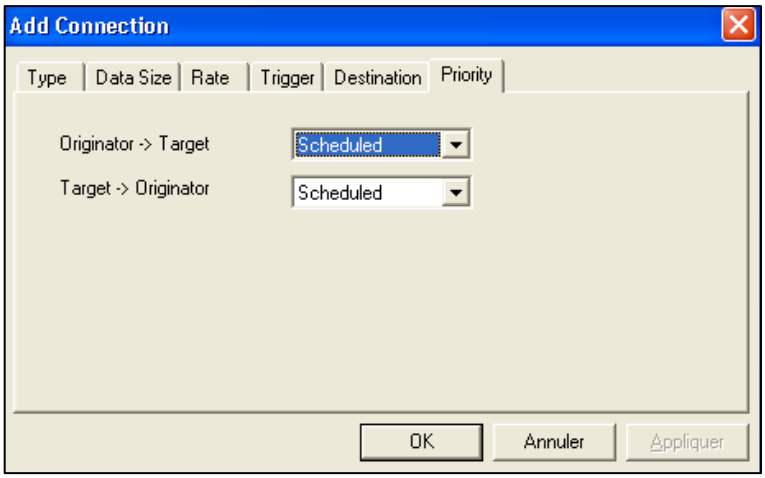
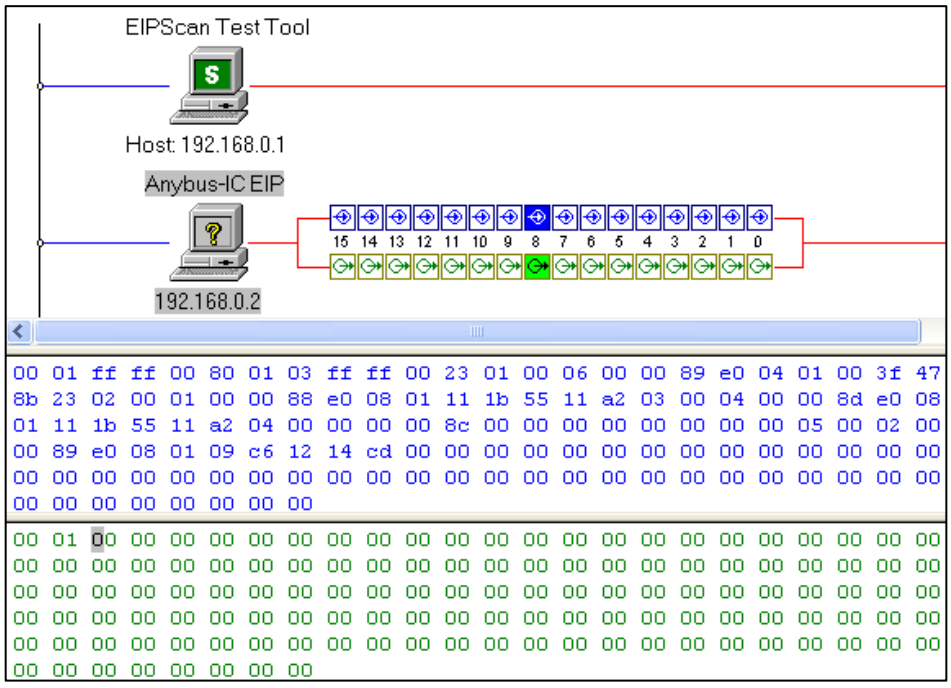


Object IDs (Assembly) are asked here, it's needed by scanner. Configuration ID is 0. Inputs ID is 150 and outputs ID 100.



Priority exchanges are scheduled because transfers are cyclic.

Once the connection is enabled and runs, inputs and outputs buffers are displayed:



Outputs buffer where the automatic read table is sent.

Inputs buffer where the scanner can send commands.

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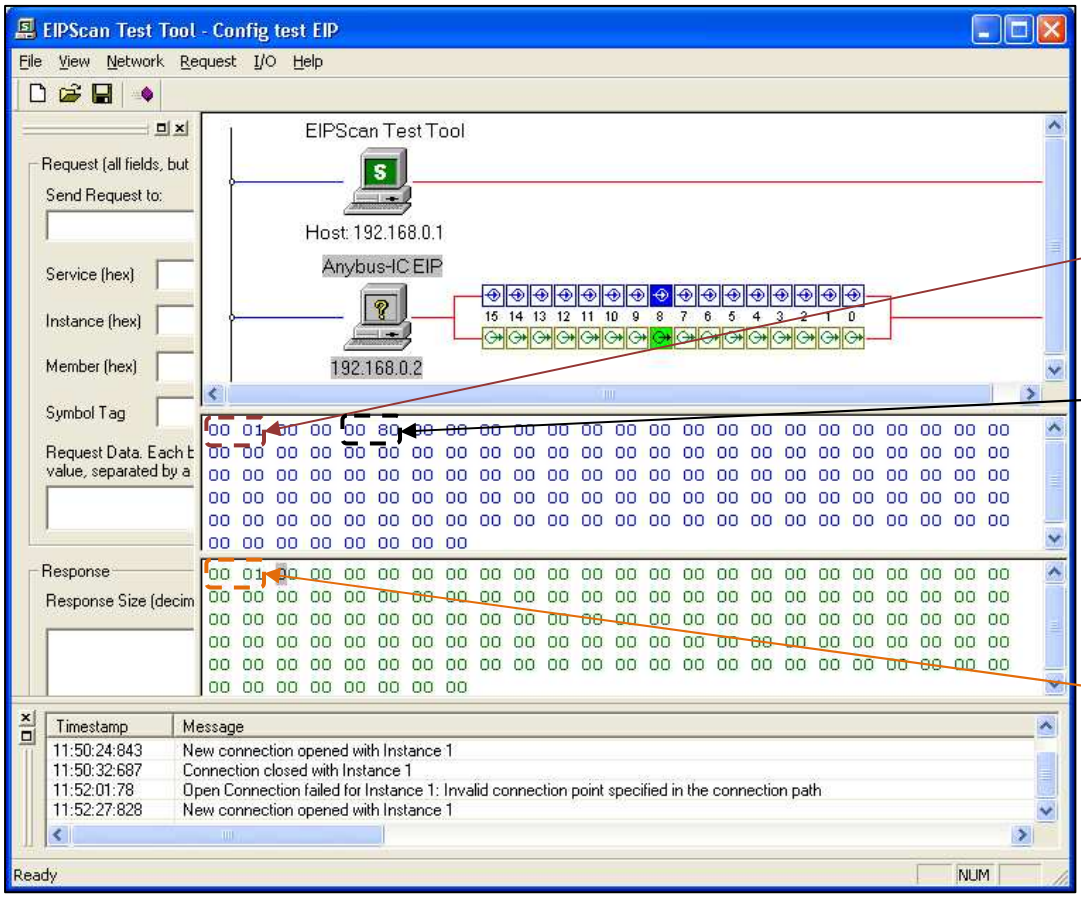
7.4 ANNEX 4: 56 WORDS READ COMMAND WITH EIPSCAN

Read request (identifier 0xEED7) in 0x0000 address on the reader number 2. It has responded (a TAG is present) over the BRMO 80 / ETH-IP used in Command mode.

1 step : put BRM in run mode

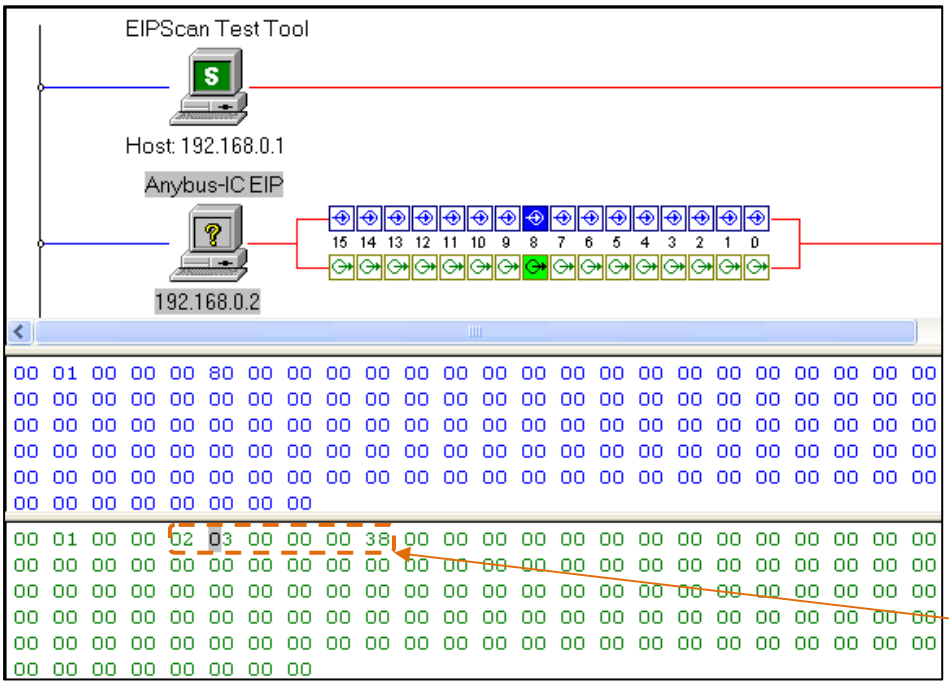


Echo run mode set in Module Status word

No cmd in progress in dynamic status

Set run mode in Module Control word

2 step : load command parameters



On reader 2 set a read (0x03) in address 0x0000 for 56 words (0x38)

