# NGWarp

www.promax.it

# VTB Software Resources

Motion & Control

The contained information in this handbook are only informative and they can being change without warning and they must not being understandings with some engagement from Promax srl. Promax srl does not assume responsibility or obligates for errors or inaccuracies that can be found in this handbook. Except how much granted from the license, no part of this publication can be reproduced, saved in a recording system or transmitted in whatever form or with any means, electronic, mechanical or recording system or otherwise without Promax srl authorization.
Any reference to names of society or products have only demonstrative scope and it does not allude to some real organization.

*Rev. 1.0.2*

© Promax s.r.l. – Via Newton, 5/G – Z.I. Malacoda – CastelFiorentino (Fi) ITALY
email:info@promax.it - internet:www.promax.it

# 1 Preface

This document is refered to NGWARP Board HARDWARE resources usable with VTB language
For more  details to VTB language, see the following links:

Programming Guide
Objects Guide

The following examples, are not refered to real applications

# 2 Ethernet Port

The TCP/IP STACK is managed, by operating system. The management protocols that using TCP/IP, is delegated to VTB APPLICATION. For example, the TCP/IP MODBUS, is managed by a OBJECT in VTB language. In the same mode, is possible, management the propretary protocols.

## 2.1 SET_IP

Sets the parameters of TCP/IP protocol.

**Syntax**

```
        SET_IP(ip as *char, sm as *char, gw as *char)          as void
```

***Parameters***

| | |
|---|---|
| **ip** | NGWARP IP Addres |
| **sm** | Subnet mask |
| **gw** | Gateway (normally not used) |

**WARNING**
**This function must be called in the INIT section of the MAIN or PLC TASK**

## 2.2 PXETH_ADD_PROT

Adds a custom protocol to a specific port of TCP/IP. A custom function to process the new protocol must be written and its pointer must be pass to this function.

**Syntax**

```
        PXETH_ADD_PROT(port as long, fun as delegate) as void
```

***Parameters***

| | |
|---|---|
| **port** | TCP port on which the new protocol is added |
| **fun** | Pointer to the custom process function |

### 2.2.1 PROTOCOL PROCESS FUNCTION

This function isn't defined by system but it must be written in the application. The system will call this function, by the pointer passed with ***pxeth_add_prot,*** each time a data packet is received from the port associated to this protocol. To read the received data the function **pxeth_rx** have to be call while to send the response data they must be written in the transmit buffer (buftx) and return from the function the number of bytes we want to send.

**Syntax**

```
MY_PROTOCOL(len as long, buftx as *char) as long
```

***Parameters***

**len** Length of data packet received

**buftx** Pointer to the transmit buffer

**Return value**

**long** Number of bytes to be send

## 2.3 PXETH_RX

Read a single byte from the TCP/IP receive buffer. It is called by the protocol process function to read the received data.

**Syntax**

```
PXETH_RX() as char
```

**Return Value**

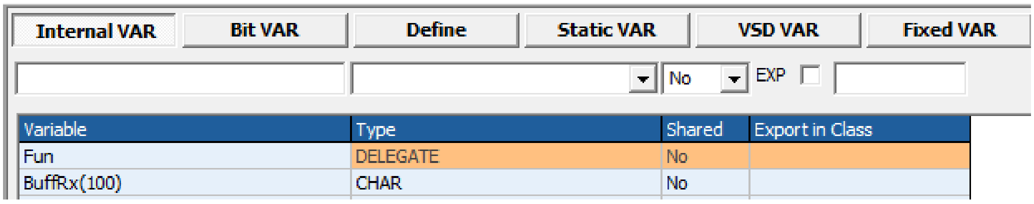
Char Data read from the receive buffer

## 2.4 Example

In the following example, when is received a TCP/IP block, are checked the **first 3 characters** in the buffer. If these are equal to the string **“VTB”**, the reply is **“YES”**, otherwise the reply is **“NO”**
Is checked the ASCII code:

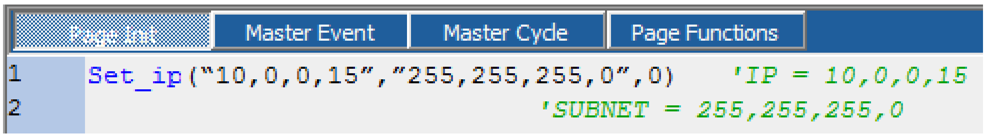
| | | |
|---|---|---|
| **V** = 86 | **Y** = 89 | **N** = 78 |
| **T** = 84 | **E** = 69 | **O** = 79 |
| **B** = 66 | **S** = 83 | |

**Variables used**



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| Fun | DELEGATE | No | |
| BuffRx(100) | CHAR | No | |

**Code in Init Main**

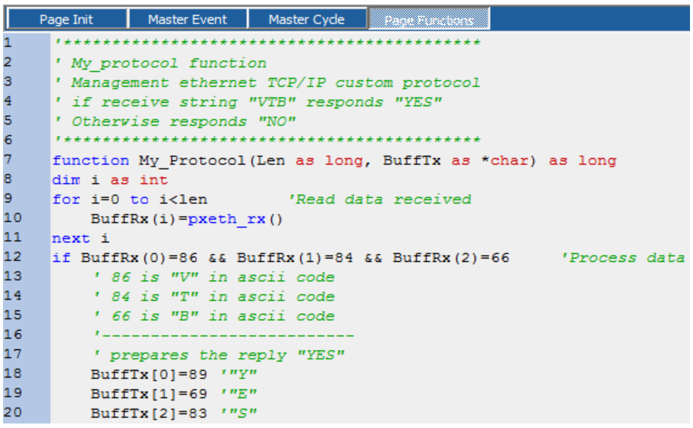


```
Set_ip("10,0,0,15","255,255,255,0",0)      'IP = 10,0,0,15
                                          'SUBNET = 255,255,255,0
```

```
Set_ip(“10,0,0,15”,”255,255,255,0”,0)         'IP = 10,0,0,15
                                              'SUBNET = 255,255,255,0
```

```
                                        'GATEWAY = none
Fun=my_protocol
pxeth_add_prot(502,Fun)'Add Function my_protocol to 502 port
```

## Code in Main Page Functions



```
'********************************************
' My_protocol function
' Management ethernet TCP/IP custom protocol
' if receive string "VTB" responds "YES"
' Otherwise responds "NO"
'********************************************
function My_Protocol(Len as long, BuffTx as *char) as long
dim i as int
for i=0 to i<len        'Read data received
    BuffRx(i)=pxeth_rx()
next i
if BuffRx(0)=86 && BuffRx(1)=84 && BuffRx(2)=66     'Process data
    ' 86 is "V" in ascii code
    ' 84 is "T" in ascii code
    ' 66 is "B" in ascii code
    '--------------------------
    ' prepares the reply "YES"
    BuffTx[0]=89 '"Y"
    BuffTx[1]=69 '"E"
    BuffTx[2]=83 '"S"
```

```
'*********************************************
' My_protocol function
' Management ethernet TCP/IP custom protocol
' if receive string "VTB" responds "YES"
' Otherwise responds "NO"
'*********************************************
function My_Protocol(Len as long, BuffTx as *char) as long
dim i as int

for i=0 to i<len                    'Read data received
            BuffRx(i)=pxeth_rx()
next i

if BuffRx(0)=86 && BuffRx(1)=84 && BuffRx(2)=66                'Process data
            ' 86 is "V" in ascii code
            ' 84 is "T" in ascii code
            ' 66 is "B" in ascii code
            '-------------------------
            ' prepares the reply "YES"
            BuffTx[0]=89 '"Y"
            BuffTx[1]=69 '"E"
            BuffTx[2]=83 '"S"
            My_Protocol=3 ' Data len for YES 3 Chars
else
            ' prepares the reply "NO"
            BuffTx[0]=78 '"N"
            BuffTx[1]=79 '"O"
            My_Protocol=2 ' Data len for NO 2 Chars
endif
endfunction
```

Example Download

# 3 Modbus TCP/IP

The Ethernet Port, can be configured with TCP(/P MODBUS Protocol
The TCP/IP STACK, can supporting, multi protocols connection.
The TCP/IP MODBUS, is managed by VTB OBJECT

## 3.1 Modbus TCP/IP OBJECT

This object, manages, the TCP/IP Modbus protocol

**Property**

| | |
|---|---|
| ***Nodo*** | Node slave |
| ***IpAddress*** | Slave IP Adress ex. “10.0.0.80” |
| ***Service Port*** | Slave IP Port (default 502 ) |
| ***PtData()*** | Array Data Register |
| ***Max Len Data*** | Data Register dimension |

**Methods**

***No***

The following requests are handled:

| | |
|---|---|
| **Function Code 3** | Read Multiple Registers |
| **Function Code 4** | Read Input Registers |
| **Function Code 6** | Preset Single Registers |
| **Function Code 16** | Preset Multiple Registers |

**Events**

***No***

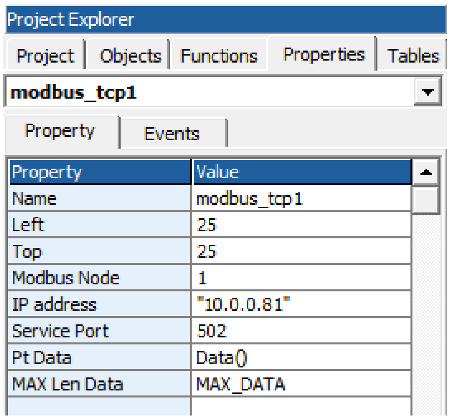
## 3.2 Example

In the following example, are read and written the 16 bit registers in NGWARP memory.
The Array data, is named – **Data,** and the maximum number register, is in the DEFINE **MAX_DATA** (100 Register in the example)

Where :
***Read/Write from Modbus register Nr.1 → Data(0)***
***Read/Write from Modbus register Nr.2 → Data(1)***
***etc.***
***In the example, is read the register Nr.2 – Data(1), and written the register Nr. 1 - Data(0)***

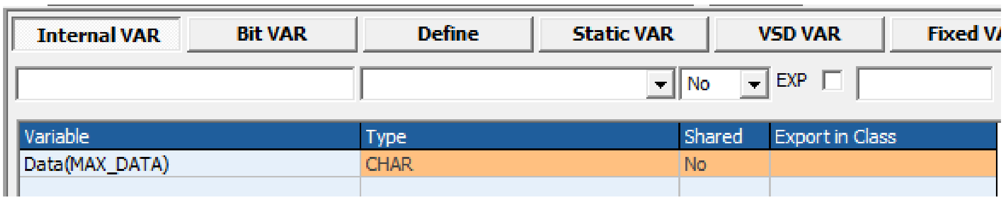
**Objects used:**

### *Modubus → CModbus → Modbus protocol TCP*



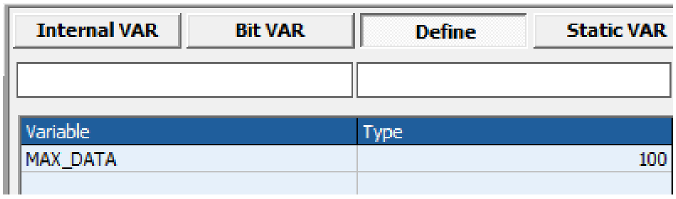
| Property | Value |
|---|---|
| Name | modbus_tcp1 |
| Left | 25 |
| Top | 25 |
| Modbus Node | 1 |
| IP address | "10.0.0.81" |
| Service Port | 502 |
| Pt Data | Data() |
| MAX Len Data | MAX_DATA |

## Variables used



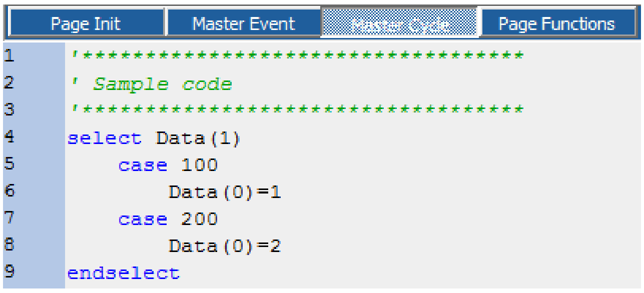
| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| Data(MAX_DATA) | CHAR | No | |

## DEFINE used



| Variable | Type |
|---|---|
| MAX_DATA | 100 |

## Code in Master Ciclo – Main



```
'***********************************
' Sample code
'***********************************
select Data(1)
    case 100
        Data(0)=1
    case 200
        Data(0)=2
endselect
```

```
'******************************
' Sample code
'******************************
select Data(1)
      case 100
            Data(0)=1
      case 200
            Data(0)=2
endselect
```

## Example Download

# 4 CLIENT TCP/IP

The Ethernet port, can be configured CLIENT TCP and connect to external devices with TCP/IP protocol.

## 4.1 OBJECT TCP_Client

This Object manages the TCP/IP Client communication and the RPC Promax Protocol.

### Property

| | |
|---|---|
| ***IP address*** | Remote connection IP Address - ***not in Run time*** |
| ***Port*** | Remote connection Port - ***not in Run time*** |
| ***Idle TimeOut*** | Time out for inactivity connection (seconds) - ***not in Run time*** |
| ***RPC TimeOut*** | Time out for RPC  responses (milliseconds ) - ***not in Run time*** |
| ***bytes_received*** | Number of Bytes in receive buffer ***– Read Only*** |
| ***status_connected*** | True - connection occurred ***– Read Only*** |
| ***status_closed*** | True - connection closed ***– Read Only*** |
| ***status_abort*** | True - connection closed (by remote IP or error) ***– Read Only*** |
| ***status_overun*** | True- Data lost ***– Read Only*** |

### Methods

These Methods manages the TCP/IP CLIENT communication.

***function .connect*(wait_time *as long*) *as char***

Connection request at remote  IP Address and PORT number setting in the properties.
This function, waits for remote response or  **“wait_time”** parameter.
**WARNING**: The connection manage, is not dependent by **“wait_time”** parameter, the parameter **“wait_time”** is used only for exit to  function. The system try  to establish connection. The TIME OUT, occurred when the bit **status_closed** or **status_abort** is true. If the bit **status_connected** is setted, the connection is established regulary.
Do not execute another function connect, up to that the TIME OUT is not finished.

***Parameters***

**Wait_time** Time for waiting connection (see above)

***Return***

>**0** Connection OK
-**1** Connection Error
-**2** Wait Time finished

***function .close*() *as void***

Connection close request. Terminates the active connection, freeing the system resources.

***function .send*(buf** as ****char, len as uint ) as int***

Sending Data to active connection. This function, sends the bytes and returns immediately. If the network errors are occurred, the system try automatically to resend the data bytes for more time. If the network errors are persistent , the connection is closed.

***Parameters***

**buf** Data pointer to send
***len*** Number of Bytes to send

***Return***

>=**0** Number of Bytes sent
-**1** Error data sent

***function .recv*(buf** as ****char, len as uint ) as int***

Bytes reading. With the property bytes_received (only read) is possible know the bytes number that are present in the system receive buffer. The **len** parameter, indicates the number of bytes to discharge from system receive buffer.
The return value, indicates the effective number of data read ( normally it is equal to **len** parameter).
If the value is less to len, you must try to call the **function.recv** more times.

***Parameters***

| | |
|---|---|
| **buf** | Pointer to destination buffer |
| ***len*** | Max number of data reading |

***Return***

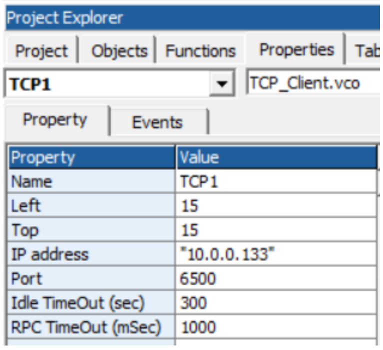
| | |
|---|---|
| >=**0** | Number of data read |

## 4.2 Example Generic TCP/IP

Example of connectionwith external NGWARP at IP ADRESS **10.0.0.133** Port **6500** for write a string **START** in the remore endpoint.

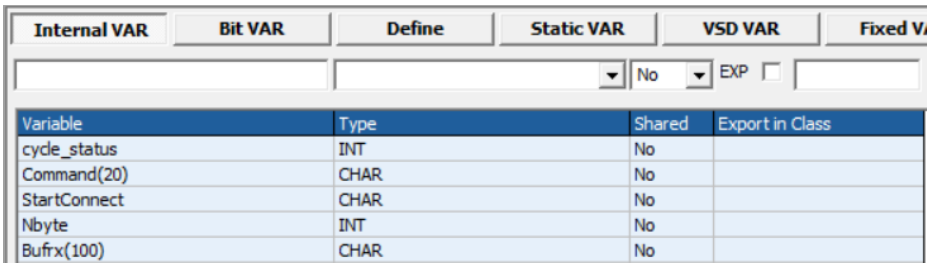
**Objects used:**

***CommMaster → TCP_Client → TCP_Client***



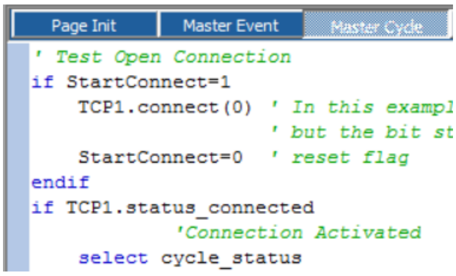
| Property | Value |
|---|---|
| Name | TCP1 |
| Left | 15 |
| Top | 15 |
| IP address | "10.0.0.133" |
| Port | 6500 |
| Idle TimeOut (sec) | 300 |
| RPC TimeOut (mSec) | 1000 |

**Variables used**



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| cycle_status | INT | No | |
| Command(20) | CHAR | No | |
| StartConnect | CHAR | No | |
| Nbyte | INT | No | |
| Bufrx(100) | CHAR | No | |

**Code in Master Ciclo – Main**



```
' Test Open Connection
if StartConnect=1
    TCP1.connect(0)  ' In this exampl
                     ' but the bit st
    StartConnect=0   ' reset flag
endif
if TCP1.status_connected
                'Connection Activated
    select cycle_status
```

```
' Test Open Connection
if StartConnect=1
        TCP1.connect(0) ' In this example is not used the time out Wait_time (the function return immediatly)
                                        ' but the bit status_connected is dinamically read
        StartConnect=0  ' reset flag
endif
if TCP1.status_connected
                        'Connection Activated
        select cycle_status
                Case 10                 ' Send String START
                        cycle_status=20
                        strcpy(command(),"START")
                        TCP1.send(command(),5)
                Case 20                 ' Wait response
                        nbyte=TCP1.recv(bufrx(),20)
                        If nbyte
                                ' Process Data
                                cycle_status=0
                        endif
        endselect
endif
if TCP1.status_closed || TCP1.status_abort
                        ' Connection closed
endif
```

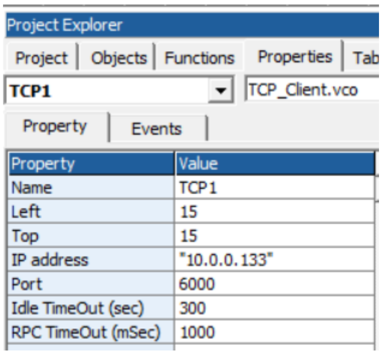
Example Download

## 4.3 Example TCP/IP RPC

Example of connection with NGWARP at IP ADDRESS **10.0.0.133** Port **6000** for array exchange by protocol TCP/IP – RPC (Remote Procedure Call).
In the SLAVE must be defined **AD_PARAMETER** in the FIXED at ADRR 0 and init the pointer:
**AD_PARAMETER =tab_param()** – insert this code in INIT TASK PLC – **tab_param** is the array for exchange data.
In the NGWARP MASTER must be deifined **AD_PARAMETER** in the fixed at ADDR 0 (the same of the slave) and define the array **tab_param** at the same dimension of the SLAVE (example 25 long)

