



VLT® 5000 DeviceNet and Allen Bradley Control logix 5550

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Foreword

This application note describes how to set up DeviceNet communication between a Danfoss VLT 5000 frequency converter and 1756-DNB DeviceNet Scanner from Allen Bradley. It is assumed that you have some knowledge of Control Logix 5550, the 1756-DNB Scanner and ladder logic.

This note describes:

- VLT 5000 DeviceNet card
- Configuring of the VLT 5000 with RS Network
- I/O communication with RS Logix 5000
- Explicit messages with RS Logix 5000



NOTE!:

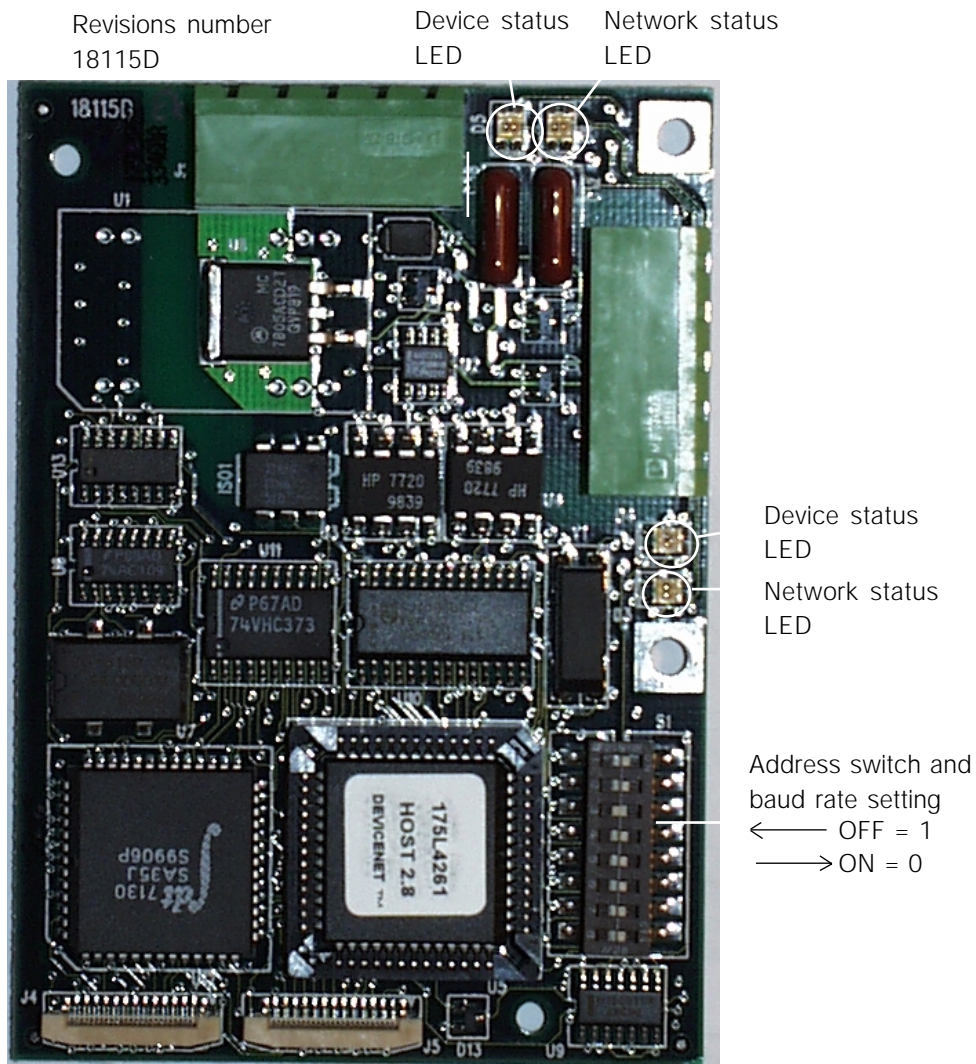
The examples do not describes all the functions needed for a real application, for example error handling.

The examples are based upon that a RS Logix5000 project has been created, and the 1756-DNB has been added to the I/O configuration.

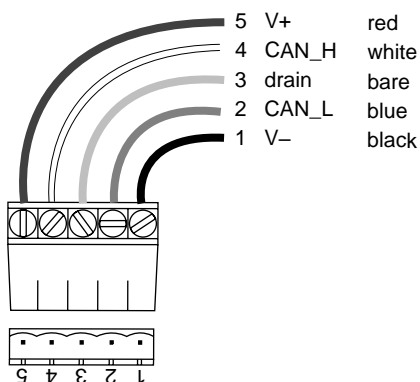
Details of some of the components/software:
 VLT5000 with DeviceNet - Host chip version 2.9.
 1756-DNB Series A Firmware Revision 3.3
 RS Networkx 2.11.51
 RS Logix 2.25

VLT 5000 DeviceNet card

The photo shows the DeviceNet card which can be installed in VLT 5001 - 5500.



■ **DeviceNet connection**



■ **Cable length**

Transmission speed	Max. total cable length [m]
125 kBaud	500
250 kBaud	250
500 kBaud	100

■ **Cable specification**

- Cross section: max. 0.78 mm², corresponding to AWG 18
- Cable type: twisted in pairs, 2 x 2 wires with drain wire in center
- Screening: Copper-braided screen or braided screen and foil screen

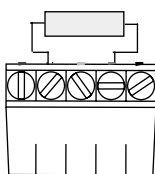
It is recommended to use the same cable type in the entire network to avoid impedance mismatch.

■ **DeviceNet termination**

Termination resistors should be installed at each end of the bus line.

The resistors must be mounted between terminal 2 CAN_L and terminal 4 CAN_H and should have the following specification:

121 Ohm, 1 % Metal film and 1/4 Watt



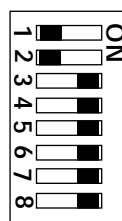
■ **Address and baud rate setting**

Dip switch 1-6 set the VLT frequency converters address and 7-8 the baud rate.

When setting the address/Mac ID you must ensure that each device on the network has a unique address. The address/Mac ID can be read in parameter 918 *Mac ID*.

Switch 6 is the Most Significant Bit (MSB) and Switch 1 is the Least Significant Bit (LSB).

If the address is to be set to 3, the dip switches should be set as follow:



ON = 0
OFF = 1

■ **LEDs**

For the device status LED:

1. when the LED is off, the device is off
2. when the LED is green, the device is operational
3. When the LED is flashing green, the device is in standby
4. when the LED is flashing red, the device detects a minor fault
5. when the LED is red, the device detects an unrecoverable fault
6. when the LED is flashing red/green, the device is self testing

For the network status LED:

1. when the LED is off, the network is non-powered/not online
2. when the LED is flashing green, the network is online but not connected
3. when the LED is green, the network is online and connected
4. when the LED is flashing red, the network has a connection time-out
5. when the LED is red, the network has a critical link failure.

