User defined protocol

User Manual

WUXI XINJE ELECTRIC CO., LTD.

Catalog

1 Introduction

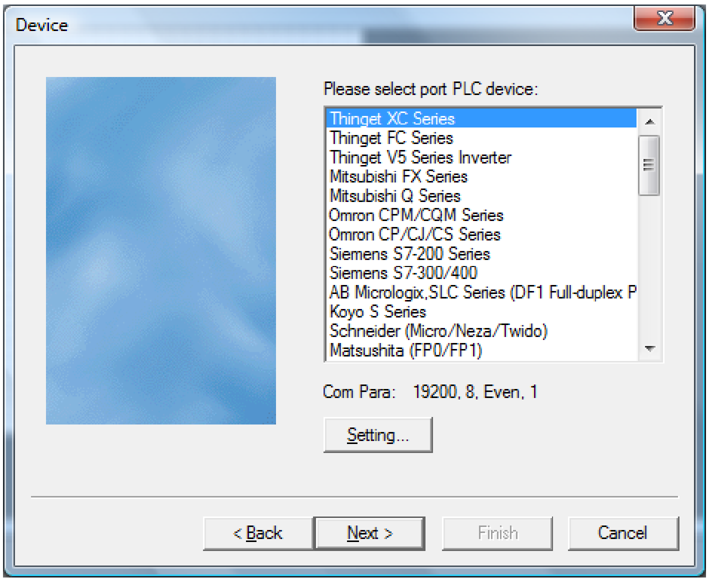
■What is user-define protocol?

User-define protocol is a communication protocol programmed by users to support those devices which are not included in device list.

■ Why do we use user-define protocol?

As a communication rule, communication protocol is an agreement made by both transmission parties, including data structure, synchronous method, transmission speed, debug method, character define and so on. In other word, the data transmission between panels and device takes effect only when both parties comply with communication rule strictly.

As we can see from the *Touchwin* editing tool, most of the communication protocol for general PLC, inverter and other protocol in market already in the selection list of devices.



Please select port PLC device:

Thinget XC Series
Thinget FC Series
Thinget V5 Series Inverter
Mitsubishi FX Series
Mitsubishi Q Series
Omron CPM/CQM Series
Omron CP/CJ/CS Series
Siemens S7-200 Series
Siemens S7-300/400
AB Micrologix,SLC Series (DF1 Full-duplex P
Koyo S Series
Schneider (Micro/Neza/Twido)
Matsushita (FP0/FP1)

Com Para: 19200, 8, Even, 1

Devices list

If the destination device is not listed in the device list, please check whether the protocol of this device is same as those have existed in the list, such as ‘Modbus’ protocol. In this case , just select the same protocol, otherwise ,program a user-define protocol according to destination device .

2 Procedure

2-1 Have a view of destination device protocol

The following chapters take device V900(a virtual parameter) for example to describe how to program a user-define protocol.

Please find out the send and receive data information from the V900 communication protocol. In this example, the parameters including current weight, destination weight and flow, will appear on panels.

Address of assignment of V900			
Current weight	H42	Flow	H43
Destination weight	H44		

Data structure of read registers				
Request to V900	Station NO.	Function code (read registers)03	Starting Address	Checksum
Response from V900	Station NO.	High byte	Low byte	Checksum

Set communication parameters of V900 as follow:

Station NO: 1
Baud rate:9600
Even parity
Data bit :8
Stop bit:1

There is example of data structure based on V900

1. Read current weight:
Request: H01 H03 H42 SUMCHECK
Response: H01 Highbyte Lowbyte SUMCHECK

2. Read flow:
Request: H01 H03 H43 SUMCHECK
Response: H01 Highbyte Lowbyte SUMCHECK

3. Read destination weight:
Request: H01 H03 H44 sumcheck;
Response: H01 Highbyte Lowbyte SUMCHECK

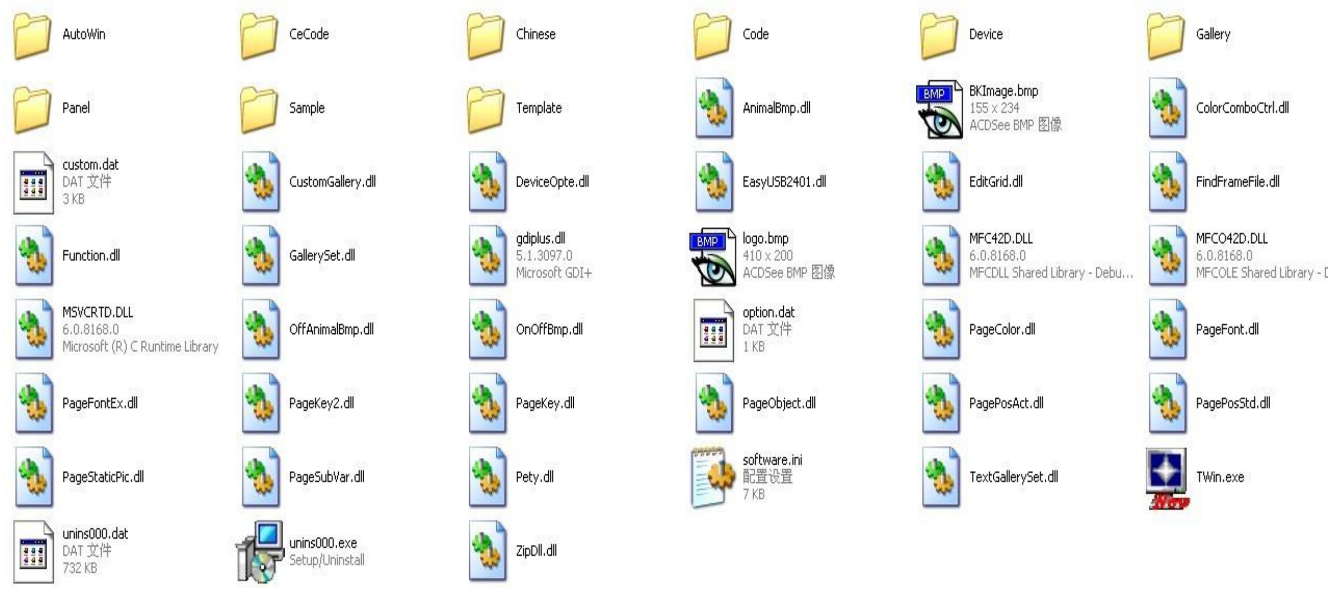
2-2 Register and establish protocol file

■ Introduction

The purpose of this step is to add new device item named V900 into device list, and establish carrier file for this protocol.

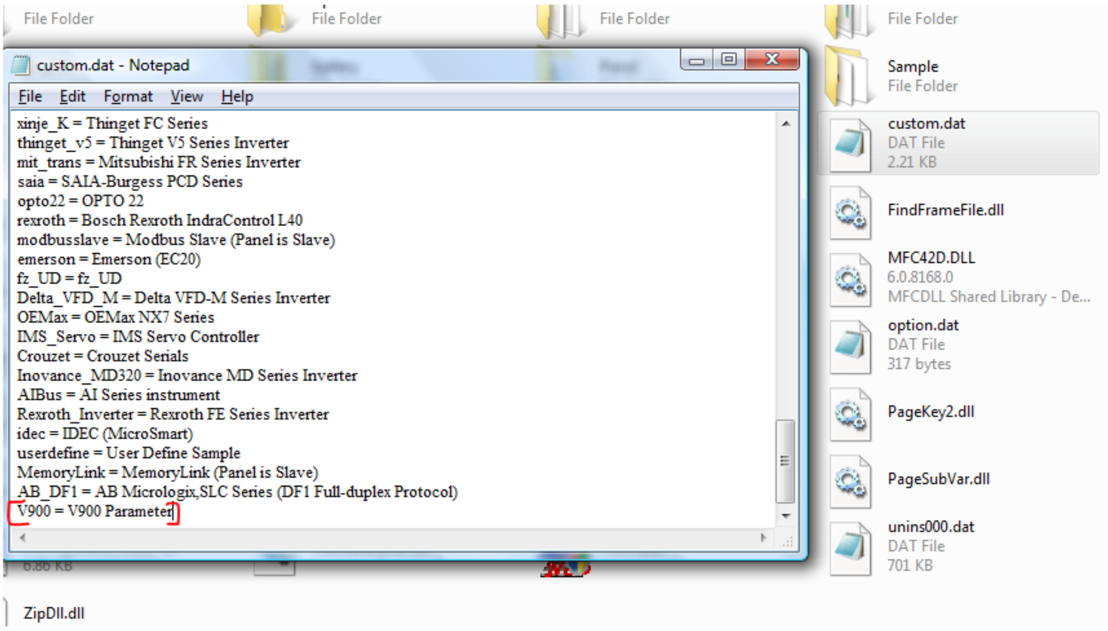
■ Procedure

1.Open the root directory of *Touchwin* software:



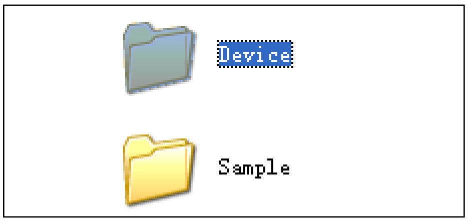
2.Find the *custom..dat* file and open in notepad format, add item '*V900=V900 parameter'* in bottom part, save this and close. Please note that the left part of '=' is filename, the right part of '=' is device name existed in device list.

