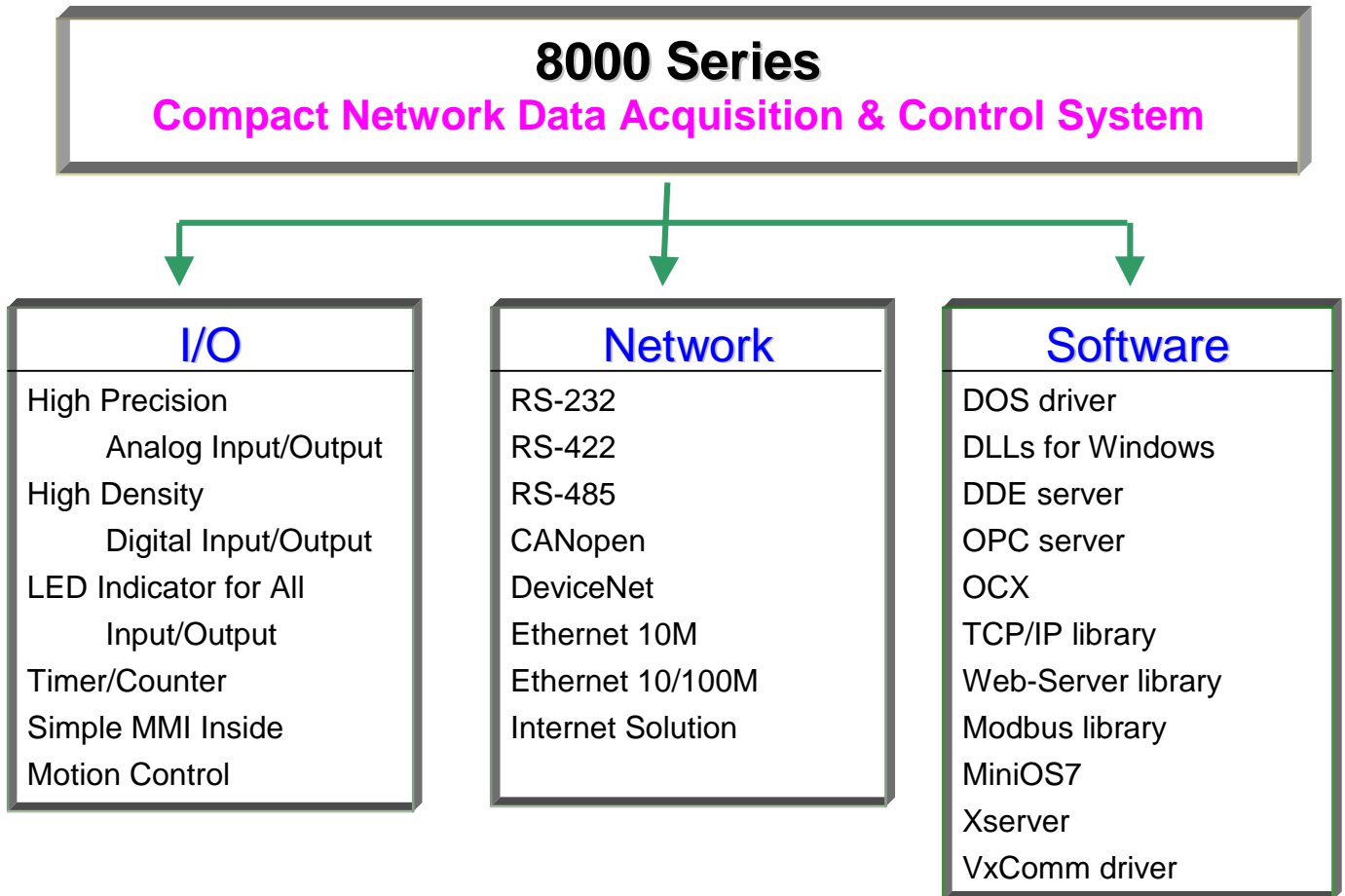


8000 Series User's Manual



Warranty

All products manufactured by ICP DAS are warranted against defective materials for a period of one year from the date of delivery to the original purchaser.

Warning

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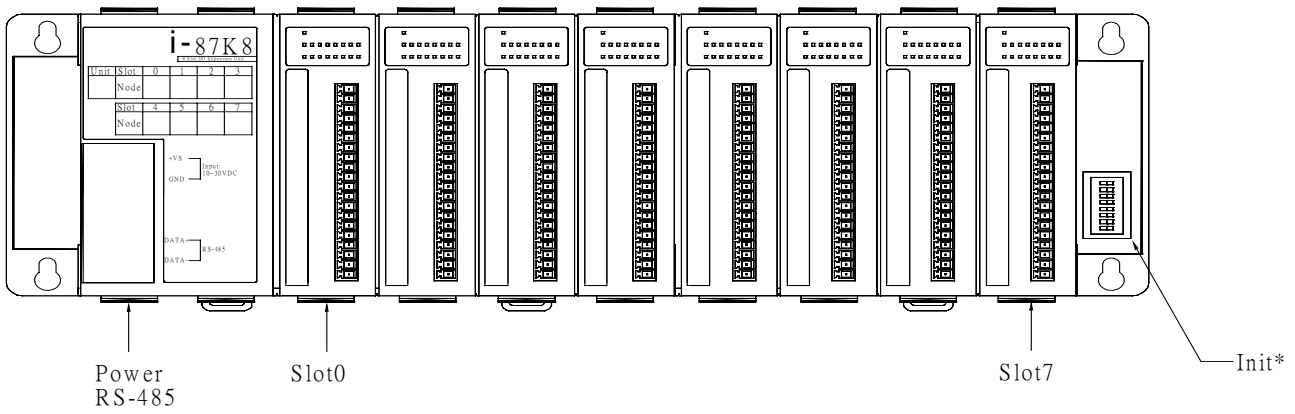
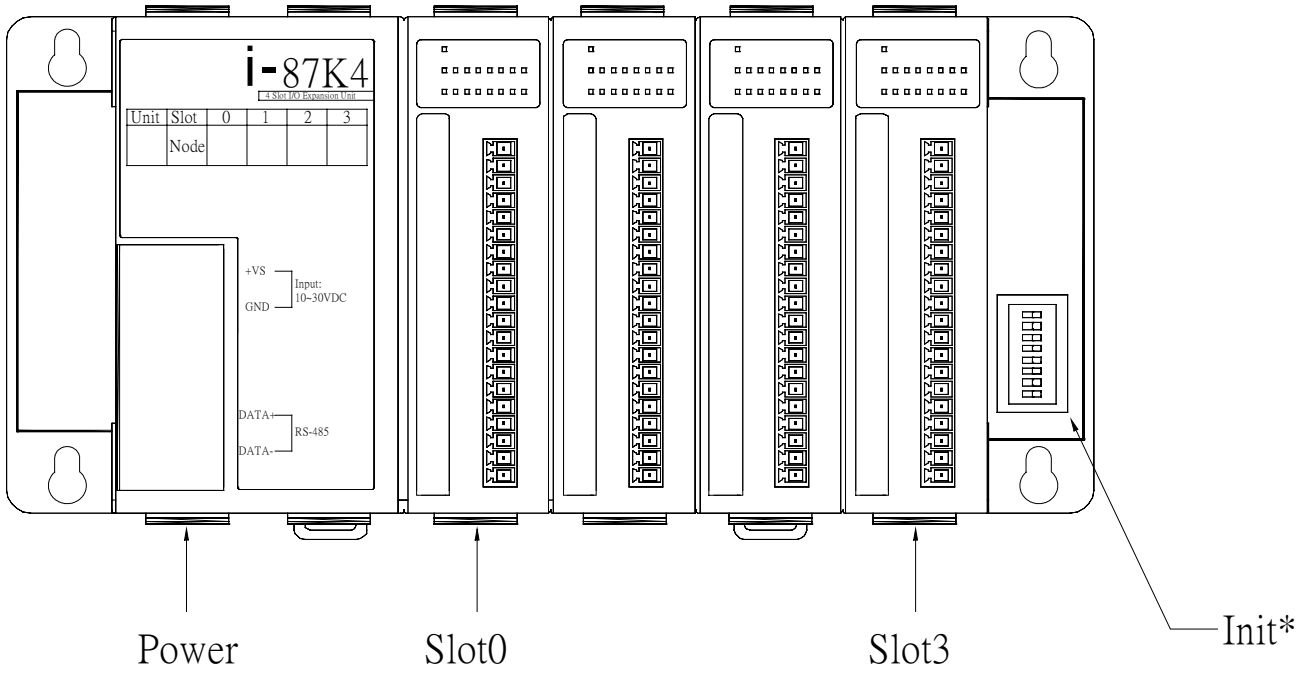
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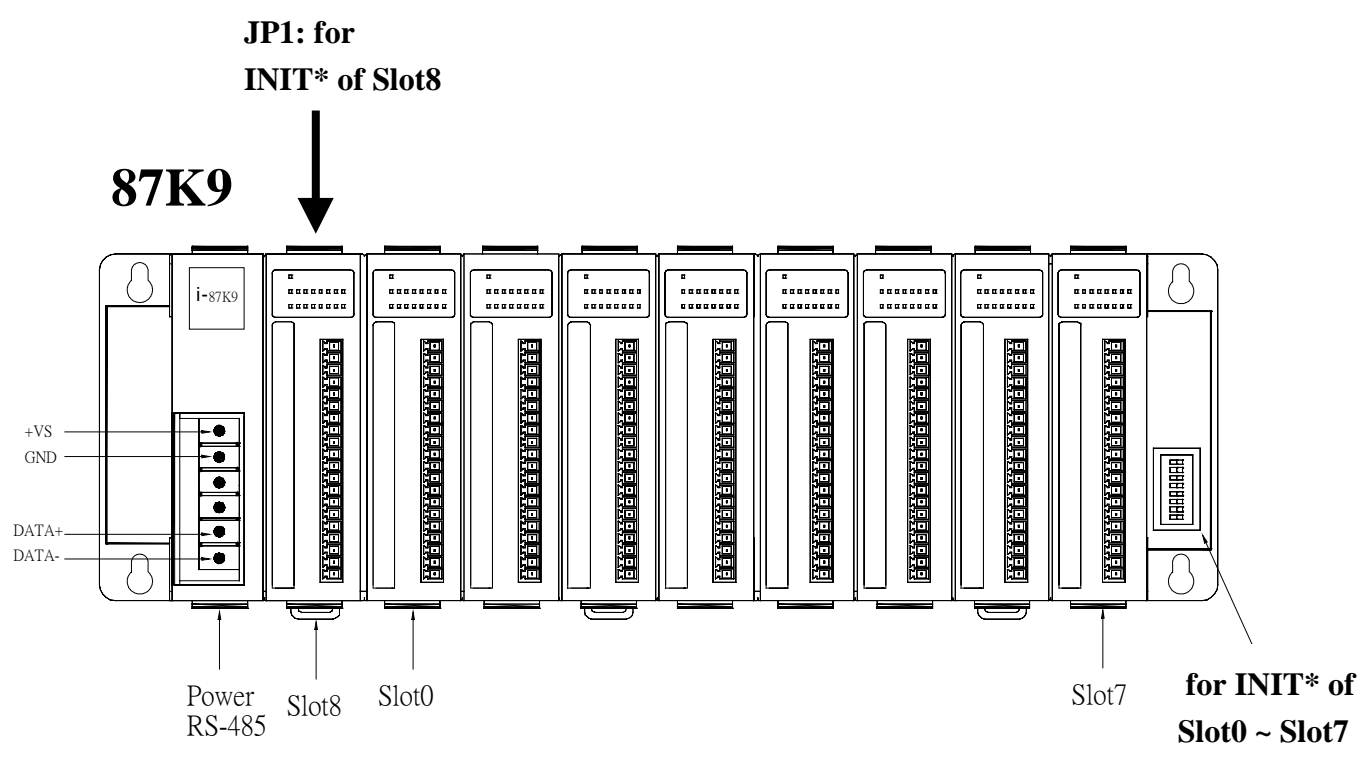
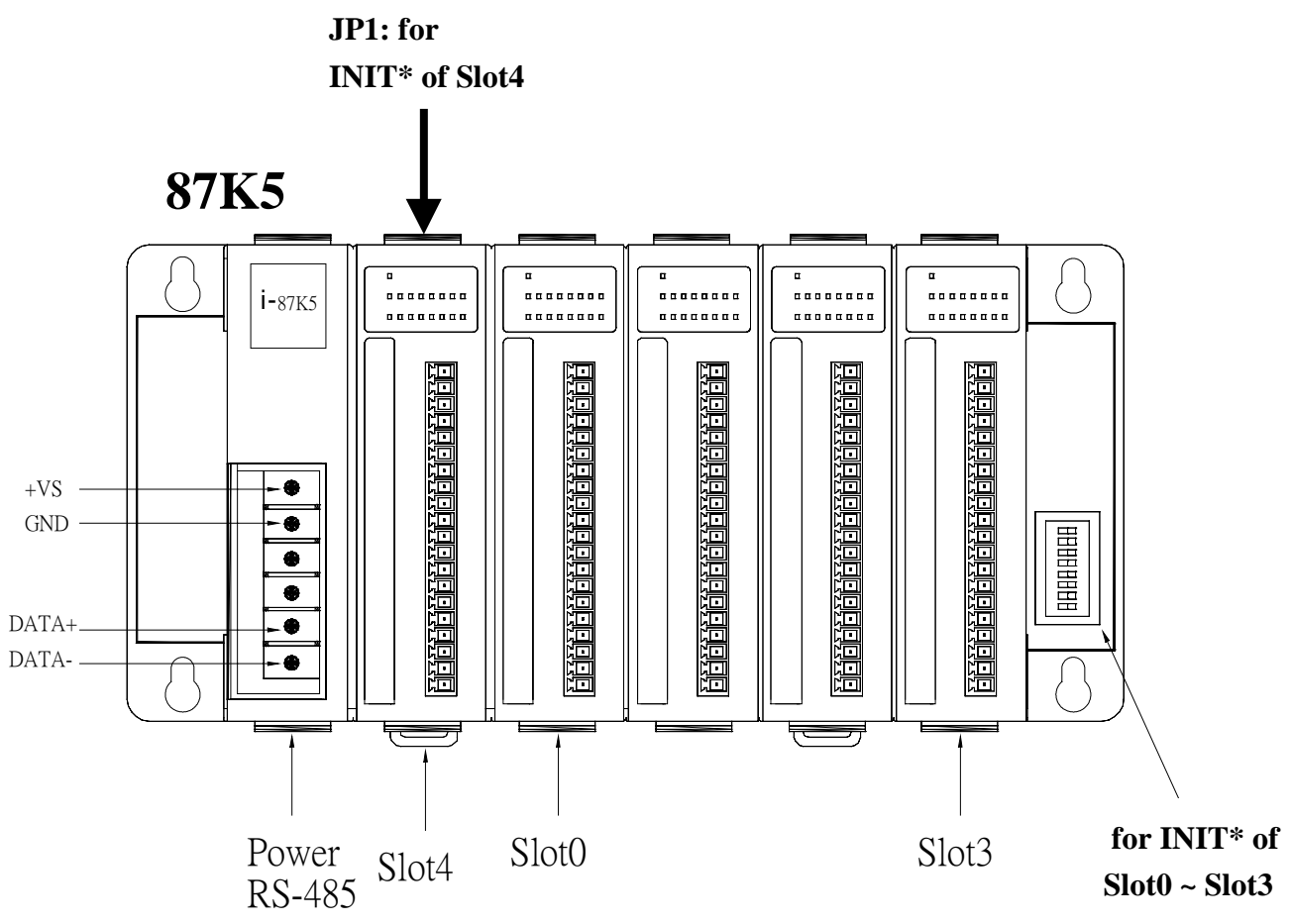
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Chapter 1: I-87K4 / 87K5 / 87K8 / 87K9

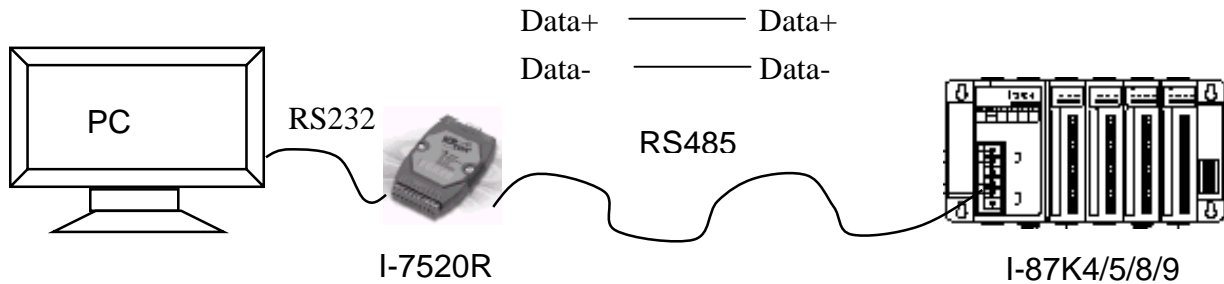
1.1 Hardware Installation

1.1.1 Front view of 87K4/5/8/9





1.1.2 Host computer connect to 87K4/5/8/9



- The I/O Expansion Unit, 87K4/5/8/9, is used to expand the 87K serial I/O modules.
- 87K4/5/8/9 is equivalent to one 7510 + 4/5/8/9 serial I/O expansion slots.
- One DC power supply must be applied to 87K4/5/8/9. It can be from +10V to +30V unregulated.
- The network interface of 87K4/5/8/9 is RS-485, D+ & D-. So one 7520A is used as a bridge between the host computer & 87K4/5/8/9.
- The isolation voltage of RS-485 network is 3000V DC
- Only 87K serial I/O modules can be installed in the 87K4/5/8/9.

In typical application, this 7520A is installed together with the host computer & 87K4/5/8/9 located in the faraway field room.

Every serial I/O module installed in 87K4/5/8/9 must equip a **unique** module address. **For example, the A1, A2,...B1, B2.., must be different.** The default module address is 01 & it is stored in the internal EEPROM of serial I/O module. If the serial I/O module is changed from one slot to another slot, the module address is unchanged. The 87K4/5/8/9 only support power and I/O slots. There is no any ID is defined in the internal of 87K4/5/8/9. The module address can be set from 00 to 0xFF.

NOTE: If the INIT*-Switch is set to ON-position, the corresponding I/O module will be set to its **initial state** as following: **Module address=00, baud rate=115200, format=N,8,1, checksum is disable** (refer to Section 1.3.1 for more information.)

1.2 Software Installation & Manuals

1.2.1 Manuals

Double click on **CD:\NAPDOS\8000\index.htm** to get a starting page as following:

| Name | Description |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Common | 7188X User's Manual MiniOS7 for I-8000 Series User's Manual Library Function for I-8000 Series User's Manual |
| 8410,8411,8810,8811 | Host Control with RS-485 Bus Slave Controller -- 8410,8810 Master Controller -- 8411,8811 |
| 8420,8421,8820,8821 | 8420, 8820 : DeviceNet main Uint 8421, 8821 : CANopen main Uint |
| 8430,8431,8830,8831 | Host Control with 10 BaseT Ethernet Slave Controller -- 8430,8830 Master Controller -- 8431,8831 |
| 8440,8441,8840,8841 | Host Control with 10/100 BaseT Ethernet Slave Controller -- 8440,8840 Master Controller -- 8441,8841 |
| 8000 Modules | 8000 series Modules |
| 87k family | 87K series Modules |
| Getting Start | The getting start for 8000 family |
| Order Information | How to order the 8000 family products ? |

1.2.2 Installing DCON utility

The DCON utility is for setting, debugging & monitoring 8410/8810/8430/8830, I-7000 I/O modules & I-87K4/5/8/9 + I-87K I/O cards.

Please run “**setup.exe**” at
CD-ROM: \napdos\driver\dcon_utility\setup\ to install it.

If it is not found in your CD-ROM, please download “**dcon_utility**” folder at the below ftp site.

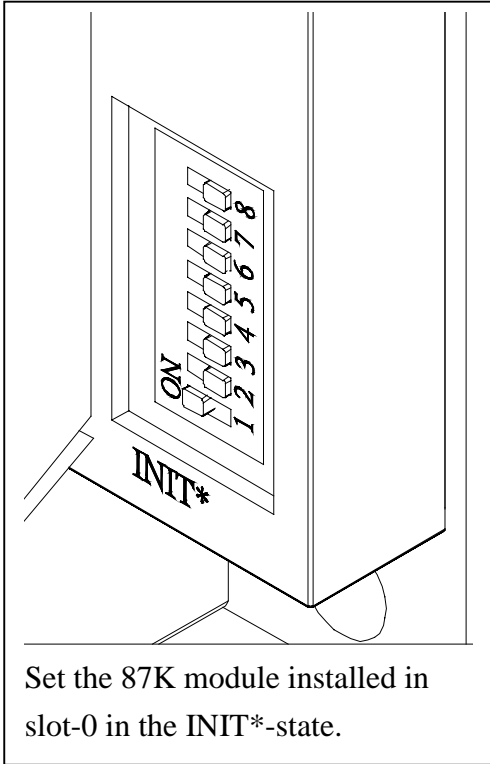
<ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/>



After DCON utility is well installed, Please click on “Help - On Line Help” to learn how to use it.

1.3 Getting Start

1.3.1 Initial setting for 87K I/O modules



| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Slot-0=INIT* | ON | Off | Off | Off | Off | Off | Off | Off |
| Slot-1=INIT* | Off | ON | Off | Off | Off | Off | Off | Off |
| Slot-2=INIT* | Off | Off | ON | Off | Off | Off | Off | Off |
| Slot-3=INIT* | Off | Off | Off | ON | Off | Off | Off | Off |
| Slot-4=INIT* | Off | Off | Off | Off | ON | Off | Off | Off |
| Slot-5=INIT* | Off | Off | Off | Off | Off | ON | Off | Off |
| Slot-6=INIT* | Off | Off | Off | Off | Off | Off | ON | Off |
| Slot-7=INIT* | Off | Off | Off | Off | Off | Off | Off | ON |

- Only one INIT*-Switch can be set to ON at the same time
- Normal: Set all INIT*-Switch to the non-ON position.
- **default state: address=01, baudrate=115200, format=N,8,1, checksum=disable**
- **INIT* state: address=00, baudrate=115200, format=N,8,1, checksum=disable**

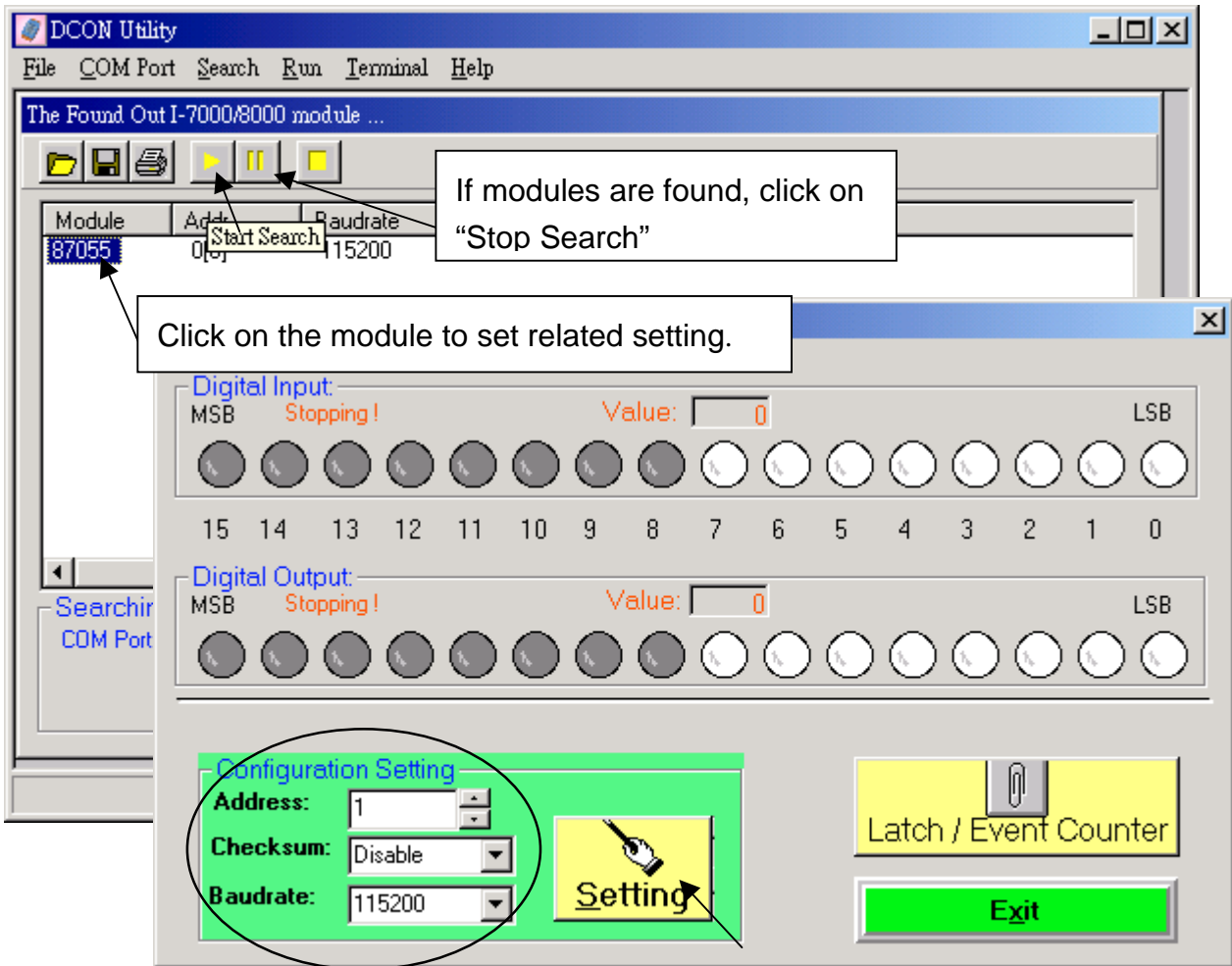
Every 87K serial I/O module installed in 87K4/5/8/9 must equip a unique module address in the same RS-485 network. The default module address is 01 & it is stored in the internal EEPROM of serial I/O module. If the serial I/O module is changed from one slot to another slot, the module address is unchanged. The module address can be set from 00 to FF. The 87K4/5/8/9 only support power & I/O slots. No ID is defined in the internal of the 87K4/5/8/9.

The default setting of serial I/O module is given as following: **Module address=01, baud rate=115200, format=N,8,1, checksum is disable**. If you install two brand new serial I/O modules into the 87K4/5/8/9, both of these two module addresses are all equal to 01. In this condition, the main control unit can not control these two modules properly.

The module address 00 is reserved for module address setting as following:

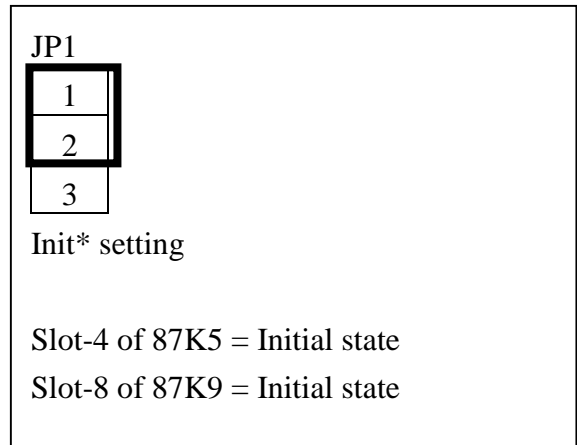
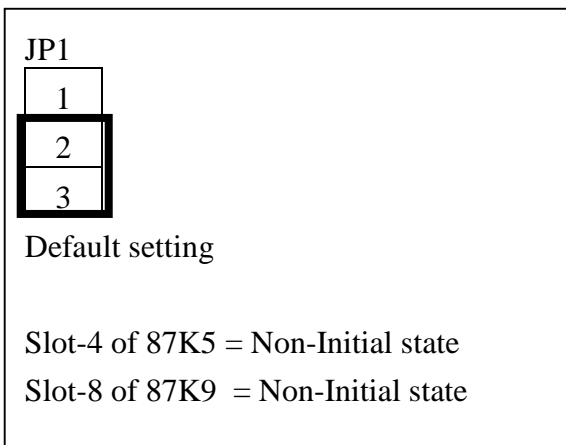
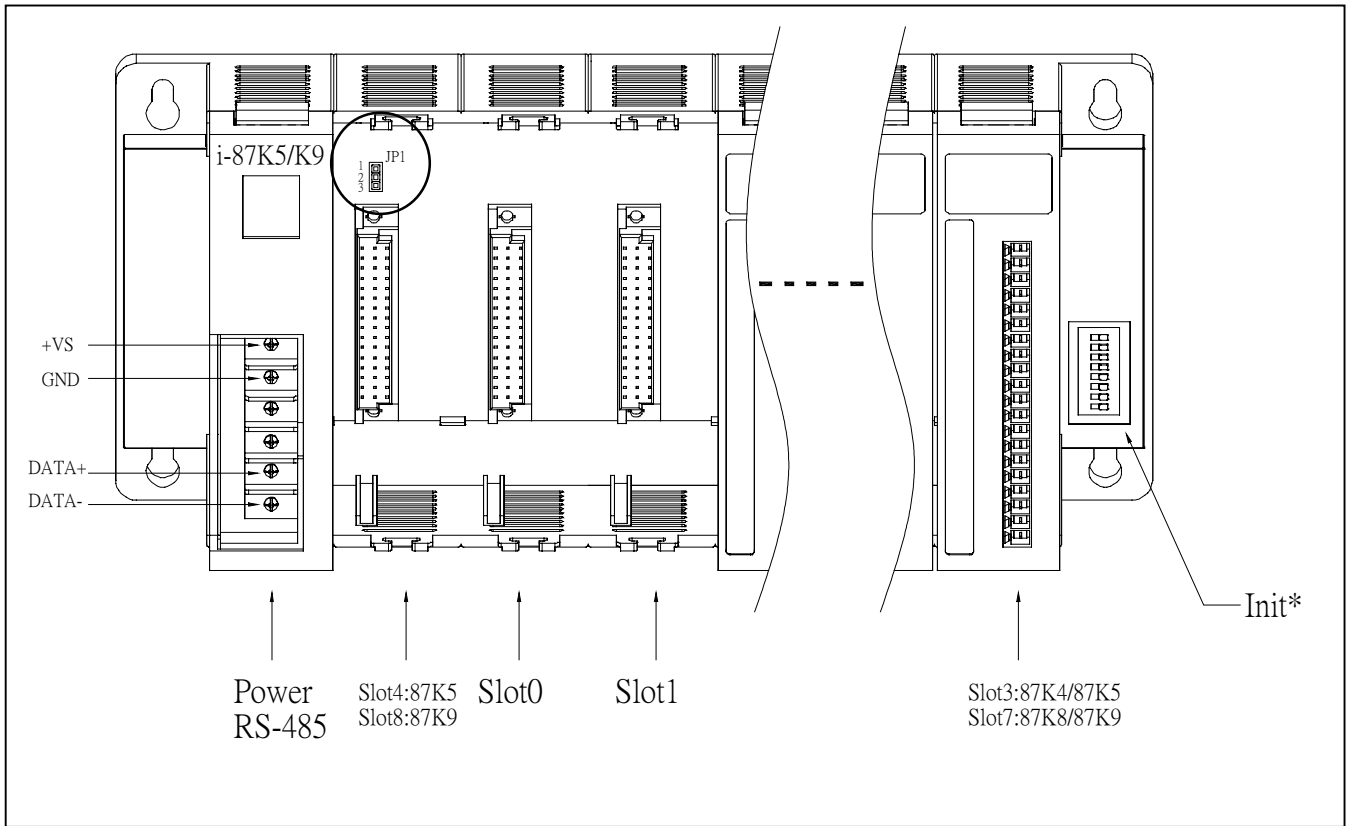
- Connect Host PC to a RS232/485 convector, and connect this convector to the I-87K4/5/8/9 as described in 1.1.2.
- power down & set the destination INIT*-Switch of the I-87K4/5/8/9 to ON (**only one switch set to ON is allowed**)
- install the serial I/O module into the destination-slot & power-up, now the destination module will go to its **initial state** as following: **module address=00, baud rate=115200, format=N,8,1, checksum is disable**

- Run the DCON utility on the host PC, click on “Start Search”. If modules are found, click on “Stop Search”. Then click on the module to set its related setting.



- set the destination INIT*-Switch back to OFF position then power down.
- Power up the 87K4/5/8/9 again, and click on “Start Search”, the states of destination serial I/O module now are given as what you have set. (For above example, module address=01, baud rate=115200, format=N,8,1, checksum is disable)

NOTE: the slot-4 of 87K5 & slot-8 of 87K9 is set by internal JP1 as follows:



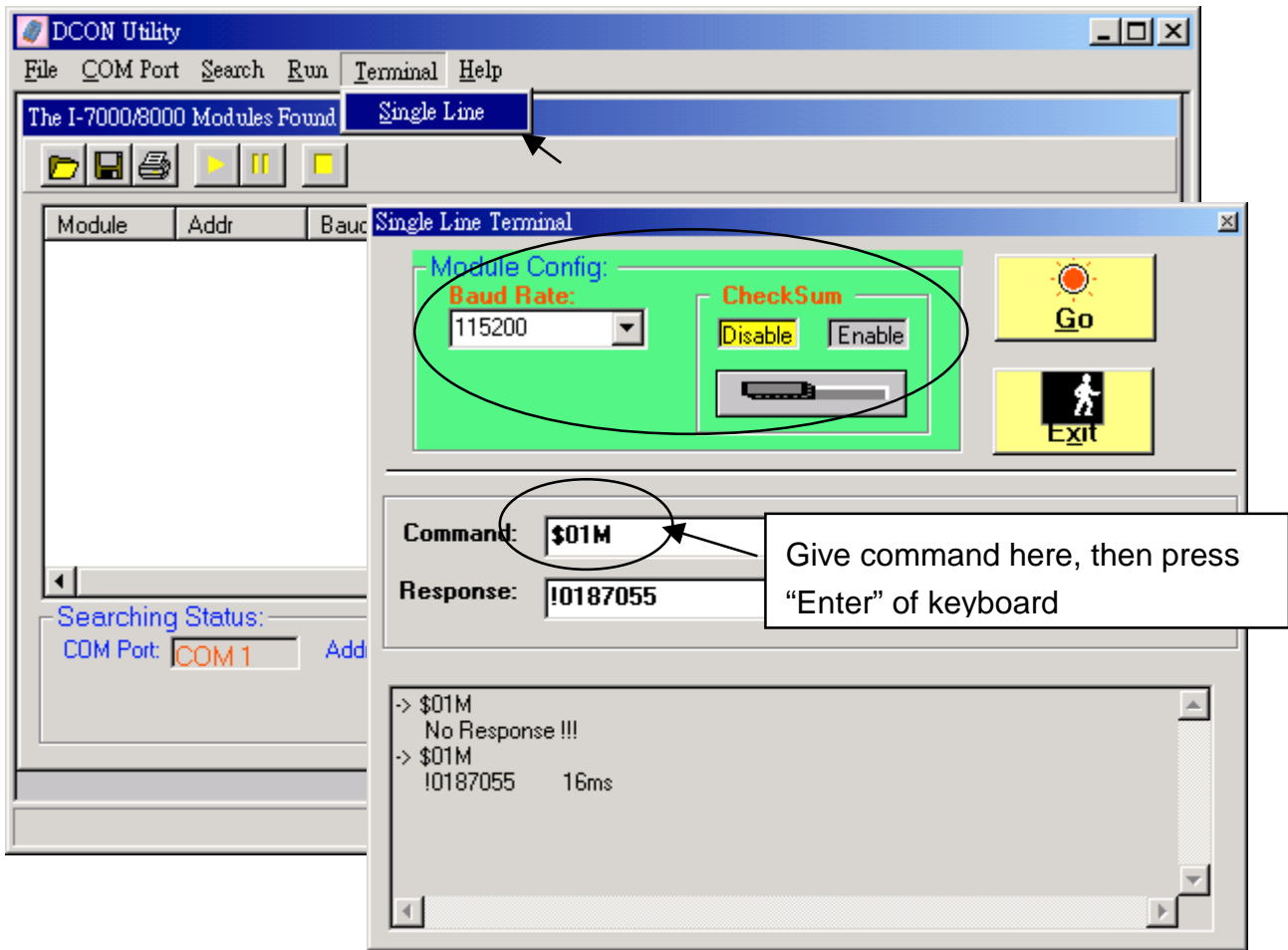
1.3.2 Sending command to 87K I/O modules

After each 87K I/O module has well set its address, baud rate & checksum (& range, type for analog 87K I/O modules). Host PC can send 87k I/O's command to get status of each I/O & output them at run time (**All switch of I-87K4/5/8/9 should set to OFF & then power OFF & then power ON**),

Please double click on **CD:\NAPDOS\8000\index.htm** to get a starting page as following to get 87K I/O's command list.

| Name | Description |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Common | 7188X User's Manual MiniOS7 for I-8000 Series User's Manual Library Function for I-8000 Series User's Manual |
| 8410,8411,8810,8811 | Host Control with RS-485 Bus Slave Controller -- 8410,8810 Master Controller -- 8411,8811 |
| 8420,8421,8820,8821 | 8420, 8820 : DeviceNet main Uint 8421, 8821 : CANopen main Uint |
| 8430,8431,8830,8831 | Host Control with 10 BaseT Ethernet Slave Controller -- 8430,8830 Master Controller -- 8431,8831 |
| 8440,8441,8840,8841 | Host Control with 10/100 BaseT Ethernet Slave Controller -- 8440,8840 Master Controller -- 8441,8841 |
| 8000 Modules | 8000 series Modules |
| 87k family | 87K series Modules |
| Getting Start | The getting start for 8000 family |
| Order Information | How to order the 8000 family products ? |

To test the command, click on “Terminal-Single Line”, then set proper “Baud Rate” & “CheckSum”. Then give your command, if the command is correct, it will display the returned response answer.

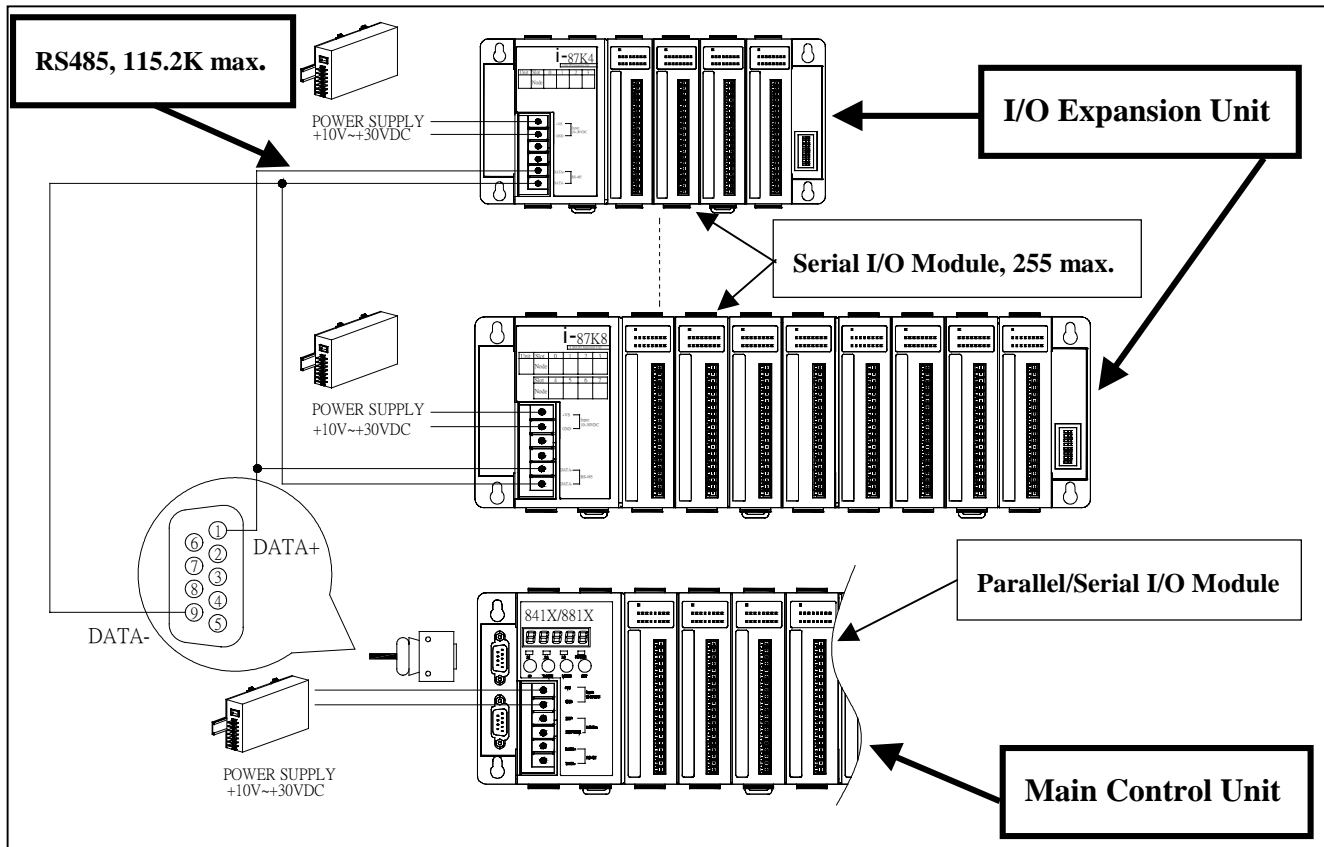


1.3.3 Application software for host PC

Please refer to Chapter 7 - Application Software For Host PC

1.3.4 Application of 841x/881x/843x/883x connect to 87K

Com3 of I-841x/881x/843x/883x provide RS485 signals, can connect to I-87K4/5/8/9 & I-7000 I/O modules.



Only 87K serial I/O modules can be installed in the I/O expansion unit, 87K4/5/8/9. The main control unit can link to serial I/O modules & 7000 series in the same way. So the 87K4/5/8/9 & 7000 modules can be installed to the same RS-485 network if RS-485 addresses of all module are unique.

