Linking ISaGRAF PAC to Modbus TCP/IP Slave Devices Using Modbus TCP/IP Master

Download FAQ-113 Demo

ISaGRAF PAC WP-8147/8447/8847, WP-8137/8437/8837 and VP-25W7/23W7 support Modbus TCP/IP Master Protocol to link to various Standard Modbus TCP/IP Slave devices using the following version drivers:

WP-8xx7: driver Ver.1.14 and above
VP-25W7/23W7: driver Ver.1.05 and above

Download the latest version of driver from:

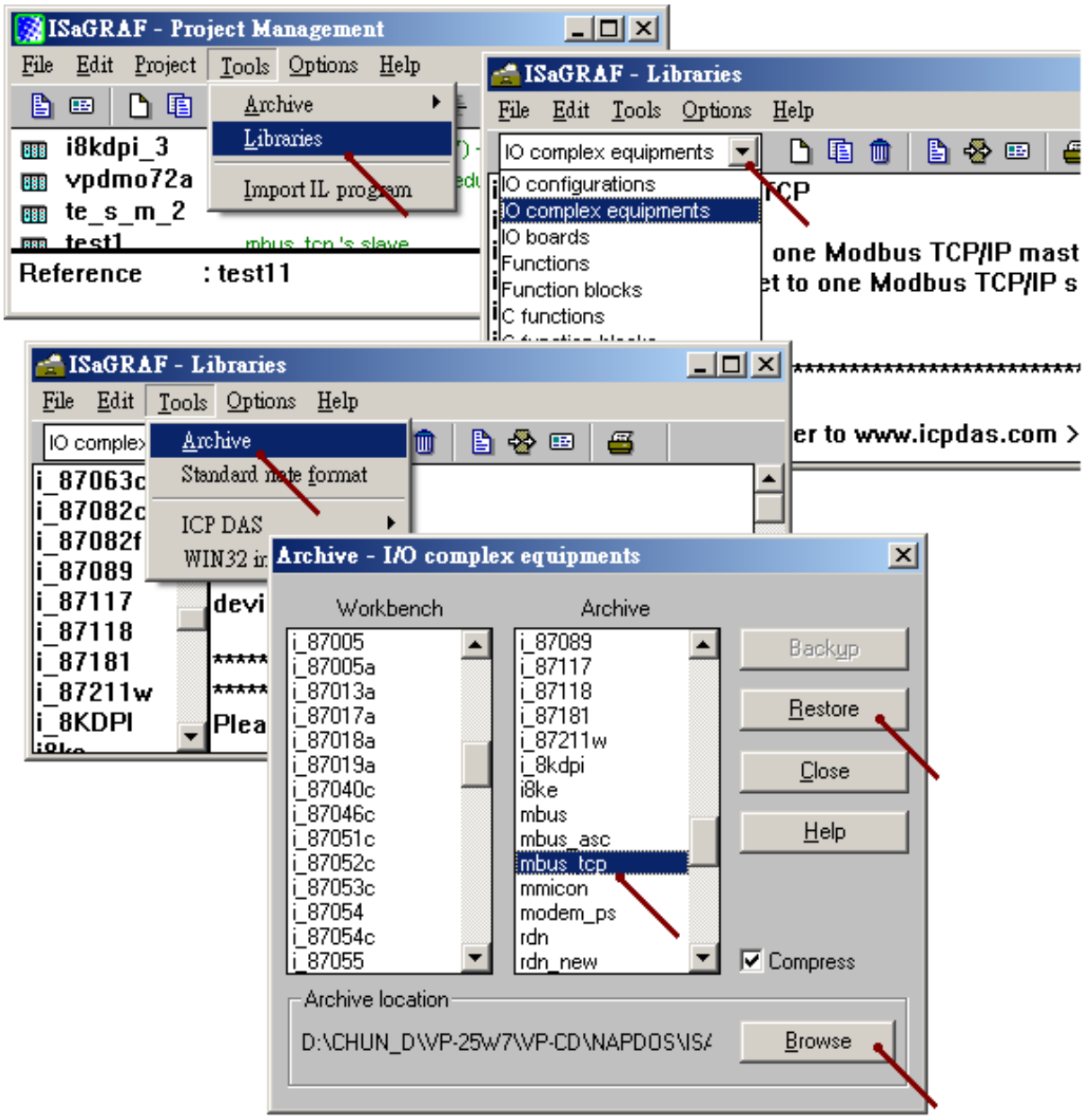
http://www.icpdas.com/en/download/file.php?num=1658

Each WP-8xx7 or VP-25W7/23W7 can link to up to 100 Modbus TCP/IP slave devices. Please make sure the driver version of PAC is consistent with the above listed versions. Then, make sure the I/O complex equipment - “mbus_tcp” is installed in the PC/ISaGRAF. If not, please download “mbus_tcp.xia” from the following website:

http://www.icpdas.com/en/download/index.php?root=&model=&kw=nModbus

Then follow the steps to install it to the PC/ISaGRAF.