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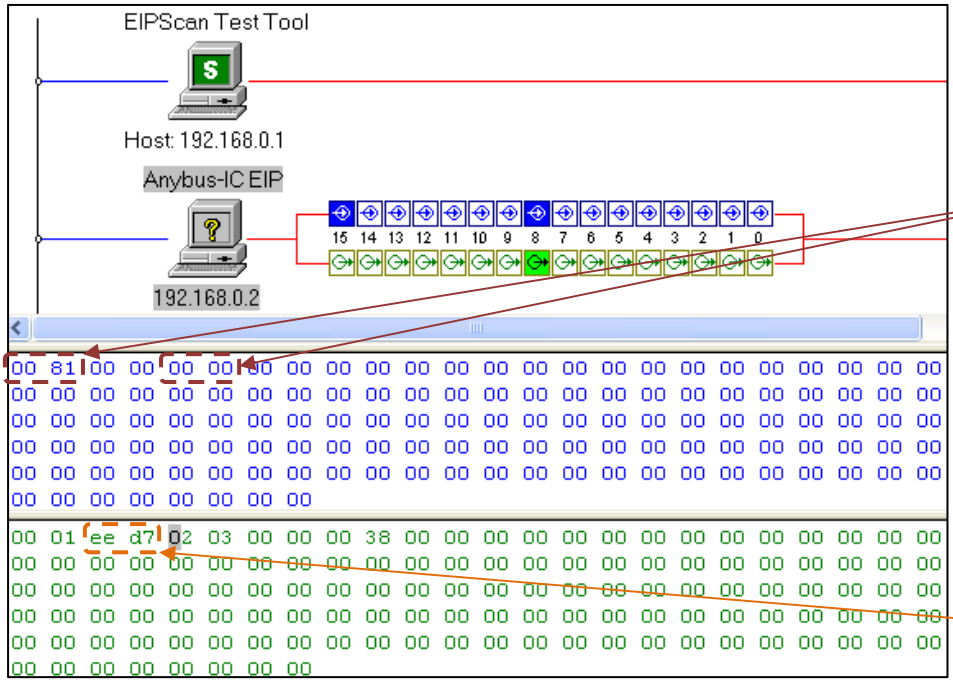
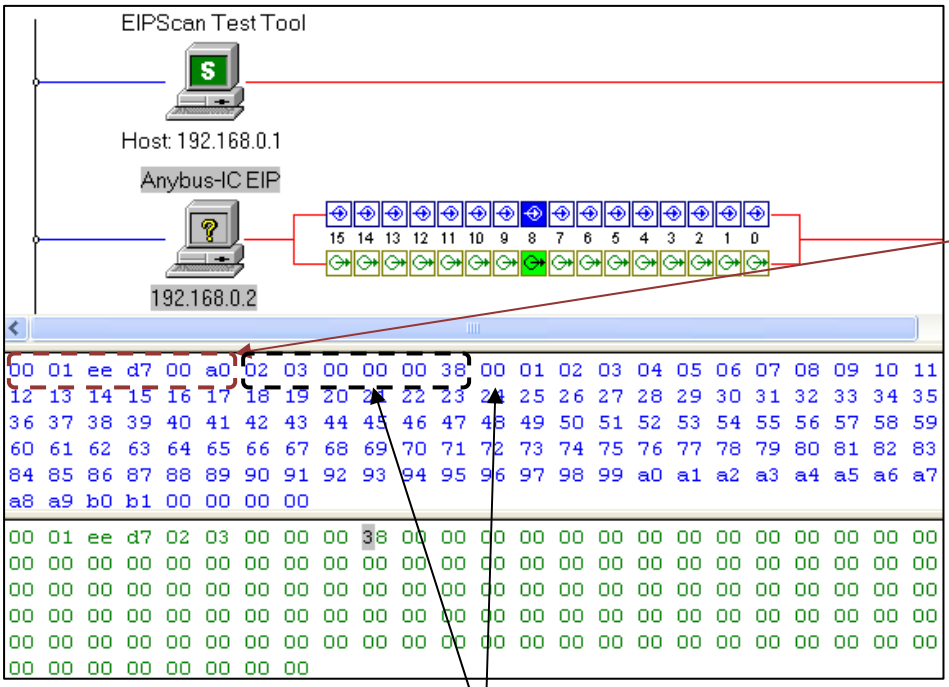
3 step : send Frame identifier



Command in progress bit is set in Module status word. Transition low for command completed bit in dynamic status word.

Write new frame identifier to start command management

4 step : command status and data reception



Command completed bit (in dynamic status word) transits to one => response to command 0xEED7 is well treated. Dynamic status to 0x00A0 indicates that a TAG was presented in front of reader when read command was sent.

Correct response from reader 2, read response (0x03) of 56 words (0x38). Data bytes are 0x00, 0x01, 0x02, 0x03 …

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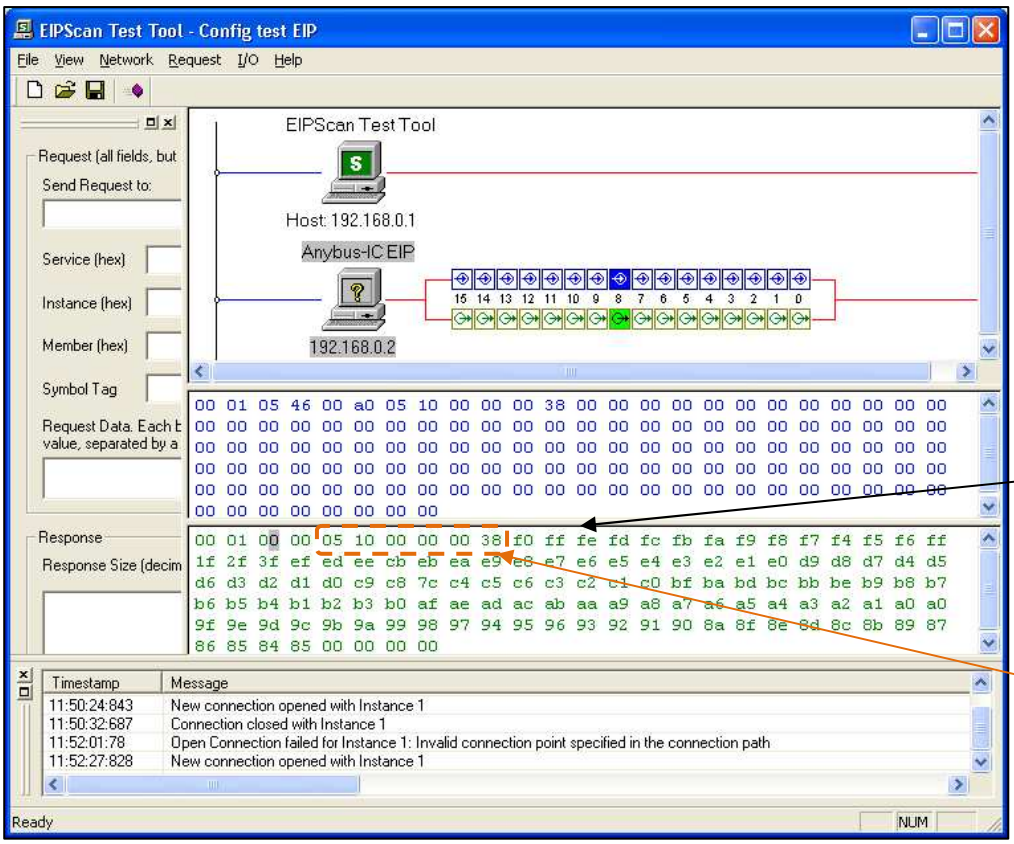
7.5 ANNEX 5: 56 WORDS WRITE COMMAND WITH EIPSCAN

Write request (identifier 0xEF74) in 0x0000 address on the reader number 5. It has responded (a TAG is present) over the BRMO 80 / ETH-IP used in Command mode.

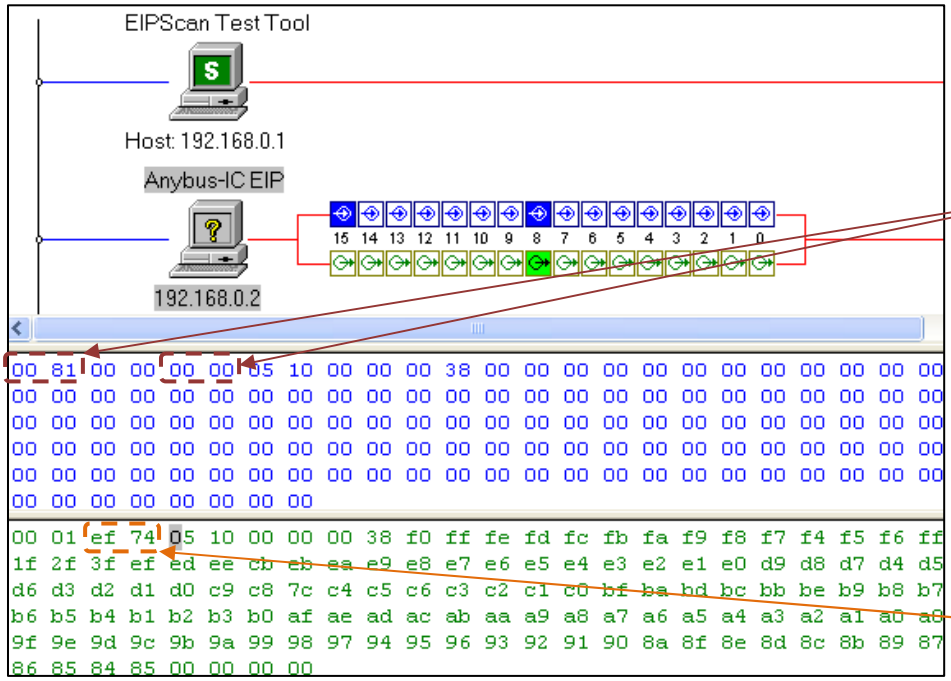
1 step : load command parameters and data



Load data : 0xF0, 0xFF, 0xFE …

On reader 5 set a write (0x10) in address 0x0000 for 56 words (0x38)

2 step : send Frame identifier



Command in progress bit is set in Module status word. Transition low for command completed bit in dynamic status word.