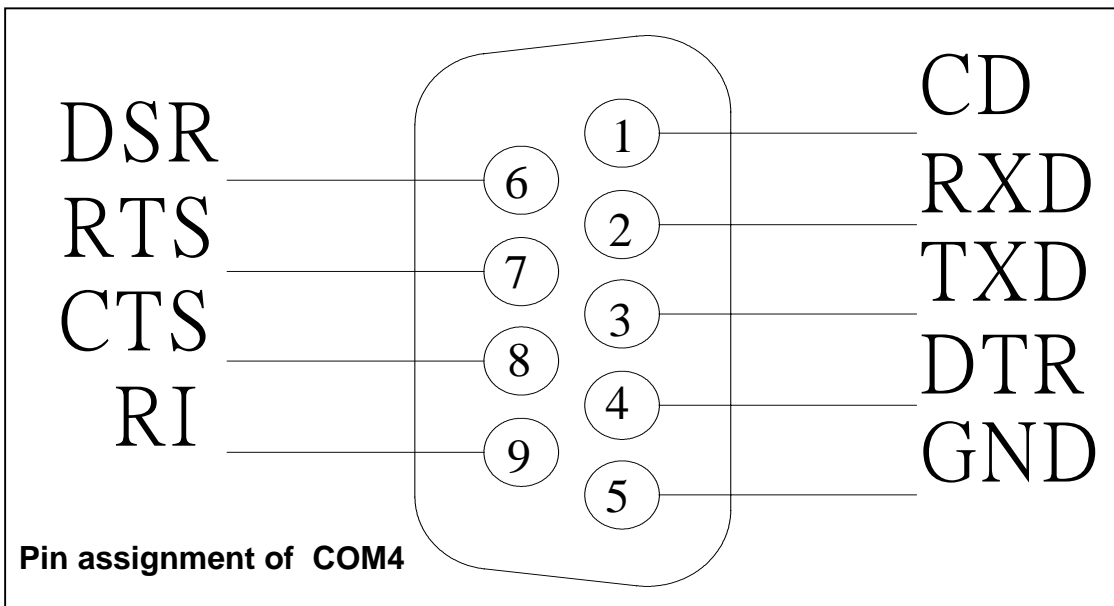
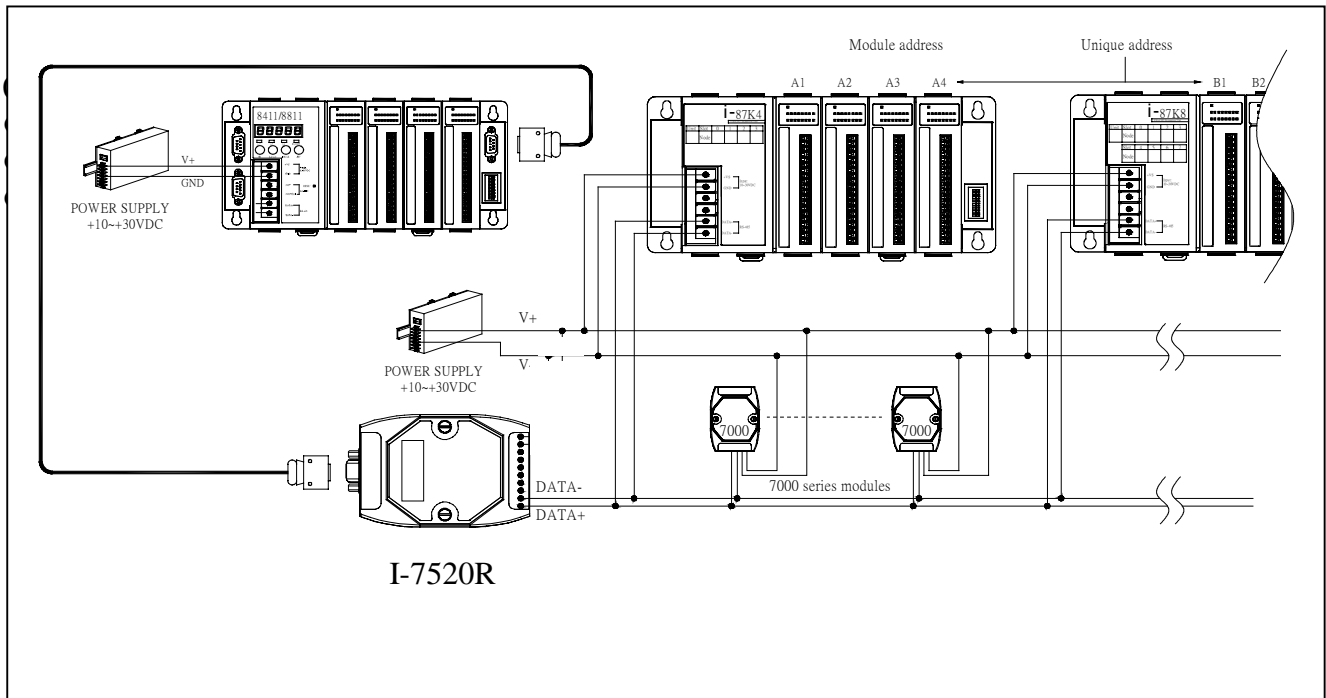
The module ID can be set from 01 to FF, so the maximum modules of serial I/O modules or 7000 series can be installed in one COM3 is 255 (from 0x01 to 0xff).

For main control unit of I-8417/8817/8437/8837, I-7188EG/XG connect to I-87K4/5/8/9, please refer to CD:\napdos\isagraf\8000\english_manu\ Chapter 6 of the “User_Manual_I_8xx7.pdf”.

For main control unit of I-8411/8811/8431/8831 connect to I-87K4/5/8/9, refer to Chapter 4.

Com4 of I-841x/881x/843x/883x provide RS232 signals, & can also connect to I-87K4/5/8/9 & I-7000 I/O modules (next page).

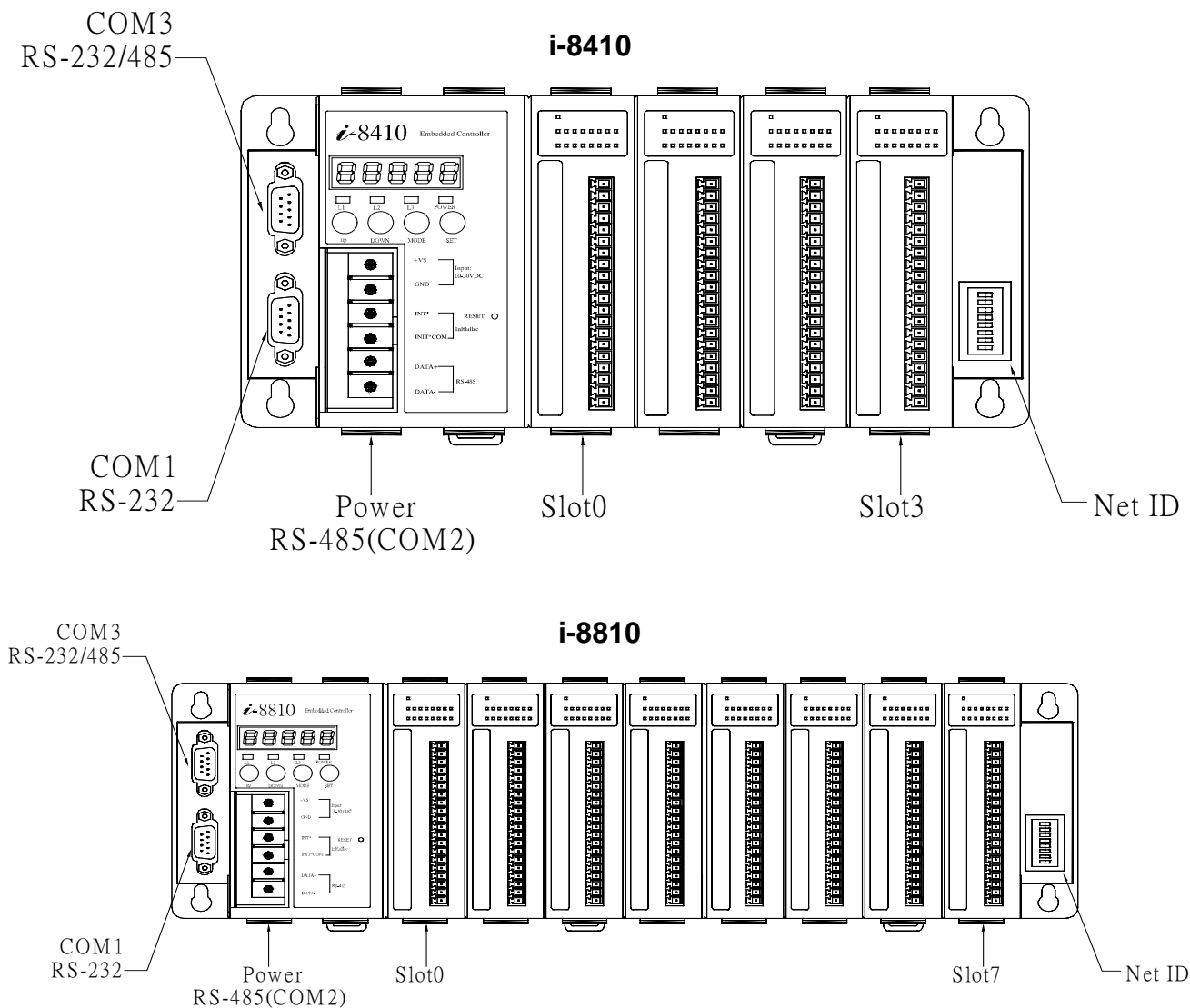
Com4 of I-841x/881x/843x/883x connect to 87K:



Chapter 2: I-8410 / 8810

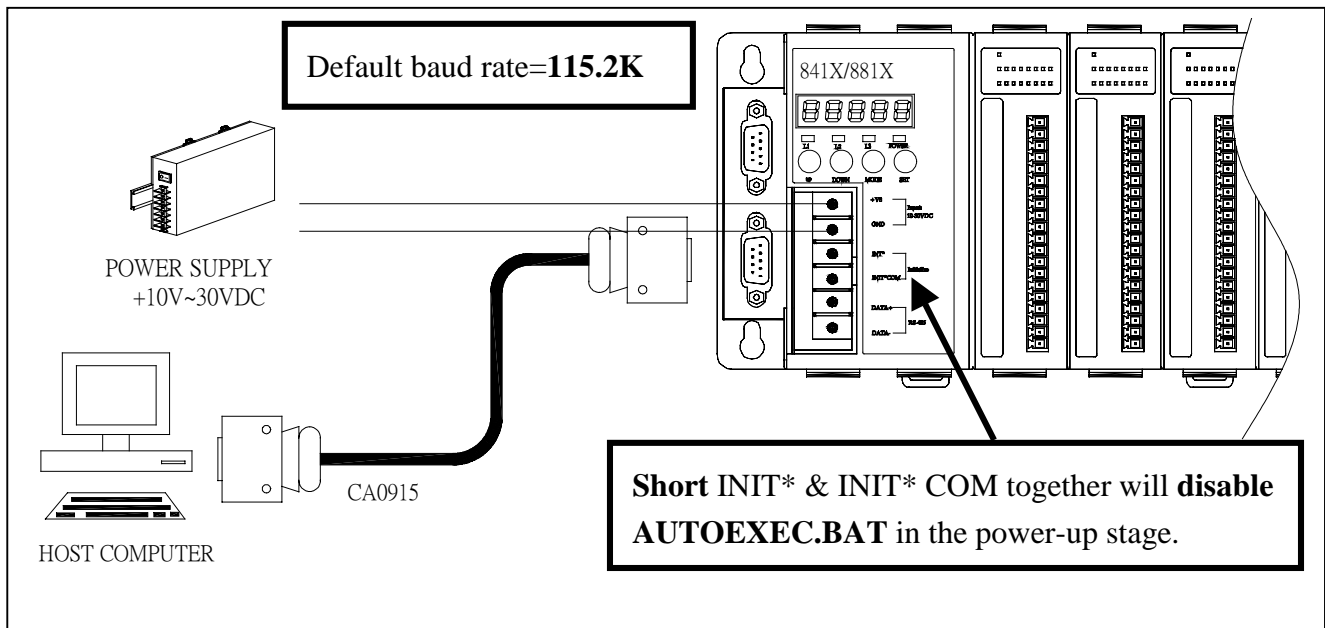
2.1 Hardware Installation

2.1.1 Front view of 8410/8810

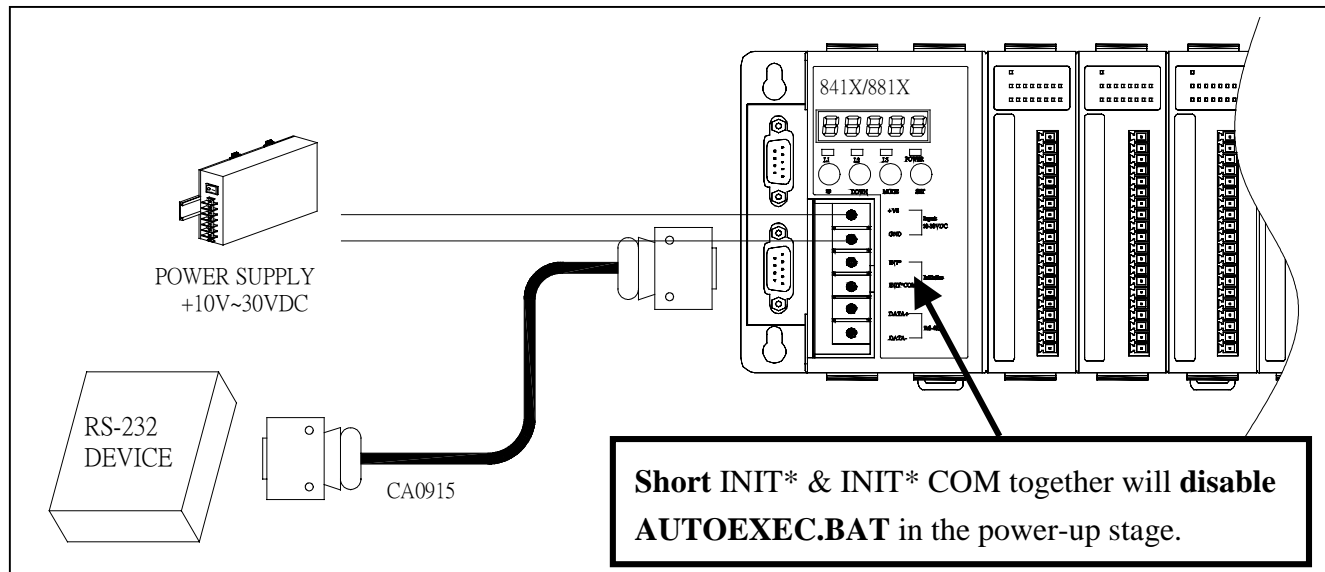


- 8410 provides four I/O Expansion Slots for 87K & 8k I/O Modules (from Slot0 to Slot3).
- 8810 provides eight I/O Expansion Slots for 87K & 8k I/O Modules (from Slot0 to Slot7).
- Net-ID DIP-SWITCH is used to set the NET-ID of 8410/8810 (refer to Appendix A)
- DC-power(+Vs, GND): DC +10V to +30V, unregulated
- **Note:** I/O modules can not be inserted/removed from 8410/8810 when DC-power is applied
- COM1 is used to download program from PC. It also can link to RS232 device after download
- COM2 is used to link to Host-PC or the other RS-485 device
- COM3 can be used to link to 87K4/5/8/9 or the other RS-232/RS-485 device(refer to Sec. 2.1.5). Short INIT* & INIT*-COM together will force 8410/8810 to go to its initial state (Appendix B)

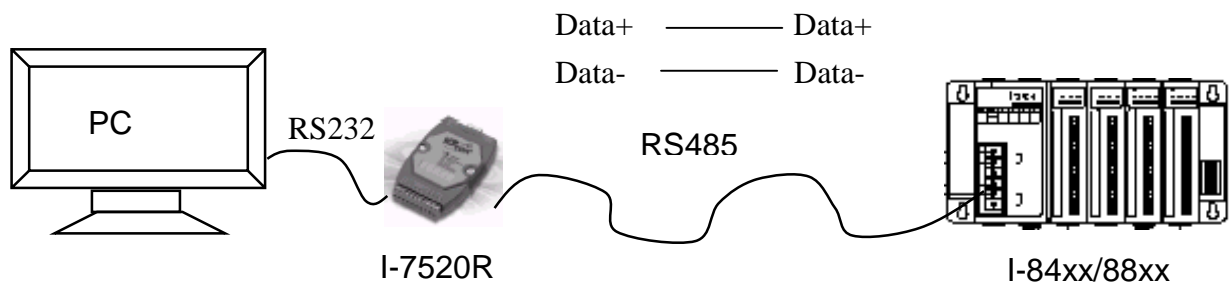
2.1.2 Host PC connect to COM1 of 8410/8810



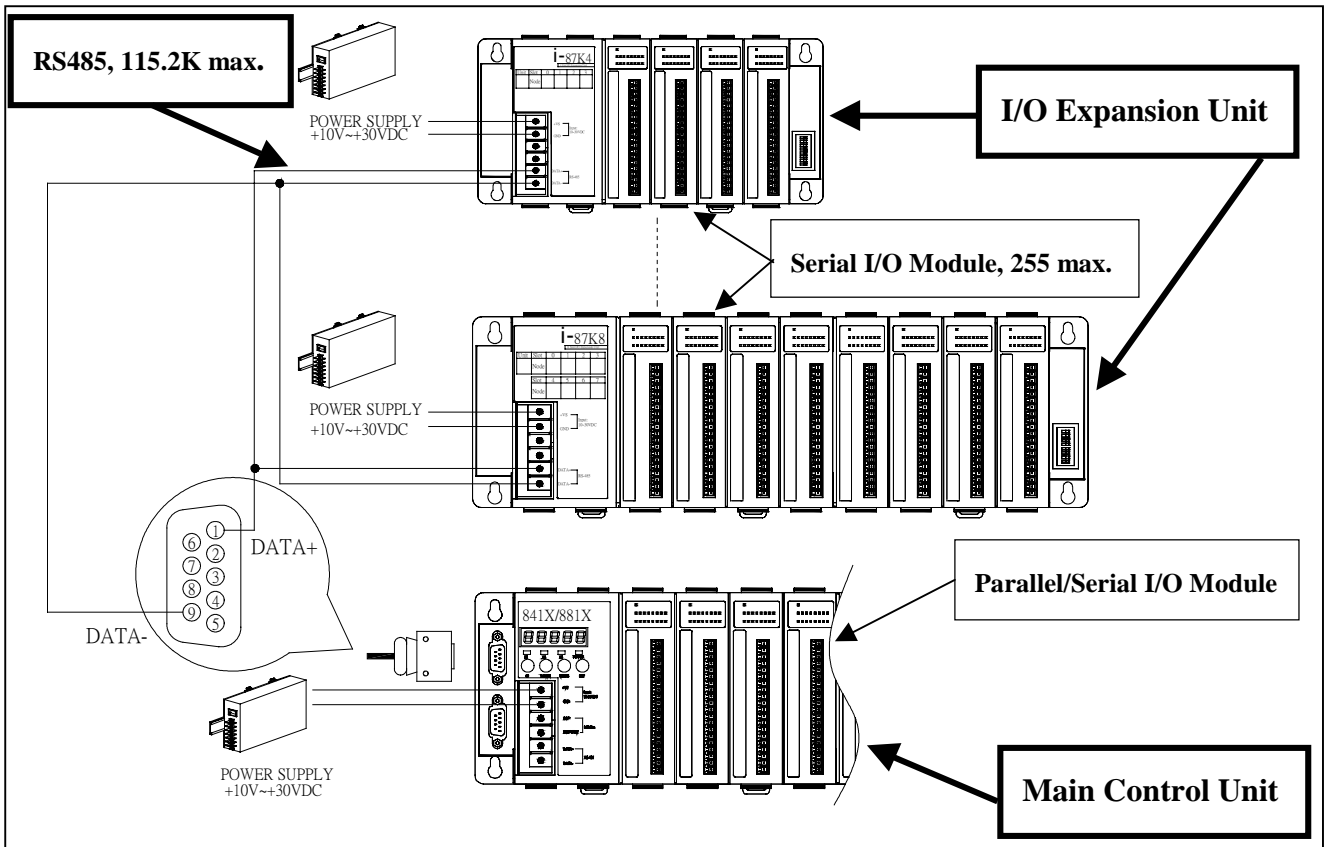
2.1.3 COM1 of 8410/8810 connect to RS232 device



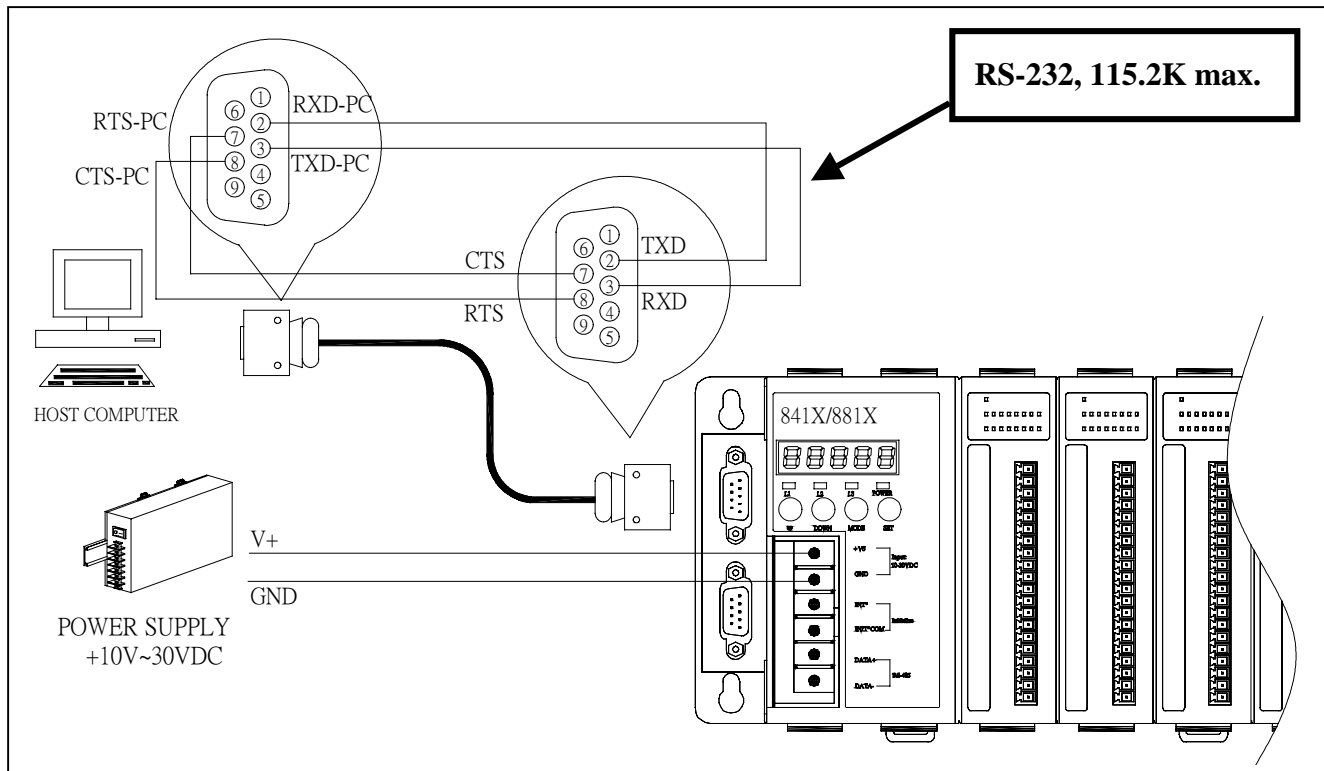
2.1.4 Host PC connect to COM2 of 8410/8810



2.1.5 COM3 of 8410/8810 connect to I-87K4/5/8/9 or I-7000



2.1.6 COM3 of 8410/8810 connect to RS232 device



2.2 Software Installation & Manuals

2.2.1 Manuals

Double click the `CD:\NAPDOS\8000\index.htm` can get a starting page as following:

| Name | Description |
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| 8000 Modules | 8000 series Modules |
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| Order Information | How to order the 8000 family products ? |

2.2.2 Installing DCON utility

The DCON utility is for setting, debugging & monitoring 8410/8810/8430/8830, I-7000 I/O modules & I-87K4/5/8/9 + I-87K I/O cards.

Please run “**setup.exe**” at
CD-ROM: `\napdos\driver\dcon_utility\setup\` to install it.

If it is not found in your CD-ROM, please download
“**dcon_utility**” folder at the below ftp site.

<ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/>



After DCON utility is well installed, Please click on “Help - On Line Help” to learn how to use it.

2.2.3 Installing 7188XW.exe utility & 8410/8810 firmware

Note: ICP DAS provides one easy-use utility – “MiniOS7 utility”. (Please refer to Appendix F)

1. **7188xw.exe** is for download program, & debug I-8000 main controllers, also for setting IP, Mask & Gateway of I-8x3x ethernet controllers.

Please copy CD:\napdos\minios7\utility\ “**7188xw.exe**” to one folder of your PC (Windows 98/NT/2000/XP), for example, to C:\8000\8410\

2. OS image is located at CD:\napdos\minios7\8000new\ with a extension name of “.img”, for ex. “8n030124.img”. Please copy to, for ex, C:\8000\8410\

3. **8k485.exe** is the default firmware of the I-8410/8810 using its COM2:RS485 when first shipped. Please copy

CD:\napdos\8000\841x881x\firmware\8k485\ “**autoexec.bat**” &

CD:\napdos\8000\841x881x\firmware\8k485\ (newest , for ex. “A1.94”) \ “**8k485.exe**” to one folder of your PC, for example, to C:\8000\8410\

4. **8k232.exe** is the firmware of the I-8410/8810 using its COM1:RS232.

Please copy

CD:\napdos\8000\841x881x\firmware\8k232\ “**autoexec.bat**” &

CD:\napdos\8000\841x881x\firmware\8k232\ (newest , for ex. “A1.94”) \ “**8k232.exe**” to one folder of your PC, for example, to C:\8000\8410\

New firmware can be found from ICP DAS’s FTP site.

OS image: <ftp.icpdas.com/pub/cd/8000cd/napdos/minios7/8000new/>

8k485 : <ftp.icpdas.com/pub/cd/8000cd/napdos/8000/841x881x/firmware/8k485/>

8k232 : <ftp.icpdas.com/pub/cd/8000cd/napdos/8000/841x881x/firmware/8k232/>

User may update to new firmware by yourself by below steps.

1. Go to C:\8000\8410\, then run “7188xw.exe” on your PC.
2. Link COM1 of your PC to COM1 of the I-84XX/88XX controller through a RS232 cable.
3. Power off the I-84XX/88XX controller, connect pin "INIT" to "INIT COM" and then power it up.
4. If the connection is Ok, some message will appear on the 7188xw screen.
8000>
5. Type "ver" to see the current OS version.
8000> **ver**
6. The OS image should upgrade first. Type "upload" to load the OS image
8000> **upload**
press ALT + E and type in the **image name** (for ex, 8n030124.img)
and then type "bios1"
8000> **bios1**
(**WAIT ABOUT 30 SEC. ***DO NOT REMOVE THE POWER IN THESE 30 SEC.*****)

7. Then we are going to update the 8k232 or 8k485 driver.

Type "del" and reply "y" to delete the current driver.

8000> **del**

Total File number is 2, do you really want to delete(y/n)? ← please give "y"

8. Type "load", then press ALT + E and then type "autoexec.bat" .

8000> **load**

File will save to 8000:0000

StartAddr-->7000:FFFF

Press ALT_E to download file!

Input filename: **autoexec.bat**

Please make sure the contents of
"autoexec.bat" file is
8k232.exe (or 8k485.exe)

9. Type "load" again, then press ALT + E and then type "8k485.exe" (or "8k232.exe").

It will take about 30 seconds to finish.

8000> **load**

File will save to 8003:0002

StartAddr-->8000:0031

Press ALT_E to download file!

Input filename: **8k485.exe**

10. Type "dir" to make sure "autoexec.bat" and "8k485.exe" are well burned.

8000> dir

11. Press ALT_X to exit "7188xw".

12. Remove the connection between "INIT" - "INIT COM", then reset the controller.

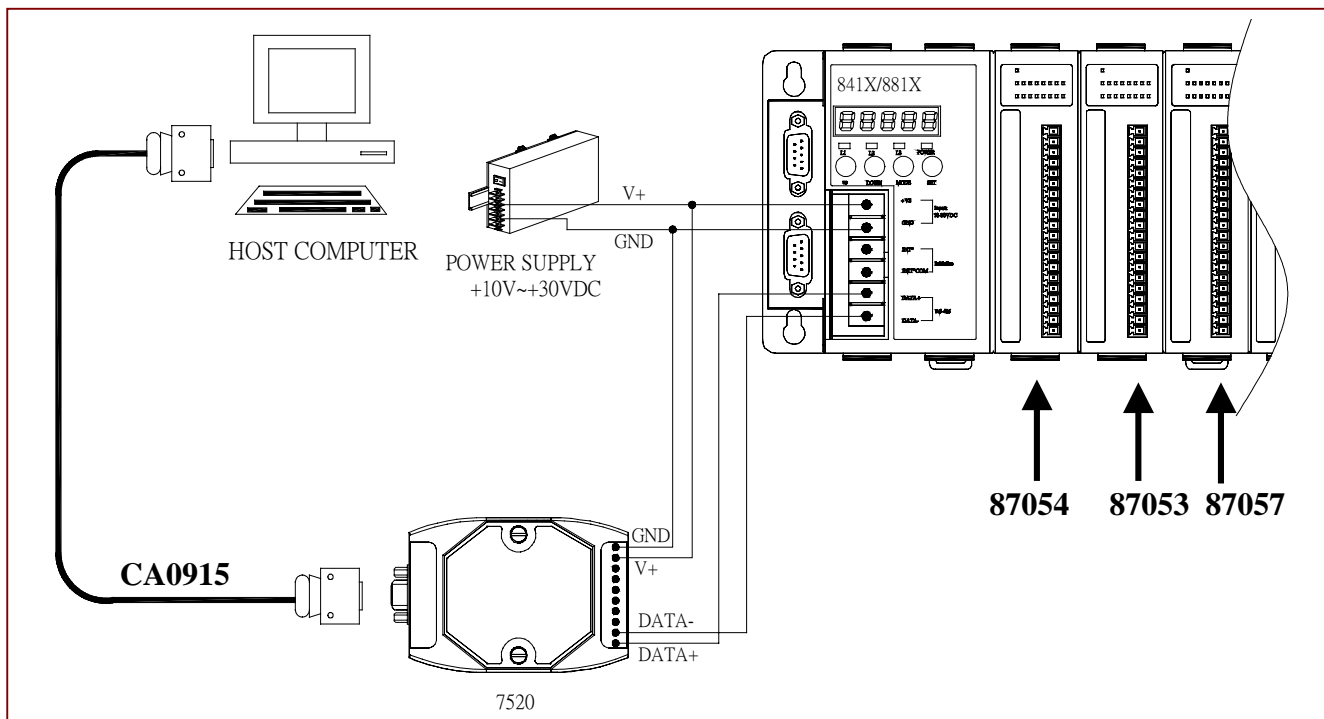
2.3 Getting Start

Assume the testing hardware are given as following:

- 8410/8810 * 1 & 7520 * 1
- 87054 * 1 → install it in the slot-0
- 87053 * 1 → install it in the slot-1
- 87057 * 1 → install it in the slot-2
- 8054 * 1 → install it in the slot-3

The key points of this section are given as following:

- How to change NET-ID
- How to change communication speed
- Access I/O modules of 8410/8810 by DCON utility (or 7000 utility)
- Access I/O modules of 8410/8810 by DCON_DLL, DLL driver for windows



NOTE: the 5-digit of 7-seg LED of 8410/8810 are defined as follows:

(LED1,LED2) → NET ID

(LED3) → speed of COM2,

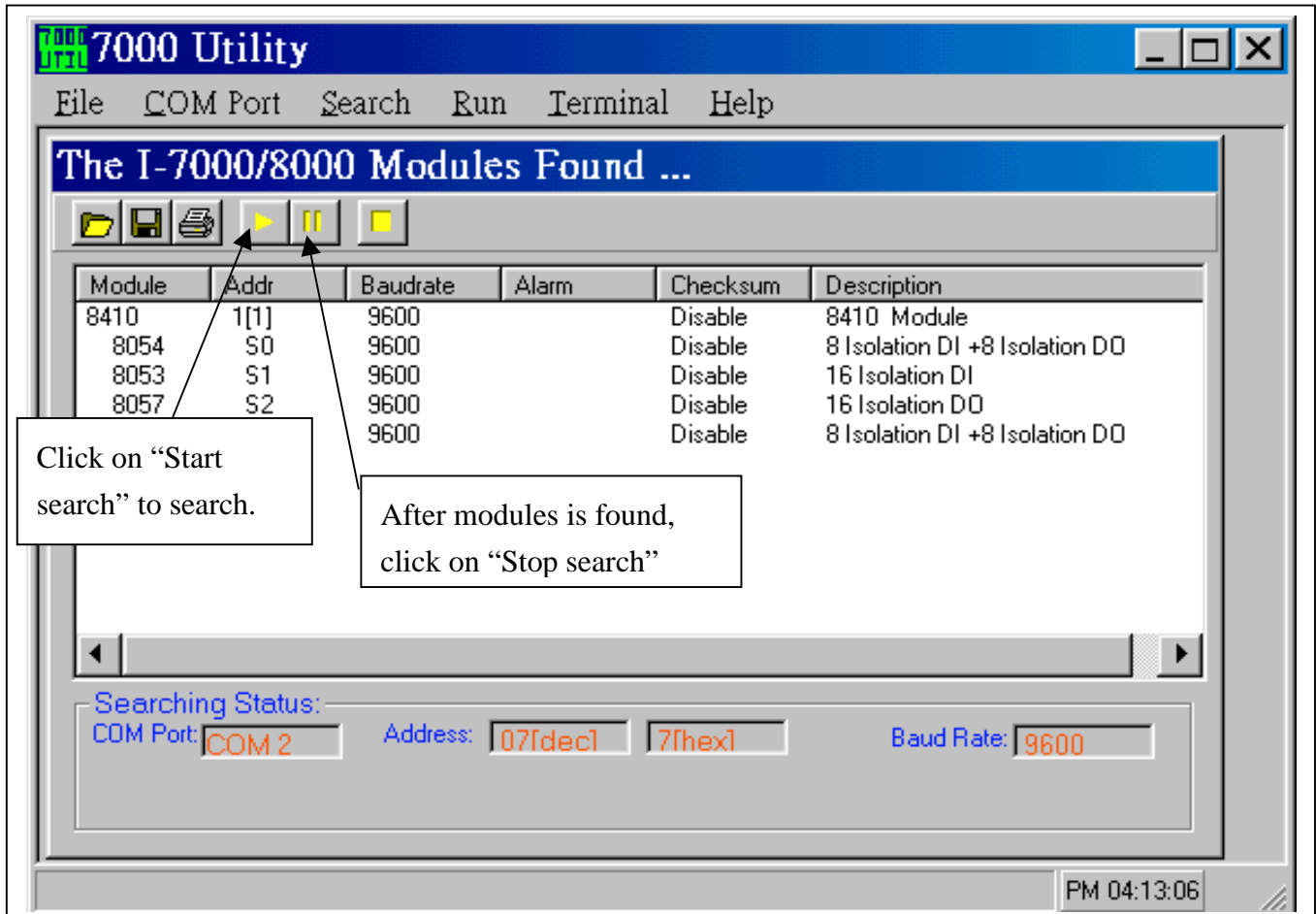
| | | | |
|-----------------|-----------------|-----------------|------------------|
| 3: 1200 | 4: 2400 | 5: 4800 | 6: 9600 |
| 7: 19200 | 8: 38400 | 9: 57600 | A: 115200 |

(LED4) → **0:** checksum enable **1:** checksum disable

(LED5) → reserved

2.3.1 Change NET-ID

Step 1: Refer to Section 2.3 for wiring. The default NET-ID of 8410/8810 is 0x01 (Fig of Appendix A). Run DCOM utility (or 7000 utility) in host computer to search the 8410/8810, the search result is given as following:



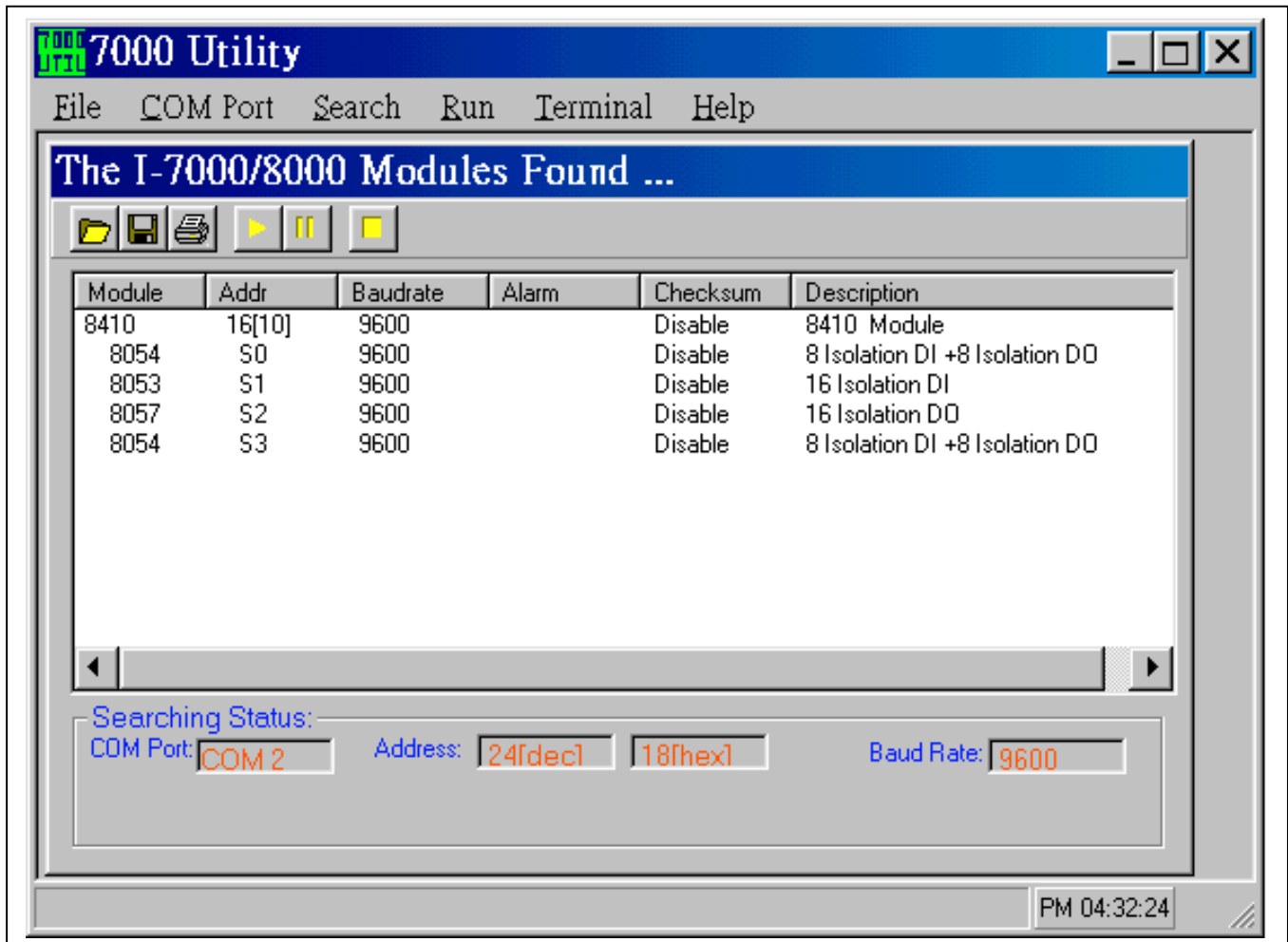
From above diagram you can find the following information:

- The NET-ID of 8410/8810 is 1[0x01] → it is the default setting
- One 87054 or 8054 is installed in slot-0 (S0) → now a 87054 is installed
- One 87053 or 8053 is installed in slot-1 (S1) → now a 87053 is installed
- One 87057 or 8057 is installed in slot-2 (S2) → now a 87057 is installed
- One 87054 or 8054 is installed in slot-3 (S3) → now a 8054 is installed

Check the (LED1,LED2)=01→NET-ID is 1,
 LED3=6 → speed of COM2 is 9600 bps
 LED4=0→ checksum is disable

Step 2: power off

Step 3: change the NET-ID of 8410/8810 to 0x10 (Refer to Appendix A, DIP-5=ON, others=OFF). Run DCON utility in host computer to search the 8410/8810, the search result is given as



From above diagram you can find the following information:

- The NET-ID of 8410/8810 is 16[0x10]
Check the (LED1,LED2)=10 → NET-ID is 0x10

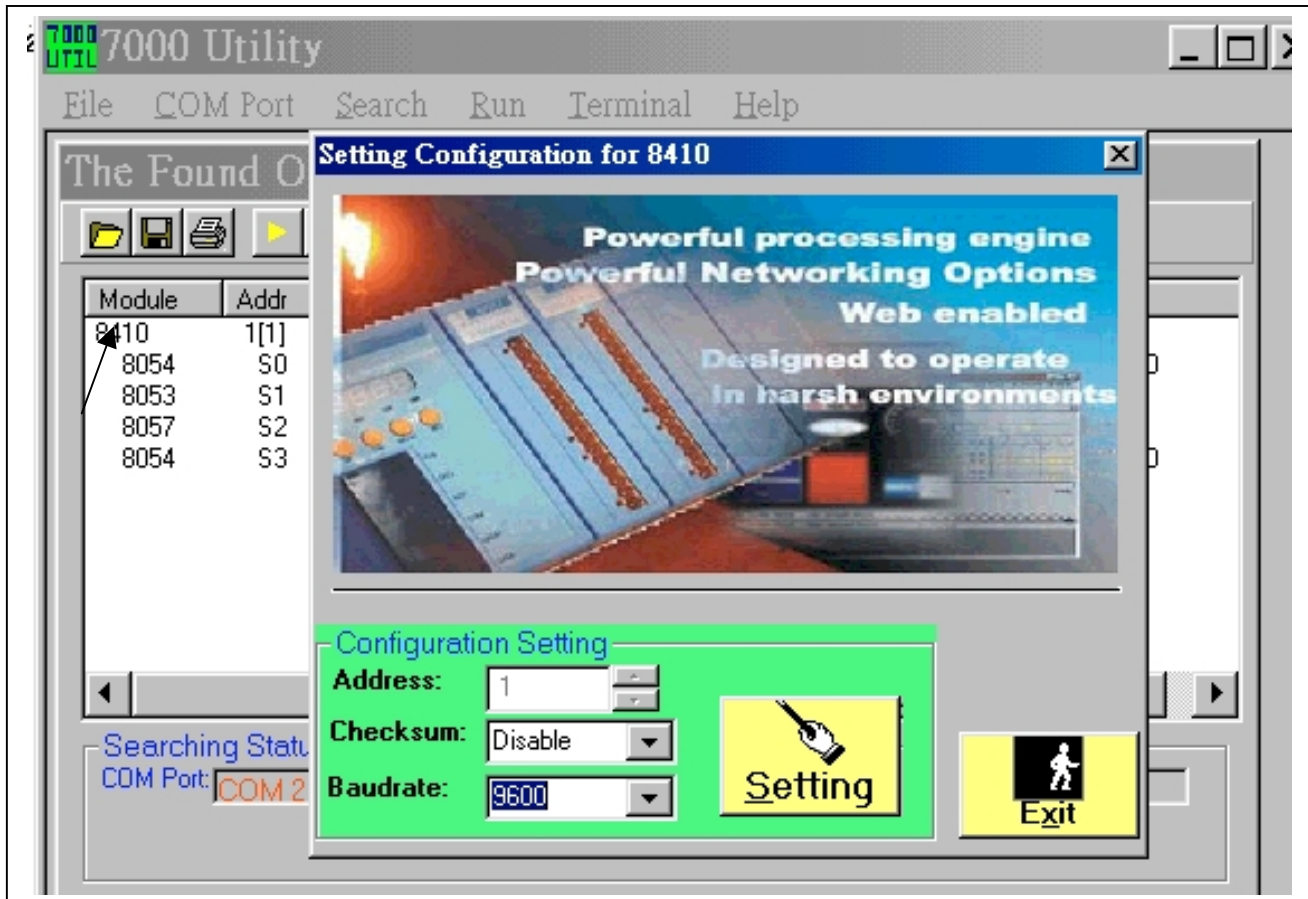
Step 4: power off

Step 5: change the NET-ID of 8410/8810 to 0x01 (Refer to Appendix A, DIP-1=ON, others=OFF) for next testing.