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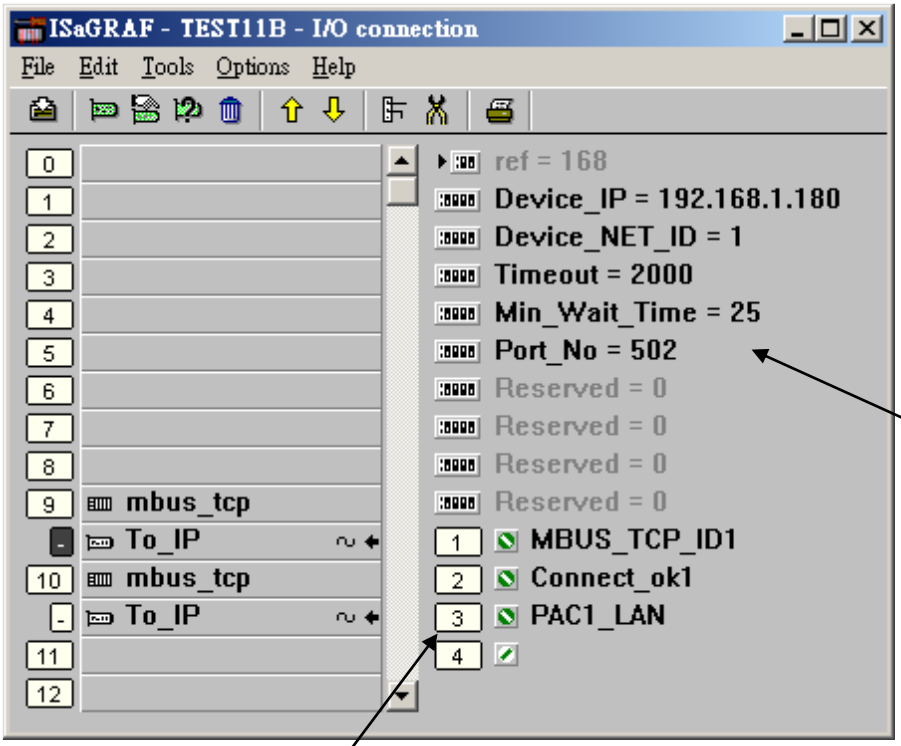
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1.1 Using “Mbus_tcp” to Link Modbus TCP/IP Slave Devices

1. Setup for using “Mbus_tcp”

One PAC supports up to 100 “Mbus_tcp” connections. Using more “Mbus_tcp” connections will reduce the PAC efficiency. If the PAC does not actually connect to a Modbus TCP/IP slave device, do not use “Mbus_tcp”. It is to prevent the PAC efficiency reducing from trying to connect with a non-existing device.

Some Modbus TCP/IP slave devices may not allow read/write data in fast frequency. The user can assign a larger value to “Min_Wait_Time”, so that the Modbus TCP/IP command will not be sent too frequently.



Device_IP: the IP address of the linked device.

Device_NET_ID: the Modbus ID number of the device. (Usually is number 1)

Timeout: unit ms (0.001sec.), more than a period time did not respond called Timeout (could be 500 ~ 5000).

Min_Wait_Time: unit ms, the minimum waiting time before send the next MBTCP command. (Could be 10 ~ 60,000).

Port_No: the Modbus TCP/IP port used by the device. Normally is 502.

Mbus_tcp has 4 Integer inputs, listed below:

The 1st Channel: return a “Mbus_tcp” ID code, the correct ID code value at least is 1,000,001.
Must use the input parameter of “SLAVE_” on the left side of mbus_xxx function blocks.
The 2nd Channel: the connection situation of the current device, 1: connect, 0: not connect.
The 3rd Channel: reserved.
The 4th Channel: reserved.

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2. Edit the Mbus_xxx function blocks to read/write data from/to the Modbus TCP/IP slave devices

After the step 1 about linking Mbus_tcp, next step is similar to the method in the **Chapter 8 - "Linking The Controller To Modbus RTU & Modbus ASCII Devices" of the** "**User's Manual of ISaGRAF PAC**". Up to now, "Mbus_tcp" supports the following Modbus read/write function blocks.

