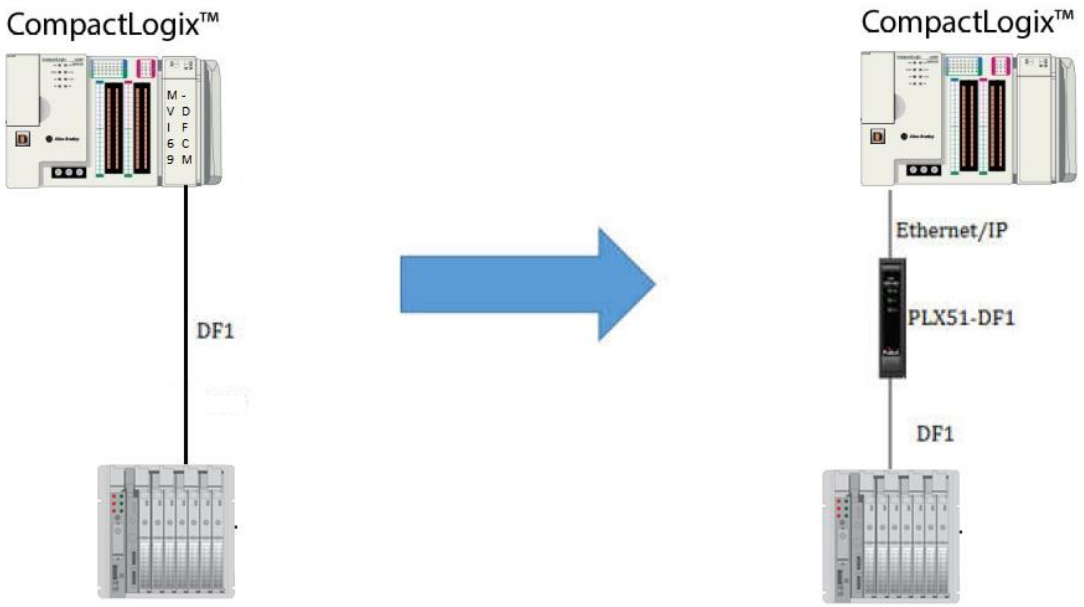
Technical Note

PLX51-DF1-ENI to communicate a CPX and a PLC5

Document Code: TN-PLX51DF1ENI_Migration from MVI69-DFCM-1907
Date: July, 2019
Revision: 1.0

This document shows how to set up the required software and hardware in order to migrate from MVI69-DFCM to PLX51-DF1-ENI.



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Hardware requirements

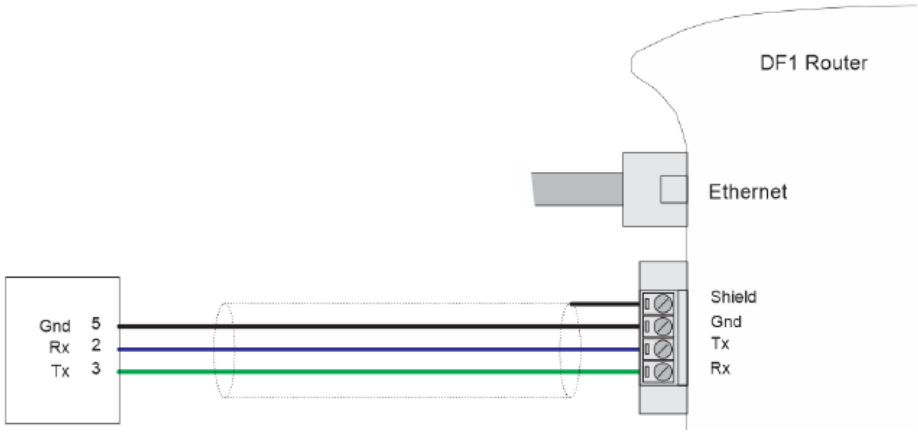
Part #	Rev.	Qty.	Description	Manufacturer
PLX51-DF1-ENI	1.003	1	Gateway DF1 to Ethernet/IP	ProSoft Technology
PLC5/40C	1.5	1	PLC	Rockwell
1769-L35E	20.013	1	Logix Controller	Rockwell
1783-US05T		1	5 ports Switch	Rockwell

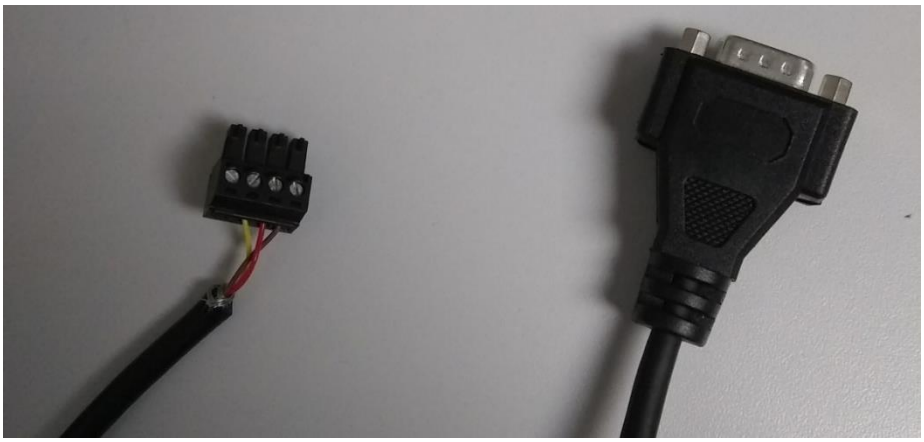
Before to start

- User should have basic knowledge on how to program under Logix platform as well as setting up a PLC5.
- User must download and install the PLX50 Configuration Utility Software.

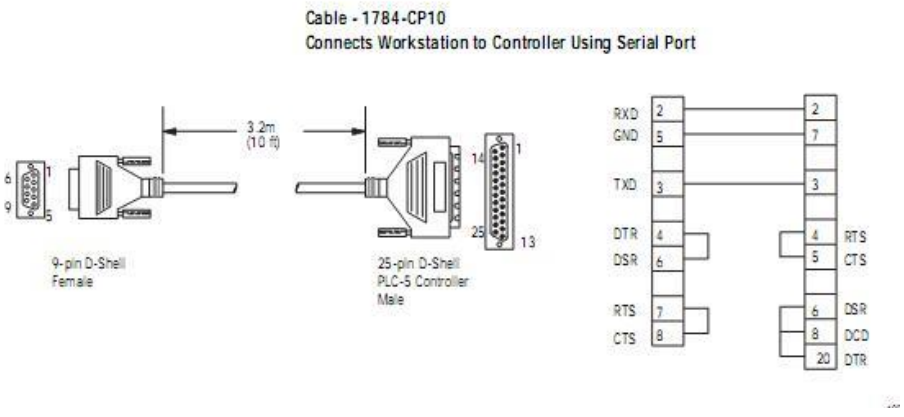
I. Wiring

Below you can find a diagram to wire DF1 interface.





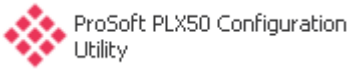
This is the pinout of the cable to communicate with PLC5.

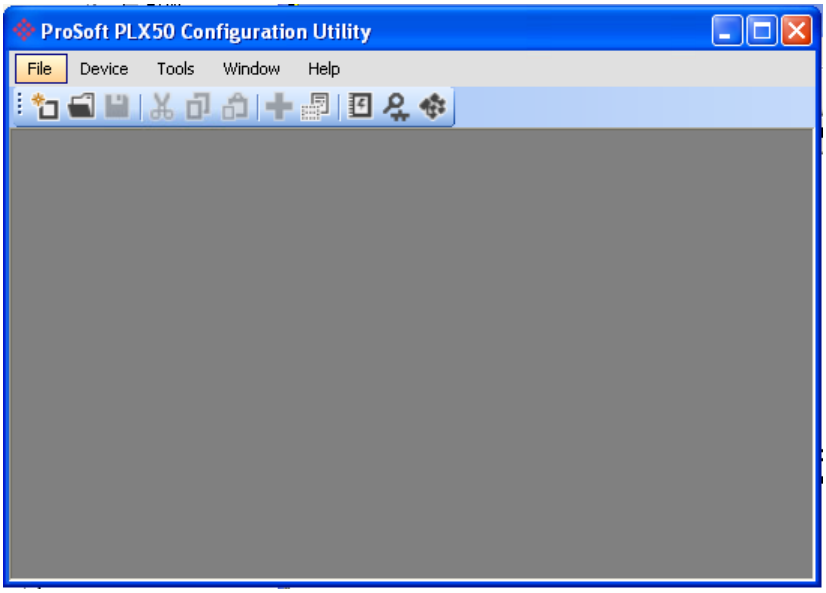



PROG
REM
RUN
I/O
BATT
PROC
FORCE
COMM
ControlNet
CH 2
A
B
1A
1B

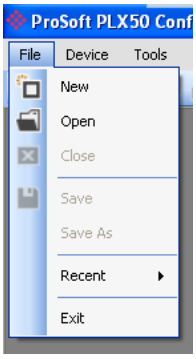
II. Configuring PLX51-DF1-ENI in Unscheduled mode

This operation mode allows a Logix PLC to issue Message to the gateway then this routes them to DF1 device.

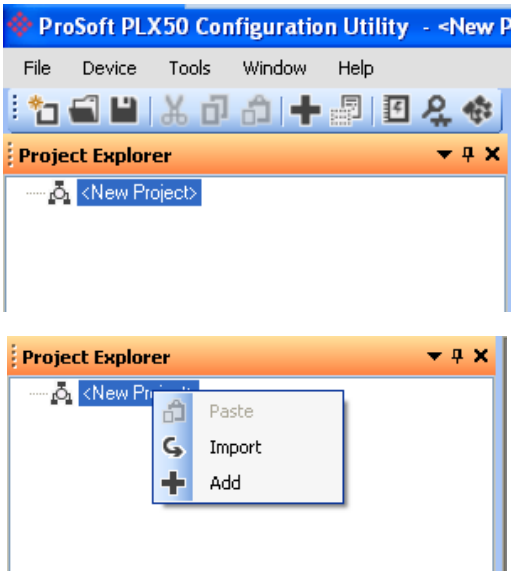
1. Open configuration software 



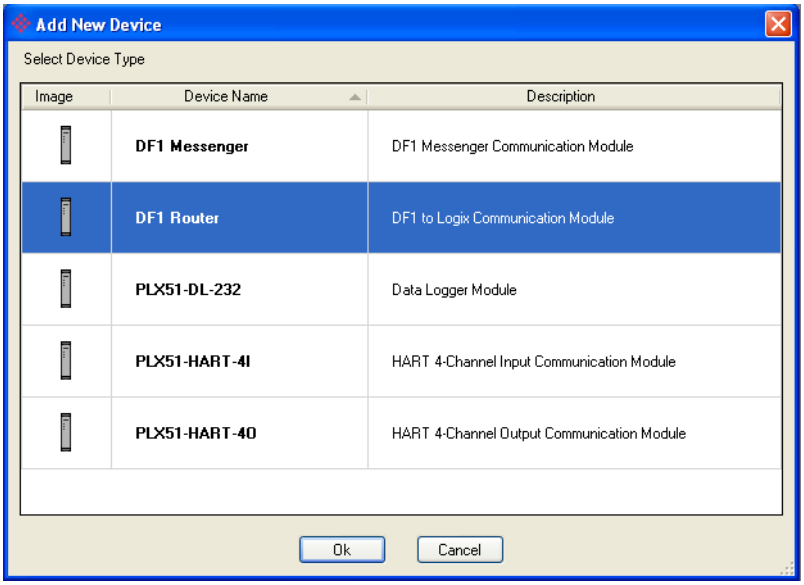
2. Go to **File** and select **New** to create a new project.