Switch Settings for DeviceNet Module Baud Rate:

Baud Rate	Switch Setting 8	Switch Setting 7
125 kBPS	0	0
250 kBPS	0	1
500 kBPS	1	0
125 kBPS	1	1

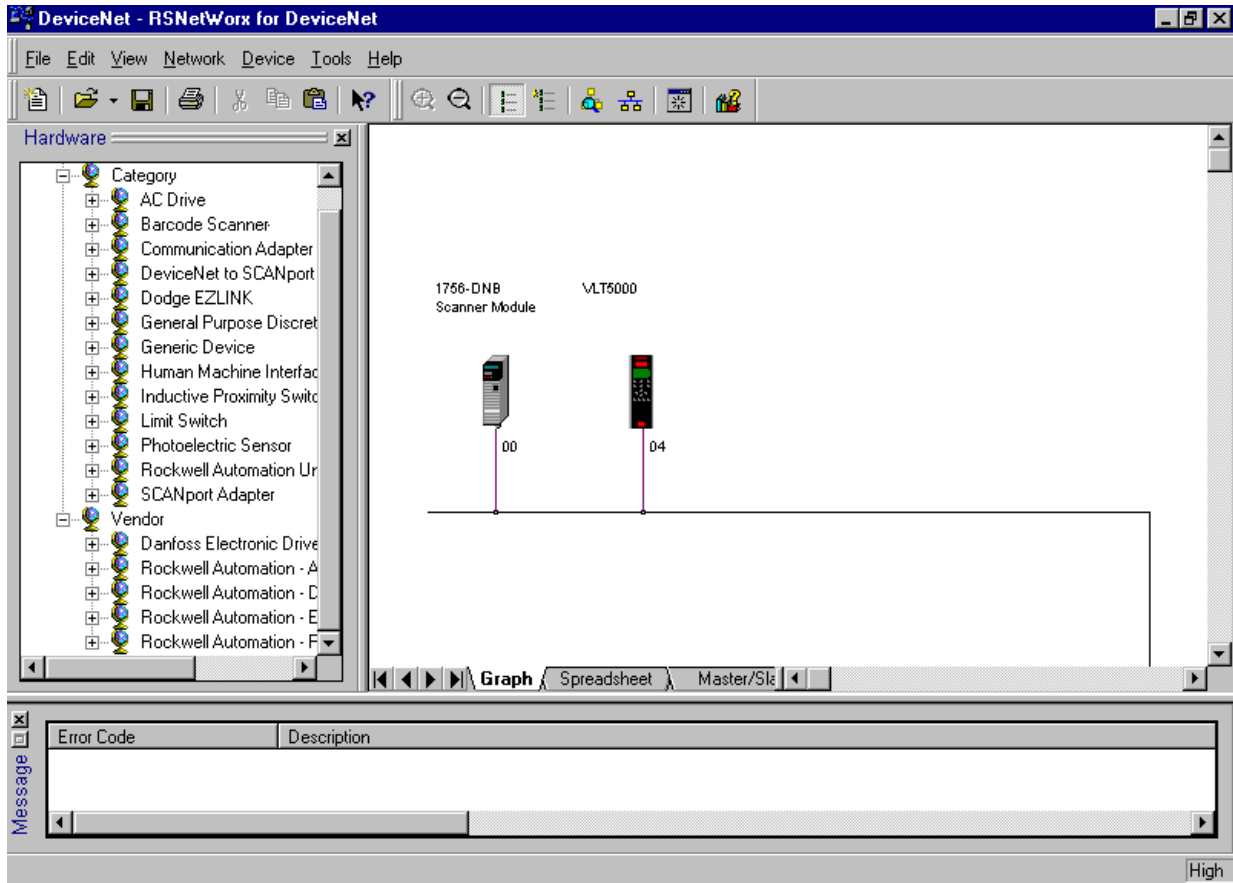
■ **Configuring the VLT 5000 with RS Networkx**

In this example we will only have one VLT 5000 set up to address 4 and the Master (1756-DNB) set up to address 0.

Start RS Networkx and a new project.

First install the EDS file by using the EDS wizard under TOOLS and IMPORT EDS FILE. The file can be ordered from your local Danfoss sales company.

After you have powered up the system and browsed for active nodes on the DeviceNet you map the I/O area of the VLT 5000 DeviceNet card to the 1756 DeviceNet Scanner.

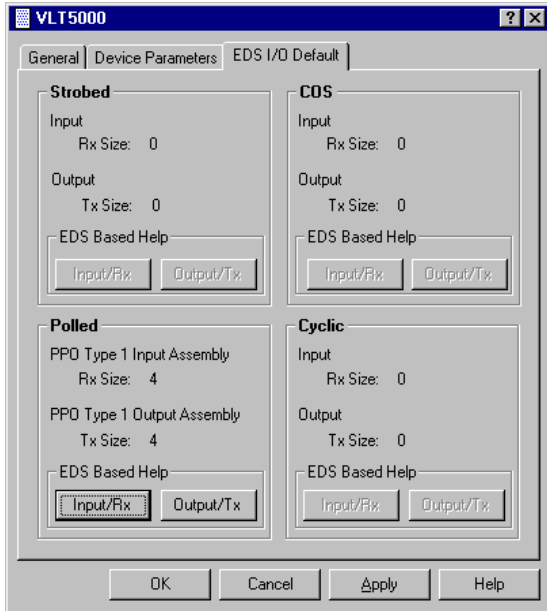


■ **Configuring the VLT 5000 with RS Network**

Double click on the VLT 5000.

Click on EDS I/O default. Here is shown that VLT 5000 support Polled I/O.

The actual PPO type is type 1 using 4 byte Input and 4 byte Output.



The PPO type can be changed in parameter 904 *PPO Selection*.

Parameter	Polled Size Rx	Polled Size Tx
PPO1	4 Bytes	4 Bytes
PPO2	8 Bytes	8 Bytes
PPO3	4 Bytes	4 Bytes
PPO4	8 Bytes	8 Bytes

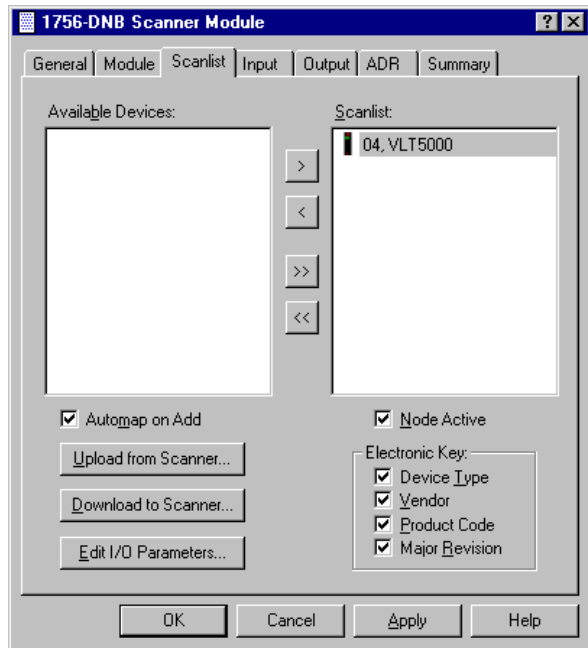
The 4 byte Input is Status word and Main Actual Value from the VLT 5000.

The 4 byte Output is Control word and reference to the VLT 5000.