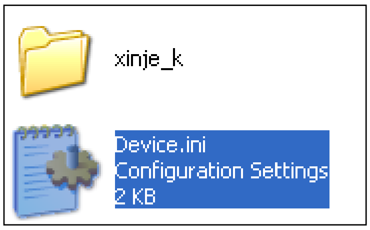
Note: please remove the *attributes 'read-only'* or '*hidden'* if there is a problem in saving operation.



```
xinje_K = Thinget FC Series
thinget_v5 = Thinget V5 Series Inverter
mit_trans = Mitsubishi FR Series Inverter
saia = SAIA-Burgess PCD Series
opto22 = OPTO 22
rexroth = Bosch Rexroth IndraControl L40
modbusslave = Modbus Slave (Panel is Slave)
emerson = Emerson (EC20)
fz_UD = fz_UD
Delta_VFD_M = Delta VFD-M Series Inverter
OEMax = OEMax NX7 Series
IMS_Servo = IMS Servo Controller
Crouzet = Crouzet Serials
Inovance_MD320 = Inovance MD Series Inverter
AIBus = AI Series instrument
Rexroth_Inverter = Rexroth FE Series Inverter
idec = IDEC (MicroSmart)
userdefine = User Define Sample
MemoryLink = MemoryLink (Panel is Slave)
AB_DF1 = AB Micrologix,SLC Series (DF1 Full-duplex Protocol)
V900 = V900 Parameter
```

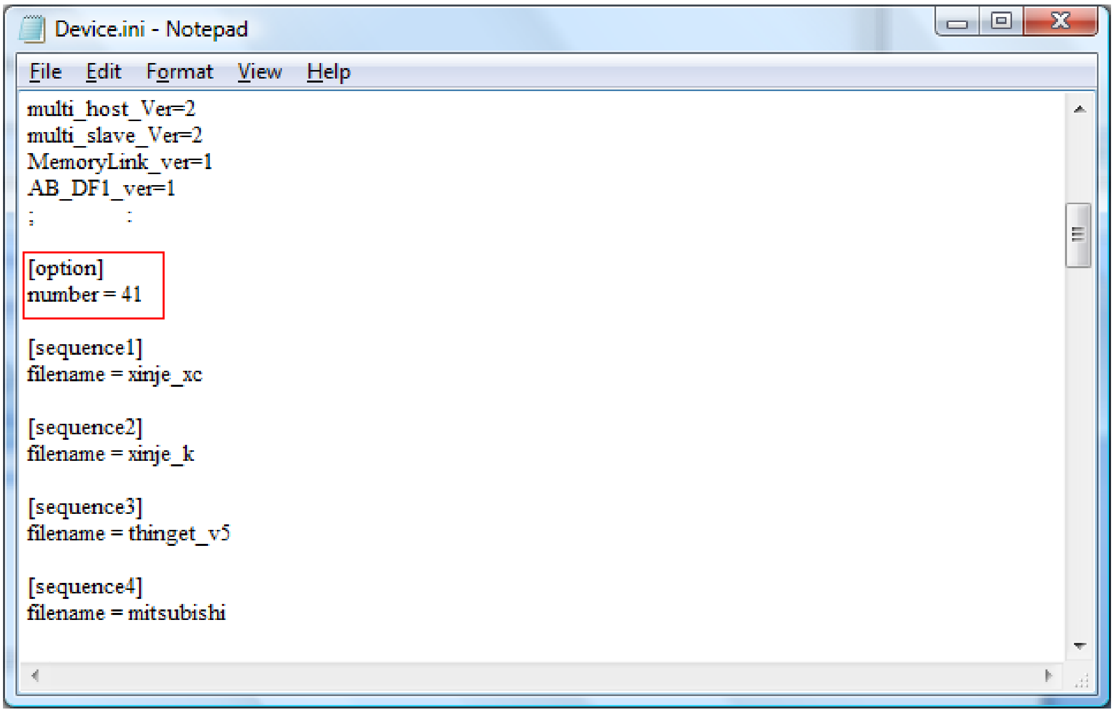
3. Open the file '*Device*' in the root directory and find configuration file '*Device.ini*' to check following code:





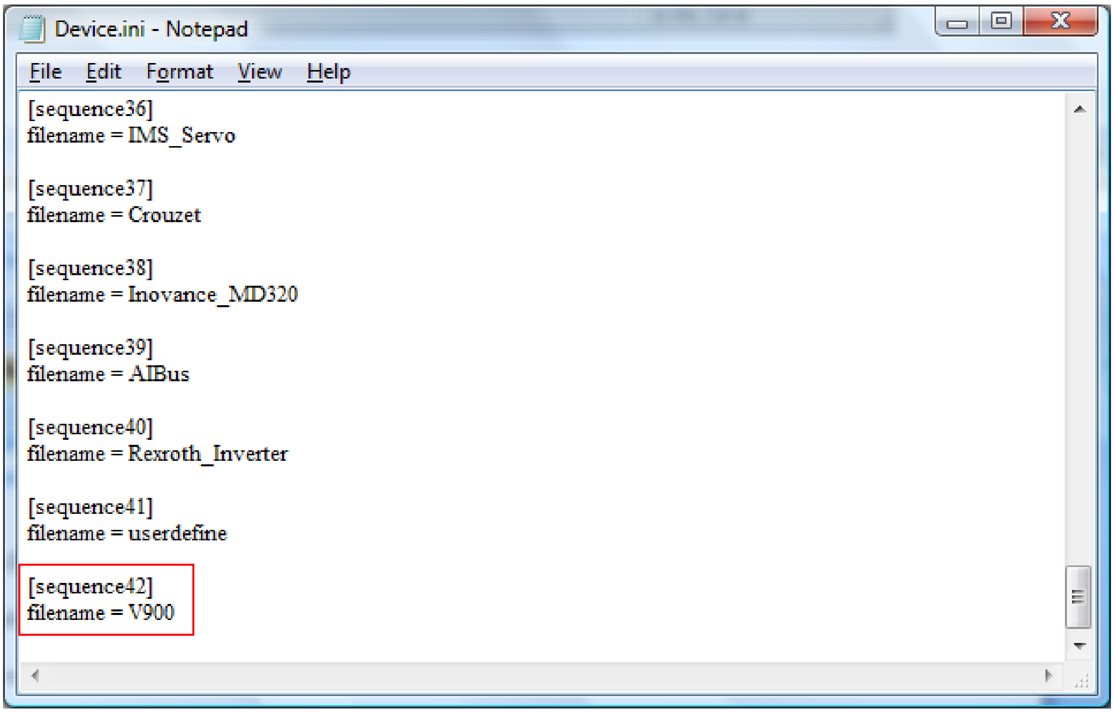
```
[option]
Number=n
```

In this example, the quantity of devices is n=41, after adding a new item, now the quantity is n= 41+1= 42