Write new frame identifier to start command management

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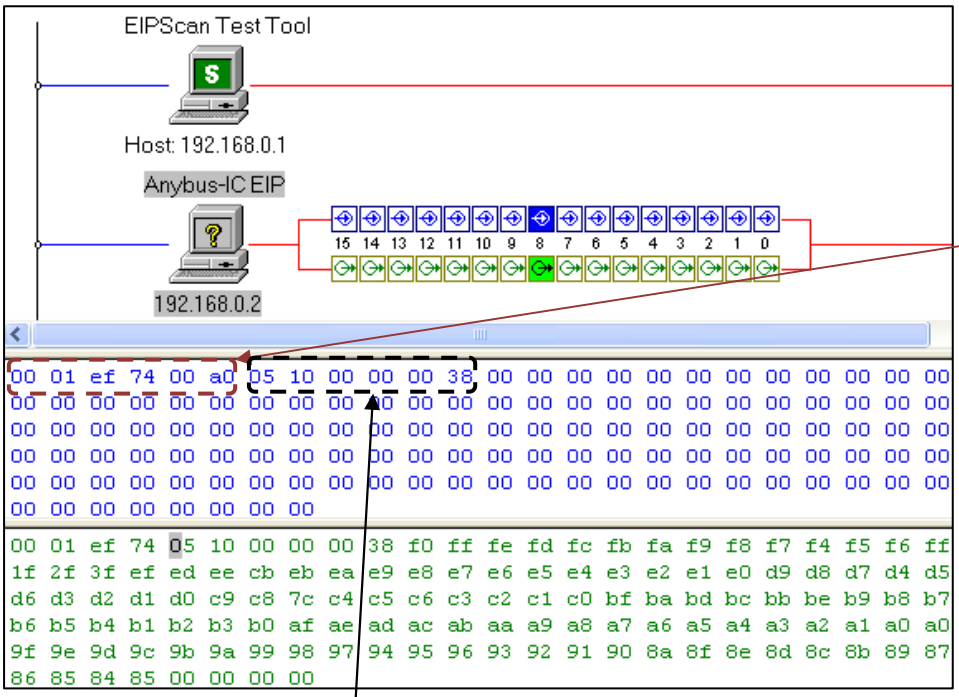
3 step : command status



Command completed bit (in dynamic status word) transits to one => response to command 0xEF74 is well treated. Dynamic status to 0x00A0 indicates that a TAG was presented in front of reader when write command was sent.

Correct response from reader 5, write response (0x10) of 56 words (0x38).

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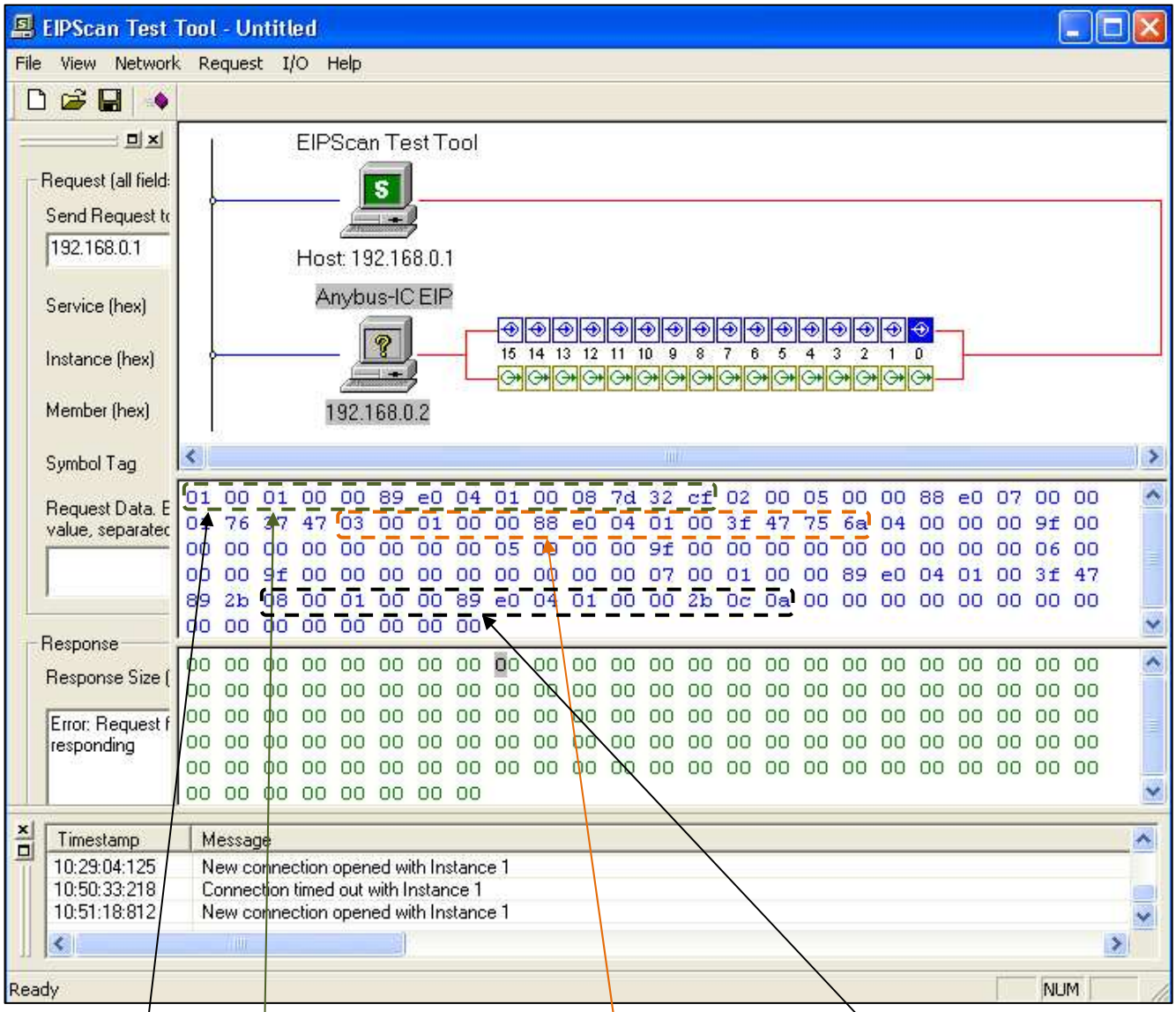
7.6 ANNEX 6: READER TABLE ACCESS IN FULL MASTER MODE WITH EIPSCAN

Full table access in Full Master mode.



Directly automatic data bytes without identifier because none command are needed.

On this reader 1 there were 1 TAG reads and the TAG is always in front of the reader (status at 0x89).

The status 0x88 signifies that there is no TAG present in front of the reader 3. Follow the 8 UID bytes of the last TAG accessed.

The status 0x89 signifies that there is a TAG present in front of the reader 8. Follow the 8 UID bytes of the actual TAG.

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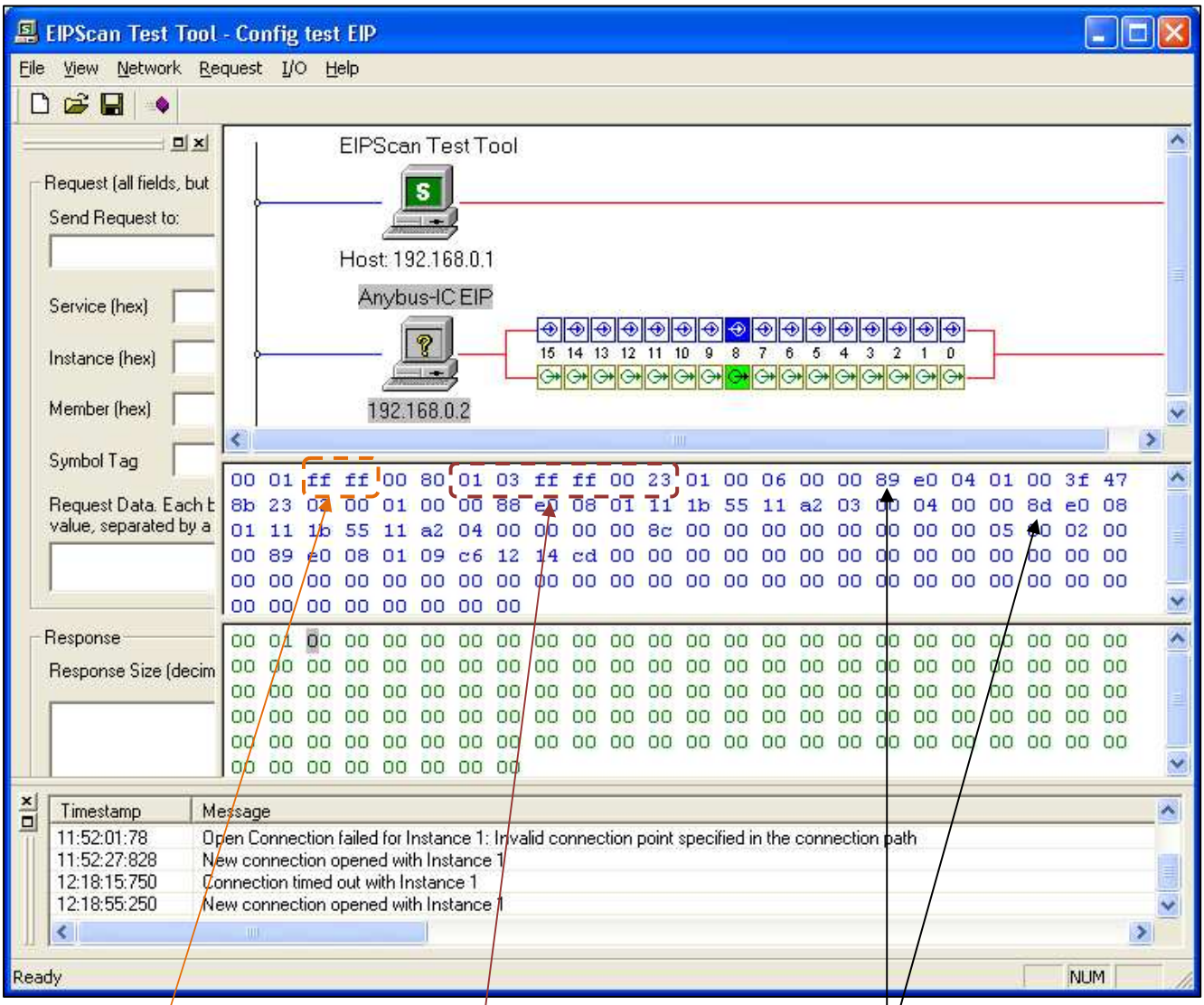
7.7 ANNEX 7: AUTOMATIC READER TABLE IN FULL MASTER WITH COMMAND MODE (WITH EIPSCAN)

All automatic reader information in the table where BRMO 80 / ETH-IP is in mode ‘full master with command’:



Specific frame identifier (0xFFFF) in this mode for the automatic reader data table.