2.3.2 Change Communication Speed & Enable Checksum

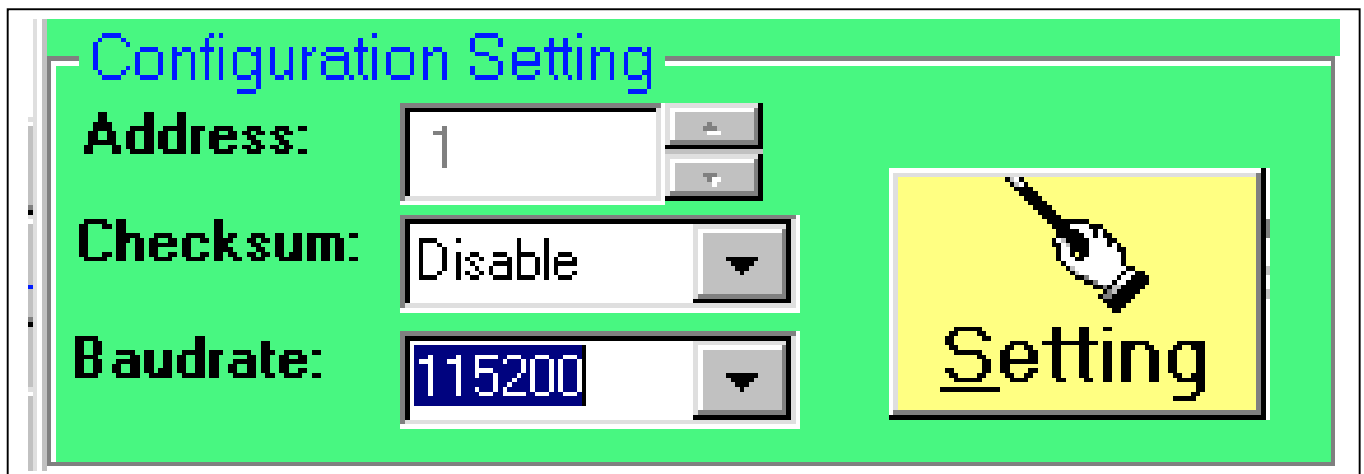
Step 1: Refer to Section 2.3 for wiring. The default NET-ID of 8410/8810 is 0x01 (Fig of Appendix A). Run DCON utility (or 7000 utility) in host computer to search the 8410/8810 (refer to Section 2.3.1)

Step 2: double click on “8410” (or 8810) as following:



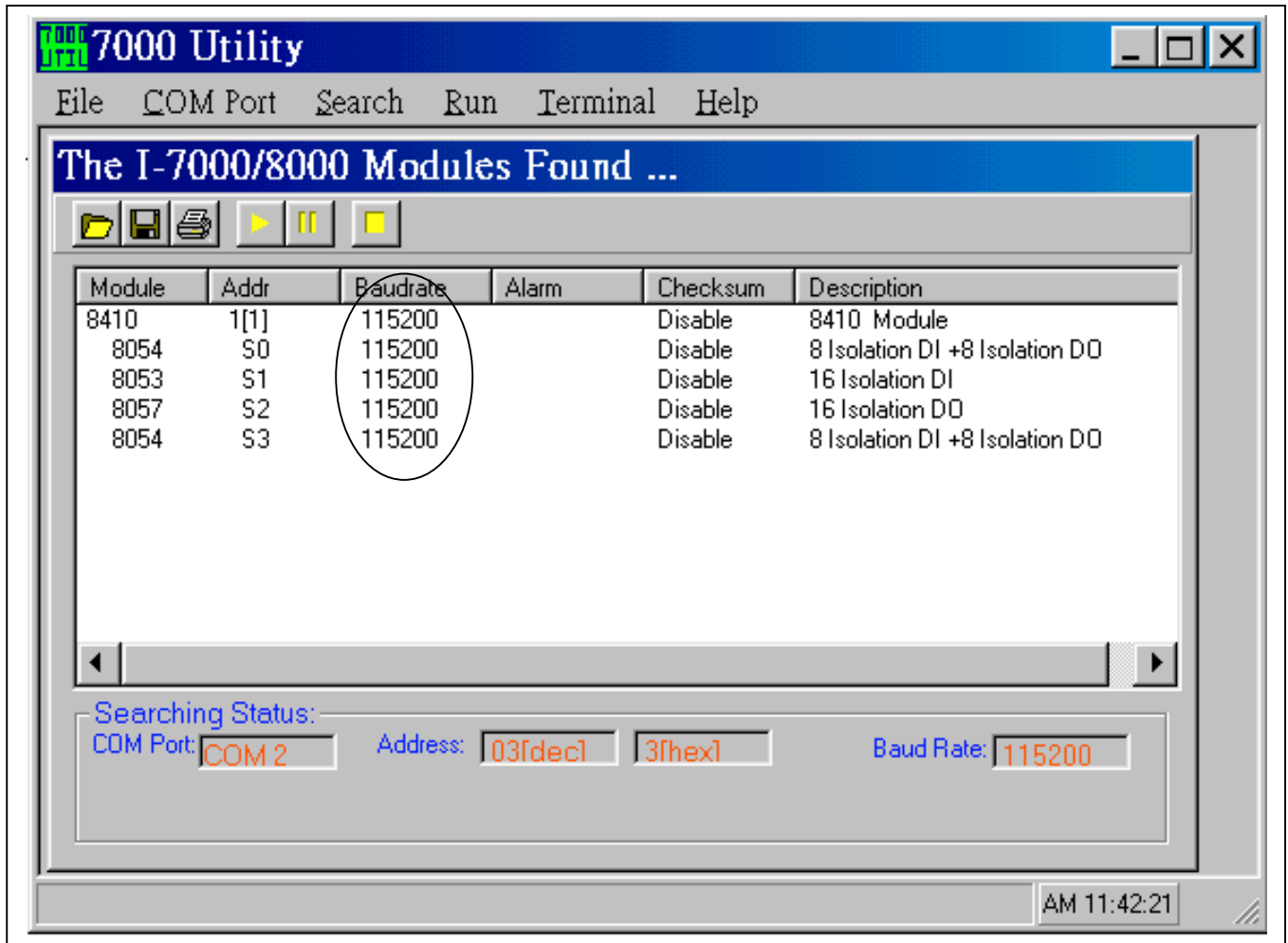
Step 3: Short INIT* & INIT*COM together

Step 4: Select baud rate = 115200 & then click on “Setting”.



Step 5: Open **INIT*** & **INIT*COM**

Step 6: Power OFF, and then Power ON, and then search again as following:



Note:

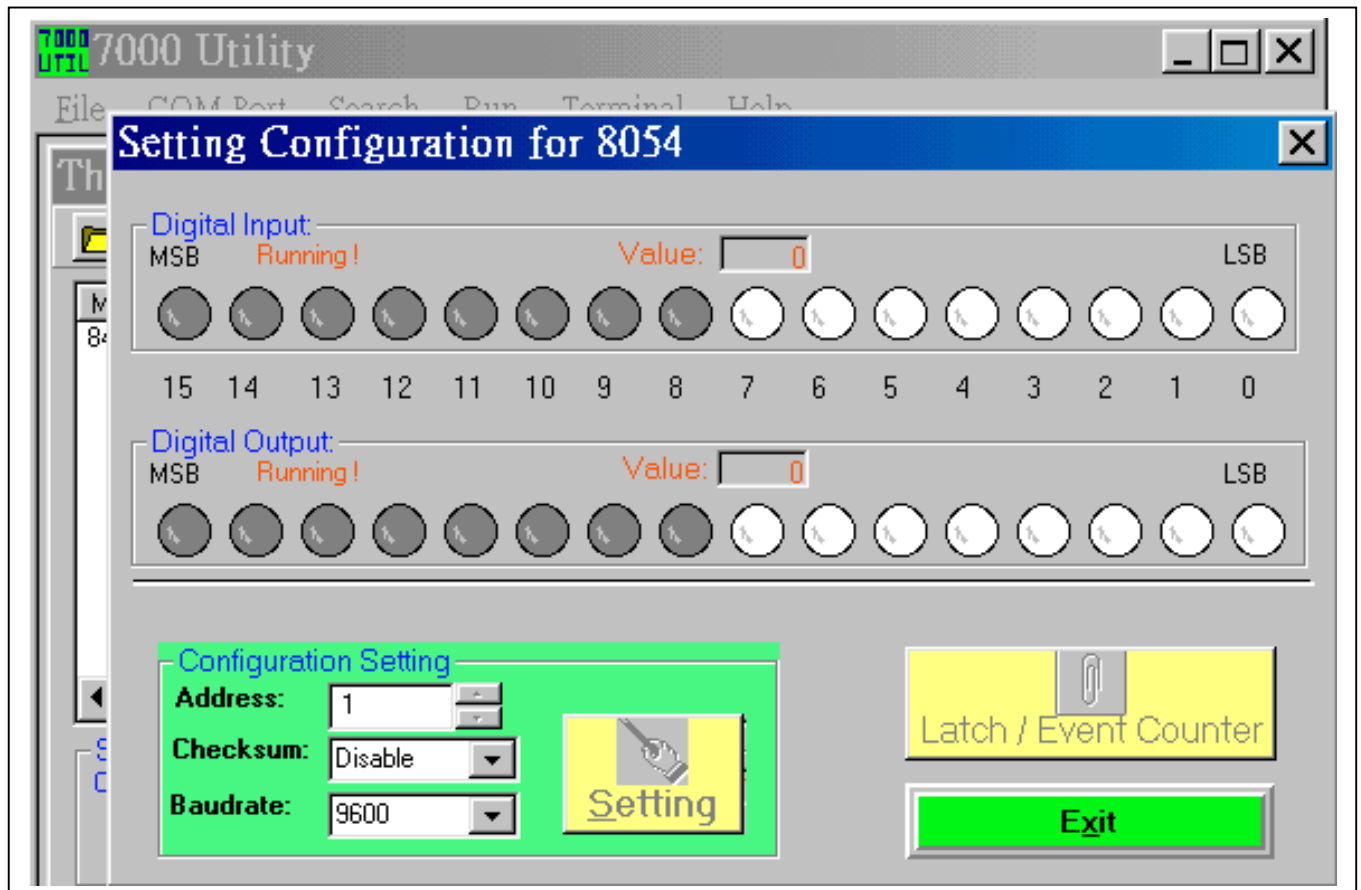
1. When you wish to **change the baud rate** or **enable checksum**, the **INIT*** & **INIT*COM** must be connected together.
2. The new setting will be active after **power off**, and then **power on**.
3. select **115200** & **check sum enable fields** in **DCON** utility before the search operation. If the checksum is enable, the search result is given as follows:
4. check the LED3=A → speed of COM2 is 115200 bps

| | | | | |
|------|------|--------|--------|--------------------------------|
| 8410 | 1[1] | 115200 | Enable | 8410 Module |
| 8054 | S0 | 115200 | Enable | 8 Isolation DI +8 Isolation DO |
| 8053 | S1 | 115200 | Enable | 16 Isolation DI |
| 8057 | S2 | 115200 | Enable | 16 Isolation DO |
| 8054 | S3 | 115200 | Enable | 8 Isolation DI +8 Isolation DO |

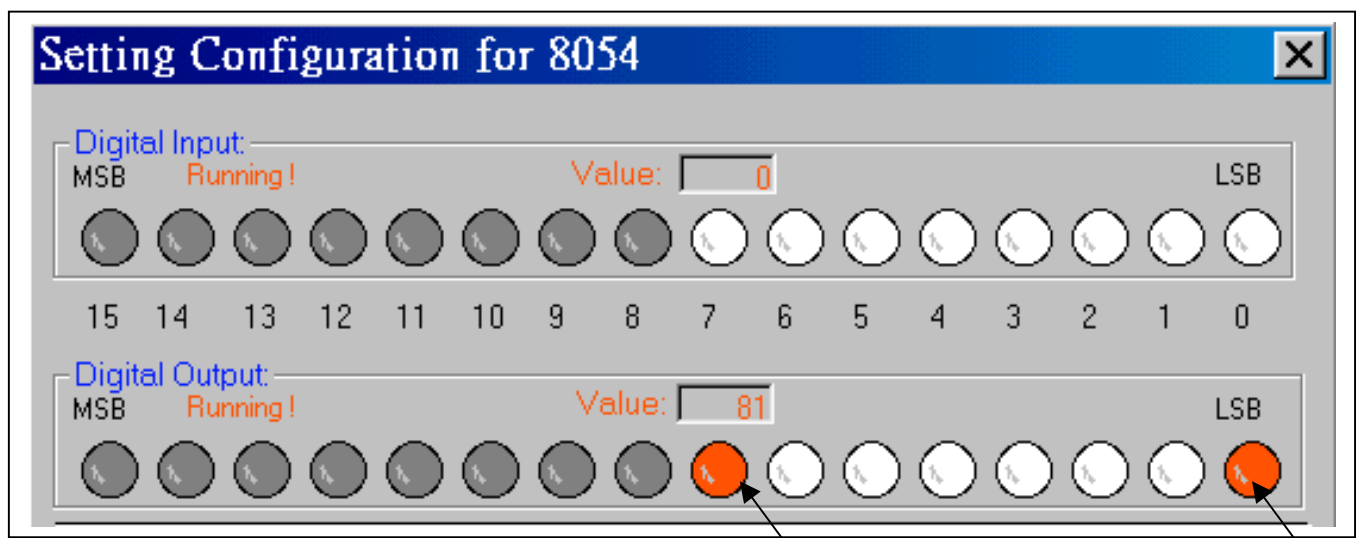
2.3.3 Access to I/O Modules by DCON Utility

Step 1: Refer to Section 2.3 for wiring. The default NET-ID of 8410/8810 is 0x01 (Fig of Appendix A). Run DCON utility (or 7000 utility) in host computer to search the 8410/8810 (refer to Section 2.3.1)

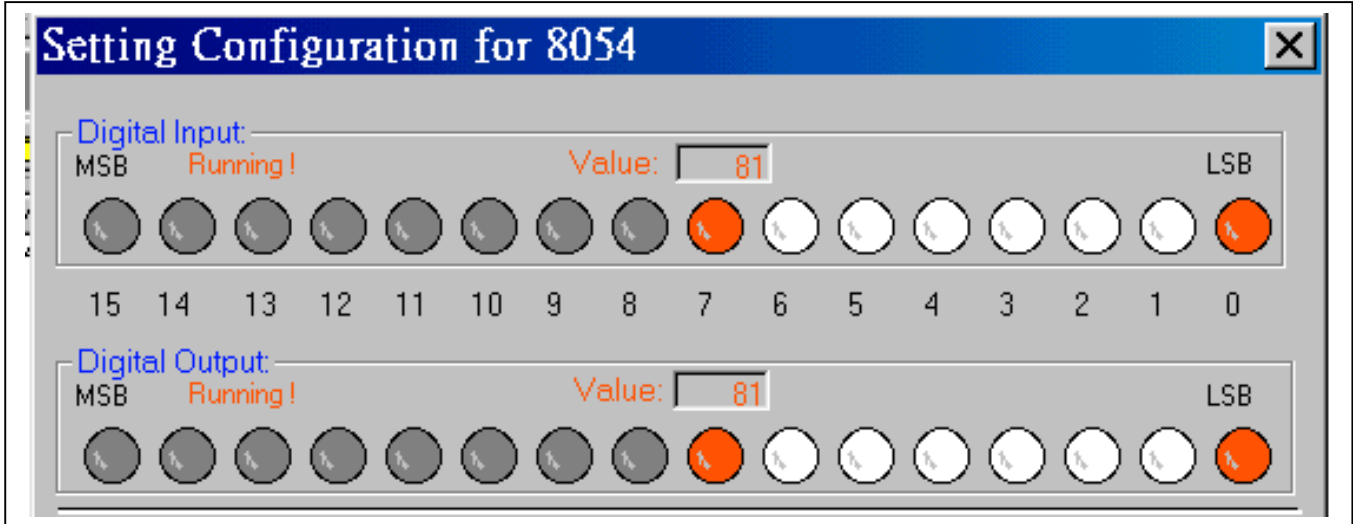
Step 2: double click on “8054” as following:



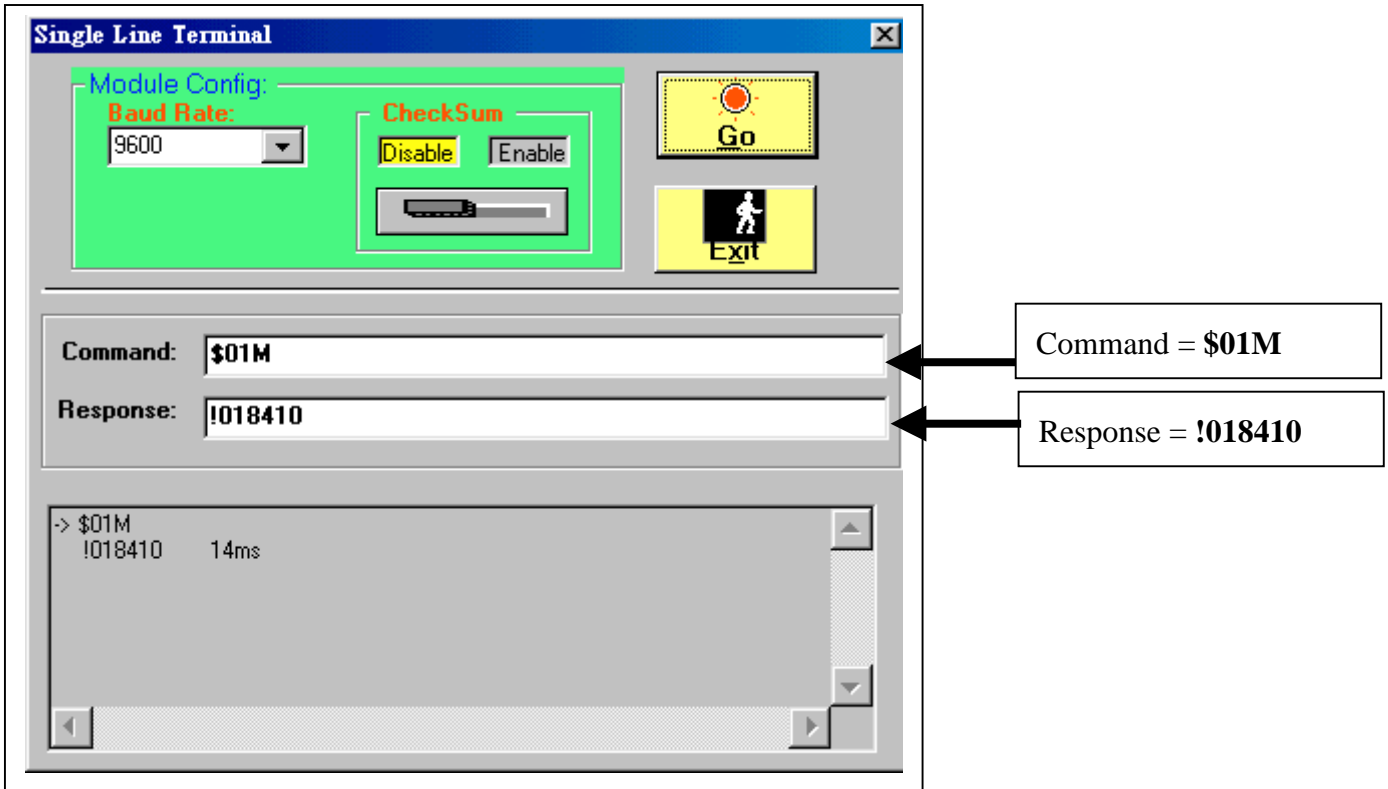
Step 3: Click on LSB & D7 of Digital output will toggle these two D/O ON as follows:



Step 4: connect 8054's
 P-20 to +Vs
 Pin-19 to GND
 Pin-2 to Pin-10
 Pin-9 to Pin-17
 Pin-1 to +Vs. Then the screen will shown as follows:(DI0=DO0, DI7=DO7)



Step 5: Click on Exit
Step 6: Click on "Terminal"
Step 7: Click on "Single line"
Step 8: key-in **\$01M** & Click **Go** as following:



Step 9: check the following CPU commands:

| command | response | description |
|---------|-------------|---------------------------------------------------------------|
| \$01F | !01A1.0 | Read version number of firmware=A1.0 |
| \$012 | !010600 | Baud rate=9600, checksum=disable (note 1) |
| \$01T | !0154535754 | Slot-0~ 3=8054, 8053, 8057, 8054 |
| \$01E | !0100000000 | No Error |
| \$015 | !011 | It is the first read since power is applied (note 2) |
| \$015 | !010 | It is not the first read since power is applied |
| \$015 | !010 | It is not the first read since power is applied |
| | | Power off 8410/8810 |
| | | Power on 8410/8810 |
| \$015 | !011 | It is the first read since power is applied (note 2) |
| \$015 | !010 | It is not the first read since power is applied |

Note 1: the data format is designed for 87K modules

2: This command is compatible to 7000 family for dual-watchdog mechanism

Step 10: check the following SMMI commands:

| command | response | description |
|------------|----------|-------------------------------|
| ~01L11 | !01 | Turn LED1 ON |
| ~01L21 | !01 | Turn LED2 ON |
| ~01L31 | !01 | Turn LED3 ON |
| ~01LR | !011111 | LED status read back |
| ~01L30 | !01 | Turn LED3 OFF |
| ~01L20 | !01 | Turn LED2 OFF |
| ~01L10 | !01 | Turn LED1 OFF |
| ~01LR | !01000 | LED status read back |
| ~01DMU | !01 | Enter user-display mode |
| ~01DV12345 | !01 | Display=12345 |
| ~01DV54321 | !01 | Display=54321 |
| ~01D12 | !01 | Display=24321 |
| ~01D21 | !01 | Display=21321 |
| ~01DR | !0121321 | Display read back |
| ~01DMS | !01 | Return to system-display mode |

Note: The 5-digit LED of 8410/8810 can be programmed to 2 modes as follows:

- system mode: 8k485.exe will show information on 5-digit LED
- user mode: application program will show information on 5-digit LED

Step 11: check the following D/I/O commands of Slot-0:

| command | response | description |
|-----------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | Connect the following signals of Slot-0 <ul style="list-style-type: none"> ● DI PWR=24V, DO GND=0V ● DI0=DO0, DI1=DO1,, DI7=DO7 |
| #01S00055 | > | Set DO=0x55; check LEDs of DO & DI |
| \$01S06 | !01555500 | DI=0x55, DO=0x55 |
| #01S000AA | > | Set DO=0xAA; check LEDs of DO & DI |
| \$01S06 | !01AAAA00 | DI=0xAA, DO=0xAA |
| #01S01001 | > | Turn-ON channel-0 of DO |
| \$01S06 | !01ABAB00 | DI=0xAB, DO=0xAB |
| #01S01700 | > | Turn-OFF channel-7 of DO |
| \$01S06 | !012B2B00 | DI=0x2B, DO=0x2B |

Step 12: check the following D/I/O commands of Slot-1 & Slot-2:

| command | response | description |
|------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | <ul style="list-style-type: none"> ● Connect DI PWR of Slot-1 to 24V ● Connect DO GND of Slot-2 to GND ● Connect DI0=DO0, DI1=DO1, ..., DI15=DO15 |
| #01S2055AA | > | Set DO=0x55AA; check LEDs of DO & DI |
| \$01S16 | !0155AA00 | DI=0x55AA |
| #01S21F01 | > | Turn-ON channel-15 of DO |
| \$01S16 | !01D5AA00 | DI=0xD5AA |
| #01S21700 | > | Turn-OFF channel-7 of DO |
| \$01S16 | !01D52A00 | DI=0xD52A |

Step 13: check the following D/I/O commands of Slot-3:

| command | response | Description |
|-----------|-----------|-----------------------------------------|
| | | Refer to Step 11 for wiring (in slot-3) |
| #01S300AA | > | Set DO=0xAA; check LEDs of DO & DI |
| \$01S36 | !01AAAA00 | DI=0xAA, DO=0xAA |
| #01S31001 | > | Turn-ON channel-0 of DO |
| \$01S36 | !01ABAB00 | DI=0xAB, DO=0xAB |
| #01S31700 | > | Turn-OFF channel-7 of DO |
| \$01S36 | !012B2B00 | DI=0x2B, DO=0x2B |

The module in **Step 11 is 87054** & the module in **step 13 is 8054**. But the command sets provided by 8410 are same for these two different modules.

2.3.4 Access to I/O Modules by DCON_DLL

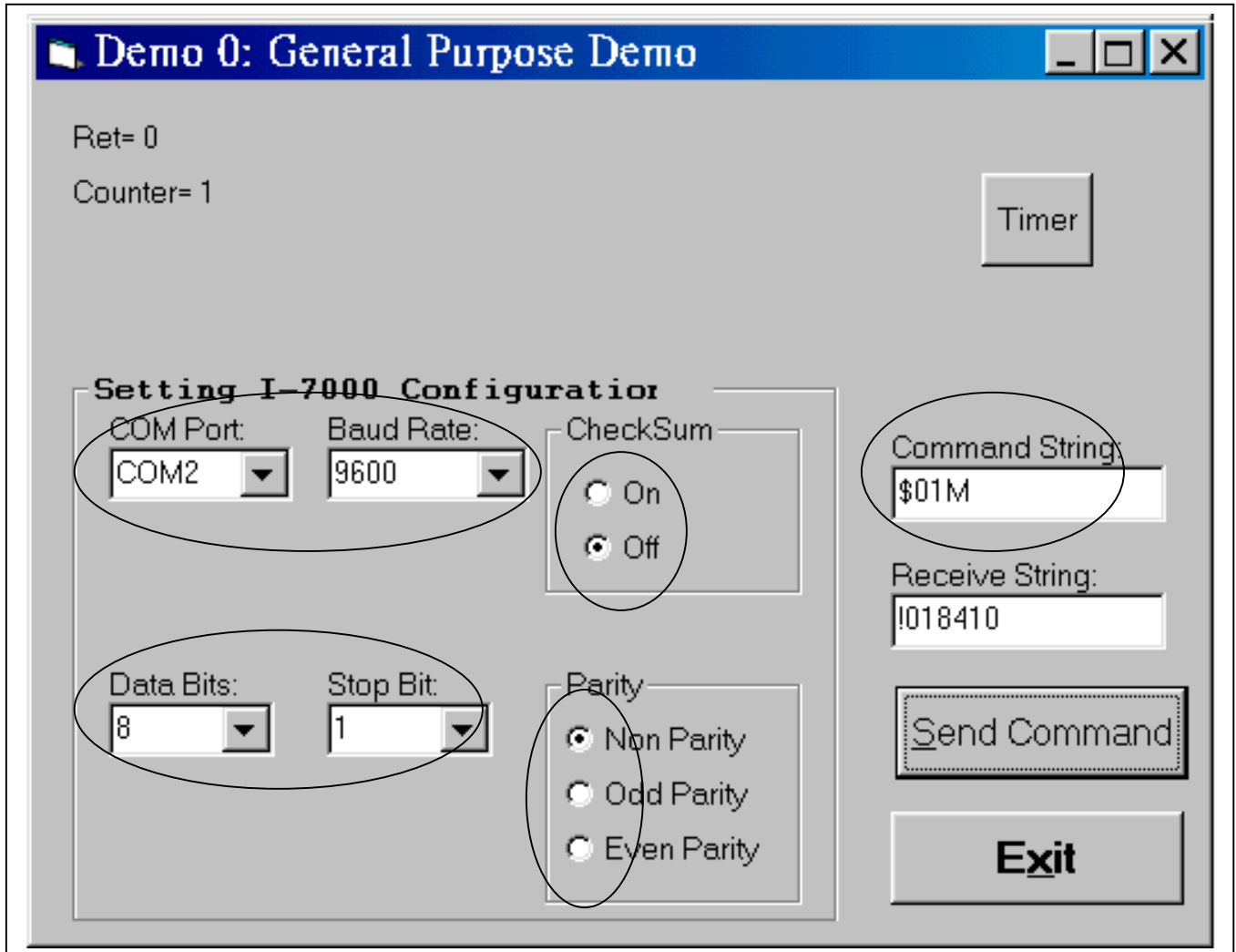
DCON_DLL is a DLL driver designed for Windows. (Section 7.3).

Step 1: Refer to Section 2.3 for wiring.

Step 2: Install DCON_DLL, please refer to Section 7.3

Step 3: Execute DAQPRO\DCON_DLL\Demo\VB5\7K\UART\Demo00\Demo00.exe as follows:

Step 4: Refer to step 9/10/11/12/13 in Section 2.3.3 for command testing



Note :

1. All source codes of demo are given in the hard disk.
2. Refer to DAQPRO\DCON_DLL\Demo\VB5\8K\AutoDemo.exe for change D/O automatically.
3. Refer to DAQPRO\DCON_DLL\Demo\VB5\7K*. * for more VB demo program about 7000 series.
4. Refer to DAQPRO\DCON_DLL\Demo\VB5\87K*. * for more VB demo program about 87K series.
5. Refer to DAQPRO\DCON_DLL\Demo\VB5\8K*. * for more VB demo program about 8000 series
6. Refer to DAQPRO\DCON_DLL\Demo\BCB3*. * for more BC++ Builder demo program
7. Refer to DAQPRO\DCON_DLL\Demo\Delphi3*. * for more Delphi demo program
8. Refer to DAQPRO\DCON_DLL\Demo\VC5*. * for more VC++ demo program

2.3.5 Change 8410/8810 to master devices (C programming)

User can download his own C program into 8410/8810 to replace “8k485.exe” (or “8k232.exe”).

Please copy your program (for ex, start100.exe) to, for ex, C:\8000\8410\. Then please follow the similar steps described in section 2.2.3 to update it.

Note: please edit “autoexec.bat” as, for ex, like

Start100.exe

Demo program “start100.c” is located at CD:\napdos\8000\start\8x1x\

Please refer to CD:\napdos\8000\index.htm & section 4.3.5 to see the c library.

| Name | Description |
|---------------|--------------------------------------------------------------------------------------------------------------------|
| <u>Common</u> | 7188X User's Manual MiniOS7 for I-8000 Series User's Manual Library Function for I-8000 Series User's Manual |
| | Host Control with RS-485 Bus |

Click on your familiar language

Click on the “8000 Library” to see the useful c functions for I-8000 controllers.

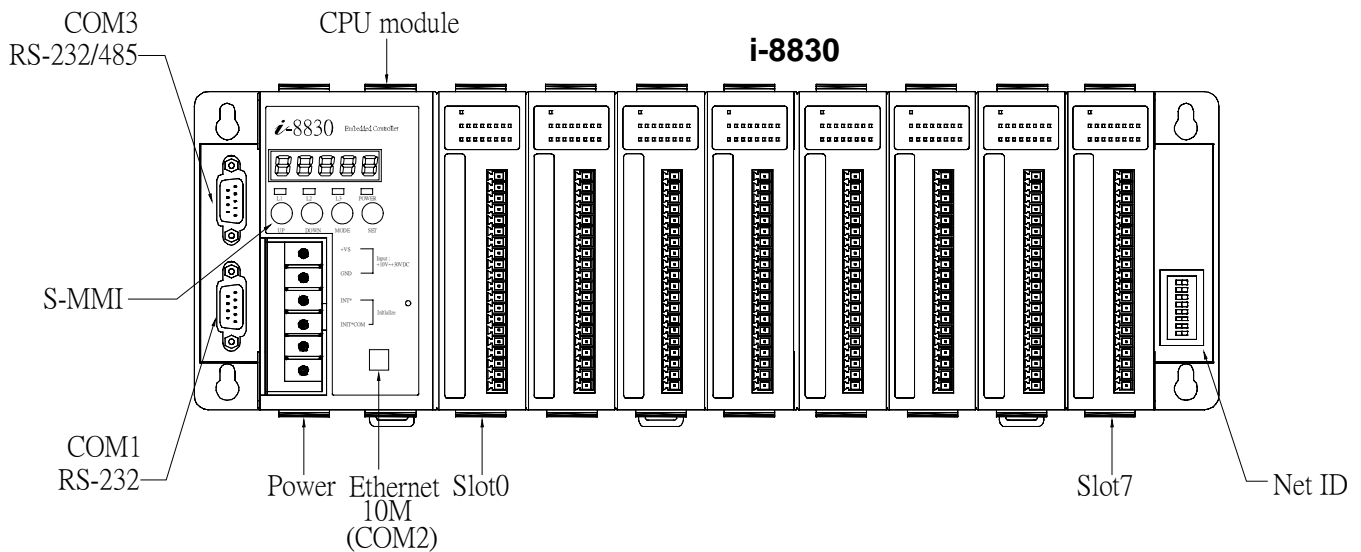
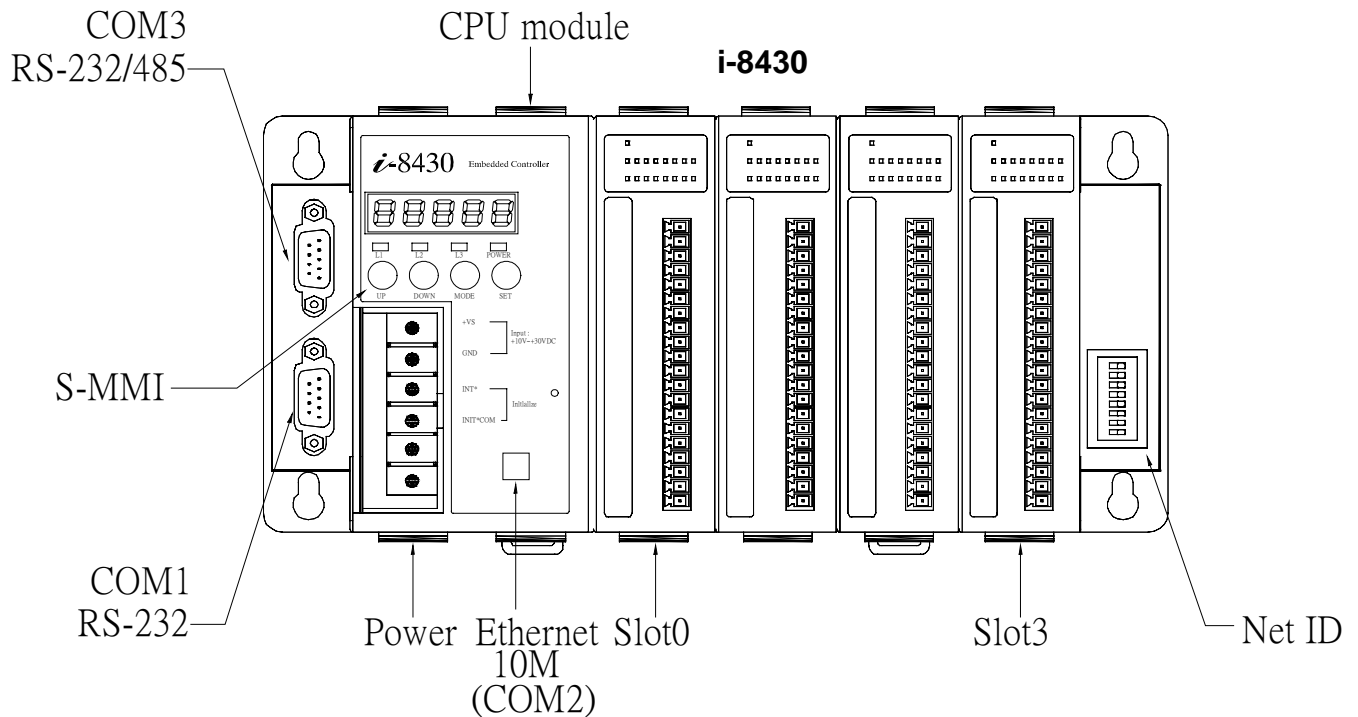
The newest I-8000 series document & news can be found on the following web-sites:

1. <http://www.icpdas.com/>(In Taiwan, Update first.)
2. <http://www.icpdas.com.tw/>(In Taiwan.)
3. [Japan1](#)(In Japan)
4. [Japan2](#)(In USA, Support by Japan Company.)

Chapter 3: 8430 / 8830

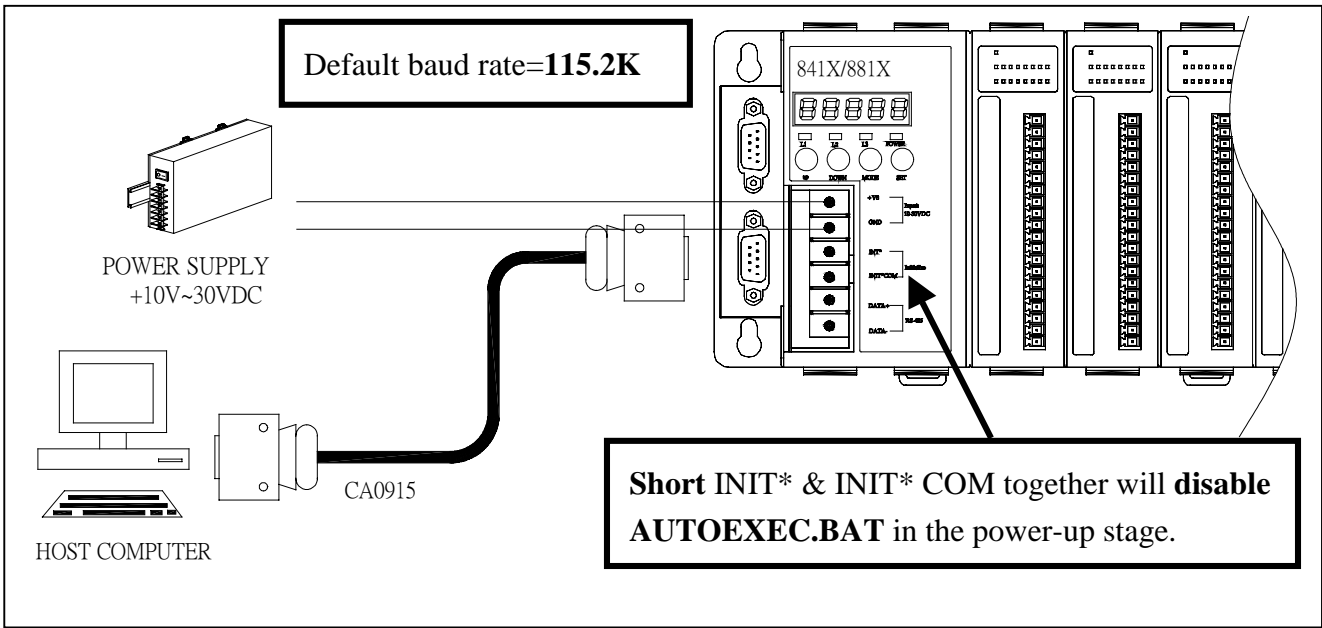
3.1 Hardware Installation

3.1.1 Front view of 8430/8830

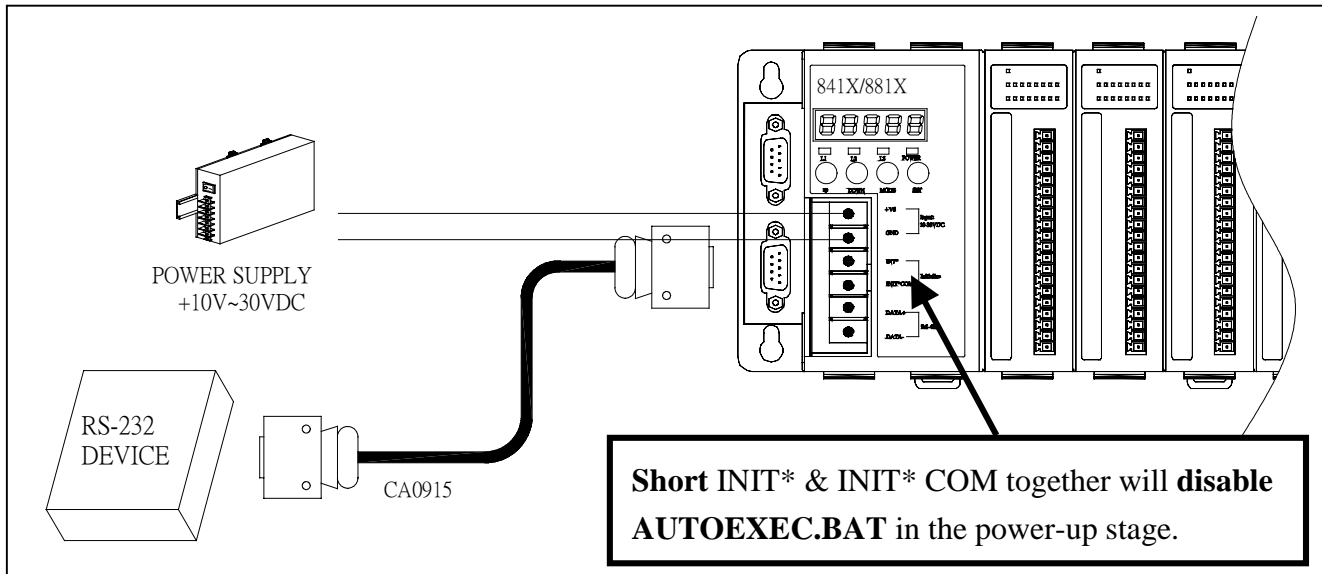


- 8430 provides four I/O Expansion Slots for 87K & 87k I/O Modules (from Slot0 to Slot3).
- 8830 provides eight I/O Expansion Slots for 87K & 87k I/O Modules (from Slot0 to Slot7).
- Net-ID DIP-SWITCH is used to set the NET-ID of 8430/8830 (refer to Appendix A)
- DC-power(+Vs, GND): DC +10V to +30V, unregulated
- **Note:** I/O modules can not be inserted/removed from 8430/8830 when DC-power is applied
- COM1 is for download program from PC. It also can link to RS232 device after download
- COM2 is used to link to Host-PC or the other Ethernet 10M device
- COM3 can be used to link to 87K4/5/8/9 or the other RS-232/RS-485 device(refer to Section 2.1.5). Short INIT* & INIT*-COM together will force 8430/8830 to go to its initial state (Appendix B)

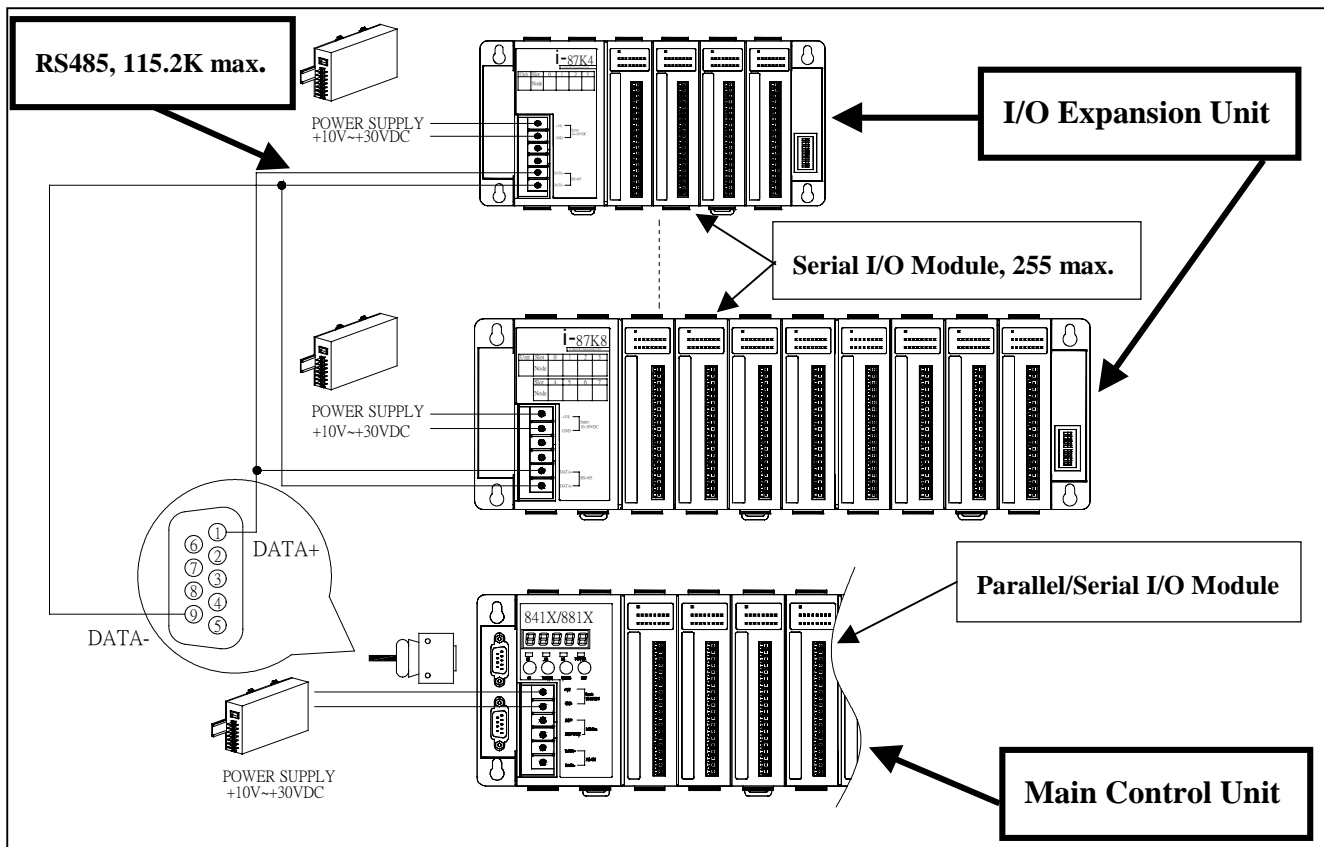
3.1.2 Host PC connect to COM1 of 8430/8830