**Object Used:**

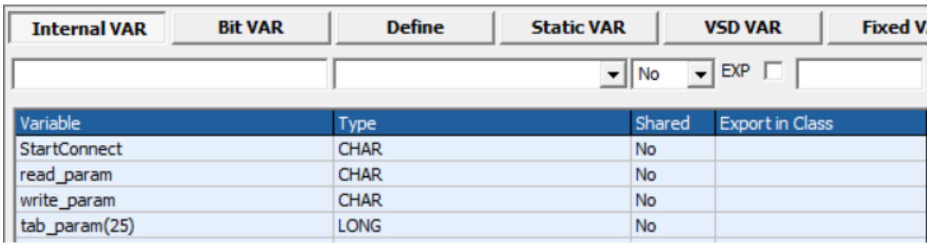
***CommMaster → TCP_Client → TCP_Client***



TCP1 | TCP_Client.vco

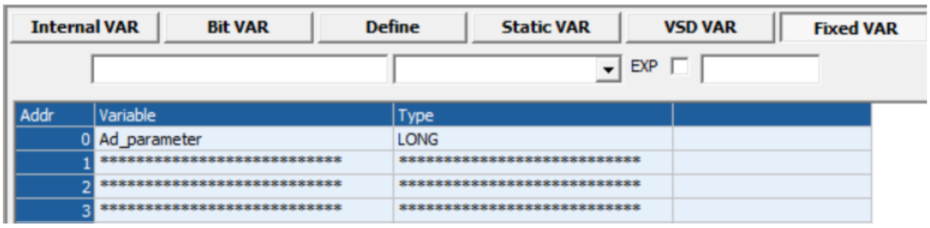
| Property | Value |
|---|---|
| Name | TCP1 |
| Left | 15 |
| Top | 15 |
| IP address | "10.0.0.133" |
| Port | 6000 |
| Idle TimeOut (sec) | 300 |
| RPC TimeOut (mSec) | 1000 |

**Variables used**



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| StartConnect | CHAR | No | |
| read_param | CHAR | No | |
| write_param | CHAR | No | |
| tab_param(25) | LONG | No | |

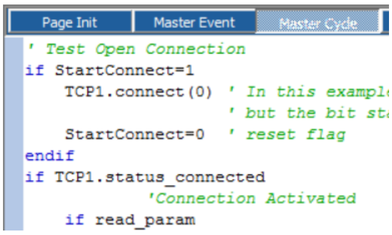
**Fixed used**



| Addr | Variable | Type | |
|---|---|---|---|
| 0 | Ad_parameter | LONG | |
| 1 | ****************************** | ****************************** | |
| 2 | ****************************** | ****************************** | |
| 3 | ****************************** | ****************************** | |

**WARNING:**
**The FIXED ADDRESS must be equal to fixed NGWARP SLAVE**

**Code in Master Ciclo – Main**



```
' Test Open Connection
if StartConnect=1
    TCP1.connect(0)  ' In this exampl
                     ' but the bit st
    StartConnect=0   ' reset flag
endif
if TCP1.status_connected
                'Connection Activated
    if read_param
```

```
' Test Open Connection
if StartConnect=1
        TCP1.connect(0) ' In this example is not used the time out Wait_time (the function return immediatly)
                        ' but the bit status_connected is dinamically read
        StartConnect=0  ' reset flag
endif
if TCP1.status_connected
                        'Connection Activated
        if read_param
                read_param=0
                TCP1.rpc_read(AD_PARAMETER(),4, AD_PARAMETER())     ' Pointer Read
                TCP1.rpc_read(AD_PARAMETER,100,tab_param())         ' Read 100 bytes - 25 long
        endif

        if write_param
                write_param=0
                TCP1.rpc_read(AD_PARAMETER(),4, AD_PARAMETER())     ' Pointer Read
                TCP1.rpc_write(AD_PARAMETER,100,tab_param())        ' Write 100 bytes - 25 long
        Endif
endif
if TCP1.status_closed || TCP1.status_abort
                        ' Connection closed
endif
```

**Example Download**

# 5 RS232/RS485 Port

The NGWARP allows to use 1 RS232/485 port, with a custom or standard (MODBUS RTU) protocols.

## 5.1 SER_SETBAUD

Programming the BaudRate of the second SERIALE PORT - SER2.

**Syntax**

```
SER_SETBAUD (Baud as long) as void
```

***Parameters***

| | |
|---|---|
| **Baud** | Value of Baud Rate. The standard value are:<br>**1200-2400-4800-9600-19200-38400-57600-115200** |

## 5.2 SER_MODE

Programming the mode of the second SERIAL PORT. If this function is never called, by default the port is programmed with:

***No parity***
***8 bit per character***
***1 bit stop.***

**Syntax**

```
SER_MODE(par as char, nbit as char, nstop as char) as void
```

***Parameters***

| | |
|---|---|
| **par** | Parity (0=no parity, 1=odd parity, 2=even parity) |
| **nbit** | Number of bits per character (7 or 8) |
| **nstop** | Number of stop bits (1 or 2) |

## 5.3 SER_GETCHAR

Reads the receive buffer of the serial port. It doesn't wait for the presence of a character.
This function, must be calling, in POLLING by VTB application.
The operating System, manages the INTERRUPT BUFFER

**Syntax**

```
SER_GETCHAR () as int
```

**Return Value**

| | | |
|---|---|---|
| ***int*** | ***-1*** | No character is in the buffer |
| | ***>=0*** | Code (0 to 255) of the character read from the buffer |

## 5.4 SER_PUTCHAR

ISends a character to the serial port.

**Syntax**

```
SER_PUTCHAR (Car as int) as void
```

***Parameters***

| | |
|---|---|
| **Car** | Code (0 to 255) of the character to send |

## 5.5 SER_PUTS

Sends a string of characters to the serial port. The string must be ended with the character 0 (NULL).

**Syntax**

```
SER_PUTS (str as *char) as void
```

***Parameters***

| | |
|---|---|
| ***str** | String Pointer |

## 5.6 SER_PRINTL

SFormatting print of an INTEGER value.

**Syntax**

SER_PRINTL (format as *char,val as long) as void

***Parameters***

**Format** String corresponding to the format to be printed

**Val** Any integer value or expression

**Avalaible formats**

| | | |
|---|---|---|
| **######** | Print a fixed number of characters | 23456 |
| **###.###** | Force the print of decimal point | 123.456 |
| **+####** | Force the print of the sign | +1234 |
| **#0.##** | Force the print of a ZERO | 0.12 |
| **X####** | Print in HEXADECIMAL format | F1A3 |
| **B####** | Print in BINARY format | 1011 |

## 5.7 SER_PRINTF

Formatting print of a FLOAT value. It is the same as ***ser_printl*** but use a float value

**Syntax**

SER_PRINTF (const char *format, val as float) **as void**

***Parameters***

**Format** String corresponding to the format to be printed

**Val** Any integer value or expression

## 5.8 SER_PUTBLK

Sends a precise number of characters to the serial port. Unlike the function ***ser_puts*** it allows to send also the character with 0 code enabling the managing of binary protocols, furthermore it starts the background transmission setting in appropriate mode the RTS signal useful to work with RS485 lines.

**WARNING**
**This function allows to manage BINARY and RS485 protocols**

**Syntax**

SER_PUTBLK (Buffer as *char, Len as int) as void

***Parameters***

***Buffer** Pointer to the data buffer to send

**Len** Number of bytes to send

## 5.9 SER_PUTST

Reads the state of background transmission started by ***ser_putblk.***

**Syntax**

SER_PUTST () as int

**Return Value**

***int*** ***-1*** Transmit error

***>=0*** Number of characters to be transmitted

## 5.10 Example

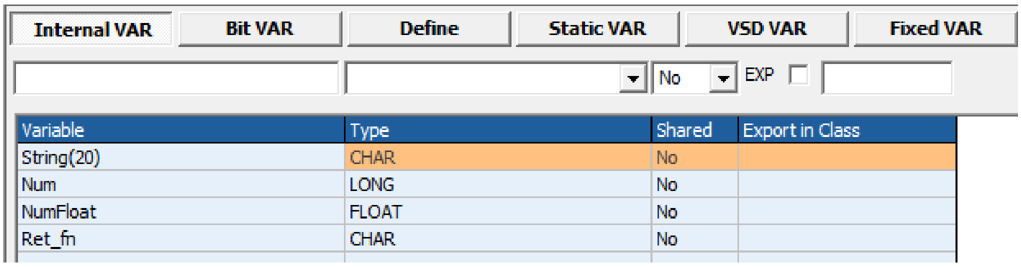
In the following example, is call the Read_Data() function, in polling in the Task Main
SER2 Setting:

| | |
|---|---|
| ***Baud rate*** | ***→ 115,200*** |
| ***Nr. bit dati*** | ***→ 8*** |
| ***Nr. bit Stop*** | ***→ 1*** |
| ***Parità*** | ***→ NO*** |

Response value:

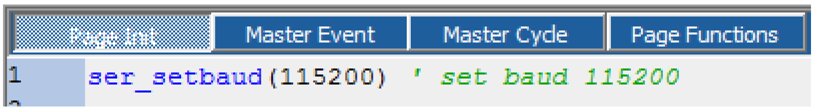
***Character received =1*** ***→ Echo charatcer reveived (1) with ser_putchar***
***Character received =2*** ***→ Send Text "Test String" with Ser_puts***
***Character received =3*** ***→ Formatted Print Variable Num (number of characters received)***
***Character received =4*** ***→ Formatted Print Variable NumFloat (Float random)***
***Character received =5*** ***→ Send in Binary mode Nr. 789488 with Ser_putblk***
***Character received =6*** ***→ Test state Ser_putblk - reply:***
***255 send data error***
***Nr characters in the transmission buffer***
***Character received=Others → Response 254 - Error unknown command***

**Variables used**



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| String(20) | CHAR | No | |
| Num | LONG | No | |
| NumFloat | FLOAT | No | |
| Ret_fn | CHAR | No | |

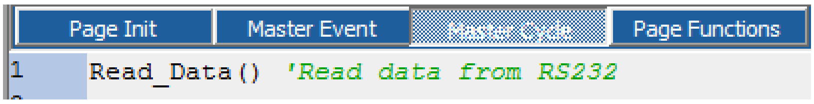
**Code in Init Main**



```
ser_setbaud(115200) ' set baud 115200
```

**ser_setbaud**(115200) **' set baud 115200**

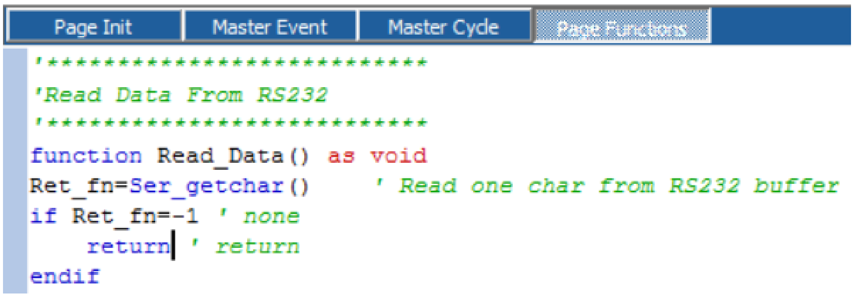
**Code in Master Ciclo Main**



```
Read_Data() 'Read data from RS232
```

**Read_Data()** **'Read data from RS232**

**Code in Page Functions Main**



```
'****************************
'Read Data From RS232
'****************************
function Read_Data() as void
Ret_fn=Ser_getchar()     ' Read one char from RS232 buffer
if Ret_fn=-1  ' none
    return  ' return
endif
```

```
'***************************
'Read Data From RS232
'***************************
function Read_Data() as void

Ret_fn=Ser_getchar()        ' Read one char from RS232 buffer
if Ret_fn=-1 ' none
            return ' return
endif
inc Num ' increases the received chars
NumFloat=Num*2.13 'random number
'process data received
select Ret_fn
            case 1 ' ------ echo char with send_putchar
                        Ser_putchar(Ret_fn)         ' send reply echo char
            case 2 ' ------ send string with ser_puts
                        strcpy(String(),"Test String") ' Copy in array string text
                        ser_puts(String()) ' put data
            case 3 ' ------ print a long formatted with ser_printl
                        ser_printl("###.##",Num) ' print ex: 123.45 format
            case 4 ' ------ print a float formatted with ser_printf
                        ser_printf("####.###",NumFloat) ' print NumFloat
            case 5 ' ------ put a block with ser_putblk
                        'Send a number 789488
                        String(0)=0xF0 'LSB
                        String(0)=0xOB
                        String(0)=0x0C
                        String(0)=0 'MSB
                        Ser_putblk(String(),4) ' Data len 4 byte
            case 6 ' ------ test if ser_putblk is busy
                        Ret_fn= Ser_putst() ' check if function ser_putblk is busy
                        if Ret_fn=-1
                                    Ser_putchar(255)            ' send error
                        else
                                    Ser_putchar(Ret_fn)         ' send number of chars
                        endif
            case else
                        Ser_putchar(254)            ' send error no char
endselect

endfunction
```

**Example Download**

# 6 Modbus RTU

The SER2 port, is able to manage the RTU MODBUS protocol.
The protocol MODBUS RTU is available in two configuration:
***Master***
***Slave***

## 6.1 Modbus RTU Slave Object

Thsi Object, manage, the RTU MODBUS SLAVE protocol.

**Property**

***Nodo*** Node slave
***BaudRate*** baud rate
***PtData()***Array Data Register in the NGWARP memory
***Max Len Data*** Data Register dimension
***TimeOut*** Master Time Out (millisecond)
This must be smallest by a MASTER TimeOut

**Methods**

***No***

The following requests are handled MODBUS RTU:

**Function Code 3** Read Multiple Registers
**Function Code 6** Preset Single Registers
**Function Code 16** Preset Multiple Registers

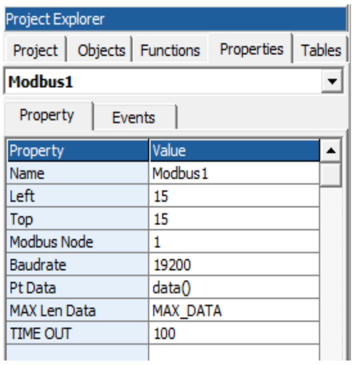
**Events**

***No***

## 6.2 Example ModBus slave

In the next example,are read and written, some registers 16 bit declared in the NGWARP memory.
The registers array is named **Data,** and the maximum dimension, is in the DEFINE **MAX_DATA**

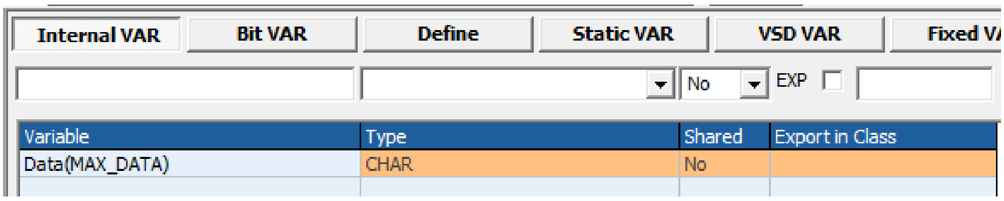
Where :
***Read/Written from Modbus register Nr.1 → Data(0)***
***Read/Written from Modbus register Nr.2 → Data(1)***
***etc.***
***The example, Read the data register Nr. 2 - Data(1) and written the Data register Nr1 - Data(0)***



| Property | Value |
|---|---|
| Name | Modbus1 |
| Left | 15 |
| Top | 15 |
| Modbus Node | 1 |
| Baudrate | 19200 |
| Pt Data | data() |
| MAX Len Data | MAX_DATA |
| TIME OUT | 100 |

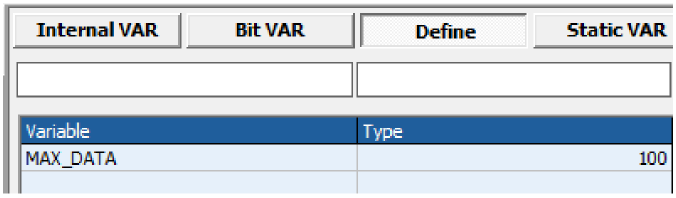
**Objects used:**
***Modbus → Cmodbus → ModBus Protocol***

## Variables used



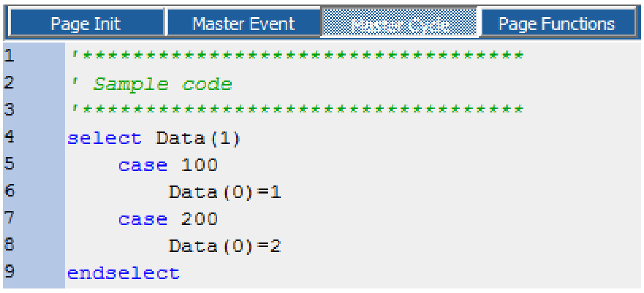
| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| Data(MAX_DATA) | CHAR | No | |

## DEFINE Used



| Variable | Type |
|---|---|
| MAX_DATA | 100 |

## Code in Master Ciclo Main



```
'**********************************
' Sample code
'**********************************
select Data(1)
    case 100
        Data(0)=1
    case 200
        Data(0)=2
endselect
```

```
'******************************
' Sample code
'******************************
select Data(1)
      case 100
            Data(0)=1
      case 200
            Data(0)=2
endselect
```

**Example Download**

## 6.3 Modbus RTU Master Object

Thsi Object, manage, the RTU MODBUS MASTER protocol.