The automatique table is always sent with parameters: read command in reader 1 on address 0xFFFF. The length (0x23) depends on reader number configured.

With the status 0x89and 0x8D, supervisor has the information that TAGs are presented in front of readers 1 and 3.

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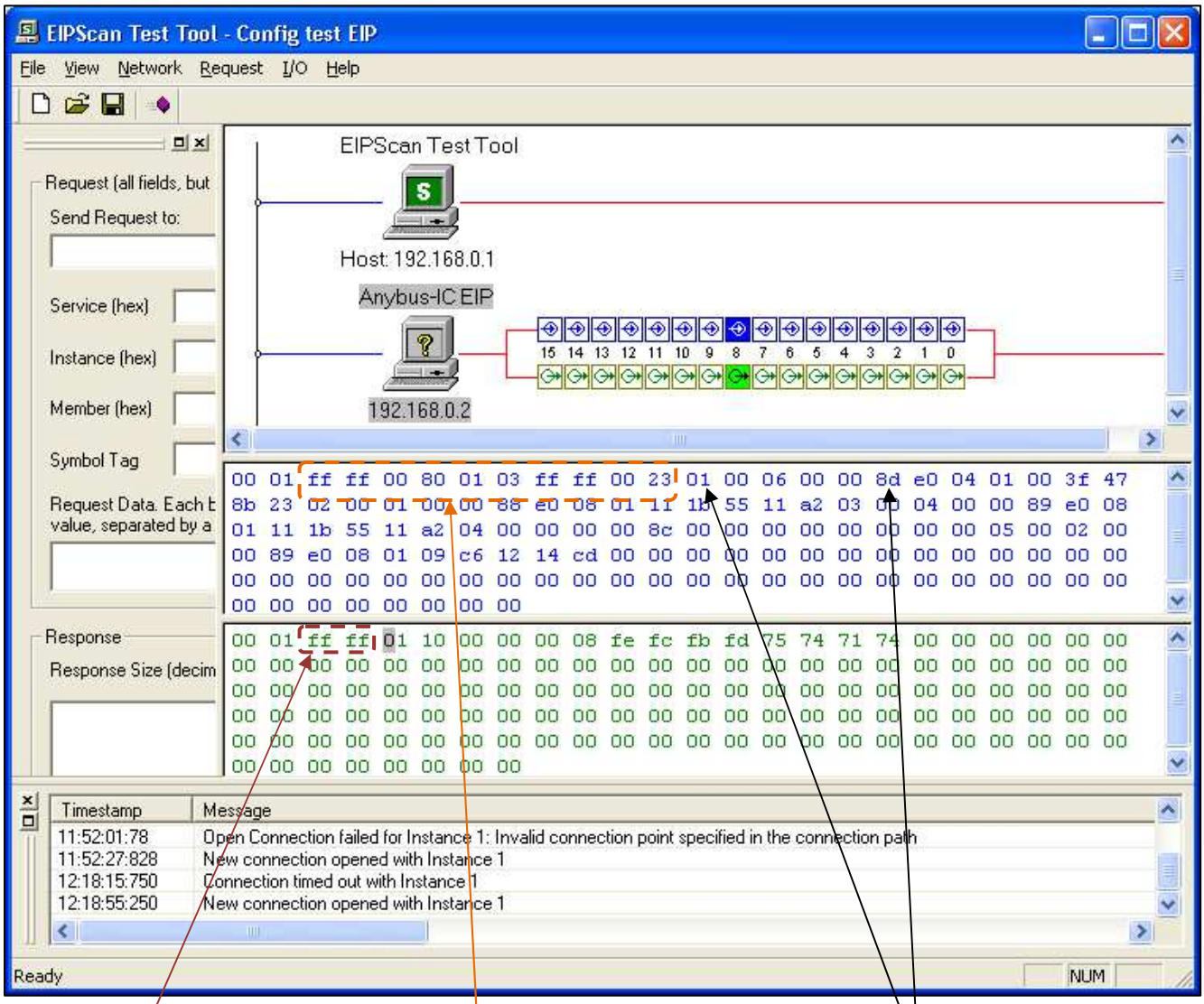
7.8 ANNEX 8: SPECIFIC FRAME IDENTIFIER IN FULL MASTER WITH COMMAND MODE(WITH EIPSCAN)

To leave the “Command” behavior in this mode, the specific frame identifier must be sent:



0xFFFF frame identifier sent to enter in automatic mode => BRM sends automatic reader table.

Always same parameters sent in automatic mode.

Automatic reader information begins with reader 1 => status 0x8D indicates that a TAG is presented in front of it.

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8 ADD-ON-INSTRUCTION FOR COMMAND MODE OF OPERATION (MODE 0)

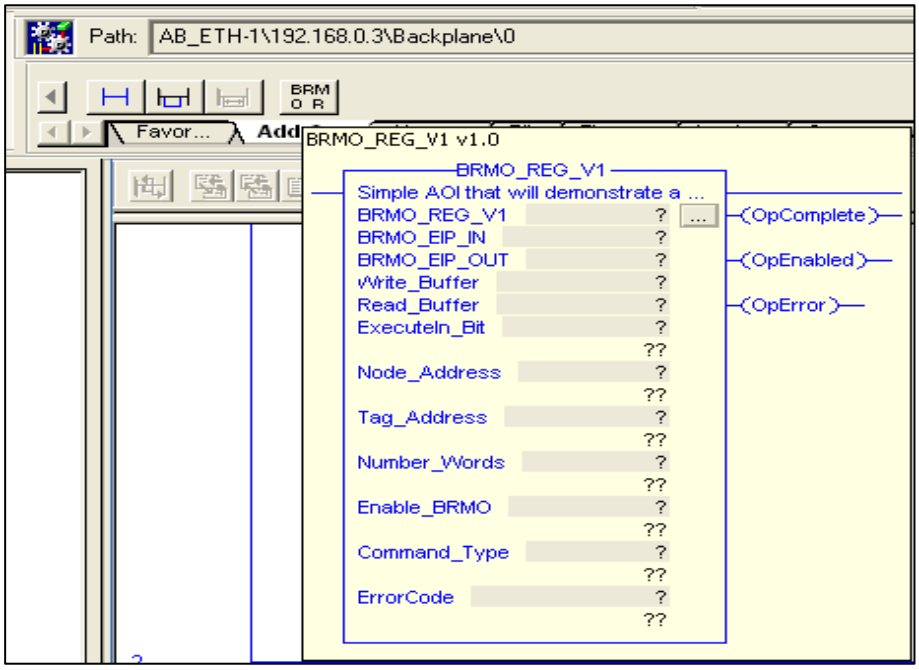
8.1 INTRODUCTION

In order to simplify the application of the BRMO 80 when interfacing to a Rockwell Logix Platform PLC an Add-On-Instruction has been created. The Instructions purpose is to manage the movement of Commands and Data between the BROM 80 / MOF reader network and the users PLC application.

The Add-On-Instruction is designed to exchange data with the BRMO 80 when the device is configured for Mode 0 of Operation. (see Sec 4.4 Change Configuration for steps required)

ADD-ON-INSTRUCTION:

The graphic below depicts the AOI as it looks when imported into the user application program.



The following discussion will explain the concept of and steps involved when applying the AOI (Add-On-Instruction):

- Theory of Operation behind this Add-On-Instruction
- Placing the Add-On-Instruction into an application program.
- Demonstration of an Application program that utilizes the Add-On-Instruction.

8.2 THEORY OF OPERATION

The AOI manages the task of translating an array of predefined user commands into the format required by the BRMO 80. The AOI will issue the command to the BRMO 80 that is defined in the AOI parameter list. Once a command is issued, the AOI will monitor the Command Complete Bit of the Dynamic Status Word to determine when a command is received and then retrieve the results of each operation when the BRMO 80 has signaled that the command is finished. The AOI repackages a traditional Balogh Command structure into the Modbus format desired by the BRMO 80.