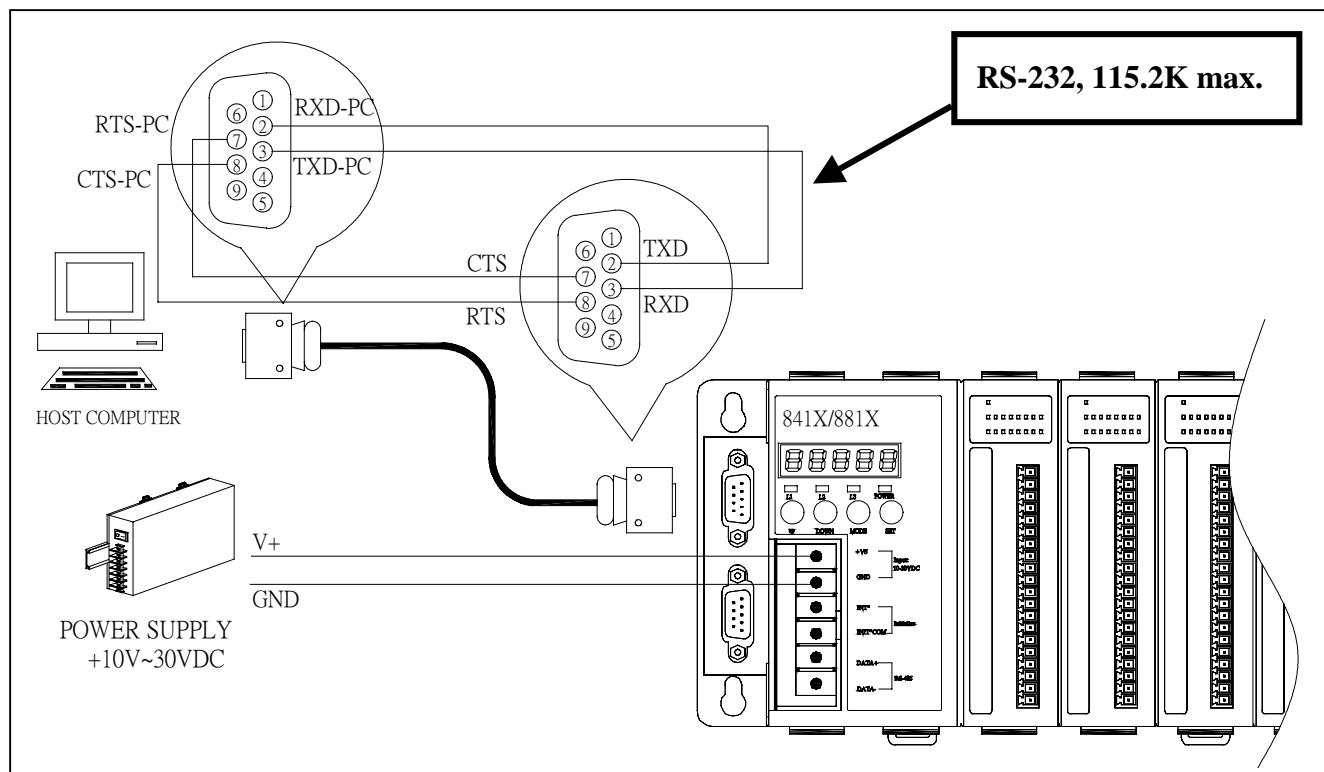
3.1.3 COM1 of 8430/8830 connect to RS232 device



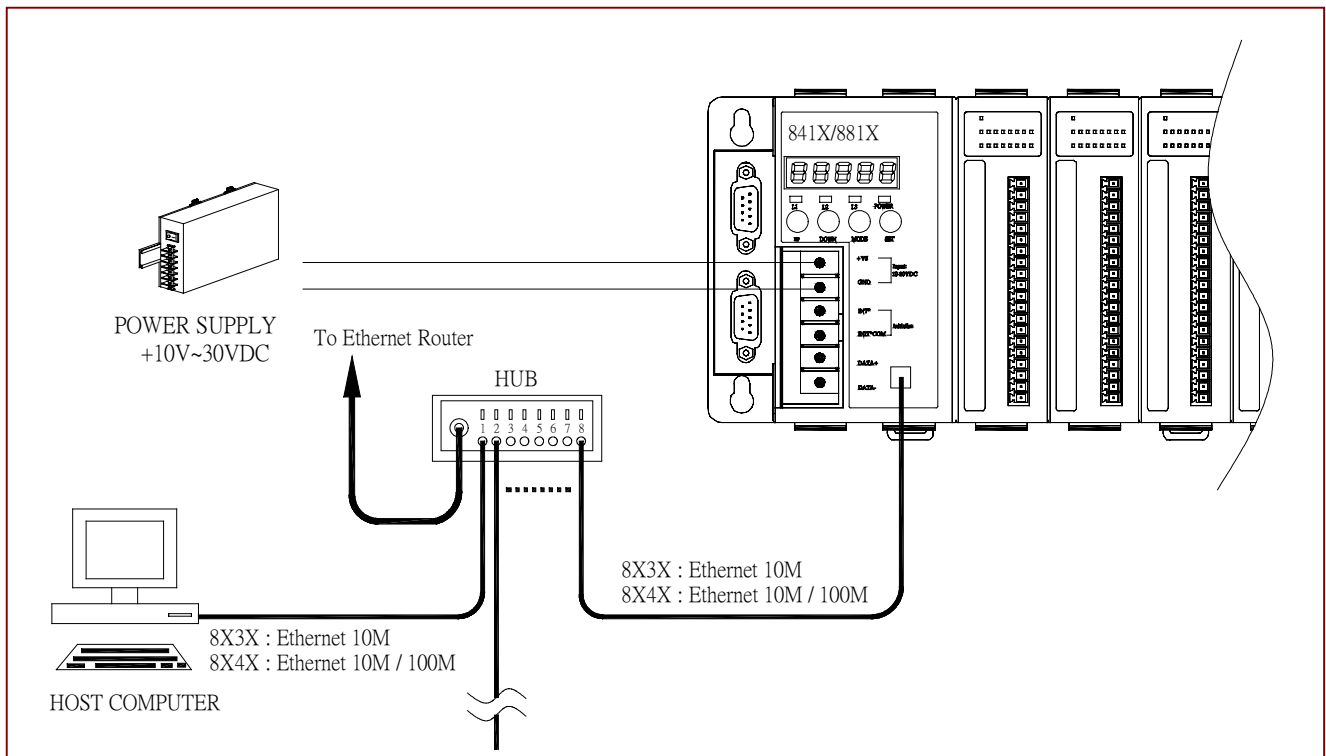
3.1.4 COM3 of 8430/8830 connect to I-87K4/5/8/9 or I-7000



3.1.5 COM3 of 8430/8830 connect to RS232 device



3.1.6 Host PC connect to Ethernet port of 8430/8830



3.2 Software Installation & Manuals

3.2.1 Manuals

Double click on **CD:\NAPDOS\8000\index.htm** to get a starting page as following:

| Name | Description |
|----------------------------|--------------------------------------------------------------------------------------------------------------------|
| <u>Common</u> | 7188X User's Manual MiniOS7 for I-8000 Series User's Manual Library Function for I-8000 Series User's Manual |
| <u>8410,8411,8810,8811</u> | Host Control with RS-485 Bus Slave Controller -- 8410,8810 Master Controller -- 8411,8811 |
| 8420,8421,8820,8821 | 8420, 8820 : DeviceNet main Uint 8421, 8821 : CANopen main Uint |
| 8430,8431,8830,8831 | Host Control with 10 BaseT Ethernet Slave Controller -- 8430,8830 Master Controller -- 8431,8831 |
| 8440,8441,8840,8841 | Host Control with 10/100 BaseT Ethernet Slave Controller -- 8440,8840 Master Controller -- 8441,8841 |

More manuals about I-8430/8431/8830/8831 resides at **CD:\napdos\8000\843x883x\document**
8000Ehh.pdf : 8000E series hardware user's manual
8000Ess.pdf : 8000E series software user's manual
8431_Quick_Start.pdf : 8431/8831 quick start
TCPIPLib.pdf : TCP/IP User's manual

3.2.2 Installing DCON utility

The DCON utility is for setting, debugging & monitoring 8410/8810/8430/8830, I-7000 I/O modules & I-87K4/5/8/9 + I-87K I/O cards.

Please run "**setup.exe**" at
 CD-ROM: \napdos\driver\dcon_utility\setup\ to install it.

If it is not found in your CD-ROM, please download "**dcon_utility**" folder at the below ftp site.

<ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/>



After DCON utility is well installed, Please click on "Help - On Line Help" to learn how to use it.

3.2.3 Installing 7188XW.exe utility & 8430/8830 firmware

Note: ICP DAS provides one easy-use utility – “MiniOS7 utility”. (Please refer to Appendix F)

1. **7188xw.exe** is for download program, & debug I-8000 main controllers, also for setting IP, Mask & Gateway of I-8x3x ethernet controllers.

Please copy CD:\napdos\minios7\utility\ “**7188xw.exe**” to one folder of your PC (Windows 98/NT/2000/XP), for example, to C:\8000\8430\

2. OS image is located at CD:\napdos\minios7\8000new\ with a extension name of “.img”, for ex. “8n030124.img”. Please copy to, for ex, C:\8000\8430\

3. **8ke10.exe** is the default firmware of the I-8430/8830 when first shipped.

Please copy

CD:\napdos\8000\843x883x\tcp\vxcomm\server(843x883x)\ “**autoexec.bat**” &

CD:\napdos\8000\843x883x\tcp\vxcomm\server(843x883x)\ (newest , for ex. “A1.93”) \ “**8ke10.exe**”

to one folder of your PC, for example, to C:\8000\8430\

New firmware can be found from ICP DAS’s FTP site.

OS image: <ftp.icpdas.com/pub/cd/8000cd/napdos/minios7/8000new/>

8ke10 : [ftp.icpdas.com/pub/cd/8000cd/napdos/8000/843x883x/tcp/vxcomm/server\(843x883x\)/](ftp.icpdas.com/pub/cd/8000cd/napdos/8000/843x883x/tcp/vxcomm/server(843x883x)/)

User may update to new firmware by yourself by below steps.

1. Go to C:\8000\8430\, then run “7188xw.exe” on your PC.
2. Link COM1 of your PC to COM1 of the I-84XX/88XX controller through a RS232 cable.
3. Power off the I-84XX/88XX controller, connect pin "INIT" to "INIT COM" and then power it up.
4. If the connection is Ok, some message will appear on the 7188xw screen.

8000>

5. Type "ver" to see the current OS version.

8000> **ver**

6. The OS image should upgrade first. Type "upload" to load the OS image

8000> **upload**

press ALT + E and type in the **image name** (for ex, 8n030124.img)
and then type "bios1"

8000> **bios1**

(**WAIT ABOUT 30 SEC. ***DO NOT REMOVE THE POWER IN THESE 30 SEC.*****)

7. Then we are going to update the 8ke10.exe driver.

Type "del" and reply "y" to delete the current driver.

8000> **del**

Total File number is 2, do you really want to delete(y/n)? ← please give "y"

8. Type "load", then press ALT + E and then type "autoexec.bat" .

8000> **load**

File will save to 8000:0000

StartAddr-->7000:FFFF

Press ALT_E to download file!

Input filename: **autoexec.bat**

Please make sure the contents of
"autoexec.bat" file is
8ke10.exe

9. Type "load" again, then press ALT + E and then type "8ke10.exe".

It will take about 30 seconds to finish.

8000> **load**

File will save to 8003:0002

StartAddr-->8000:0031

Press ALT_E to download file!

Input filename: **8ke10.exe**

10. Type "dir" to make sure "autoexec.bat" and "8ke10.exe" are well burned.

8000> dir

11. Press ALT_X to exit "7188xw".

12. Remove the connection between "INIT" - "INIT COM", then reset the controller.

3.2.4 Change IP, Mask & Gateway of 8430/8830

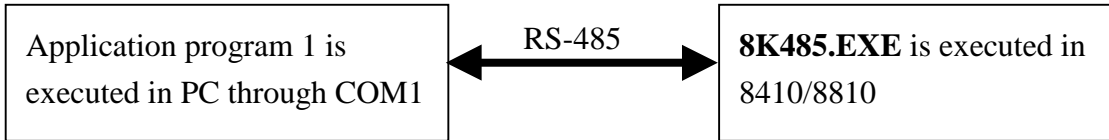
Note: ICP DAS provides one easy-use utility – “PCDiag”. (Please refer to Appendix E)

1. Link from COM1 your PC to COM1 of the 8430 / 8830 controller by a RS232 cable.
2. Power off the 8430/8830 controller, connect pin "INIT" to "INIT COM", and then power it up.
3. Execute 7188xw.exe on your PC, then press “Enter” of the keypad several times. If the connection is Ok, messages will appear similar as below.
8000>
4. Type "ip" to see the current IP address.
8000> ip
IP=192.168.255.255
5. Type "ip xxx.xxx.xxx.xxx" to set to a new IP address.
8000> ip 192.168.1.200
Set IP=192.168.1.200
[ReadBack]IP=192.168.1.200
6. Type "mask" to see the current address mask
8000> mask
MASK=255.255.0.0
7. Type "mask xxx.xxx.xxx.xxx" to set to a new address mask.
8000> mask 255.255.255.0
Set MASK=255.255.255.0
[ReadBack]MASK=255.255.255.0
8. Type "gateway" to see the current gateway address.
8000> gateway
Gateway=192.168.0.1
9. Type "gateway xxx.xxx.xxx.xxx" to set to a new gateway address.
8000> setgateway 192.168.1.1
Set GATEWAY=192.168.1.1
[ReadBack]Gateway=192.168.1.1
10. Press ALT_X to exit "7188xw"
11. Remove the connection between "INIT" - "INIT COM", reset 8430 / 8830 controller.

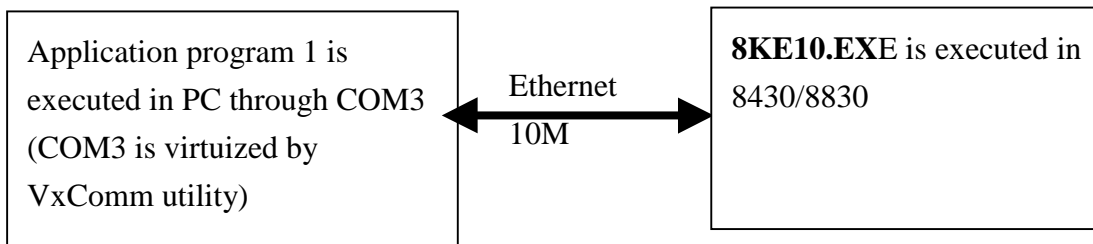
3.3 Getting Start

The default shipping of 8430/8830 is a slave device with the firmware 8KE10.EXE. It is used to upgrade the 8410/8810 from RS-485 networking to Ethernet networking without any software modification.

Assume the original 8410/8810 system is given as follows:



The above system can be upgraded to Ethernet 10M, 8430/8830, as follows:



The key points are given as follows:

- The application program 1 for both applications is same.
- The VxComm utility can virtualize the Ethernet 10M to a COM3 which is compatible to PC's COM1/2
- The **8KE10.EXE** talks to VxComm utility in TCP/IP protocol
- The **8KE10.EXE** provides same command sets as **8K485.EXE** → So the application program 1 designed for 8410/8810 can be used for 8430/8830 without any modification.

After the Ethernet 10M is virtualized to COM3, any program calls MS-COMM standard can access to 8430/8830 through COM3. In this condition, the program can access to COM3 as same as COM1/2. So the original application program designed for RS-485 networking can be upgraded to Ethernet 10M without any modification.

The getting start of 8430/8830 is given as follows:

- Refer to Section 3.3.1 to virtualize 8430/8830 to COM3
- Refer to Section 3.3.2 to use DCON utility to access to 8430/8830 as same as 8410/8810.
- Refer to Section 2.3.4 to use NAP700P to access to 8430/8830 through COM3

3.3.1 Use VxComm Utility to Virtualize 8430/8830 to COM3

VxComm driver and utility is easy to install and use. At first you should find out the installation file in CD. The driver & utility directory is given as follows:

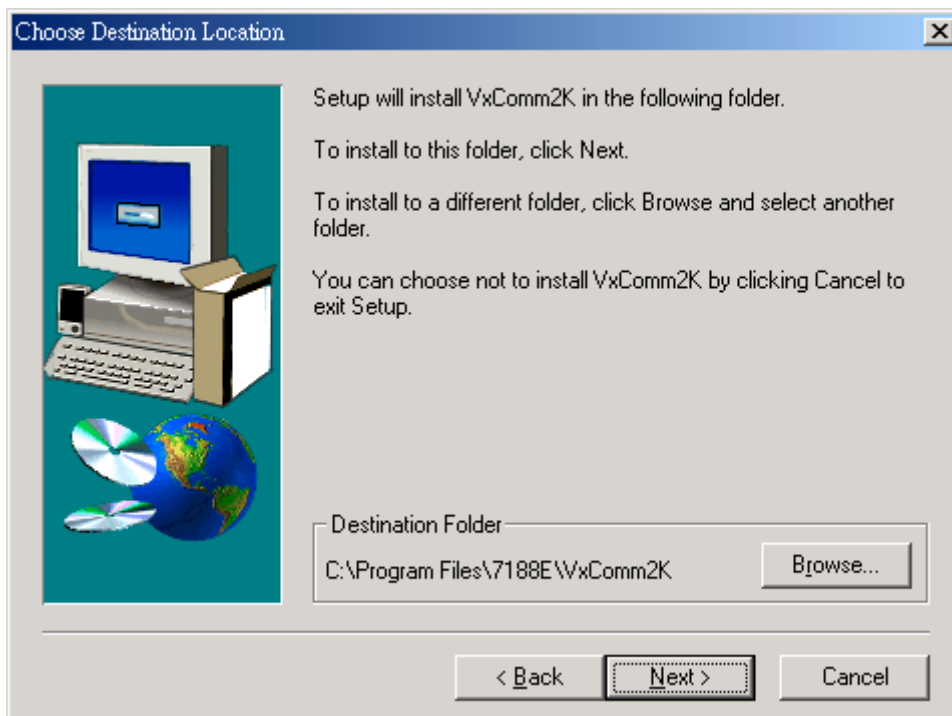
CD:\Napdos\7188e\tcp\vxcomm\driver(pc)\nt\vxcommnt.exe → for NT4.0
CD:\Napdos\7188e\tcp\vxcomm\driver(pc)\2k\vxcomm2k.exe → for Windows 2000 & XP
CD:\Napdos\7188e\tcp\vxcomm\driver(pc)\9x\vxcomm98.exe → for Windows 98.

The document will show you how to install the driver and configure correctly. The working steps are given as follows:

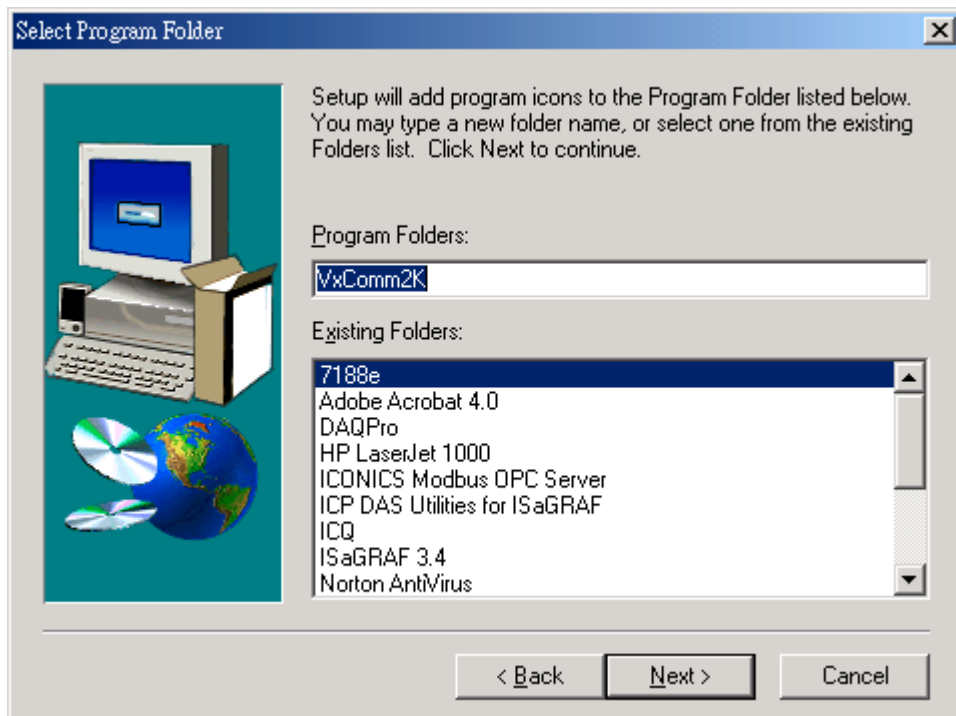
- show you how to install the VxComm utility & software driver.
- show you how to add a 8430/8830/7188E server and configure a com port.
- show you how to remove a 8430/8830/7188E server if the server is removed or there are any installation errors.

Install the VxComm Driver (ex. Windows 2000):

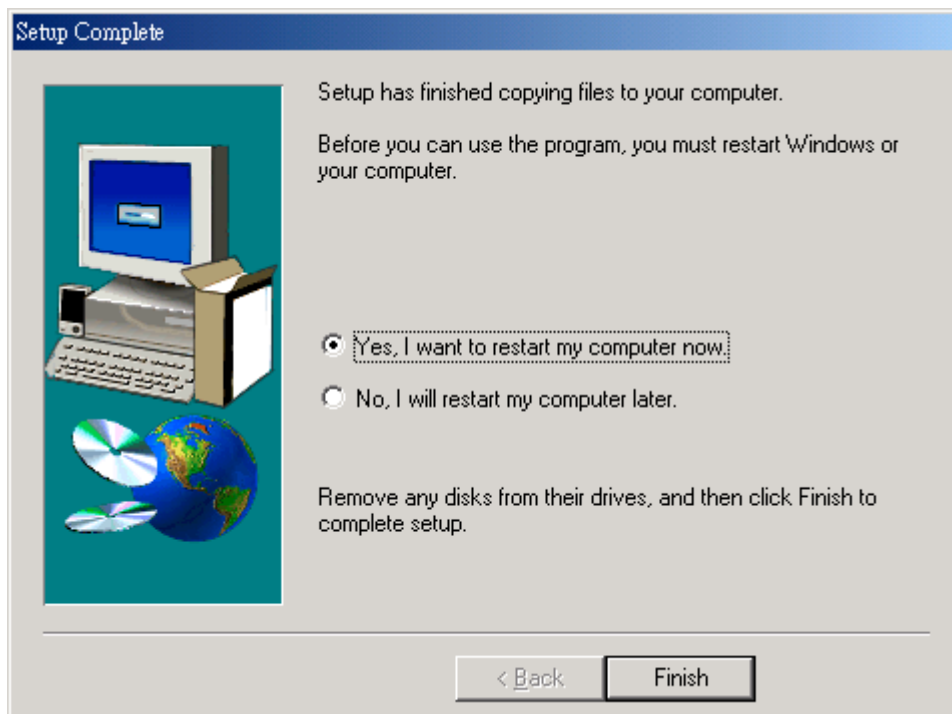
- Step 1: Double Click CD:\Napdos\7188e\tcp\vxcomm\driver(pc)\2k\vxcomm2k.exe
- Step 2: Choose a Destination Folder and Click Next



Step 3: Choose a Program Folder and Click Next

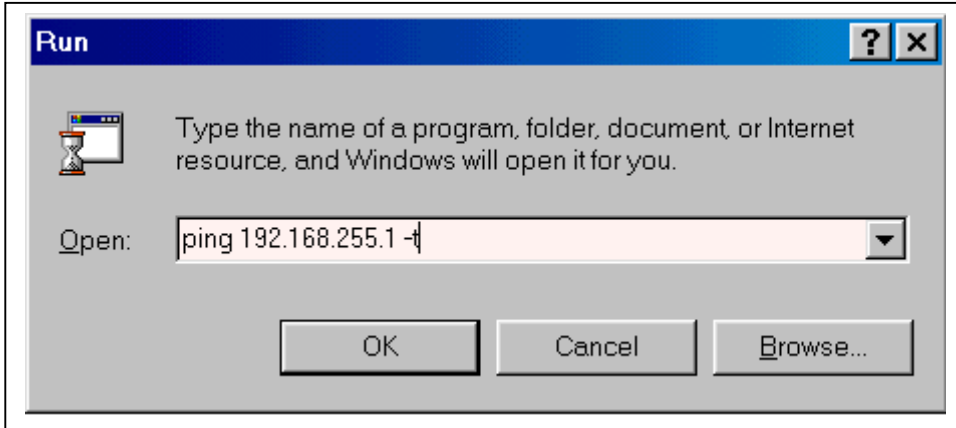


Step 4: Click Finish to Reboot your computer



Step 5: Add and Configure the Server after re-boot PC

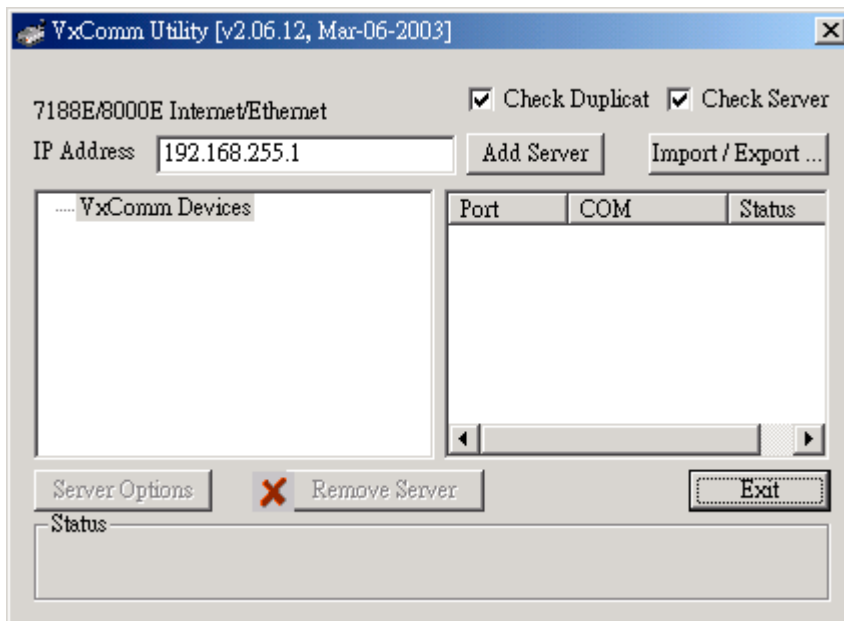
1. Power on your 8430/8830. Link PC to it (refer to Fig. 3.1.6). Make sure you could connect to 8430/8830/7188E hardware by Ping.exe , the default IP is **192.168.255.1** (Factory setting). Please refer to 3.2.4 to know how to change IP, Mask & Gateway.



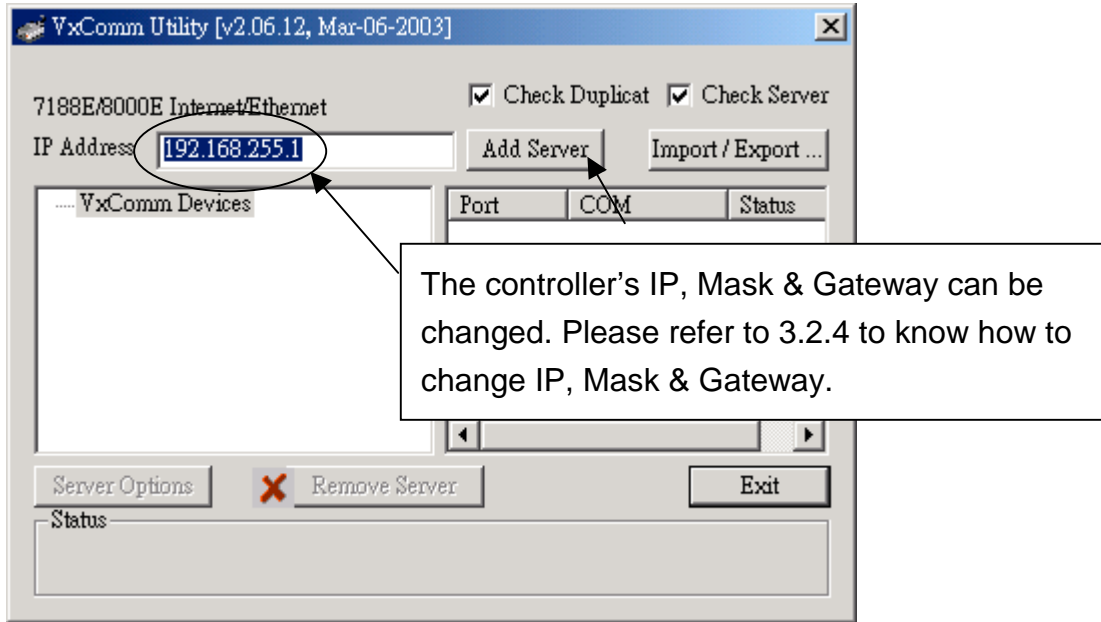
2: Execute the VxComm Utility



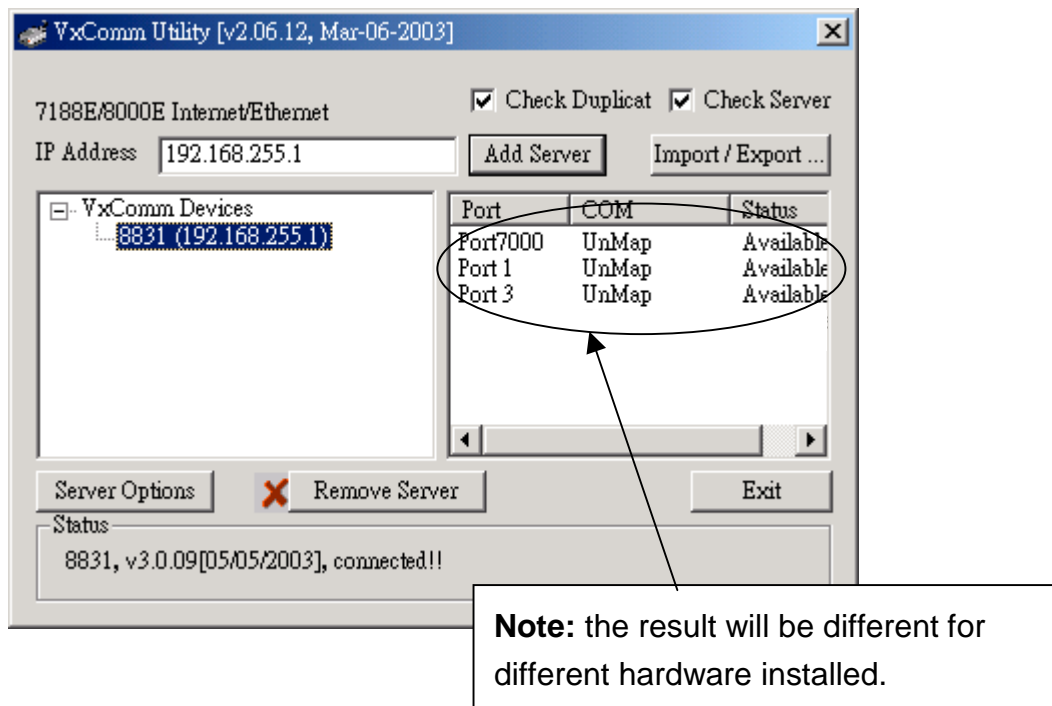
Then you could see as below.



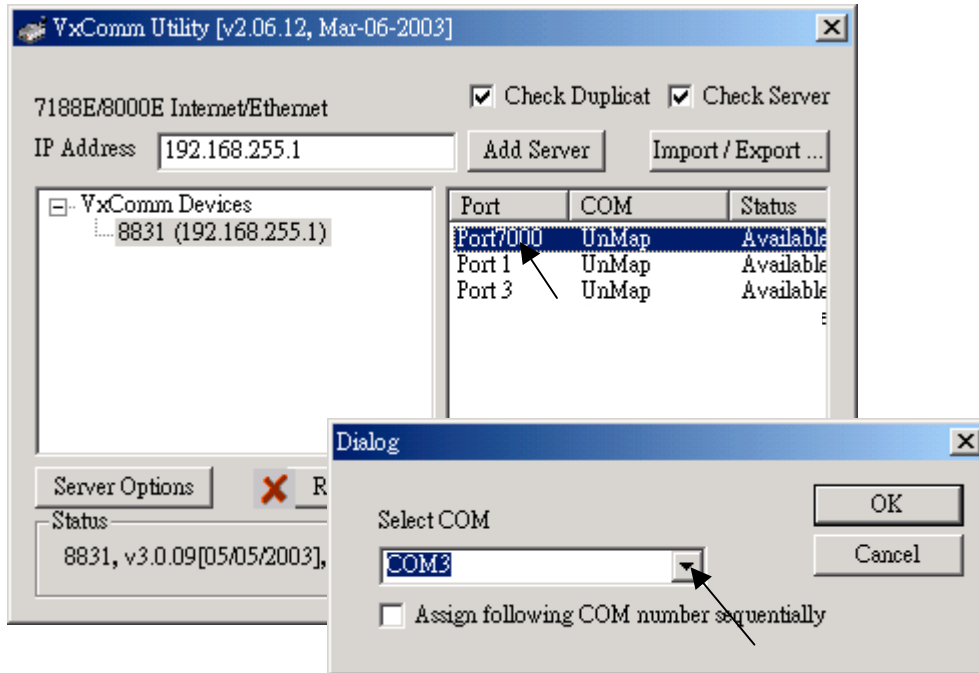
3: Add a 8430/8830/7188E server IP address and Press “Add Server” Button



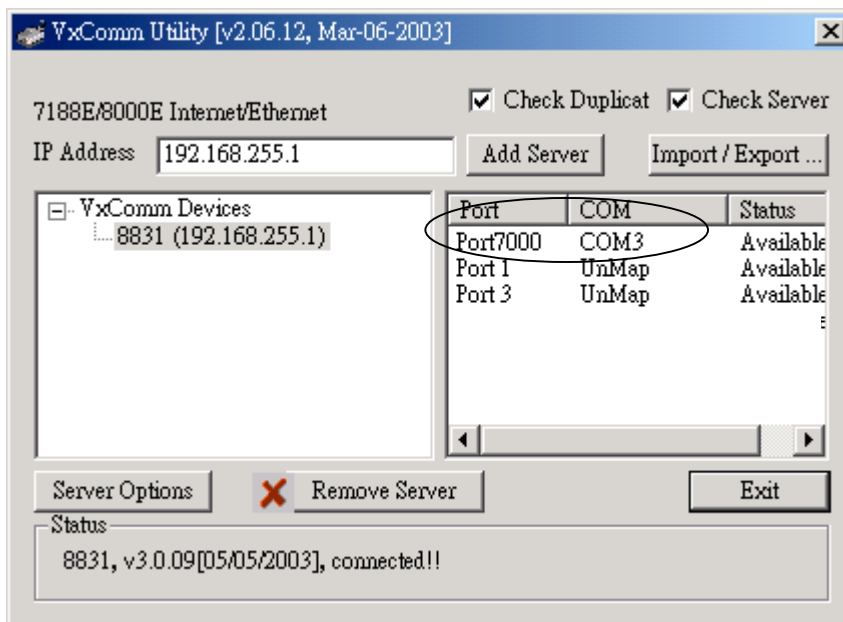
If the 8430/8830 is well connected, then you will see the following result:



4: Configure the Virtual COM Port by Double Clicking on “Port7000”, then select “COM3”

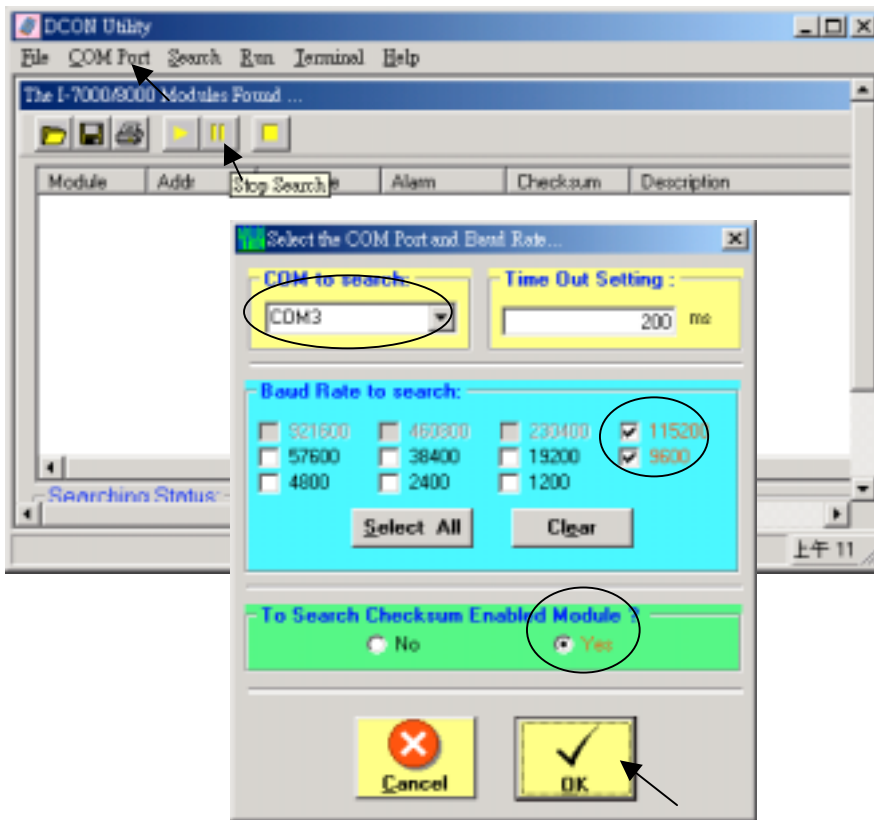


then you will see the following result, click on “Exit” to exit.

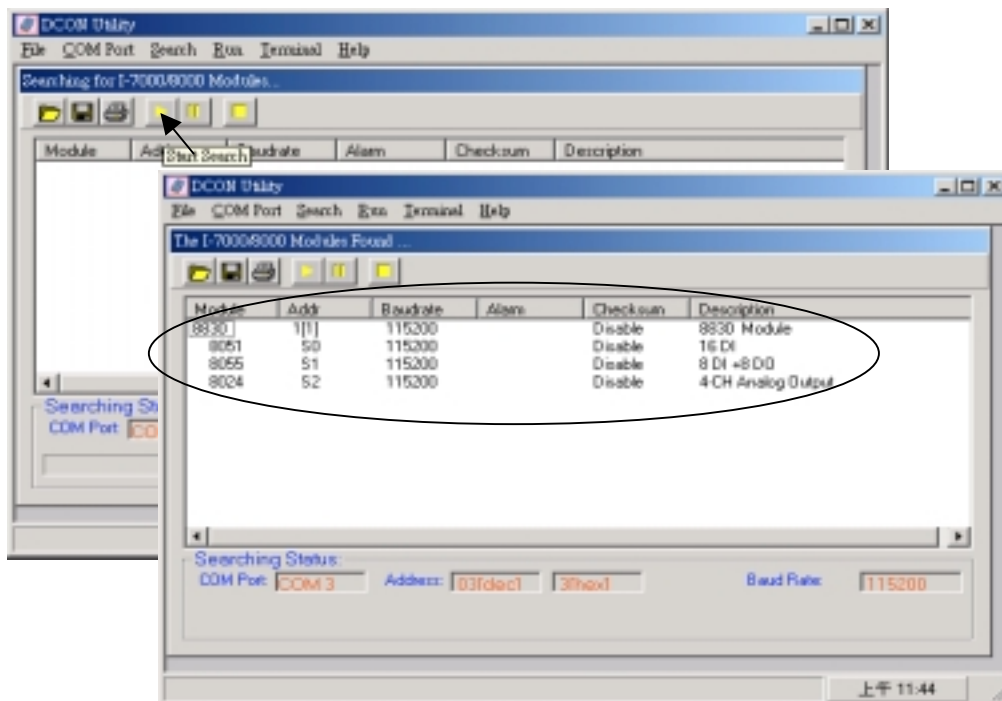


3.3.2 Use VxComm:COM3 to talk to 8430/8830

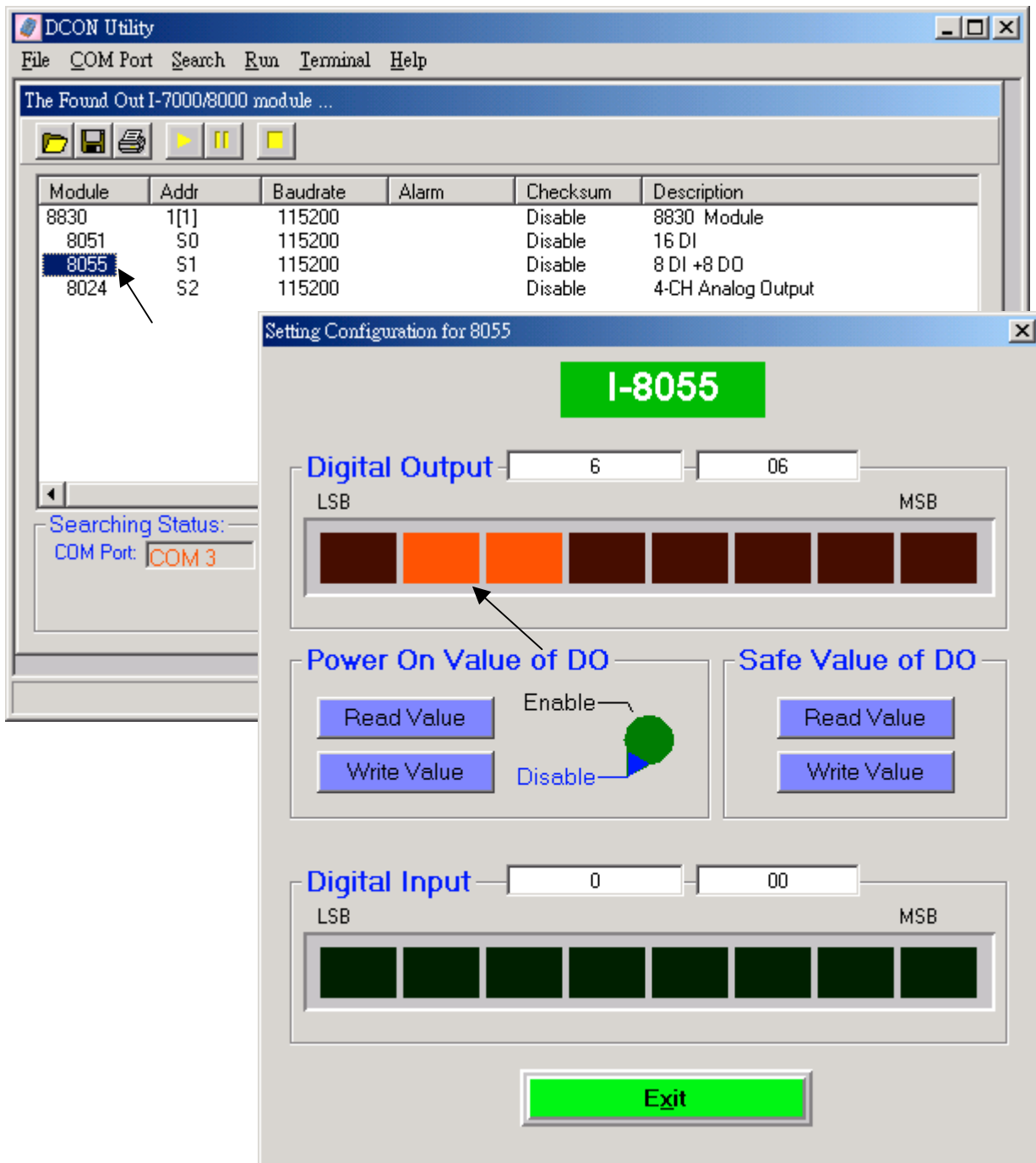
Execute DCON utility (7000 utility), click on “Stop Search” first, then click on “COM Port” to select “COM3”, “115200” & “9600”.



Then click on “Start Search”, modules will be found.



You may click on the module name & test it.



Note: The command is the same as listed in 2.3.3 step 9 to step 13.

3.3.3 Change 8430/8830 to master devices (C programming)

User can download his own C program into 8430/8830 to replace “8ke10.exe” .

Please copy your program (for ex, demo1.exe) to, for ex, C:\8000\8430\. Then please follow the similar steps described in section 3.2.3 to update it.