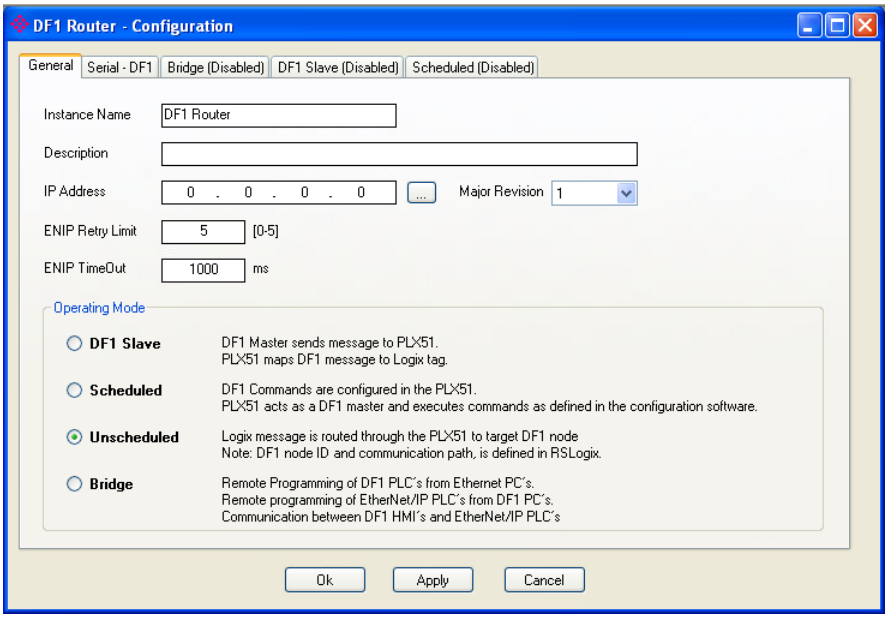
3. Right click on **<New Project>** and choose **Add**.



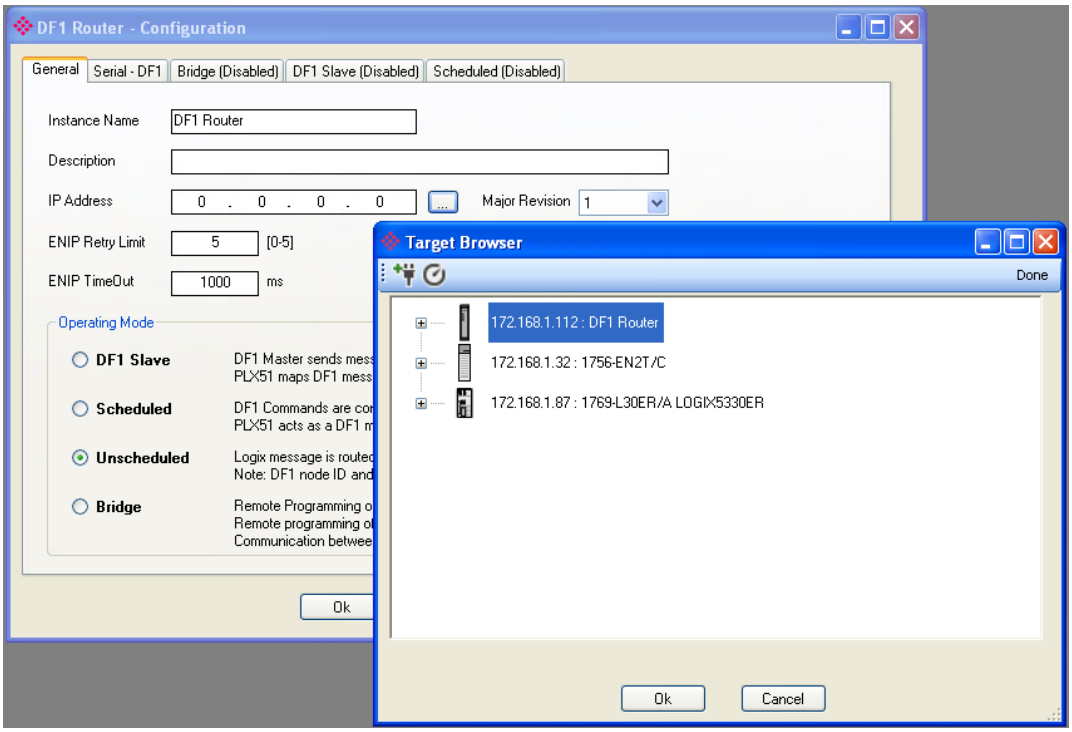
4. In the **Add New Device** window select **DF1 Router**. Click in **OK** button.



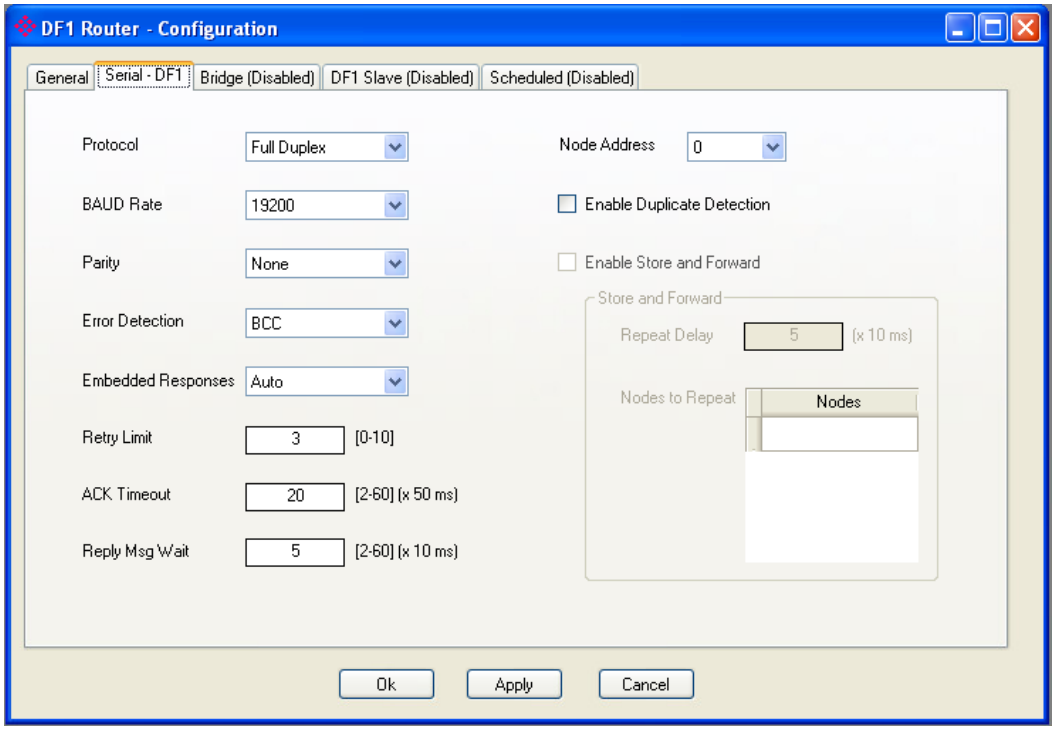
5. You can see now the **DF1 Router – Configuration** window. In **General** tab select **Unscheduled** in **Operation Mode** section.



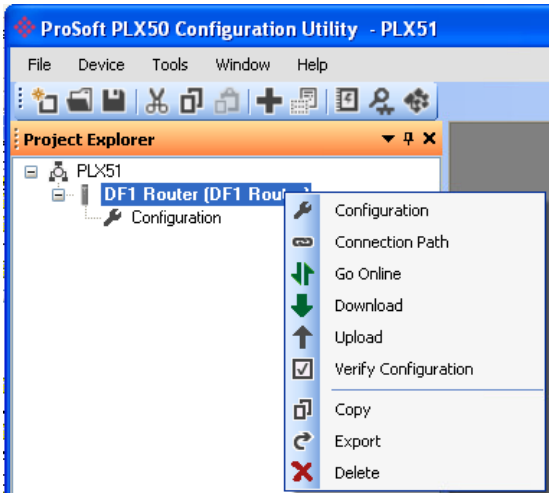
6. Click on the dotted button  to browse the PLX51 module in the **IP Address** section then you can select the module in the **Target Browser** window. Click on **OK** button.

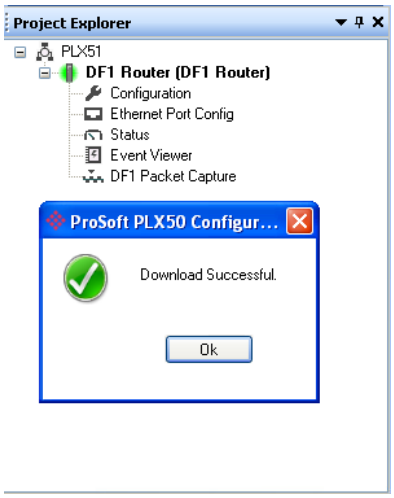


7. Go to the **Serial – DF1** tab and configure the basic serial communication parameter to match with PLC5 Chanel 0 configuration (see section III in this document).



8. Now download configuration to the gateway.



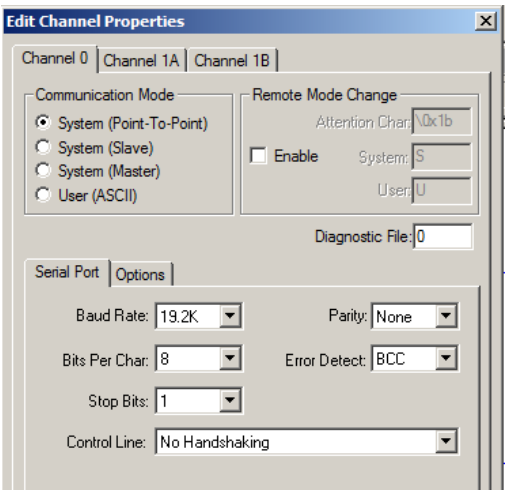


With this configuration the module is ready to route message from Ethernet/IP side to DF1 protocol.

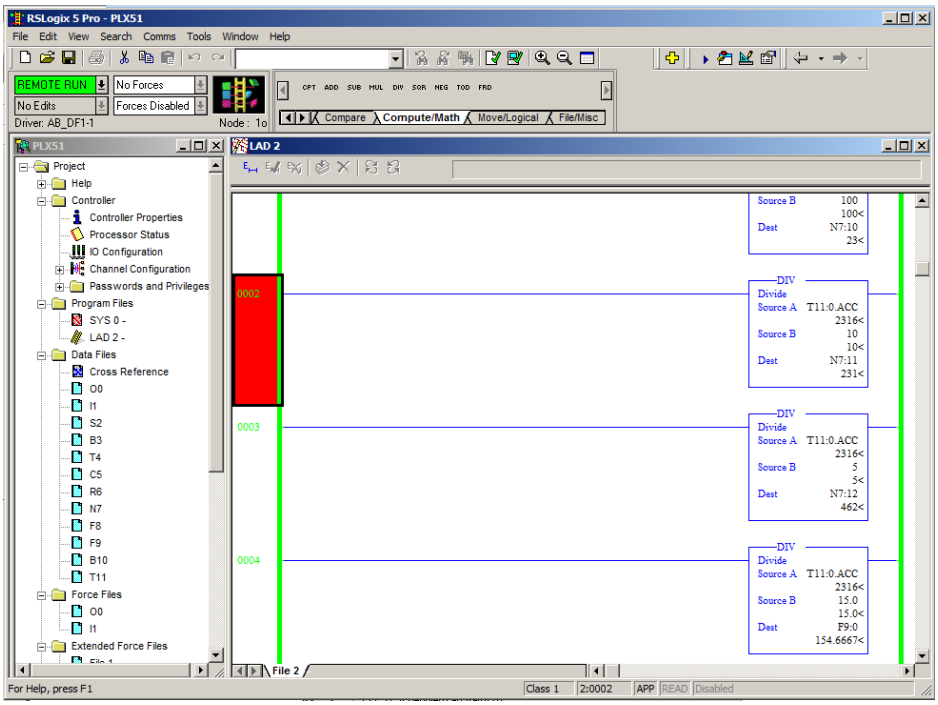
III. PLC5 configuration

You should verify the PLC5 configuration in order to make it match with PLX51 configuration, additionally you should take in account what data files are available in PLC.