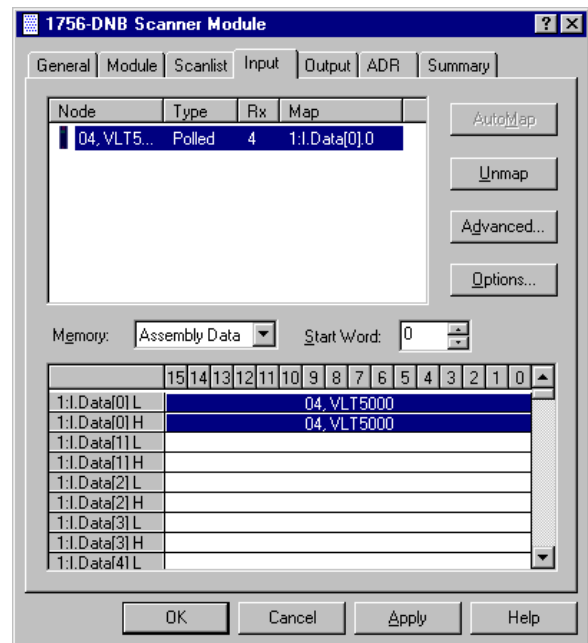
Click on OK

Double click on the 1756-DNB Scanner.

Click on *Scanlist* and add VLT 5000 from Available Devices to the Scanlist.



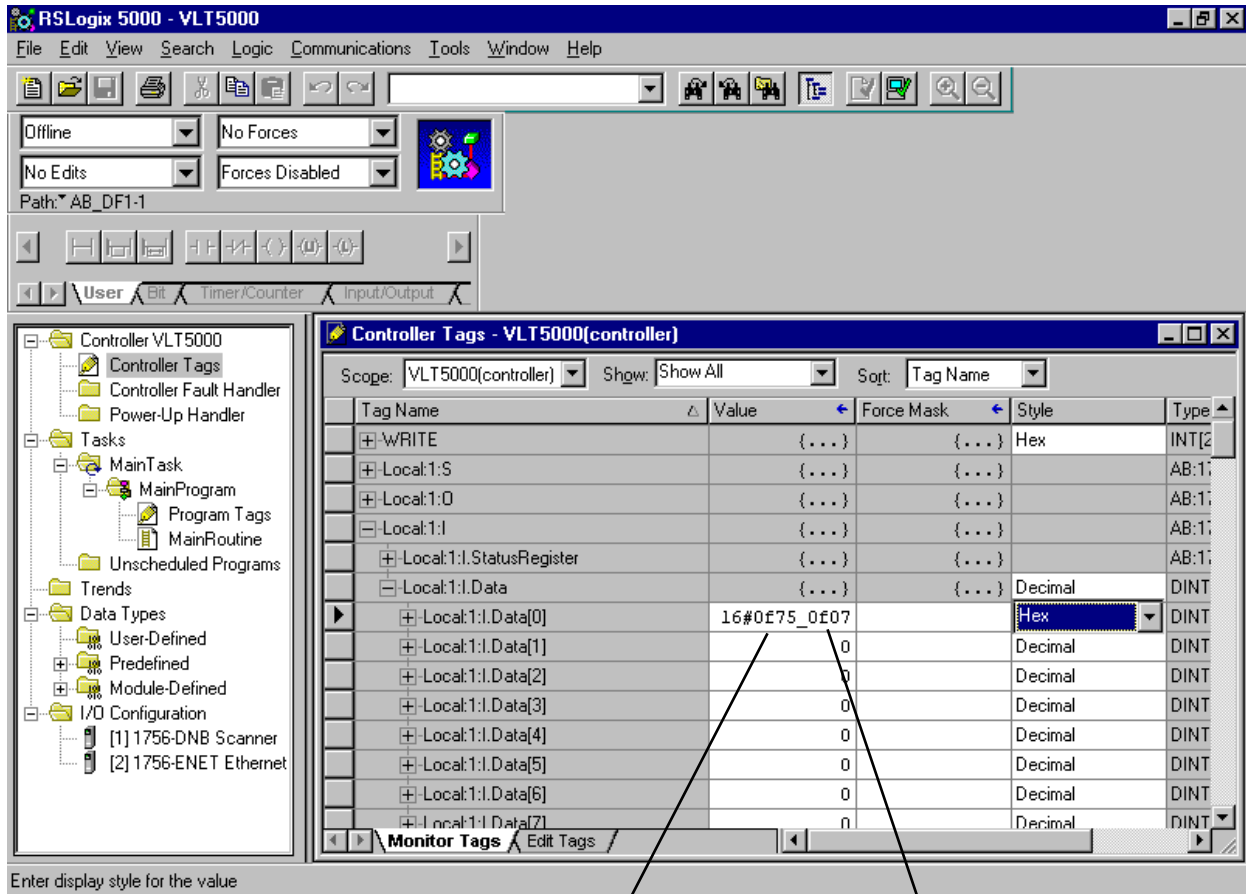
Click on Input and if you click on AutoMap the I/O area of VLT 5000 will be added to the first free area, here I 0.0. This means that the Status word will be read from the VLT 5000 to I/O area I:0.0 to I:0.15 and the Main Actual Reference to I:0.16 to I:0.32. Do the same with the Output to map Control word and reference.



Save the file and download the RS network to the Scanner.

■ I/O communication with RS Logix 5000

Start RS Logix 5000 and a new project.
 Make the I/O configuration and click on *Controller tags*.
 Click on Local:1:I and on Local 1:I.Data. Now you can see the full input area of the DeviceNet system.
 Local:1:I.Data[0] indicates mapping of status word and Main Actual Reference. Choose to see the format in Hex. See the status word in the DeviceNet manual.



Main Actual Reference

Status Word

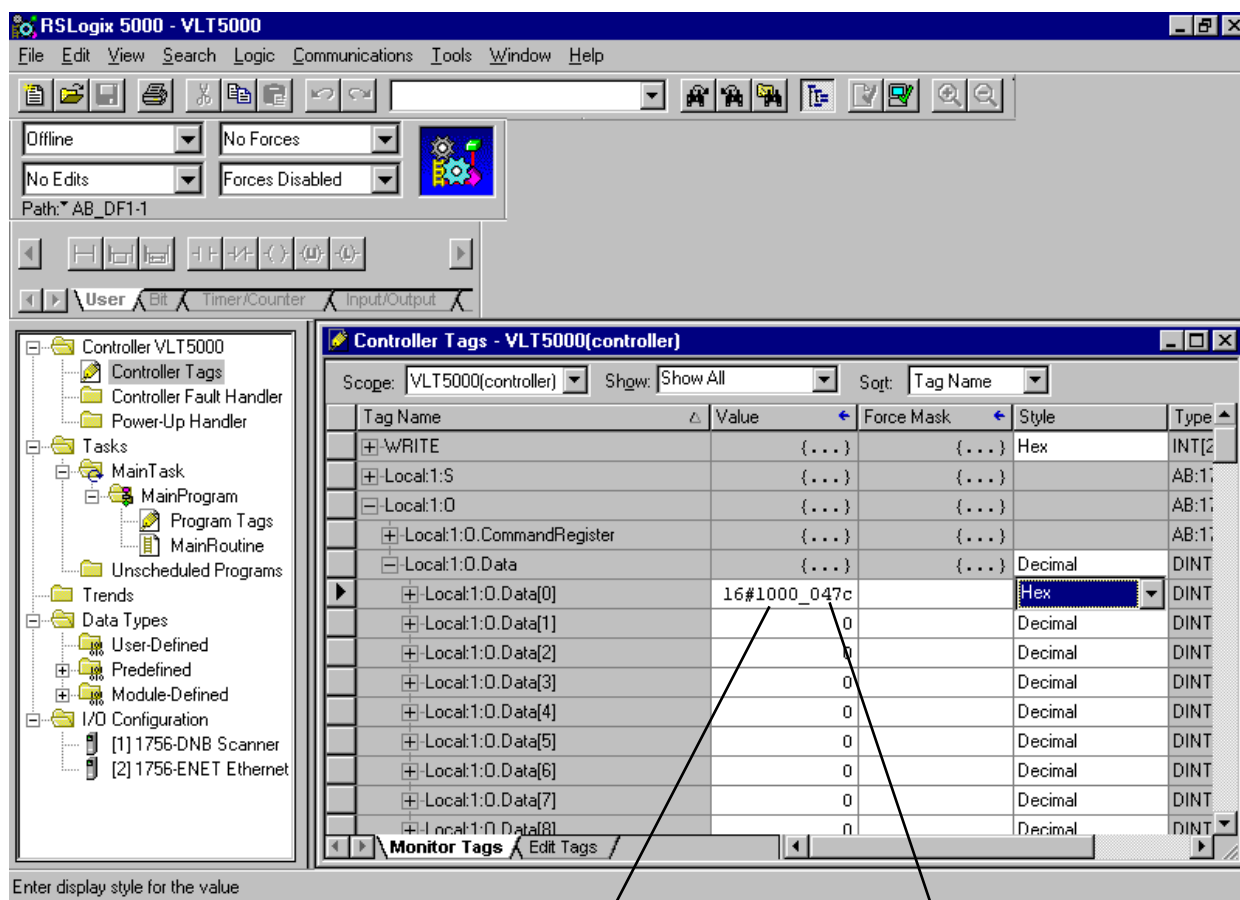
Example on status words from the VLT 5000 (par. 512 Telegram profile = FC Drive [1]):