Note: please edit “autoexec.bat” as, for ex, like
Demo1.exe

Demo program “demo1.c” is located at CD:\napdos\8000\843x883x\tcp\other\server\demo1\

Please refer to CD:\napdos\8000\index.htm & section 4.3.5 to see the c library .

| Name | Description |
|------------------------|--------------------------------------------------------------------------------------------------------------------|
| Common | 7188X User's Manual MiniOS7 for I-8000 Series User's Manual Library Function for I-8000 Series User's Manual |
| | Host Control with RS-485 Bus |

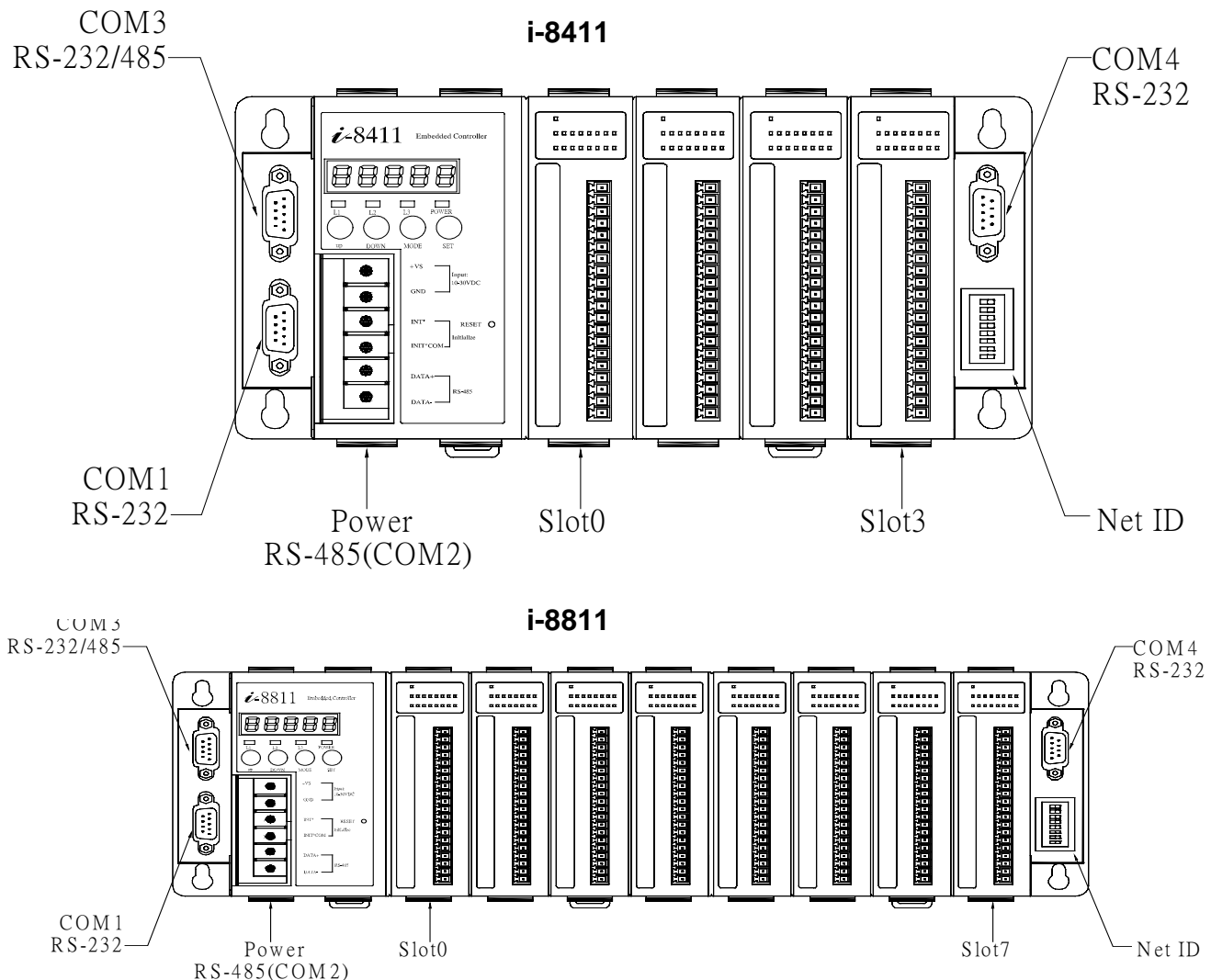
Click on your familiar language

Click on the “8000 Library” to see the useful c functions for I-8000 controllers.

Chapter 4: I-8411 / 8811 / 8431 / 8831

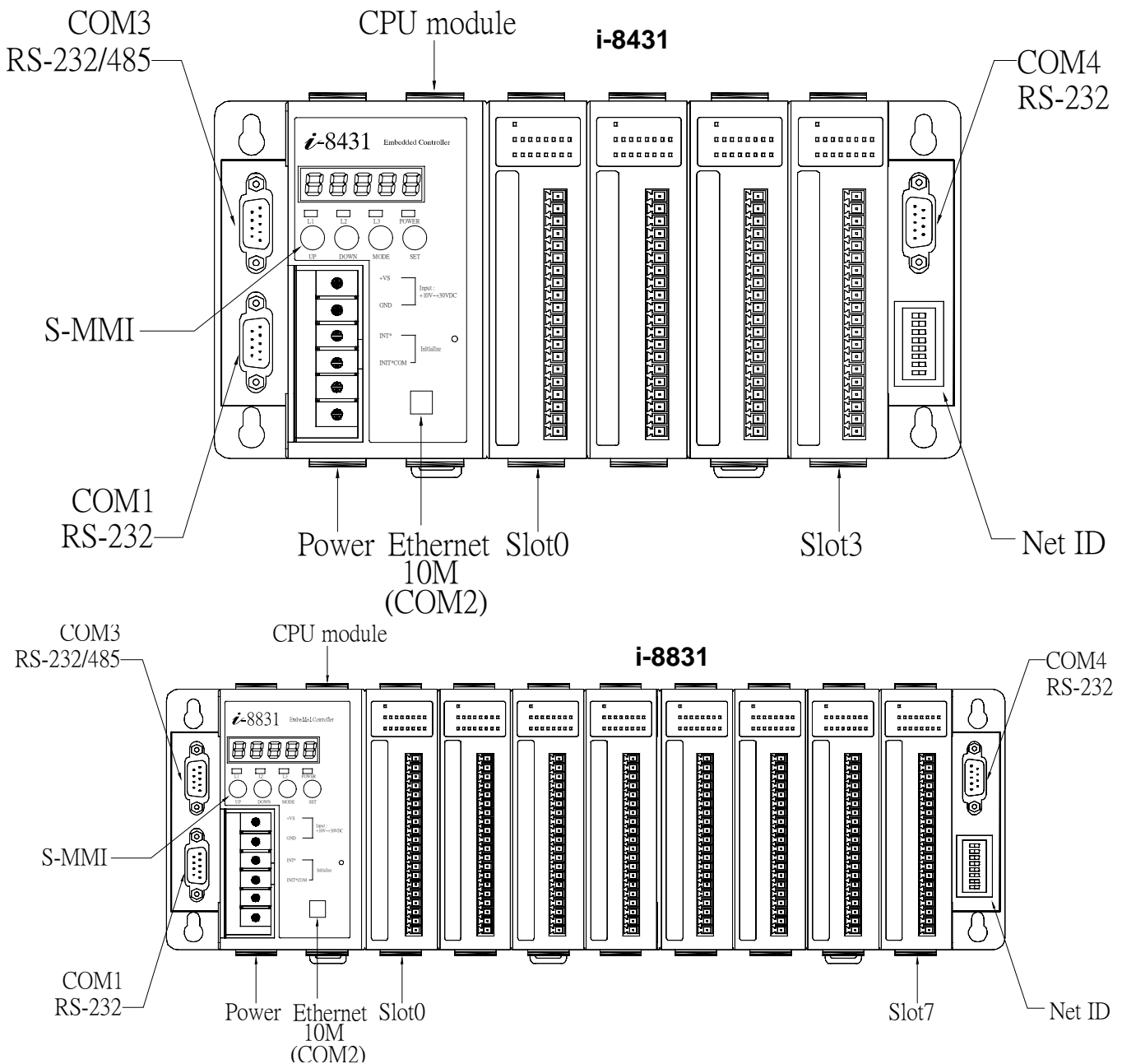
4.1 Hardware Installation

4.1.1 Front view of 8411/8811



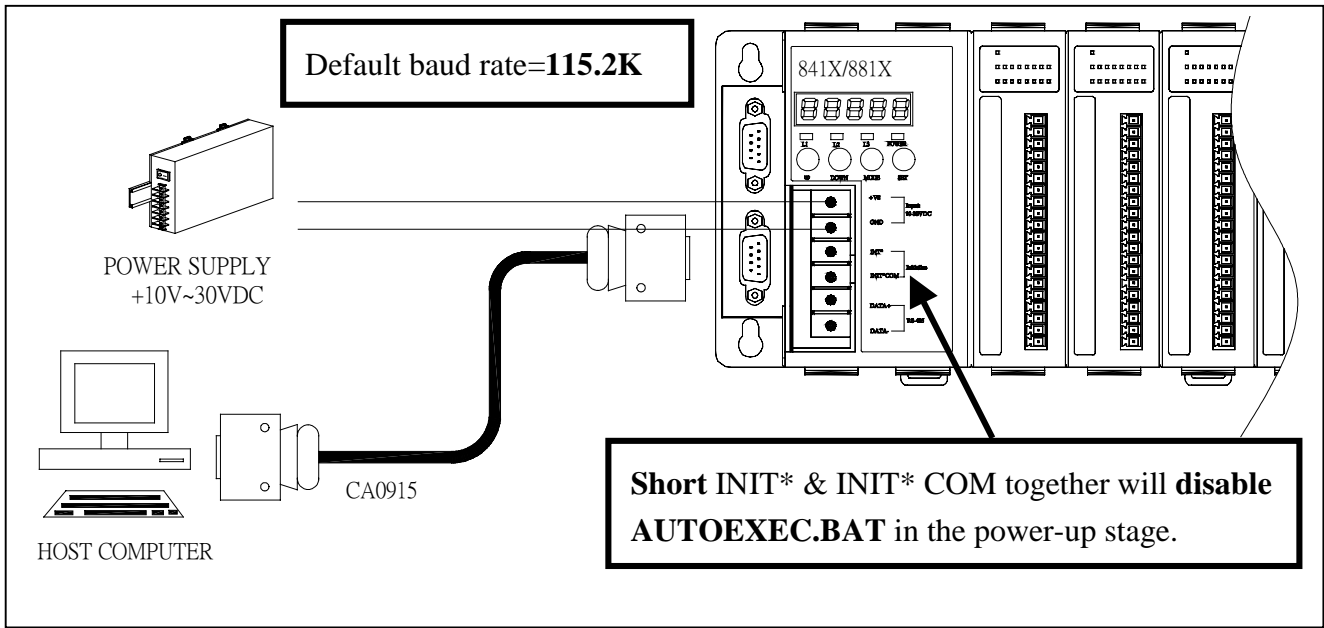
- 8411 provides four I/O Expansion Slots for 87K & 8k I/O Modules (from Slot0 to Slot3).
- 8811 provides eight I/O Expansion Slots for 87K & 8k I/O Modules (from Slot0 to Slot7).
- Net-ID DIP-SWITCH is used to set the NET-ID of 841X/881X (refer to Appendix A)
- DC-power(+Vs, GND): DC +10V to +30V, unregulated
- **Note:** I/O modules can not be inserted/removed from 841X/881X when DC-power is applied
- COM1 is used to download program from PC. It also can link to RS232 device after download
- COM2 is used to link to Host-PC or the other RS-485 device
- COM3 can be link to 87K4/5/8/9 or the other RS-232/RS-485 device
- COM4 can be link to modem device or the other RS-232 device
- Short INIT* & INIT*-COM together will force 841X/881X to go to its initial state(Appendix B)

4.1.2 Front view of 8431/8831

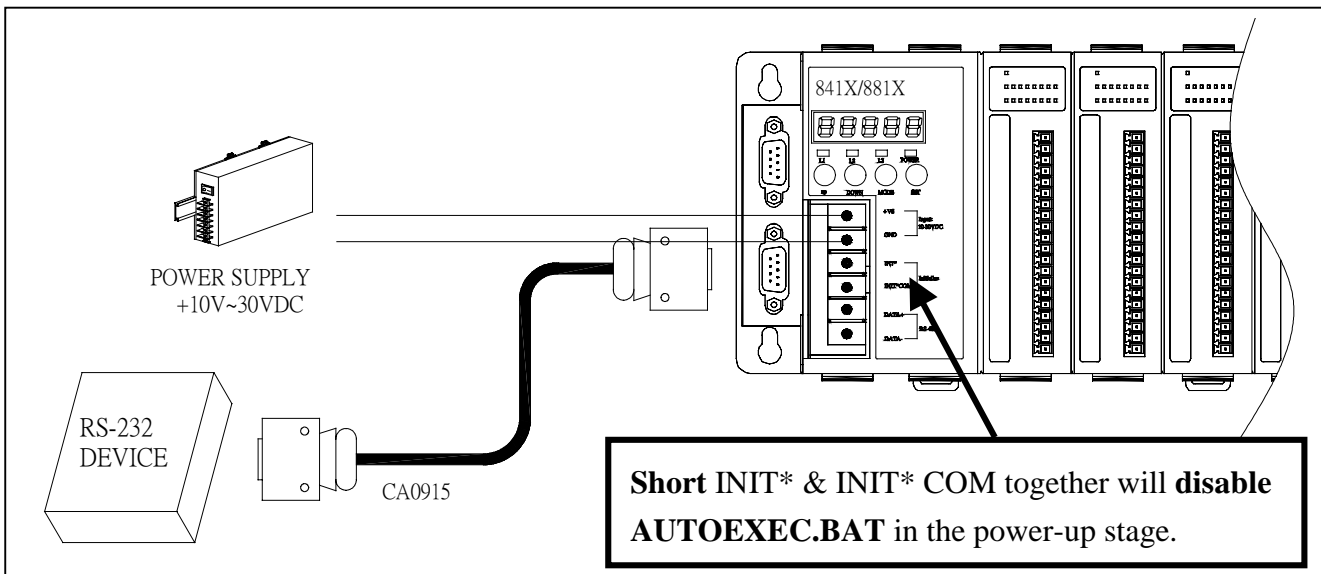


- 8431 provides four I/O Expansion Slots for 87K & 8k I/O Modules (from Slot 0 to 3).
 - 8831 provides eight I/O Expansion Slots for 87K & 8k I/O Modules (from Slot 0 to 7).
 - Net-ID DIP-SWITCH is used to set the NET-ID of 843X/883X (refer to Appendix A)
 - DC-power(+Vs, GND): DC +10V to +30V, unregulated
 - **Note:** I/O modules can not be inserted/removed from 843X/883X when DC-power is applied
 - COM1 is used to download program from PC. It also can link to RS232 device after download
 - COM2 is used to link to Host-PC or the other Ethernet 10M device
 - COM3 can be link to 87K4/5/8/9 or the other RS-232/RS-485 device
 - COM4 can be link to modem device or the other RS-232 device
- Short INIT* & INIT*-COM together will force 843X/883X to go to its initial state(Appendix B)

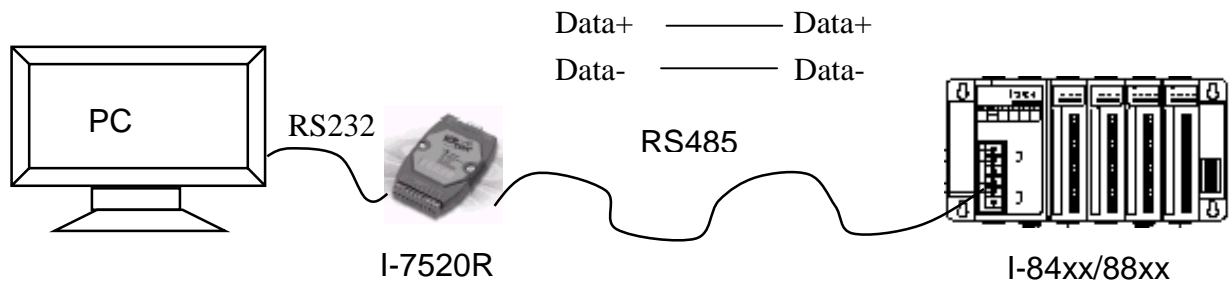
4.1.3 Host PC connect to COM1 of 84XX/88XX



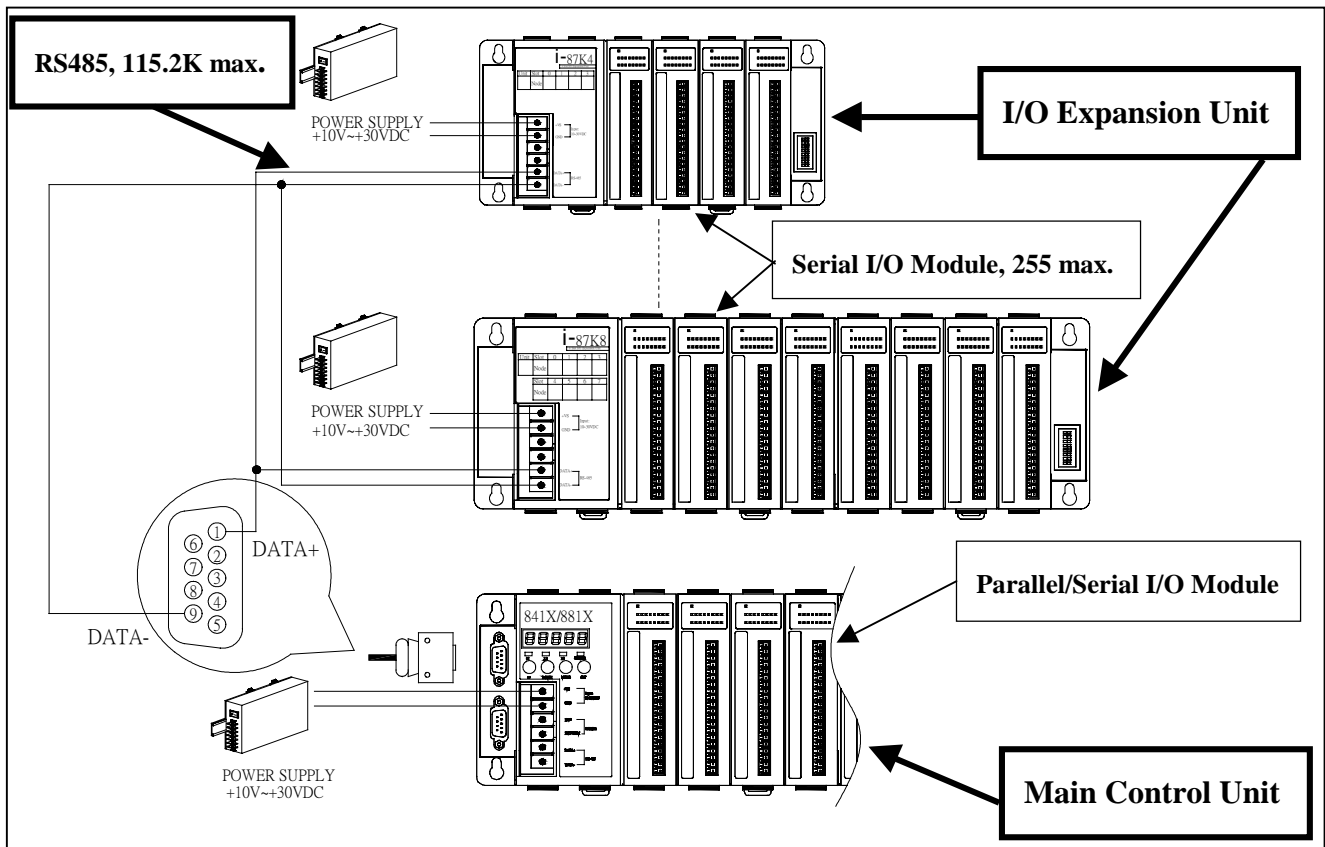
4.1.4 COM1 of 84XX/88XX connect to RS232 device



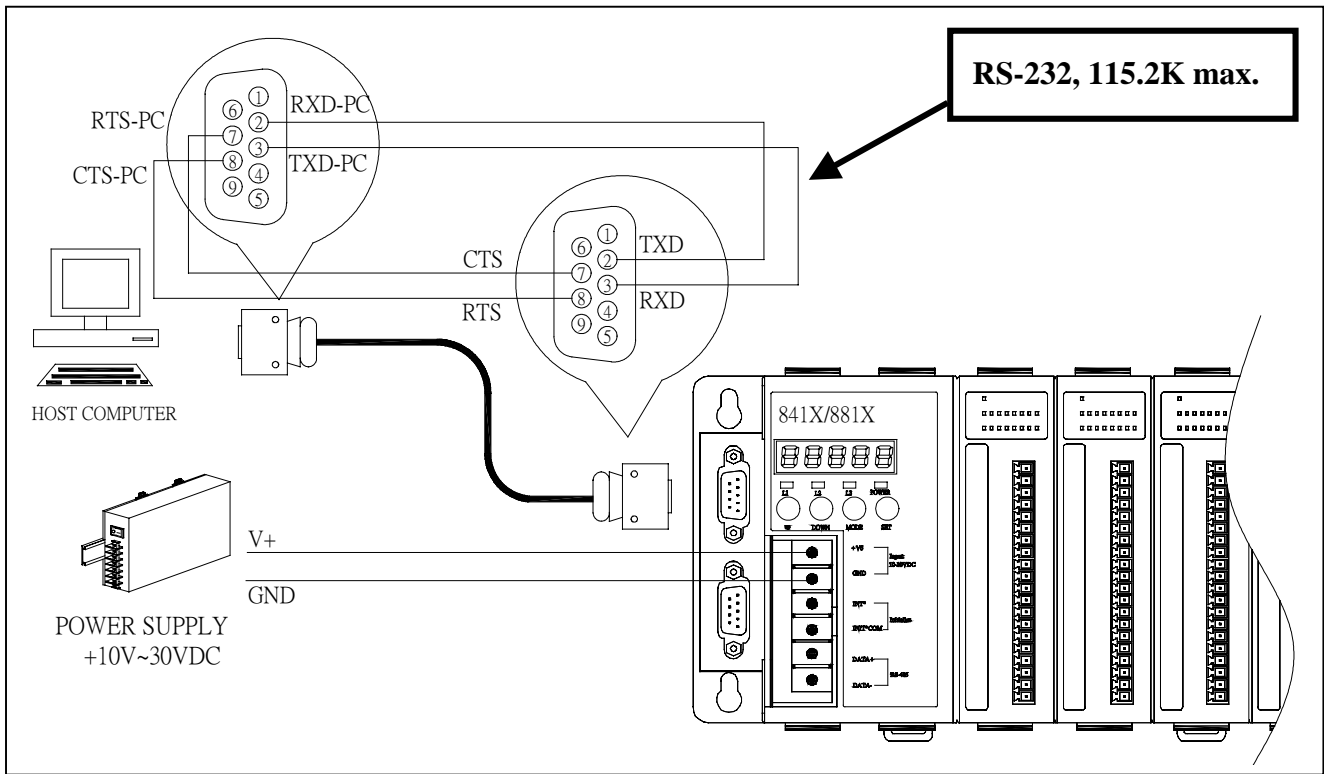
4.1.5 Host PC connect to COM2 of 841X/881X



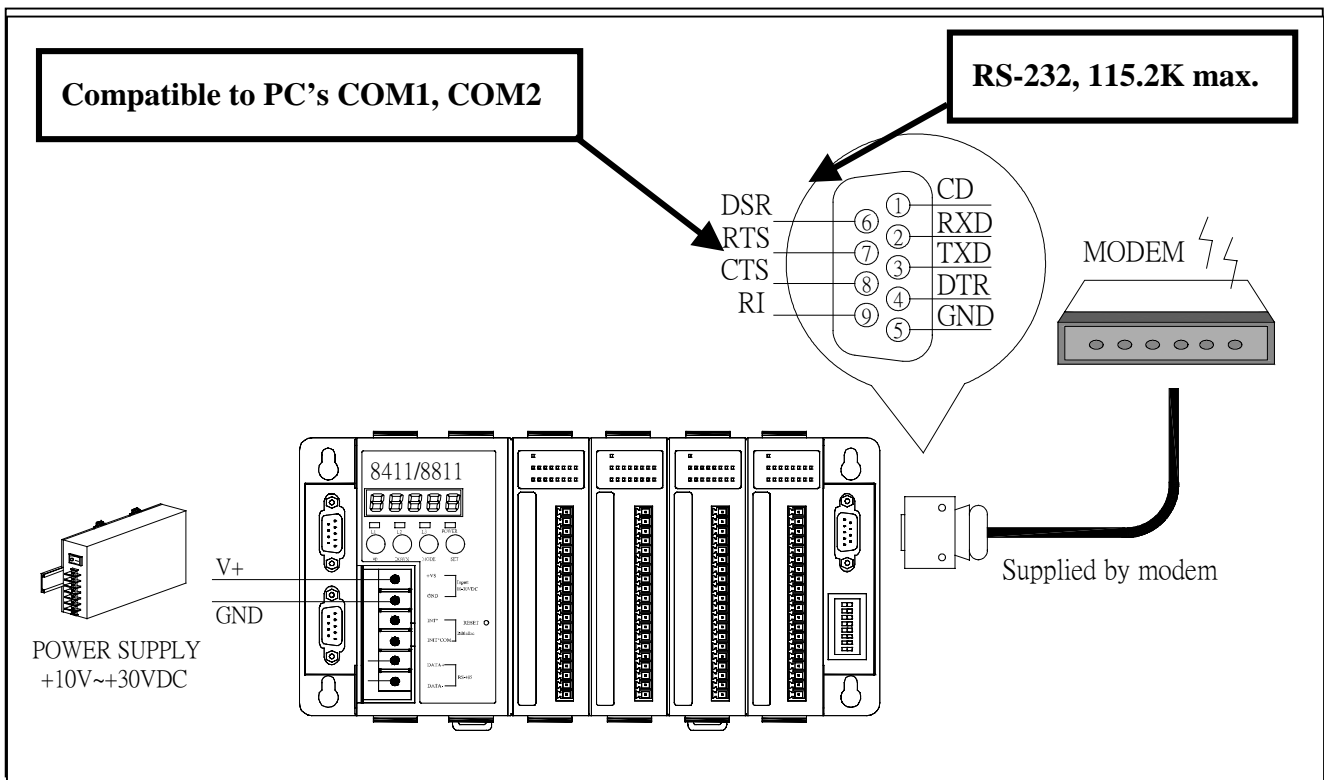
4.1.6 COM3 of 84XX/88XX connect to I-87K4/5/8/9 or I-7000



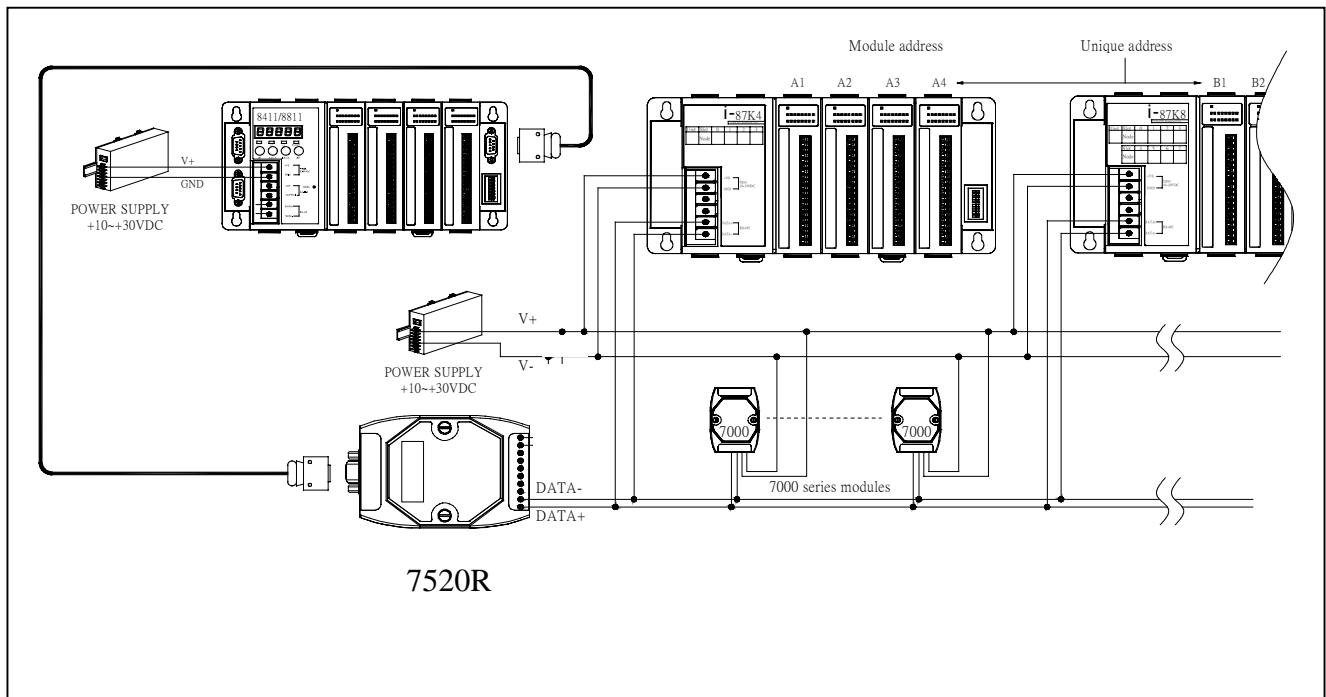
4.1.7 COM3 of 84XX/88XX connect to RS232 device



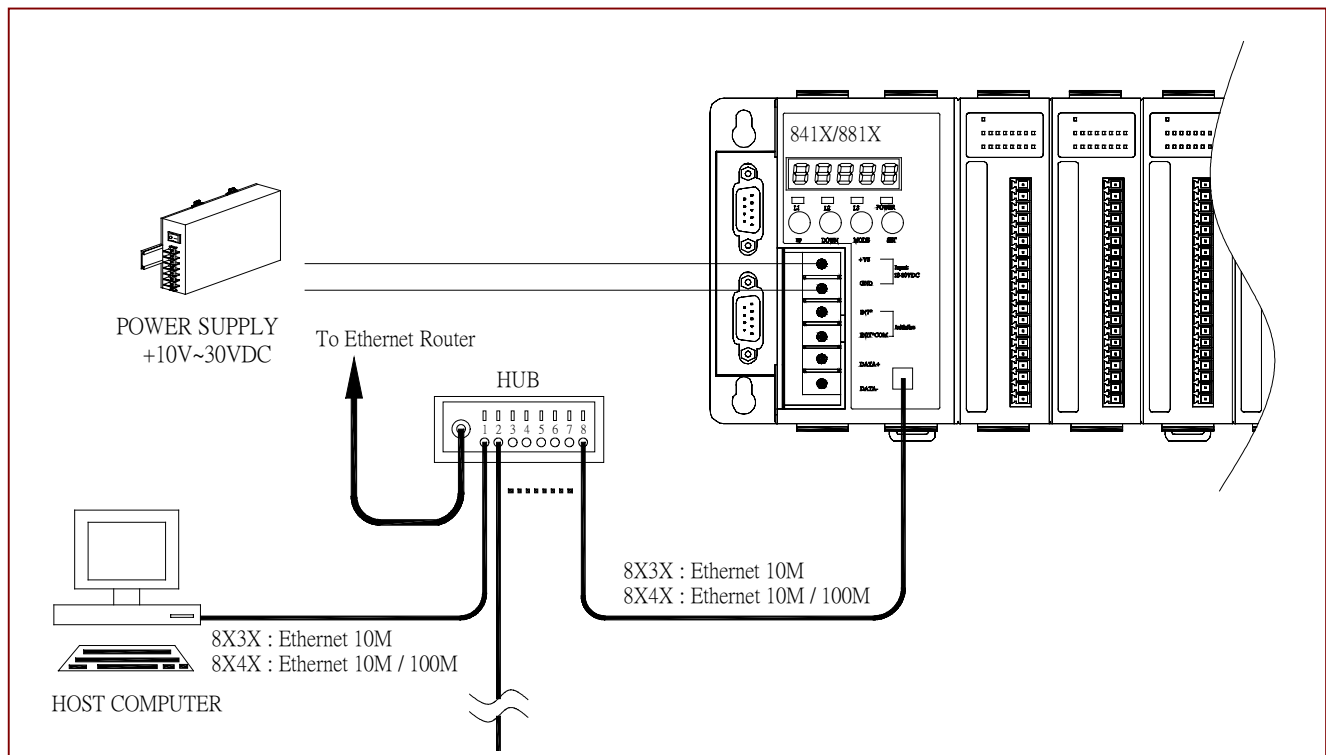
4.1.8 COM4 of 84XX/88XX connect to modem



4.1.9 COM4 of 84XX/88XX connect to I-87K4/5/8/9 or I-7000



4.1.10 Host PC connect to Ethernet port of 843X/883X



4.2 Software Installation & Manuals

4.2.1 Manuals

Double click on `CD:\NAPDOS\8000\index.htm` to get a starting page as following:

| Name | Description |
|------------------------|--------------------------------------------------------------------------------------------------------------------|
| Common | 7188X User's Manual MiniOS7 for I-8000 Series User's Manual Library Function for I-8000 Series User's Manual |
| | Host Control with RS-485 Bus |

Click on your familiar language

Click on "MiniOS7" to see the command list of MiniOS7

Click on the "8000 Library" to see the useful c functions for I-8000 controllers.

More manual about I-8430/8431/8830/8831 resides at `CD:\napdos\8000\843x883x\document\`
8000Ehh.pdf : 8000E series hardware user's manual
8000Ess.pdf : 8000E series software user's manual
8431_Quick_Start.pdf : 8431/8831 quick start
TCIPLib.pdf : TCP/IP User's manual

4.2.2 Installing 7188XW.exe utility & user's program

Note: ICP DAS provides one easy-use utility – “MiniOS7 utility”. (Please refer to Appendix F)

1. **7188xw.exe** is for download program, & debug I-8000 main controllers, also for setting IP, Mask & Gateway of I-8x3x ethernet controllers.

Please copy CD:\napdos\minios7\utility\ “**7188xw.exe**” to one folder of your PC (Windows 98/NT/2000/XP), for example, to C:\8000\8411\

2. OS image is located at CD:\napdos\minios7\8000new\ with a extension name of “.img”, for ex. “8n030124.img”. Please copy to, for ex, C:\8000\8411\

New firmware can be found from ICP DAS's FTP site.

OS image: <ftp.icpdas.com/pub/cd/8000cd/napdos/minios7/8000new/>

Demo program “demo92.c” is located at

| | | |
|-------------------------------------------------|----|----------------------|
| CD:\napdos\8000\common\minios7\demo\bc\demo92\ | or | (Borland C compiler) |
| CD:\napdos\8000\common\minios7\demo\msc\demo92\ | or | (MSC compiler) |
| CD:\napdos\8000\common\minios7\demo\tc\demo92\ | | (Turbo C compiler) |

User may update to new firmware by yourself by below steps.

1. Go to C:\8000\8411\, then run “7188xw.exe” on your PC.
2. Link COM1 of your PC to COM1 of the I-84XX/88XX controller through a RS232 cable.
3. Power off the I-84XX/88XX controller, connect pin "INIT" to "INIT COM" and then power it up.
4. If the connection is Ok, some message will appear on the 7188xw screen.
8000>
5. Type "ver" to see the current OS version.
8000> **ver**
6. The OS image should upgrade first. Type "upload" to load the OS image
8000> **upload**
press ALT + E and type in the **image name** (for ex, 8n030124.img)
and then type "bios1"
8000> **bios1**
(**WAIT ABOUT 30 SEC. ***DO NOT REMOVE THE POWER IN THESE 30 SEC.*****)

If you have succeeffly compiles your c program, then you can install it into the controller as below steps.

7. Then we are going to update the user's program (assume “demo92.exe”)
Type "del" and reply "y" to delete the current driver or program.
8000> **del**
Total File number is 2, do you really want to delete(y/n)? ← please give “y”

8. Type "load", then press ALT + E and then type "autoexec.bat" .

8000> **load**

File will save to 8000:0000

StartAddr-->7000:FFFF

Press ALT_E to download file!

Input filename: **autoexec.bat**

| |
|--------------------------------------------------------------------------------------------------------------------------------|
| Please edit a "autoexec.bat" file in the same folder (\8000\8411 for this example) as Demo92.exe (only for this example) |
|--------------------------------------------------------------------------------------------------------------------------------|

9. Type "load" again, then press ALT + E and then type "demo92.exe".

It will take about 30 seconds to finish.

8000> **load**

File will save to 8003:0002

StartAddr-->8000:0031

Press ALT_E to download file!

Input filename: **demo92.exe**

10. Type "dir" to make sure "autoexec.bat" and "demo92.exe" are well burned.

8000> dir

11. Press ALT_X to exit "7188xw".

12. Remove the connection between "INIT" - "INIT COM", then reset the controller.

4.2.3 Change IP, Mask & Gateway of 8431/8831

Note: ICP DAS provides one easy-use utility – “PCDiag”. (Please refer to Appendix E)

1. Link from COM1 your PC to COM1 of the 8431 / 8831 controller by a RS232 cable.
2. Power off the 8431/8831 controller, connect pin "INIT" to "INIT COM", and then power it up.
3. Execute 7188xw.exe on your PC, then press “Enter” of the keypad several times. If the connection is Ok, messages will appear similar as below.
8000>
4. Type "ip" to see the current IP address.
8000> ip
IP=192.168.255.255
5. Type "ip xxx.xxx.xxx.xxx" to set to a new IP address.
8000> ip 192.168.1.200
Set IP=192.168.1.200
[ReadBack]IP=192.168.1.200
6. Type "mask" to see the current address mask
8000> mask
MASK=255.255.0.0
7. Type "mask xxx.xxx.xxx.xxx" to set to a new address mask.
8000> mask 255.255.255.0
Set MASK=255.255.255.0
[ReadBack]MASK=255.255.255.0
8. Type "gateway" to see the current gateway address.
8000> gateway
Gateway=192.168.0.1
9. Type "gateway xxx.xxx.xxx.xxx" to set to a new gateway address.
8000> setgateway 192.168.1.1
Set GATEWAY=192.168.1.1
[ReadBack]Gateway=192.168.1.1
10. Press ALT_X to exit "7188xw"
11. Remove the connection between "INIT" - "INIT COM", reset 8431 / 8831 controller.

4.3 Getting Start

4.3.1 Using 7188xw.exe

7188xw.exe is an utility running on PC for I-8000 & I-7188 series controllers.

7188xw.exe is the Win32 version of 7188x.exe. 7188x.exe can only use the standard COM PORT(RS-232) of PC, however Win32 systems(WIN95/98/ME/NT/2K) also have RS-232 port located in PCMCIA or USB interface. Therefore 7188xw.exe is for Win32 systems.

7188xw.exe basically is a terminal program. It send out the data that user key-in to COM port, and show the data received from COM port on the screen of PC.

The main function of the 7188xw.exe is to DOWNLAOD files to 8000 & 7188 series controllers.

| | |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Command line parameter | /c# : Set to use COM#. /b# : Set use baud rate #. (Default baud rate is 115200) /s# : Set the screen display rows. (default is 25, max is 50.) |
| F1 | Show the help message of 7188XW.exe |
| ALT_F1 | Show the Chinese(Big5) help message of 7188XW.exe. |
| ALT_F2 | Set the filenames for auto downlaod process.(Maximum files:10 files) |
| ALT_F9 | Auto download all of the files that set by ALT_F2 to FlashROM. |
| ALT_F10 | Auto download a file that set by F2 to SRAM. |
| CTRL_F1 | Show the Chinese(GB2312) help message of 7188XW.exe. |
| ALT_1 | Select use COM1 if it can be used. |
| ALT_2 | Select use COM2 if it can be used. |
| ALT_3 | Select use COM3 if it can be used. |
| ALT_4 | Select use COM4 if it can be used. |
| ALT_5 | Select use COM5 if it can be used. |
| ALT_6 | Select use COM6 if it can be used. |
| ALT_7 | Select use COM7 if it can be used. |
| ALT_8 | Select use COM8 if it can be used. |
| ALT_9 | Select use COM9 if it can be used. |
| ALT_A | Toggle between normal mode and ANSI Escape code support mode |
| ALT_C | Go into COMMAND MODE, can use following commands. b# : set new baudrate. c# : set new comport.#=1 to 256. n/e/o : set to None/Even/Odd Parity. 8/7/6/5: set to 8/7/6/5 data bits. 1/2: set to 1/2 stop bits. p#: set new work directory. q: quit command mode. |
| ALT_D | Send out "DATE "+ system date read from PC+ CR. (That is set the date of PC to 7188X/I-8000 series.) |
| ALT_T | Send out "TIME "+ system time read from PC+ CR. (That is set the date of PC to 7188X/I-8000 series.) |
| ALT_E | For download files to MiniOS7 system. (only after the message "Press ALT_E to download file!" is show on screen, then user can press ALT_E.) |
| ALT_H | Toggle between Hex/ASCII display mode. |

| | |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ALT_L | Switch to LINE mode. In LINE mode, wait user key-in one line message, then send it out. The major function for LINE mode is to test I-7000 modules. Press ALT_L again back to normal mode. |
| ALT_X | Exit 7188XW.EXE. |
| F2 | Set the filename for auto download process. |
| F5 | Auto send out the filename(setting by function F2) +[parameter set by function F6] +CR. |
| ALT_F5 | Auto send out the "runr "+[parameter set by function F6] +CR.(run the program saved in sram.) |
| F6 | Set the parameters for auto run. Maximum can set 10 parameters.(If less than 10 item, please use '*' to end.) |
| CTRL_F6 | Clear screen. |
| F8 | Auto download and run.(=F9 + F5) |
| F9 | Auto download file.(=command "LOAD"+CR, then press ALT_E, then key-in the filename.) |
| F10 | Auto download and run file. The same function as F8, but save file in SRAM.(use commands "LOADR" and "RUNR") |
| | |

Note :

Using the F2/ALT_F2 to set the filename will result a saving operation in the "7188xw.ini" file. It will load the setting saved in "7188xw.ini" next time when run 7188xw.exe.

4.3.2 Basic commands of MiniOS7

The MiniOS7 is an embedded O.S. designed for the following families:

- 7188 series
- 752X series
- 8000 series.
- Iview-100 series
- More new embedded application family

It is used to replace the ROMDOS used in the 7188 series. Several brands of DOS have been created by various companies. In all cases, DOS--whether PC-DOS, MS-DOS, or ROM-DOS--is a set of commands or code which tells the computer how to process information. DOS runs programs, manages files, controls information processing, directs input and output, and performs many other related functions. **The MiniOS7 will provide equivalent functions of ROMDOS and provide more special functions for 7188/752N/8000 family.**

Comparison table between MiniOS7 & ROM-DOS?

| | MiniOS7 | ROMDOS |
|-----------------------------------------------------|---------|-----------|
| Power up time | 0.1 sec | 4 ~ 5 sec |
| Support I/O expansion bus | Yes | No |
| Support AsicKey | Yes | No |
| Support hardware unique serial number | Yes | No |
| Support MMI, Iview-100 series | Yes | No |
| Support Ethernet 10M interface, 7188E & 8X3X series | Yes | No |
| Direct download single program to Flash ROM | Yes | No |
| O.S. update(download) | Yes | No |
| Built-in hardware diagnostic functions | Yes | No |
| Direct control 7000 series modules | Yes | No |
| Customer ODM functions | Yes | No |
| Free charge | Yes | No |

Note: We reserve the right to change the specifications of MiniOS7 without notice

Command Set Table of MiniOS7:

Please Click on **CD:\NAPDOS\8000\index.htm** to see the detailed command demo of MiniOS7.

| Name | Description |
|------------------------|--------------------------------------------------------------------------------------------------------------------|
| Common | 7188X User's Manual MiniOS7 for I-8000 Series User's Manual Library Function for I-8000 Series User's Manual |
| | Host Control with RS-485 Bus |

Document files for I-8000 series - Microsoft Internet Explorer

地址: E:\Napdos\8000\Common\MiniOS7\doc\index.htm

I-8000 series document.

ICPDAS

- MiniOS7
- 8000 Start
- 8000 Library
- 8000 FAQ
- 8000 Demo
- Download New Program

English 繁體中文

Click on your familiar language

Click on "MiniOS7" to see the command list of MiniOS7

← Please select the document from left side.

I-8000 series support M10, M11... for USER.

The newest I-8000 series document & news can be found on the following web-sites:

1. <http://www.icpdas.com/> (In Taiwan, Update first.)
2. <http://www.icpdas.com.tw/> (In Taiwan.)
3. [Japan](#) (In Japan)
4. [Japan](#) (In USA, Support by Japan Company.)