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8.3 PARAMETER LIST

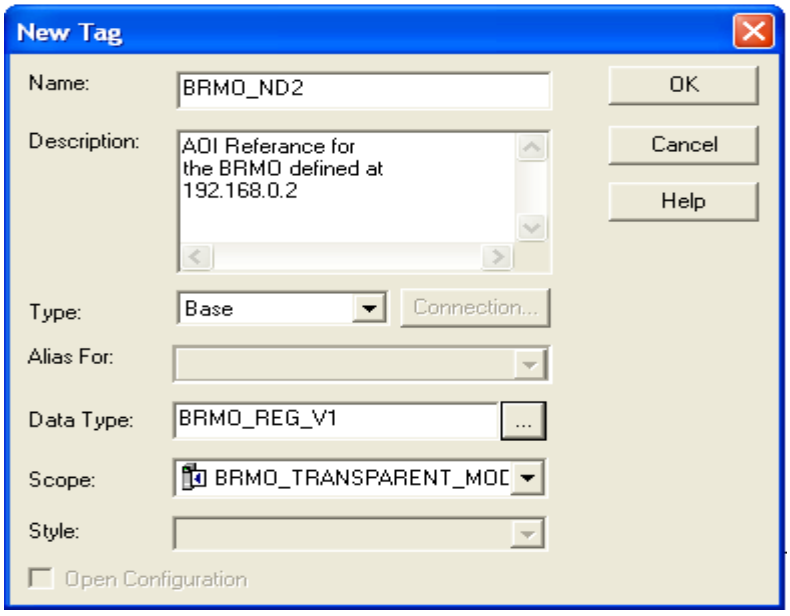
Parameter List and Meanings:

The AOI is comprised of a set of parameters that are used to pass information between the users application and the BRMO 80. The table below defines the parameter lists data types and their meanings.

Name	Direction	Data Type	Description
BRMO_EIP_IN	Input / Output	INT [64]	Map the EIP Input Image to this location.
BRMO_EIP_OUT	Input / Output	INT [64]	Map the EIP Output Image to this Location
Write_Buffer	Input / Output	INT [32]	Tag Data Write storage buffer
Read_Buffer	Input / Output	INT [32]	Tag Data Read Results storage buffer
ExecuteIn_Bit	Input	Boolean	Increment Frame Index (Initiate a Command)
NodeAddress	Input	INT	MonoBlock Slave Address
Tag_Address	Input	INT	Tags Starting Address
Number_Words	Input	INT	Number of Word to Read or Write
Enable_BRMO	Input	Boolean	Place the BRMO into RUN Mode
Command Type	Input	INT	Indicates the Type of Command Requested
ErrorCode	Output	INT	Result of Last Command Request
OpComplete	Output	Boolean	Command Complete
OpEnabled	Output	Boolean	Command Execution has started
OpError	Output	Boolean	Command Completed With an Error

Data Type: BRMO_REG_V1

The user defined data type for the AOI is named BRMO_REG_V1. This is the base type name for the instruction. The application program will use this reference to create a **New Tag** for use in the application program. The screen capture below is an example of how a **New Tag** created from BRMO_REG_V1 might look in your application.



This new Tag reference ***BRMO_ND2*** will be used in the application program to manage communications to the BRMO 80 located at 192.168.0.2 for example.

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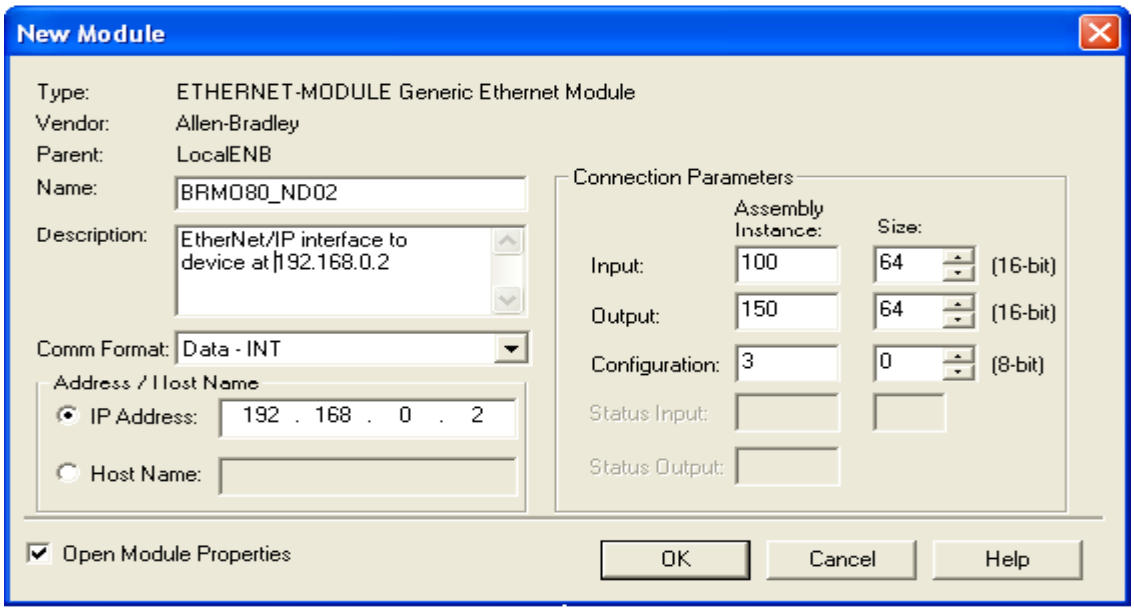
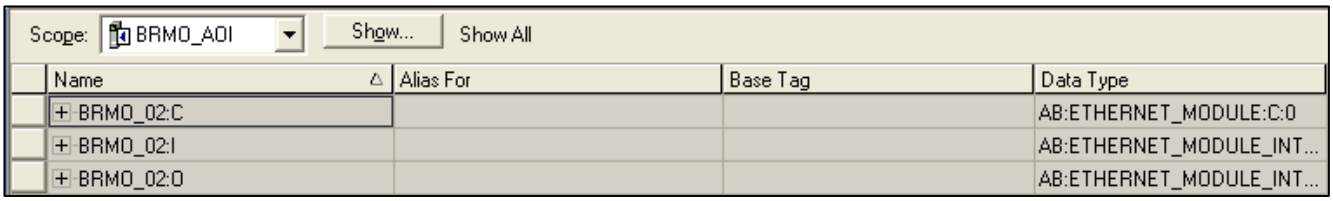
Parameter Name: BRMO_EIP_IN and BRMO_EIP_OUT

This data type points to the actual instance of the BRMO 80 that you have defined in your application. An Instance of the physical BRMO 80 is added when a ***New Module*** is defined for the projects Ethernet/IP network. The screen capture below is and example of a new BRMO 80 Module being created and placed into our projects Ethernet device tree. Please Note that the BRMO 80 must be added in as a ***Generic Ethernet Module***.



The screen capture below depicts the new instance of the BRMO 80 as it will appear once it is created and added to a project.



Parameter BRMO_EIP_IN will be assigned the actual type BRMO_02:I.Data
Parameter BRMO_EIP_OUT will be assigned the actual type BRMO_02:O.Data

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Parameter Name: Write Buffer Input / Output INT [32]

This must point to an array of type Integer. This array will contain the data that is to be written onto an RFID Tag.

Parameter Name: Read Buffer Input / Output INT [32]

This must point to an array of type Integer. This array will contain the results of a Tag Read Operation. Data that was Read from the RFID Tag will be placed into this array starting at index 0. Any previous data in this location will be over written.

Parameter Name: ExecuteIn_Bit Input Boolean

This is a Boolean data type defined as an Input to the AOI. The purpose of this bit is to act as a Trigger to actually signal to the BRMO 80 that a set of command parameters are available and a command is being requested. When this bit is set the Frame Index Word mapped to the Output Image is incremented by 1.

Parameter Name: Node Address Input INT

This is an integer data type defined as an Input to the AOI that will point to the MOF Slave Device Address that will be the target of the command.

Parameter Name: Tag_Address Input INT

This is an integer data type defined as an Input to the AOI that will point to a variable that contains the Tags Starting Address parameter. This is an address on the RFID Tag where a Read or Write Operation shall begin.

Parameter Name: Number_Words Input INT

This is a integer data type defined as an Input to the AOI that will point to a variable that contains the Number of Words parameter. This is defined as Words (2 - 8 bit bytes)therefore multiply by 2 to determine the number of bytes.

Parameter Name: Enable_BRMO Input Boolean

This is a Boolean data type defined as an Input to the AOI. This Bit will place the BRMO 80 into RUN Mode when set High (True).

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Parameter Name: Command_Type Input INT

This is an integer data type defined as an Input to the AOI. This will point to a variable that will store the Read or Write Command Code.

Because this Add-On-Instruction has been designed to reflect Balogh's traditional Command Code structure the Command Codes are translated from Balogh Codes into ModBus Codes by the AOI. The user is not required to build the ModBus Command. The AOI manages all of these details.

Command Type	Command Code AOI	BRMO 80 ModBus Code
Read Command	2 Dec	4 Dec
Write Command	1 Dec	16 Dec

Parameter Name: ErrorCode Output INT

This is an integer data type defined as an Output from the AOI. This will point to a variable that will receive the Error Code Result in the event that a requested Read or Write Operation fails. See table 6.2.3 Specific Fault Code Table of a description of the possible values.

Parameter Name: OpComplete Output Boolean

This is a Boolean data type defined as an Output from the AOI. This will point to a Boolean data type within the application. This Output is used to indicate that the AOI has completed a requested operation. This is a latching Output which is normally Low and will Latch High once a command has completed. This Output will unlatch upon the start of a new command.

Parameter Name: OpEnabled Output Boolean

This is a Boolean data type defined as an Output from the AOI. This will point to a Boolean data type within the application. This Output is used to indicate that the AOI is currently processing the requested operation. This Output Flag is internally managed by the AOI and transitions High when a command is in progress and will return Low when the operation is completed.

Parameter Name: OpError Output Boolean

This is a Boolean data type defined as an Output from the AOI. This will point to a Boolean data type within the application. This Output is used to indicate that the AOI has completed a requested operation by an error was detected. This is a latching Output which is normally Low and will Latch High if the operation has resulted in an error. This Output will unlatch upon the start of a new command.