- Stand by: 0607 Hex
- VLT running: 0F07 Hex Speed = ref.
- VLT running: 0E07 Hex Speed ≠ ref. i.e. ramping
- Warning: 0F87 Hex

■ I/O communication with RS Logix 5000

Click on Local:1:O and on Local 1:O.Data. Now you can see the full Output area of the DeviceNet system. Local:1:O.Data[0] indicates mapping of Control word and reference.

To start the VLT 5000 when using FC Drive profile (See par. 512) the start command should be 047C Hex. The Reference goes from 0 – 4000 Hex, corresponding to 0 –100 %.



Reference

Control Word

Example on Control words to the VLT 5000 (par. 512 Telegram profile = FC Drive [1]):

- Start: 047C Hex via ramp time in Par. 207
- Stop: 043C Hex via ramp time in Par. 207
- Coast: 0474 Hex
- Quick Stop: 046C Hex via ramp time in Par. 212
- Reversing: 847C

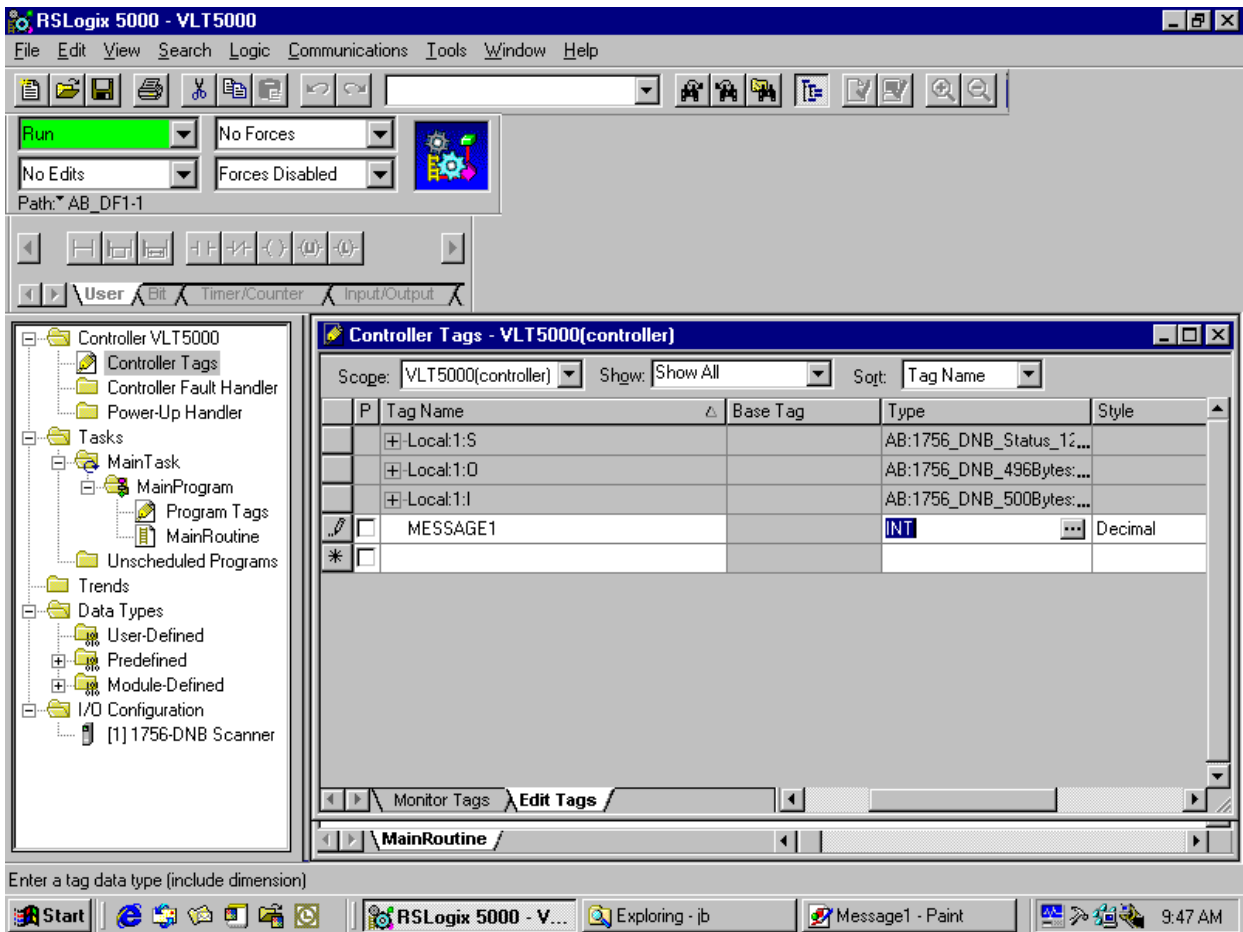
Example on reference to the VLT 5000 (par. 202 High output frequency and 205 Max. reference = 50 Hz):

- 1000 Hex ~ 25 % reference = 12.5 Hz
- 2000 Hex ~ 50 % reference = 25.0 Hz
- 4000 Hex ~ 100 % reference = 50.0 Hz

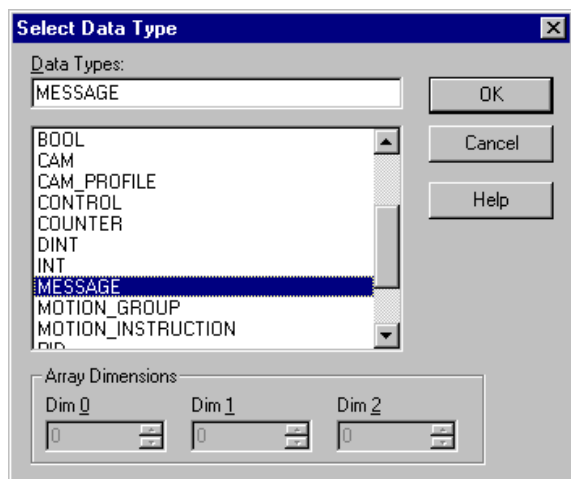
Remember by reversing to set par. 200 to both direction and par. 506 to Bus [1].