Note:

1. Command line prompt is:

7188x> : I-7188XC/7521/7522/7523

7188xA> : I-7188XA ◦

7188xB> : I-7188XB ◦

i7188> : I-7188 ◦

8000> : I-8000 ◦

2. command is case-insensitive ◦

3. Some commands are supported by some special modules only, please refer to the note of each command.

| Command | Description |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| USE NVRAM | Go into the sub-function for read/write NVRAM. (The function works only with RTC hardware.) |
| USE EEPROM | Go into the sub-function for read/write EEPROM |
| USE FLASH | Go into the sub-function for read/write/erase FLASH memory.(Also can read SRAM.) |
| USE COM2 /option USE COM0 /option (For I-8000 use "use com0" to test 87K board.) | Go into the sub-function for COM2(RS-485).(Like the function of "echo485.exe" on I-7188.) option can be as follows: axx : Set the start address of auto scan. bxxxx : Set baudrate. cxxxx : Set direct send command out to COM2. dx : Set data bits, 7 or 8. exx : set the end address of auto scan. px : Set Parity.(0:NONE, 1:EVEN, 2:ODD) q: Auto quit after send command. txx : Set Timeout period(ms). |
| DATE [new_date] | Set/Read system date.(work with RTC.) |
| TIME [new_time] | Set/Read system time.(work with RTC.) |
| MCB | Display the amount and status of SARM |
| UPLOAD | The 1st step for update MiniOS7.(save the image file to SRAM.) |
| BIOS1 | The 2nd step for update MiniOS7.(write the image file to FLASH memory.)(After update will reset the system.) |
| LOAD | DOWNLOAD file to FLASH memory. |
| DIR [/crc] | Display information about files saved in Flash memory. use the option /crc will also do CRC-16 check. |
| RUN [fileno] | Execute the file that file index is "fileno". (only .BAT .COM .EXE files can be executed.) File index is begin from 0, use command DIR will show the file index. If only type RUN (miss fileno), the last file will be run ("last file" is the last file when type DIR). |
| Execution file name | run that file. (if not key-in the full filename, MiniOS7 will search ".BAT" first, then ".COM" and final ".EXE". If the filename is the same as command of MiniOS7, please use full filename.(For example: "led.exe") |
| DELETE [/y] DEL [/y) | DELETE all files saved in Flash memory.(will ask user to press 'y' then DELETE the files.) (06/07/2000 add) option : /y. Delete files directly. |
| RESET | reset the system. (08/15/2000 add) The command "RESET" is use software RESET, the hardware signal /RESET will not be send out. If want the hardware signal /RESET to be send out, please use DIAG WDT or use turn POWER off to reset system |
| DIAG [option] | options are as follows: ram : check SRAM eeprom : check EEPROM nvram : Check NVRAM led : check LED |

| | |
|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <p>led5 : check 5DigitLed flash : check FLASH MEMORY wdt : check WatchDog Timer clock : (check)display system TIMER ticks. All : Check all items of above. ON : Set to show the debug message. OFF : Set to hide the debug message.</p> <p>If no option will show the INIT* status, SRAM/FLASH size, system reset status,and so on.</p> |
| BAUD baudrate | <p>Set new BAUDRATE(300-115200). (06/07/2000 add):@BAUD baudrate. The same function, but do not send message to COM1.(For use on autoexec.bat)</p> |
| TYPE filename [/b] | <p>Display the contents of the specified file. use /b will show hex code.</p> |
| REP [/#] command | <p>Repeat the COMMAND [#] times. If do not specify the repeat times, it will repeat infinitely.</p> |
| RESERVE [n] | <p>(05/25/2000 add) If use the parameter n, set to reserve n sectors of Flash Memory for user to store data. Else will show the reserved sector number of Flash Memory.</p> |
| LOADR | <p>(06/30/2000 add) The same function as "LOAD", but the file is stored to SRAM. Only one file can be stored in SRAM, use LOADR again will overwrite the last file. Use the command "runr" to run the program stored in SRAM.</p> |
| RUNR [param1 [param2...]] | <p>(06/30/2000 add) Run the program stored in SRAM.(only one file, need not key-in the filename.)</p> |
| I/INP/IW/INPW port | <p>(07/25/2000 add) Read data from Input PORT. port is the port to read, in HEX. I/INP read one BYTE(8-BITS mode). IW/INPW read one WORD(16-BITS mode).</p> |
| O/OUTP port value OW/OUTPW port value valueW port value | <p>(07/25/2000 add) Output data to the Output PORT. port is the output port, in HEX. value is the output data, in HEX. O/OUTP output one BYTE(8-BITS mode). OW/OUTPW output one WORD(16-BITS mode).</p> |
| DI | <p>(07/25/2000 add)(FOR 7188XC/7521) Read the status of DI1/2/3 pins. 0:LOW,1:HIGH.</p> |
| DO1 0/1 | <p>(07/25/2000 add)(FOR 7188XC/7521) Set the output value of DO1 pin.[Note 1] 0 : output LOW,1 : output HIGH.</p> |
| DO2 0/1 | <p>(07/25/2000 add)(FOR 7188XC/7521) Set the output value of DO2 pin.[Note 1] 0 : output LOW,1 : output HIGH.</p> |
| DO3 0/1 | <p>(07/25/2000 add)(FOR 7188XC/7521) Set the output value of DO3 pin.[Note 1] 0 : output LOW,1 : output HIGH.</p> |

| | |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OUTWAVE port freq hi lo | (07/25/2000 add)(FOR 7188XC/7521/7188e/8000) Set TO_0/TO_1 to output DUTY CYCLE waveform.[Note 2] port : 0, set output from TO_0 pin. 1, set output from TO_1 pin. freq : frequency. When CPU clock=40M Hz, Maximun frequency is 5M Hz,Minimun frequency is 77Hz. When CPU clock=20M Hz, Maximun frequency is 2.5M Hz, Minimun frequency is 77Hz. hi/lo : Set the high/low ratio. (Use HI:LO=30:70 is the same as HI:LO=3:7 or HI:LO=6:14) |
| STOPWAVE port | (07/25/2000 add)(FOR 7188XC/7521/7188e/8000) Stop to output DUTY CYCLE waveform from TO_0/TO_1. port : 0, stop output from TO_0 pin. 1, stop output from TO_1 pin. |
| SETDO pin 0/1 | (07/25/2000 add)(FOR 7188XC/7521/7188e/8000) Set output status for I/O BUS.(only when the PIO pin is set on output mode will work. The PIO pins that user can use please refer to "SETPIO".) 0 : output LOW, 1: output HIGH. |
| SETPIO pin [mode] | (07/25/2000 add)(FOR 7188XC/7521/7188e/8000)(Please use it carefully.) Set the mode of PIO pin. pin : AM188ES PIO pin number. (Please refer to User'S Manual of AM188ES.) User can use are as follows:(pin can be used will be different between modules.) TO_0(pin=10). TO_1(pin=1). TI_0(pin=11). TI_1(pin=0). DIO4(pin=4). DIO9(pin=9). DIO14(pin=14). mode = 0 : NORMAL, 1 : input with pull up/down, 2 : output, 3 : input without pull up/down. If do not key-in the parameter "mode", will show the current mode of the PIO pin.[12/21/2000] |

More & more functions will be added to MiniOS7.

Note 1 : The output pins(DO1/2/3) of 7188XC series are Open Collector, user maybe add pull up resister to work well.

Note 2 : The DUTY CYCLE wave form output is not for any ratio of HI:LO, and not for any frequency.

The output frequency equal to CPU CLOCK/4/(high+low), and high+low <= 65536, and minimum value of high/low is 1.

4.3.3 Update MiniOS7 to the controller

Please refer to Section 4.2.2.

The image file of MiniOS7 in the shipping is given in the companion CD as below.

CD:\NAPDOS\MiniOS7\

Note: the OS image is named as followed by 6 numbers, they are Year/Month/Date. For ex., for I-8000 OS image, "8K030605.IMG" is advanced than "8K030428.IMG"

You can refer to our web-site,

ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/minios7/minios7_2.0/

to download all new image file of MiniOS7. If you have any further questions, please email to: service@icpdas.com for technical service.

4.3.4 Download user's program to the controller & run it

Please refer to Section 4.2.2.

After user's program has been successfully download, type its file name to run & test. For ex., if user's program is "userpro.exe", type

```
8000> userpro
```

Please edit an "autoexec.bat" file to let controller autoexec the command listed in it. Then every time the controller is powered up (remove connection between INIT & INIT*COM in advance), it will auto run the specified command. For ex.

Userpro

← run "userpro.exe" when powered up

4.3.5 C Libraries For I-8000 Controllers

The library of I-8000 series support two memory models :

- (1) 8000S.LIB is for SMALL MODEL.(TC/BC++/MSC/MSVC++)
- (2) 8000L.LIB is for LARGE MODEL.(TC/BC++/MSC/MSVC++)

Since all the function declaration are put on the file – “8000.h” , please add one line in the beginning of program :

```
#include "8000.h"
```

(8000.h and 8000S.lib, 8000L.lib all put in the directory of
 CD:\napdos\minios7\8000\lib\ or
 CD:\napdos\8000\common\minios7\demo\lib\)

Please double click on **CD:\NAPDOS\8000\index.htm** to get a starting page as following:

| Name | Description |
|------------------------|--------------------------------------------------------------------------------------------------------------------|
| Common | 7188X User's Manual MiniOS7 for I-8000 Series User's Manual Library Function for I-8000 Series User's Manual |
| | Host Control with RS-485 Bus |

Navigation menu items:

- ICPDAS
- MiniOS7
- 8000 Start
- 8000 Library
- 8000 FAQ
- 8000 Demo
- Download New Program

Callout instructions:

- Click on your familiar language (pointing to 'English')
- Click on “MiniOS7” to see the command list of MiniOS7
- Click on the “8000 Library” to see the useful c functions for I-8000 controllers.

(3) TCPIPL.LIB is only for LARGE MODEL.(TC/BC++/MSC/MSVC++), its declaration is TCPIP.H

For the application need Ethernet communication, please add two more line:

```
#include "8000.h"
#include "tcpip.h"
```

(TCPIPL.lib and TCPIP.h are put in the directory of
 CD:\napdos\minios7\tcpip_lib\ or
 CD:\napdos\8000\minios7\tcpip_lib\)

Note:

Please refer to PDF files (manuals) at below for detailed description of Ethernet communication.

CD:\napdos\8000\843x883x\document

There are hundreds of functions are supported in 8000S.LIB/8000L.LIB as following.

Note: There may be some new functions released. Please read the “8000.H” for complete & detailed declaration of all available functions in 8000S.Lib / 8000L.Lib .

| EEPROM | | | |
|--------------------------------------------------------------------|-----------------|---------------|-------------|
| 1st group functions: | | | |
| WriteEEP | ReadEEP | EnableEEP | ProtectEEP |
| 2nd group functions (Don't use with 1st group functions): | | | |
| EE_WriteEnable | EE_WriteProtect | EE_RandomRead | EE_ReadNext |
| EE_MultiRead | EE_RandomWrite | EE_MultiWrite | |

| NVRAM & RTC | | | |
|------------------------|------------|------------|------------|
| ReadNVRAM | WriteNVRAM | GetTime | SetTime |
| GetDate | SetDate | GetWeekDay | SetWeekDay |

| LED & 5DigitLed | | |
|----------------------------|-----------------------|----------------------|
| LedOn | LedOff | LedToggle |
| Init5DigitLed | Show5DigitLed | Show5DigitLedWithDot |
| Show5DigitLedSeg | Disable5DigitLed | Enable5DigitLed |
| Set5DigitLedTestMode | Set5DigitLedIntensity | |

| COM port | | | |
|---------------------------------------|----------------------------------------|-------------------|-------------------|
| InstallCom InstallCom3 | InstallCom0 InstallCom4 | InstallCom1 | InstallCom2 |
| RestoreCom RestoreCom3 | RestoreCom0 RestoreCom4 | RestoreCom1 | RestoreCom2 |
| IsCom IsCom3 | IsCom0 IsCom4 | IsCom1 | IsCom2 |
| ReadCom ReadCom3 | ReadCom0 ReadCom4 | ReadCom1 | ReadCom2 |
| ToCom ToCom3 | ToCom0 ToCom4 | ToCom1 | ToCom2 |
| ToComStr ToCom3Str | ToCom0Str ToCom4Str | ToCom1Str | ToCom2Str |
| ToComBufn ToCom3Bufn | ToCom0Bufn ToCom4Bufn | ToCom1Bufn | ToCom2Bufn |
| ClearCom ClearCom3 | ClearCom0 ClearCom4 | ClearCom1 | ClearCom2 |
| WaitTransmitOver WaitTransmitOver3 | WaitTransmitOver0 WaitTransmitOver4 | WaitTransmitOver1 | WaitTransmitOver2 |
| DataSizeInCom DataSizeInCom3 | DataSizeInCom0 DataSizeInCom4 | DataSizeInCom1 | DataSizeInCom2 |
| SetRtsActive1 | SetRtsActive3 | SetRtsActive4 | |
| SetRtsInactive1 | SetRtsInactive3 | SetRtsInactive4 | |
| printCom printCom3 | printCom0 printCom4 | printCom1 | printCom2 |
| GetCtsStatus1 | GetCtsStatus3 | GetCtsStatus4 | |
| IsTxBufEmpty IsTxBufEmpty3 | IsTxBufEmpty0 IsTxBufEmpty4 | IsTxBufEmpty1 | IsTxBufEmpty2 |
| SetBaudrate SetBaudrate3 | SetBaudrate0 SetBaudrate4 | SetBaudrate1 | SetBaudrate2 |
| SendBreak SendBreak3 | SendBreak0 SendBreak4 | SendBreak1 | SendBreak2 |
| IsDetectBreak IsDetectBreak3 | IsDetectBreak0 IsDetectBreak4 | IsDetectBreak1 | IsDetectBreak2, |
| ClearTxBuffer ClearTxBuffer3 | ClearTxBuffer0 ClearTxBuffer4 | ClearTxBuffer1 | ClearTxBuffer2, |

| Flash Memory | | | |
|---------------------|------------|------------|-----------|
| FlashReadId | FlashErase | FlashWrite | FlashRead |

| Timer & Watchdog Timer | | | |
|-----------------------------------|--------------------|-----------------------------|----------------|
| TimerOpen | TimerClose | TimerResetValue | TimerReadValue |
| DelayMs | StopWatchReset | StopWatchStart | StopWatchStop |
| StopWatchPause | StopWatchContinue | StopWatchReadValue | |
| CountDownTimerStart | | CountDownTimerReadValue | |
| InstallUserTimer | InstallUserTimer1C | | |
| EnableWDT | DisableWDT | RefreshWDT | |
| T_StopWatchStart | T_StopWatchGetTime | T_StopWatchPause | |
| T_StopWatchContinue | | | |
| T_CountDownTimerIsTimeUp | | T_CountDownTimerGetTimeLeft | |

| File | |
|---------------------|-----------------------|
| GetFileNo | GetFileName |
| GetFilePositionByNo | GetFilePositionByName |
| GetFileInfoByNo | GetFileInfoByName |

| Connect to I-7000 | |
|--------------------------|-------------------------|
| SendCmdTo7000 | ReceiveResponseFrom7000 |

| CPU's Programmable I/O Pin | | | |
|-----------------------------------|------------|--------------|------------|
| SetTi0Dir | SetTo0Dir | SetTi1Dir | SetTo1Dir |
| SetTi0High | SetTo0High | SetTi1High | SetTo1High |
| SetTi0Low | SetTo0Low | SetTi1Low | SetTo1Low |
| GetTi0 | GetTo0 | GetTi1 | GetTo1 |
| ClockHigh | ClockLow | ClockHighLow | |

| Stdio & Misc functions | | | |
|-----------------------------------|-------------|--------------------|-----------------|
| Kbhit | Getch | Ungetch | Putch |
| Puts | Print | Is7188x | Is8000 |
| GetLibVersion | ReadInitPin | LineInput | ResetScanBuffer |
| SetScanBuffer | Scanf | SystemSerialNumber | |

| Special for I-8000 | | | |
|---------------------------|------------|--------------|-------------|
| ChangeToSlot | SetA9 | SetA12 | SetB1A5 |
| GetNetId | ModuleType | NameOfModule | ShowLED8 |
| GetNumberOfSlot | | | |
| DO_16 | DO_8 | DIO_DO_8 | DI_16 |
| DI_8 | DI_32 | DO_32 | DIO_DO_16 |
| SetLedL1 | SetLedL2 | SetLedL3 | |
| ClrSlotInt | GetSlotInt | IsSytemKey | GetSytemKey |
| ClearSystemKey | | | |

| IP / MASK / GATEWAY / MAC | |
|----------------------------------|------------|
| GetIp | GetEid |
| GetMask | GetGateway |
| SetIp | SetEid |
| SetMask | SetGateway |

Note: There may be some new functions released. Please read the “8000.H” for complete & detailed declaration of all available functions in 8000S.Lib / 8000L.Lib .

4.3.6 Compiler and Linker for C programming

User must use C Language to write application program. You can use TC, TC++, BC++, MSC or MSVC++(version 1.52 or before 1.52). Please take care of the following items:

Generate a standard DOS executable program.

select CPU=80188/80186.

select EMULATION if the floating point computation is required.(can not select 8087)

Remove DEBUG INFORMATION to reduce program size.(MiniOS7 does not support it)

MiniOS7 provide some special libraries to replace standard I/O-libraries as following:

standard I/O-library → MiniOS7 provided IO-library

getch is replaced by → Getch

kbhit is replaced by → Kbhit

putchar is replaced by → Putch

ungetch is replaced by → Ungetch

puts is replaced by → Puts

printf is replaced by → Print

scanf is replaced by → Scanf

NOTE: We use '\n' in printf & puts for line changed display. It must be changed to '\n\r' or '\r\n' in the MiniOS7 environment.

The source code of HELLO1.C is given as follows:

```
#include"..lib\8000.h"
void main(void)
{
Print("***Hello 8000***\n\r");
}

/* NOTE: The 8000.H is a included file. */
```

User can compile the HELLO1.C into HELLO1.OBJ first. Then link HELLO1.OBJ & 8000L.LIB (or 8000s.LIB) together to generate the executable file - HELLO1.EXE. User can download HELLO1.EXE into main control unit of 8000 for testing.

The HELLO1.EXE is so simple, so it can be executed under both 8000 & PC

4.3.6.1 Using TC

Please refer to CD:\napdos\8000\common\minios7\demo\tc\hello1\
The working steps to use TC2.0 are given as following:

Method 1: command line

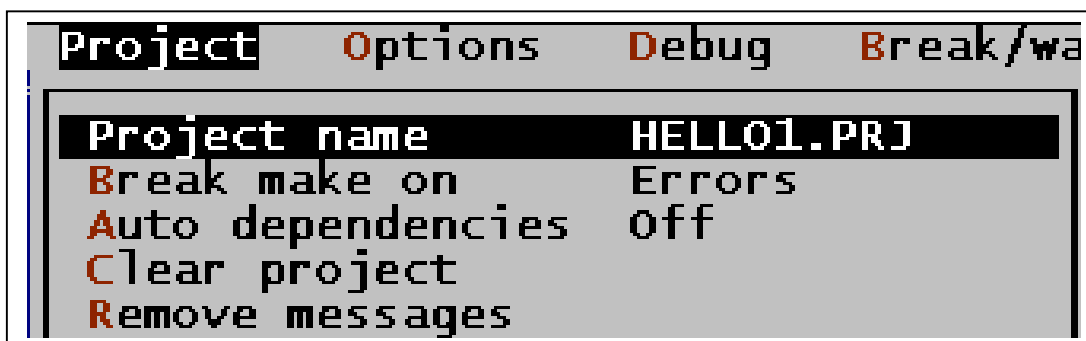
```
tcc -Ic:\tc\include -Lc:\tc\lib hello1.c ..\lib\8000L.lib
```

Method 2: Use TC Integrated Environment

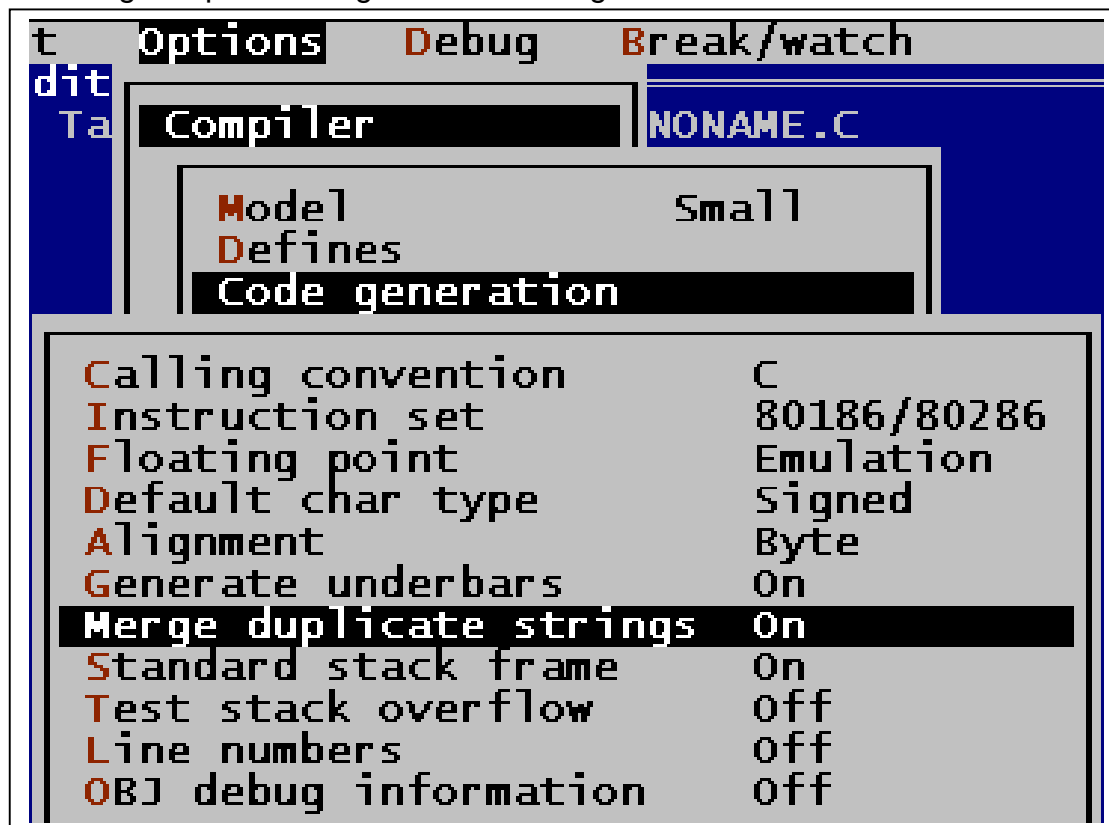
edit the project file HELLO1.PRJ as following:

```
hello1.c  
\lib\8000L.lib
```

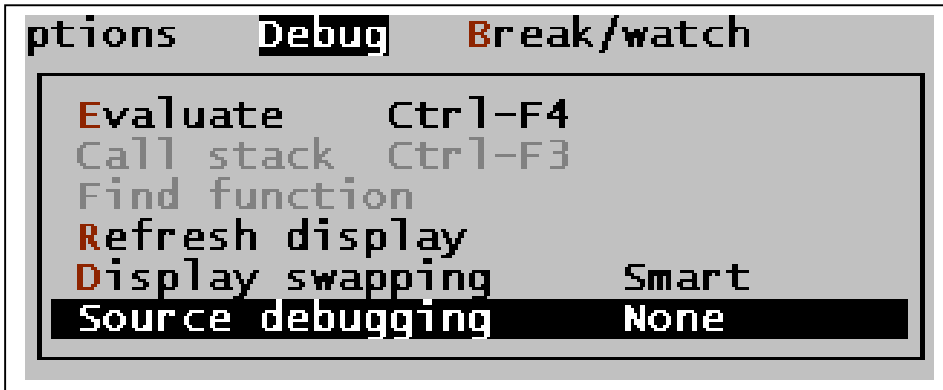
Select Project, input "HELLO1.PRJ" as follows:



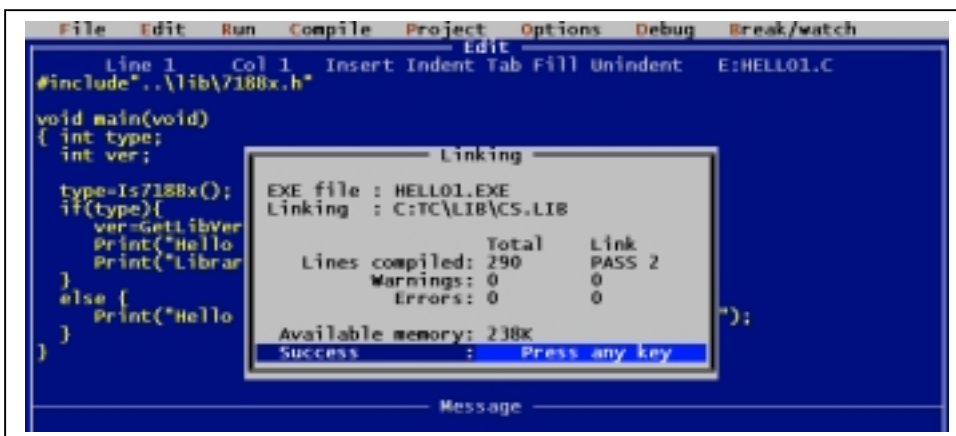
The setting of Options are given as following:



disable source debugging in the DEBUG field



Press F9 to generate 'HELLO1.EXE' as follows:

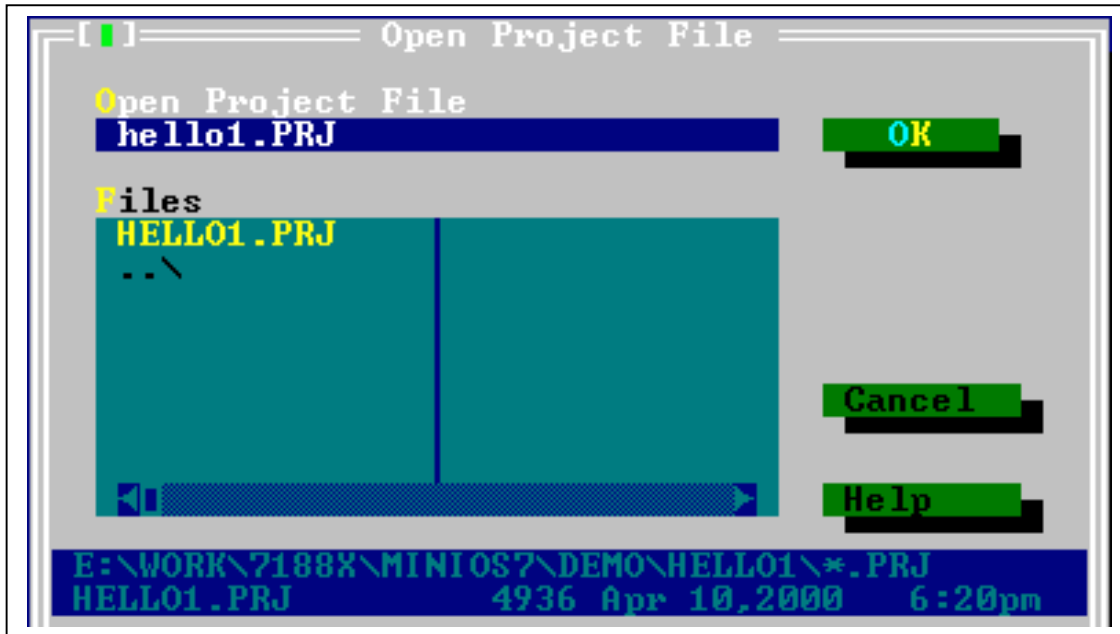


4.3.6.2 Using BC++

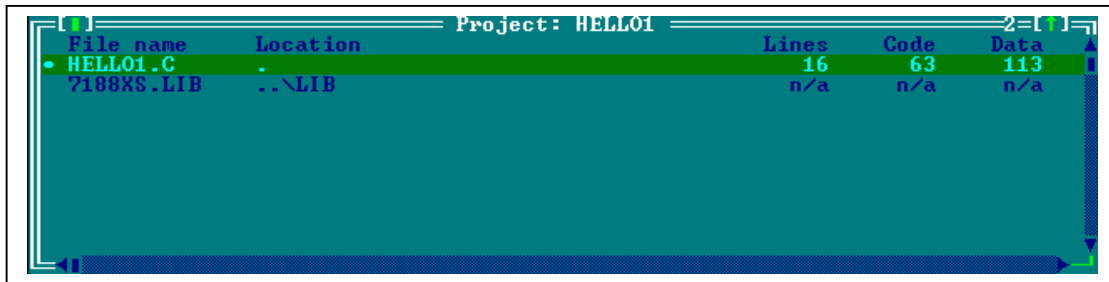
Please refer to CD:\napdos\8000\common\minios7\demo\bc\hello1\
The working steps to use BC++/TC++ are given as following:

Execute BC.EXE in the same directory with HELLO1.C.

Edit a new project file, HELLO1.PRJ, as following:

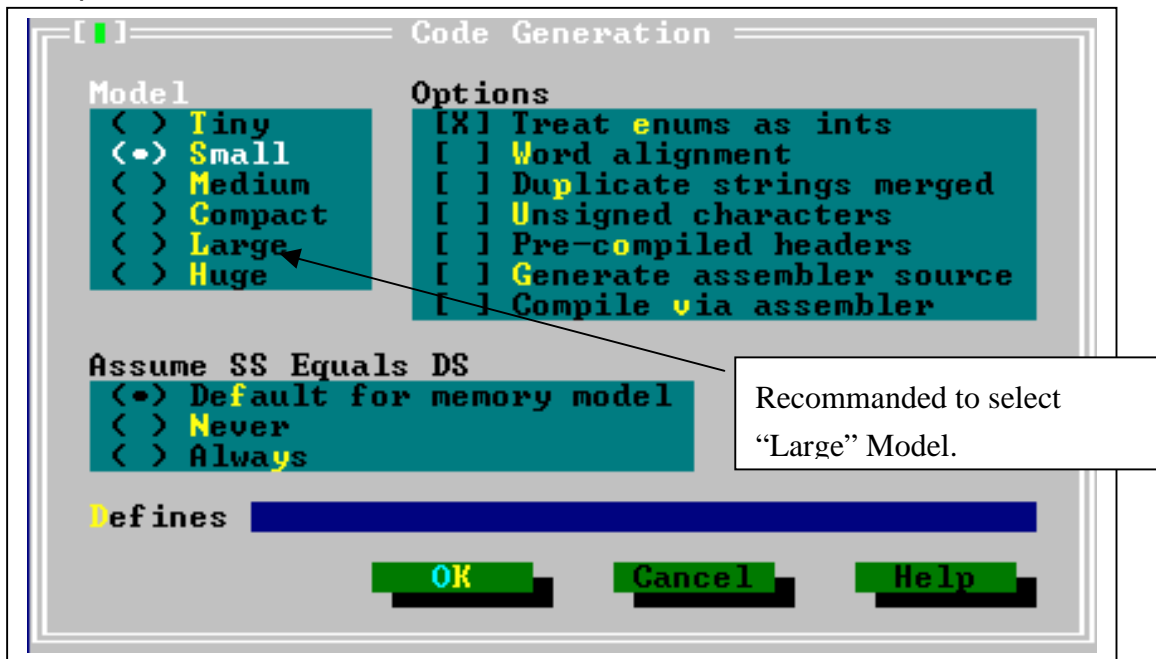


Add Hello1.C & ..\lib\8000L.lib into project as follows:

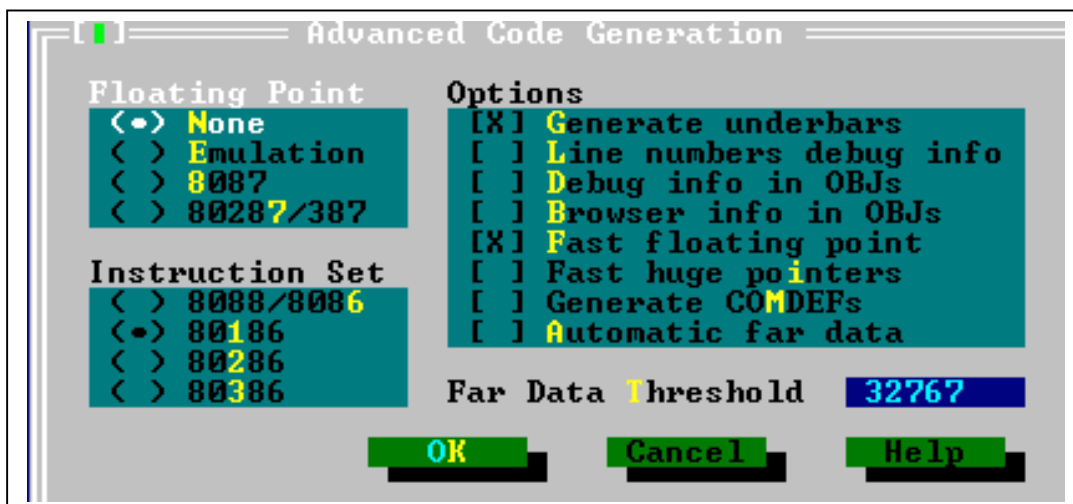


Set some options as following:

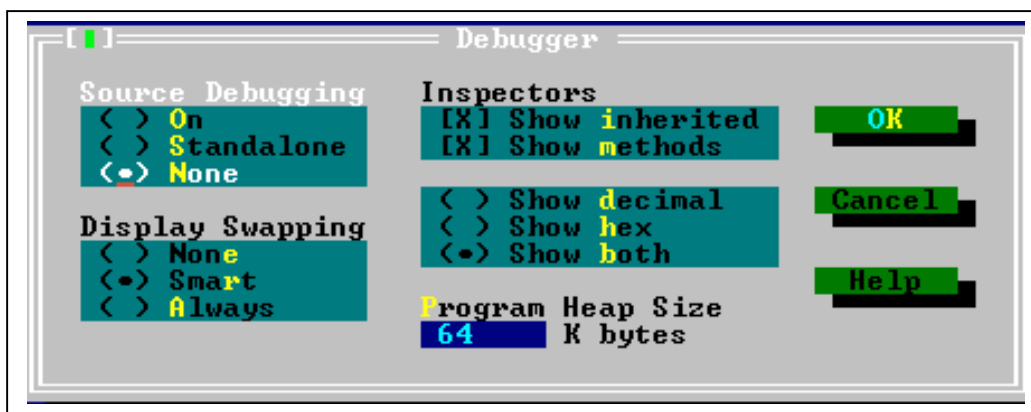
1. Compiler -> Code Generation



2. Compiler -> Advance Code Generation



3. Debugger (Turn source debugging off)



Press F9 now will start the compilation & link steps as follows:

```
==== Linking ====
EXE file : HELLO1.EXE
Linking  : C:BC\LIB\CS.LIB

      Total      Link
Lines compiled: 289    PASS 2
Warnings: 0          0
Errors: 0            0

Available memory: 1979K
Success          : Press any key
```

4.3.6.3 Using MSC or MSVC++

Please refer to CD:\napdos\8000\common\minios7\demo\msc\hello1\

The working steps to use MSC or MSVC++(Version 1.52 or befor 1.52) are given as following:

Execute the following two commands sequentially will generate HELLO1.EXE

```
CL /c /Gs /Odi /Fm /G2 /FPa HELLO1.c
Link /MA /NOE /NOI HELLO1 , , , ..\lib\8000L
```

4.4 Demo Program for C Programming

4.4.1 How to R/W COM ?

Please refer to 4.3.5 – “C Libraries For I-8000 Controllers” for searching description of c functions.

Please refer to CD:\napdos\8000\Common\MiniOS7\demo\bc\

\slv_com\ Slv_COM.c : PC sends commands to I-8000/I-7188, and get back responses is a very typical application.

In this kind application, one COM port of I-8000/I-7188 must acts as a command decoder.

This demo shows how to do this and how to use another COM port or LED to show information to help you debug your program.

Hardware: I-8000/I-7188

\COM0_DMA\COM0_DMA.c : Using DMA to access to 87K modules that plug in the I-8000 system.

When using normal mode to access 87K modules via COM0, data could be lost. To solve this problem, you can use either of following methods:

Method 1: check response data length. If length of response is not correct, discard the response.

Method 2: use DMA technique.

Hardware: I-8000 + 87017

\Mod8000\main.c & modbus_s.c : Demo program about Modbus protocol.

4.4.2 How to access to I/O ?

Please refer to 4.3.5 – “C Libraries For I-8000 Controllers” for searching description of c functions.

Demo programs about access to I/O boards reside at below location.

CD:\napdos\8000\841x881x\master\demo\

Demo1 : DIO demo program for I-8054.

Demo2 : DIO demo program for I-87054.

Demo3 : DIO demo program for I-8053 & 8057.

Demo4 : DIO demo program for I-87053 & 87057.

Demo5 : DIO demo program for I-8053 & 87057.

Demo6 : DIO demo program, I-8057 & 87053, MCU parallel to expansion unit (COM3)

Demo7 : DIO demo program, I-87057 & 87053, MCU serial to expansion unit (COM3)

Demo8 : DIO demo program, I-87054, expansion unit (COM3)

FindID1: How many card and slots in the system.

FindID2: Get the I-8000 system expansion unit Information.

8017h : Parallel analog input demo, I-8017h

8024 : Parallel analog output demo, I-8024

8072 : Demo program, Lib & Manual for I-8072

8073 : Demo program, Lib & HTML manual for I-8073

8077 : DIO demo, I-8077

87022 : Serial analog output, I-87022

8090 : Encoder demo, I-8090

8142 : Multi-port demo, I-8142 / I-8142i

S256 : Battery backup SRAM demo, S256 / S512

4.4.3 How to access to the Main Control Unit ?

Please refer to 4.3.5 – “C Libraries For I-8000 Controllers” for searching description of c functions.

Demo program about access to the Main Control Unit (**MCU**) resides at below location.

CD:\napdos\8000\common\minios7\demo\

bc\ : Borland C++ compiler

tc\ : Turbo C compiler

msc\ : MSC or MSVC++ compiler (1.52 or before)

Com47050 : The led of 7050D will glitter per second. Press ‘ q ’ to quit program.

Com47060 : The led of 7060D will glitter per second. Press ‘ q ’ to quit program.

Com47067 : The led of 7067D will glitter per second. Press ‘ q ’ to quit program.

DateTime : To read the date & time of RTC peer second and print it on monitor (user can set the date & time). Press ‘ q ’ to quit program.

Demo5 : To read and write data to NVSRAM.

Demo6 : To write, read and show the EEPROM data for checking.

Demo90 : It's a demonstration for using Timer function.

Demo91 : To use CountdownTimer channel 0 for LED ON/OFF. Press ‘ q ’ to quit program.

Demo92 : To use Stopwatch channel 0 for LED ON/OFF. Press ‘ q ’ to quit program.

Demo96 : To use User timer function for 5DigitLed. Press ‘ q ’ to quit program.

Demo97 : To use DelayMs function for LED ON/OFF. Press ‘ q ’ to quit program.

Demo98 : To use I-8000 timer function to send/receive data to/from 7000's modules.

Echo485 : To use echo485 to (1) monitor data on RS485, (2) send command to 7000's. Press ‘ /q ’ to quit program.

Echocom4 : To use com4 port creating a connection from pc and I-8000 to control the 7060. Press ‘ /q ’ to quit program.

Eeprom : To write a value to EEPROM and show it on monitor.

Eeprom-r : To reading the data you write to EEPROM.

Eeprom-w : Input a value to write to EEPROM block 1 per address (value will auto-plus 1)

File : To get the file (*.dat) that is wrote to the flash memory.

Flash : To read, write and erase Flash memory.

Flash-r : To read the value that is wrote to the flash memory. Press ' q ' to quit program.

Flash-w : Inputting a value and write to flash memory. (value will auto-plus 1). Press ' q ' to quit program.

Hello : Detecting if the operation system is Minios7.

Hello1 : Detecting if the operation system is Minios7.

Hello2 : Detecting if the operation system is Minios7.

Init : To read the situation of 8831 init pin.

Key_led : This program is used to control the led of 8831 by button of 8831.

Led : The led of I-8000 will glitter per second. Press ' q ' to quit program.

Led5 : To press any key from keyboard to control the led.

Nvram-r : To read the value that is wrote to NVRAM.

Nvram-w : To write a value to NVRAM (value will auto-plus 1).

Readfile : You can choose a file that is already wrote in flash memory and read it.
Press ' q ' to quit program.

Rsttime : To press string " reset " & key " 8 ", then the I-8000 will start to count time.

Scanf : To show how to write a function for inputting data.

Seg7led : The first digital led will display 1 to f until you press ' q ', and the others will show the same number with the key you press (even is with dot; odd is not).
Press ' q ' to quit program.

Serial : To get the serial number of 8831.

Stdcom : To read the data from com1 input buffer. Press ' q ' to quit program.

Syskey : To show the button name, which you click on monitor.

Watchdog : If system is reset by watchdog timer, then load this file and run it.

4.4.3 How to R/W Ethernet port ?

More manual about I-8430/8431/8830/8831 resides at CD:\napdos\8000\843x883x\document\

8000Ehh.pdf : 8000E series hardware user's manual

8000Ess.pdf : 8000E series software user's manual

8431_Quick_Start.pdf : 8431/8831 quick start

TCPIPLib.pdf : TCP/IP User's manual

Please refer to 4.3.5 – “C Libraries For I-8000 Controllers” for searching description of c functions.

Demo program about R/W Ethernet port of the I-843x and 883x controller resides at below location.

CD:\napdos\8000\843x883x\tcp\

other\server\demo1\bc\ : 8000 TCP/IP DIO demo

CD:\napdos\8000\843x883x\tcp\Xserver\demo\bc\ Xdemo04 ~ XDemo66

(Please refer to CD:\napdos\8000\843x883x\tcp\Xserver\ Xserver.htm for description of each demo program)

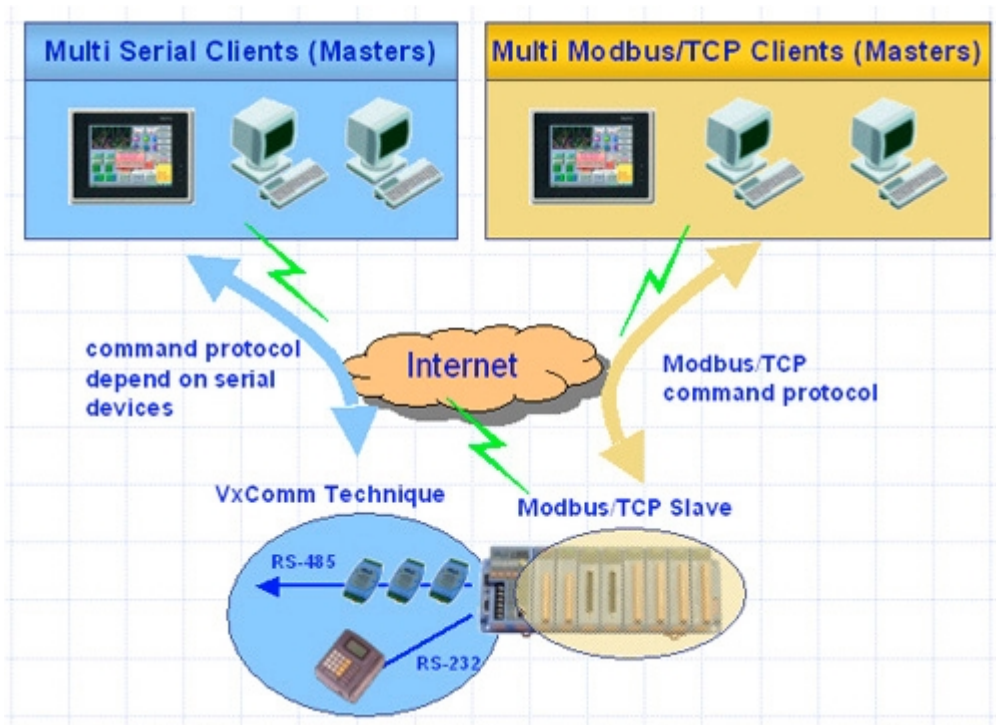
Chapter 5: I-8430/8830/8431/8831-MTCP

5.1 Features

When you buy an I-8000E -MTCP controller, it is already installed with a default Modbus firmware in the Flash memory. The default firmware has the follows features:

- **Supports Modbus/TCP communication protocol to access I/Os that plug on slots**
- **Supports VxComm technique for every COM port of controllers**
Even if a serial device doesn't support the Modbus/RTU, you can still access these devices via Ethernet. However, you will first need to install a VxComm driver on the host PCs and assign a COM port number to link to the remote I-8000E -MTCP COM ports. Once installed, your serial clients can access these remote serial devices via the Ethernet by using the standard RS-232 functions.
- **Automatically scan I/O modules and range I/O register addresses to continuous**
You can plug an I/O module in any slot. The Modbus firmware can automatically scan all slots and range I/Os to registers in continuous. After using the Modbus Utility to connect to the I-8000 -MTCP, you can get the register mapping of the I/Os.
- **Allowed a maximum of 8 host PCs access simultaneously**
Different I-8000E -MTCP controller supports different client numbers connect to. Please refer to the FAQ on our web site for more details.
<http://www.icpdas.com/faq/7188e/ech003.htm>
- **Firmware modifiable**
We provide the [Modbus SDK](#) allowing users to develop their custom Modbus firmware.