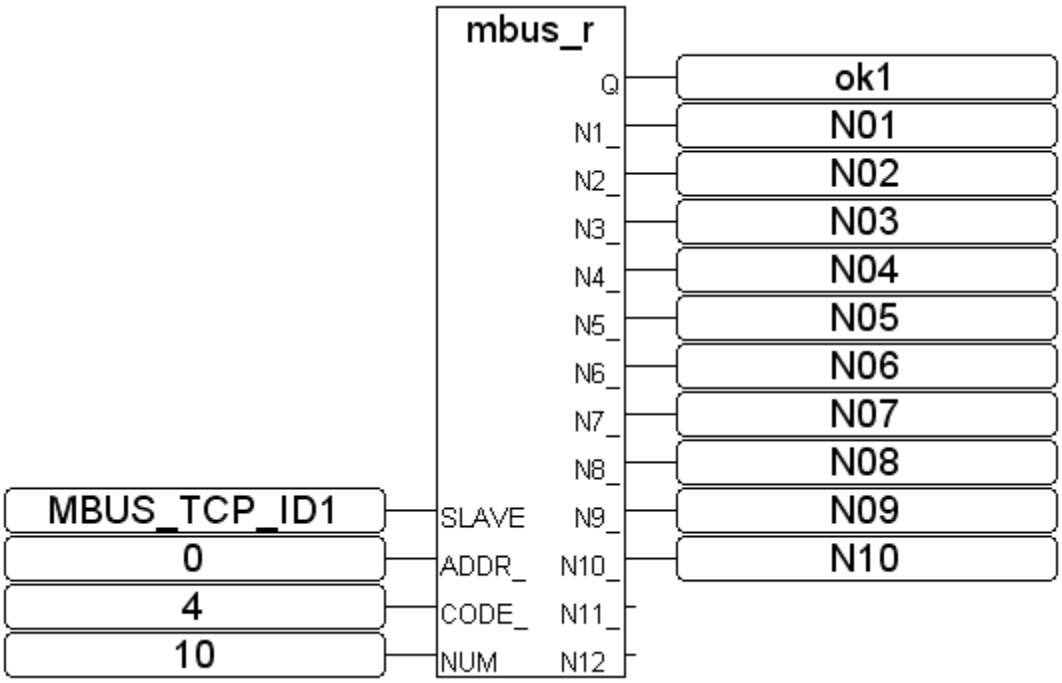
Mbus_R	Setting "CODE_" as Modbus function code 3 or 4: 1. Read max. 12 Word-values (-32768 ~ +32767) 2. Read max. Six 32-bit Integer-values (-2,147,483,648 ~ +2,147,483,647): must transform two words to one 32-bit Integer-value using function block "WD_LONG". 3. Or read max. 6 Real-values (32-bit floating point): must transform two words to one 32-bit Integer-value using function block "WD_LONG", then, transform that 32-bit Integer-value to one 32-bit Float-value using function block "INT_REAL". Setting "CODE_" as Modbus function code 1 or 2: 4. Read max. 192 Boolean (Bit)-values: must transform one word to 16 Boolean-values using function block "WD_Bit".
Mbus_R1	Same as "MBUS_R" but with one extra setting – "PERIOD_" (unit: sec., 1 ~ 600). Read words or bits with a specified period time.
Mbus_N_R	Read 8 Word-values (-32768 ~ +32767) using Modbus function code 3 (Each Modbus command requests 8 Words, if the device does not support 8 Words per time or it supports Modbus function code 4 only, please use another function block "MBUS_R".)
Mbus_NR1	Same as "MBUS_N_R", but with one extra setting - "PERIOD_" (unit: sec., 1 ~ 600). Read words with a specified period time.
MBUS_B_R	Read 8 Boolean (Bit)-values (True or False) using Modbus function code 1. (Each Modbus command requests 8 Bits, if the device does not support 8 Bits per time or it supports Modbus function code 2 only, please use another function block "MBUS_R".)
MBUS_BR1	Same as "MBUS_B_R", but with one extra setting - "PERIOD_" (unit: sec., 1 ~ 600). Read value with a specified period time.
MBUS_N_W	1. Write max. 4 Word-values (-32768~+32767) using Modbus function code 6 or 16. If "NUM_W_" is 1, use Modbus function code 6. If "NUM_W_" is 2 ~ 4, use Modbus function code 16. 2. Or write 1~2 32-bit Integer-values: use function block "LONG_WD" transform one 32-bit Integer to 2 Words, send them into "MBUS_N_W" and set "NUM_W_" as 2 or 4. 3. Or write 1~2 32-bit Float point values: use function block "REAL_INT" transform one 32-bit Float to one 32-bit Integer, then use function block "LONG_WD" transform the 32-bit Integer to 2 Words, send them into "MBUS_N_W" and set "NUM_W_" as 2 or 4.
MBUS_B_W	Write max. 4 bit-values using Modbus function code 5 or 15.

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	If “NUM_W_” is 1, use Modbus function code 5. If “NUM_W_” is 2 ~ 4, use Modbus function code 15.
MBUS_WB	Write max. 16 bit-value using Modbus function code 15.
MBUS24R	Read max. 24 Word-values or 12 long Integer or Real values (Refer to FAQ-096)
MBUS_24R1	Read max. 24 Word-values or 12 long Integer or Real values (Refer to FAQ-096)
MBUS_XR	Read max. 120 Word-values or 60 long Integer or Real values (Refer to FAQ-101)
MBUS_XR1	Read max. 120 Word-values or 60 long Integer or Real values (Refer to FAQ-101)

For example, read from the address 0~9 of the Modbus TCP/IP salve device. It is 10 Words (suppose the device using Modbus function code 4), so user can use function block “Mbus_R” to read. (“Mbus_TCP_ID1” is the first channel value returned by the “Mbus_tcp” in the screen “I/O connection”. It is the ID code of the “Mbus_tcp”. Please refer to the previous step 1 for detail information.)

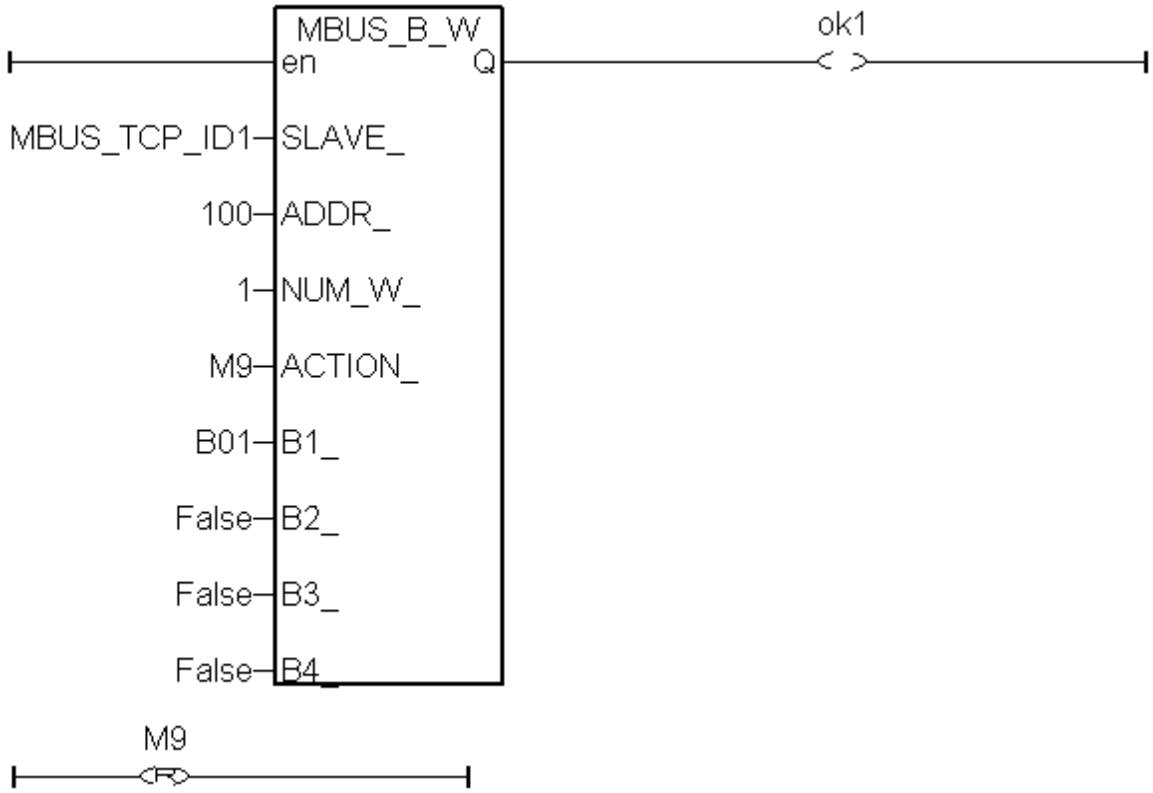
The first returned value in the right side is the communication situation of function block “mbus_R”, True: ok, False: fail.