■ **Explicit messages with RS Logix 5000**

Click on *Controller Tags* and add a new tag called MESSAGE1. This message will be set up to read parameter 518 *Data read-out: Frequency*.

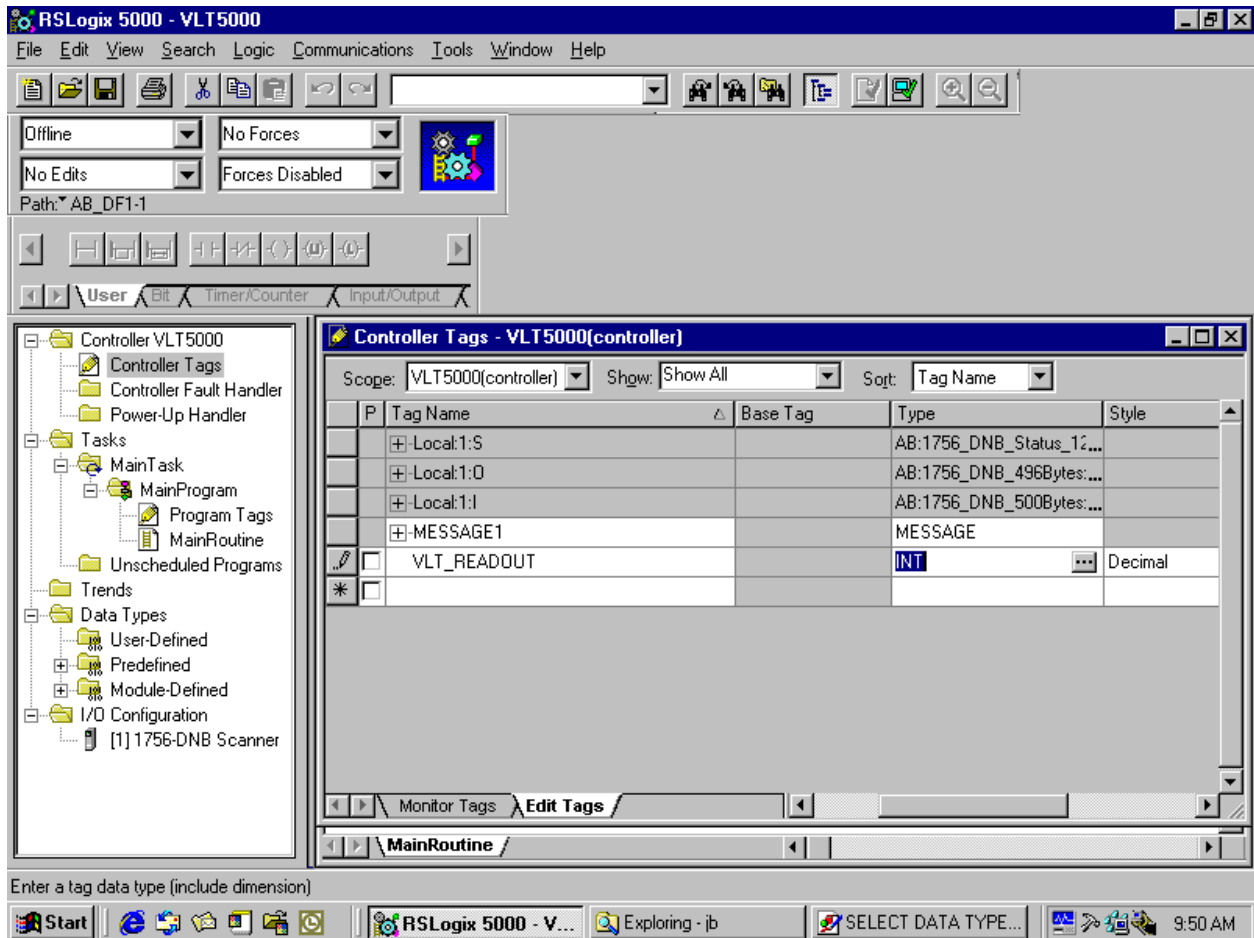


Click on box next to INT and in *Select Data type* choose MESSAGE.



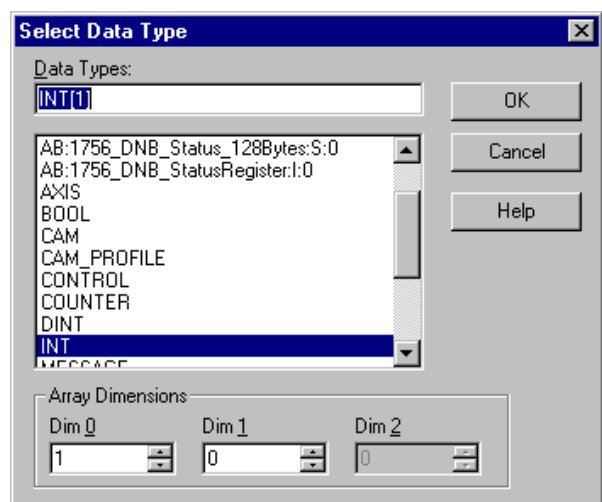
■ **Explicit messages with RS Logix 5000**

Add a new tag called VLT_READOUT.



Click on box next to INT and in *Select Data type* chose INT with an Array of 1.