1. Go online with PLC then you can see the current PLC configuration in **Channel Configuration**, just double click on it. In **Channel 0** tab you can see the DF1 port configuration and our gateway must be match with this.



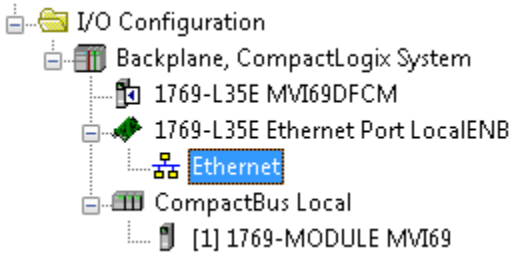
2. On the left side, in **Data Files** section you can see the data files available to read/write.

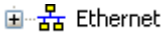


IV. Configuring RSLogix5000 or Studio5000

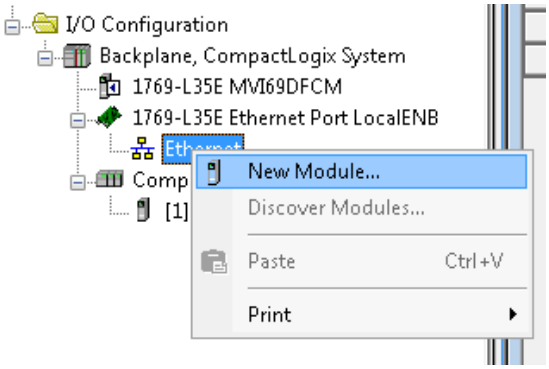
In this section we are going to set up Message instruction to read from or write to data from/to PLC5.

1. Open your project.



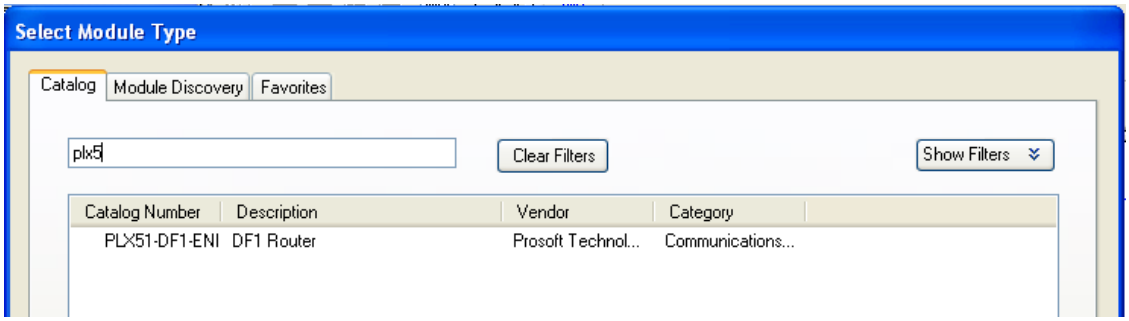
2. Right click on Ethernet network 

and select **New Module**.

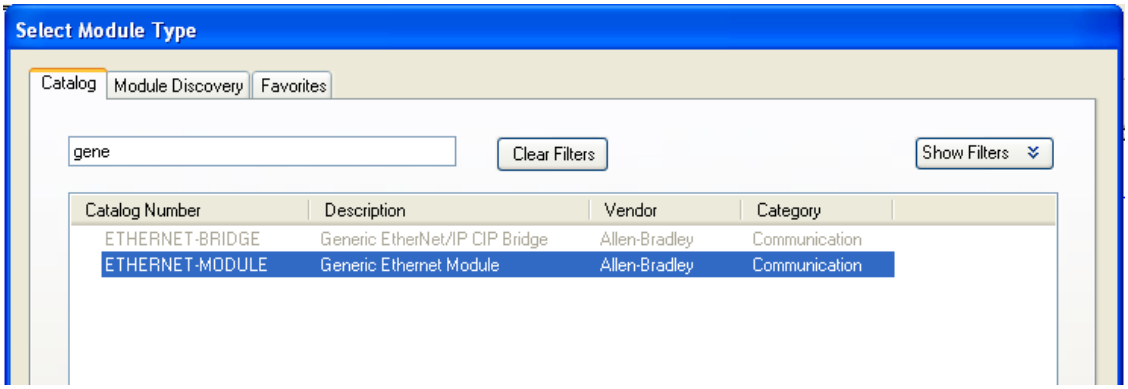


3. In the **Select Module Type** window select a **PLX51-DF1-ENI** module if you already have installed the EDS file if not, you can select a **Generic Ethernet Module**.

If you already installed the EDS file you can select the module directly from here.

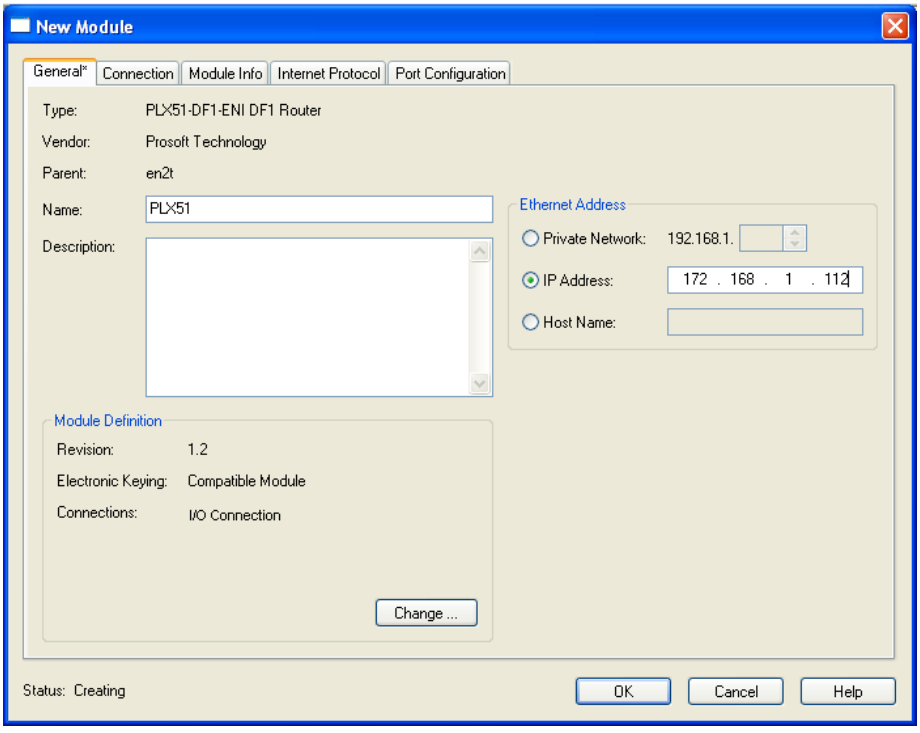


If you are using RSLogix5000 version 19 or lower, or if you have not installed the EDS file you can select the Generic Ethernet Module.

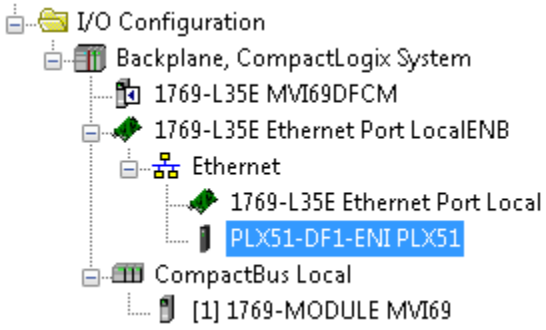


In this document we are going to use the first option.

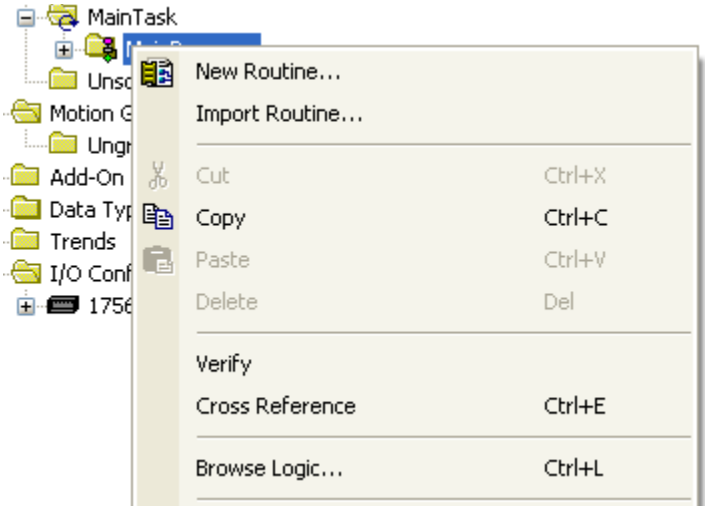
4. Assign a Name and IP Address to the module and click on **OK** button to apply changes and close window.



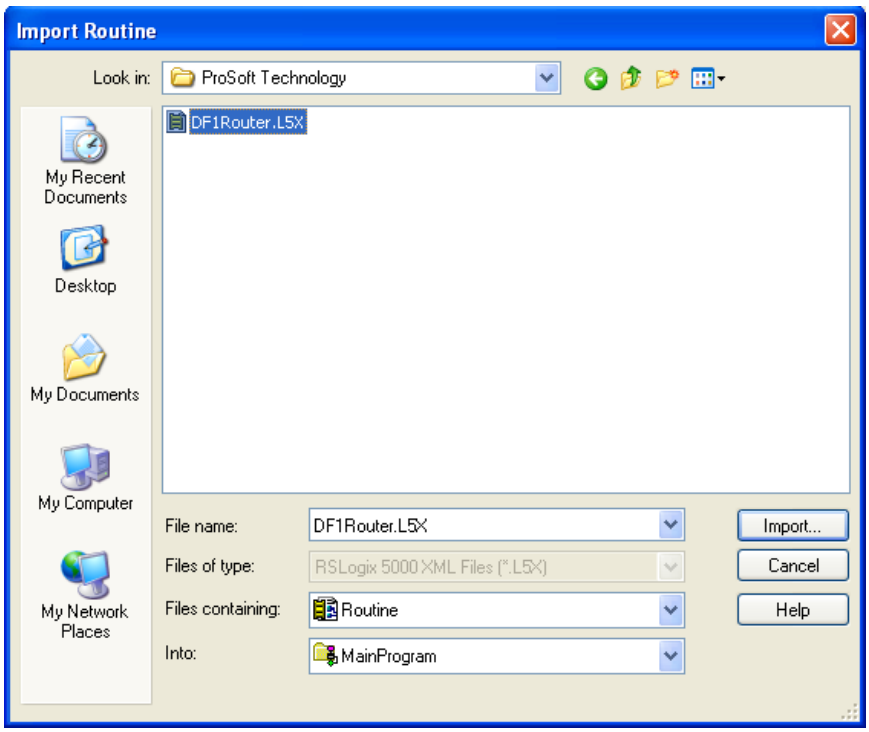
You can see the module in the Ethernet/IP network.