**Property**

| | |
|---|---|
| ***BaudRate*** | Comm Baud rate |
| ***TimeOut*** | Time Out for SLAVE response (millisecond).<br>This must be more great by a slaves TimeOut |
| ***Parita*** | 0 none - 1 odd - 2 even |
| ***N. bit car*** | Number bit for char |
| ***N. bit stop*** | Number stop bit |

**Methods**

***function .write_regn(nodo as char, addr as uint, value as *int) as char***

Preset single register func 16 ModBus RTU

***Parameters***

| | |
|---|---|
| **nodo** | Node slave modbus |
| **addr** | Start Address register  to write (Slave) |
| **Value** | Unsigned integer (values to write) |

***Return***

| | |
|---|---|
| **0** | Write OK |
| **1** | Error respons |
| **2** | Time Out |
| **3** | Data len >  127 |

***function .read_regn(nodo as char, addr as uint, value as *int) as char***

Read single register func 3 ModBus RTU

***Parameters***

| | |
|---|---|
| **nodo** | Node slave modbus |
| **addr** | Start Address register  to read (Slave) |
| **Value** | Pointer to unsigned integer (value to read) |

***Return***

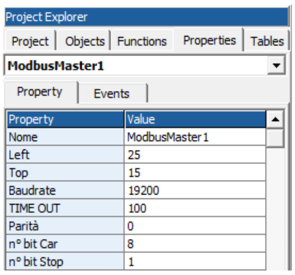
| | |
|---|---|
| **0** | Read OK |
| **1** | Error respons |
| **2** | Time Out |
| **3** | lData len >  127 |
| **4** | Checksum error |

## 6.4 Example ModBus Master

In the next example, are read and written, some registers 16 bit in a slave

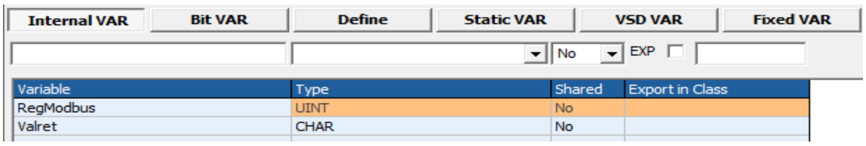
**Objects used:**

***Modbus → CmodbusMaster → ModBus Master Protocol***



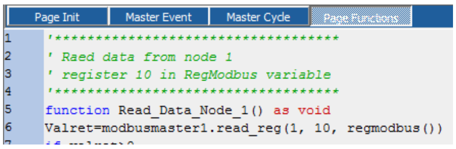
| Property | Value |
|---|---|
| Nome | ModbusMaster1 |
| Left | 25 |
| Top | 15 |
| Baudrate | 19200 |
| TIME OUT | 100 |
| Parità | 0 |
| n° bit Car | 8 |
| n° bit Stop | 1 |

### Variables used



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| RegModbus | UINT | No | |
| Valret | CHAR | No | |

### Code in Main Page Functions



```
'************************************
' Raed data from node 1
' register 10 in RegModbus variable
'************************************
function Read_Data_Node_1() as void
Valret=modbusmaster1.read_reg(1, 10, regmodbus())
```

```
'***********************************
' Raed data from node 1
' register 10 in RegModbus variable
'***********************************
function Read_Data_Node_1() as void
Valret=modbusmaster1.read_regn(1, 10, regmodbus())
if Valret>0
        ' read error
endif
endfunction
'*********************************
' Write data to node 1
' register 10 RegModbus variable
'*********************************
function Write_Data_Node_1() as void
RegModbus=100
Valret=modbusmaster1.write_regn(1, 10, RegModbus)
if valret>0
        ' write error
endif
endfunction
```

Example Download

# 7 Analog Inputs Read

The NGWARP board, has 8 analog inputs managed by VTB functions
In this Board revision, the analog inputs, have a 10 bit resolution (value from 0 to 1023)

## 7.1 Inputs Read

**Syntax**

**NG_ADC**(Channel **as Char**) **as uint**

***Parameters***

**Channel** Channel number (from 0 to 7)

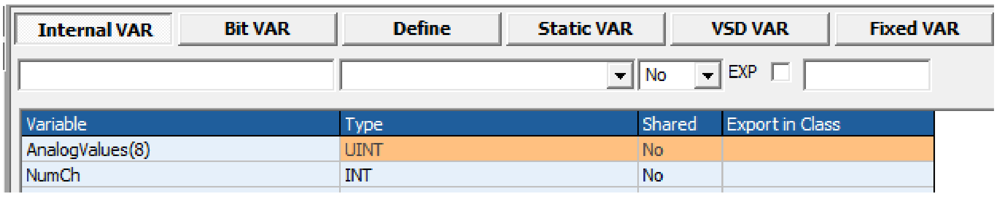
**Return Value**

Returns the analog value (from 0 to 1023)
Where 0 is the minimum voltage level (0 volt) , 1023 is the maximun voltage level configured in the input (normally 10 Volt)

## 7.2 Example Analog inputs read

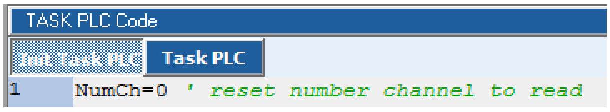
In the following example, are read the analog inputs from 0 to 7. the values are written in the array AnalogValues
The channels are read in TaskPlc

**Variables used**



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| AnalogValues(8) | UINT | No | |
| NumCh | INT | No | |

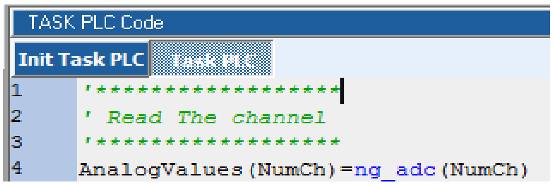
**Code in Init TaskPlc**



```
NumCh=0 ' reset number channel to read
```

```
NumCh=0          ' reset number channel to read
```

**Code in Task Plc**



```
'******************
' Read The channel
'******************
AnalogValues(NumCh)=ng_adc(NumCh)
```

```
'******************
' Read The channel
'******************
AnalogValues(NumCh)=ng_adc(NumCh)
inc NumCh 'increase channel number
if NumCh=8 ' limit
        NumCh=0
endif
```

**Example Download**

# 8 CanOpen Management

The NGWARP board, can use, two Canopen lines. One line can be configured in SLAVE mode, and the management is demanded to System Operating.
The MASTER port, can use the PDO programmable by CanOpen configuurator.(see Canopen Configurator - Link Chapr. 14)

## 8.1 PXCO_SDODL

This function allows to send data to a node of the canopen net using the protocol SDO. It is supported only the SDO EXPEDITED mode allowing to send up to 4byte of data length.

**Syntax**
PXCO_SDODL(node **as char**, index **as int**,subidx **as uchar**,len **as long**,data **as *char**) **as char**

***Parameters***

| | |
|---|---|
| **Node** | Node ID of the SLAVE to whch send data |
| **Index, subindex** | Address in the Object-Dictionary of the data to be written |
| **Len** | Number of bytes to send |
| ***data** | Pointer to the data to send |

**Return value**
**char** **0** No error
**<>0** Communication error
=**2** The node responded with a SDO ABORT CODE, calling the function ***read_sdoac*** in the system variables _SYSTEM_SDOAC0 e _SYSTEM_SDOAC0 will be available the relative error code.

**WARNING**
**Do not use this function in TASK PLC**

## 8.2 PXCO_SDOUL

This function allows to read data from a node of the canopen net using the protocol SDO. It is supported only the SDO EXPEDITED mode allowing to read up to 4byte of data length.

**Syntax**
PXCO_SDOUL(node **as char**, index **as uint**,subidx **as uchar**,dati **as *char**) **as char**

***Parameters***

| | |
|---|---|
| **Node** | Node ID of the SLAVE to whch send data |
| **Index, subindex** | Address in the Object-Dictionary of the data to be written |
| ***data** | Pointer to the data to send |

**Return value**
**char** **0** No error
**<>0** Communication error
=**2** The node responded with a SDO ABORT CODE, calling the function ***read_sdoac*** int the system variables _SYSTEM_SDOAC0 e _SYSTEM_SDOAC0 will be available the relativeerror code.

**WARNING**
**Do not use this function in TASK PLC**

## 8.3 READ_SDOAC

Reading of the SDO ABORT CODE sended by a node in the canopen net as answer to a request done with the function PXCO_SDODL or PXCO_SDOUL. The read code will be written in the system variables _SYSTEM_SDOAC0 e _SYSTEM_SDOAC1. Refer to the DS301 specific of the CAN OPEN for the code error values.

**Syntax**

**READ_SDOAC**() **as void**

## 8.4 PXCO_SEND

Sending of a CAN frame at low level. This function allows to send in the net a CAN frame with a desired COB-ID and DATS. For example it's possible to send manually PDO frames, HEART-BEAT frames, etc.
Should be specified the manage of PDO is managed AUTOMATICALLY by the CANOPEN CONFIGURATOR.

**Syntax**

**PXCO_SEND(**id **as int**, Len **as char**,Dati **as *char**) **as char**

***Parameters***

| | |
|---|---|
| **id** | COB-ID value |
| **Len** | Number of data to send |
| ***Data** | Pointer to the data buffer |

**Return value**

| | | |
|---|---|---|
| **char** | **0** | No error |
| | **<>0** | Communication error |

## 8.5 PXCO_NMT

Sending of a NMT frame of the CAN OPEN. NMT protocol allows to set the state of the nodes in the net. Remind that all the nodes correctly configured (canopen configurator) are automatically set in START state.

**Syntax**

**PXCO_NMT(**state **as char**, node **as char) as char**

***Parameters***

| | |
|---|---|
| **state** | State to set:<br>1 = START NODE<br>2 = STOP NODE<br>128 = PRE-OPERATIONAL<br>129 = RESET NODE<br>130 = RESET COMUNICATION |
| **node** | Number of the node |

**Return value**

| | | |
|---|---|---|
| **char** | **0** | No error |
| | **<>0** | Communication error |

**WARNING**
**Do not use this function in TASK PLC**

## 8.6 READ_EMCY

Reads the last EMERGENCY OBJECT frame sended by a CAN OPEN node.
The emergency code is written in the system array _SYSTEM_EMCY(8) and it will contain all the 8 bytes of the EMERGENCY OBJECT frame as from the DS301 specific of the CAN OPEN. Usually it is called cyclically. The emergency code depends by type of connected device, therefore refer to its manual.

**Syntax**

READ_EMCY() as char

**Return Value**

| | | |
|---|---|---|
| **char** | **0** | No error |
| | **<>0** | Node that generated the emergency object. |

| **_SYSTEM_EMCY** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| **Emergency Error Code** | | **Error Register** | **Manufacturer specific Error Code** | | | | |

⚠ **WARNING**

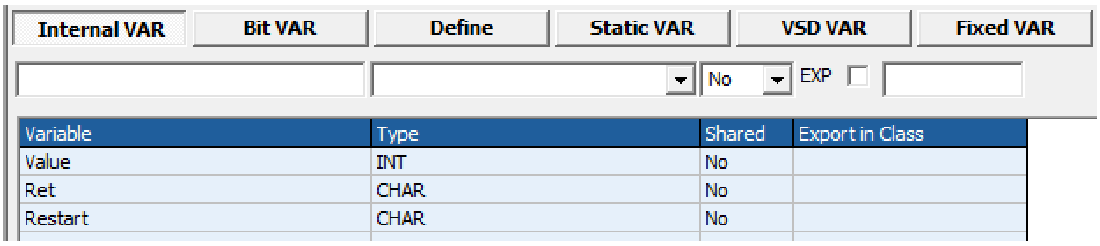
**The system doesn't buffer more than one message, then if more EMERGENCY OBJECT are sended along a single task plc, only the last will be read.**

**An EMERGENCY OBJECT does not mean that there is actually a node in an emergency. The DS301 specific provide that an EMERGENCY OBJECT are send also on alarm reset. Furthermore some devices can be send this frame at start up.**

## 8.7 Example CanOpen Functions

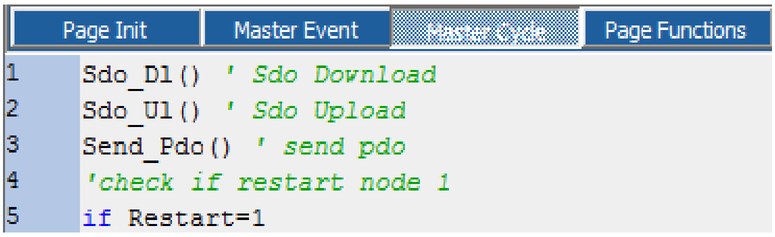
In the following example, are used the Canopen Functions.

**Variables used**



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| Value | INT | No | |
| Ret | CHAR | No | |
| Restart | CHAR | No | |

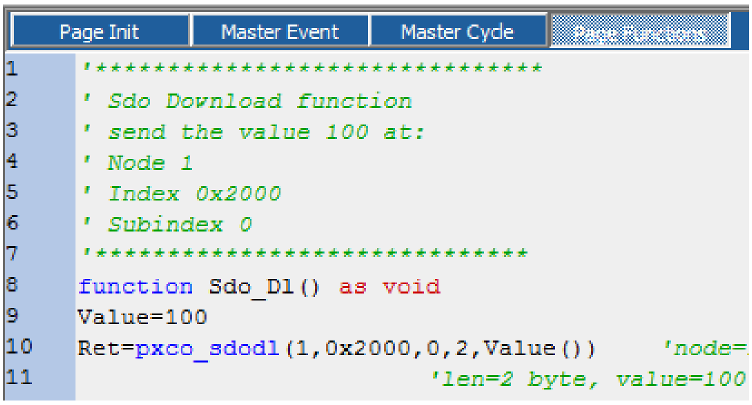
**Code in Master Ciclo Main**



```
Sdo_Dl() ' Sdo Download
Sdo_Ul() ' Sdo Upload
Send_Pdo() ' send pdo
'check if restart node 1
if Restart=1
```

```
Sdo_Dl() ' Sdo Download
Sdo_Ul() ' Sdo Upload
Send_Pdo() ' send  pdo
'check if restart node 1
if Restart=1
        Restart=0 ' reset flag restart
        Ret=pxco_nmt(1,1) ' Start Node
        if Ret<>0       'test error
                '...
        endif
endif

'polling emergency object
Ret=Read_emcy()
if Ret<>0
        ' in Ret node error
        ' in _SYSTEM_EMCY code error
endif
```

## Code in Main Page Functions



```
'*******************************
' Sdo Download function
' send the value 100 at:
' Node 1
' Index 0x2000
' Subindex 0
'******************************
function Sdo_Dl() as void
Value=100
Ret=pxco_sdodl(1,0x2000,0,2,Value())    'node=
                                'len=2 byte, value=100
```

```
'*******************************
' Sdo Download function
' send the value 100 at:
' Node 1
' Index 0x2000
' Subindex 0
'******************************
function Sdo_Dl() as void
Value=100
Ret=pxco_sdodl(1,0x2000,0,2,Value())'node=1, index=0x2000, subidx=0,
                                                 'len=2 byte, value=100
if Ret<>0               'test error
        if Ret=2
                read_sdoac()'Read SDO ABORT CODE
                'in _SYSTEM_SDOAC0 code error
                'in _SYSTEM_SDOAC1 code error
        endif
        '...
endif
endfunction

'*******************************
' Sdo Upload function
' read the value at:
' Node 1
' Index 0x2000
' Subindex 0
'******************************
function Sdo_Ul() as void
Ret=pxco_sdoul(1,0x2000,0,Value())       'node=1, index=0x2000, subidx=0,
                                                 'read in value
if Ret<>0               'test error
        if Ret=2
                read_sdoac()'Read SDO ABORT CODE
                'in _SYSTEM_SDOAC0 code error
                'in _SYSTEM_SDOAC1 code error
        endif
        '...
endif
endfunction
```

```
'*******************************
' Send PDO
' COB - ID = 0x201
' 2 Bytes
' SVariable in Value
'******************************
function Send_Pdo() as void
Value=100
Ret=pxco_send(0x201,2,Value())    'cob-id=0x201) 2 bytes
if Ret<>0            'test error
                     '...
endif
endfunction
```

Example Download

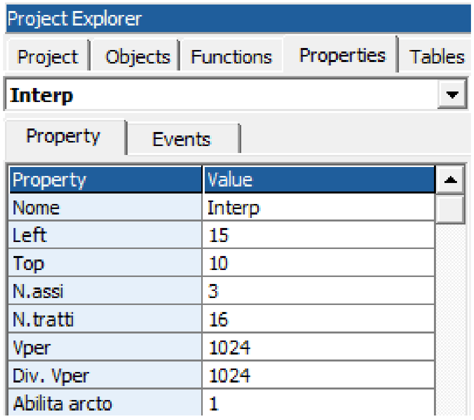
## 8.8 Example CanOpen Axes interpolation mode

In the following example, are managed 3 CanOpen Axes in linear interpolation.

**ATTENTION:**
All speed are managed in mm/min if setted the following parameters
**RapX,RapY,RapZ**
All axes target positions are managed in micron (0.001 mm)  if setted the following parameters
**RapX,RapY,RapZ**

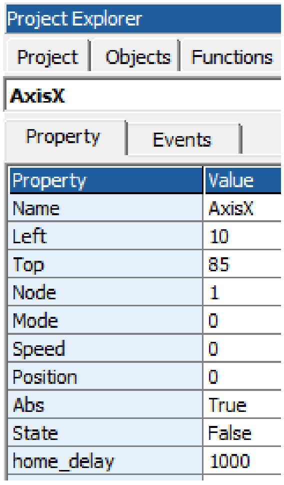
**Objects used**

***Motor Control → CobjInterpola → Interpolatore***

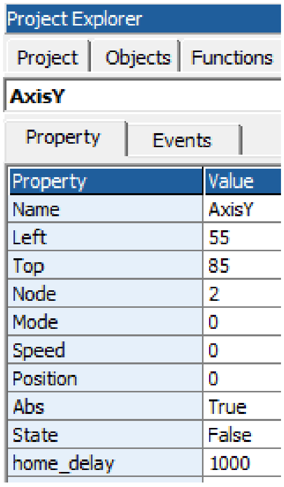


| Property | Value |
|---|---|
| Nome | Interp |
| Left | 15 |
| Top | 10 |
| N.assi | 3 |
| N.tratti | 16 |
| Vper | 1024 |
| Div. Vper | 1024 |
| Abilita arcto | 1 |

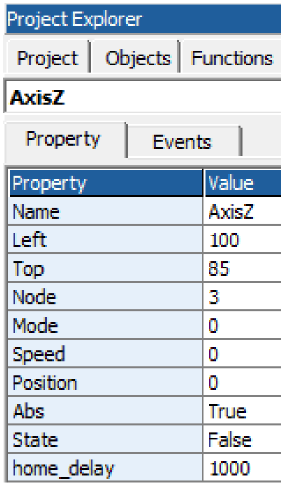
***Motor Control → CstdCanOpen → Ds402 x 3***



| Property | Value |
|---|---|
| Name | AxisX |
| Left | 10 |
| Top | 85 |
| Node | 1 |
| Mode | 0 |
| Speed | 0 |
| Position | 0 |
| Abs | True |
| State | False |
| home_delay | 1000 |



| Property | Value |
|---|---|
| Name | AxisY |
| Left | 55 |
| Top | 85 |
| Node | 2 |
| Mode | 0 |
| Speed | 0 |
| Position | 0 |
| Abs | True |
| State | False |
| home_delay | 1000 |



| Property | Value |
|---|---|
| Name | AxisZ |
| Left | 100 |
| Top | 85 |
| Node | 3 |
| Mode | 0 |
| Speed | 0 |
| Position | 0 |
| Abs | True |
| State | False |
| home_delay | 1000 |

**Are managed the following functions:**

***Wait_Move – Axes state movement***

***Parameters*** ***No***

***Return*** ***1 Axes in movement***

***0 Axes stop***

***Move_Axes – Move the Axes in linear interpolation***

***Parameters*** ***Vel → Feed Axes in mm/min***

***Flg → Set to 1 for disable the movements buffer***

***( Stop axes at end trajectory)***

***Set to 0 for enable the movements buffer***

***(Stop Axes only if edge > SGLP)***

***Px,Py,Pz → Axes target values in 0.001 mm***

***Return*** ***0 Movement inserted in the buffer – buffer empty***

***1 Buffer full (you must repeat Move_Axes up to when buffer empty)***

***Acc_Axes – Set interpolation Acceleration***

***Parameters*** ***Value → Value in count per TAU***

***Return*** ***No***

***Stop_Axes – Stop Axes***

***Parameters*** ***No***

***Return*** ***No***

***Enable_Axis_X_Y_Z – Enable the Axes control and preset at value 0***

***Parameters*** ***No***

***Return*** ***No***

***Disable_Axis_X_Y_Z – Disable the Axes control***

***Parameters*** ***No***

***Return*** ***No***

***cancfgerr – CanOpen Custom Error. This function is called at Canopen Node init (node setted in configuration by Canopen configurator) when the node, reply error***