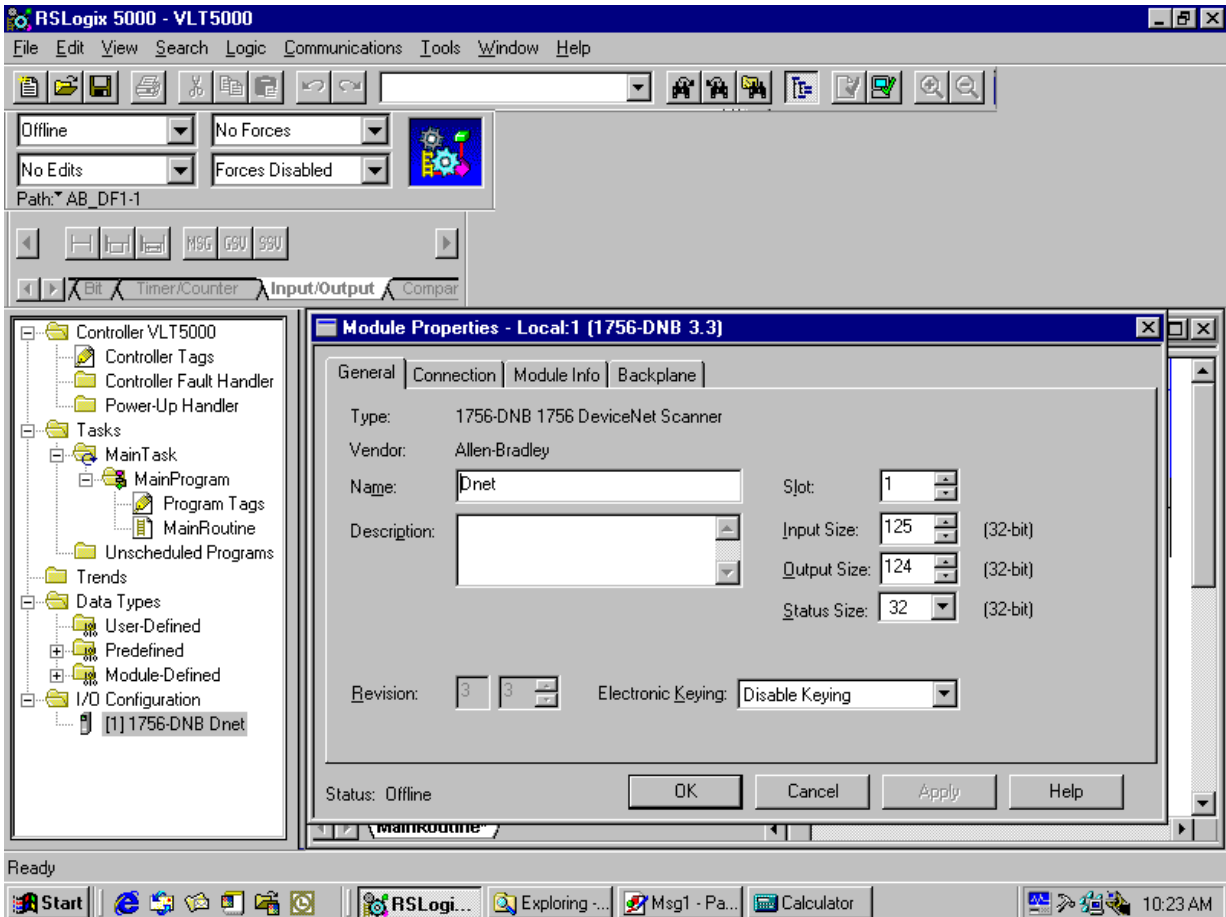
Now all the Tags are created to read parameter 518 on address number 4.



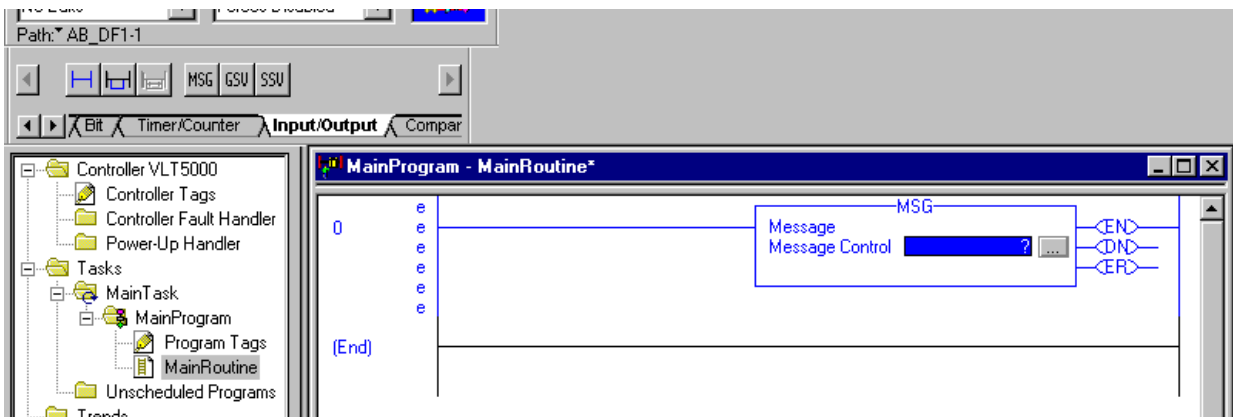
■ **Explicit messages with RS Logix 5000**

Under I/O configuration double click on 1756-DNB Scanner.

Give the Scanner a name, for example *Dnet* and click on OK.

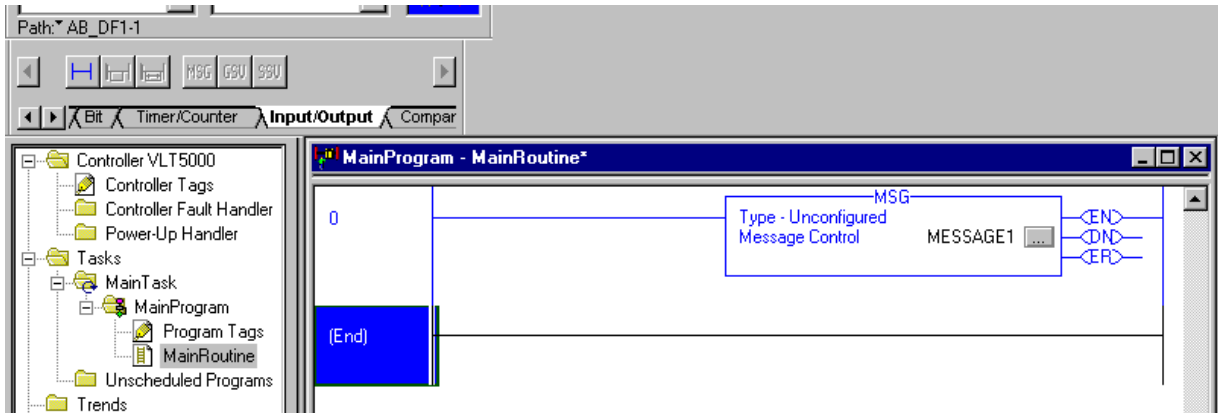


Click on Main routine and add a new rung.
Click on the Input/Output tag and drag and drop a MSG block to the rung.



■ **Explicit messages with RS Logix 5000**

Click on blue ? and choose the MESSAGE1 tag from the list.

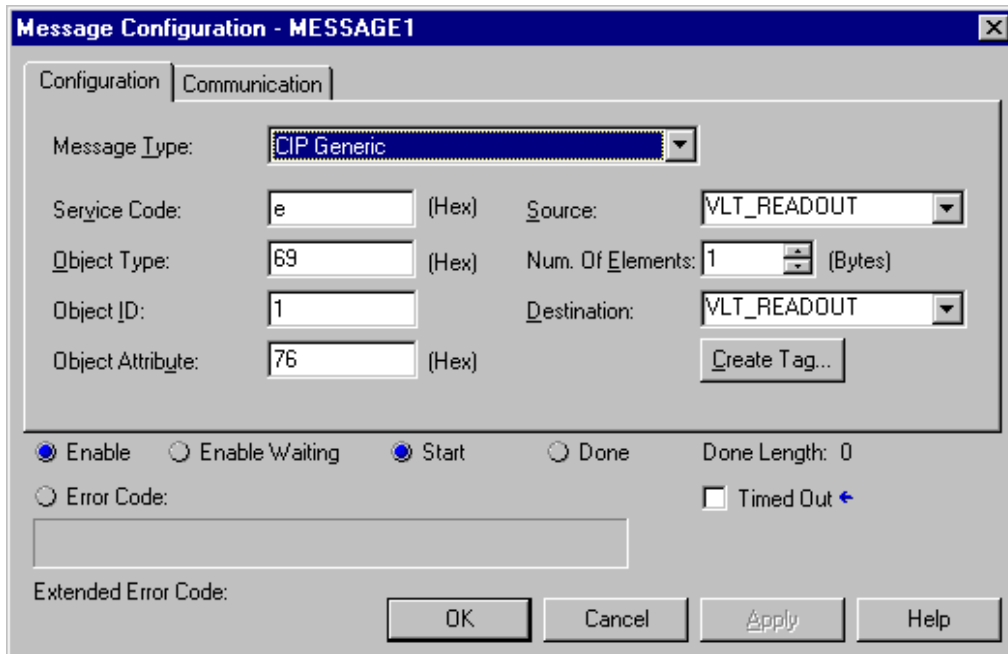


Click on box next to MESSAGE1 to configure the read command.