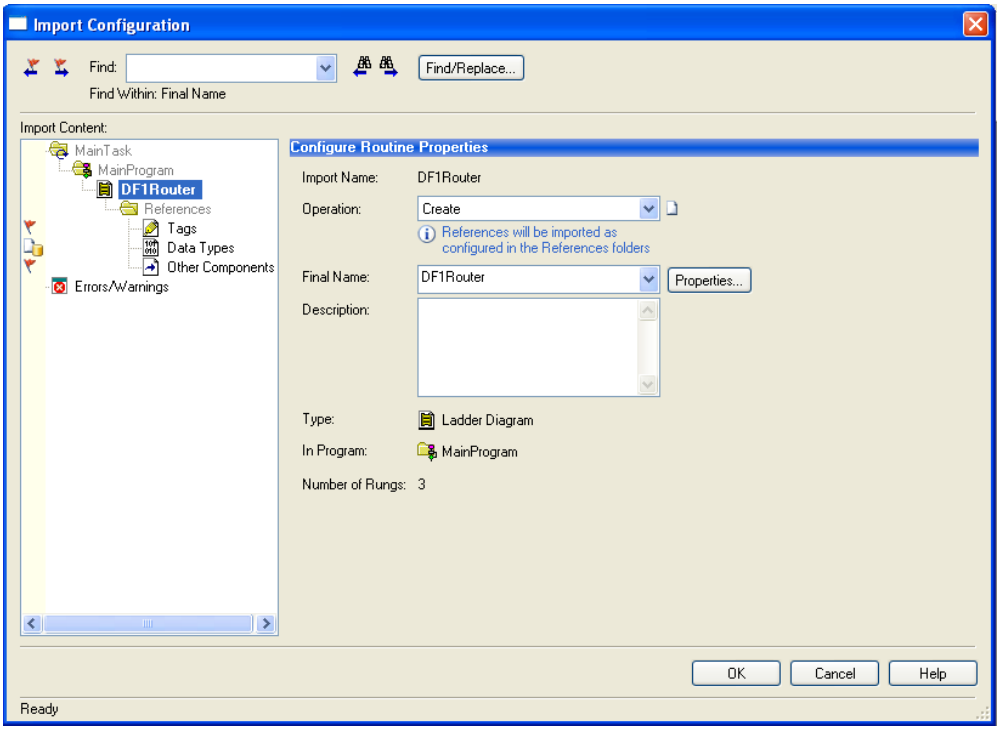
5. **Prosoft Technology** offers you an exported routine to be imported in the user program, this L5X file contains all the DataTypes needed to configure MSG instructions such as a configured Message instruction as an example. In your project, go to the Program where you would like to import the routine and right click on that to select **Import Routine** option



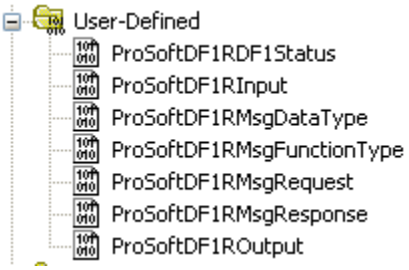
6. In the **Import Routine** window select the **.L5X** file to import, then click on the **Import** button.



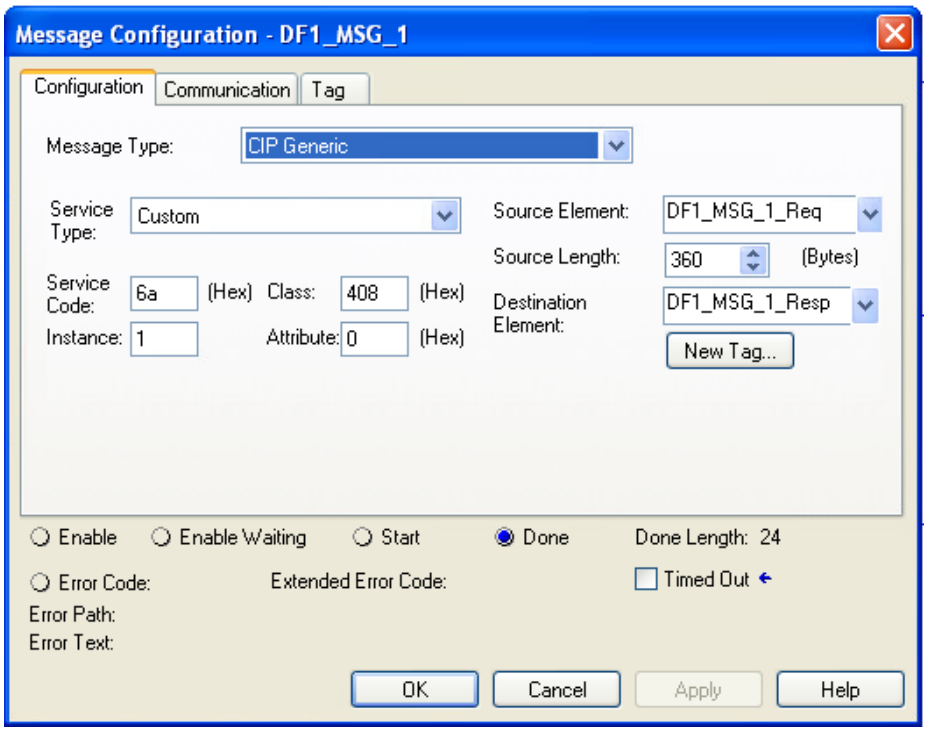
7. In the **Import Configuration** window click on **OK**. All DataTypes will be created in your project.



You will be able to see the routine and datatypes imported



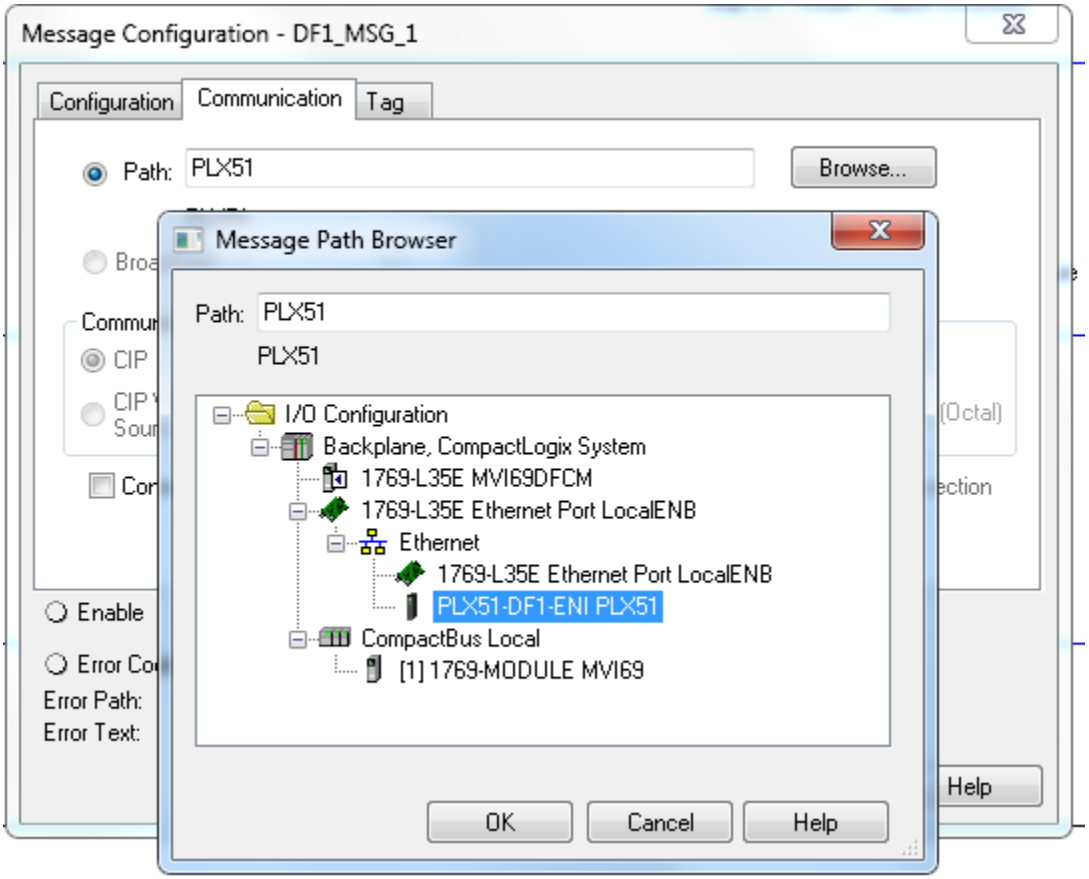
8. Create a new **MSG** instruction with parameters show below.



Tags in **Source Element** and **Destination Element** must be created as show below.

Name	Alias For	Base T	Data Type
DF1_MSG_1_Req			ProSoftDF1RMsgRequest
DF1_MSG_1_Resp			ProSoftDF1RMsgResponse

9. In the **Communication** tab fill the **Path** field using **Browse** button Then click on **OK** button to apply changes.



10. Using the tag **DF1_MSG_Req** we can configure the command to issue through the Message instruction.

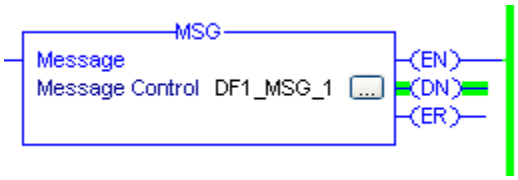
- **DestinationNode**: is the DF1 node.
- **DF1DataFileAddress**: is the first element to read/write.
- **Function**: function to issue.
- **DataType**: data type to read/write.
- **ElementCount**: number of elements to read/write.
- **RequesData**: data to send with the command when a writing command is being configured.

Name	Value
DF1_MSG_1_Req	{...}
DF1_MSG_1_Req.DestinationNode	1
DF1_MSG_1_Req.DF1DataFileAddress	'N7:10'
DF1_MSG_1_Req.Function	{...}
DF1_MSG_1_Req.Function.PLC5TypedRead	1
DF1_MSG_1_Req.Function.PLC5TypedWrite	0
DF1_MSG_1_Req.Function.SLCTypedRead	0
DF1_MSG_1_Req.Function.SLCTypedWrite	0
DF1_MSG_1_Req.DataType	{...}
DF1_MSG_1_Req.DataType.BOOLEAN	0
DF1_MSG_1_Req.DataType.INT	1
DF1_MSG_1_Req.DataType.REAL	0
DF1_MSG_1_Req.ElementCount	10
DF1_MSG_1_Req.RequestData	{...}

V. Communication test

Reading command

After the message instruction is enabled the Done bit (DN) is set if this instruction is executed properly if not, Error bit (ER) is set and you should see what is the error code.