***Parameters*** ***Node → Node number in error***

***Err → Error code***

***Return*** ***No***

***Close_cancfgerr - CanOpen Custom Error. This function is called at end Canopen nodes configuration***

***Parameters*** ***No***

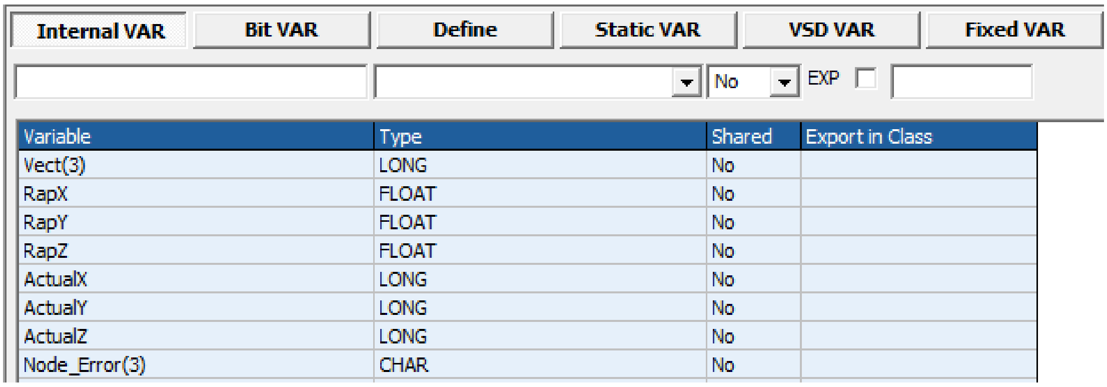
***Return*** ***No***

***Open_cancfgerr - CanOpen Custom Error. This function is called at start Canopen nodes configuration***

***Parameters*** ***Nodes → Nodes number in configuration***

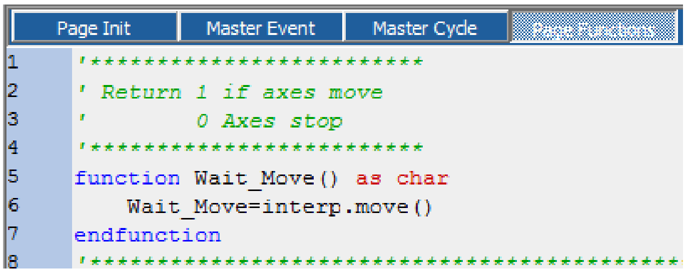
***Return*** ***No***

## Variables used



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| Vect(3) | LONG | No | |
| RapX | FLOAT | No | |
| RapY | FLOAT | No | |
| RapZ | FLOAT | No | |
| ActualX | LONG | No | |
| ActualY | LONG | No | |
| ActualZ | LONG | No | |
| Node_Error(3) | CHAR | No | |

## Code in Main Page Functions

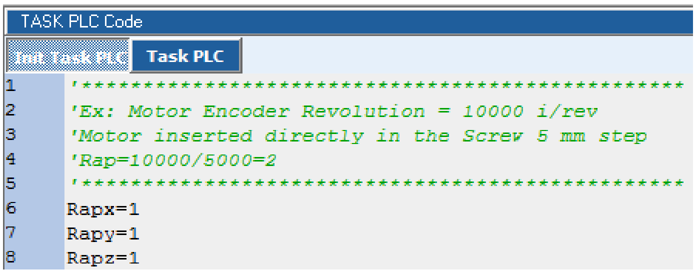


```
'*************************
' Return 1 if axes move
'         0 Axes stop
'*************************
function Wait_Move() as char
    Wait_Move=interp.move()
endfunction
'**********************************************
```

```
'*************************
' Return 1 if axes move
'      0 Axes stop
'*************************
function Wait_Move() as char
        Wait_Move=interp.move()
endfunction

'*******************************************************
' Move Axes
' Vel= interp vel Axes in mm/min
' Flg if 1 move without buffer
'      0 move in buffer mode
' Px,Py,Pz Axes value in 0.001 mm
'Return 1 if movement is inserted in the buffer
'     0 The movement is not inserted in the buffer
'       in this case, is necessary reload the movement
'*******************************************************
function Move_Axes(Vel as long, Flg as char, Px as long, Py as long,Pz as long) as char
        Vel=Vel*TAU/60 ' Transform in mm/min
        Vect(0)=Px
        Vect(1)=Py
        Vect(2)=Pz
        Move_Axes=interp.moveto(Vel, Flg, Vect())
endfunction

'*******************************************************
' Set ACC
' Value Acc value in count
'*********************************************************
function Acc_Axes(Value as long) as void
            interp.acc=Value
endfunction
'*********************************************************
' Stop Axes
'*********************************************************
function Stop_Axes() as void
            interp.stop()
endfunction
'*******************
' Axis X enable
'*******************
function Enable_X() as void
AxisX.modo=0 ' remove interpolation mode
AxisX.start=0 ' stop PDO Qx
'Preset Axis X 0, not change y,z
Vect(0)=0
Vect(1)=interp.pc(1)
Vect(2)=interp.pc(2)
interp.preset(Vect())
AxisX.home=0 'preset driver
'enable axis
AxisX.enable=1
AxisX.start=1 ' start PDO Qx
AxisX.modo=2 ' set interpolation mode
endfunction
'*******************
' Axis X Disable
'*******************
function Disable_X() as void
AxisX.enable=0
endfunction

'*******************
' Axis Y enable
'*******************
function Enable_Y() as void
AxisY.modo=0 ' remove interpolation mode
AxisY.start=0 ' stop PDO Qx
'Preset Axis Y 0, not change x,z
Vect(0)=interp.pc(0)
Vect(1)=0
Vect(2)=interp.pc(2)
interp.preset(Vect())
AxisY.home=0 'preset driver
'enable axis
AxisY.enable=1
AxisY.start=1 ' start PDO Qx
AxisY.modo=2 ' set interpolation mode
endfunction

'*******************
' Axis Y Disable
```

```
'*******************
function Disable_Y() as void
AxisY.enable=0
endfunction

'*******************
' Axis Z enable
'*******************
function Enable_Z() as void
AxisZ.modo=0 ' remove interpolation mode
AxisZ.start=0 ' stop PDO Qx
'Preset Axis Z 0, not change x,y
Vect(0)=interp.pc(0)
Vect(1)=interp.pc(1)
Vect(2)=0
interp.preset(Vect())
AxisZ.home=0 'preset driver
'enable axis
AxisZ.enable=1
AxisZ.start=1       ' start PDO Qx
AxisZ.modo=2        ' set interpolation mode
endfunction

'*******************
' Axis Z Disable
'*******************
function Disable_Z() as void
AxisZ.enable=0
endfunction

'***********************
' Error check
' CanOpen node
'***********************
function cancfgerr(node as int,err as uchar) as void
Node_Error(node)=err ' copy the code error
endfunction
'***********************
' Close init CanOpen
'***********************
function close_cancfgerr() as void
endfunction
'***********************
' Custom error init
' CanOpen node
'***********************
function open_cancfgerr(nodes as int) as void
' Reset nodes  status error
Node_Error(0)=0
Node_Error(1)=0
Node_Error(2)=0
endfunction
```

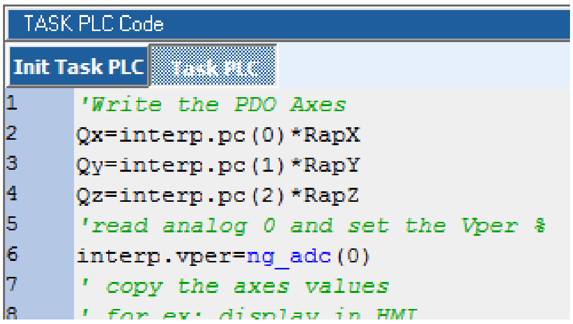
## Code in Init Task PLC



```
'****************************************************
'Ex: Motor Encoder Revolution = 10000 i/rev
'Motor inserted directly in the Screw 5 mm step
'Rap=10000/5000=2
'****************************************************
Rapx=1
Rapy=1
Rapz=1
```

```
'****************************************************
'Ex: Motor Encoder Revolution = 10000 i/rev
'Motor inserted directly in the Screw 5 mm step
'Rap=10000/5000=2
'****************************************************
Rapx=1
Rapy=1
Rapz=1
```

## Code in  Task PLC



```
'Write the PDO Axes
Qx=interp.pc(0)*RapX
Qy=interp.pc(1)*RapY
Qz=interp.pc(2)*RapZ
'read analog 0 and set the Vper %
interp.vper=ng_adc(0)
' copy the axes values
' for ex: display in HMI
```

```
'Write the PDO Axes
Qx=interp.pc(0)*RapX
Qy=interp.pc(1)*RapY
Qz=interp.pc(2)*RapZ
'read analog 0 and set the Vper %
interp.vper=ng_adc(0)
' copy the axes values
' for ex: display in HMI
' value in 0.001 mm
ActualX=interp.pc(0)
ActualY=interp.pc(1)
ActualZ=interp.pc(2)
```

Example Download

## 8.9 Example CanOpen Axes position mode

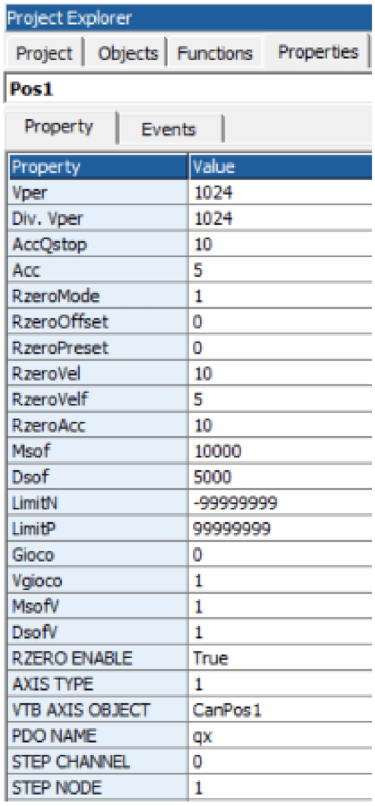
In the following example, are management, a CanOpen Axis by VTB OBJECT
See doc Vtb Object Guide for more informations.

**WARNING:**
All speed are managed in mm/min if setted the following parameters:
**MSOF e DSOF**
All axes target positions are managed in micron (0.001 mm)  if setted the following parameters:
**MSOF e DSOF**

**Objects used:**

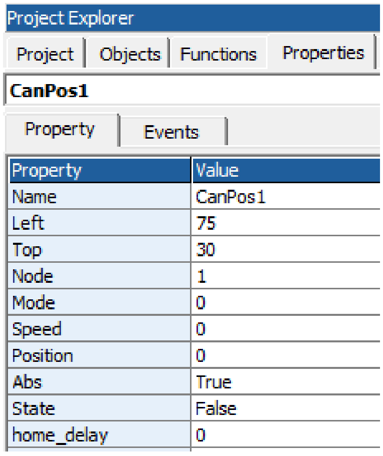
OBJ POS CiA DS402

***Motor Control Plus → CobjPos → Posizionatore***



| Property | Value |
|---|---|
| Vper | 1024 |
| Div. Vper | 1024 |
| AccQstop | 10 |
| Acc | 5 |
| RzeroMode | 1 |
| RzeroOffset | 0 |
| RzeroPreset | 0 |
| RzeroVel | 10 |
| RzeroVelf | 5 |
| RzeroAcc | 10 |
| Msof | 10000 |
| Dsof | 5000 |
| LimitN | -99999999 |
| LimitP | 99999999 |
| Gioco | 0 |
| Vgioco | 1 |
| MsofV | 1 |
| DsofV | 1 |
| RZERO ENABLE | True |
| AXIS TYPE | 1 |
| VTB AXIS OBJECT | CanPos1 |
| PDO NAME | qx |
| STEP CHANNEL | 0 |
| STEP NODE | 1 |

### *Motor Control → CstdCanOpen → Ds402*



| Property | Value |
|---|---|
| Name | CanPos1 |
| Left | 75 |
| Top | 30 |
| Node | 1 |
| Mode | 0 |
| Speed | 0 |
| Position | 0 |
| Abs | True |
| State | False |
| home_delay | 0 |

**Are managed the following functions:**

### *Wait_Move – Axis state movement*

| | |
|---|---|
| *Parameters* | *No* |
| *Return* | *1 Axis in movement*<br>*0 Axes stop* |

### *Move_Axis – Move the Axis*

| | |
|---|---|
| *Parameters* | *Vel → Feed Axes in mm/min*<br>*Flg → Set to 1 for disable the movements buffer*<br>*( Stop axes at end trajectory)*<br>*Set to 0 for enable the movements buffer*<br>*Px, → Axes target values in 0.001 mm* |
| *Return* | *0 Movement inserted in the buffer – buffer empty*<br>*1 Buffer full (you must repeat Move_Axes up to when buffer empty)* |

### *Acc_Axis – Set Acceleration*

| | |
|---|---|
| *Parameters* | *Value → Value in count per TAU* |
| *Return* | *No* |

### *Stop_Axis – Stop Axes*

| | |
|---|---|
| *Parameters* | *No* |
| *Return* | *No* |

### *Enable – Enable the Axis control and preset at value 0*

| | |
|---|---|
| *Parameters* | *No* |
| *Return* | *No* |

### *Disable – Disable the Axes control*

| | |
|---|---|
| *Parameters* | *No* |
| *Return* | *No* |

### *StartHome – Start homing - Vel in pos1.rzerovel and pos1.rzerovelf*

| | |
|---|---|
| *Parameters* | *No* |
| *Return* | *No* |

### *CheckHome – Check homing state*

| | |
|---|---|
| *Parameters* | *No* |
| *Return* | *1 homing finished* |

### *StopHome – Stop homing*

| | |
|---|---|
| *Parameters* | *No* |
| *Return* | *No* |

### *cancfgerr – CanOpen Custom Error. This function is called at Canopen Node init (node setted in configuration by Canopen configurator) when the node, reply error*

| | |
|---|---|
| *Parameters* | *Node → Node number in error*<br>*Err → Error code* |
| *Return* | *No* |

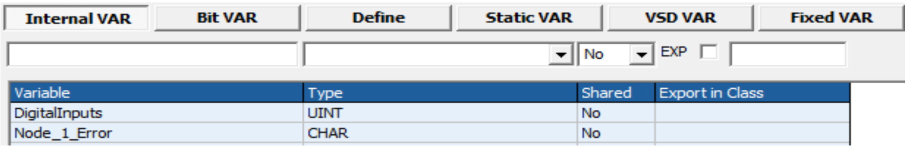
### *Close_cancfgerr - CanOpen Custom Error. This function is called at end Canopen nodes configuration*

| | |
|---|---|
| *Parameters* | *No* |
| *Return* | *No* |

### *Open_cancfgerr - CanOpen Custom Error. This function is called at start Canopen nodes configuration*

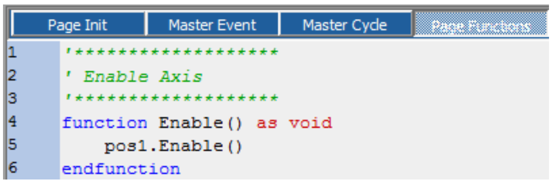
| | |
|---|---|
| *Parameters* | *Nodes → Nodes number in configuration* |
| *Return* | *No* |

## Variables used



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| DigitalInputs | UINT | No | |
| Node_1_Error | CHAR | No | |

## Code in Main Page Functions

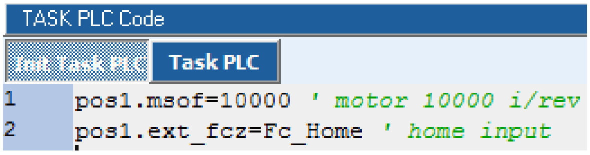


```
'*******************
' Enable Axis
'*******************
function Enable() as void
    pos1.Enable()
endfunction
```

```
'*******************
' Enable Axis
'*******************
function Enable() as void
            pos1.Enable()
endfunction
'*******************
' Disable Axis
'*******************
function Disable() as void
            pos1.Disable()
endfunction
'*******************
' Preset Axis
'*******************
function Preset(Val as long) as void
            pos1.Preset(Val)
endfunction
'*************************
' Return 1 if axis move
'       0 Axis stop
'*************************
function Wait_Move() as char
            Wait_Move=pos1.move()
endfunction
'*******************
' Axis Stop Move
'*******************
function Stop() as void
            pos1.Stop()
endfunction
'*****************************
' Start Homing
' Homing input see in task plc
'*****************************
function StartHome() as void
            pos1.StartHome()
endfunction
'*****************************
```

```
' Check if homing finished
' Return 1 if finished
'*****************************
function CheckHome() as char
        CheckHome=pos1.status_home
endfunction
'*****************************
' Stop home function
'*****************************
function StopHome() as void
        pos1.StopHome()
endfunction
'**********************************************************
' Move Axis
' Vel=  vel Axis in mm/min
' Flg if 1 move without buffer
'       0 move in buffer mode
' Px  Axis value in 0.001 mm
'Return 1 if movement is inserted in the buffer
'       0 The movement is not inserted in the buffer
'        in this case, is necessary reload the movement
'**********************************************************
function Move_Axis(Vel as long, Flg as char, Px as long) as char
        Vel=Vel*TAU/60 ' Transform in mm/min
        Move_Axis=pos1.moveto(Vel, Flg, Px)
endfunction
'**********************************************************
' Set ACC
' Value Acc value in count
'**********************************************************
function Acc_Axis(Value as long) as void
        pos1.acc=Value
endfunction
'***********************
' Error check
' CanOpen node
'***********************
function cancfgerr(node as int,err as uchar) as void
Node_1_Error=err ' copy the code error
endfunction
'***********************
' Close init CanOpen
'***********************
function close_cancfgerr() as void
endfunction
'***********************
' Custom error init
' CanOpen node
'***********************
function open_cancfgerr(nodes as int) as void
' Reset node 1 status error
Node_1_Error=0
endfunction
```

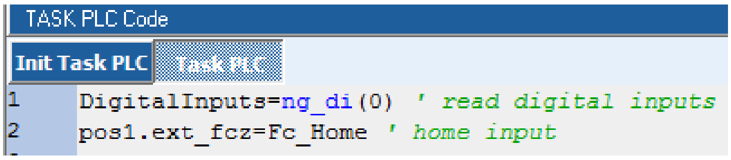
## Code in Init Task PLC



```
pos1.msof=10000 ' motor 10000 i/rev
pos1.ext_fcz=Fc_Home ' home input
```

```
pos1.msof=10000 ' motor 10000 i/rev
pos1.dsof=5000 ' 5 mm per revolution motor
```