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For another example, write 1 Bit-value to Modbus TCP/IP slave device. User can use function block "Mbus_B_W" (or "Mbus_wb", Note: When write 1 bit, Mbus_b_w uses Modbus function code 5. But "Mbus_wb" uses Modbus function code 15. When write 2 or more Bits, "Mbus_b_w" and "Mbus_wb" are all use Modbus function code 15.)

In the program below, when M9 is set to "True", it will send a command once to set 1 bit-value (addr=100) as B01 (B01 is an ISaGRAF Boolean variable. Its value can be "True" or "False".). If want to send the command continually, please directly set "True" to the parameter of "ACTION_". The program below sends the command just once when M9 is "True".



For the setup information about other "Mbus_xxx" function blocks, please refer to the following document. (http://www.icpdas.com/en/download/show.php?num=1005&nation=US&kind1=&model=&kw=isagraf)

FAQ-101: How to read max. 120 Words or max. 60 Long-Integers or max. 60 Real values from **Modbus RTU/ ASCII** devices by using **MBUS_XR** or **MBUS_XR1** function block (for WP-8xx7/ 8xx6 and VP-25W7/23W7/25W6/23W6 and Wincon-8xx7/ 8xx6 only)?
FAQ-096: Release Two C-Function-Blocks To Read Max. 24 Words Or 384 Bits From **Modbus RTU/ ASCII** Devices
FAQ-047: How to Read or Write Floating Point Values to **Modbus RTU Slave** device?

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FAQ-046: How to Write **16-bits** to **Modbus RTU** devices by **Modbus** function call **No. 6**?
"User's Manual of ISaGRAF PAC" Chapter 8. ("User_Manual_I_8xx7.pdf") or WP-8xx7 CD:\napdos\ISaGRAF\wp-8xx7\chinese_manu\ or VP-2xW7 CD:\napdos\ISaGRAF\vp-25w7-23w7\chinese_manu\ or http://www.icpdas.com/en/download/file.php?num=1658

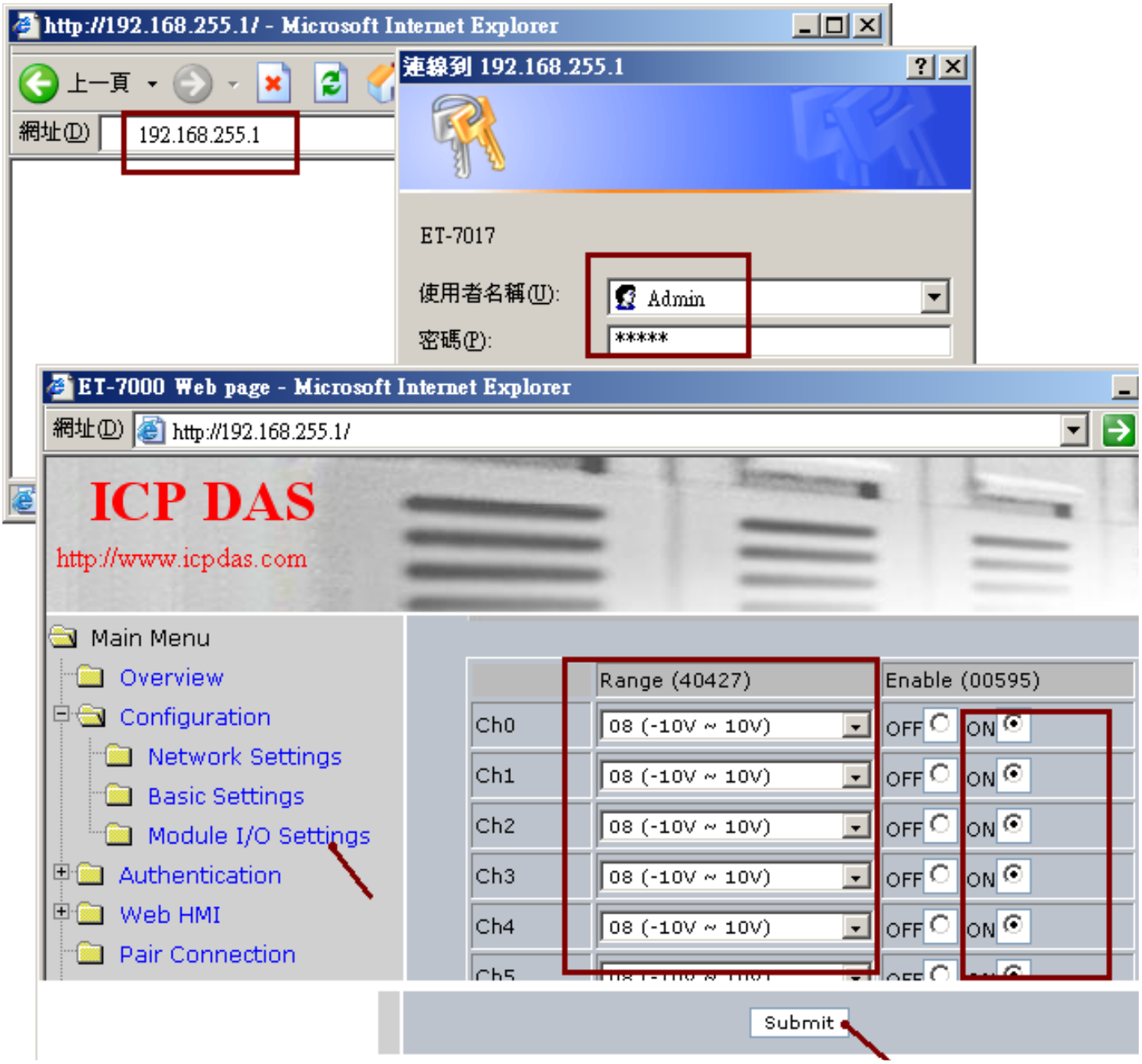
1.2 Using "Mbus_tcp" to Link ET-7000 I/O Modules