Set the Message Configuration to the following:

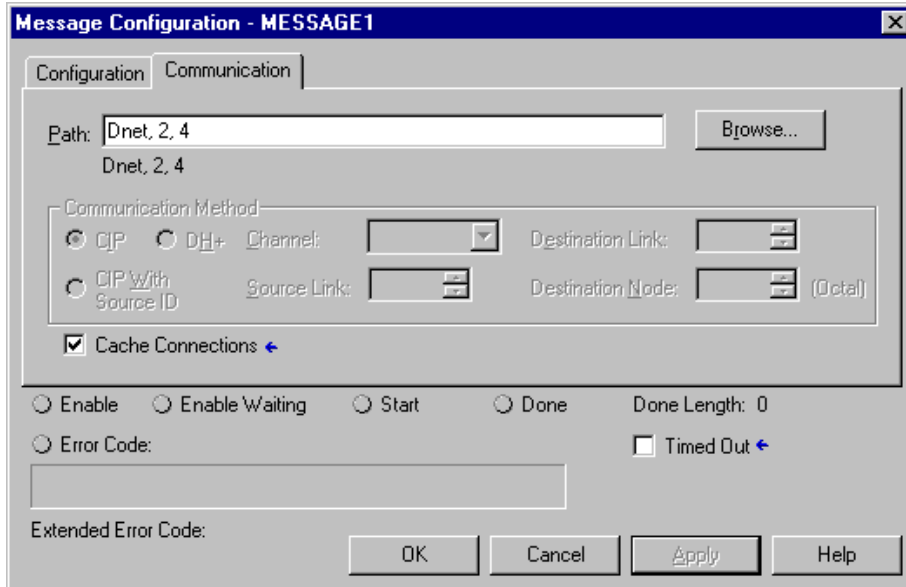
Service code: E Hex	This is a read command GET_ATTRIBUTE_SINGLE
Object type: 69 Hex	This is the Class ID. 69 Hex means par. Group 500. See page 15.
Object ID: 1	This is the Instance. Always 1 in VLT 5000.
Object Attribute: 76	This is the attribute. 76 Hex (118 dec) is par. 518. See page 15.

Set Source and Destination to VLT_READOUT tag and the number of elements to 1.
Now the message is set up to read par. 518 *Data read-out: Frequency*

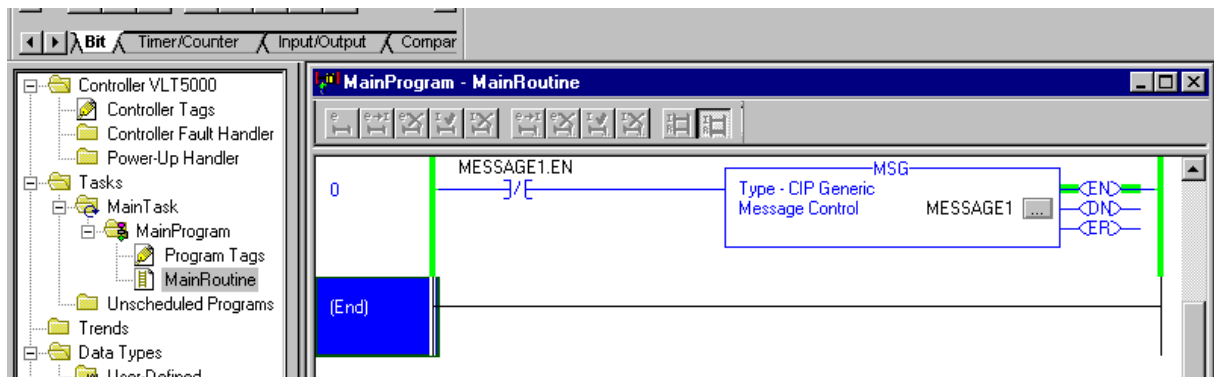


■ **Explicit messages with RS Logix 5000**

Click on Communication and add the path to the VLT 5000. Dnet is the name of 1756-DNB Scanner and 2 is a fixed number and 4 is the address of VLT 5000. Click Apply and OK.



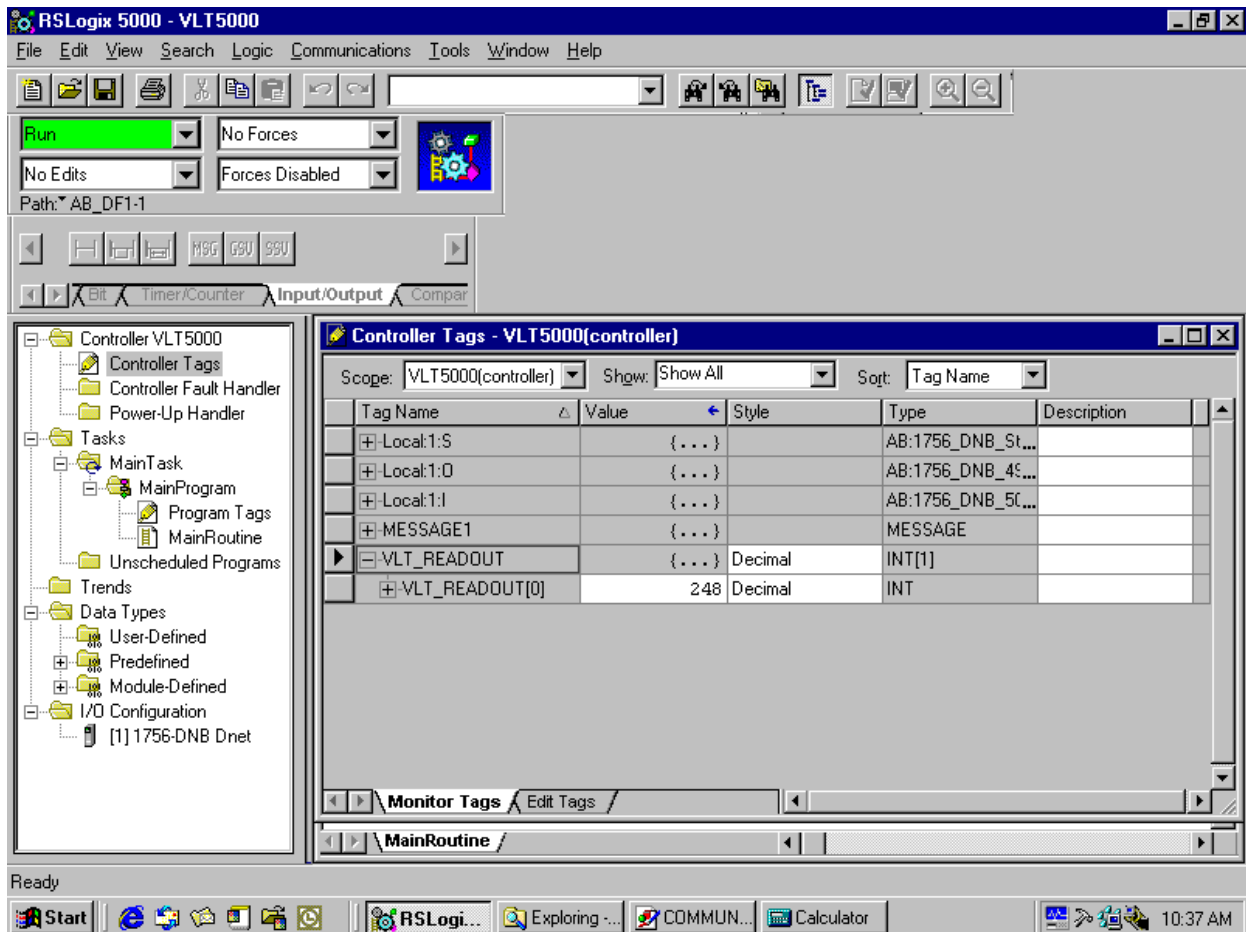
Add an input to the Message block. In this example the program always reads the parameter.