**Code in  ask PLC**



```
DigitalInputs=ng_di(0) ' read digital inputs
pos1.ext_fcz=Fc_Home ' home input
```

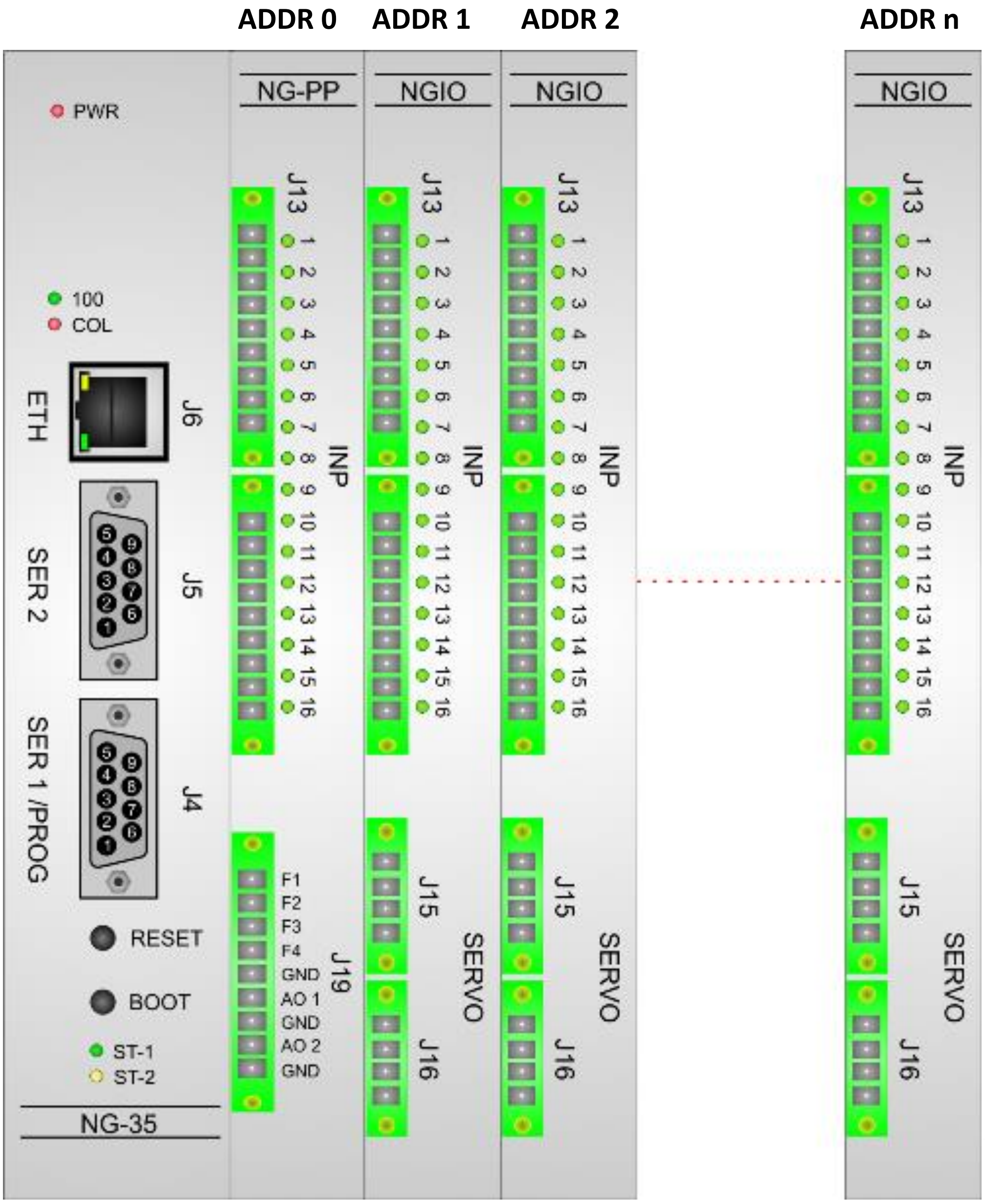
DigitalInputs=ng_di(0) **' read digital inputs**
pos1.ext_fcz=Fc_Home **' home input**

**Example Download**

# 9 NGIO-NGPP Addressing

Inside to NGWARP, can be included, expansions boards NGIO and NGPP
These expansions boards, are managed by VTB functions with phisical address from 0 to 7
This address is automatically assigned by local position in the BUS
The expansion board more near to NGWARP CPU, takes the address 0, the next, address 1 etc.

| Address | Expansion Nr |
|---|---|
| 0 | Board 0 (near to NGWARP) |
| 1 | Board 1 |
| 2 | Board 2 |
| 3 | Board 3 |
| 4 | Board 4 |
| 5 | Board 5 |
| 6 | Board 6 |
| 7 | Board 7 |



# 10 Digital I/O on NGIO-NGPP

The NGIO and NGPP expansions boards, allows to use 16 digital inputs and 14 digital outputs, management by VTB functions. About addressing see chapr. 8

## 10.1 NG_DI – Read Digital Inputs

Read the Digital Inputs state.
The Digital Inputs are bit mapped – from 0 to 15

| **Input** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bit** | **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |

**Syntax**

**NG_DI**(CardNumber **as Char**) **as uint**

***Parameters***

**CardNumber** Expansion number (from 0 to 7 see chapr. 8)

**Return Value**

**Uint** Value - 16 inputs bit mapped
**bit = 1 → Input ON**
**bit = 0 → Input OFF**

## 10.2 NG_DO – Writ Digital Outputs

Writes the digital outputs state
The Digital Outputs are bit mapped – from 0 to 14

| **Output** | | **14** | **13** | **12** | **11** | **10** | **9** | | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bit** | 15 | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |

**WARNING**
**BIT 8 and 15 ARE NOT USED**

**Syntax**

**NG_DO**(CardNumber **as Char,** StatoOutputs **as Uint**) **as void**

***Parameters***

**CardNumber** Expansion number (from 0 to 7 see chapr. 8)
**StatoOutputs** Output state
**bit = 1 → Output ON**
**bit = 0 → Output OFF**

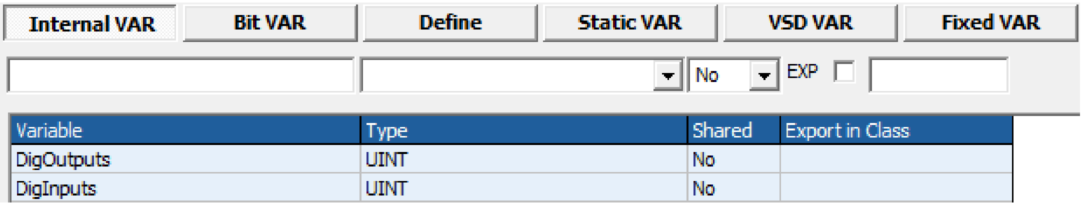
## 10.3 Example Digital I/O

In the next  example, are managed the Digital I/O in the following mode:

**UPDATING I/O IN TASK PLC**

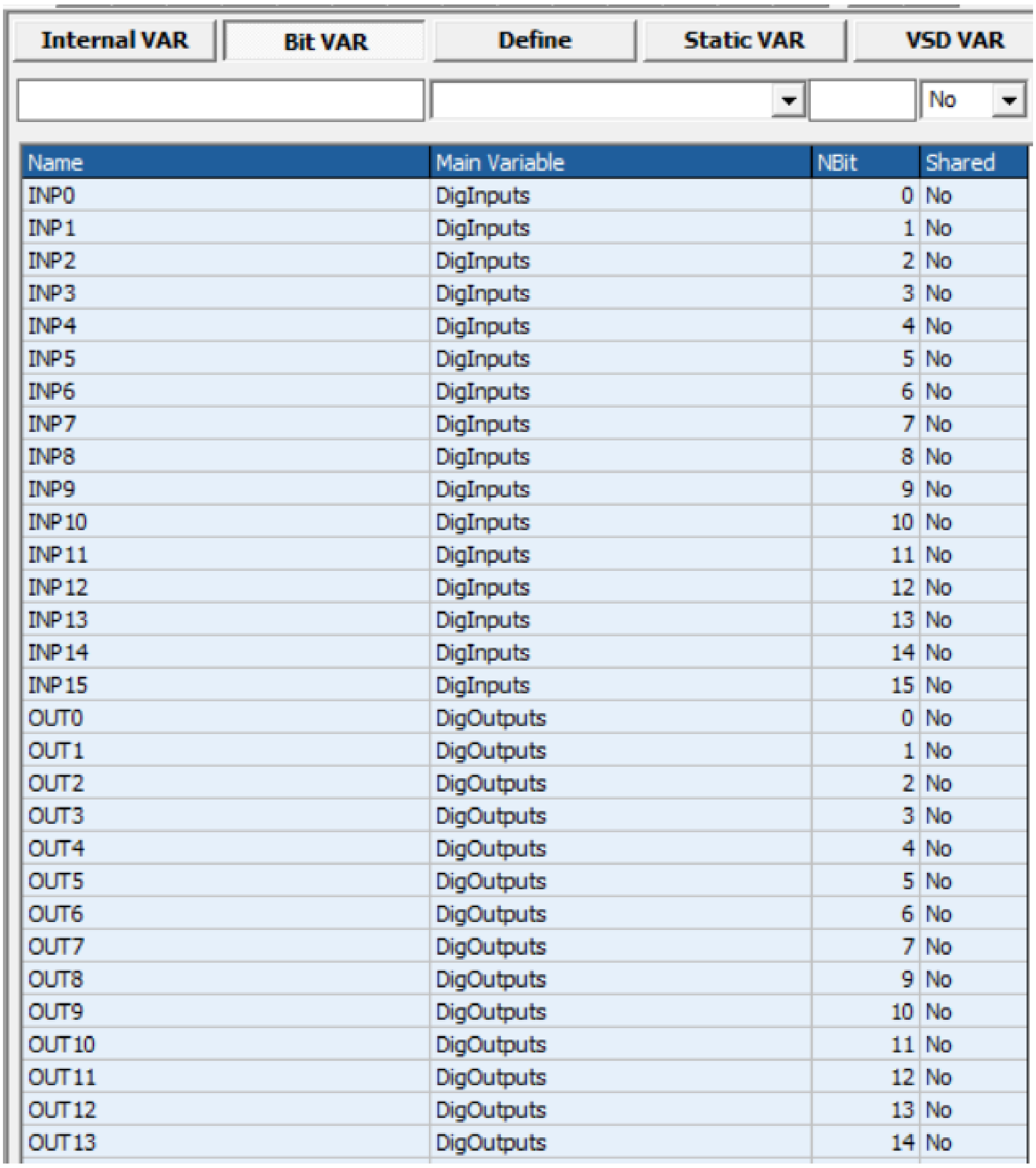
Management I/O in bit mode. The first 3 inputs are copied in the first 3 outpts

**Variables used**



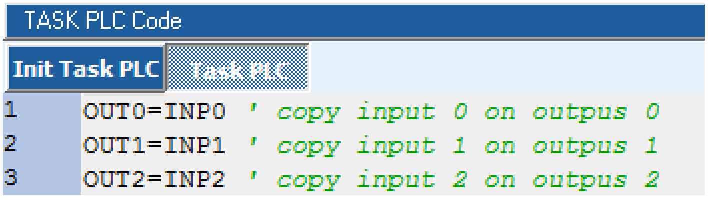
| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| DigOutputs | UINT | No | |
| DigInputs | UINT | No | |

**BIT Used**



| Name | Main Variable | NBit | Shared |
|---|---|---|---|
| INP0 | DigInputs | 0 | No |
| INP1 | DigInputs | 1 | No |
| INP2 | DigInputs | 2 | No |
| INP3 | DigInputs | 3 | No |
| INP4 | DigInputs | 4 | No |
| INP5 | DigInputs | 5 | No |
| INP6 | DigInputs | 6 | No |
| INP7 | DigInputs | 7 | No |
| INP8 | DigInputs | 8 | No |
| INP9 | DigInputs | 9 | No |
| INP10 | DigInputs | 10 | No |
| INP11 | DigInputs | 11 | No |
| INP12 | DigInputs | 12 | No |
| INP13 | DigInputs | 13 | No |
| INP14 | DigInputs | 14 | No |
| INP15 | DigInputs | 15 | No |
| OUT0 | DigOutputs | 0 | No |
| OUT1 | DigOutputs | 1 | No |
| OUT2 | DigOutputs | 2 | No |
| OUT3 | DigOutputs | 3 | No |
| OUT4 | DigOutputs | 4 | No |
| OUT5 | DigOutputs | 5 | No |
| OUT6 | DigOutputs | 6 | No |
| OUT7 | DigOutputs | 7 | No |
| OUT8 | DigOutputs | 9 | No |
| OUT9 | DigOutputs | 10 | No |
| OUT10 | DigOutputs | 11 | No |
| OUT11 | DigOutputs | 12 | No |
| OUT12 | DigOutputs | 13 | No |
| OUT13 | DigOutputs | 14 | No |

**Code in Task PLC**



```
OUT0=INP0 ' copy input 0 on outpus 0
OUT1=INP1 ' copy input 1 on outpus 1
OUT2=INP2 ' copy input 2 on outpus 2
```

```
OUT0=INP0 ' copy input 0 on outpus 0
OUT1=INP1 ' copy input 1 on outpus 1
OUT2=INP2 ' copy input 2 on outpus 2
DigInputs=ng_di(0) ' udpate digital inputs
ng_do(0,DigOutputs) ' update digital outputs
```

**Example Download**

# 11 Analog Outputs and relè outputs NGIO-NGPP

The expansion boards NGIO and NGPP, manage 2 Analog Outputs +/- 10 V 12 bit.
The NGIO can manage 2 relè outputs up to 1 A.

## 11.1 NG_DAC – Write Analog Outputs NGIO-NGPP

This function allows to update the analog outputs of each channel equipped in the NGWARP expansions **NG-IO** and **NG-PP**. These expansions have a digital to analog converter at 12 bit, with a range of +/-10V. Therefore a value of +2047 corresponds to 10V in output, a value of -2047 corresponds to -10V.
The selection of the channel is made by an index from 0 to 7, each expansion manages two channels:

| Index Channel | Expansion Addr |
|---|---|
| 0 | Board 0 |
| 1 | |
| 2 | Board 1 |
| 3 | |
| 4 | Board 2 |
| 5 | |
| 6 | Board 3 |
| 7 | |

**The maximum number of analog outputs is 8.**

**Syntax**

NG_DAC(Channel as Char, Val as Long) as void

***Parameters***

**Channel** Number of channel (from 0 to 7)
**val** Analog output value (from -2047 to +2047)

## 11.2 NG_DAC_CAL - CALIBRATION OF THE ANALOG OUTPUT OFFSET

This function allows to calibrate the OFFSET of the analog outputs. Usually it can be occur that the analog output has a little value of voltage (OFFSET) in the order of mV also if zero has been set. With ***ng_dac_cal*** we can null this voltage setting a value opposite to the offset one. Remind that for each unit the output value will be about 4mV.

**Syntax**

NG_DAC_CAL(Channel as Char, Offset as Long) as void

***Parameters***

**Channel** Numero Canale ( from 0 to 7)
**Offset** OFFSET value ( from -2047 to +2047)

⚠ **WARNING**
**THE OFFSET VALUE ISN'T SAVED AND IT MUST BE SET AT EACH TURN-ON.**
**Save this value in NGWARP memory flash or static**

## 11.3 NG_RELE - RELE' on NGIO

This function allows to update the two RELAIS equipped in each expansion card **NG-IO**.
Usually these RELAIS are connected to the input ENABLE of the SERVO DRIVER but they can be managed for any applications.
The channel selection is made as for the reading of encoders.

| Index Channel | Expansion Addr |
|---|---|
| **0** | **Board 0** |
| **1** | |
| **2** | **Board 1** |
| **3** | |
| **4** | **Board 2** |
| **5** | |
| **6** | **Board 3** |
| **7** | |
| **.....** | .... |
| **14** | **Board 7** |
| **15** | |

**Syntax**

**NG_RELE(**Channel **as Char**, State **as Char**) **as void**

***Parameters***

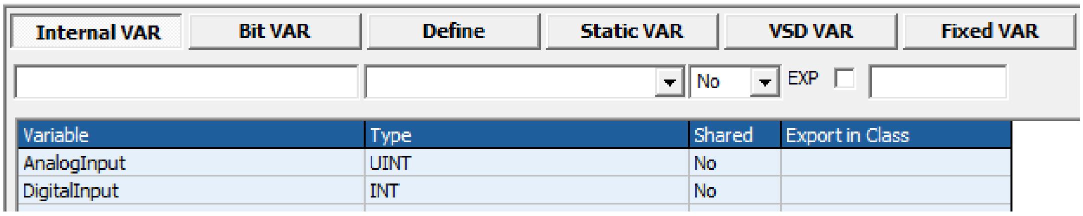
**Channel** Number of channel (from 0 to 15)

**State** State of the relay:
0 OFF (contact opened)
1 ON (contact closed)

## 11.4 Example Analog Outputs and relè outputs

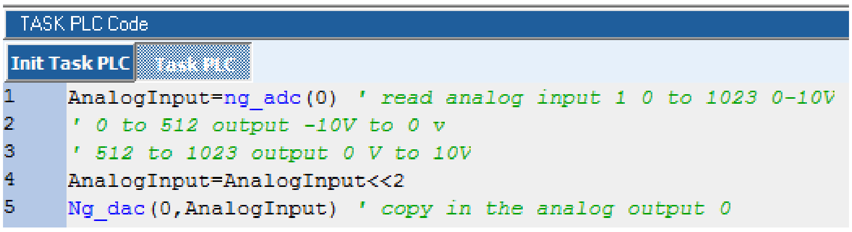
In the next examople, are managed the analog outputs and relè
Is read the analog input 0 and copied in the analog output 0.
The digital input 1 is copied in the relè output

**Variables used**



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| AnalogInput | UINT | No | |
| DigitalInput | INT | No | |

**Code in Task PLC**



```
AnalogInput=ng_adc(0) ' read analog input 1 0 to 1023 0-10V
' 0 to 512 output -10V to 0 v
' 512 to 1023 output 0 V to 10V
AnalogInput=AnalogInput<<2
Ng_dac(0,AnalogInput) ' copy in the analog output 0
```

```
AnalogInput=ng_adc(0) ' read analog input 1 0 to 1023 0-10V
' -512 0 output -10V to 0 v
' 0 512 output 0 V to 10V
AnalogInput=AnalogInput-1024
Ng_dac(0,AnalogInput) ' copy in the analog output 0
DigitalInput=ng_di(0) ' read digital input
if DigitalInput & 1 ' test input 1
        ng_rele(0,1) ' set rele'
else
        ng_rele(0,0) ' reset rele'
endif
```

**Example Download**

# 12 Encoder and Index Read NGIO

The expansions boards NGIO, allows to use 2 incremental channels encoder line and 2 Index zero encoder.

## 12.1 NG_ENC – READ CHANNEL ENCODER

This function allows to read the quadrature encoder input of each channel equipped on the expansion card **NG-IO.** The resolution is 32 bits. This function read only the increment which will be added to a variable passed by its pointer. Therefore the real encoder counter will be contained in a variable defined in the application and it will can be zeroed in any time. For a correct processing of the encoders we recommend to use this function only in TASK PLC and then use it at the occurrence.
The selection of the channel is made by an index from 0 to 15, each expansion manages two channels:

| Index Channel | Expansion Addr |
|---|---|
| **0** | **Board 0** |
| **1** | |
| **2** | **Board 1** |
| **3** | |
| **4** | **Board 2** |
| **5** | |
| **6** | **Board 3** |
| **7** | |
| **…..** | …. |
| **14** | **Board 7** |
| **15** | |

**Syntax**

NG_ENC(Channel as Char, Value as *Long) as void

***Parameters***

**Channel** Number of channel (from 0 to 15)
**Value** Pointer to a long variable where will be contained the counter

**WARNING**
**FOR A SINCRONOUS FUNCTION, USE ONLY IN TASK PLC**

## 12.2 NG-T0 - ZERO INDEX OF ENCODER

This function allows to read the state of the zero index input of each encoder channel equipped in the expansion card **NG-IO**. The channel selection is made as for the reading of encoders.