Below is the structure of default Modbus firmware.



5.2 Modbus Utility

When you first connect/install an I-8000E-MTCP, you need to adjust each setting to suit your requirements. The Modbus Utility can help you quickly configure the I-8000E-MTCP and let it can begin to work soon.

The Modbus Utility also includes help files (English and Traditional Chinese version). You can refer the help files to get the basic concept about the Modbus product.

Installation: CD:\Napdos\Modbus\Modbus_UTILITY\Setup\Setup.exe

I-8830 NetID: 1

192.168.255.1 Connect

Off line Mode (file) Disconnect

I-8017H

Range Code Set All

| | | |
|-----|-------------|-----|
| Ch0 | +/- 2.5 V | Set |
| Ch1 | +/- 2.5 V | Set |
| Ch2 | +/- 20.0 mA | Set |
| Ch3 | +/- 20.0 mA | Set |
| Ch4 | +/- 1.25 V | Set |
| Ch5 | +/- 10.0 V | Set |
| Ch6 | +/- 10.0 V | Set |
| Ch7 | +/- 5.0 V | Set |

Digital Module Mapping **Analog Module Mapping** **Summary**

| Slot | Module | DI (1xxxx) address | Points | DO (0xxxx) address | Points | AI (3xxxx) address | Points | AO (4xxxx) address | Points |
|------|---------|--------------------|--------|--------------------|--------|--------------------|--------|--------------------|--------|
| 0 | I-8017H | - | - | - | - | 00 [00] | 8 | - | - |
| 1 | I-8024 | - | - | - | - | - | - | 00 [00] | 4 |
| 2 | I-87051 | 00 [00] | 16 | - | - | - | - | - | - |
| 3 | I-87053 | 16 [10] | 16 | - | - | - | - | - | - |
| 4 | I-8054 | 32 [20] | 8 | 00 [00] | 8 | - | - | - | - |
| 5 | I-8056 | - | - | 08 [08] | 16 | - | - | - | - |
| 6 | I-8060 | - | - | 24 [18] | 6 | - | - | - | - |
| 7 | I-8090 | 40 [28] | 1 | 30 [1E] | 2 | 08 [08] | 2 | - | - |

5.3 What I/O modules are supported by 8000-MTCP ?

Most 8K and 87K I/O modules are supported by the i-8000-MTCP, such as DI, DO, DIO, AI, AO and Encoder modules. After installing the Modbus Utility, you can find a list in the help. Another way is to refer the web page of the i-8000-MTCP.

<http://www.icpdas.com/products/8000/i-8430-mtcp.htm>

The screenshot shows the ICP DAS website navigation bar with the following elements:

- ICP DAS logo
- High Quality, Industrial Data Acquisition and Control Products
- Navigation buttons: I-8000, I-7000, I-7188, AD/DA Card, others, HOME
- Product title: I-8431-MTCP/I-8831-MTCP
- Product description: Modbus/TCP Embedded Controller
- A search box containing the following text:
 - What is Modbus ?
 - What is VxComm technique ?
 - What is SCADA?
 - I/O modules supported
- A language selection button labeled 中文.

5.4 Software Development Toolkit (in C language)

If the default firmware doesn't fully meet your requirements. You can use the Modbus SDK to modify the default firmware to add extra functions. It has below features:

- **Supports extra user-defined command protocol (TCP/IP)**

Modbus/TCP protocol supports 2 basic data format (bit and 2-byte integer). It means if clients (or called masters) don't support Modbus/TCP or you need other format data (for example: string of floating value), I-8000Es (with default firmware) cannot communicate with them. Using this feature, you can develop your special command protocol to transfer any format of data.
- **Register based programming method (easy to use)**

Modbus library supports 4 internal register tables (iMemory_AI, iMemory_AO, iMemory_DI, iMemory_DO), you can use these to store specific information. When Modbus/TCP clients request to I-8000E, Modbus kernel will response information from these 4 tables.
- **Provides user-defined registers**

First part of the 4 internal register tables are reserve for I/Os, others are open to users. You need to assign these tables by yourself.
- **Can link to Modbus/RTU slave devices**

By using function `ModbusMaster2Slave` (declared in `MBTCP_8E.h`), Modbus/RTU devices can be easily integrated to internal registers of I-8000Es. An I-8000E polling every Modbus/RTU devices and put every necessary information to internal registers. Clients only ask the I-8000E to get all information of Modbus/RTU devices. That reduces loading of Clients.

- **Can link to non-Modbus/RTU serial devices**

Some serial devices don't support Modbus/RTU. We provide functions to let I-8000E -MTCP access serial devices. You can put information to internal registers of it. Thus, the non-Modbus serial devices can also support Modbus/TCP.

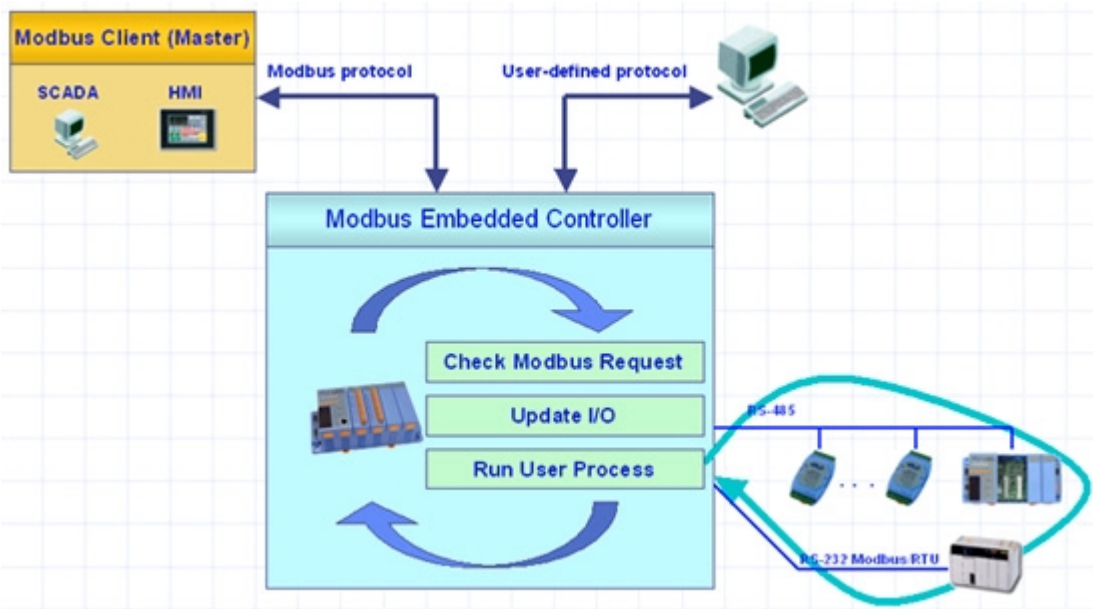
- **Xserver SDK compatible**

Modbus SDK is based on Xserver SDK. To learn more programming skills, you can refer demos of Xserver. To get information of demos of Xserver, please refer to

CD:\Napdos\8000\843x883x\TCP\Xserver\Xserver.htm

Note: To use the Modbus SDK to develop custom firmware, the controller must be equipped with 512K SRAM, that is i-8431-MTCP and i-8831-MTCP.

Below is the structure of the Modbus SDK



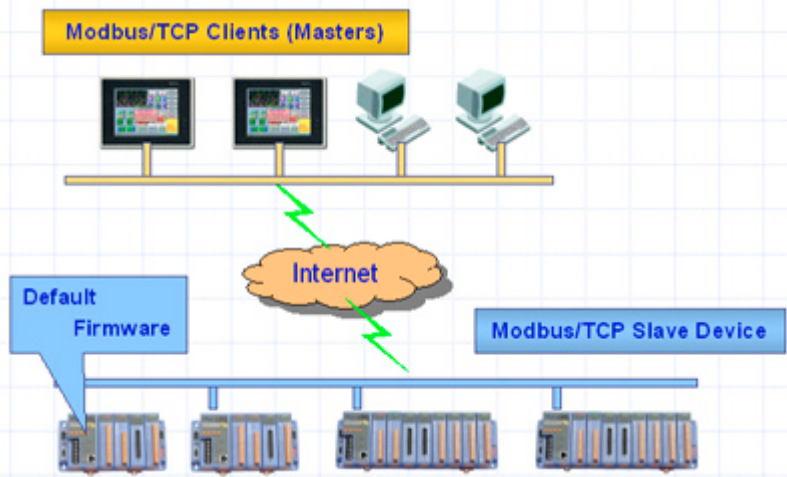
You can refer the demos to learn how to use the SDK to develop your custom Modbus firmware. The comments are all in the source code (user.c) and the location of the demos is:

CD:\Napdos\Modbus\Demo

5.5 Typical applications

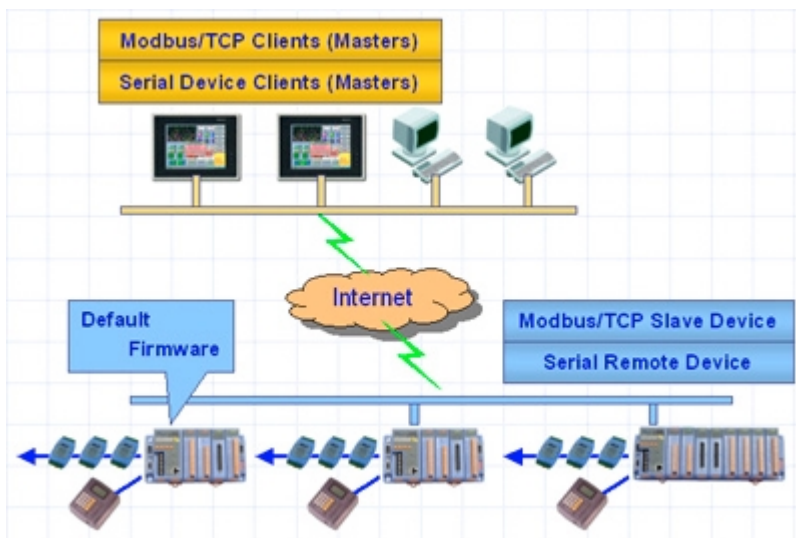
Basic application 1: Modbus/TCP I/O device

An I-8000E -MTCP runs a default firmware to be a Modbus/TCP slave I/O device. You can simply use the Modbus Utility to configure the device and then set connection between SCADA, HMI software and the I-8000E -MTCP.



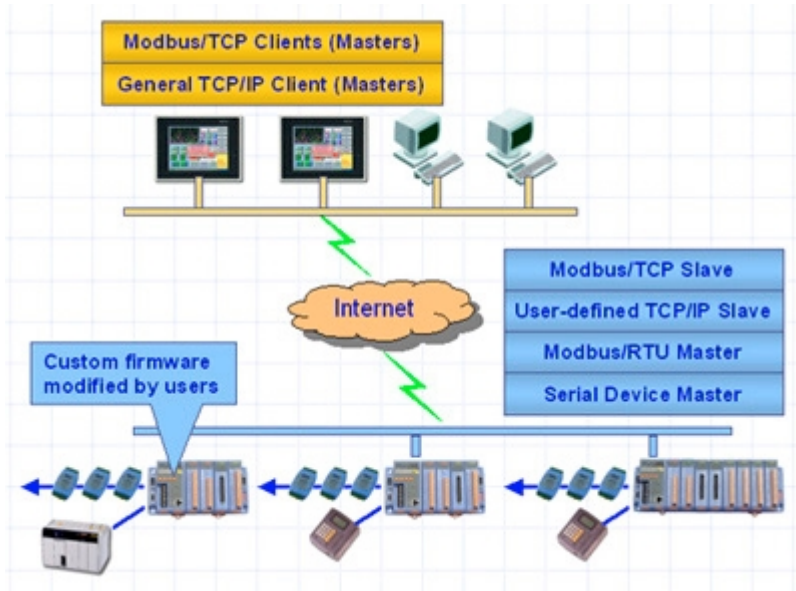
Basic application 2: Modbus/TCP I/O device with VxComm technique

An I-8000E -MTCP is also be able to link serial devices that connect to COM ports of the I-8000E -MTCP. To use this function, you will need to install VxComm driver on host PCs. After installation, you will be able to access the remote COM ports via the standard serial driver.



Advanced application 1: Modbus/TCP controller

Using the Modbus SDK, users can develop their own custom firmware, allowing extra functions, integration serial devices to the Modbus/TCP kernel. Thus an I-8000 can be a powerful controller.



Advanced application 2: Modbus/TCP controller with VxComm technique

When an I-8000E -MTCP links same hardware devices as Advanced application 1 link to, if any devices connected to certain COM ports are not integrated into your custom firmware, you are still able to access the COM ports via standard serial driver. In order to do this, you must install VxComm driver on host PCs.

5.6 Where is the newest Modbus document and SDK ?

You can refer the download area in our web site and check the files that you need to update.

http://www.icpdas.com/download/modbus/modbus_download.htm

Chapter 6: I-8417/8817/8437/8837

The User's Manual Of I-8417/8817/8437/8837 can be found at below folder.

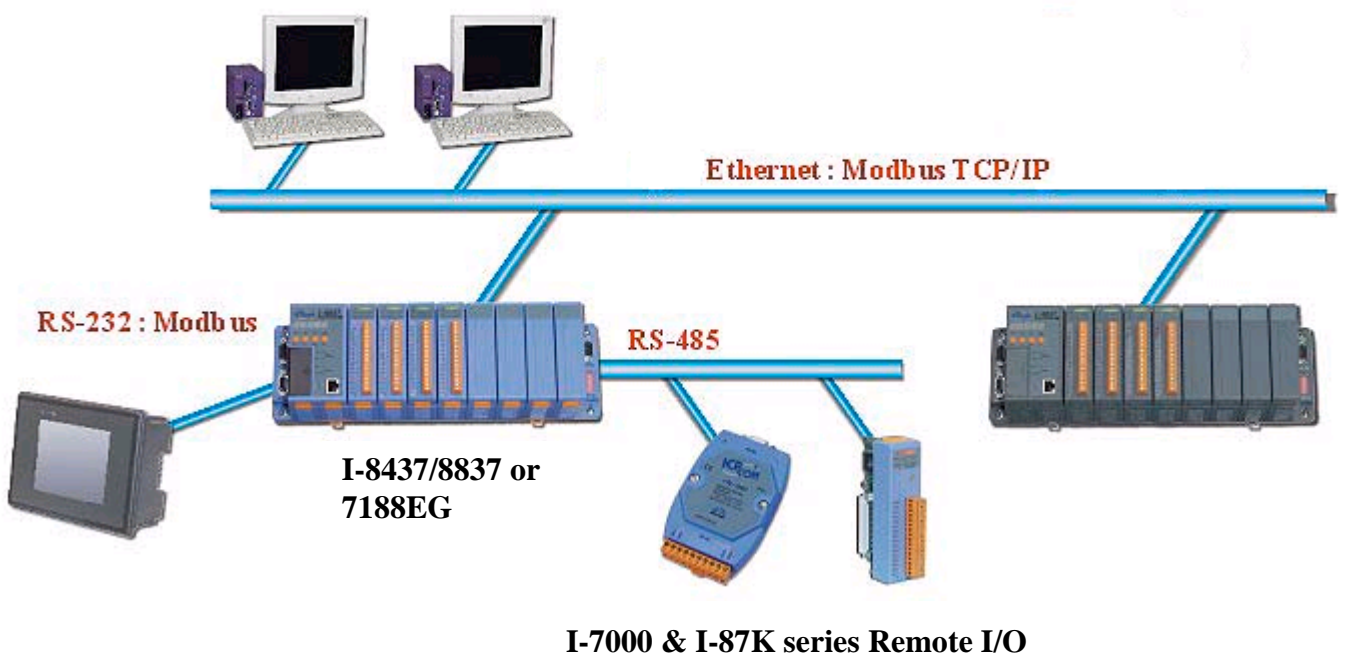
English: CD:\napdos\isagraf\8000\english_manu\ "User_Manual_I_8xx7.pdf"

Chinese: CD:\napdos\isagraf\8000\chinese_manu\ "Chinese_User_Manual_I_8xx7_A.pdf"
"Chinese_User_Manual_I_8xx7_B.pdf"
"Chinese_User_Manual_I_8xx7_C.pdf"
"Chinese_User_Manual_I_8xx7_D.pdf"

Please visit <http://www.icpdas.com/products/8000/isagraf.htm> for more information.

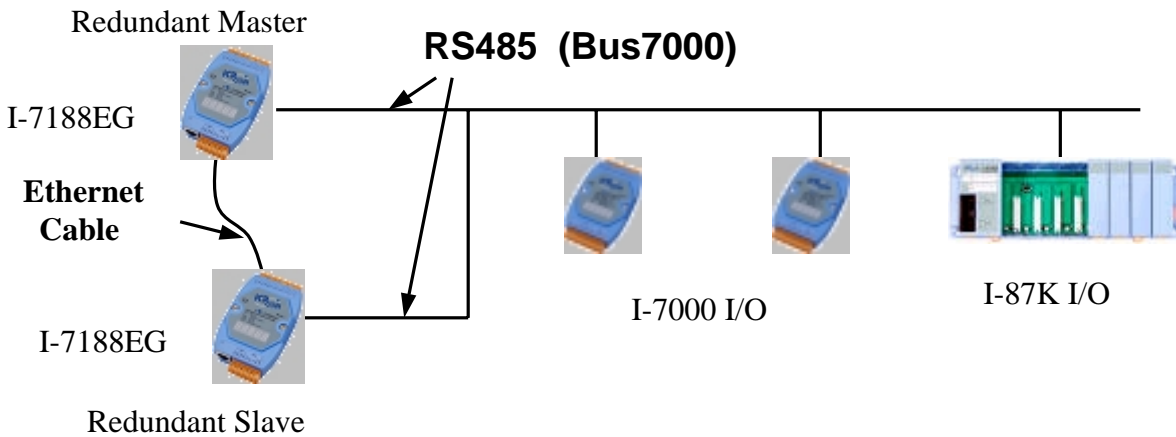
Application: Multi-HMI

Multi-HMI & Touch Panel

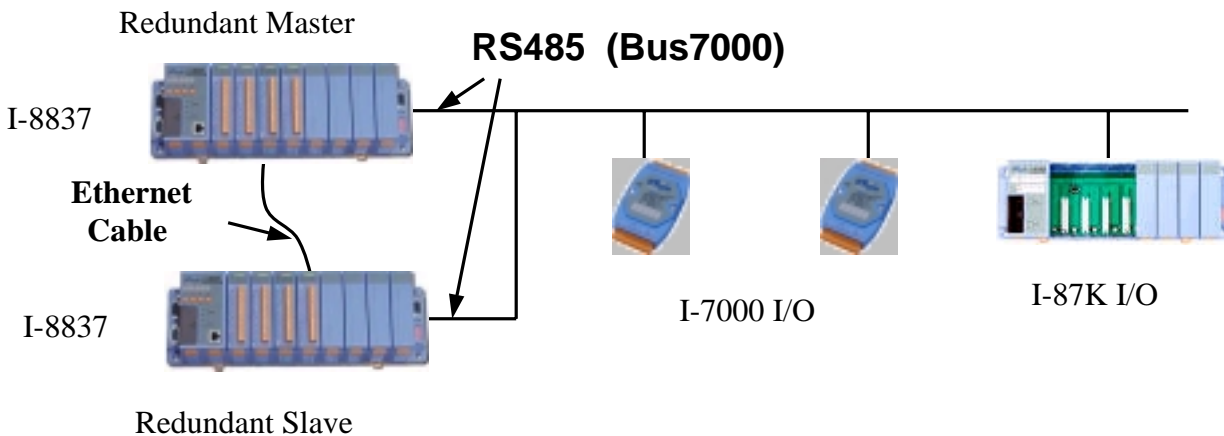


Application: Redundant Bus7000

I-7188EG:



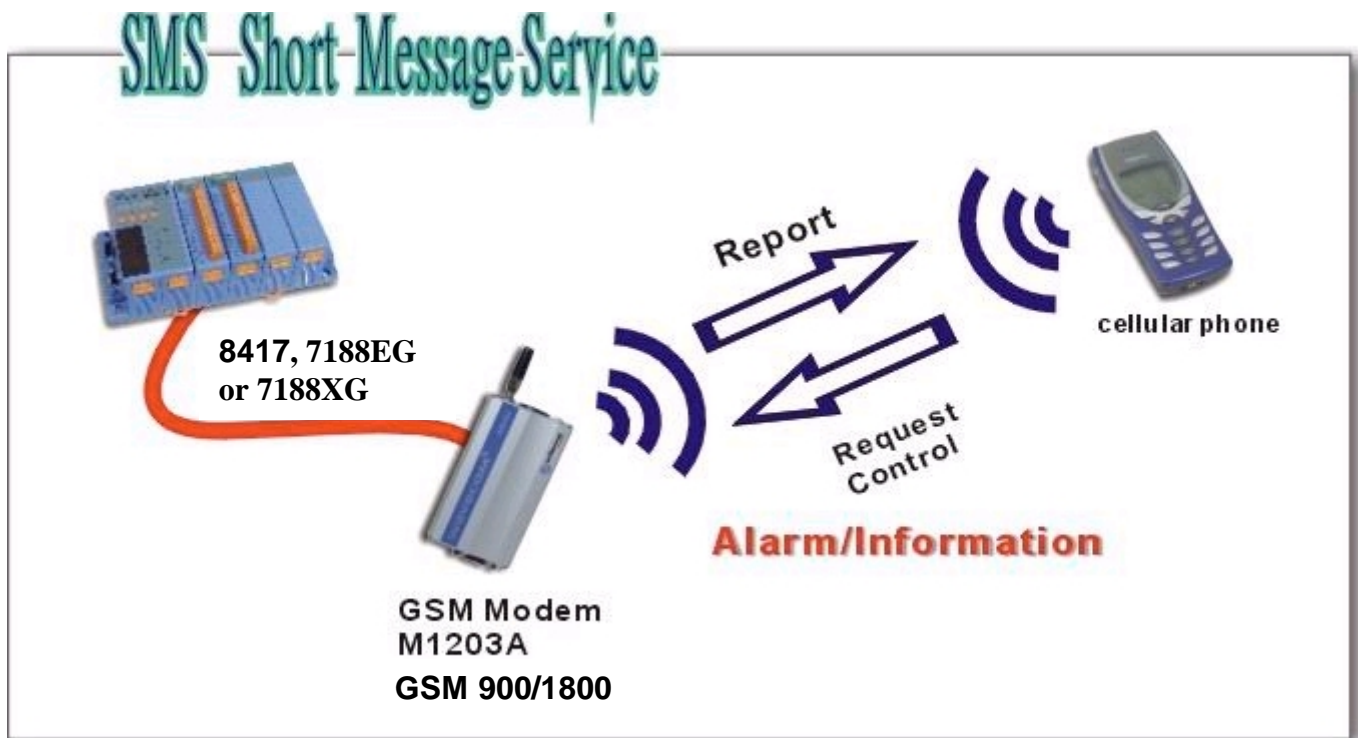
I-8437/8837:



Operations Principle:

1. When the system is powered up, the control right of Bus7000 belong to "Redundant Master".
2. If "Redundant Master" is dead(Power off), "Redundant Slave" takes over the control right of Bus7000.
3. If "Redundant Master" is alive from dead (power up again), it takes over the control of Bus7000 again.
4. User's control data is exchanging via Fbus or Ebus.

Application: SMS



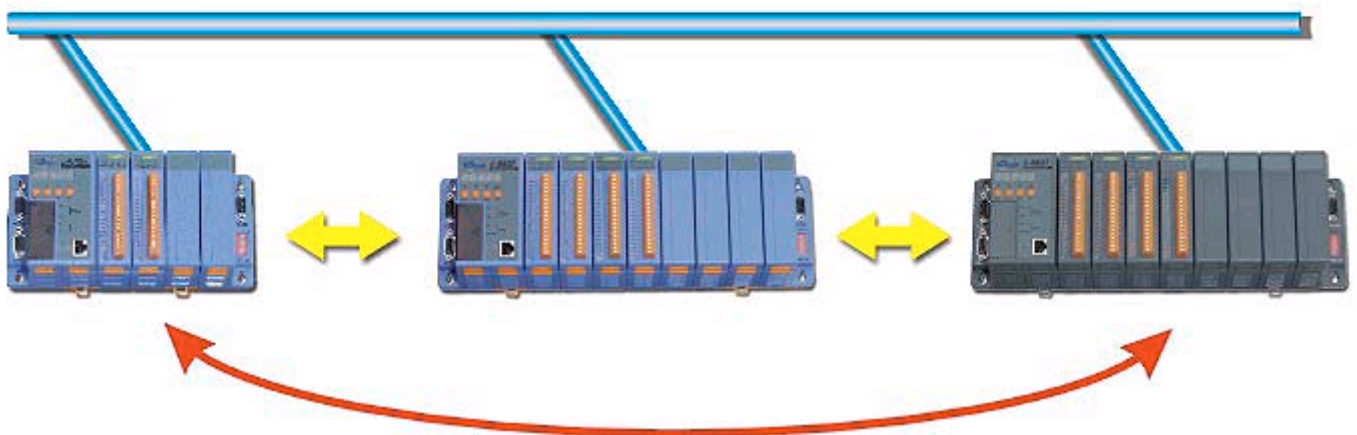
Application: Data Exchange thru. Ethernet & RS485

Data Exchange

Controller to controller data exchange

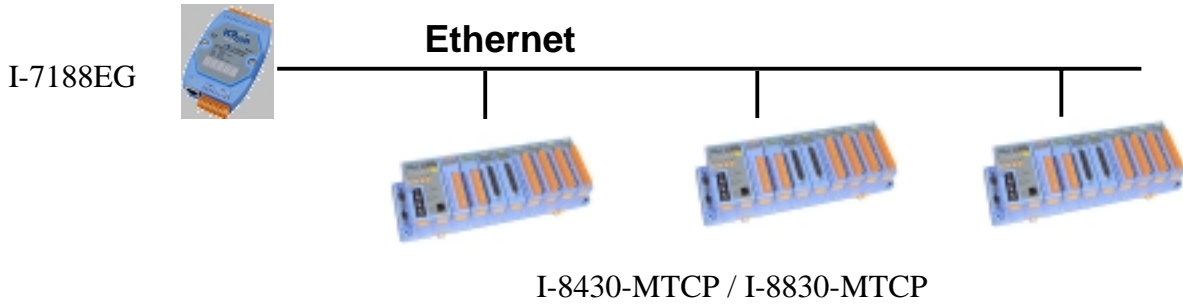
Ethernet: I-8437/8837 & I-7188EG

RS485: I-8417/8817/8437/8837, I-7188EG & I-7188XG

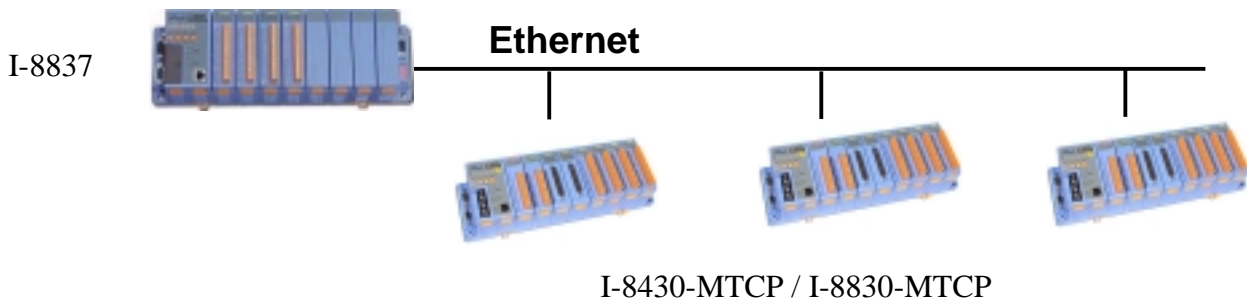


Application: Ethernet I/O

I-7188EG:



I-8437/8837:



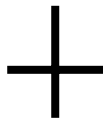
Application: Motion Control

One I-8091 can control 2-axes: X-Y plane, or 2 axes independent

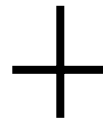
Two I-8091 can control 4-axes: X-Y plane + 2 axes independent, or 4 axes independent



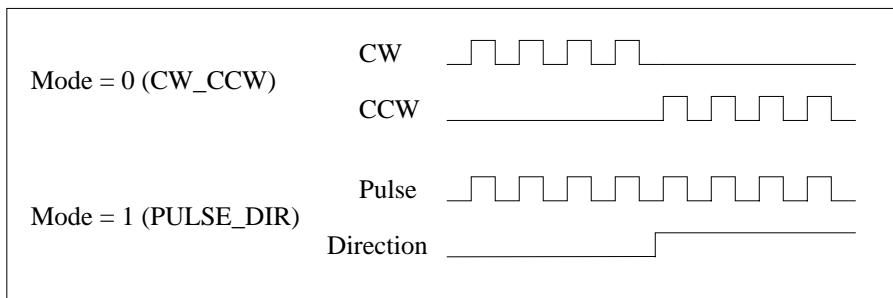
I-8417/8817/8437/8837



I-8091: 2 axes



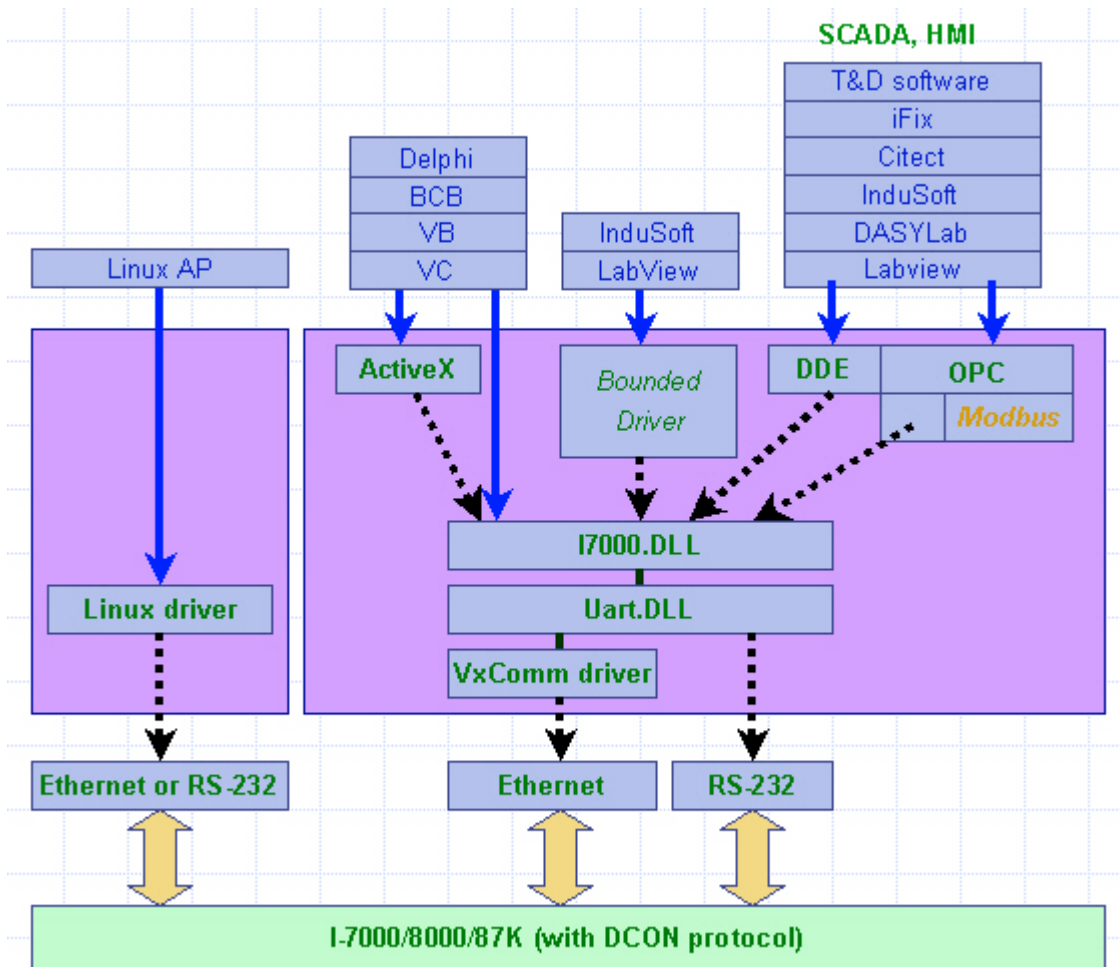
I-8090: 3 axes Encoder



Chapter 7: Application software for host PC

7.1 Software for Host-PC

The block of software for host-PC is given as following:



From above diagram, the software for 8000 series can be divided as following:

- DOS driver for host-PC (refer to Section 7.2) → **NAP7000S**
- Windows DLLs for host-PC (refer to Section 7.3) → **DCON_DLL**
- Windows DDEs for host-PC (refer to Section 7.4) → **DCON_DDE (or NAP7000D)**
- Windows OCX for host-PC (refer to Section 7.5) → **DCON_ActiveX(or NAP7000X)**
- Windows OPC for host-PC (refer to Section 7.6) → **NAPOPC Server**
- Linux Driver for host-PC (refer to Section 7.7) → **DCON_Linux**
- LabVIEW Driver for host-PC (refer to Section 7.8) → **DCON_Labview(or NAP7000V)**

NOTE: All these software drivers are upgraded to support both 7000 & 8000 family now.

7.2 DOS Driver for Host-PC

Manual: CD:\napdos\driver\ DCON_Utility_DOS\ DCON_Utility_DOS.pdf

Installation: Copy all files at CD:\napdos\driver\ DCON_Utility_DOS\ *.*

The NAP7000S is designed for 7000 & 8000 series under DOS environment. It provides utility, demo program, performance evaluation and data acquisition subroutines for 7000 & 8000 family. It can be executed under DOS & Windows 3.1/95/98/NT. All program sources of NAP7000S are given in the companion CD.

The driver sources of diagnostic utility are given as following:

UART.H → header file
UART.C → library file
TEST.C → application file
TEST.PRJ → project file

The compiler and link for TC are given as below:

1. Set DOS PATH to TC
2. Using TC integrated environment to set **PROJECT** to TEST.PRJ
3. Press **F9** to MAKE the project file (TEST.PRJ)
4. Execution file = **TEST.EXE**

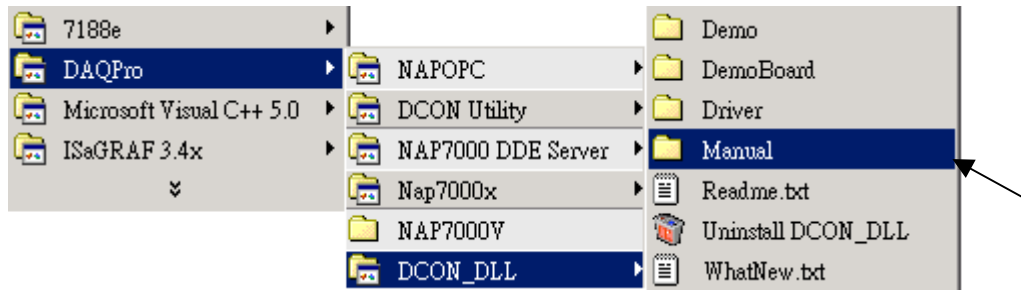
The starting screen of DOS diagnostic utility is given as following:

```
***** Diagnostic Program *****
* STATUS : COM=1,Baud_Rate= 9600,Checksum=DISABLE *
*-----*
*      0 : init (for all module) *
*      1 : search (1200 to 115200) (for all module) *
*      2 : send command (for all module) *
*      3 : demo ($012,$01M,$01F) (for all module) *
*      4 : Host Watchdog test (for 7021) *
*      5 : RS-485 network testing (for all module) *
*      Q : quit *
***** Press Keyword *****
```


7.3 Windows DLLs for Host-PC

Installation: Double click on CD:\napdos\driver\DCON_DLL\setup\setup.exe

Manual: Please refer to “DAQPro” - “DCON_DLL” – “Manual” after installation.



The DCON_DLL is a Windows DLL designed for 7000 & 8000 series under Windows environment. The DCON_DLL provides windows compatible DLLs which can be called by VC++, BC++, VB, Delphi, BC++ Builder or other package. The features of DCON_DLL are given as following:

1. Provide general-purpose 7000/8000 series module send/receive functions.
2. Provide high performance 7000/8000 series module application functions.
3. Multi-speed demos.
4. Multi-data-format demos.
5. Lots of demo programs with completely source code.

After the user install the DCON_DLL, the files I7000.DLL and UART.DLL will be copied into the user's system folder as follows :

- C:\Windows\system (Windows 95/98)
- C:\WinNT\System32 (Windows NT)

To use these functions of I7000.DLL and UART.DLL, the user must declare these function's prototype(interface) for development tools that the user using. DCON_DLL provides the completely declaration files of I7000.DLL and UART.DLL for VC++, VB, Delphi and BCB. The user can copy these declaration files into the project folder and include them into the user's project. And then the user can use these functions as the function that provided by the development tools that the user using.

After the DCON_DLL is installed, the sub-directory tree is given as follows:

The default [Base Directory] is "\DAQPro\DCON_DLL".

```
[Base Directory] <-- the directory you selected to setup
|--\Driver
|  |--\i7000.dll    <-- dynamic linking library
|  |--\uart.dll    <-- dynamic linking library
|  |--\Source      <-- source code of i7000.DLL
|  |--\BCB3        <-- demo code for Borland C++ Builder
|  |  |--\I7000.h  <-- Header file of 7000 series for I7000.dll & uart.dll for BCB
|  |  |--\I8000.h  <-- Header file of 8000 series for I7000.dll & uart.dll for BCB
|  |  |--\I87000.h <-- Header file of 87000 series for I7000.dll & uart.dll for BCB
|  |  |--\Uart.h   <-- Header file of uart.dll for BCB
|  |  |--\I7000bc.lib <-- Import library for i7000.dll for BCB
|  |  |--\uartbc.lib <-- Import library for uart.dll for BCB
|  |--\Delphi3     <-- Demo code for Delphi
|  |  |--\I7000.pas <-- Declare file of 7000 series for I7000.dll & uart.dll for delphi
|  |  |--\I8000.pas <-- Declare file of 8000 series for I7000.dll & uart.dll for delphi
|  |  |--\I87000.pas <-- Declare file of 87000 series for I7000.dll & uart.dll for delphi
|  |  |--\I7000u.pas <-- Declare file for global variables.
|  |--\VB5         <-- Demo code for Visual Basic
|  |  |--\7000.bas  <-- Declare file for I7000.dll & uart.dll for VB
|  |  |--\7000u.bas <-- Declare file for global variables.
|  |--\VC5         <-- Demo code for Visual C++
|  |  |--\Uart.h   <-- Header file of uart.dll for VC
|  |  |--\I7000.h  <-- Include header file of 7000 series for I7000.dll & uart.dll for VC
|  |  |--\I8000.h  <-- Include header file of 8000 series for I7000.dll & uart.dll for VC
|  |  |--\I87000.h <-- Include header file of 87000 series for I7000.dll & uart.dll for VC
|  |  |--\I7000u.cpp <-- Declare file for global variables.
|  |  |--\I7000.lib <-- Import library for i7000.dll for VC
|  |  |--\uart.lib  <-- Import library for uart.dll for VC
|--\DEMO
|  |--\C2Delphi.htm <-- data type from C to DELPHI
|  |--\delphitype.htm <-- data type list for DELPHI and BCB
|  |--\BCB3         <-- demo code for Borland C++ Builder
|  |  |--\DemoList.txt <-- BCB3 demo list
|  |--\Delphi3     <-- demo code for Delphi
|  |  |--\DemoList.txt <-- DELPHI demo list
|  |--\VB5         <-- demo code for Visual Basic
|  |  |--\DemoList.txt <-- Visual Basic demo list
|  |--\VC5         <-- demo code for Visual C++
|  |  |--\DemoList.txt <-- Visual C++ demo list
|--\Manual
|  |--\DCON_DLL.pdf <-- the software manual
|  |--\FAQ.pdf      <-- Question and Answer
|  |--\Quick Start.pdf <-- Getting Start
|--\DemoBoard      <-- Demo program for Demo-Board-I(VB5, Delphi3, BCB3)
--\readme.txt
```

7.4 Windows DDE for Host-PC

Note: The new release version will be available as a different name of "DCON_DDE". Please refer to CD:\Napdos\driver\DCON_DDE\ReadMe.txt

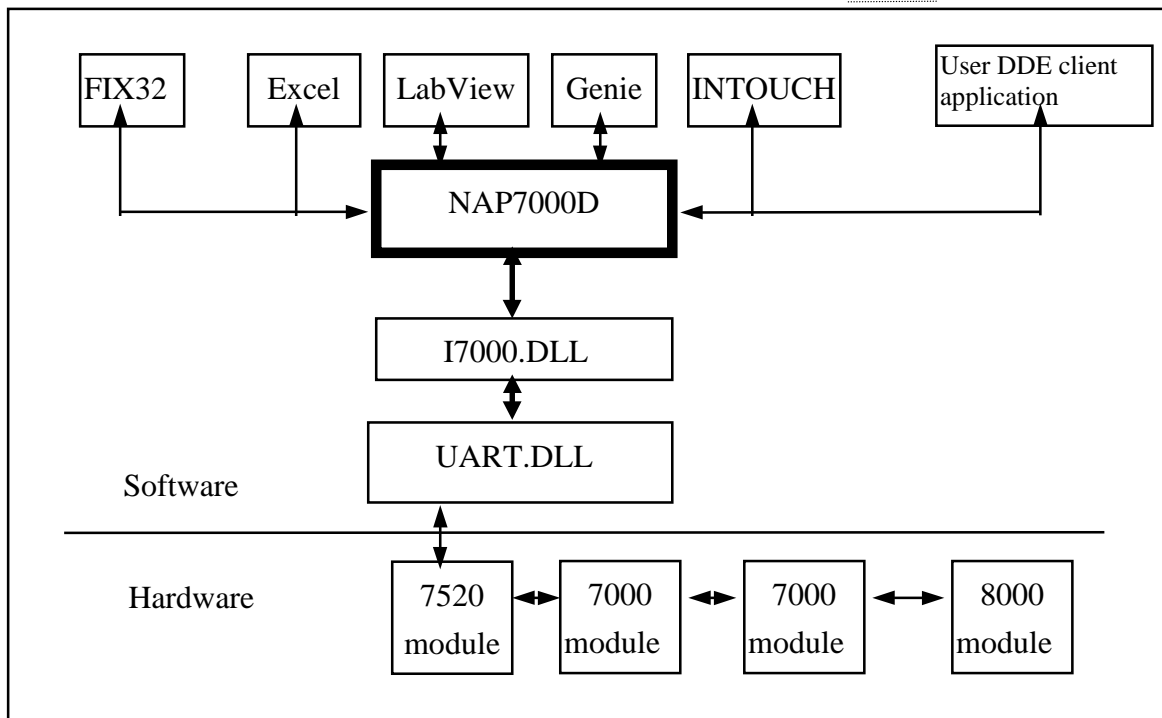
Installation: Double click on CD:\napdos\7000\ NAP7000D\setup\setup.exe or CD:\napdos\driver\DCON_DDE\setup\setup.exe

Manual: Please refer to "DAQPro" – "Nap7000 DDE Server" - "Nap7000D Help" .



The DCON_DDE (or NAP7000D) is Windows hot-link DDE(Dynamic Data Exchange) server designed for 7000 & 8000 series. The DDE is a communication protocol that enables to exchange data between windows application. The NAP7000D pass the data acquired from 7000/8000 series module to other application by means of the hot-link. Or user can control the 7000/8000 module using the NAP7000D after establishing these hot-link conversation. The NAP7000D is a mouse driven system that provides the ability of developing 7000/8000 application by just clicking mouse.

The block diagram of NAP7000D is given as follows:



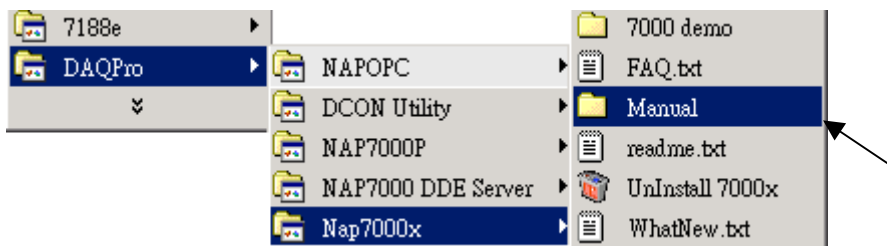
7.5 Windows OCX for Host-PC

7.5.1 Introduction

Note: The new release version will be available as a different name of "DCON_ActiveX". Please refer to CD:\Napdos\driver\DCON_ActiveX\ReadMe.txt

Installation: Double click on CD:\napdos\7000\ NAP7000X\setup\setup.exe or CD:\napdos\driver\ DCON_ActiveX\setup\setup.exe

Manual: Please refer to "DAQPro" – "Nap7000x" - "Manual" after installation.