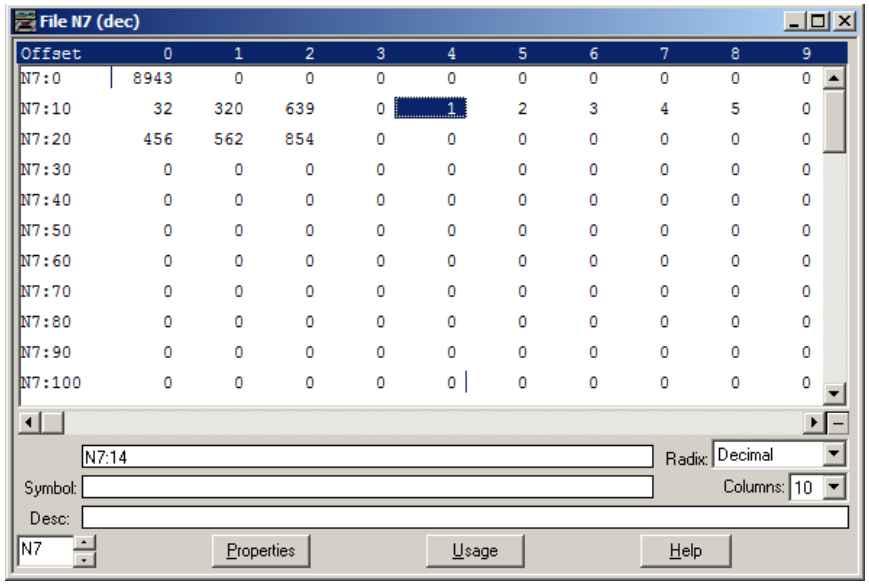
Go to the controller tags then in **DF1_MSG_1_Resp.ResponseData** check if the array has been populated with the values from PLC5.

Name	Value
DF1_MSG_1_Resp	{...}
DF1_MSG_1_Resp.Status	0
DF1_MSG_1_Resp.ResponseLength	20
DF1_MSG_1_Resp.ResponseData	{...}
DF1_MSG_1_Resp.ResponseData[0]	66
DF1_MSG_1_Resp.ResponseData[1]	655
DF1_MSG_1_Resp.ResponseData[2]	1311
DF1_MSG_1_Resp.ResponseData[3]	0
DF1_MSG_1_Resp.ResponseData[4]	0
DF1_MSG_1_Resp.ResponseData[5]	0
DF1_MSG_1_Resp.ResponseData[6]	0
DF1_MSG_1_Resp.ResponseData[7]	0
DF1_MSG_1_Resp.ResponseData[8]	0
DF1_MSG_1_Resp.ResponseData[9]	0

Writing Command

Below you can see how a writing command should be configured to write values from N7:14 to N7:18 in a PLC5 in Node 1. The values to write will be in **DF1_MSG_3_Req.RequestData**

Name	Value
DF1_MSG_3	{...}
DF1_MSG_3_Req	{...}
DF1_MSG_3_Req.DestinationNode	1
DF1_MSG_3_Req.DF1DataFileAddress	'N7:14'
DF1_MSG_3_Req.Function	{...}
DF1_MSG_3_Req.Function.PLC5TypedRead	0
DF1_MSG_3_Req.Function.PLC5TypedWrite	1
DF1_MSG_3_Req.Function.SLCTypedRead	0
DF1_MSG_3_Req.Function.SLCTypedWrite	0
DF1_MSG_3_Req.DataType	{...}
DF1_MSG_3_Req.DataType.BOOLEAN	0
DF1_MSG_3_Req.DataType.INT	1
DF1_MSG_3_Req.DataType.REAL	0
DF1_MSG_3_Req.ElementCount	5
DF1_MSG_3_Req.RequestData	{...}
DF1_MSG_3_Req.RequestData[0]	1
DF1_MSG_3_Req.RequestData[1]	2
DF1_MSG_3_Req.RequestData[2]	3
DF1_MSG_3_Req.RequestData[3]	4
DF1_MSG_3_Req.RequestData[4]	5
DF1_MSG_3_Req.RequestData[5]	6



VI. Migrating from an MVI69-DFCM module as a Master

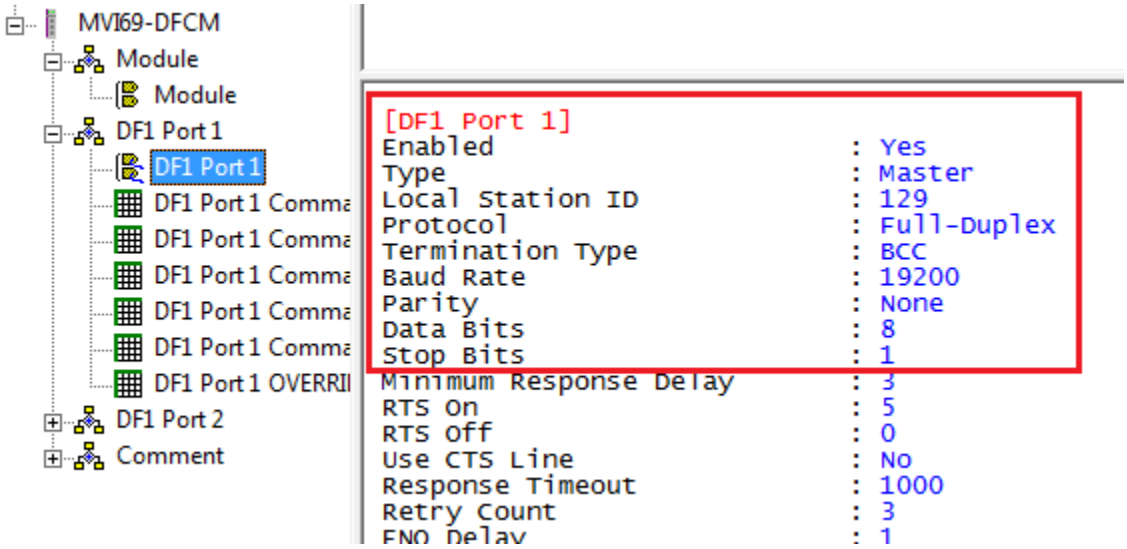
MVI69-DFCM configuration is done With Prosoft Configuration Builder Software, If you don't have the PCB project, it is possible to upload the configuration from the MVI69-DFCM module.

Open up a new project in ProSot Configuration Builder and add the MVI69-DFCM module to the project.

In the tree view of PCB, click on the 5201-DFNT-DFCM module to select it.
On the menu bar, select PROJECT, and then choose Module > Upload from Device to PC.

1. Make sure the PLX51-DF1-ENI is configured as the MVI69-DFCM module is.

MVI69-DFCM



The MVI69-DFCM module is configured under these parameters:

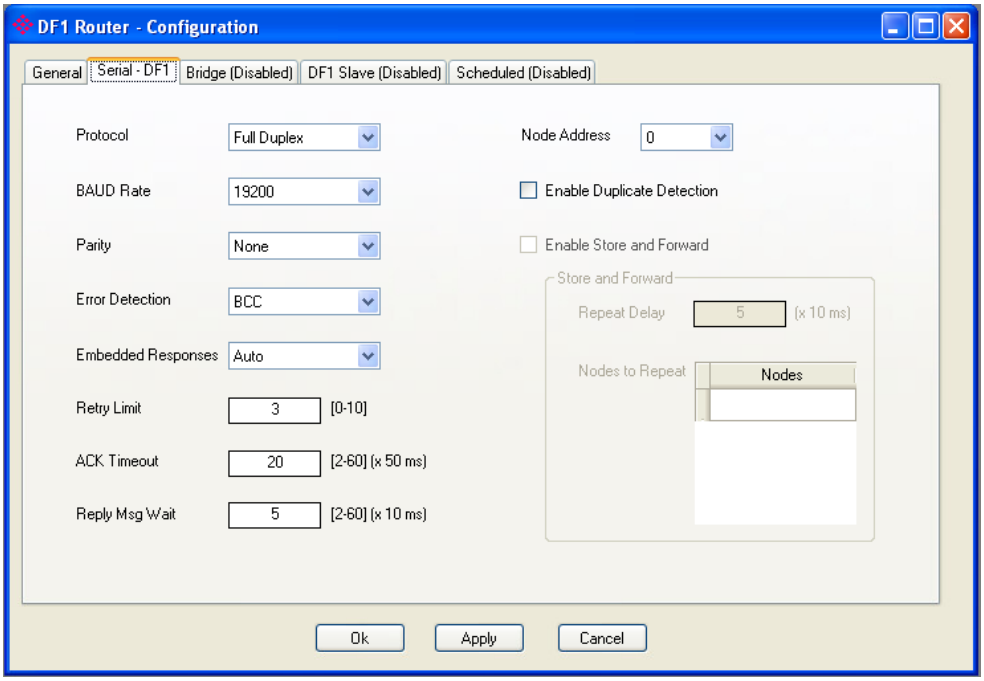
- **Enabled**: enable the serial port to communicate.
- **Type**: it configures the port to works as a Master or Slave.
- **StationID**: node configured to this port.
- **Protocol**: '**0**' for Full Duplex and '**1**' for Half Duplex.
- **TerminationType**: '**0**' for BCC and '**1**' for CRC.
- **Baudrate**: network baud rate.
- **Parity**: parity on the serial network.
- **DataBits**: Data bits on the serial network.
- **StopBits**: Stop bits on the serial network.

PLX51-DF1-ENI

Configure these parameters as follow.

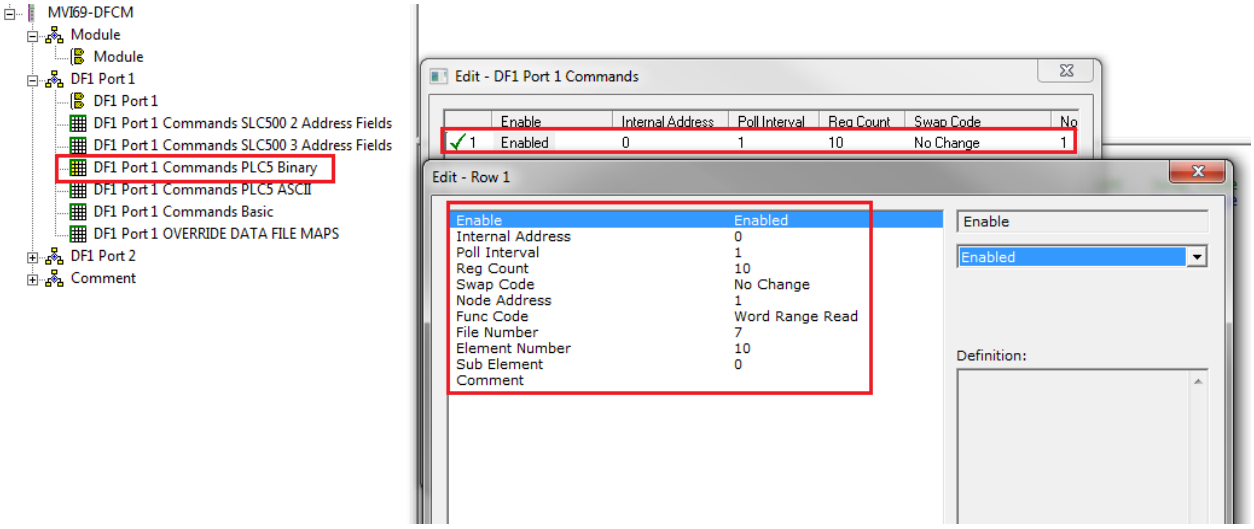
PLX51-DF1-ENI	MVI69-DFCM
Protocol	Protocol
BAUD Rate	Baudrate
Parity	Parity
Error Detection	TerminationType

- **Protocol**: Full Duplex
- **BAUD Rate**: 19200
- **Parity**: None
- **Error Detection**: BCC



2. Configure the Message instruction, considering the configuration of each command in the MVI69-DFCM module.

MVI69-DCFM



- **Enable**: enable the command.
- **Internal Address**: where data is stored for read commands and source of data for write commands.
- **Poll Interval**: minimum number of seconds between commands.
- **Reg Count**: number of registers to read or write.
- **Swap Code**: allows to swap data.
- **Node Address**: address of device to issue this command.
- **Func Code**: function code to execute.
- **File Number**: this is the File number.
- **Element Number**:this is the File element.