**Syntax**

NG_T0(Channel as Char) as char

***Parameters***

**Channel** Number of channel (from 0 to 15)

**Return Value**

*State of the index input:*

***0 OFF***

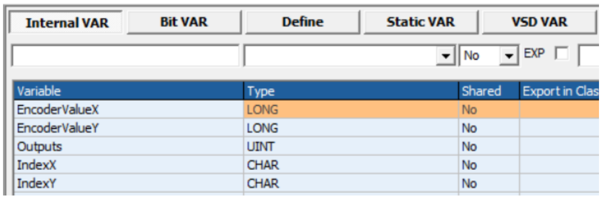
***1 ON***

**On hardware  NGIO 2.0, is more performance, read the INDEX ENCODER by** **FAST INPUT see CHAPR 12**

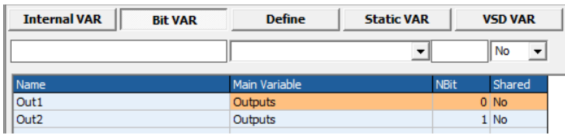
## 12.3 Example Read Encoder NGIO and Index

In this example, are read 2 channel encoder and 2 Index to NGIO Addr 0

**Variables used**

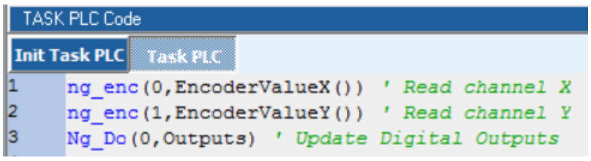


| Variable | Type | Shared | Export in Clas |
|---|---|---|---|
| EncoderValueX | LONG | No | |
| EncoderValueY | LONG | No | |
| Outputs | UINT | No | |
| IndexX | CHAR | No | |
| IndexY | CHAR | No | |



| Name | Main Variable | NBit | Shared |
|---|---|---|---|
| Out1 | Outputs | 0 | No |
| Out2 | Outputs | 1 | No |

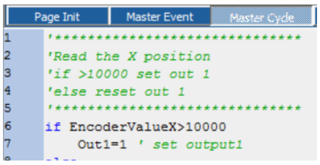
**Code in Task PLC**



```
ng_enc(0,EncoderValueX())  ' Read channel X
ng_enc(1,EncoderValueY())  ' Read channel Y
Ng_Do(0,Outputs)  ' Update Digital Outputs
```

```
ng_enc(0,EncoderValueX()) ' Read channel X
ng_enc(1,EncoderValueY()) ' Read channel Y
Ng_Do(0,Outputs) ' Update Digital Outputs
```

**Codice in Task MAIN**



```
'*******************************
'Read the X position
'if >10000 set out 1
'else reset out 1
'*******************************
if EncoderValueX>10000
    Out1=1  ' set output1
```

```
'*******************************
'Read the X position
'if >10000 set out 1
'*******************************
if EncoderValueX>10000
            Out1=1 ' set output1
else
            Out1=0 ' reset output1
endif
'*******************************
'Read the Y position
'if >5000 set out 2
'*******************************
if EncoderValueY>5000
            Out2=1 ' set output2
else
            Out2=0 ' reset output2
endif
IndexX=ng_t0(0) 'read index X
IndexY=ng_t0(1) 'read index Y
```

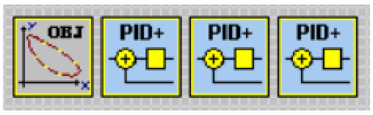
**Example Download**

## 12.4 Example Analog Axes in Interpolation Mode

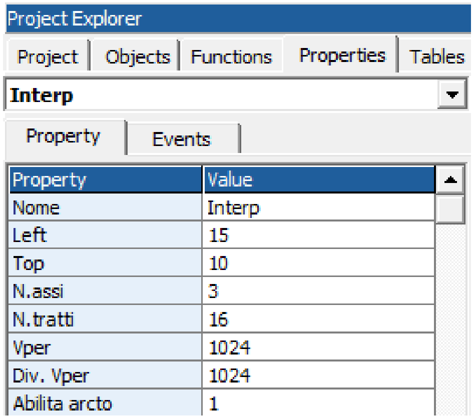
In the following example, are managed, 3 Analog Axes +/- 10V with encoder Loop and PID filter. In linear interpolation.

**WARNING:**
**ATTENTION:**
All speed are managed in mm/min if setted the following parameters
**RapX,RapY,RapZ**
All axes target positions are managed in micron (0.001 mm)  if setted the following parameters
**RapX,RapY,RapZ**

**Objects used:**

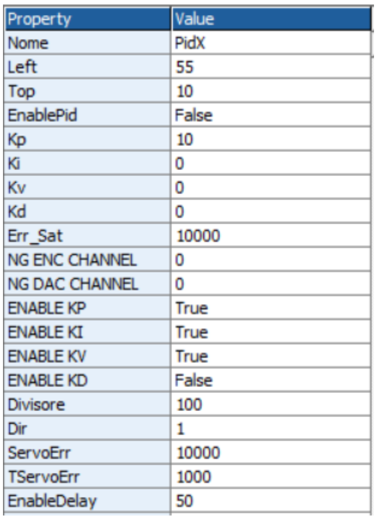


***Motor Control → CobjInterpola → Interpolatore***

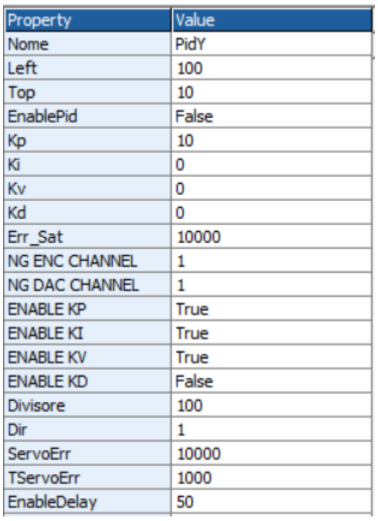


| Property | Value |
|---|---|
| Nome | Interp |
| Left | 15 |
| Top | 10 |
| N.assi | 3 |
| N.tratti | 16 |
| Vper | 1024 |
| Div. Vper | 1024 |
| Abilita arcto | 1 |

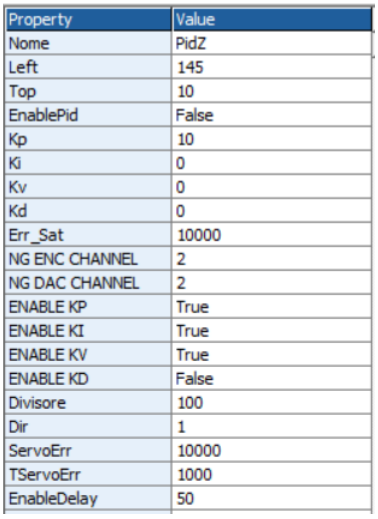
***Motor Control  Plus→ CPidPlus →  Pid NG***



| Property | Value |
|---|---|
| Nome | PidX |
| Left | 55 |
| Top | 10 |
| EnablePid | False |
| Kp | 10 |
| Ki | 0 |
| Kv | 0 |
| Kd | 0 |
| Err_Sat | 10000 |
| NG ENC CHANNEL | 0 |
| NG DAC CHANNEL | 0 |
| ENABLE KP | True |
| ENABLE KI | True |
| ENABLE KV | True |
| ENABLE KD | False |
| Divisore | 100 |
| Dir | 1 |
| ServoErr | 10000 |
| TServoErr | 1000 |
| EnableDelay | 50 |



| Property | Value |
|---|---|
| Nome | PidY |
| Left | 100 |
| Top | 10 |
| EnablePid | False |
| Kp | 10 |
| Ki | 0 |
| Kv | 0 |
| Kd | 0 |
| Err_Sat | 10000 |
| NG ENC CHANNEL | 1 |
| NG DAC CHANNEL | 1 |
| ENABLE KP | True |
| ENABLE KI | True |
| ENABLE KV | True |
| ENABLE KD | False |
| Divisore | 100 |
| Dir | 1 |
| ServoErr | 10000 |
| TServoErr | 1000 |
| EnableDelay | 50 |



| Property | Value |
|---|---|
| Nome | PidZ |
| Left | 145 |
| Top | 10 |
| EnablePid | False |
| Kp | 10 |
| Ki | 0 |
| Kv | 0 |
| Kd | 0 |
| Err_Sat | 10000 |
| NG ENC CHANNEL | 2 |
| NG DAC CHANNEL | 2 |
| ENABLE KP | True |
| ENABLE KI | True |
| ENABLE KV | True |
| ENABLE KD | False |
| Divisore | 100 |
| Dir | 1 |
| ServoErr | 10000 |
| TServoErr | 1000 |
| EnableDelay | 50 |

**Are managed the following functions:**

***Wait_Move – Axes state movement***

***Parameters*** ***No***
***Return*** ***1 Axes in movement***
***0 Axes stop***

***Move_Axes – Move the Axes in linear interpolation***

***Parameters*** ***Vel → Feed Axes in mm/min***
***Flg → Set to 1 for disable the movements buffer***
***( Stop axes at end trajectory)***
***Set to 0 for enable the movements buffer***
***(Stop Axes only if edge > SGLP)***
***Px,Py,Pz → Axes target values in 0.001 mm***
***Return*** ***0 Movement inserted in the buffer – buffer empty***
***1 Buffer full (you must repeat Move_Axes up to when buffer empty)***

***Acc_Axes – Set interpolation Acceleration***

***Parameters*** ***Value → Value in count per TAU***
***Return*** ***No***

***Stop_Axes – Stop Axes***

***Parameters*** ***No***
***Return*** ***No***

***Enable_Axis_X_Y_Z – Enable the Axes control and preset at value 0***

***Parameters*** ***No***
***Return*** ***No***

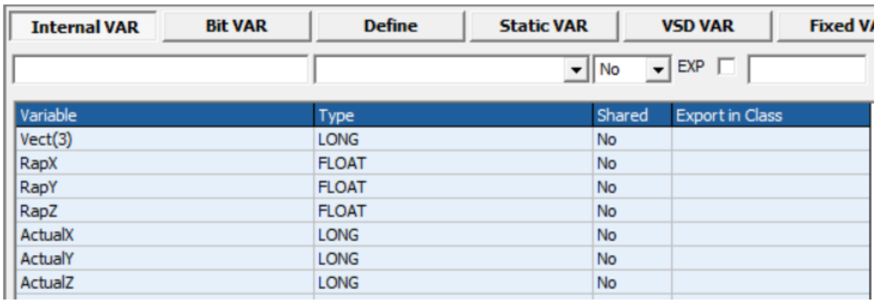
***Disable_Axis_X_Y_Z – Disable the Axes control***

***Parameters*** ***No***
***Return*** ***No***

***Test_Following_Error – Test axes following error***
***If errror, disable all axes***

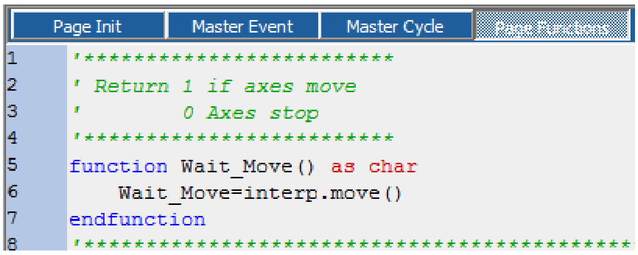
***Parameters*** ***No***
***Return*** ***No***

## Variables used



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| Vect(3) | LONG | No | |
| RapX | FLOAT | No | |
| RapY | FLOAT | No | |
| RapZ | FLOAT | No | |
| ActualX | LONG | No | |
| ActualY | LONG | No | |
| ActualZ | LONG | No | |

## Code in Main Page Functions



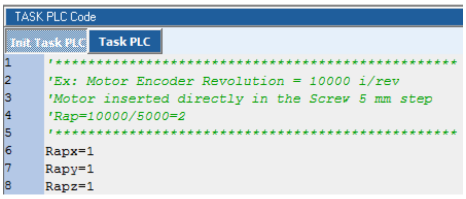
```
'*************************
' Return 1 if axes move
'          0 Axes stop
'*************************
function Wait_Move() as char
    Wait_Move=interp.move()
endfunction
'*************************************************
```

```
'*************************
' Return 1 if axes move
'       0 Axes stop
'*************************
function Wait_Move() as char
        Wait_Move=interp.move()
endfunction

'*********************************************************
' Move Axes
' Vel= interp vel Axes in mm/min
' Flg if 1 move without buffer
'       0 move in buffer mode
' Px,Py,Pz Axes value in 0.001 mm
'Return 1 if movement is inserted in the buffer
'      0 The movement is not inserted in the buffer
'        in this case, is necessary reload the movement
'*********************************************************
function Move_Axes(Vel as long, Flg as char, Px as long, Py as long,Pz as long) as char
        Vel=Vel*TAU/60 ' Transform in mm/min
        Vect(0)=Px
        Vect(1)=Py
        Vect(2)=Pz
        Move_Axes=interp.moveto(Vel, Flg, Vect())
endfunction

'*********************************************************
' Set ACC
' Value Acc value in count
'*********************************************************
function Acc_Axes(Value as long) as void
        interp.acc=Value
```

```
endfunction
'*********************************************************
' Stop Axes
'*********************************************************
function Stop_Axes() as void
            interp.stop()
endfunction
'*******************
' Axis X enable
'*******************
function Enable_X() as void
PidX.enablepid=0
'Preset Axis X 0, not change y,z
Vect(0)=0
Vect(1)=interp.pc(1)
Vect(2)=interp.pc(2)
interp.preset(Vect())
PidX.posr=0
'enable axis
PidX.enablepid=1
PidX.enable() ' closes the rele' on NGIO
endfunction
'*******************
' Axis X Disable
'*******************
function Disable_X() as void
Pidx.disable()
endfunction
'*******************
' Axis Y enable
'*******************
function Enable_Y() as void
PidY.enablepid=0
'Preset Axis Y 0, not change X,z
Vect(0)=interp.pc(0)
Vect(1)=0
Vect(2)=interp.pc(2)
interp.preset(Vect())
PidY.posr=0
'enable axis
PidY.enablepid=1
PidY.enable() ' closes the rele' on NGIO
endfunction
'*******************
' Axis Y Disable
'*******************
function Disable_Y() as void
PidY.disable()
endfunction
'*******************
' Axis Z enable
'*******************
function Enable_Z() as void
PidZ.enablepid=0
'Preset Axis Z 0, not change X,Y
```

```
Vect(0)=interp.pc(0)
Vect(1)=interp.pc(1)
Vect(2)=0
interp.preset(Vect())
PidZ.posr=0
'enable axis
PidZ.enablepid=1
PidZ.enable() ' closes the rele' on NGIO
endfunction
'*******************
' Axis Z Disable
'*******************
function Disable_Z() as void
PidZ.disable()
endfunction
'***************************
' Test following error
' Disable all Axes if error
'***************************
function Test_Following_Error()as void
dim Error as char
error=0
if PidX.err=1 ' test X
        error=1
endif
if PidY.err=1 ' test Y
        error=1
endif
if PidZ.err=1 ' test Z
        error=1
endif
if error=1 'if serror disable all motor
        Disable_X()
        Disable_Y()
        Disable_Z()
endif
endfunction
```

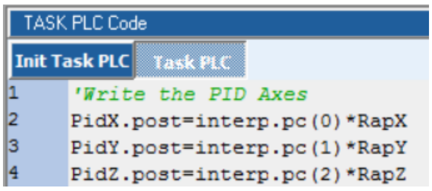
**Code in Init Task PLC**



```
'*************************************************
'Ex: Motor Encoder Revolution = 10000 i/rev
'Motor inserted directly in the Screw 5 mm step
'Rap=10000/5000=2
'*************************************************
Rapx=1
Rapy=1
Rapz=1
```

```
'*************************************************
'Ex: Motor Encoder Revolution = 10000 i/rev
'Motor inserted directly in the Screw 5 mm step
'Rap=10000/5000=2
'*************************************************
Rapx=1
Rapy=1
Rapz=1
```

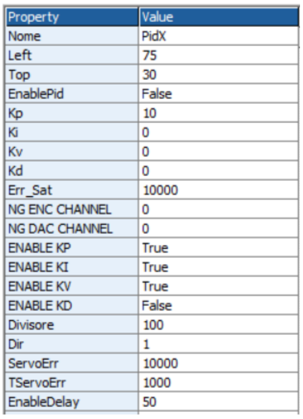
## Code in Task PLC



```
'Write the PID Axes
PidX.post=interp.pc(0)*RapX
PidY.post=interp.pc(1)*RapY
PidZ.post=interp.pc(2)*RapZ
```

```
'Write the PID Axes
PidX.post=interp.pc(0)*RapX
PidY.post=interp.pc(1)*RapY
PidZ.post=interp.pc(2)*RapZ
'read analog 0 and set the Vper %
interp.vper=ng_adc(0)
' copy the axes values
' for ex: display in HMI
' value in 0.001 mm
ActualX=PidX.posr ' read actual position X
ActualY=PidY.posr ' read actual position Y
ActualZ=PidZ.posr ' read actual position Z
```

Example Download



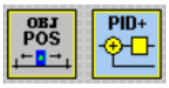
| Property | Value |
|---|---|
| Nome | PidX |
| Left | 75 |
| Top | 30 |
| EnablePid | False |
| Kp | 10 |
| Ki | 0 |
| Kv | 0 |
| Kd | 0 |
| Err_Sat | 10000 |
| NG ENC CHANNEL | 0 |
| NG DAC CHANNEL | 0 |
| ENABLE KP | True |
| ENABLE KI | True |
| ENABLE KV | True |
| ENABLE KD | False |
| Divisore | 100 |
| Dir | 1 |
| ServoErr | 10000 |
| TServoErr | 1000 |
| EnableDelay | 50 |

## 12.5 Example Analog Axis in Position Mode

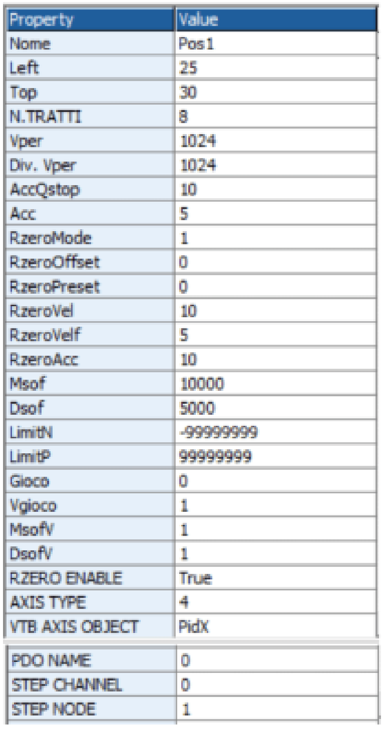
In the following example, are management, a CanOpen Axis by VTB OBJECT
See doc Vtb Object Guide for more informations.