ICP DAS ET-7000 series supports Modbus TCP/IP slave protocol and Web configuration. WP-8xx7 or VP-2xW7 can link to several ET-7000 modules using"Mbus_tcp". In theory a single WP-8xx7 or VP-2xW7 can link to up to 100 ET-7000 modules.
For more ET-7000 product information, please visit the following website.
http://www.icpdas.com/en/product/guide+Remote__I_O__Module__and__Unit+Ethernet__I_O__Modules+ET-7000_ET-7200

1. Using Internet Browser to setup ET-7000 module

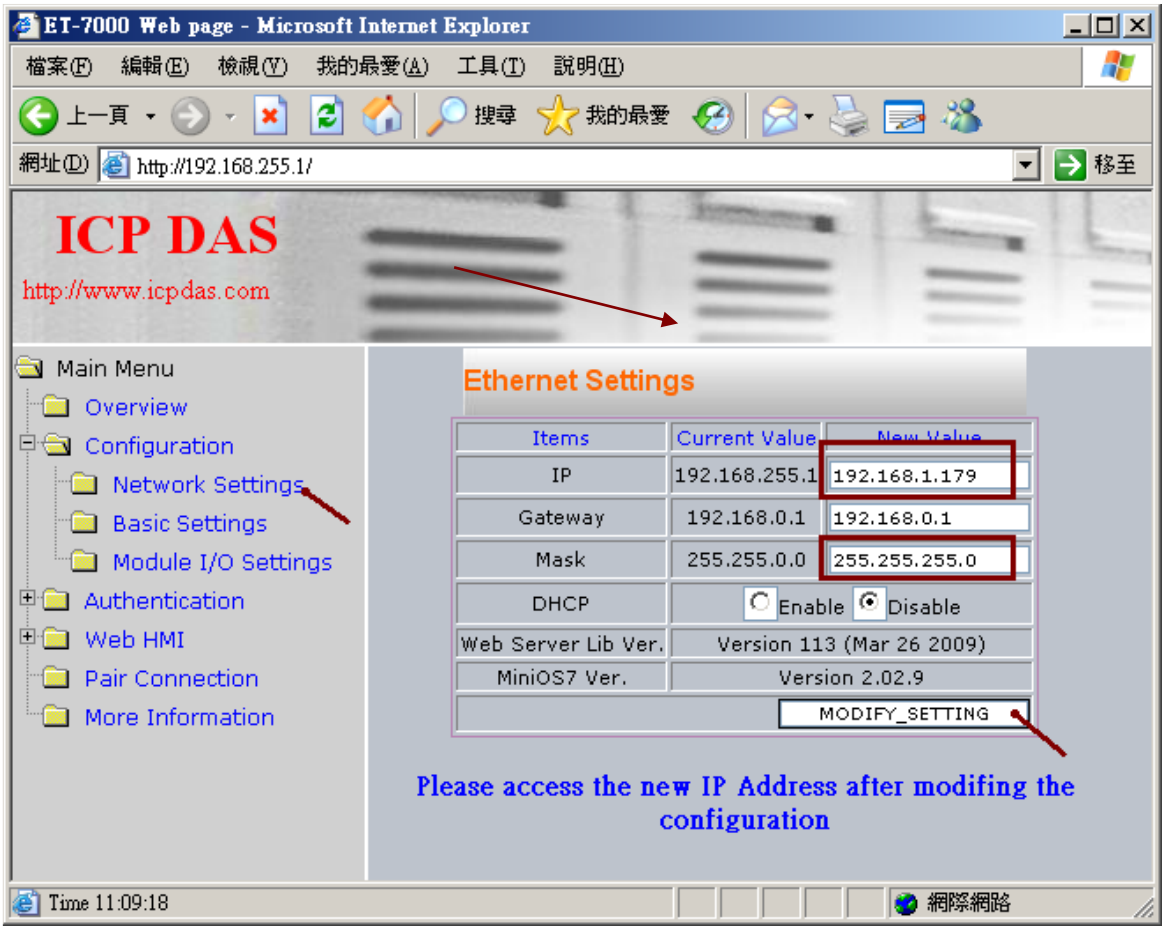
Each ET-7000 must be configured via Internet Browser before its first usage. ET-7000 series manufactured with the IP address=192.168.255.1, Mask=255.255.0.0. Please set your PC in the same domain of IP address, ex: set PC to IP=192.168.255.100, Mask=255.255.0.0. Then run the Internet Browser, such as IE, input the IP address to connect the ET-7000, as the below screen (Note: The Dip Switch in the back of ET-7000 must be set to the "Normal" position.).
First, click **[Configuration] > [Module I/O Settings]** for the Channel setting, then click "**Submit**" to finish.