PLX51-DF1-ENI

Configure module as follow.

PLX51-DF1-ENI	MVI69-DFCM
DestinationNode	Node
DataFileAddress	Parameter_1:Parameter_2
Function	Func
DataType	-
ElementCount	Count

- **DestinationNode**: 1
- **DataFileAddress**: N7:10
- **Function**: PLC5TypedRead = 1
- **DataType**: INT = 1
- **ElementCount**: 10

Name	Value
DF1_MSG_1_Req.DestinationNode	1
DF1_MSG_1_Req.DF1DataFileAddress	'N7:10'
DF1_MSG_1_Req.Function	{...}
DF1_MSG_1_Req.Function.PLC5TypedRead	1
DF1_MSG_1_Req.Function.PLC5TypedWrite	0
DF1_MSG_1_Req.Function.SLCTypedRead	0
DF1_MSG_1_Req.Function.SLCTypedWrite	0
DF1_MSG_1_Req.DataType	{...}
DF1_MSG_1_Req.DataType.BOOLEAN	0
DF1_MSG_1_Req.DataType.INT	1
DF1_MSG_1_Req.DataType.REAL	0
DF1_MSG_1_Req.ElementCount	10

Note: the poll interval will depend on how often the Message instruction is going to enable.

Functions supported by the MVI69-DFCM module

5.3.2 PLC-5 Command Set Functions

Function Code	Command	Function	Definition	PLC5	SLC500 & MicroLogix	Power-monitor II	ControlLogix
100	0x0F	0x00	Word Range Write (Binary Address)	X			X
101	0x0F	0x01	Word Range Read (Binary Address)	X			X

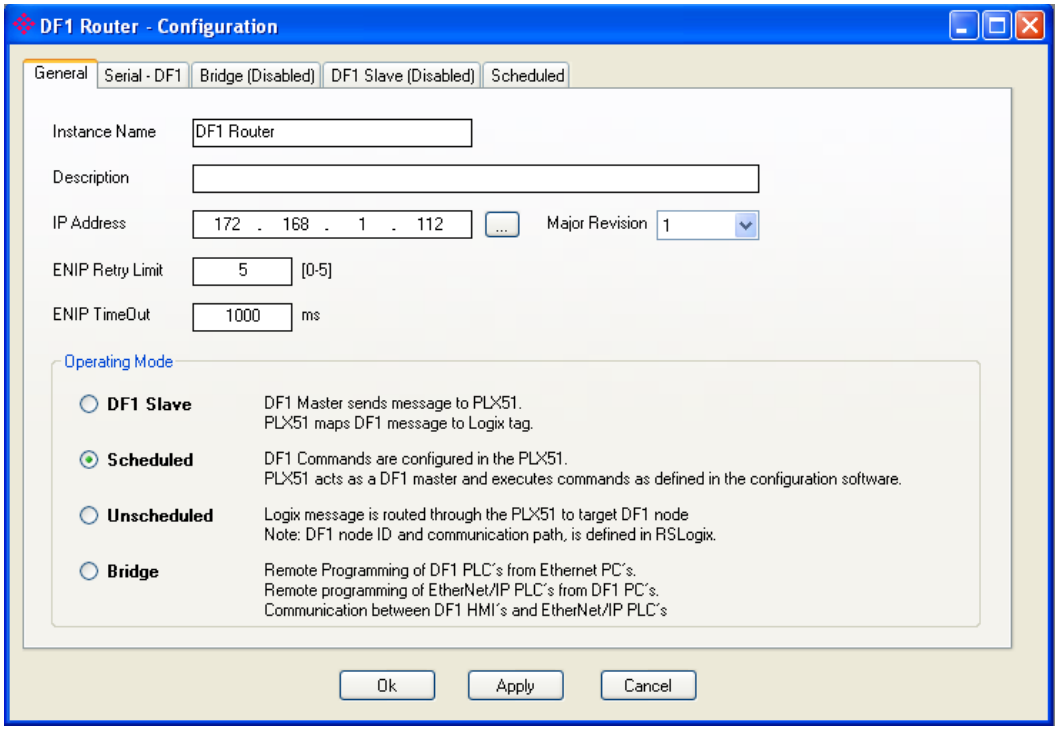
5.3.3 SLC-500 Command Set Functions

Function Code	Command	Function	Definition	PLC5	SLC500 & MicroLogix	Power-monitor II	ControlLogix
501	0x0F	0xA1	Protected Typed Logical Read With Two Address Fields		X		X
502	0x0F	0XA2	Protected Typed Logical Read With Three Address Fields		X	X	X
509	0x0F	0XA9	Protected Typed Logical Write With Two Address Fields		X		X
510	0x0F	0XAA	Protected Typed Logical Write With Three Address Fields		X	X	X
511	0x0F	0XAB	Protected Typed Logical Write With Mask (Three Address Fields)		X		X

VII. Configuring PLX51-DF1-ENI in Scheduled mode

This option allow to configure DF1 commands in the gateway so it is not necessary programming any new lines in any PLC.

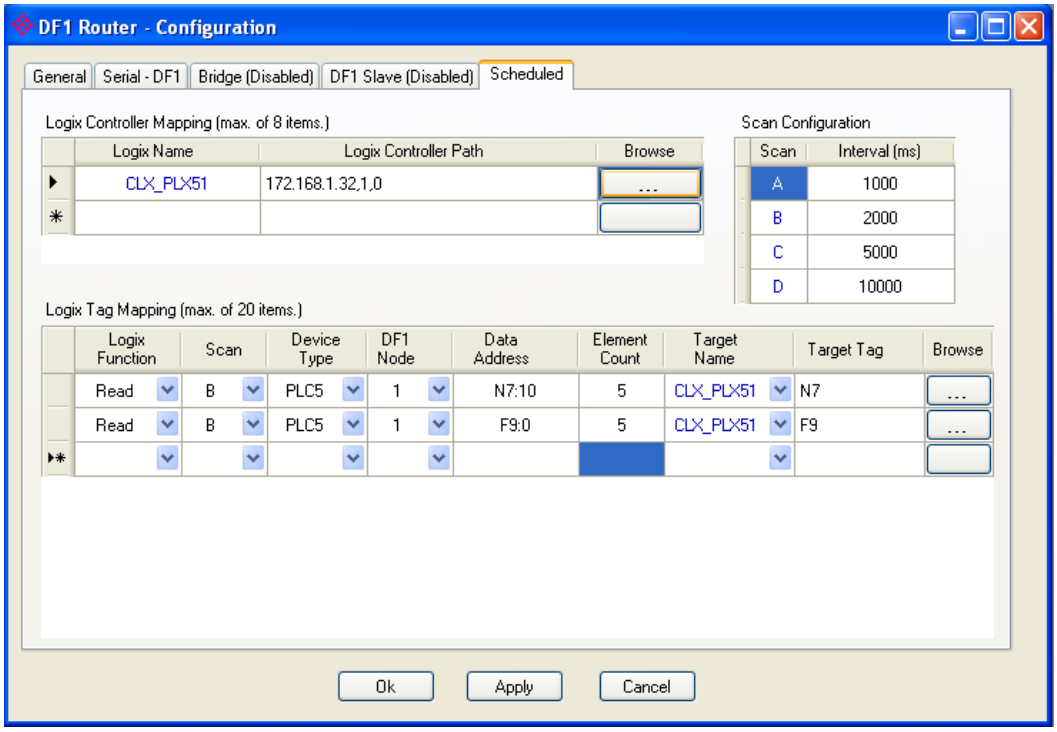
1. Go to the configuration utility and open the gateway configuration, set the **Scheduled** mode.



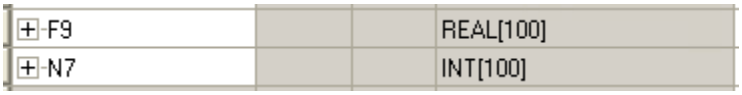
2. In the **Scheduled** tap you need to configure the path to the logix controller using the **Browser** button. Assign a name in **Logix Name** field.

In the Logix Tag Mapping you have up to 20 commands to write to or read from a DF1 device. Parameters to configure are described below.

- **Logix Function**: Read or Write.
- **Scan**: This is the poll interval configured in **Scan Configuration** section.
- **Device Type**: Define if the command to execute will be PLC5 Typed or SLC Typed.
- **DF1 Node**: Node assigned to the DF1 device.
- **Data Address**: Data File to read/write.
- **Element Count**: Number or register to read/write.
- **Target Name**: Select a defined Logix PLC in **Logix Controller Mapping** section.
- **Target Tag**: Tag array in controller tags where read data will be placed or written data will be taken to issue to.

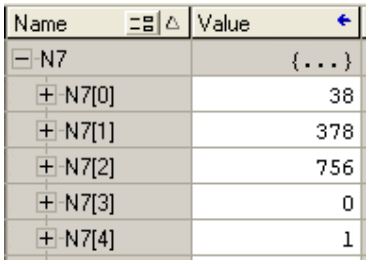


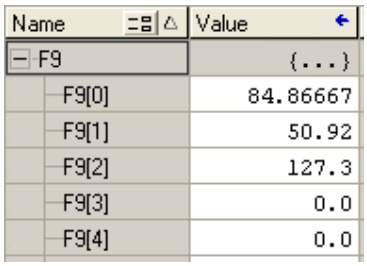
In Controller tags these are the tags created.



Click on **OK** button to accept the changes. Then Download the new configuration.