**WARNING:**
All speed are managed in mm/min if setted the following parameters:
**MSOF e DSOF**
All axes target positions are managed in micron (0.001 mm) if setted the following parameters:
**MSOF e DSOF**

**Objects used:**



***Motor Control Plus → CobjPos → Posizionatore***



| Property | Value |
|---|---|
| Nome | Pos1 |
| Left | 25 |
| Top | 30 |
| N.TRATTI | 8 |
| Vper | 1024 |
| Div. Vper | 1024 |
| AccQstop | 10 |
| Acc | 5 |
| RzeroMode | 1 |
| RzeroOffset | 0 |
| RzeroPreset | 0 |
| RzeroVel | 10 |
| RzeroVelf | 5 |
| RzeroAcc | 10 |
| Msof | 10000 |
| Dsof | 5000 |
| LimitN | -99999999 |
| LimitP | 99999999 |
| Gioco | 0 |
| Vgioco | 1 |
| MsofV | 1 |
| DsofV | 1 |
| RZERO ENABLE | True |
| AXIS TYPE | 4 |
| VTB AXIS OBJECT | PidX |
| PDO NAME | 0 |
| STEP CHANNEL | 0 |
| STEP NODE | 1 |

***Motor Control Plus→ CPidPlus → Pid NG***

**Are managed the following functions:**

### *Wait_Move – Axis state movement*

***Parameters*** ***No***
***Return*** ***1 Axis in movement***
***0 Axes stop***

### *Move_Axis – Move the Axis*

***Parameters*** ***Vel → Feed Axes in mm/min***
***Flg → Set to 1 for disable the movements buffer***
***( Stop axes at end trajectory)***
***Set to 0 for enable the movements buffer***
***Px, → Axes target values in 0.001 mm***
***Return*** ***0 Movement inserted in the buffer – buffer empty***
***1 Buffer full (you must repeat Move_Axes up to when buffer empty)***

### *Acc_Axis – Set Acceleration*

***Parameters*** ***Value → Value in count per TAU***
***Return*** ***No***

### *Stop_Axis – Stop Axes*

***Parameters*** ***No***
***Return*** ***No***

### *Enable – Enable the Axis control and preset at value 0*

***Parameters*** ***No***
***Return*** ***No***

### *Disable – Disable the Axes control*

***Parameters*** ***No***
***Return*** ***No***

### *StartHome – Start homing - Vel in pos1.rzerovel and pos1.rzerovelf*

***Parameters*** ***No***
***Return*** ***No***

### *CheckHome – Check homing state*

***Parameters*** ***No***
***Return*** ***1 homing finished***

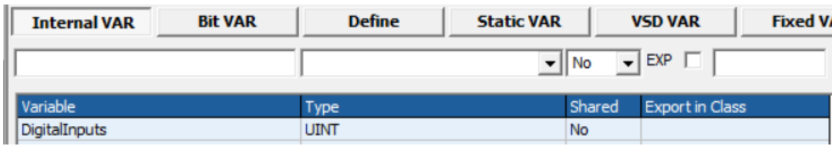
### *StopHome – Stop homing*

***Parameters*** ***No***
***Return*** ***No***

### *Test_Following_Error – Test axis following error*
### *If errror, disable axis*

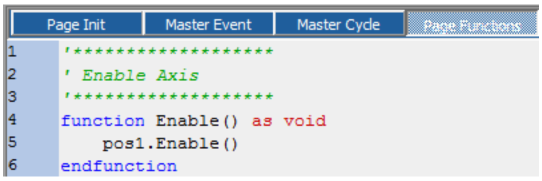
***Parameters*** ***No***
***Return*** ***No***

## Variables used



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| DigitalInputs | UINT | No | |

## Code in Main Page Functions

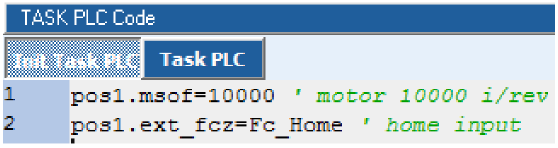


```
'*******************
' Enable Axis
'*******************
function Enable() as void
    pos1.Enable()
endfunction
```

```
'*******************
' Enable Axis
'*******************
function Enable() as void
            pos1.Enable()
endfunction
'*******************
' Disable Axis
'*******************
function Disable() as void
            pos1.Disable()
endfunction
'*******************
' Preset Axis
'*******************
function Preset(Val as long) as void
            pos1.Preset(Val)
endfunction
'*************************
' Return 1 if axis move
'       0 Axis stop
'*************************
function Wait_Move() as char
            Wait_Move=pos1.move()
endfunction
'*******************
' Axis Stop Move
'*******************
function Stop() as void
            pos1.Stop()
endfunction
'*****************************
' Start Homing
' Homing input see in task plc
'*****************************
function StartHome() as void
            pos1.StartHome()
endfunction
'*****************************
' Check if homing finished
' Return 1 if finished
```

```
'*****************************
function CheckHome() as char
        CheckHome=pos1.status_home
endfunction
'*****************************
' Stop home function
'*****************************
function StopHome() as void
        pos1.StopHome()
endfunction
'**********************************************************
' Move Axis
' Vel=  vel Axis in mm/min
' Flg if 1 move without buffer
'       0 move in buffer mode
' Px  Axis value in 0.001 mm
'Return 1 if movement is inserted in the buffer
'      0 The movement is not inserted in the buffer
'       in this case, is necessary reload the movement
'**********************************************************
function Move_Axis(Vel as long, Flg as char, Px as long) as char
        Vel=Vel*TAU/60 ' Transform in mm/min
        Move_Axis=pos1.moveto(Vel, Flg, Px)
endfunction
'**********************************************************
' Set ACC
' Value Acc value in count
'**********************************************************
function Acc_Axis(Value as long) as void
        pos1.acc=Value
endfunction

'***************************
' Test following error
' Disable Axis
'***************************
function Test_Following_Error() as void
if PidX.err=1 ' test Axis
        Disable()
endif
endfunction
```

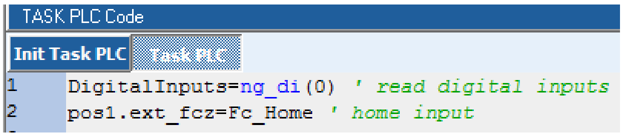
## Code in Init Task PLC



```
pos1.msof=10000  ' motor 10000 i/rev
pos1.ext_fcz=Fc_Home  ' home input
```

```
pos1.msof=10000 ' motor 10000 i/rev
pos1.dsof=5000 ' 5 mm per revolution motor
```

**Code in Task PLC**



```
DigitalInputs=ng_di(0)  ' read digital inputs
pos1.ext_fcz=Fc_Home  ' home input
```

DigitalInputs=ng_di(0) **' read digital inputs**
pos1.ext_fcz=Fc_Home **' home input**

**Example Download**

# 13 FAST INPUTS Interrupt mode NGIO-NGPP

The NGIO, allows to use 2 fast inputs (Index encoder), and the NGPP, allows to use 4 fast inputs (FAST INPUTS 1-4 ). All these inputs, are managed in INTERRUPT MODE
The interrupt mode, is very fast for read a input (the fast inputs on NGPP, can be read only interrupt mode)
The Fast Inputs on NGIO (index encoder) can be read also by the function NG_T0() see Chapr 11.2

## 13.1 FAST INPUTS Object - Management Inputs Interrupt

For read the inputs in interrupt mode, is used the Fast Inputs Object:

***General → Fast Input → NGWARP Finput***

**Property**

***Card Index*** Card Index on the BUS:
from 0 to 7

***Channel*** Digital inputs Channel:
NGIO from 0 to 1 – Encoder Index
NGPP from 0 to 3 - Fast Input

**Methods**

***Name.get() as void***

Updates the latch registers used for read rising and falling EDGE
(call this function first to read the edge with **.UP** and **.DN** variables)

***Name.clear() as void***

Reset the latch registers
This function, reset the variables .**UP** and .**DN**

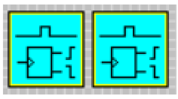
**Variables read only**

| | |
|---|---|
| ***Name.stato*** | Contains the actual input state (0 o 1) |
| ***Name.up*** | Contains RISING EDGE LATCH state.<br>Management in INTERRUPT MODE |
| ***Name.dn*** | Contains FALLING EDGE LATCH state.<br>Management in INTERRUPT MODE |

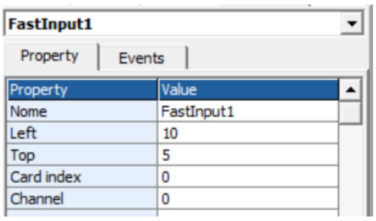
## 13.2 Example Fast Input Read

In this example, is read the fast input 1 bt NGIO and NGPP

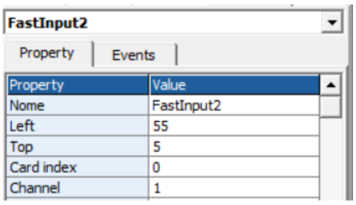
**Obects used:**



***General → Fast Input → NGWARP Finput***

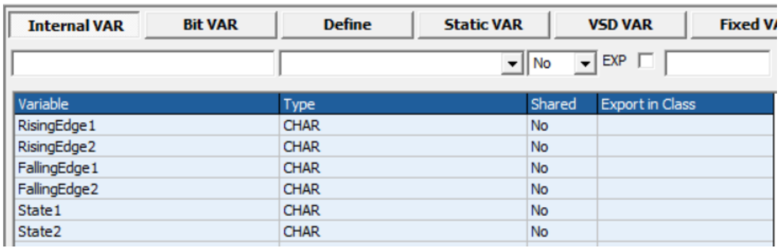


| Property | Value |
|---|---|
| Nome | FastInput1 |
| Left | 10 |
| Top | 5 |
| Card index | 0 |
| Channel | 0 |



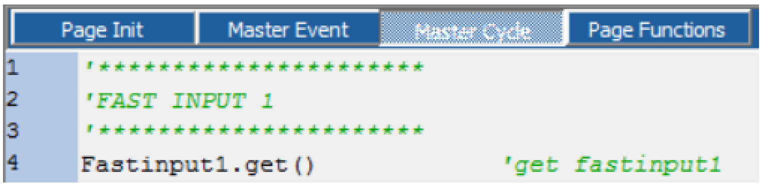
| Property | Value |
|---|---|
| Nome | FastInput2 |
| Left | 55 |
| Top | 5 |
| Card index | 0 |
| Channel | 1 |

**Variables used**



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| RisingEdge1 | CHAR | No | |
| RisingEdge2 | CHAR | No | |
| FallingEdge1 | CHAR | No | |
| FallingEdge2 | CHAR | No | |
| State1 | CHAR | No | |
| State2 | CHAR | No | |

**Code in Task Main – Master ciclo**



```
'**********************
'FAST INPUT 1
'**********************
Fastinput1.get()             'get fastinput1
```

```
'**********************
'FAST INPUT 1
'**********************
Fastinput1.get()                    'get fastinput1
RisingEdge1=FastInput1.up           'ceck the rising edge
FallingEdge1=FastInput1.dn          'ceck the falling edge
State1=FastInput1.inp               'read the state
FastInput1.clear()                  'reset latch up e dn
'**********************
'FAST INPUT 2
'**********************
Fastinput2.get()                    'get fastinput2
RisingEdge2=FastInput2.up           'ceck the rising edge
FallingEdge2=FastInput2.dn          'ceck the falling edge
State2=FastInput2.inp               'read the state
FastInput2.clear()                  'reset latch up e dn
```

**Example Download**

# 14 STEP/DIR channels on NGPP

The NGPP allows to use 4 STEP/DIR channels by VTB functions, in interpolation or position mode.

## 14.1 PP_STEP – Generating STEP/DIR signals

This function, is the primitive that allows the generation STEP and DIR signal on the specified channel. Generally it is used, by objects that allows to ***"Ramp and Position"*** generator.

**Syntax**

PP_STEP(Channel as Char, Value as Long) as void

***Parameters***

**Channel** Number of the STEP/DIR channel
from 0 to 3 channels on First NGPP expansion
from 4 to 7 channels on Second NGPP expansion
.
.
from 28 to 31 channels on Last NGPP expansion

**Value** Absolute value of the position of the step/dir axis

**WARNING**
**THIS FUNCTION MUST BE INSERTED IN TASK_PLC**

## 14.2 PP_PRESET – PRESET OF STEP/DIR POSITION

This function updates the current position of a step/dir channel.

**Syntax**

PP_PRESET(Channel as Char, Value as Long) as void

***Parameters***

**Channel** Numero del canale STEP/DIR
***Value*** Valore della posizione che assumerà il l'asse step/dir

**WARNING**
**FOR A CORRECT AXES PRESET, SEE THE EXAMPLE USED IN THE INTERPOLATOR OR POSITIONER**

## 14.3 PP_GETPOS – READING OF ACTUAL POSITION

This function reads the actual position of a step/dir channel. **The value will correspond to the DOUBLE of the real position**.

**Syntax**

PP_GETPOS(Channel as Char) as long

***Parameters***

**Channel** Number of the STEP/DIR channel

**Return Value**

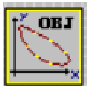
***Long*** *Actual position x 2*

## 14.4 Example STEP/DIR Axes in Interpolation Mode

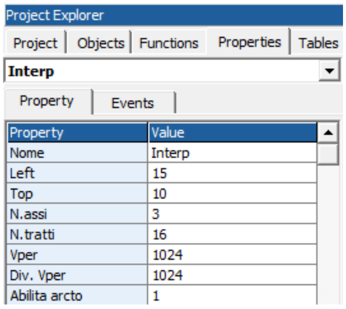
In the following example, are managed, 3 STEP/DIR Axes In linear interpolation.

**WARNING:**
**ATTENTION:**
All speed are managed in mm/min if setted the following parameters
**RapX,RapY,RapZ**
All axes target positions are managed in micron (0.001 mm) if setted the following parameters
**RapX,RapY,RapZ**

**Objects used:**



***Motor Control → CobjInterpola → Interpolatore***



Interp

| Property | Value |
|---|---|
| Nome | Interp |
| Left | 15 |
| Top | 10 |
| N.assi | 3 |
| N.tratti | 16 |
| Vper | 1024 |
| Div. Vper | 1024 |
| Abilita arcto | 1 |

**Are managed the following functions:**

***Wait_Move – Axes state movement***

***Parameters*** ***No***
***Return*** ***1 Axes in movement***
***0 Axes stop***

***Move_Axes – Move the Axes in linear interpolation***

***Parameters*** ***Vel → Feed Axes in mm/min***
***Flg → Set to 1 for disable the movements buffer***
***( Stop axes at end trajectory)***
***Set to 0 for enable the movements buffer***
***(Stop Axes only if edge > SGLP)***
***Px,Py,Pz → Axes target values in 0.001 mm***
***Return*** ***0 Movement inserted in the buffer – buffer empty***
***1 Buffer full (you must repeat Move_Axes up to when buffer empty)***

***Acc_Axes – Set interpolation Acceleration***

***Parameters*** ***Value → Value in count per TAU***
***Return*** ***No***

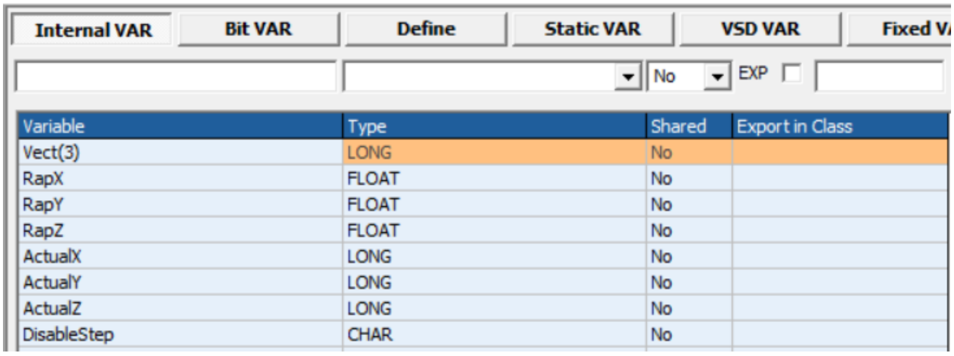
***Stop_Axes – Stop Axes***

***Parameters*** ***No***
***Return*** ***No***

***Enable_Axis_X_Y_Z – Enable the Axes control and preset at value 0***

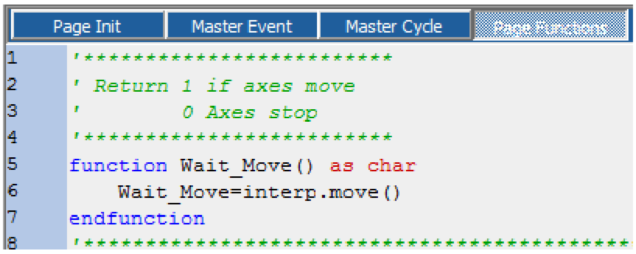
***Parameters*** ***No***
***Return*** ***No***

## Variables used



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| Vect(3) | LONG | No | |
| RapX | FLOAT | No | |
| RapY | FLOAT | No | |
| RapZ | FLOAT | No | |
| ActualX | LONG | No | |
| ActualY | LONG | No | |
| ActualZ | LONG | No | |
| DisableStep | CHAR | No | |

## Code in Main Page Functions

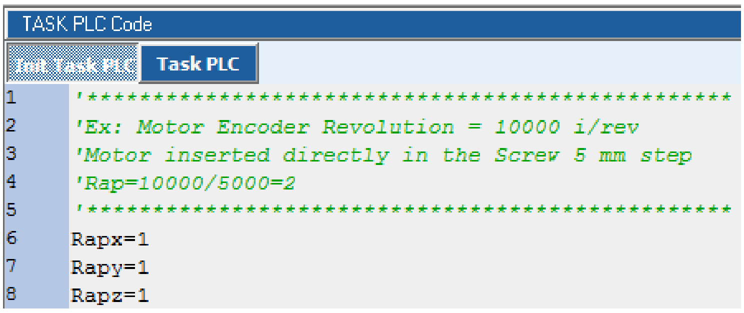


```
'************************
' Return 1 if axes move
'        0 Axes stop
'************************
function Wait_Move() as char
    Wait_Move=interp.move()
endfunction
'********************************************
```

```
'************************
' Return 1 if axes move
'       0 Axes stop
'************************
function Wait_Move() as char
            Wait_Move=interp.move()
endfunction

'*******************************************************
' Move Axes
' Vel= interp vel Axes in mm/min
' Flg if 1 move without buffer
'       0 move in buffer mode
' Px,Py,Pz Axes value in 0.001 mm
'Return 1 if movement is inserted in the buffer
'      0 The movement is not inserted in the buffer
'        in this case, is necessary reload the movement
'*******************************************************
function Move_Axes(Vel as long, Flg as char, Px as long, Py as long,Pz as long) as char
            Vel=Vel*TAU/60 ' Transform in mm/min
            Vect(0)=Px
            Vect(1)=Py
            Vect(2)=Pz
            Move_Axes=interp.moveto(Vel, Flg, Vect())
endfunction

'*******************************************************
' Set ACC
' Value Acc value in count
'*******************************************************
function Acc_Axes(Value as long) as void
```

```
            interp.acc=Value
endfunction
'**********************************************************
' Stop Axes
'**********************************************************
function Stop_Axes() as void
            interp.stop()
endfunction
'*******************
' Axis X enable
'*******************
function Enable_X() as void
DisableStep=1
'Preset Axis X 0, not change y,z
Vect(0)=0
Vect(1)=interp.pc(1)
Vect(2)=interp.pc(2)
interp.preset(Vect())
'enable axis
DisableStep0=0
endfunction
'*******************
' Axis Y enable
'*******************
function Enable_Y() as void
DisableStep=1
'Preset Axis Y 0, not change X,z
Vect(0)=interp.pc(0)
Vect(1)=0
Vect(2)=interp.pc(2)
interp.preset(Vect())
'enable axis
DisableStep=0
endfunction
'*******************
' Axis Z enable
'*******************
function Enable_Z() as void
DisableStep=1
'Preset Axis Z 0, not change X,Y
Vect(0)=interp.pc(0)
Vect(1)=interp.pc(1)
Vect(2)=0
interp.preset(Vect())
PidZ.posr=0
'enable axis
DisableStep=0
endfunction
```

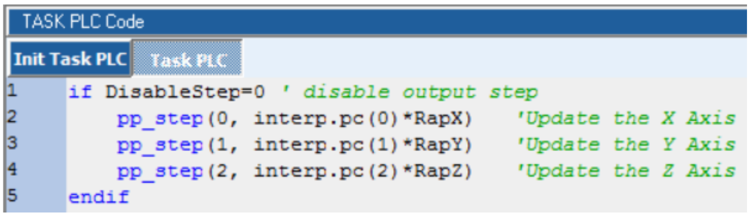
## Code in Init Task PLC



```
'************************************************
'Ex: Motor Encoder Revolution = 10000 i/rev
'Motor inserted directly in the Screw 5 mm step
'Rap=10000/5000=2
'************************************************
Rapx=1
Rapy=1
Rapz=1
```

```
'************************************************
'Ex: Motor Encoder Revolution = 10000 i/rev
'Motor inserted directly in the Screw 5 mm step
'Rap=10000/5000=2
'************************************************
Rapx=1
Rapy=1
Rapz=1
```

## Code in  Task PLC



```
if DisableStep=0 ' disable output step
    pp_step(0, interp.pc(0)*RapX)    'Update the X Axis
    pp_step(1, interp.pc(1)*RapY)    'Update the Y Axis
    pp_step(2, interp.pc(2)*RapZ)    'Update the Z Axis
endif
```

```
if DisableStep=0 ' disable output step
        pp_step(0, interp.pc(0)*RapX)    'Update the X Axis
        pp_step(1, interp.pc(1)*RapY)    'Update the Y Axis
        pp_step(2, interp.pc(2)*RapZ)    'Update the Z Axis
endif
'read analog 0 and set the Vper %
interp.vper=ng_adc(0)
' copy the axes values
' for ex: display in HMI
' value in 0.001 mm
ActualX=interp.pc(0) ' read actual position X
ActualY=interp.pc(1) ' read actual position Y
ActualZ=interp.pc(2) ' read actual position Z
```

**Example Download**

## 14.5 Example STEP/DIR Axis in Position Mode

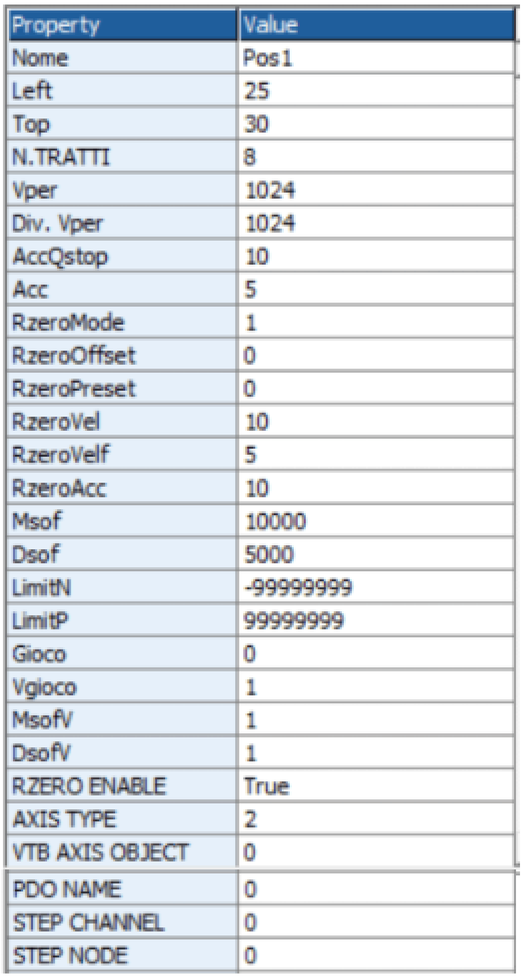
In the following example, are management, a CanOpen Axis by VTB OBJECT
See doc Vtb Object Guide for more informations.