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Username: Admin
Password: Admin
(大小寫必須完全相同)

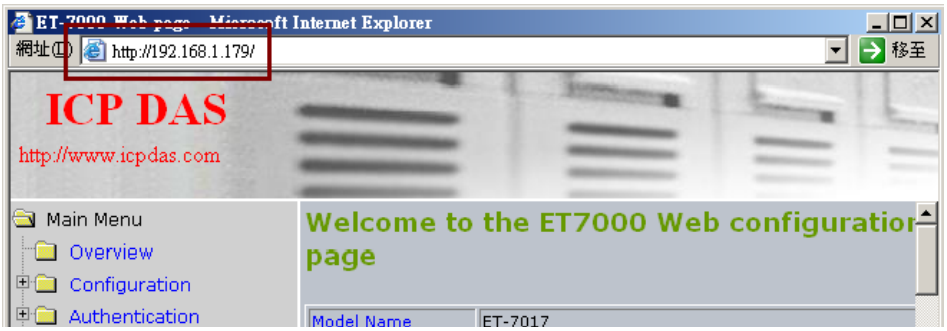
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Note: After changing the IP or Mask of ET-7000, user must link by the new IP. The PC must also set to the same domain with the new IP address. (If forget IP or Mask of the ET-7000, please refer to the section 1.3 of this document.)

Next, to set up the IP and Mask of the ET-7000, please click **[Configuration] > [Network Settings]**. After changing IP & Mask, click "**MODIFY_SETTING**".

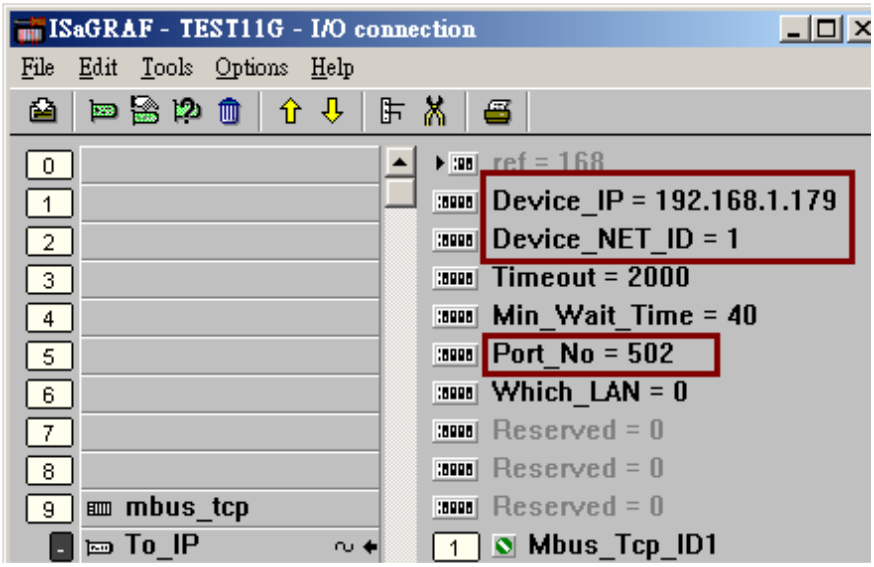
Please use the new IP address to connect it after setting the new IP & Mask. (If forget IP or Mask of the ET-7000, please refer to the section 1.3 of this document.)



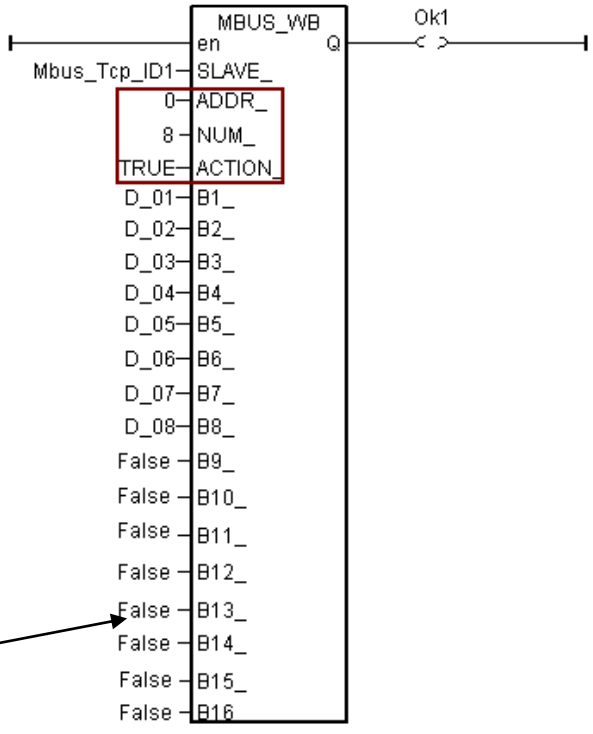
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2. Using Mbus_tcp & Mbus_xxx function block to link ET-7000

Next, connect the “Mbus_tcp” in the “ISaGRAF I/O connection” window, please refer to the section 1.1 of this document. Then use the suitable function block Mbus_xxx to read or write the data in the ET-7000.