3. Check if data is received properly in the Logix controller.

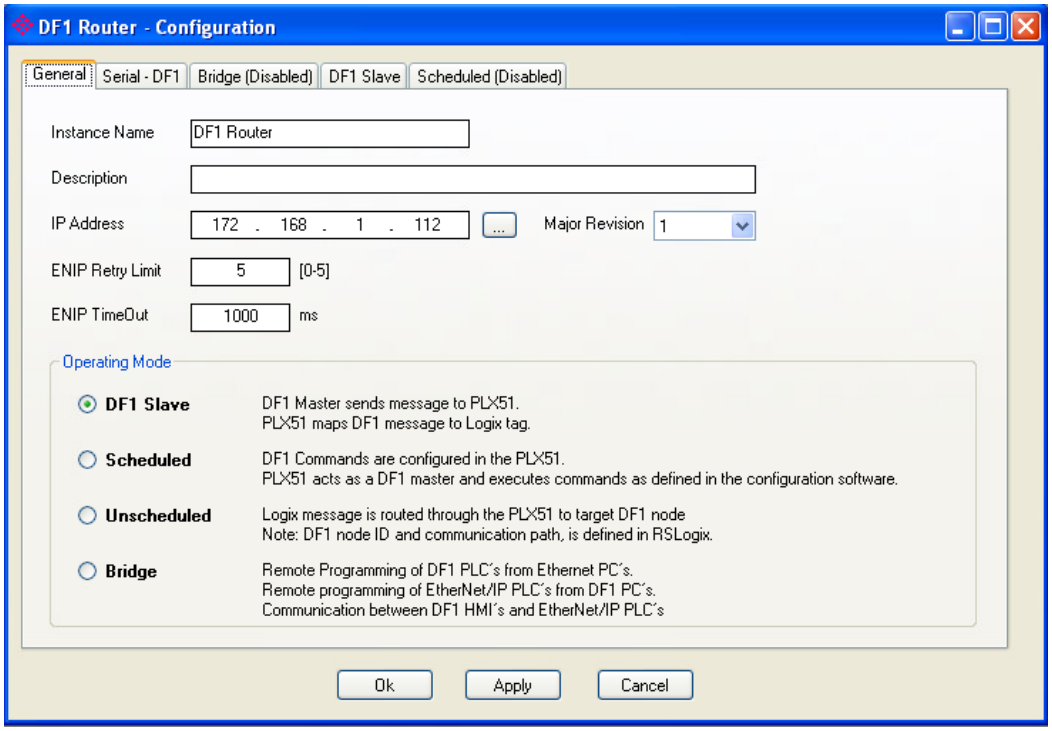




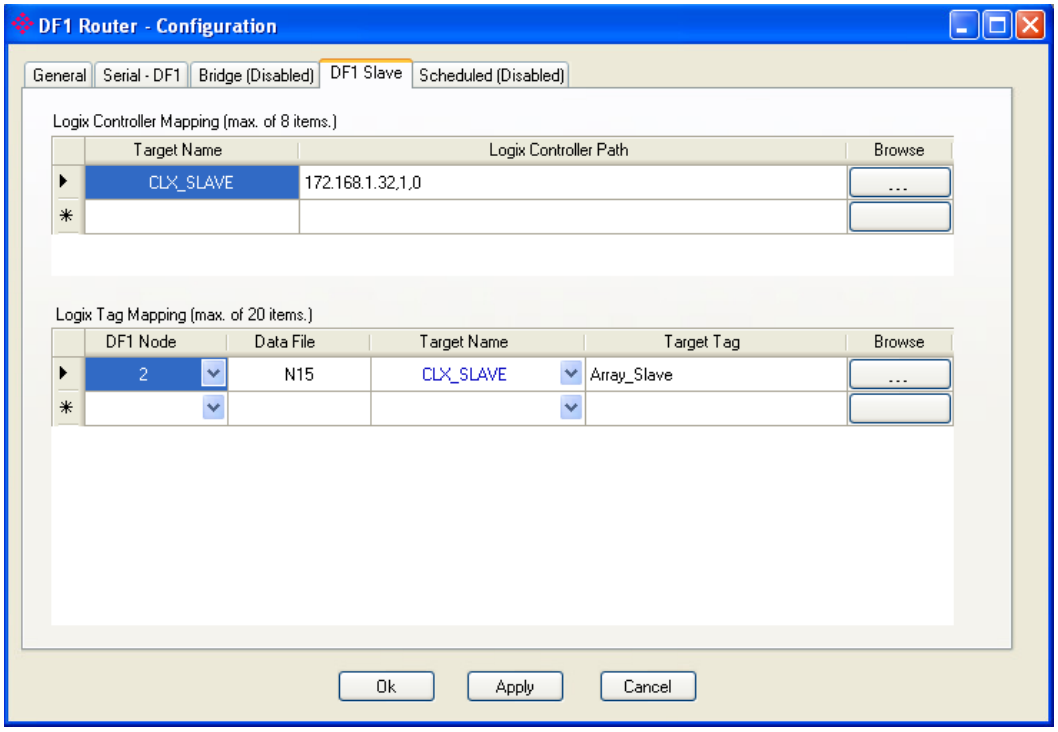
VIII. Configuring in DF1 Slave mode

This allow to connect a PLC5 or any other DF1 Master to a Logix PLC working as a server.

1. Set the operation mode to **DF1 Slave**.



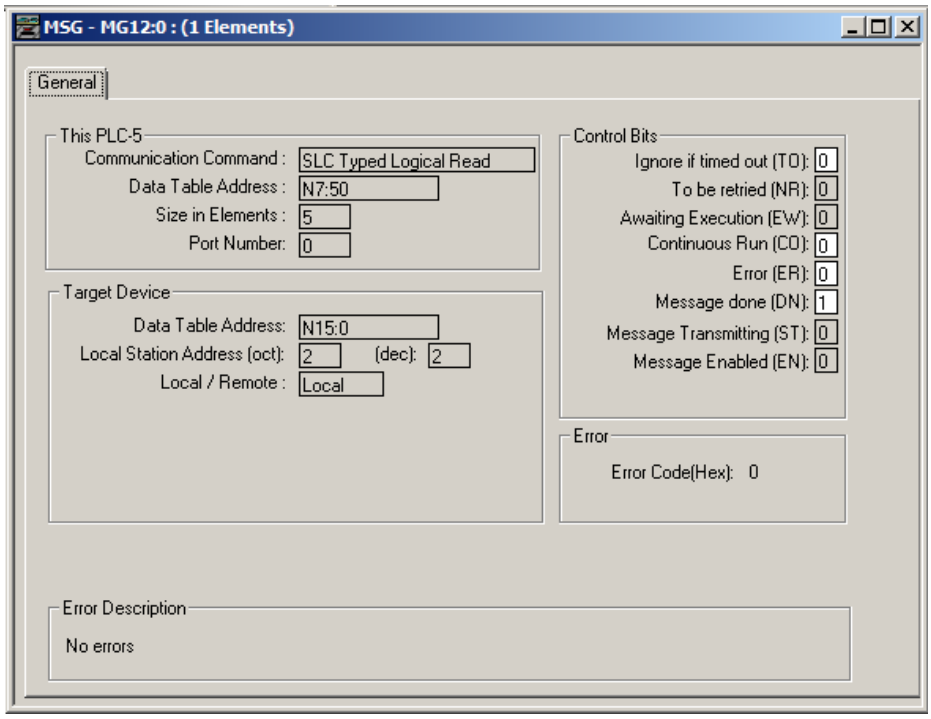
2. Go to the DF1 Slave tab, then configure the path to the logix controller in **Logix Controller Mapping** and assign a name to this map. In **Logix Tag Mapping** configure a **DF1 Node** and **Data File** that will be emulated in DF1 side, then select the Logix PLC in **Target Name** and finally write or browse the array tag placed in Controller tags in **Target Tag** field.



Array tag in Logix controller.

Name	Value
Array_Slave	{...}
Array_Slave[0]	1
Array_Slave[1]	2
Array_Slave[2]	3
Array_Slave[3]	4
Array_Slave[4]	0
Array_Slave[5]	0
Array_Slave[6]	0
Array_Slave[7]	0
Array_Slave[8]	0
Array_Slave[9]	0
Array_Slave[10]	0
Array_Slave[11]	0
Array_Slave[12]	0
Array_Slave[13]	0
Array_Slave[14]	0
Array_Slave[15]	0
Array_Slave[16]	0

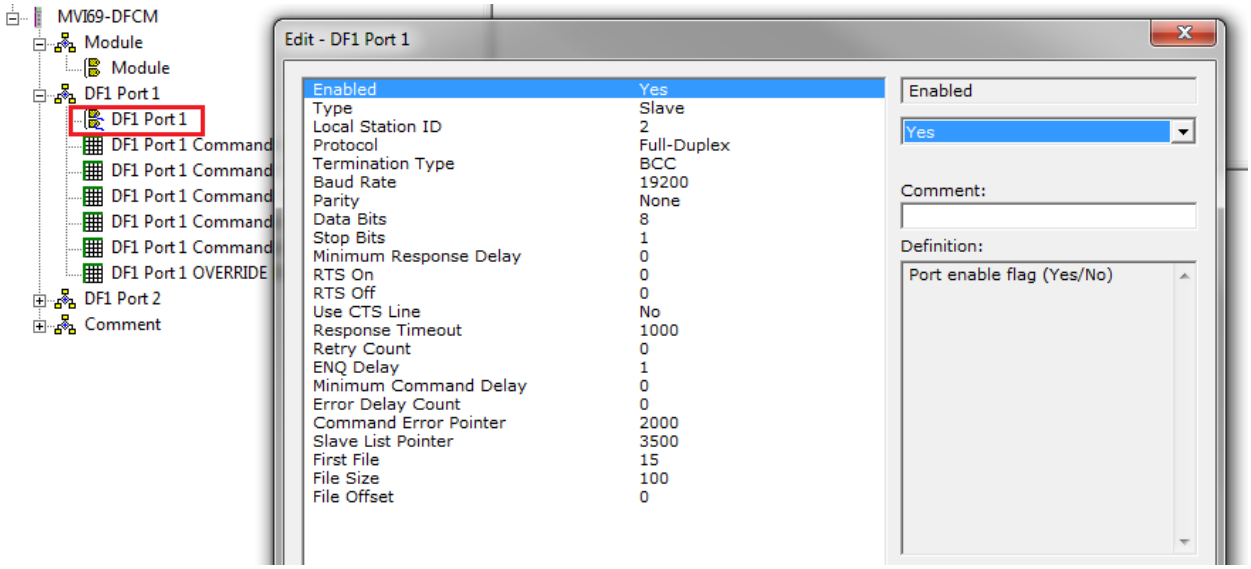
3. In the PLC5 a Message instruction must be configured to read/write data file N15 in DF1 Node 2 and store those values in N7:50 in PLC Data Files.



IX. Migrating from MVI69-DFCM configured as Slave

1. PLX51-DF1-ENI should be configured from the MVI69-DFCM module's configuration.

MVI69-DFCM



The MVI69-DFCM module is configured under these parameters:

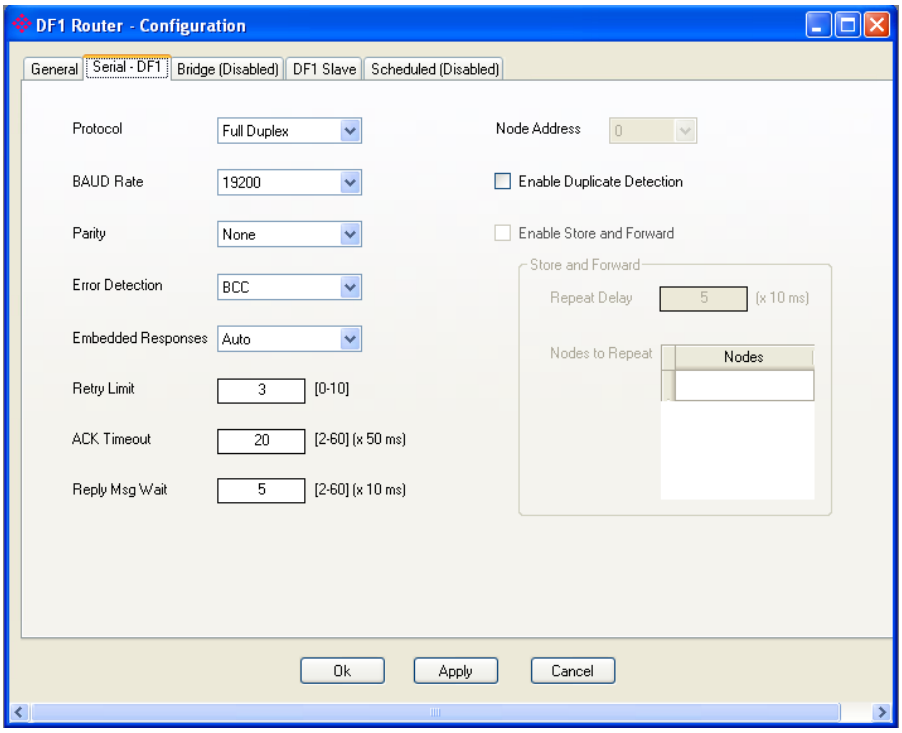
- **Enabled**: enable the serial port to communicate.
- **Type**: it configures the port to works as a Master or Slave.
- **StationID**: node configured to this port.
- **Protocol**: Full Duplex or Half Duplex.
- **TerminationType**: BCC or CRC.
- **Baudrate**: network baud rate.
- **Parity**: parity on the serial network.
- **DataBits**: Data bits on the serial network.
- **StopBits**: Stop bits on the serial network.
- **FirstFile**: first file to emulate.
- **FileSize**: size of each file to emulate.
- **FileOffset**: Register offset into database where file emulation starts.