■ **Explicit messages with RS Logix 5000**

Save the program and download the software to the scanner. Click on controller tags and start the VLT.

By VLT Readout [0] the actual frequency is shown. 248 means that the frequency is 24.8 Hz.

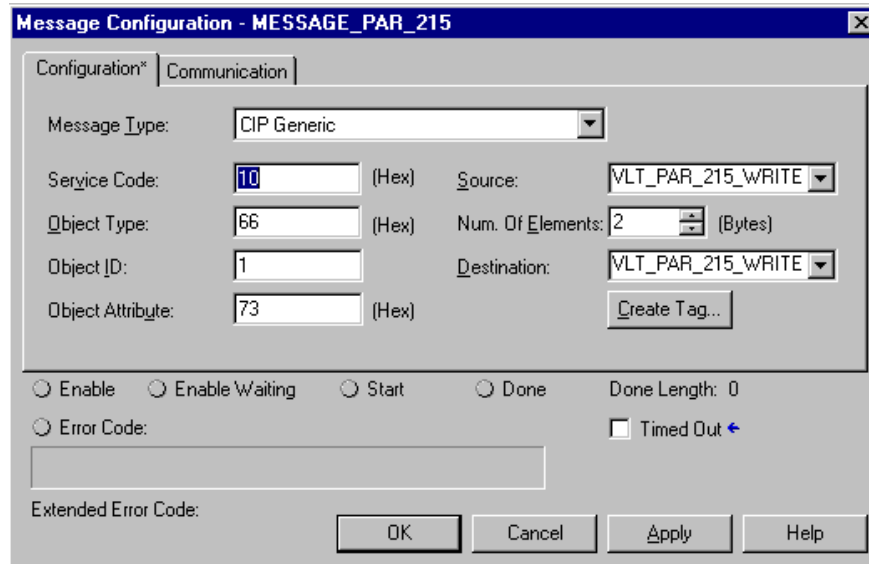


■ **Explicit messages with RS Logix 5000**

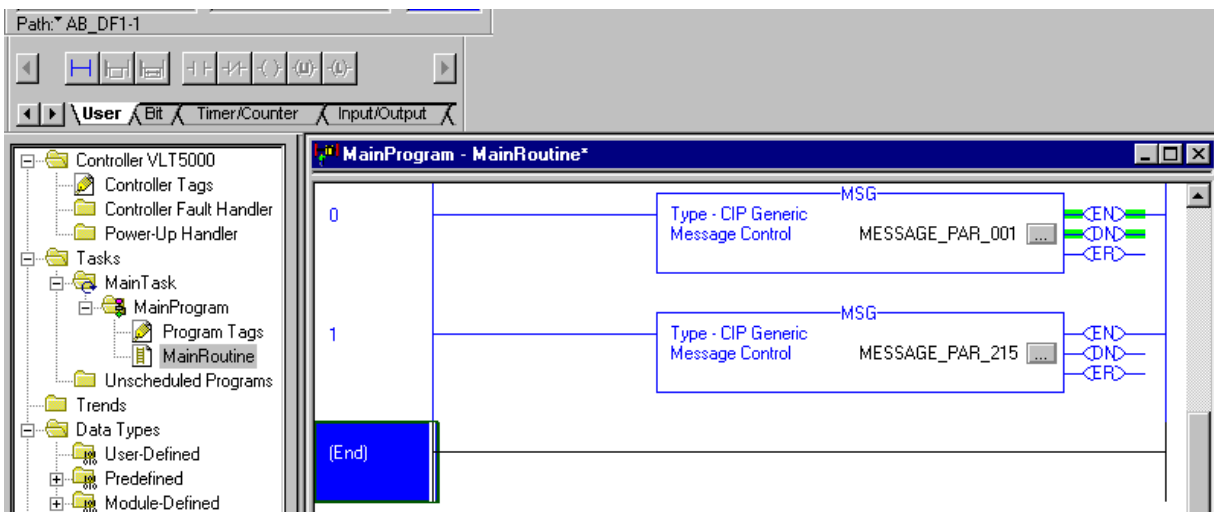
If you want to write to a parameter you must create a new Message tag and a new Write tag.

The Service code for a write command is 10 Hex

SET_ATTRIBUTE_SINGLE.



In this example the message is set up to write to parameter 215 *Preset reference 1*.





VLT® 5000 DeviceNet and Allen Bradley Control logix 5550

■ Explicit messages with RS Logix 5000

Class Description:

Group 0 = Operation & Display	Parameter 001 to 099	Class 100 (64 Hex)
Group 1 = Load & Motor	Parameter 101 to 099	Class 101 (65 Hex)
Group 2 = Ref. & Limits	Parameter 200 to 299	Class 102 (66 Hex)
Group 3 = Inputs & Outputs	Parameter 300 to 399	Class 103 (67 Hex)
Group 4 = Special functions	Parameter 400 to 499	Class 104 (68 Hex)
Group 5 = Serial Communication.	Parameter 500 to 599	Class 105 (69 Hex)
Group 6 = Technical Function	Parameter 600 to 699	Class 106 (6A Hex)
Group 7 = Option Specific	Parameter 700 to 799	Class 107 (6B Hex)
Group 8 = DeviceNet Profile	Parameter 800 to 899	Class 108 (6C Hex)
Group 9 = DeviceNet	Parameter 900 to 999	Class 109 (6D Hex)

Instance Description:

In the Danfoss VLT 5000 we only handle Instance 1, so always leave this at the value of 1.

Attribute Description:

The attribute for the VLT 5000 parameters is the 2 (two) last digits of the Parameter + 100.

By following this structure all 1 dimensional parameters can be accessed by Explicit Message.

As example for Parameter 520,

VLT 5000 Parameter	Class	Instance	Attribute
520	105	1	120