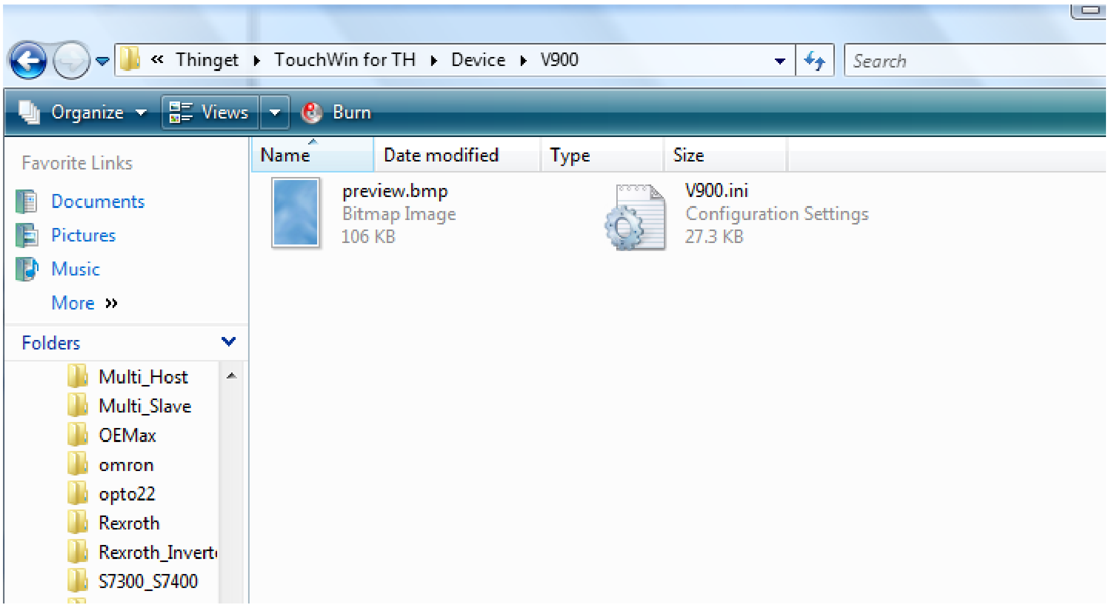
```
multi_host_Ver=2
multi_slave_Ver=2
MemoryLink_ver=1
AB_DF1_ver=1
:          :

[option]
number = 41

[sequence1]
filename = xinje_xc

[sequence2]
filename = xinje_k

[sequence3]
filename = thinget_v5

[sequence4]
filename = mitsubishi
```

4. Please add the following content in the bottom part of 'Device.ini' file.
[sequence42]
filename = V900
Save this change and exit.



```
[sequence36]
filename = IMS_Servo

[sequence37]
filename = Crouzet

[sequence38]
filename = Inovance_MD320

[sequence39]
filename = AIBus

[sequence40]
filename = Rexroth_Inverter

[sequence41]
filename = userdefine

[sequence42]
filename = V900
```

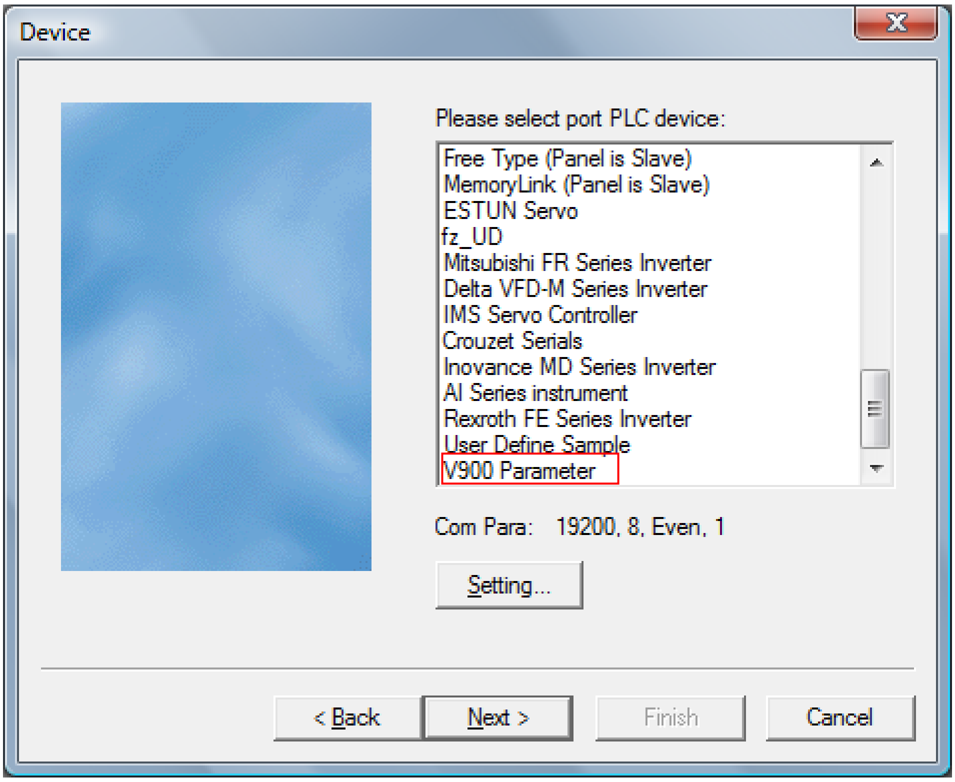
5. After this please return to '*Device*' file and establish a new file named '*V900'*, open this new file and build the following two files.
Note:　you can build these two new files by copying from other device file , and rename as '*V900*'



preview.bmp
Bitmap Image
106 KB

V900.ini
Configuration Settings
27.3 KB

6.。Now, the step of 'register and establish protocol file' is finished and you will find the device named ‘*V900 parameter* is existed in the device list already.



Please select port PLC device:

Free Type (Panel is Slave)
MemoryLink (Panel is Slave)
ESTUN Servo
fz_UD
Mitsubishi FR Series Inverter
Delta VFD-M Series Inverter
IMS Servo Controller
Crouzet Serials
Inovance MD Series Inverter
AI Series instrument
Rexroth FE Series Inverter
User Define Sample
V900 Parameter

Com Para: 19200, 8, Even, 1

2-3 Program a protocol file

2-3-1 Introduction

This chapter will describe how to program protocol code.

2-3-2 Where do program protocol code ?

Open *‘V900’file* in the ‘Device’ file from root directory to double-click file ‘*V900.ini’* file where we program protocol code.

2-3-3 Structure of protocol code

AS a communication rule, protocol code consists of following parts:

- File description
- Default communication setting

- Default Station NO
- Object description
- Communication rule
- Object Type optimization

2-3-4 Procedure

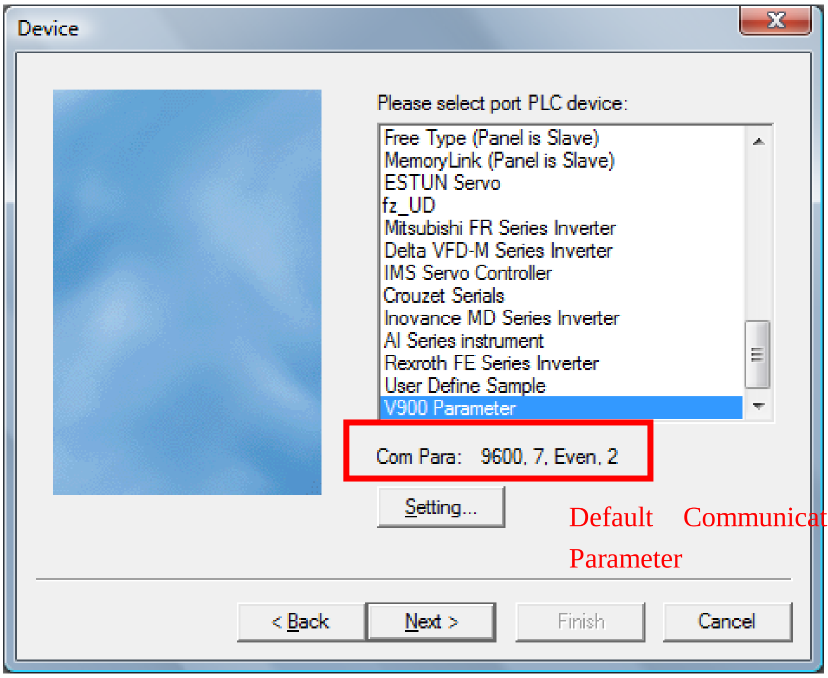
- Descript (File description)