PLX51-DF1-ENI

Configure these parameters as follow.

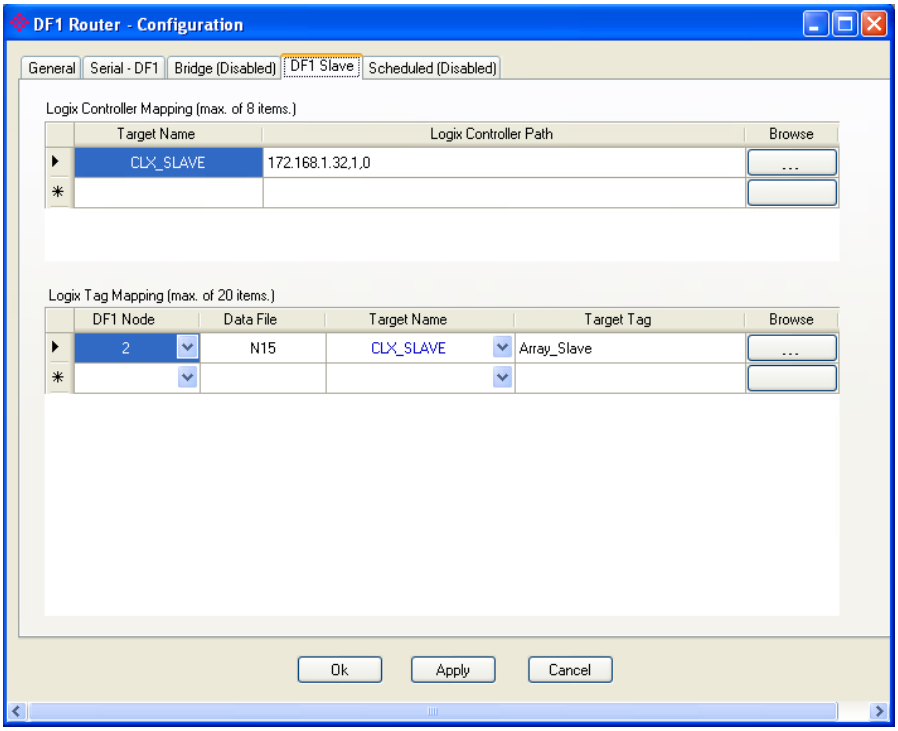
PLX51-DF1-ENI	MVI69-DFCM
Protocol	Protocol
BAUD Rate	Baudrate
Parity	Parity
Error Detection	TerminationType

- **Protocol**: Full Duplex
- **BAUD Rate**: 19200
- **Parity**: None
- **Error Detection**: BCC



PLX51-DF1-ENI	MVI69-DFCM
Target Name	-
Logix Controller Path	-
DF1 Node	StationID
DataFile	FirstFile
TargetName	-
TargetTag	It seems to FileOffset

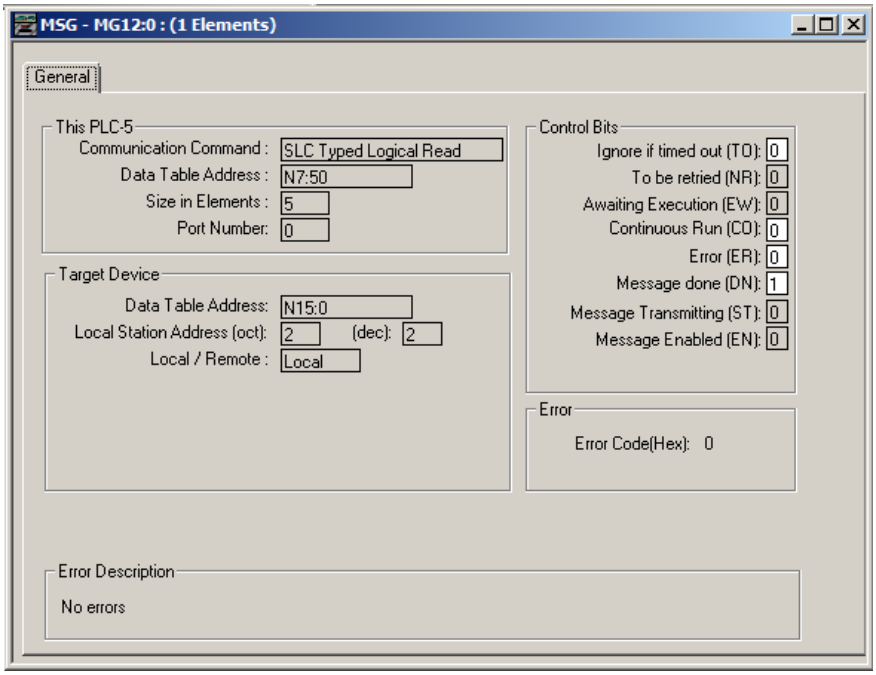
- **Target Name**: CLX_SLAVE.
- **Logix Controller Path**: 172.168.1.32,1,0
- **DF1 Node**: 2
- **Data File**: N15
- **Target Name**: CLX_SLAVE
- **Target Tag**: Array_Slave (Array in controller tags)



Note that in both cases the modules are mapping the Data File N15, so the PLC5 is going to write to or read from it.

2. Testing configuration.

Message instruction is configured in PLC5 as show below, in order to read from N15:0 and to store values in N7:50.

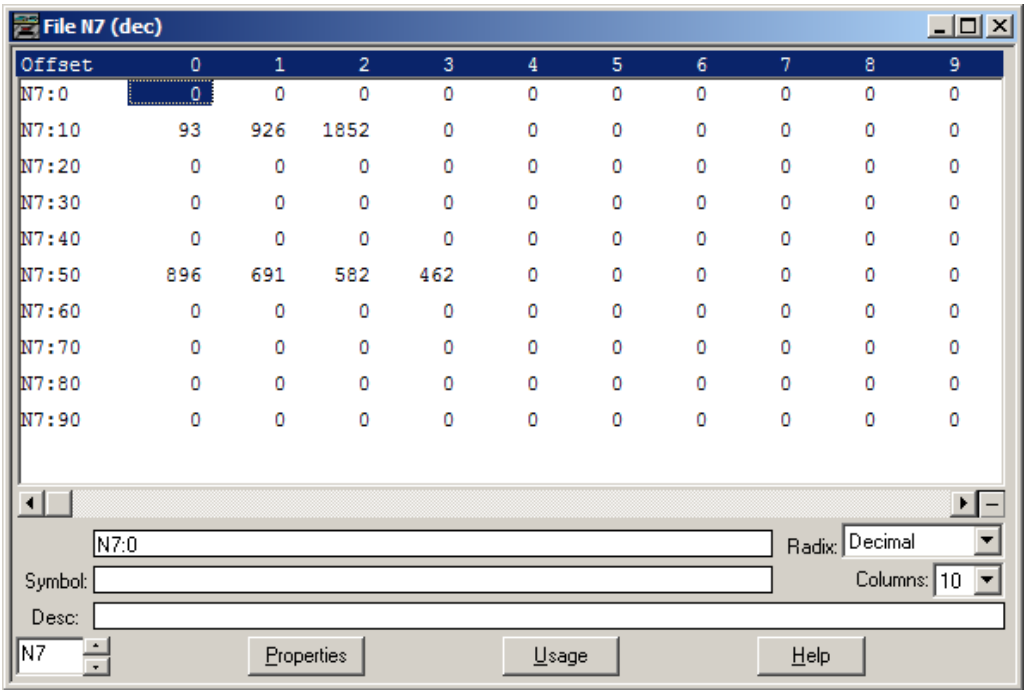


MVI69-DFCM

These are data read by PLC5.

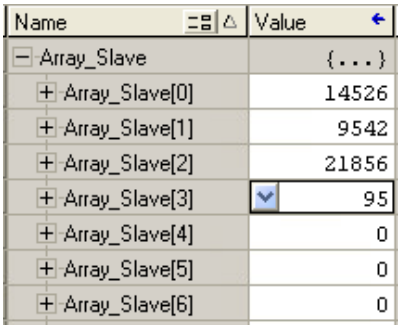
Name	Value	Force Mask	Style
DFCM.WriteData	{...}	{...}	Decimal
DFCM.WriteData[0]	896		Decimal
DFCM.WriteData[1]	691		Decimal
DFCM.WriteData[2]	582		Decimal
DFCM.WriteData[3]	462		Decimal
DFCM.WriteData[4]	0		Decimal
DFCM.WriteData[5]	0		Decimal
DFCM.WriteData[6]	0		Decimal
DFCM.WriteData[7]	0		Decimal
DFCM.WriteData[8]	0		Decimal
DFCM.WriteData[9]	0		Decimal
DFCM.WriteData[10]	0		Decimal

Data are store from the N7:50.

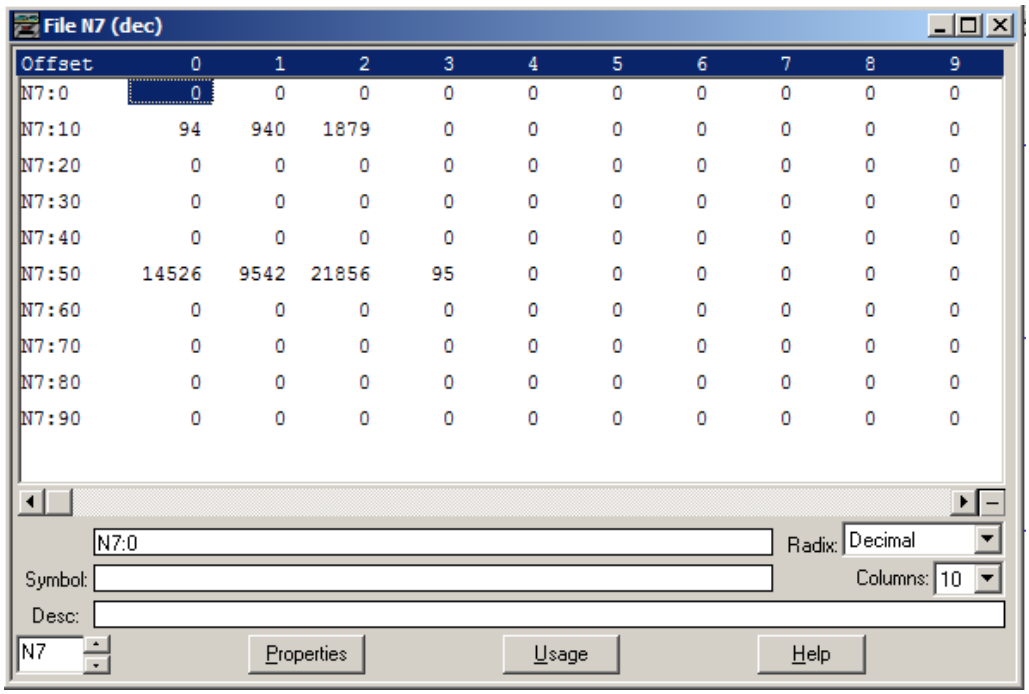


PLX51-DF1-ENI

These are data read by PLC5 from the Array_Slave array.



Data is stored properly from N7:50 though N7:54.



X. Conclusions

The PLX51-DF1-ENI module allows a Logix Controller to communicate with a DF1 PLC using three different operating mode.

If possible to performance changes in logix program it is a good option to implement the Unscheduled operating mode, so user can configure Message instructions to read or write.

The Scheduled operating mode is recommended when user cannot performance any important change in logix program. In some cases will be necessary to create new tags in controller tags.

When there is a PLC working as a DF1 Master, the gateway should work in DF1 Slave mode so message instructions will be configured in DF1 PLC.