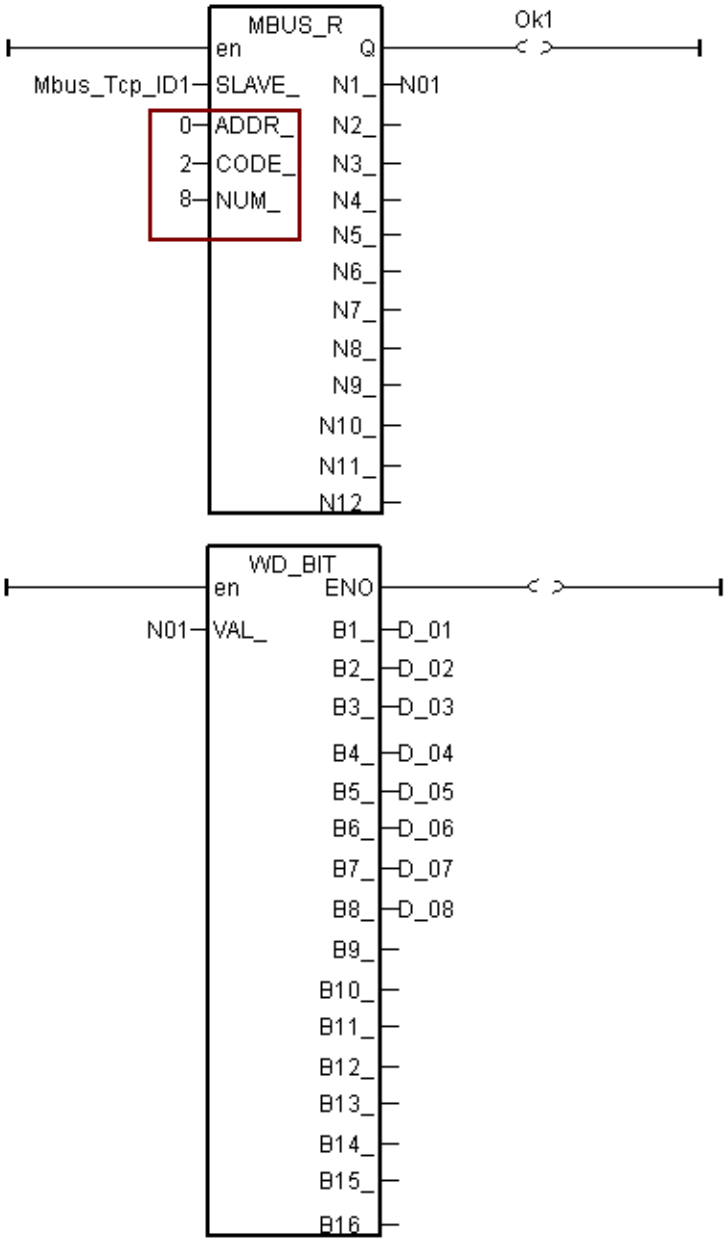


For DO channel of ET-7000, please use **Mbus_WB** function block. The “NUM_” parameter must assign in the DO channel number of the ET-7000 (<= 16). Assign the “ACTION_” parameter with “True” and the “ADDR_” with “0” (If the ET-7000 has more than 16 DO channels, use 2 Mbus_wb function block to control it and set one of “ADDR_” to “0”, the other to “16”.)



Please assign “False” to the DO channels that been not used.

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For DI channel of ET-7000, please use **Mbus_R** function block. Assign the “ADDR_” with “0” and assign the “CODE_” with “2”. The “NUM_” parameter must assign in the DI channel number of the ET-7000 (1 ~ 32).

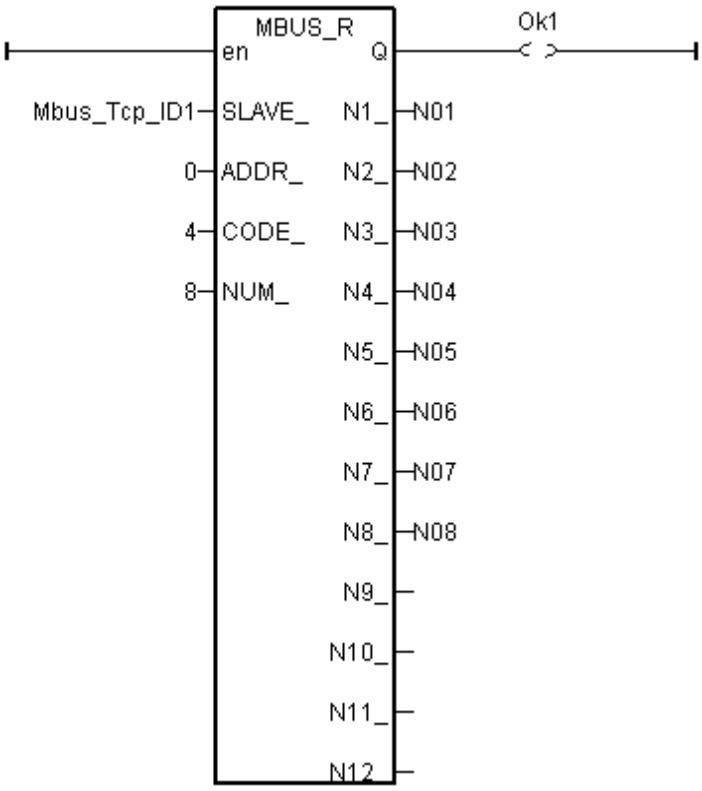
Each “N1_” ~ “N12_” in the right side of “Mbus_R” function block is a Word-value (range: -32768 ~ +32767). Each Word-value can be transformed to 16 DI channel values, so please use “WD_BIT” to transform Word to Boolean variable, as the following pictures. (Note: If the ET-7000 has more than 16 DI channels, must use 2 words, such as N1_ & N2_, in the right side.)