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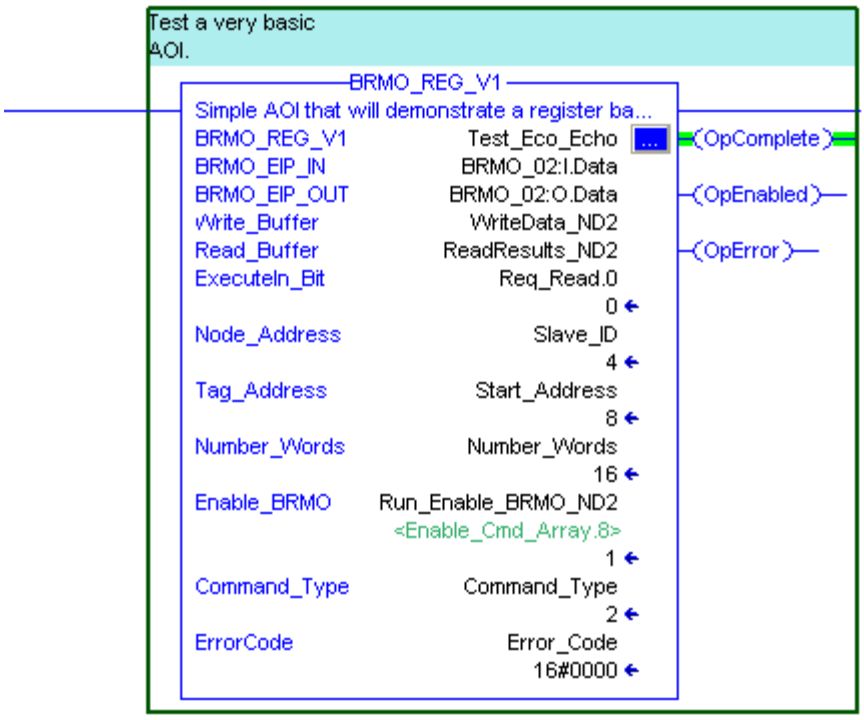
Completed AOI as it might appear in the users application with program arguments assigned to the AOI Parameter Names.



Add-On-Instruction release file:

BRMO_REG_V1.L5X

Demonstration program release file:

BRMO_AOI_V1.ACD written in release 16.0 and based on 1756-L61 processor

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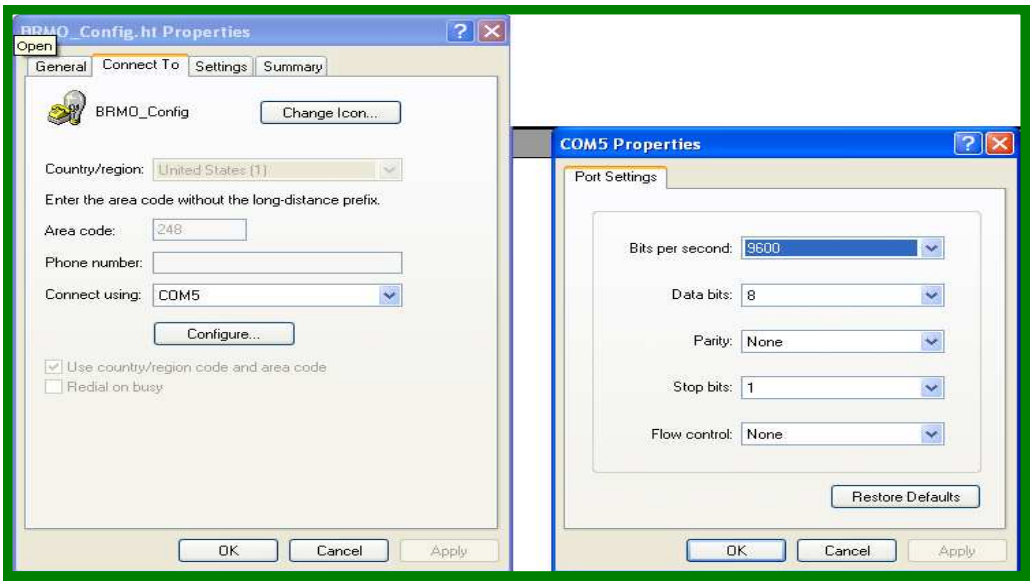
9 EXAMPLE OF FULL MASTER (MODE 1) OPERATION USING ETHERNET/IP

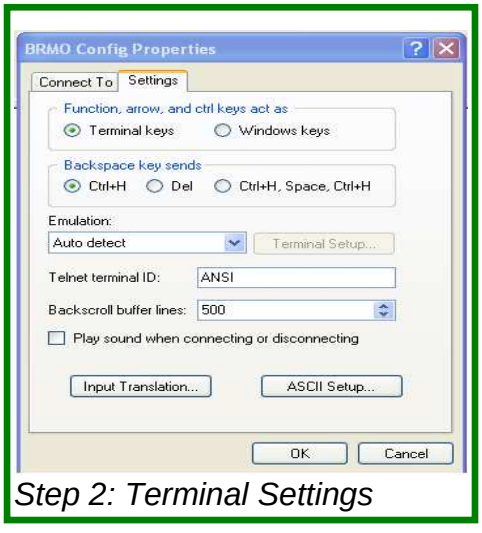
This example will demonstrate how to setup a BRMO 80 that will operate in Full Master Mode and manage a network of 4 MOF Monoblock devices. This example was created to operate under the RSLogix 5000 Version 16.0 environment using an Allen Bradley 1769-L32e CompactLogix 5332E Controller. This example assumes that the 4 MOF devices have already been configured with slave addresses 1 through 4.

9.1 CONFIGURATION OF THE BRMO 80

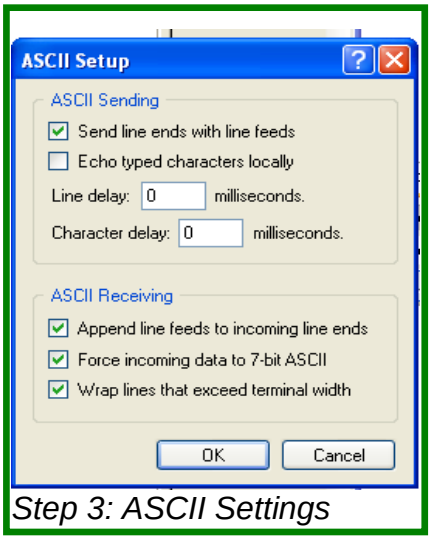
The BRMO 80 will first need to be configured using HyperTerminal. Open a new HyperTerminal Connection with the following settings. Follow steps 1 thru 3.



Step 1: Port Settings



Step 2: Terminal Settings



Step 3: ASCII Settings

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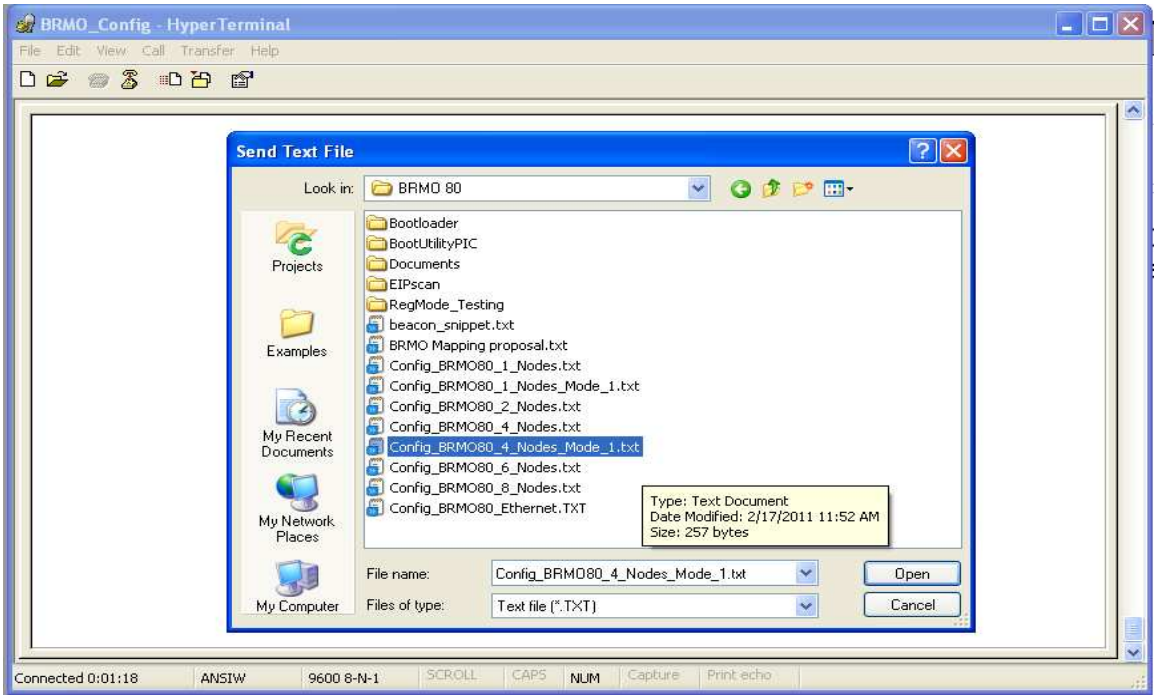
Once the terminal settings have been established and the terminal window is open it will be necessary to send a simple text file to the BRMO 80. The text file will configure it for operation in mode 1 and management of 4 slave devices. The BRMO 80 will execute its internal program and will be responsible for sensing Tags at all of the 4 readers and automatically reading the 8 bytes of data at the Tag Address assigned in this configuration.

Below is the text file used for the demonstration. You will notice that the Reader Number is set to 4 and the BRMO80 mode is set to 1. The Auto High / Low Block Address is set to 0x2000 which is the address used to instruct each MOF to return the 4 Word UID contents of each tag that appears in front of a reader.

IP addr on LAN : 192.168.0.4
LAN subnet mask : 255.255.255.0
Network gateway addr : 0.0.0.0
IP addr configured with switch : on
Reader number : 4
BRMO80 mode : 1
Auto high block addr read : 0x20
Auto low block addr read : 0x00
Output traces : off

Send this configuration file to the BRMO 80 by selecting the menu item Transfer → Send Text File. The screen capture below depicts this step.