Please write the following content in ‘V900.ini’file with a standard form, as below:

```
[descript]
DeviceModelCode=22
FirmwareName=UserDefine
DownLoadDll = \Device\UserDefine\DownLoad.dll
SpecInfoDll = \Device\UserDefine\DownLoad.dll
DeviceType = 100
```

- Communication (Default communication settings)

Set the default communication parameters when you select the V900 device:


Device
Please select port PLC device:
Free Type (Panel is Slave)
MemoryLink (Panel is Slave)
ESTUN Servo
fz_UD
Mitsubishi FR Series Inverter
Delta VFD-M Series Inverter
IMS Servo Controller
Crouzet Serials
Inovance MD Series Inverter
AI Series instrument
Rexroth FE Series Inverter
User Define Sample
V900 Parameter
Setting...
< Back
Next >
Finish
Cancel

Com Para: 9600, 7, Even, 2

Default Communication Parameter

Write the following ‘default communication setting’ code as below:

```
[Communication]
BaudRate=9600             ; Baud rate
DataBits=8                ; Data bits
Parity=2                  ; Parity    0-None, 1-Odd, 2-Even
StopBits=0                ; Stop bit      0-1 bit, 1-1.5 bits, 2-2 bits
```

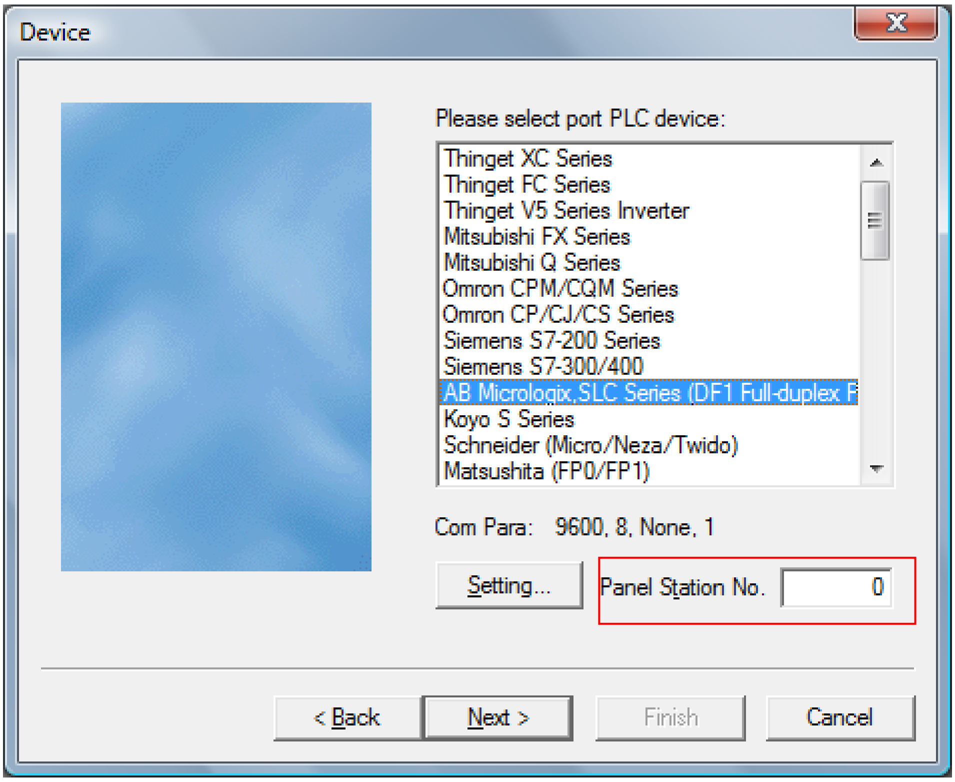
- StationNo   (Default station NO)

This part is comprised of panel part and device part, code is showed as below:

```
[StationNo]
PanelWithStationNo=0          ; 0: station NO of panel is not permitted to set    1:settable      [Note 1]
PanelDefaultStationNo=        ;Default station NO of panel, ‘there is no value because the station NO
                               is not permitted to set in this example’;
PanelMinStationNo=             ;the minimum Station NO of panel. ‘there is no value because the
                               station NO is not permitted to set in this example’;
PanelMaxStationNo=            ;The maximum Station NO of panel . ‘there is no value because the
                               station NO is not permitted to set in this example’;
DeviceWithStationNo=1          ; 0: station NO of device is not permitted to set    1: settable    [Note 1]
DeviceDefaultStationNo=1        ; Default station NO of device with 1
DeviceMinStationNo=0             ; The minimum Station NO of device
DeviceMaxStationNo=255         ; The maximum Station NO of device
```

NOTE 1

Notation: As a slave in communication system, the station NO of panel is settable with setting *PanelWithStationNo=1* as showed in the device list; when *PanelWithStationNo=0*, the settable information is not eyeable.



Please select port PLC device:

Thinget XC Series
Thinget FC Series
Thinget V5 Series Inverter
Mitsubishi FX Series
Mitsubishi Q Series
Omron CPM/CQM Series
Omron CP/CJ/CS Series
Siemens S7-200 Series
Siemens S7-300/400
AB Micrologix,SLC Series (DF1 Full-duplex F
Koyo S Series
Schneider (Micro/Neza/Twido)
Matsushita (FP0/FP1)

Com Para: 9600, 8, None, 1

Panel Station No. 0

- Object (Object description)

This chapter takes example to describe how to write code for *object description*. If we need to read the current weight of V900 device, we should define the occupied spaces and communication rule.

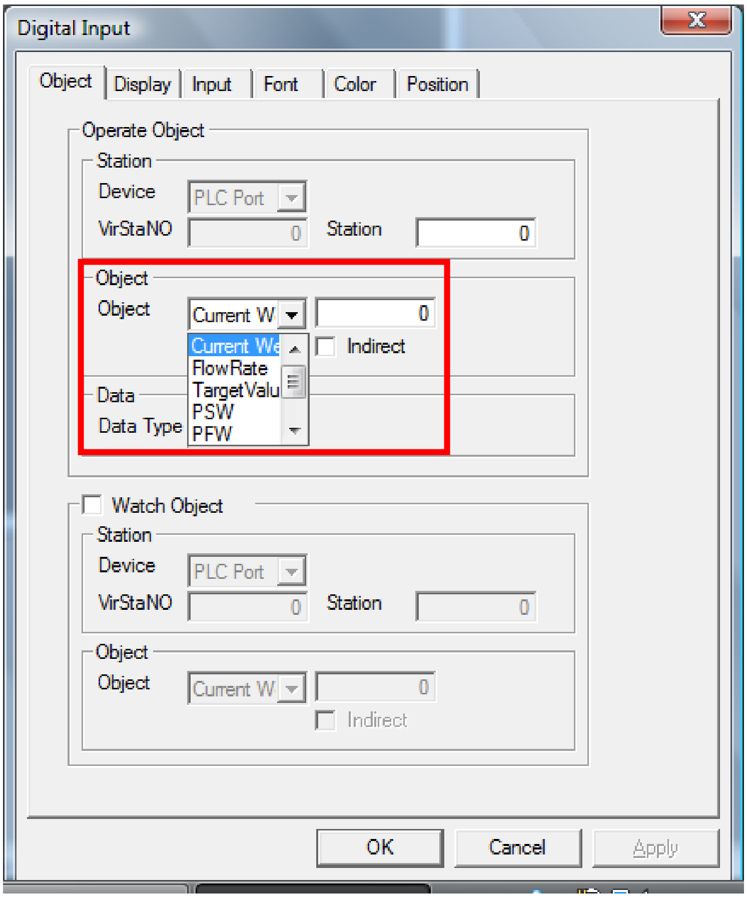
```
[Object]
ObjectNum=13       ; Numbers of objects
[Object1]          ; The first object
CanAct=1           ; Space unit occupied by objects, 0- bit; 1-register; 2-register group [Note 1]
IDSymbol= Current Weight    ; Item name lied in software [Note 2]
TypeNo=0           ; Corresponding ‘Object Type optimization’ NO.
bitlength = 16     ; ‘current weight’ occupies 16 bits
DescripNum=1       ; Section No. of object description [Note 3]
CanSelectType=4    ; Data type selection:（0000 0100）;5-3 bytes,4-n Regs,3-dword,
                     2-word,1-byte,0-bit【Note 4】
ReadWord = 1       ; Called communication rule No. of ‘read register’

[Object1Descrip1]  ; Object description Section 1
Caption=           ; standard form
Type=0             ; Type of digital input in software
             0-Number,1-(0-7),2-(00-07),3-(0-15),4-(00-15),
                     5-(0-F),6-(00-0F),7-(0-31)   【Note 5】
```

```
DefaultNumber=0        ; Default value of digital input in software
MinNumber=0             ; Min number of digital input in software
MaxNumber=0             ; Max number of digital input in software
format=10               ; Data format of digital input in software
NumberStep=1            ; Standard format
```

Notation :

【Note 1】: This item is used to define the *object type* that this item belongs to: bit, register or registers. When we select with Bit, this means the object name will appear on *bit* component like ‘*lamp button*’; when we select with register, this means the object name will appear on *word* component like ‘*digital input, digital display*’; when we select registers, that means object name will appear on *registers* components like ‘*character input*’.