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For AI channel of ET-7000, please use **Mbus_R (**or **mbus24R)** function block. Assign the “ADDR_” with “0” and assign the “CODE_” with “4”. The “NUM_” parameter must assign in the AI channel number of the ET-7000, could be 1 ~ 12 (for Mbus24R: 1 ~ 24).

The range of the Word-value read from the right side is -32768 ~ + 32767. This value is related to the AI channel range setting of the ET-7000. Please refer to the user manual of the ET-7000. (For example, ET-7017: http://www.icpdas.com/en/download/index.php?model=ET-7017)

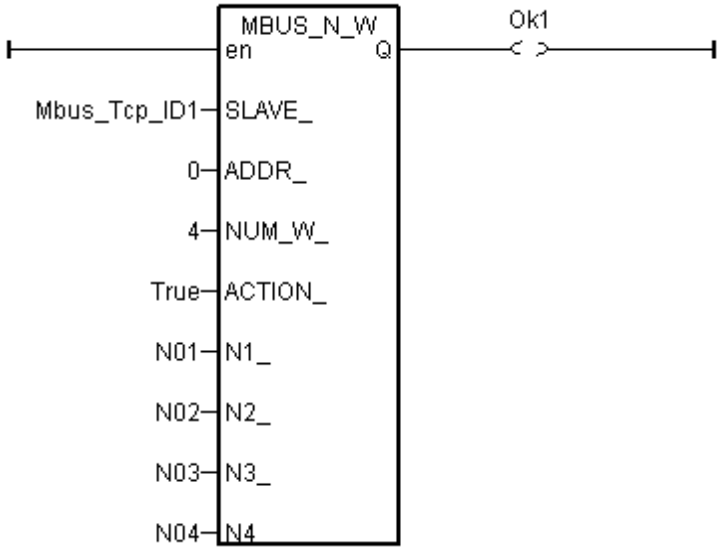
For instance, if set the range of ET-7017 to “08: -10 V to + 10V”, its word-value is mapping to -32768 ~ + 32767. When input 5 V, the Word-value read from the right side is about 16383; if input -2.5 V, the Word-value is about -8192.



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For AO channel of ET-7000, please use **Mbus_N_W** function block. The “NUM_W_” is assigned in the AO channel number of the ET-7000, could be 1 ~ 4 (If the AO channels are more than 4, please use 2 or more Mbus_N_W blocks to control it.). “ADDR_” must be filled in “0” and the “ACTION_” must be filled in “True”.

The range of the Word-value “N1_” ~ “N4_” outputted from the left side is -32768 ~ + 32767. These values are related to the AO channel range setting of the ET-7000. Please refer to each user manual of the ET-7000 products.

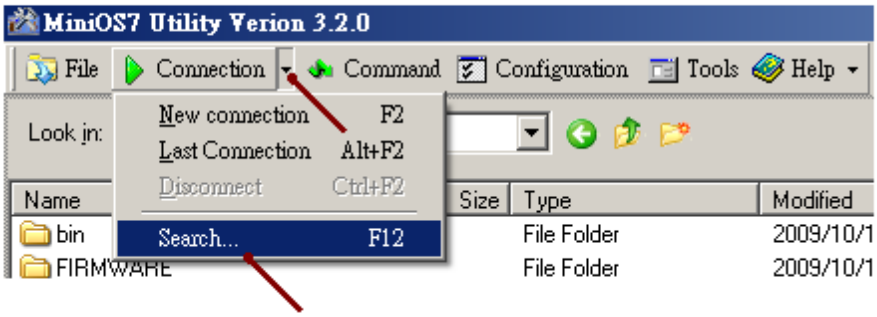


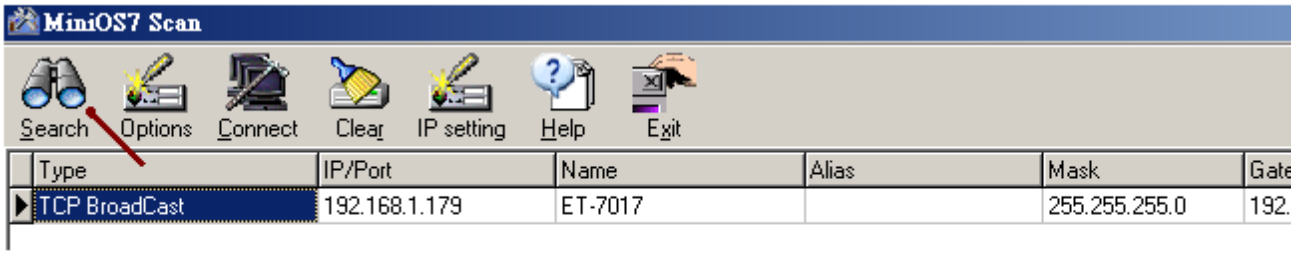
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1.3 Forgetting the IP or Mask of ET-7000, what to do?

After changing the IP of the ET-7000 modules, sometimes user will forget the set IP. Using MiniOS7_Utility can find out the set IP of the ET-7000. Please follow the pictures below. Make sure your PC has installed the MiniOS7_Utility, or please download the lasted version from the website of http://www.icpdas.com/en/download/show.php?num=1053&root=&model=&kw=MiniOS7%20Utility







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