When this file is understood by the BRMO 80 the device will respond with the message

Correct configuration => please wait until BRM restarts!

At this point its a good idea to have your 4 MOF devices attached. If not than cycle power to the BRMO 80 , attach the MOF's and reapply power.

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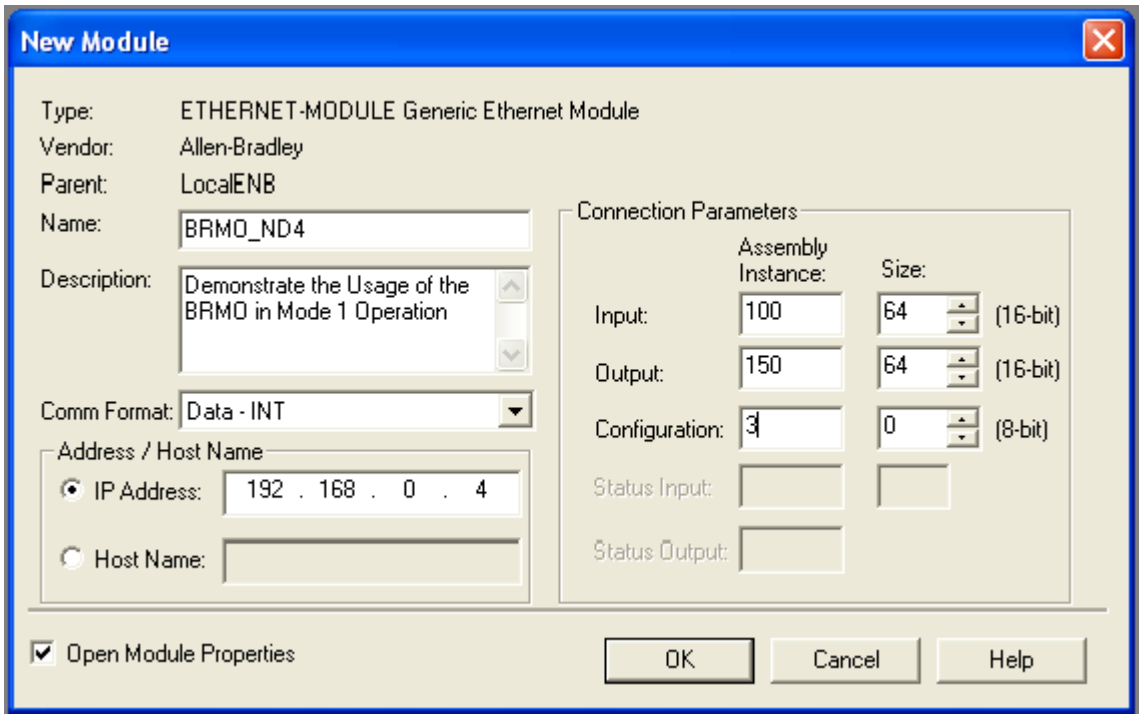
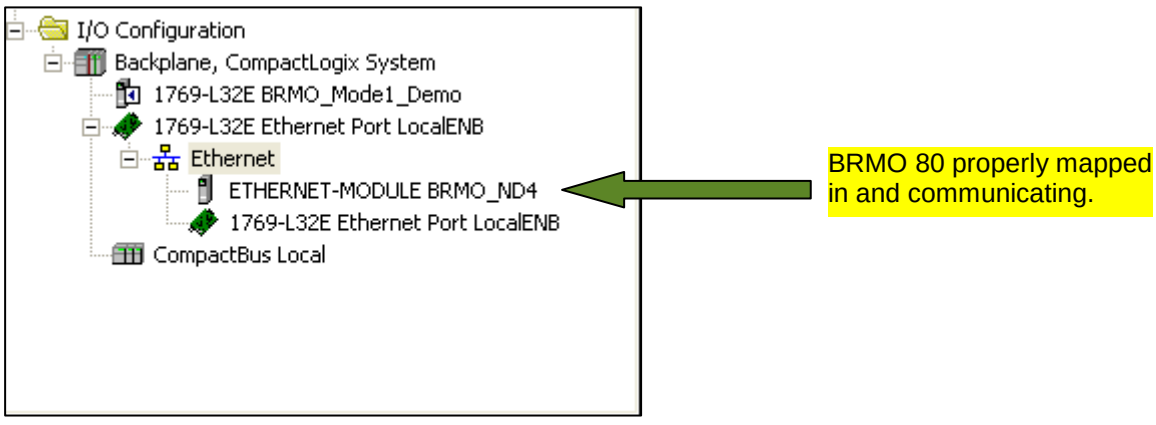
9.2 ADDING THE HARDWARE TO YOUR PLC PROJECT

Now that the BRMO 80 is configured it will be necessary of add a New Module to your ladder logic project.

This step will define the BRMO 80 and its connection parameters allowing the I / O image to be mapped into the project. Follow the screen capture below very carefully, this is where 90 % of all setup errors usually occur. Please Note that the BRMO 80 must be added in as a ***Generic Ethernet Module***.



With power applied to the BRMO 80 and the correct Generic Device setup from the previous step the device should appear in the Ethernet tree of the Controller Organizer view.



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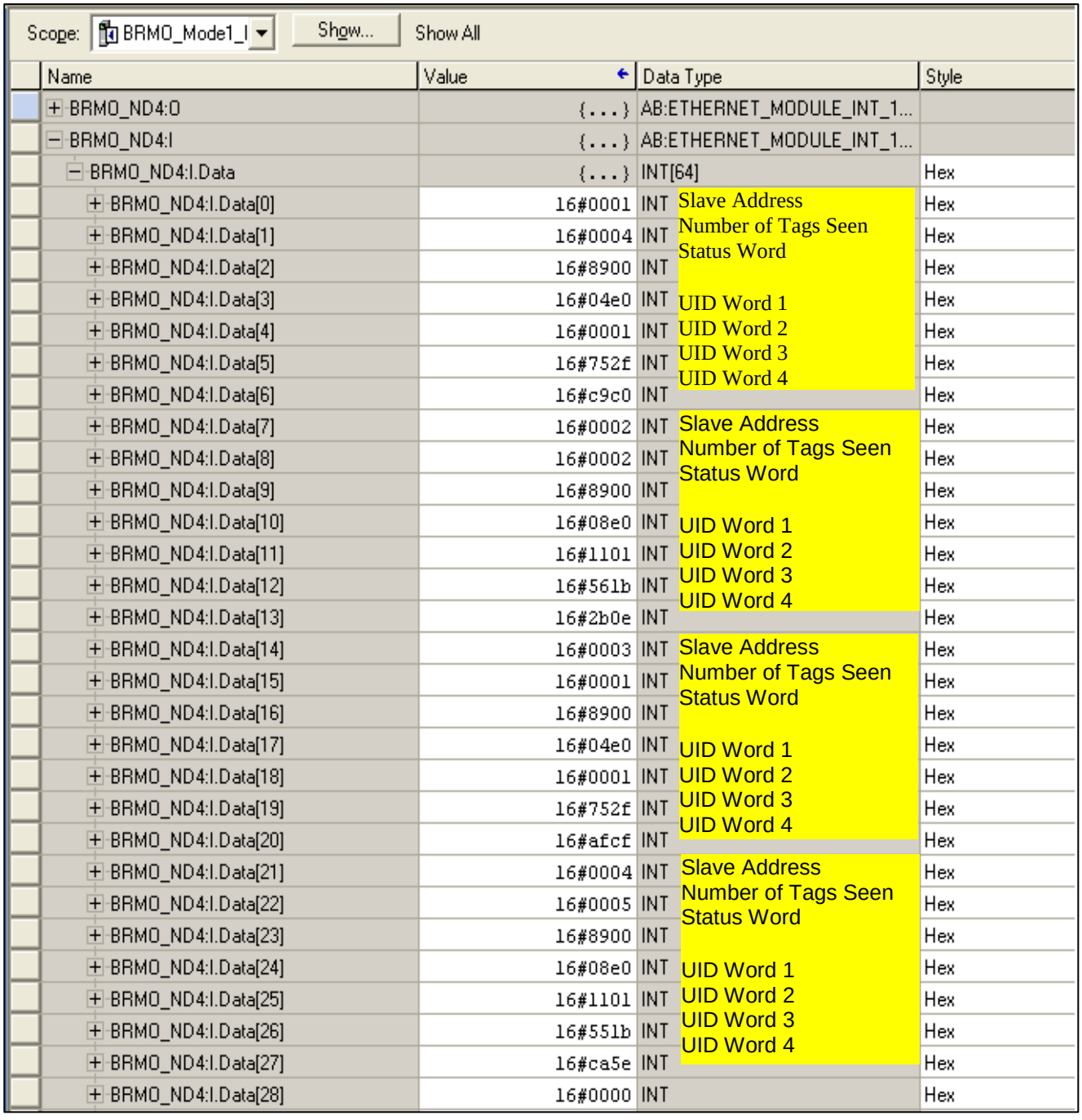
The BRMO 80 will take the form of Controller Scoped Tags

BRMO_ND4:O
BRMO_ND4:I
BRMO_ND4:C

The graphic below depicts how the BRMO 80 maps the 4 slaves into the Input Image of the PLC.