【Note 2】: Component will contains items--‘*current weight*’, as below:

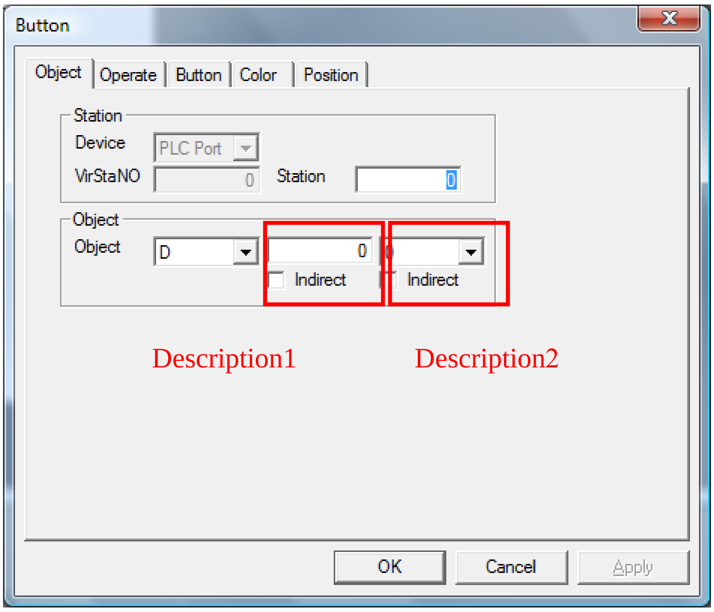


【Note 3】: *Section No*. of object description, we set with ‘1’ in this example which means there is only one description value with this object type, as above.

But it is noted that there are two description values for some object type in some protocol. For example, we can see that the object type D in *Omron PLC* protocol consists of two sections, like *D100B* is comprised of 100 which is in Decimalist format and B which is in range from 0 to F,thus we can proram code as follows (note : A part is code for 100, B part is code for B):

```
[Object9]
CanAct=0
IDSymbol=D
TypeNo=0
bitlength = 16
```

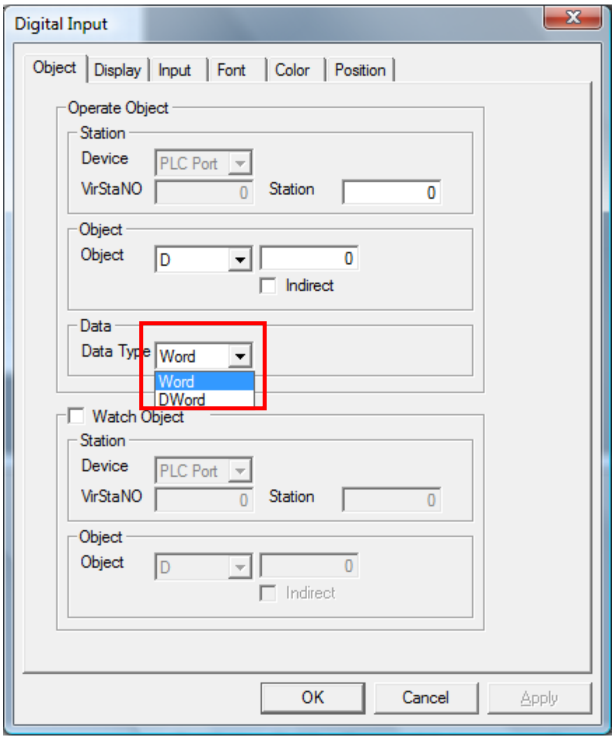
```
DescripNum=2
CanSelectType=1
ReadBit=16
SetBitOn=23
SetBitOff=23

[Object9Descrip1]    A part                                         ;
Caption=
Type=0
DefaultNumber=0
MinNumber=0
MaxNumber=99999
format=10
NumberStep=1

[Object9Descrip2]       B part
Caption=.
Type=3
DefaultNumber=0
```



【Note 4】: Define data type which is comprised of 8 bits in binary system:

Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1	**-**	**-**	**3 bytes**	**n Regs**	**dword**	**word**	**byte**	**bit**
0	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

If we need option both word and Dword, we can have value 00001100 , in decimalist form is 12, thus we can write code CanSelectType=12, as follow:


Digital Input

Operate Object

Station: Device: PLC Port; VirStaNO: 0; Station: 0

Object: Object: D, 0; □ Indirect

Data: Data Type: Word (Word, DWord)

□ Watch Object

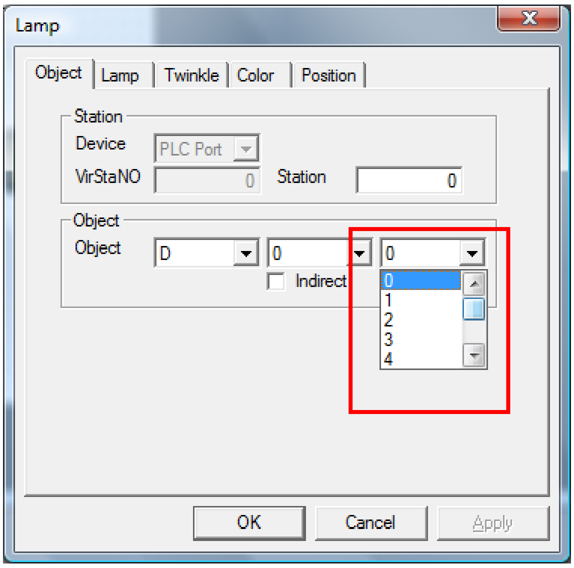
Station: Device: PLC Port; VirStaNO: 0; Station: 0

Object: Object: D, 0; □ Indirect

【Note 5】: Type of digital input in software

Standard Value.	Type of digital input
0	0~ the maximum value
1	(0-7)
2	(00-07)
3	(0-15)
4	(00-15)
5	(0-F)
6	(00-0F)
7	(0-31)

When we select standard value with 5 , the display in software is showed as below:


Lamp

Station: Device: PLC Port; VirStaNO: 0; Station: 0

Object: Object: D, 0, 0 (0, 1, 2, 3, 4); □ Indirect

- ## CommuRule (Communication rule)