**WARNING:**
All speed are managed in mm/min if setted the following parameters:
**MSOF e DSOF**
All axes target positions are managed in micron (0.001 mm) if setted the following parameters:
**MSOF e DSOF**

**Objects used:**

OBJ POS

***Motor Control Plus → CobjPos → Posizionatore***



| Property | Value |
|---|---|
| Nome | Pos1 |
| Left | 25 |
| Top | 30 |
| N.TRATTI | 8 |
| Vper | 1024 |
| Div. Vper | 1024 |
| AccQstop | 10 |
| Acc | 5 |
| RzeroMode | 1 |
| RzeroOffset | 0 |
| RzeroPreset | 0 |
| RzeroVel | 10 |
| RzeroVelf | 5 |
| RzeroAcc | 10 |
| Msof | 10000 |
| Dsof | 5000 |
| LimitN | -99999999 |
| LimitP | 99999999 |
| Gioco | 0 |
| Vgioco | 1 |
| MsofV | 1 |
| DsofV | 1 |
| RZERO ENABLE | True |
| AXIS TYPE | 2 |
| VTB AXIS OBJECT | 0 |
| PDO NAME | 0 |
| STEP CHANNEL | 0 |
| STEP NODE | 0 |

**Are managed the following functions:**

***Wait_Move – Axis state movement***

| | |
|---|---|
| ***Parameters*** | ***No*** |
| ***Return*** | ***1 Axis in movement*** |
| | ***0 Axes stop*** |

***Move_Axis – Move the Axis***

| | |
|---|---|
| ***Parameters*** | ***Vel → Feed Axes in mm/min*** |
| | ***Flg → Set to 1 for disable the movements buffer*** |
| | ***( Stop axes at end trajectory)*** |
| | ***Set to 0 for enable the movements buffer*** |
| | ***Px, → Axes target values in 0.001 mm*** |
| ***Return*** | ***0 Movement inserted in the buffer – buffer empty*** |
| | ***1 Buffer full (you must repeat Move_Axes up to when buffer empty)*** |

***Acc_Axis – Set Acceleration***

| | |
|---|---|
| ***Parameters*** | ***Value → Value in count per TAU*** |
| ***Return*** | ***No*** |

***Stop_Axis – Stop Axes***

| | |
|---|---|
| ***Parameters*** | ***No*** |
| ***Return*** | ***No*** |

***Enable – Enable the Axis control and preset at value 0***

| | |
|---|---|
| ***Parameters*** | ***No*** |
| ***Return*** | ***No*** |

***Disable – Disable the Axes control***

| | |
|---|---|
| ***Parameters*** | ***No*** |
| ***Return*** | ***No*** |

***StartHome – Start homing - Vel in pos1.rzerovel and pos1.rzerovelf***

| | |
|---|---|
| ***Parameters*** | ***No*** |
| ***Return*** | ***No*** |

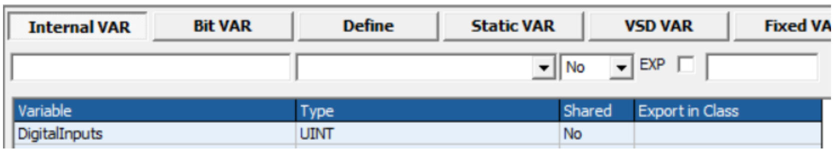
***CheckHome – Check homing state***

| | |
|---|---|
| ***Parameters*** | ***No*** |
| ***Return*** | ***1 homing finished*** |

***StopHome – Stop homing***

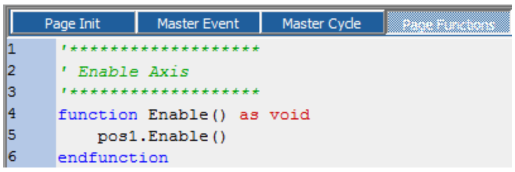
| | |
|---|---|
| ***Parameters*** | ***No*** |
| ***Return*** | ***No*** |

## Variables used



| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| DigitalInputs | UINT | No | |

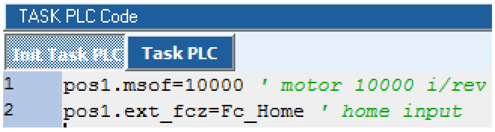
## Code in Main Page Functions



```
'*******************
' Enable Axis
'*******************
function Enable() as void
    pos1.Enable()
endfunction
```

```
'*******************
' Enable Axis
'*******************
function Enable() as void
            pos1.Enable()
endfunction
'*******************
' Disable Axis
'*******************
function Disable() as void
            pos1.Disable()
endfunction
'*******************
' Preset Axis
'*******************
function Preset(Val as long) as void
            pos1.Preset(Val)
endfunction
'*************************
' Return 1 if axis move
'       0 Axis stop
'*************************
function Wait_Move() as char
            Wait_Move=pos1.move()
endfunction
'*******************
' Axis Stop Move
'*******************
function Stop() as void
            pos1.Stop()
endfunction
'*****************************
' Start Homing
' Homing input see in task plc
'*****************************
function StartHome() as void
            pos1.StartHome()
endfunction
'*****************************
' Check if homing finished
' Return 1 if finished
'******************************
function CheckHome() as char
        CheckHome=pos1.status_home
endfunction
'******************************
' Stop home function
'******************************
function StopHome() as void
        pos1.StopHome()
endfunction
'************************************************************
' Move Axis
' Vel=  vel Axis in mm/min
' Flg if 1 move without buffer
'       0 move in buffer mode
' Px  Axis value in 0.001 mm
'Return 1 if movement is inserted in the buffer
'      0 The movement is not inserted in the buffer
'        in this case, is necessary reload the movement
'************************************************************
function Move_Axis(Vel as long, Flg as char, Px as long) as char
        Vel=Vel*TAU/60 ' Transform in mm/min
        Move_Axis=pos1.moveto(Vel, Flg, Px)
endfunction
'************************************************************
' Set ACC
' Value Acc value in count
'************************************************************
function Acc_Axis(Value as long) as void
        pos1.acc=Value
endfunction
```

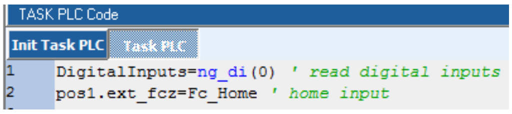
## Code in Init Task PLC



```
pos1.msof=10000  ' motor 10000 i/rev
pos1.ext_fcz=Fc_Home  ' home input
```

pos1.msof=10000 ' motor 10000 i/rev
pos1.dsof=5000 ' 5 mm per revolution motor

## Code in  Task PLC



```
DigitalInputs=ng_di(0)  ' read digital inputs
pos1.ext_fcz=Fc_Home  ' home input
```

DigitalInputs=ng_di(0) ' read digital inputs
pos1.ext_fcz=Fc_Home ' home input

**Example Download**

# 15 Permanent Memory

The NGWARP allows to use, two tipology for management permanent memory:

***STATIC MEMORY***

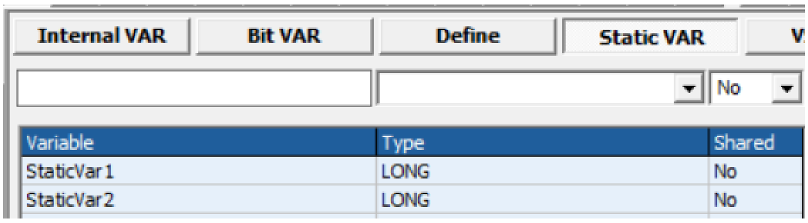
Uses a RAM with Battery

***FLASH MEMORY***

Uses a FLASH shared with code application

## 15.1 Static Memory

This memory, is directly managed by S.O. The dimension is  32Kb, and uses a battery for ensure permanent values. In this memory, can be declared, the variables directly by VTB, they are used in the same mode to normal variables.
For use this memory, declare the variables in the STATIC field:



| Variable | Type | Shared |
|---|---|---|
| StaticVar1 | LONG | No |
| StaticVar2 | LONG | No |

## 15.2  Internal Flash Memory

The internal Flash Memory, is shared with application code. Normally the flash have a dimension of 4 Mb, and NGWARP applications uses less 1 Mb of memory flash. 3 Mb more or less are free for data saving. This memory is managed by VTB functions.

### 15.2.1 IMS_READ – Read flash memory

Reads from the internal memory at address ADDR a number of byte as in NBYTE and writes them in the array pointed by Punt..

**Syntax**

**IMS_READ**(Punt **as *Char**, Addr **as Long**, Nbyte **as Long**) **as Char**

***Parameters***

| | |
|---|---|
| **Punt** | Pointer to data buffer where read data will be saved |
| **Addr** | Start address in the reserved area of the device |
| **Nbyte** | Number of bytes to be read |

**Return Value**

| | | |
|---|---|---|
| Char | 0 | No error |
| | <>0 | Writing error |

## 15.2.2 IMS_WRITE – Write flash memory

Writes in the internal FLASH at the address contained in ADDR, the data pointed by Punt for a total of NBYTE of data.
The FLASH memory is managed in BLOCKS of 256 bytes, for this it's recommended to write multiple of 256 bytes. That because also writing less than 256 bytes the entire BLOCK is erased, therefore to avoid the loss of data it needs at beginning to read all the block, save the interested data and overwrite again all the block. The systems NGWARP have enough FLASH memory to be used without problems in blocks of 256 bytes also there is the need of less data.

**Syntax**

```
        IMS_WRITE(Punt as *Char, Addr as Long, Nbyte as Long) as Char
```

***Parameters***

| | |
|---|---|
| Punt | Pointer to data buffer to be written |
| **Addr** | Start address in the reserved area of the device |
| **Nbyte** | Number of bytes to be written |

***Return value:***

| | | |
|---|---|---|
| Char | 0 | No error |
| | **<>0** | Writing error |

**WARNING**
**IN THE FLASH MEMORY, IS ALWAYS WRITTEN 256 BYTES MULTIPLE**
**THE REMAINING VALUES ASSUME A RANDOM VALUE**

## 15.3 Example save/load in FLASH

In the following example, are saved and loaded by FLASH the values in a Long Vector. This example can be used for a machines parameters management .
Is used a Checksum (parameters values sum) and saved in the LAST position of array.
The Checksum is used to ensure, the parameters integrity

**Are managed the following functions:**

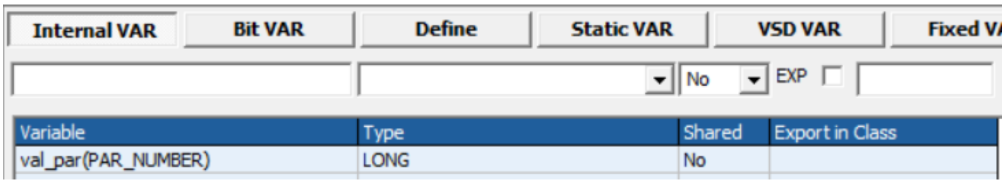
***LoadPar – Load from FLASH the values***

| | |
|---|---|
| ***Parameters*** | ***No*** |
| ***Return*** | ***0 OK*** |
| | ***1 Error FLASH*** |
| | ***2 Error checksum*** |

***SavePar – Save in FLASH the values***

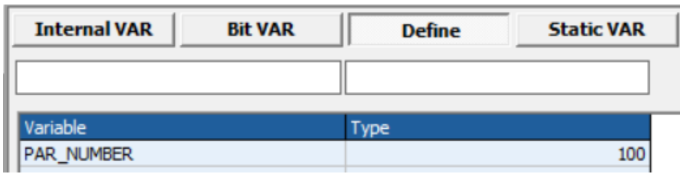
| | |
|---|---|
| ***Parameters*** | ***No*** |
| ***Return*** | ***0 OK*** |
| | ***1 Error FLASH*** |

**Variables used**



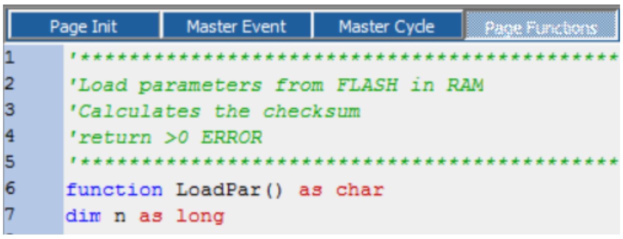
| Variable | Type | Shared | Export in Class |
|---|---|---|---|
| val_par(PAR_NUMBER) | LONG | No | |

**DEFINE used**



| Variable | Type |
|---|---|
| PAR_NUMBER | 100 |

**Code in Main Page Functions**



```
'*********************************************
'Load parameters from FLASH in RAM
'Calculates the checksum
'return >0 ERROR
'*********************************************
function LoadPar() as char
dim n as long
```

```
'*****************************************************
'Load parameters from FLASH in RAM
'Calculates the checksum
'return >0 ERROR
'*****************************************************
function LoadPar() as char
dim n as long
dim ckl as long
dim ck as long
dim Ret as char
'PAR_NUMBER is number of parameters
'all parameters are in long
Ret=ims_read(val_par(),0,PAR_NUMBER*4) ' reads parameters from flash and 'puts in val_par vector


if Ret<>0
        'LOAD ERROR !!!!
        LoadPar=1 'return ERROR 1
        return
endif
ck=val_par(PAR_NUMBER) 'gets the check sum in last position
ckl=0
for n=0 to n<(PAR_NUMBER-1) 'calculates the checksum
        ckl=ckl+val_par(n)
next n
if ckl=0                'if all parameters are ZERO - chekcsum error
        ckl=ck+1
endif
if ckl<>ck
        'CheckSum ERROR
        LoadPar=2 'return ERROR 2
else
        LoadPar=0 'return OK
endif
endfunction

'**********************************
'Save the parameters in FLASH
'Return >0 ERROR
'**********************************
function SavePar() as char
dim ck as long
dim n as long
dim Ret as char
ck=0
for n=0 to n<(PAR_NUMBER)-1 'calculates the checksum
        ck=ck+val_par(n)
next n
val_par(PAR_NUMBER-1)=ck 'put the checksum
Ret=ims_write(val_par(),0,PAR_NUMBER*4) 'save the parameters
if Ret<>0
        'SAVE ERROR !!!!
        SavePar=1 'return ERROR 1
else
        SavePar=0 'return OK
endif
endfunction
```

Example Download

# 16 System Utility

NGWARP allows to use some internal functions .
These functions can be called by VTB Application by  function **System_Utility(…)**

## 16.1 User Led

Normally, the State of Leds ST1-ST2-ST3 is managed by internal S.O.:

**ST1** – Ser2 – CanOpen Slave
**ST2** – Ethercat
**ST3** – TaskPlc Time Burst

By System_Utility() function, is possible, manage manually the ST1-ST2-ST3 state ON-OFF

| | | |
|---|---|---|
| *System_Utility(60,0,0,0)* | → | Returns the ST1-ST2-ST3 manage to S.O. |
| *System_Utility(61,State,0,0)* | → | **State=1 ST1 ON**<br>**State=0 ST1 OFF** |
| *System_Utility(62,State,0,0)* | → | **State=1 ST2 ON**<br>**State=0 ST2 OFF** |
| *System_Utility(63,State,0,0)* | → | **State=1 ST3 ON**<br>**State=0 ST3 OFF** |

If one function **61,62,63** is used, the associate LED isn't longer managed by S.O.
The function **60** returns the manage to S.O.

## 16.2 Read IMS dimension (Memory Storage)

This function, returns the IMS dimension in Bytes.
This value, is refered to total bytes and not to Bytes free or used

| | | |
|---|---|---|
| Long Bytes=*System_Utility(101,0,0,0)* | → | Returns numbero of Bytes |

## 16.3 Enabled Analog Inputs 10/12 bit

Normally the NGWARP, sets the analog inputs 1-8 to 10 Bit (this mode is used for compatibility with NG35 applications
From utility is possible to set the maximum resolution for the analog inputs 12 Bit

| | | |
|---|---|---|
| *System_Utility(132,0,0,0)* | → | Enables Analog Inputs to 10 bit |
| *System_Utility(132,1,0,0)* | → | Enables Analog Inputs to 12 bit |

There is no  Function to set the analog inputs to 10 bit.
For return to 10 bit resolution, remove the call at System_Utility 132.

## 16.4 Read Time Used Task Plc

This function returns the microsecond time  TASK PLC

| | | |
|---|---|---|
| *Long uSec = System_Utility(1601,0,0,0)* | → | Read the time |

## 16.5 Read Can Synk Time

This function returns the time in microsecond setted for SYNK CanOpen message

| | | |
|---|---|---|
| *Long uSec = System_Utility(1602,0,0,0)* | → | Read the time |

## 16.6 Read  DC Ethercat Synk Time

This function returns the time in nanosecond setted for DC SYNK ETHERCAT

*Long nSec = System_Utility(1703,0,0,0)* → Read  DC Time

## 16.7 Read Error DC Ethercat Synk Time

This function returns the ERROR time in nanosecond for DC SYNK ETHERCAT

*Long nSec = System_Utility(1706,ID,0,0)* → Read DC Error

***ID=0*** → ***Read Master Sync Error***
***ID=n*** → ***Read slave "n" Sync Error where "n" is the slave number***

# Index