Scope: BRMO_Mode1_I | Show... | Show All

Name	Value	Data Type	Style	
BRMO_ND4:O	{...}	AB:ETHERNET_MODULE_INT_1...		
BRMO_ND4:I	{...}	AB:ETHERNET_MODULE_INT_1...		
BRMO_ND4:I.Data	{...}	INT[64]	Hex	
BRMO_ND4:I.Data[0]	16#0001	INT	Hex	Slave Address
BRMO_ND4:I.Data[1]	16#0004	INT	Hex	Number of Tags Seen
BRMO_ND4:I.Data[2]	16#8900	INT	Hex	Status Word
BRMO_ND4:I.Data[3]	16#04e0	INT	Hex	UID Word 1
BRMO_ND4:I.Data[4]	16#0001	INT	Hex	UID Word 2
BRMO_ND4:I.Data[5]	16#752f	INT	Hex	UID Word 3
BRMO_ND4:I.Data[6]	16#c9c0	INT	Hex	UID Word 4
BRMO_ND4:I.Data[7]	16#0002	INT	Hex	Slave Address
BRMO_ND4:I.Data[8]	16#0002	INT	Hex	Number of Tags Seen
BRMO_ND4:I.Data[9]	16#8900	INT	Hex	Status Word
BRMO_ND4:I.Data[10]	16#08e0	INT	Hex	UID Word 1
BRMO_ND4:I.Data[11]	16#1101	INT	Hex	UID Word 2
BRMO_ND4:I.Data[12]	16#561b	INT	Hex	UID Word 3
BRMO_ND4:I.Data[13]	16#2b0e	INT	Hex	UID Word 4
BRMO_ND4:I.Data[14]	16#0003	INT	Hex	Slave Address
BRMO_ND4:I.Data[15]	16#0001	INT	Hex	Number of Tags Seen
BRMO_ND4:I.Data[16]	16#8900	INT	Hex	Status Word
BRMO_ND4:I.Data[17]	16#04e0	INT	Hex	UID Word 1
BRMO_ND4:I.Data[18]	16#0001	INT	Hex	UID Word 2
BRMO_ND4:I.Data[19]	16#752f	INT	Hex	UID Word 3
BRMO_ND4:I.Data[20]	16#afcf	INT	Hex	UID Word 4
BRMO_ND4:I.Data[21]	16#0004	INT	Hex	Slave Address
BRMO_ND4:I.Data[22]	16#0005	INT	Hex	Number of Tags Seen
BRMO_ND4:I.Data[23]	16#8900	INT	Hex	Status Word
BRMO_ND4:I.Data[24]	16#08e0	INT	Hex	UID Word 1
BRMO_ND4:I.Data[25]	16#1101	INT	Hex	UID Word 2
BRMO_ND4:I.Data[26]	16#551b	INT	Hex	UID Word 3
BRMO_ND4:I.Data[27]	16#ca5e	INT	Hex	UID Word 4
BRMO_ND4:I.Data[28]	16#0000	INT	Hex	

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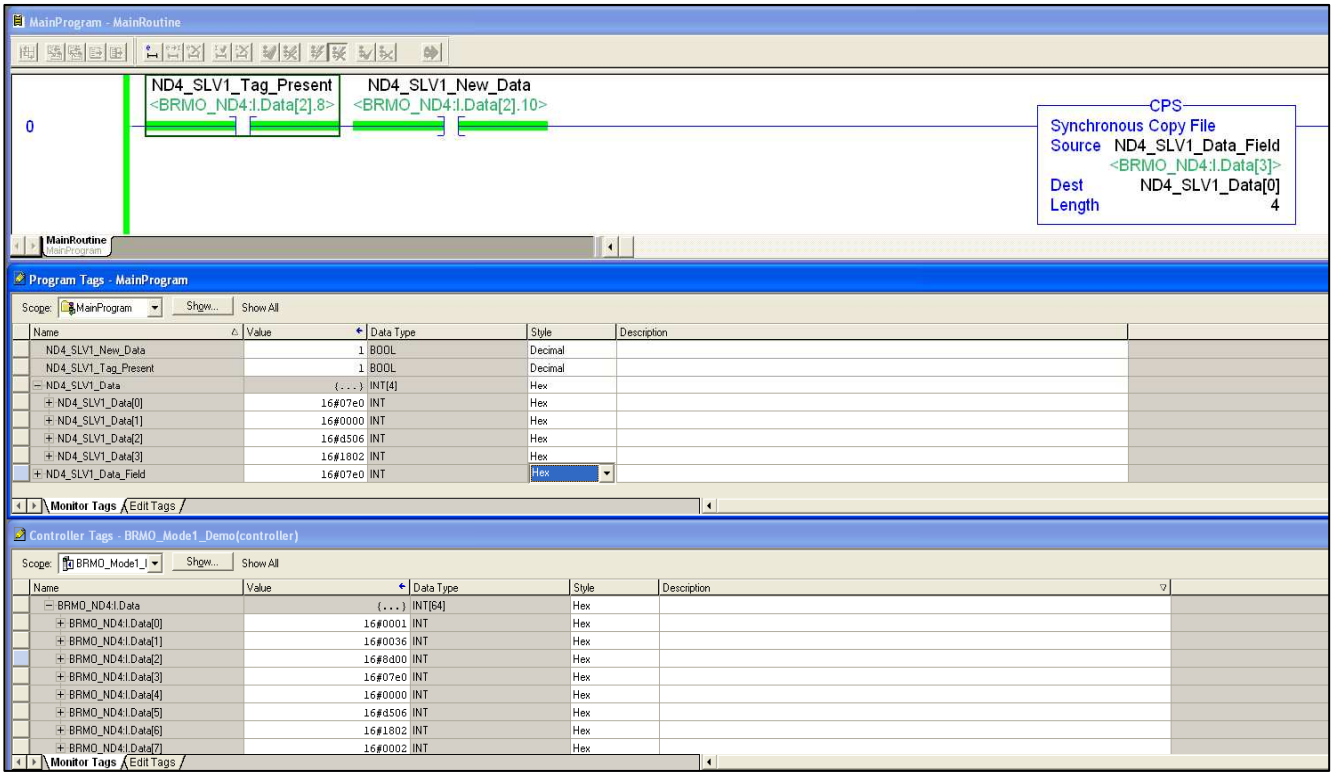
9.3 MANAGEMENT OF THE DATA RETURNED

Because the BRMO 80 does most of the work, a very small (if any) ladder logic is actually required. The 1 rung of logic below uses Bits 8 and 10 of the Status word related to the Slave MOF at Node 1 to determine when a New tag arrives with a different UID from the last Tag Read by the MOF. When a Tag is present AND the UID is different the new data is copied from the Controller Input Image and placed into a array of 4 words called ND4_SLV_Data[0].

Each MOF Slave Device will map into the Assembly Input Image as 7 Words

Word 0 Slave ID
Word 1 Number of Tags Read
Word 2 Status Result
Word 3 Word 0 Read From Tag
Word 4 Word 1 Read From Tag
Word 5 Word 2 Read From Tag
Word 6 Word 3 Read From Tag
This Pattern will repeat for each slave device that the BRMO 80 is managing

This rung will look for a TAG to be Present in front of the MOF Slave 1 and the NEW_DATA bit to be True.
Once these conditions are both true move data from the Assembly Input Image to a working buffer that is an array of 4 INTS called ND4_SLV1_Data.



Demonstration program release file:

BRMO_Mode1_Demo.ACD

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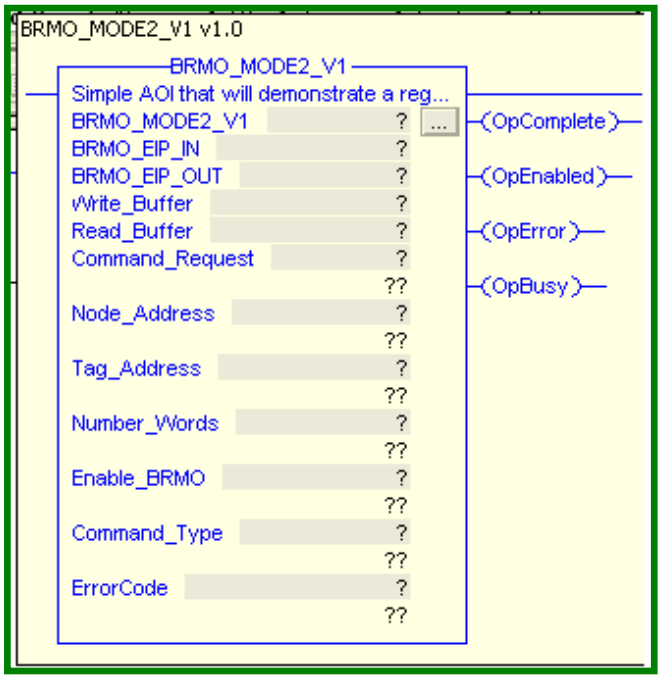
10 ADD-ON-INSTRUCTION FOR MASTER WITH COMMAND MODE OF OPERATION (MODE 2)

Introduction:

The Add On Instruction for Mode 2 Operation is nearly identical to the AOI for Mode 0 Operation from the perspective of the parameters that are supplied, therefore only the one additional output parameter will be explained here. The behavior though is quite different internally. This instruction now manages the the switching of the BRMO between Automatic Mode and Command Mode. When the BRMO first powers on it is running in Automatic Mode. The users application will be collecting 8 Bytes (4 Words) of Read data from each MOF on the Network. When it is necessary to issue a command the AOI will temporarily suspend the Automatic Mode, issue the command then return to Automatic Mode once the results of the commands execution are verified. It is important to understand that while a command is being executed all Reading is disabled from all stations. Please see the example program the accompanies this AOI for details on how this is managed.



Parameter Name: OpBusy Output Boolean

This is a Boolean data type defined as an Output from the AOI. This will point to a Boolean data type within the application. This Output is used to throttle the frequency which commands can be passed into the AOI. This Output Flag is internally managed by the AOI and transitions High after a command is completed and will return Low after 500ms. The application may use this bit to allow the Automatic Phase of operation to execute (refresh all Read operations) before another command is allowed to be processed by the AOI.

Add-On-Instruction release file Mode 2 Operation:

BRMO_MODE2_V1.L5X

Demonstration program release file using mode 2 :

BRMO_MODE2_V1.ACD written in release 16.0 and based on 1769-L32E processor

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