This chapter describes the data structure of request as a hardcore of a protocol.

```
[CommuRule]
CommuRuleNum = 19      ; Numbers of communication rule
IsUseASC = 0           ; Use ASC format or not   0:No use ASC, 1: use ASC as Transmit Data
LowBitToASC = 0        ; Ignore high bit or not ?      0:NO, 1:YES      【Note 1】
IsHightBitNext = 0     ; Based on ASC convert, is high bit or low bit in the first     0:NO, 1:YES      【Note2】
IsHightByteNext = 0    ; Take word as basic unit, is high byte in the first position?     0:No, 1:YES
IsHightWordNext = 0    ; Take Dword as basic unit, is high word in the first position?        0:NO, 1:YES

[CommuRule1]
IsInherit   = 0        ; This communication rule is inherit or base?     base=0   inherit=1    【Note 3】
GroupNum = 2           ; Group Number of data transmission, set this value with 2 because the data transmission
                       consists of two steps:   request and response.
Group1Type= 0          ; Group 1 is defined as data request
Group1Blocks = 4       ; Block quantity of group 1 is 4
Group2Type = 1         ; Group 2 is defined as data response
Group2Blocks = 3       ; Block quantity of Group 2 is 3
Group1Block1 = 4       ; The 1st block of group1: Station No. of device        【Note 4】
Group1Block2 = 5       ; The 2nd block of group1: Function code.               【Note 4】
Group1Block2_CmdNo = 3
Group1Block3 = 1                    ; the 3rd   block of group1: Static data      【Note 4】
Group1Block3_StaticValue = 0x42     ;
Group1Block4 = 11                   ; The 4th   block of group1: check            【Note 4】
Group1Block4_StartBlock = 1
Group1Block4_EndBlock = 3
Group1Block4_SelectMethod = 1
Group2Block1 = 4                    ; The 1st   block of group2:                  【Note 4】
Group2Block2 = 10            ; The 2nd   block of group2: data              【Note 4】
Group2Block2_DataAreaType = 1
Group2Block3 = 11                   ; The 3rd    block of group2: check           【Note 4】
Group2Block3_StartBlock = 1
Group2Block3_EndBlock = 2
Group2Block3_SelectMethod = 1

[CommuRule2]
IsInherit   = 1        ;   This communication rule is inherit or base?     base=0     inherit=1
InheritRule = 1        ;   Where does this communication rule inherit from?

Group1Block3 = 1                    }  Enumerate the block need to redefine
Group1Block3_StaticValue = 0x44
```

Notation

【Note1】:

There is an example for how to interpret this code, for example, after converting to ASC format ,0x56 becomes 0x35,0x36 , if we set this with *LowBitToASC = 0*, **so the code 0x56 becomes 0x36 .**

【Note2】:

There is an example for how to interpret this code, for example, after converting to ASC format,0x56 becomes 0x35,0x36, if we set with *IsHightBitNext = 1*, **so the code 0x56 becomes 0x36，0x35.**

【Note3】

Base: define each block of communication rule.

Inherit: only to enumerate the block need to redefine when the communication rule is similar to any base communication rule.

【Note4】: Nearly all transmission data structure consists of these parts: station No, function code, data content, data quantity, check sum. And how about the description in Twin user-define protocol, there is an example:

Group1Block4 = 11
Group1Block4_StartBlock = 1
Group1Block4_EndBlock = 3
Group1Block4_SelectMethod = 1

As above, we can see that *Group1Block4 = 11* **defines the function of** *Group1Block4*, **'11' is the code name which means check sum. And** *Group1Block4_StartBlock* ，*Group1Block4_EndBlock* ，*Group1Block4_SelectMetho* **are the extended definition of** *Group1Block4*,

Thus, each block is comprised of function definition and extended definition, for some simple function ,there only need to define function, such as *Group1Block1 = 4*

The following chapter describes the details of code name of function definition(X: group No, Y: block No.):

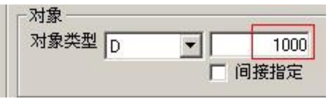
Code name of function definition	**1**
Meaning	**Static data: use in the case that block value is defined**
Extended definition	**Group X Block Y _StaticValue**

Code name of function definition	**2**	
Meanings	**Block length：Bytes length from starting block to end block.**	
Extended definition	**Group X Block Y _LowBitToASC**	**Only remain low bit after ASC conversion. For example, 0x56 ASC Convert to 0x35, 0x36， after pass through LowBitToASC , left 0x36.**

	Group X Block Y _StartBlock	**Start Block number, this block is included in count.**
	Group X Block Y _EndBlock	**End Block number, this block is included in count.**

Code name of function definition	**4**	
Meanings	**Station No.: define the device station No.**	
Extended definition	**Group X Block Y _LowBitToASC**	**Only remain the low bit after ASC conversion.**

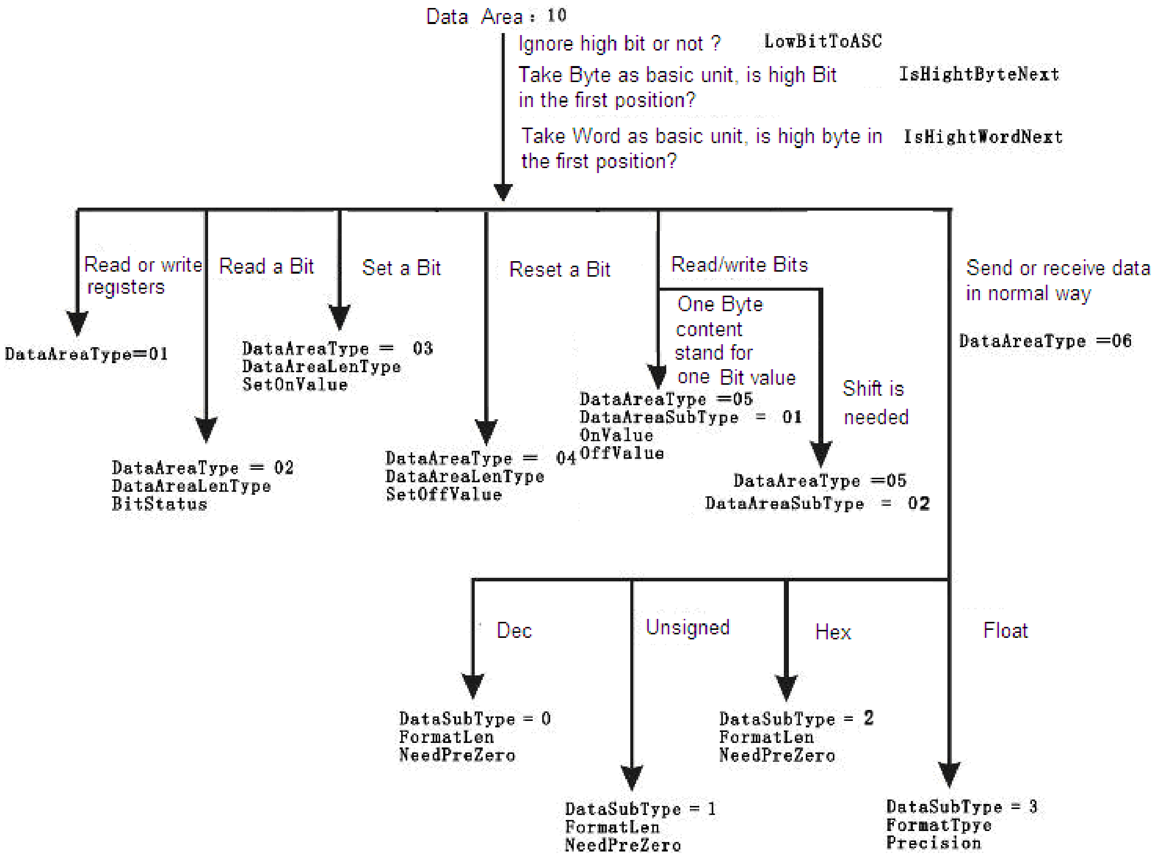
Code name of function definition	**5**	
Meanings	**Command code: define code for '*write*' or '*read* 'operation.**	
Extended definition	**Group X Block Y _LowBitToASC**	**Only remain the low bit after ASC conversion.**
	Group X Block Y _CmdNo	**Take Modbus for example, we use function code 3 for 'read holding registers', so it is expressed as** *Group X Block Y _CmdNo=3*

Code name of function definition	**7**		
Meanings	**Parameter address: example, we need to set object with D1000 if we want to read the value of D1000,thus ,1000 is taken as parameter address, as below:**  对象 对象类型 D 1000 □ 间接指定 **When parameter in software is set as 1000, after converting to *hexadecimal* format, it becomes 03 E8.** **When parameter in software is set as 1000, after converting to ASC ,it becomes 31 30 30 30.**		
Extended definition	**Parameter address convert to *hexadecimal* format**	**Group X Block Y _ DispMode=0**	**Mode selection(DispMode=0, convert address to *hexadecimal* format)**
		Group X Block Y _LowBitToASC	**Only remain low bit**

			after *ASC* conversion
		Group X Block Y_IsHightByteNext	For word, high byte in the first position with low byte followed
		Group X BlockY _IsHightWordNext	For Dword, high word in the first position with low word followed.
		Group X Block Y _ ParaAddress	Expression of address conversion
		The reason why we need expression of address conversion is that the parameter address face to users is different with the ones in data transmission, such as Xinje PLC: the address face to user is TD0, but in transmission process it is H3000, so we need a expression to describe the relation between them. As we can see that ,the address in transmission data in TD N is N+0x3000, thus the expression is *Block Y_ParaAddress = N+0x3000*.	
		Group X Block Y _HoldSpaceSize	（1：Byte；2：Word；3：DWord）which means space size, for example , Group X BlockY_HoldSpaceSize =2 defines a word size.
	Parameter address convert to *ASC* format	Group X Block Y _ DispMode = 1	Mode selection(DispMode=1 convert address to *ASC* format)
		Group X Block Y _LowBitToASC	Only remain low bit after ASC conversion
		Group X Block Y_IsHightByteNext	For word, high byte in the first position with low byte followed
		Group X BlockY _IsHightWordNext	For Dword, high word in the first position with low word followed.
		Group X Block Y _FormatLen	space size with unit Byte.
		Group X Block Y _NeedPreZero	（0：No need；1：Need）Need 0 lead or not
		Group X Block Y _ ParaAddress	Expression of address conversion

Code name of function definition	**8**	
Meanings	**Numbers of parameters: the numbers of parameters to operate. Sometime it needs to operate several continuous parameters in one transmission data to improve efficiency.**	
Extended definition	**Group X Block Y _LowBitToASC**	**Only remain low bit after ASC conversion**
	Group X Block Y_IsHightByteNext	**For word, high byte in the first position with low byte followed**
	Group X BlockY _IsHightWordNext	**For Dword, high word in the first position with low word followed.**
	Group X Block Y _HoldSpaceSize	**which means space size, for example ,** *Group X BlockY_HoldSpaceSize=2* **defines a word size.**
	Group X Block Y _CountMethod	**（1：BITS；2：BYTES；3：WORDS；4：DWORDS）**

Code name of function definition: 10, which describes the data area, the structure is showed as below:



Code name of function definition	**10**	
Meanings	**Data area: save space for transmit data. For example, if we want write 100 into register D100, thus value 100 is the destination to be saved, meanwhile , this area also save the read data.**	
Extended definition	**Group X Block Y _LowBitToASC**	**Only remain low bit after ASC conversion**
	Group X Block Y_IsHightByteNext	**For word, high byte in the first position with low byte followed.**
	Group X BlockY _IsHightWordNext	**For Dword, high word in the first position with low word followed.**
	Group X BlockY _DataAreaLenType	**（1：byte；2：word；3：dword）Group X BlockY _HoldSpaceSize= （2，3，4）Take effect**
	Group X BlockY _BitStatus	**Group X BlockY _HoldSpaceSize= 2 Take effect, the read bit value**
	Group X BlockY _SetOnValue	**Group X BlockY_DataAreaType= 3 take effect**
	Group X BlockY _SetOffValue	**Group X BlockY_DataAreaType= 4 take effect**
	Group X BlockY _DataAreaSubType	**Group X BlockY_DataAreaType= 5 take effect**
	Group X BlockY _OnValue	**Group X BlockY_DataAreaType= 5 Group X BlockY _DataAreaSubType=1**

		Take effect The status seems ON when the corresponding Byte is equal to ‘*OnValue*’
	Group X BlockY _OffValue	Group X BlockY_DataAreaType= 5 Group X BlockY _DataAreaSubType=1 take effect
	Group X BlockY _DataSubType	（0：Dec 1：Unsigned 2：Hex） Group X BlockY_DataAreaType= 6 take effect
	Group X BlockY _FormatLen	Formatlenn describes the Max.length of formatting Group X BlockY_DataAreaType= 6 Group X BlockY _DataSubType=（0，1，2）take effect Note: *Formatlen* describes the Max. length of formattin, but when the value is set as ‘0’, it means the data length adjusts automatically, and *NeedPreZero* is not available.
	Group X BlockY _NeedPreZero	（0：No need；1：Need） Group X BlockY_DataAreaType= 6 Group X BlockY _DataSubType=（0，1，2）take effect
	Group X BlockY _FormatTpye	（0：expressed in ‘dddd.dddd’ format ） Group X BlockY_DataAreaType= 6 Group X BlockY _DataSubType= 3 take effect
	Group X BlockY _Precision	precision of decimal Group X BlockY_DataAreaType= 6 Group X BlockY _DataSubType= 3 take effect
	Group X BlockY _ModNumber	data shift Group X BlockY _DataAreaType=5 Group X BlockY _DataAreaSubType=2 take effect

GroupXBlockY _DataAreaType： This parameter defines the data area type for saving data: Bit, Byte, Word or other type.

	Value	Meanings	Description
GroupXBlockY_DataA	1	Read/write register/registers	
	2	Read single Bit	Read the needful Bit status from response data word or byte. There, we take the Xinje V5series inverter for example to read the rotation direction. The address of rotation direction is H2101, the

	reaType			third bit indicates the status of direction: value ‘0’ shows forward, value ‘1’shows reverse , code is programmed as follow:
				[CommuRule12] ;read status of direction
				IsInherit = 1
				InheritRule = 1
				Group1Block3 = 7
				Group1Block3_HoldSpaceSize = 2
				Group1Block3_ParaAddress = N+0x2101
				Group2Block4 = 10
				Group2Block4_DataAreaType = 2
				Group2Block4_DataAreaLenType = 2
				Group2Block4_BitStatus = P & (1<<2)
				Please note the red part, we already get value from *H2101,* but how to get the status of the third Bit?
				Group2Block4_BitStatus = P & (1<<2)
				We use character P stand for the value of *H2101*; and the （1<<2）means left shift two bits to 0000 0001, then it becomes 0000 0100, after that , do the ‘and ’operation to P and 0000 0100, thus, we get the third bit value.
				If P & (1<<2)=0, the status is OFF,
				If P & (1<<2)=not 0, the status is ON,
				【More details regarding ‘expression’ please refer to ‘expression’ parts in this chapter】

		3	Set one Bit to ON	This form is always matched with inverters. On panel, we can control to start or stop the inverter with button component: ON means start inverter and OFF means control inverter to a stop. Command controlled to start with forward is :write value *H0002* to address *H2000;* Command controlled to stop: wire value H0007 to address H2000; The above means: when control button is in pressing status, the panel send command :write value *H0002* to address *H2000*;when control button is in releasing status, the panel send command : wire value *H0007* to address *H2000;* The following is the code to control the inverter to ‘forward /stop’: [Object12] ; forward /stop CanAct=0 ; Bit

				IDSymbol=
				TypeNo=11
				DescripNum=1
				bitlength = 1
				CanSelectType=1
				ReadBit=13
				SetBitOn=17
				SetBitOff=18
				
				-----------------some code is omitted----------------
				
				[CommuRule17] ; set to forward
				
				IsInherit = 1
				InheritRule = 15
				Group1Block3 = 7
				Group1Block3_HoldSpaceSize = 2
				Group1Block3_ParaAddress = N+0x2000
				Group1Block4 = 10
				Group1Block4_DataAreaType = 0x03
				Group1Block4_DataAreaLenType = 0x02
				Group1Block4_SetOnValue = 0x0002
				Group2Block3 = 7
				Group2Block3_HoldSpaceSize = 2
				Group2Block3_ParaAddress = N+0x2000
				
				[CommuRule18] ; coast to a stop/stop
				IsInherit = 1
				InheritRule = 15
				Group1Block3 = 7
				Group1Block3_HoldSpaceSize = 2
				Group1Block3_ParaAddress = N+0x2000
				Group1Block4 = 10
				Group1Block4_DataAreaType = 0x04
				Group1Block4_DataAreaLenType = 0x02
				Group1Block4_SetOffValue = 0x0007
				Group2Block3 = 7
				Group2Block3_HoldSpaceSize = 2
				Group2Block3_ParaAddress = N+0x2000

		4	Set single Bit to ON	Same as above
		5	Read/write Bits	1. DataAreaSubType = 0x01 Byte value read from data area means status

				of Bit (Note: Byte value only means one Bit value. For example: value H24 means ON status, H45 means OFF status) **Code is showed as below:** **DataAreaSubType = 0x01** **OnValue = 0x24** **OffValue = 0x45** **2. DataAreaSubType = 0x02** **For Xinje PLC, after panel send the command to read value of M10, the response Byte is read into buffer register, then the first bit is the value of M10. If the first bit is the M10 , there is no need to shift , then** *Group2Block4_ModNumber = 1*； **if the Nth bit is the M10, shift is needed , then** *Group2Block4_ModNumber = n.* **The following is the code used for read the Coil M with Xinje PLC:** **Group2Block4 = 10** **Group2Block4_IsHightByteNext = 1** **Group2Block4_DataAreaType = 5** **Group2Block4_DataAreaSubType = 2** **Group2Block4_ModNumber = 1**
		6	**Send/ receive data in normal way'**	**This code is used to send/ receive data in normal way.** **For example:** *3000* **in decimal notation convert to Hex notation is** *BB8*, **then divided into High Byte-***0B* **and Low Byte-***B8*, **but here ,the normal way we use is : divided** *3000* **in decimal notation to** *3 0 0 0,* **then convert into ASC format:** *33 30 30 30;* **This normal way can be divided into two kinds:** **1. Dec , Unsigned, Hex ,** **2. Float** **● Dec , Unsigned, Hex ,** **Example 1: If the data read from one object device is time information:** *31 31 30 31 34 32*, **so the time is:***11: 01:42*, **but how to display this time on the panel? The code is showed as below:** **Group2Block7=10** **Define the 7th block in receive area is data area.**

				Group2Block7_DataAreaType = 0x06 **Define this block to receive data in normal way.** **Group2Block7_DataSubType = 1** **Define the receive data to display in ‘unsigned ’format** **Group2Block7_FormatLen = 6** **Define the length of receive data is 6** **Example 2: NeedPreZero plays an important role in ‘write’ operation, but seems no meaning in ‘read’ operation.** **For example:** **Write value 100 into one parameter of a object device, code is showed as below:** **Group1Block7 = 10** **Define the 7th block in receive area is data area.** **Group1Block7_DataAreaType= 6** **Define this block to receive data in normal way** **Group1Block7_DataSubType= 1** **Define the receive data to display in ‘unsigned ’format** **Group1Block7_FormatLen= 6** **Define the length of receive data is 6** **Group1Block7_NeedPreZero = 1** **Define : lead 0 or not(0: no need, 1:need)** **If Group1Block7_NeedPreZero = 1, then the send data is 30 30 30 31 30 30;** **If Group1Block7_NeedPreZero = 0 then the send data is 31 30 30** **Obviously, the result is different.** ● **Float** **Example: if value read from an object device is** *31 34 33 37 32 32 36 34 2E 31 30,* **it means the value is** *14372264.10*, **so, how to describe this data area? The code is showed as below:** **Group2Block18= 10** **Define the 18th block in receive area is data area.**

				Group2Block18_DataAreaType = 6 **Define this block to receive data in normal way** **Group2Block18_DataSubType = 3** **Define the receive data to display in ‘float ’format** **Group2Block18_FormatTpye = 0** **Define the output format as dddd.dddd; this item is only active for ‘write’ operation, not useful for ‘read ’operation.** **Group2Block18_Precision = 2** **Define the decimal length is 2**

Code name of function definition	**11**	
Meanings	**Checkout code: this is used as checking program to get check result. When the code with checkout (there we call this checkout as checkout A) is entered into communication system, the checking program get the standard checkout (called checkout B), then compare these two checkout. If they are same, it shows the checkout A is correct and will be permitted into communication system, if not, enter the correct code again.** **An example of CRC checkout:** **Group1Block7 = 11** **Group1Block7_StartBlock = 1** **Group1Block7_EndBlock = 6** **Group1Block7_SelectMethod = 3** **Group1Block7_HoldSpaceSize = 2 ;** **Group1Block7_InitValue = 0xffff**	
Extended definition	**Group X Block Y _LowBitToASC**	**Only remain low bit after ASC conversion**
	Group X Block Y _ IsHightByteNext	**For word, high byte in the first position with low byte followed.**
	Group X Block Y _ IsHightWordNext	**For Dword, high word in the first position with low word followed.**
	Group X Block Y _ StartBlock	**Symbol of start block, this block is included in count**

	Group X Block Y _ EndBlock	**Symbol of end block, this block is included in count**
	Group X Block Y _SelectMethod	**Checkout way:（0：Lrc；1：Sum；2：-Sum；3：CRC_Modbus；4：CRC_IBM；5：CRC_ITU）** **Note: -sum check means the sum of all data and checkout is zero, and checkout is in Byte format.**

Code name of function definition	**13**
Meanings	**Incertitude block: this can be used for the uncertain block or indifference block.**

- ObjectType : Object Type optimization

This part is used to optimize the communication rules with less quantity of transmission data. For example: we want to deal with the continuous 5 registers in the panel, without optimization, we have to send 5 read messages each cycle, but if we use this function, in convert into read registers mode automatically and read values of 5 registers each time.

The following part describes a series of optimized codes:

```
[ObjectType]
ObjectTypeNum = 2       ；   numbers of optimize objects

[ObjectType0]                ；   Optimize object type 1  【Note 1】
IsConvert = 0                ；   Convert to other object type or not ? (0: no need     1: need)
Regs = 1           ；  Which communication is this object type belong ?     In this example, use the first
                             communication rule.
MaxLength = 32          ；【Note 2】
BitLength = 16          ；   Bit length of this object type.


[ObjectType1]            ；   Optimize object type 2  【Note 3】

IsConvert = 1            ；   Convert to other object type or not ? (0: no need     1: need)
```

```
ToObjectType = 0      ;   convert to which object type? In this example, the value is zero
TargetAddress = H+0x3000        ;   Conversion expression of object address
BitLength = 16                        ;   Bit length of this object type
```

Notation:

【Note 1】:From the ‘Object type’ part, we know that each object has description of object optimization, there is an example:

```
[Object1]
CanAct=1
IDSymbol=D
TypeNo=0                          ;The matched ‘object opitmization’ No. in this example it is ObjectType0
bitlength = 16;
DescripNum=1
CanSelectType=12
```

【Note 2】: It is advised to set the ‘Maxlength’ with appropriate value, because redundant object would lead to inadequate device addresses and faulty in data transmission.

【Note 3】: Obviously, the structure of ObjectType0 is easy to interpret, but why do we convert ObjectType1 to ObjectType0? There we take Xinje PLC for example to explain.

```
[Object1]
CanAct=1
IDSymbol=D
TypeNo=0
bitlength = 16;
DescripNum=1
CanSelectType=12
ReadWord      = 1
ReadDWord    = 1
WriteWord    = 47
WriteDWord = 8

 [Object2]
CanAct=1
IDSymbol=TD
TypeNo=1
bitlength = 16;
DescripNum=1
CanSelectType=12
ReadWord = 2
```

```
ReadDWord = 2
WriteWord = 9
WriteDWord = 9

------------- some code is omitted-----------------

[ObjectType]
ObjectTypeNum = 2

[ObjectType0]
IsConvert = 0
Regs = 1
MaxLength = 32
BitLength = 16

[ObjectType1]
IsConvert = 1
ToObjectType = 0
TargetAddress = H+0x3000
BitLength = 16
```

Please note the red part of above codes, as we can see, the common registers D is matched with object optimization type 0, but time registers TD is matched with object optimization type 1.

Although there is difference between these two type registers in the functions of PLC program, but in the view of physics space, they are completely same, more details can refer to Xinje XC series PLCs- communication based on Modbus protocol.

Then we find that the Modbus address of D0 is 4x0, and TD0 is 4x3000, but the data structure of them are same during the transmission ,in other word ,on the layer of data transmission with devices, they are only have difference in address, thus, object type conversion is needed.

■ Expression

Eg. 0x1600+N/8

arithmetic：+， -， *， /， %，（，），<<， >>， &， |

digital type： Dec without sign（123），Hex（0xe1；0XE1）
Note: dont’t support the expression of negative, such as -123

Special symbol :N(read or write the 1st description value); M(read or write the 1st description value),R（group quantity of registers;P(response data from ‘data aera’)

Note: capials are not distinguished.

Levels of arithmetic (from high to low) :

The 1st level：（ ， ）

The 2nd level：* ， / ， %

The 3rd level：+ ， -

The 4th level：<< ， >>

The 5th level：&

The 6th level：|

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