The DCON_ActiveX (or NAP7000X) is an OCX library for 7000 & 8000 series. The ActiveX Control (OCX) is designed for developing program easily and user friendly for 7000/8000 series module. The user can plug the ActiveX Control (OCX) object easily and use the properties, methods and events of the object to programming easily.

The ActiveX Control (OCX) support the Windows 95/98/NT 4.0 and Windows 2000 or above. It doesn't support the Windows 3.1 or Windows NT 3.51(the format of type-lib doesn't the same between NT 3.51 and NT 4.0).

Directory Tree

After installed, these files : NAP7000X.OCX, NAP7000X.tlb, I7000.DLL and UART.DLL will be copied into

- C:\WINDOWS\SYSTEM(for Windows 95/98 platform)
- C:\WINNT\SYSTEM32(for Windows NT/2000 platform)

And the NAP7000X.OCX will create the registry value for itself automatically. The user also can register the NAP7000X.OCX manually by execute the "RegSvr32 NAP7000X.OCX" on the command mode.

For work correctly, the user's system will need the following DLL files:
Olepro32.dll, Oleaut32.dll, Mfc42.dll, Msvcrt.dll

These files will be found in the folder:
C:\Windows\system ==> Windows 95/98
C:\WinNT\system32 ==> Windows NT

The default [Base Directory] is "\DAQPro\NAP7000X".

[NAP7000X]

--\Manual

- | --\NAP7000X.pdf ← User's Manual of NAP7000X
- | --\InstallOCX.pdf ← describes how to install OCX
 on system and how to uses the
 ocx with VB, Delphi, BCB.
- | --\IKIT06.pdf ← User's Manual of IKit-06
 (Professional Kit)

--\Driver

- | --\NAP7000X.TLB ← Type library
- | --\NAP7000X.OCX ← ActiveX Control file
- | --\i7000.dll
- | --\uart.dll

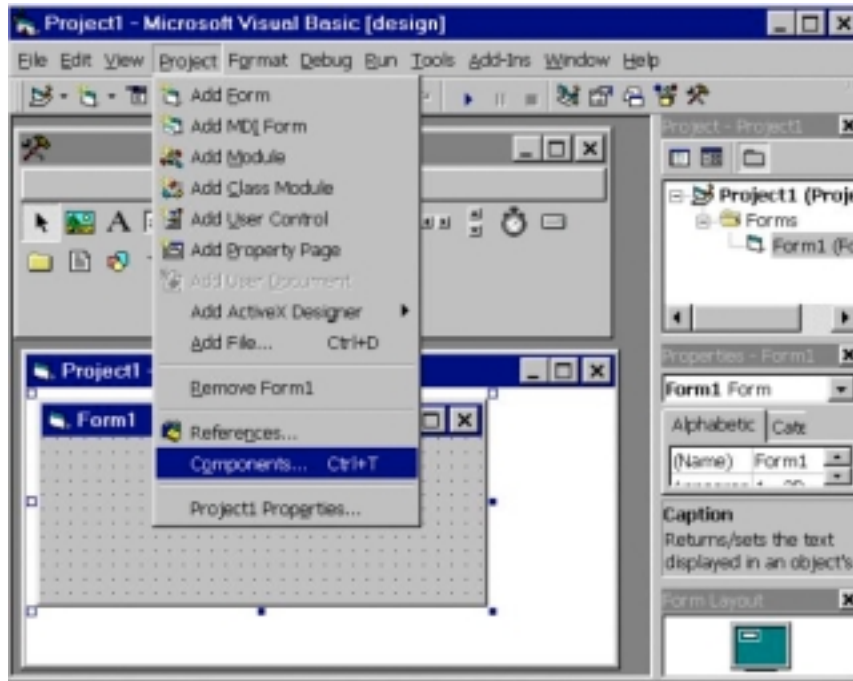
--\Demo

- | --\BCB3 ← Demo programs
 for Borland C++Builder 3
- | | --\AIIn ← Analog Input
- | | --\AIIn8 ← Analog Input (8 Channels)
- | | --\AOut ← Analog Output
- | | --\AOutRB ← Analog Output and Read-Back
- | | --\DIInOut ← Digital Input / Digital Output
- | | --\I7080 ← I-7080 demo
- | | --\Ikit06 ← Application demo of IKit-06
 (Professional Kit)
- | | --\SafeAI ← Safe-Value demo for Digital Output
 for 7011/7012/7014
- | | --\SafeAO ← Safe-Value demo for Analog Output
 for Analog-Output Modules
- | | --\SafeDO ← Safe-Value demo for Digital Output
 for Digital-Output Modules
- | | --\SendCmd ← Send-Receive-Command demo
- | | --\Start1 ← demo program for "Getting Start" manual
- | | --\WatchDog2 ← Dual-WatchDog demo for All Modules
- | --\Delphi3 ← Demo programs for Delphi 3
- | | --\AIIn ← Analog Input
- | | --\AIIn8 ← Analog Input (8 Channels)
- | | --\AOut ← Analog Output
- | | --\AOutRB ← Analog Output and Read-Back
- | | --\DIInOut ← Digital Input / Digital Output
- | | --\I7080 ← I-7080 demo
- | | --\Ikit06 ← Application demo of IKit-06
 (Professional Kit)
- | | --\SafeAI ← Safe-Value demo for Digital Output
 for 7011/7012/7014
- | | --\SafeAO ← Safe-Value demo for Analog Output
 for Analog-Output Modules
- | | --\SafeDO ← Safe-Value demo for Digital Output
 for Digital-Output Modules
- | | --\SendCmd ← Send-Receive-Command demo

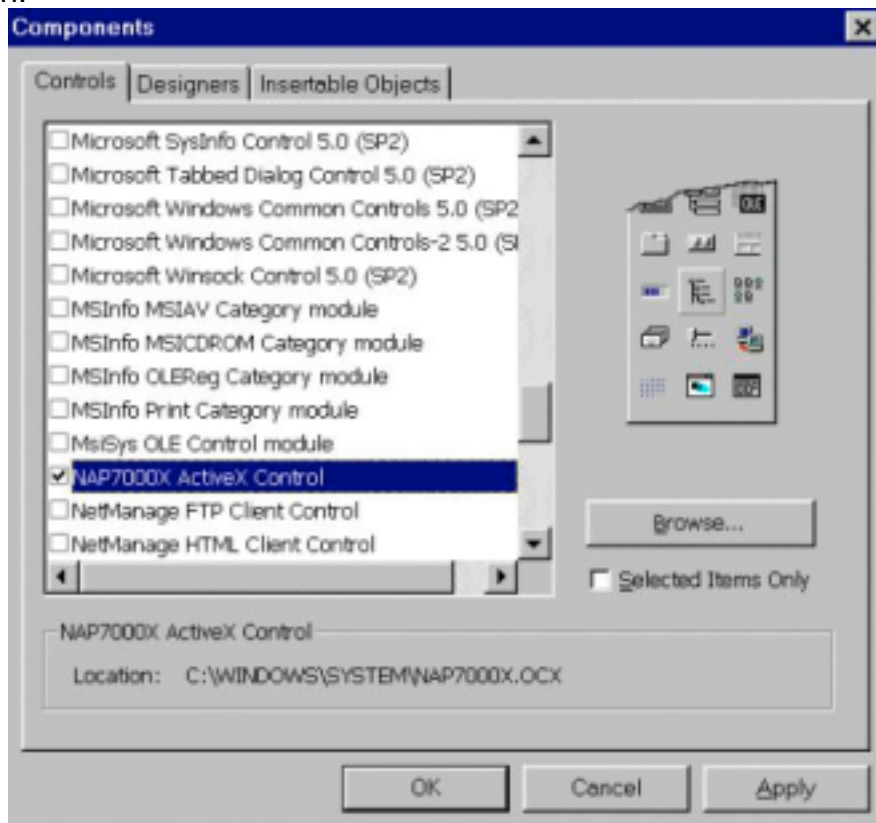
| | | |
|--|------------------|--------------------------------------------------------------------|
| | --\Start1 | ← demo program for "Getting Start" manual |
| | --\WatchDog2 | ← Dual-WatchDog demo for All Modules |
| | --\VB5 | ← Demo programs for Visual Basic 5 |
| | --\AIn | ← Analog Input |
| | --\AIn8 | ← Analog Input (8 Channels) |
| | --\AOut | ← Analog Output |
| | --\AOutRB | ← Analog Output and Read-Back |
| | --\DInOut | ← Digital Input / Digital Output |
| | --\I7080 | ← I-7080 demo |
| | --\IKit01 | ← Demo of IKit-01 |
| | --\IKit06 | ← Application demo of IKit-06 (Professional Kit) |
| | --\SafeAI | ← Safe-Value demo for Digital Output for 7011/7012/7014 |
| | --\SafeAO | ← Safe-Value demo for Analog Output for Analog-Output Modules |
| | --\SafeDO | ← Safe-Value demo for Digital Output for Digital-Output Modules |
| | --\SendCmd | ← Send-Receive-Command demo |
| | --\Start1 | ← demo program for "Getting Start" manual |
| | --\WatchDog2 | ← Dual-WatchDog demo for All Modules |
| | --\WhatNew.Txt | ← What's new ? |
| | --\Different.Txt | ← The differents between Ver 1 and Ver 3. |
| | --\Modules.txt | ← supported modules |
| | --\Readme.Txt | ← This file |

7.5.2 Using DCON_ActiveX with Visual Basic

Step 1: Adding the ActiveX Control (OCX) into the VB toolbox. Click on the **Project/Components** in Visual Basic 5.0 menu.



Step 2: Checking the item **NAP7000X ActiveX Control** in the Controls dialog box, then click on **OK** button.



Step 3: After step 2, the icon of **NAP7000X (7000 OCX)** will display in the ToolBox.



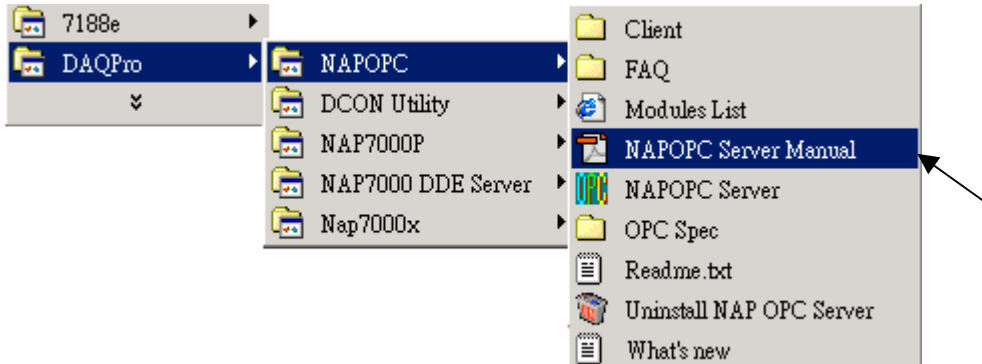
Step 4: Create a new standard project, then add an **NAP7000X (7000 OCX)** object into this project.



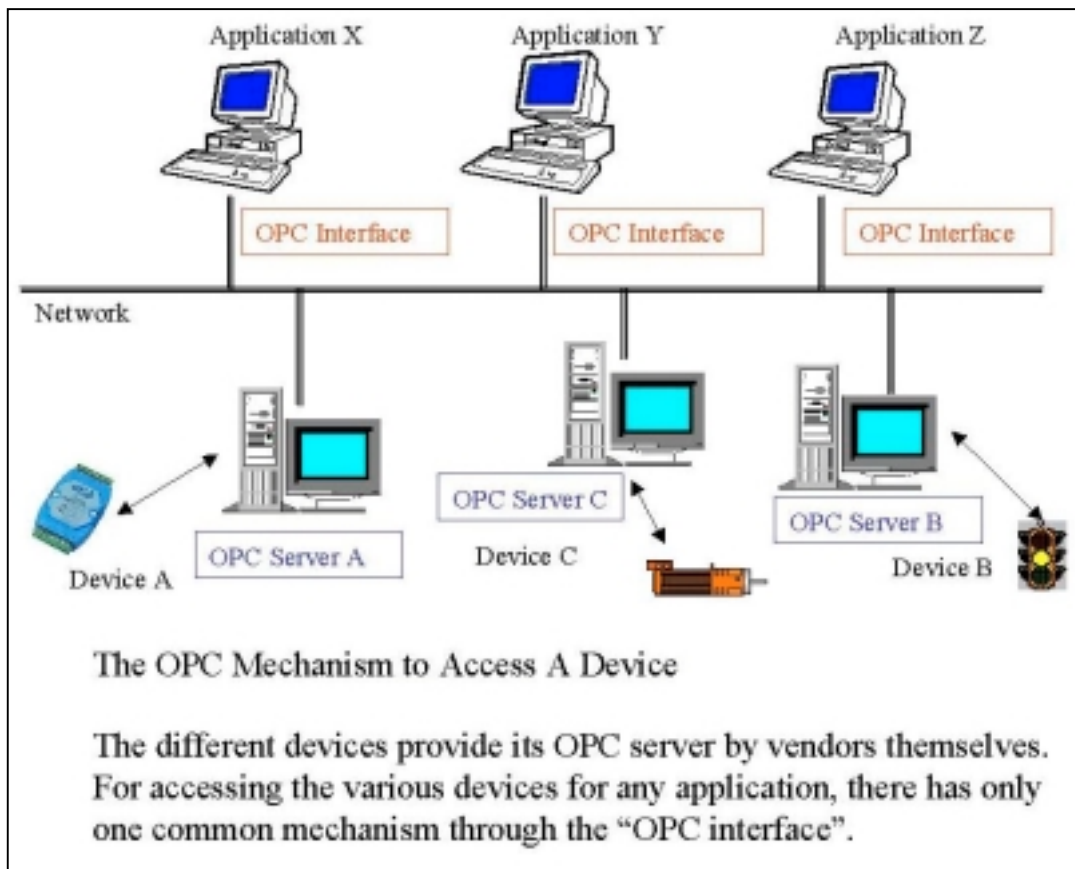
7.6 Windows OPC for Host-PC

Installation: Double click on CD:\napdos\napopcsvr\napopcdaserver.exe

Manual: Please refer to “DAQPro” – “NAPOPC” - “NAPOPC Server Manual” after installation.



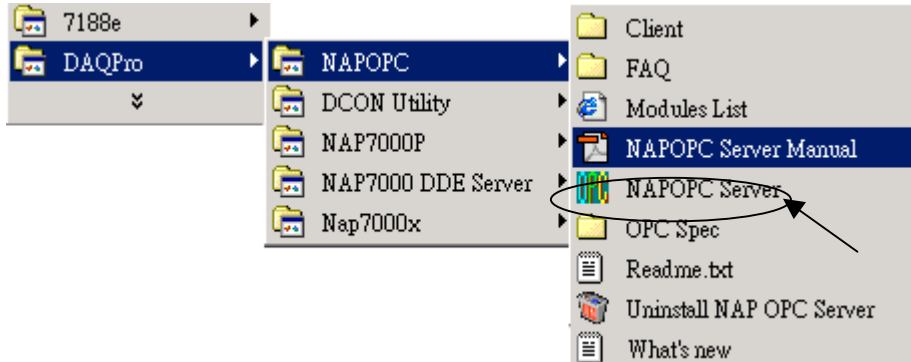
The NAP7000OPCSvr supports 7000 & 8000 series. The NAP7000 OPC DA Server uses an Explorer style user interface to display a hierarchical tree of modules and groups and their associated tags. Groups are like subdirectories that logically group tags. A module may have subgroups that all have tags within them, but all of the tags really belong to their module when they are scanned to perform I/O. (The "OPC" is stand for "OLE for Process Control" and the "DA" is stand for "Data Access".) The block diagram of a system which supports OPC interface is given as following:



Quick Start:

Please follows these steps...

1. Using the DCON utility (or 7000 Utility) to set every connected I-7000 & I-87K I/O module, the setting includes "Address", "baud rate", "Checksum", ...
2. Run the OPC Server "[NAPOPC Server](#)".



3. Refer to "[NAPOPC Server Manual : Section 1.2 - Searching Modules..](#)" to search modules on the RS-485 network.
4. Save the configuration by using "[File/Save](#)" menu item & then exit "[NAPOPC Server](#)"
5. Run the user's client program and connect to OPC Server. (You may refer to [NAPOPC Server Manual : Section 4.1 – Client Demo Program.](#))
(Please refers to user's manual for the client software that provided by vendor.)

Directory Tree:

The default [Base Directory] is "\\DAQPro\NapOpc"

[Base Directory] <-- the directory you selected to install

```
--\Client          ← OPC client program
|  +--\VB5         ← VB demo using Automation Interface
|--\Manual
|  |--\NAP7000OPCSvr.PDF ← the user's manual
|  |--\OPCOvw.PDF     ← OPC OverView
|  |--\OPCCommn.PDF   ← OPC Common Interface
|  |--\OPCDA20_Cust.PDF ← OPC DA v2.0 Custom Interface
|  +--\OPCDA20_Auto.PDF ← OPC DA v2.0 Automation Interface
|--\FAQ
|  |--\FAQ.TXT        ← Frequently Asked Questions
|  +--\FAQ_Big5.TXT   ← Frequently Asked Questions
|                     (Big5 Chinese version)
|--\ReadMe.TXT       ← this file.
|--\WhatNew.TXT      ← What's New
+--\Modules.HTM      ← Supports what Modules and what Command?
```

7.7 Linux Driver for Host-PC

Since serial port is the standard device supported by Linux, user can play serial port via the standard device file system, for example, device files /dev/ttyS0 and /dev/ttyS1 are generally mapped to first (COM1) and second (COM2) serial ports. If you are an experienced user who is familiar with the serial device manipulation, write codes to manipulate serial port by yourself is recommended, you can fully control the behavior and get the maximum ability of the serial port.

Serial port manipulation is maybe too sophisticated to user new to Linux programming. The i7k is a small source code package that simplifies the serial port manipulation, provides easy programming interface to the serial port, allows user's program to communicate the 7000 or 8000 modules by only regards the basic serial communication characters – baud-rate, parity-check, data-bits, and stop-bit. The i7k also provides a simple console tool – the i7kon, a text utility for searching connected modules and sending manual command.

Another software comes with the i7k is the iWarp, a demonstration program that reads message from a connected TCP socket, and warps the message to a local serial port, and vice versa. In other word, you can set up the iWarp, and communicate with your 7000 or 8000 modules remotely and world widely.

For user who is familiar with the I7000 programming interface on Microsoft Windows but Linux, i7k wraps functions of the I7000.DLL for Windows into package. If you like to use it, just link it with your application. It is also ideal for migrating your Windows application to Linux.

Note:

The i7k package is a zipped source code tarball that can be found from ICP DAS website:
www.icpdas.com **Download → I-7000 & I-87K Series → Linux**

or user may just copy files from
CD:\napsdso\Driver\DCON_Linux\ i7k_0.2.0

Installation

Put the i7k package, e.g. i7k_0.2.0.tar.gz, into your work directory which you have the read/write privilege, and unzip it by command

```
tar -zxvf i7k_0.2.0.tar.gz  
or gunzip -c i7k_0.2.0.tar.gz | tar -xvf
```

In this case, directory i7k_0.2.0 will be created under the work directory. For convenience of access to directory, it is a good idea to put a symbol link to i7k_0.2.0 by command

```
ln -s i7k_0.2.0 i7k
```

Above command will create a symbol "i7k" links to "i7k_0.2.0."

Once you have linked the symbol "i7k" to "i7k_0.2.0," change your work directory into i7k and build package by command

```
cd i7k  
make clean  
make
```

Check the result of make for error (you can ignore warnings.) If you get trouble and don't know how to shoot it, please contact us by email to service@icpdas.com and report the error message in mail.

Read/Write Privilege for Serial Device

Once the make command is completely successful, you are ready for test and programming your application. But before you run your program, you must enable the access to serial ports. Since modules are connected on serial port, you must have the read/write privilege to the system's serial device for communicating with modules. Linux generally maps serial ports

COM1 to /dev/ttyS0

COM2 to /dev/ttyS1

COM3 to /dev/ttyS2

COM4 to /dev/ttyS3

If you use a non-standard serial device, contact your device provider for setup information. Check your serial device, e.g. /dev/ttyS0, by command

```
ls -l /dev/ttyS0
crw-rw---- 1 root  tty    4, 64 Jul 18 1994 /dev/ttyS0
```

Above message means, if you are not user "root" and not a member of group "tty," then you haven't the read/write privilege to device ttyS0. To gain read/write privilege of ttyS0 to all user, you should "su root" that make you became root temporarily then command

```
chmod a+rw /dev/ttyS0
```

And check again

```
ls -l /dev/ttyS0
crw-rw-rw- 1 root  tty    4, 64 Jul 18 1994 /dev/ttyS0
```

Now you obtain the access to ttyS0.

However, opened read/write privilege maybe damage your system security. If you are not familiar with privilege to the file system of Unix, please read document of your Linux box for detail information. The structure of the i7k directory is looked like

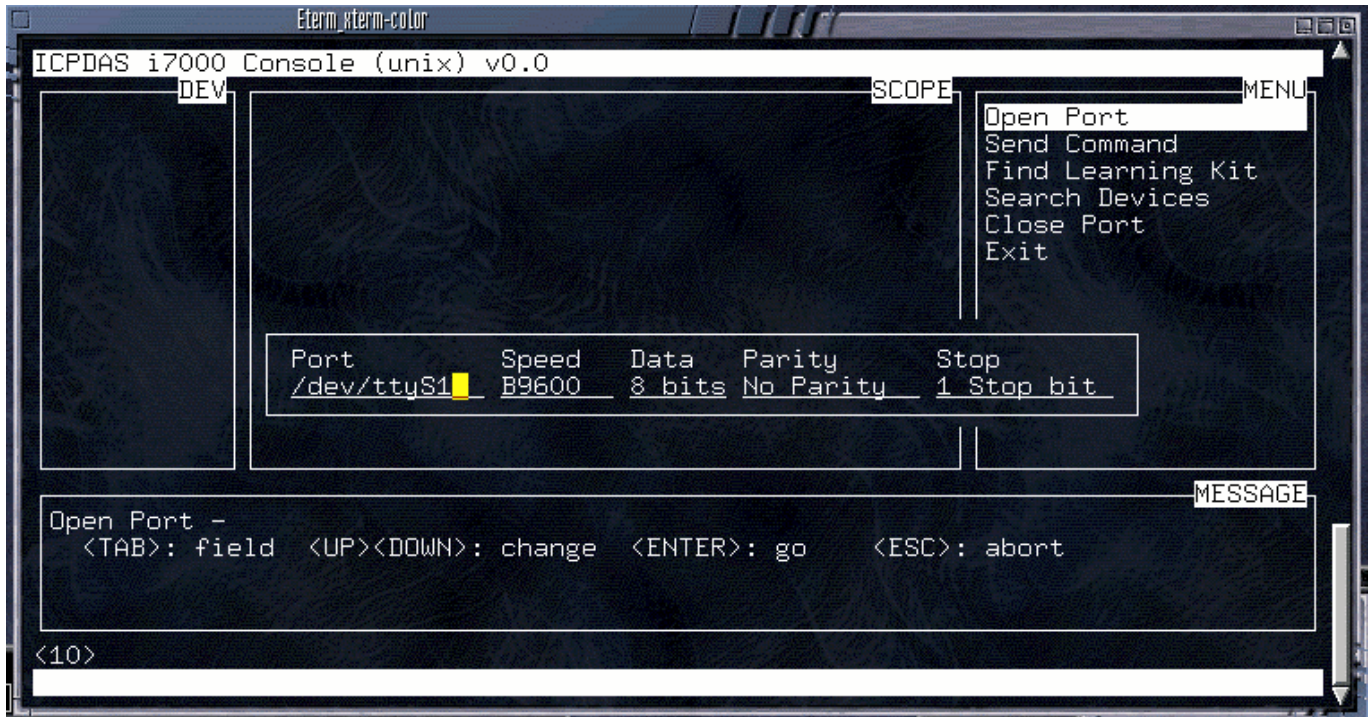
| | | | |
|---|---|-----------|---------------------------------------------------------|
| — | — | i7k/ | I7k_*.n. n. n, root directory of i7k package |
| | — | HTML/ | HTML source code tour |
| | — | i7k/ | Codes of i7k programming interface |
| | — | I7K.TXT | Functions reference for i7k.c |
| | — | Makefile | Make file for GNU make |
| | — | README | Read this file |
| | — | SIO.TXT | Functions reference for sio.c |
| | — | i7000.c | Codes wrapped from I7000.DLL for 7000 series |
| | — | i7k.c | Codes for basic send/read function for 7000/8000 series |
| | — | i8000.c | Codes wrapped from I7000.DLL for 8000 series |
| | — | i87000.c | Codes wrapped from I7000.DLL for 87000 series |
| | — | msw.c | Codes for wrapping i7000.c |
| | — | sio.c | Codes for basic serial port manipulation |
| | — | timer.c | Timer codes used by sio and i7k |
| | — | i7kon/ | Utility i7kon |
| | — | include/ | Head files |
| | — | Makefile | |
| | — | codes.h | Characters definitions |
| | — | common.h | Common definitions |
| | — | debug.h | Macros for debugging |
| | — | i7000.h | Head of i7000.c |
| | — | i7k.h | Head of i7k.c |
| | — | i8000.h | Head of i8000.c |
| | — | i87000.h | Head of i87000.c |
| | — | msw.h | Head of msw.c |
| | — | sio.h | Head of sio.c |
| | — | timer.h | Head of timer.c |
| | — | iw/ | iWarp server |
| | — | iwclient/ | iWarp client |
| | — | lib/ | |
| | — | libi7k.a | Library i7k |
| | — | misc/ | Miscellaneous programs for test |
| | — | present/ | Materials for presentation |
| | — | samples/ | Sample codes show you how to use libi7k.a |

i7kon

The i7kon is a text mode console tool that allows you to search modules and send manual commands via the opened serial port. The i7kon can be run from a text mode system console or an X terminal. You can run the i7kon under a terminal connected to a remote host by the Telnet for sending command to the modules connected on the host.

The i7kon uses the library NCURSES (5.0) to manipulate screen. If your system hasn't the NCURSES installed, you can get it from <http://www.gnu.org/software/ncurses/ncurses.html>. Again, you must have the read/write privilege to serial device to run i7kon.

Picture is a screenshot of the i7kon run under the Eterm X terminal.



The command "Open Port" opens a serial port with parameters before other operation. The command "Send Command" allows you to send a manual command to the opened serial port. The command "Find Learning Kit" searches I7000 modules by address 01 for 7012, 02 for 7021, and 03 for 7060. The command "Search Devices" searches modules by the given ranges of address and baud-rate. The command "Close Port" closes current opened serial port. The command "Exit" closes serial port if it is opened, and exits.

The frame DEV displays the names of modules found by search-command. The frame SCOPE shows the data sent to and received from the port. Use Up-down arrow-keys and press Enter to choose and execute command from frame MENU. The frame MESSAGE displays the commands' status, tips, and response.

iWarp

The iWarp is a demonstration program that allows you to control your modules across the Internet. The iWarp has two parts – the server side **iw** and the client side **iwc**. The server side runs “iw” on the remote host which has 7000/8000 modules connected. The Client side runs “iwc” on the local host which intends to control the modules.

The iWarp is included in the i7k package, but the root-make does not build the iWarp by default. To build the iw (server,) just type “make” under the directory of iw. Before make iw, you should edit file “main.c,” change the definition of SIO_PORT for serial port assignment. Then you must edit file /etc/services to add the service “iwarp” since iw looks it for port number, for example, register iwarp as port number 1500 with protocol TCP

```
iwarp      1500/tcp      # Internet Warp Service
```

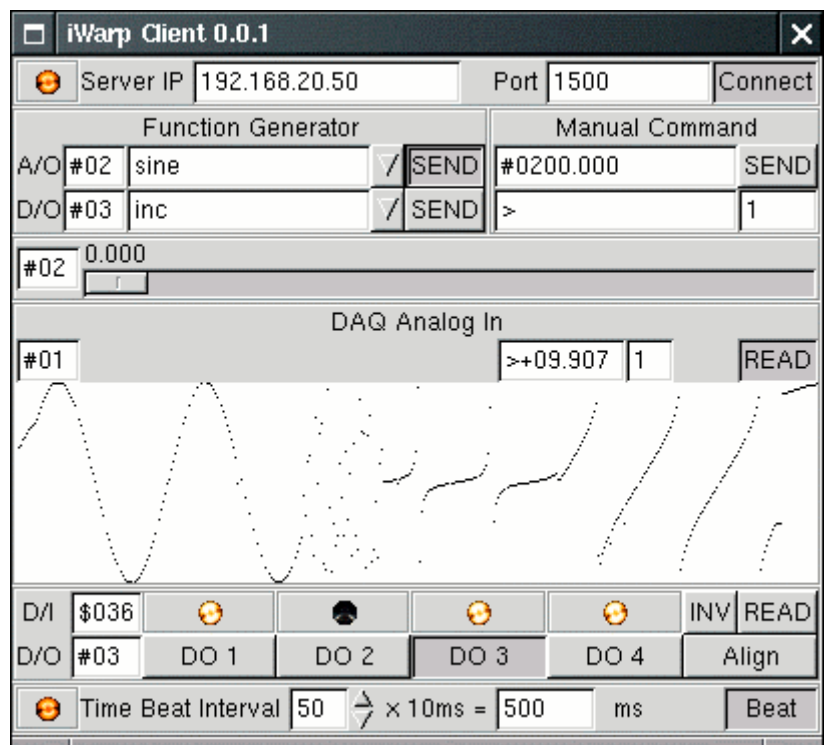
You must have read/write privilege to serial device to run iw.

The iwc (client) is an X GUI application that is written with GTK (1.2) library. If your system hasn't GTK installed, you can get it from <http://gtk.org/>. Type following commands under the iwc directory to build

```
make distclean
sh configure      or      sh ./configure
make
```

Once make is completely successful, the iwc is ready to run from directory src.

Picture is the screenshot of the iwc run to connect remote host 192.168.20.50 at port 1500. The lamp left side of Server IP is turned on for what means the connection between client and server sides has been successfully set up.



Programming

The i7k is distributed with source code. You can modify it to suit your usage or just link it into your application. Once you unzipped the i7k package, there are seven source code modules under the sub-directory i7k; they are timer, sio, i7k, msw, i7000, i8000, and i87000.

The module timer contains functions for time-measurement that is used by module i7k. The module sio is the basic open/close manipulation of serial port. The module i7k is the basic send/read function for 7000/8000. Include file i7k.h and link modules timer.o, sio.o, and i7k.o into your application is enough for sending command to and reading response from your 7000 and 8000 series modules. Please read file README under directory i7k for more information, and read files SIO.TXT and I7K.TXT for function reference.

Following is the function briefs for module sio.c

| | |
|-----------------------|------------------------------------------------------------------------|
| sio_close | close a opened serial port |
| sio_open | open a serial port and set to default non-canonical mode |
| sio_set_baud | set baud-rate of a opened serial port |
| sio_set_canon | set a opened serial port to canonical mode |
| sio_set_noncan | set a opened serial port to non-canonical mode |
| sio_set_timer mode | set time-out for a opened serial port that works on non-canonical mode |

And the function briefs for i7k.c

| | |
|-------------------|-----------------------------------------------------------|
| i7k_read | read response |
| i7k_read_cs | read response with checksum |
| i7k_readt | read response with timeout |
| i7k_readt_cs | read response with checksum and timeout |
| i7k_send | send command |
| i7k_send_cs | send command with checksum |
| i7k_send_read | send command then read response |
| i7k_send_read_cs | send command then read response with checksum |
| i7k_send_readt | send command then read response with timeout |
| i7k_send_readt_cs | send command then read response with checksum and timeout |

Include sio.h and link sio.o or libi7k.a to use functions of sio.c. Include i7k.h and link i7k.o or libi7k.a to use functions of i7k.c.

Programming with I7000 Wrapped Functions

The modules i7000, i8000, and i87000 are wrapped from the I7000.DLL. If you like to use function that is like to the function provided by I7000.DLL, you should compile and link your program with file msw.h and library libi7k.a.

Please take notice that the difference of time-measurement between the Linux and the Windows when you are using the wrapped functions. The unit of serial port timeout is tenth of one second (1/10 sec) on Linux but millisecond (1/1000 sec) on Windows. The unit of the returned value of the time expended by the called function is microsecond (1/1000000 sec) on Linux but millisecond on Windows. For example

| Function | Argument | Unit on Linux (Sec) | Unit on Windows (Sec) |
|--------------------|-----------------|--------------------------------|--------------------------------------|
| Send_Receive_Cmd() | wTimeOut | 1/10 | 1/1000 |
| Send_Receive_Cmd() | wT | 1/1000000 | 1/1000 |

Samples

The directory "samples" contains sample codes show you that how to use the basic i7k/sio functions and I7000 wrapped functions with library libi7k.a. Please read file README and source codes for further details.

7.8 LabVIEW Driver for Host-PC

Note: The new release version will be available as a different name of "DCON_Labview". Please refer to CD:\Napdos\driver\DCON_Labview\ReadMe.txt

Installation: Double click on CD:\napdos\7000\NAP7000V\setup\setup.exe or CD:\napdos\driver\DCON_Labview\setup\setup.exe

Manual: The manual is located at folder of \DAQPro\DCON_Labview\Manual\ after installation.

LabVIEW is an industrial's graphical programming system developed by National Instruments. With LabVIEW, user can quickly designed the user interface and control program as a block diagram. The DCON_Labview (or NAP7000V) provides many driver VIs & demo VIs which can be used by LabVIEW 4.0 & above. These driver VIs will call DLLs supported by DCON_DLL. The demo VIs will call driver VIs to control 7000/8000 family. So the user manuals of NAP7000V are all same as DCON_DLL. Refer to Section 7.3 for DCON_DLL installation.

After the NAP7000V is installed, the UART.DLL and I7000.DLL will be copied into
C:\WINDOWS\SYSTEM (for WINDOWS 95/98)
or
C:\WINNT\SYSTEM32 (for WINDOWS NT).

The item "DAQPro NAP7000v" will be added into the "Add/Remove Programs" (under "Control Panel"). And the sub-directory is given as follows:

The default [Base Directory] is "\DAQPro\NAP7000v".

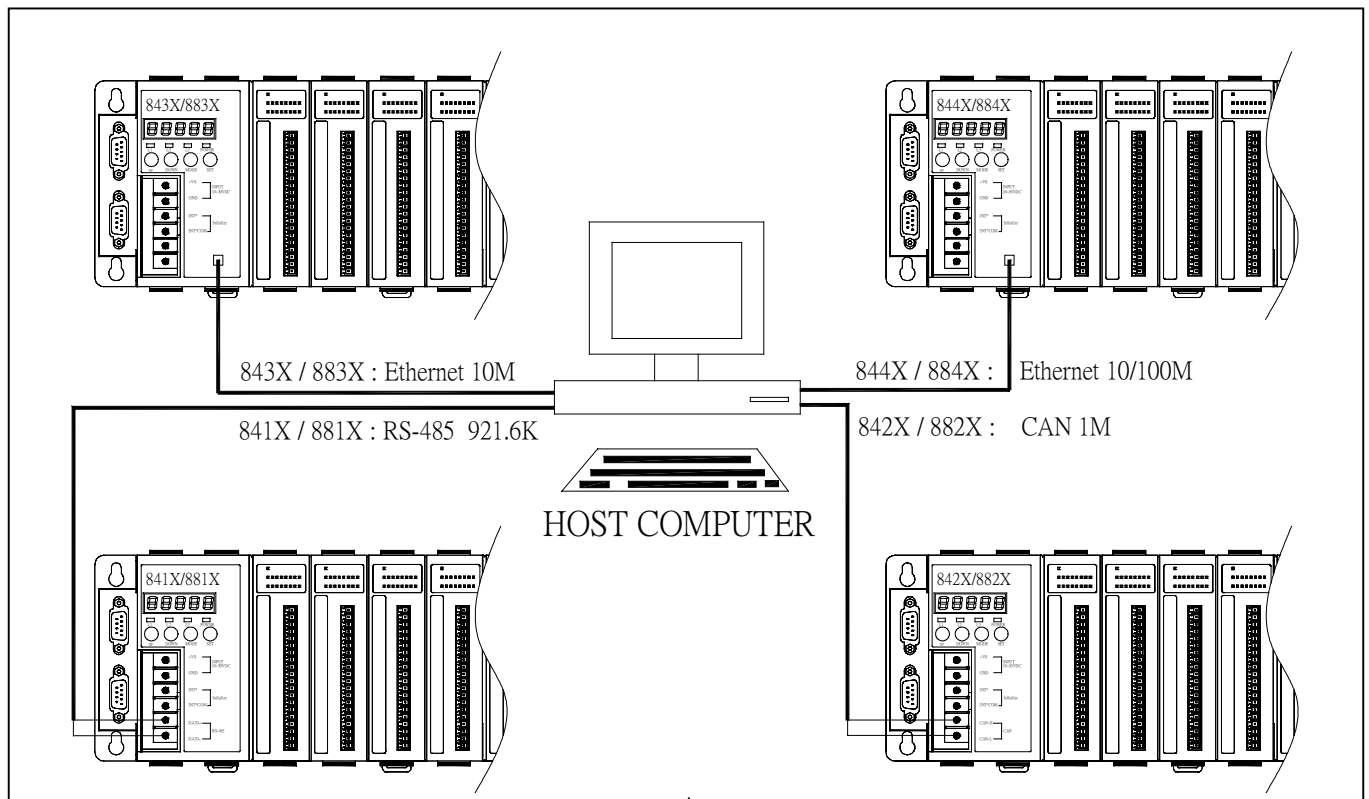
[Base Directory] <-- the directory you selected to setup

```
|--\Driver
| |--\i7000.dll <-- dynamic linking library
| +--\uart.dll <-- dynamic linking library
|--\7000LV
| |--\Readme.txt <-- Demo program list
|--\Manual
| |--\NAP7000P.pdf <-- the software manual
| |--\FAQ.pdf <-- Question and Answer
| | <-- Portion of the "Getting Start" manual.
| |--\Start.pdf <-- Getting Start
| | <-- Portion of the "Getting Start" manual.
| +--\Watchdog.pdf <-- Dual-Watchdog
| <-- Portion of the "Getting Start" manual.
+--\readme.txt <-- this file.
```

Chapter 8: Hardware System Overview

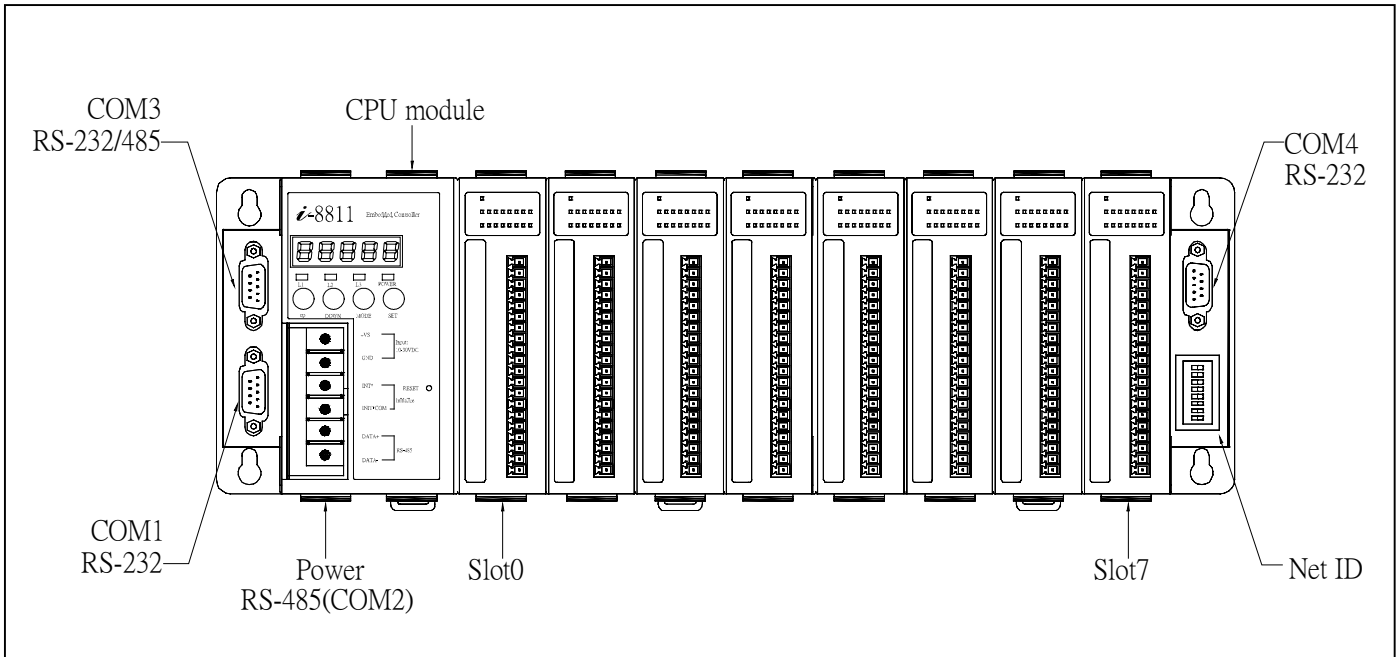
8.1 Hardware of Main Control Unit

There are about 20 main control units for different applications. There will be more main control units in the future. These main control units can be link to host-PC as following:



- Main control units
- 841X/881X → link to PC by RS232 or RS-485 network
 - 842X/882X → link to PC by RS232 or DeviceNet or CANopen
 - 843X/883X → link to PC by RS232 or Ethernet 10M network
 - 844X/884X → link to PC by RS232 or Ethernet 10/100M network
 - more → link to host-PC by other network

The front view of main control unit is given as follows:

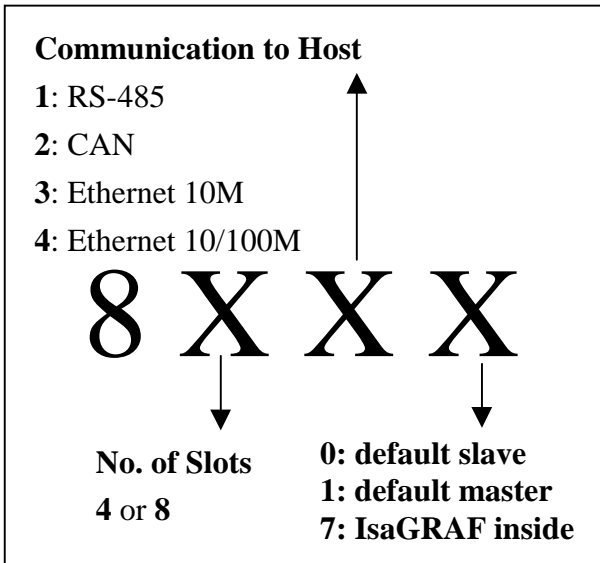


The key components of main control unit are given as following:

- power converter & RS-485 module: convert +10V ~ +30V DC to 5V DC & converter isolated RS-485 signal to TTL signal.
- CPU module: includes CPU, RAM, ROM & control circuit
- COM1: RS-232 for program download/debug, it can link to general RS-232 device or MMI after program download/debug stage
- COM2: it is designed for link to host-PC as follows:

| | |
|---------------------------|--------------------------------------------|
| COM2=RS-485 | → 841X/881X |
| COM2=CANopen or DeviceNet | → 8420/8820: DeviceNet, 8421/8821: CANopen |
| COM2=Ethernet 10M | → 843X/883X |
| COM2=Ethernet 10/100M | → 844X/884X |
- COM3: RS-232 or RS-485
 RS-232: link to general RS-232 device
 RS-485: link to 87K4/5/8/9 & 7000 family for serial I/O expansion
- COM4: RS-232 for modem device.
 (Note: the 84X0/88X0 does not support COM4)
- Slot0 to slot7: I/O expansion slots for parallel/serial I/O modules.
 (Note: 84xx only support slot0 to slot3)
- NET ID dip switch: set the NET ID of this main control unit. Host-PC can link to multiple main control units together by COM2, so the NET ID of main control unit must be unique & different from the others. If the user set the duplicated NET ID, the host-PC will lost control to these two main control units shared the same NET ID. So user has to care about the NED ID setting.
- S-MMI: provide a cost-effective MMI to replace monitor & key board.

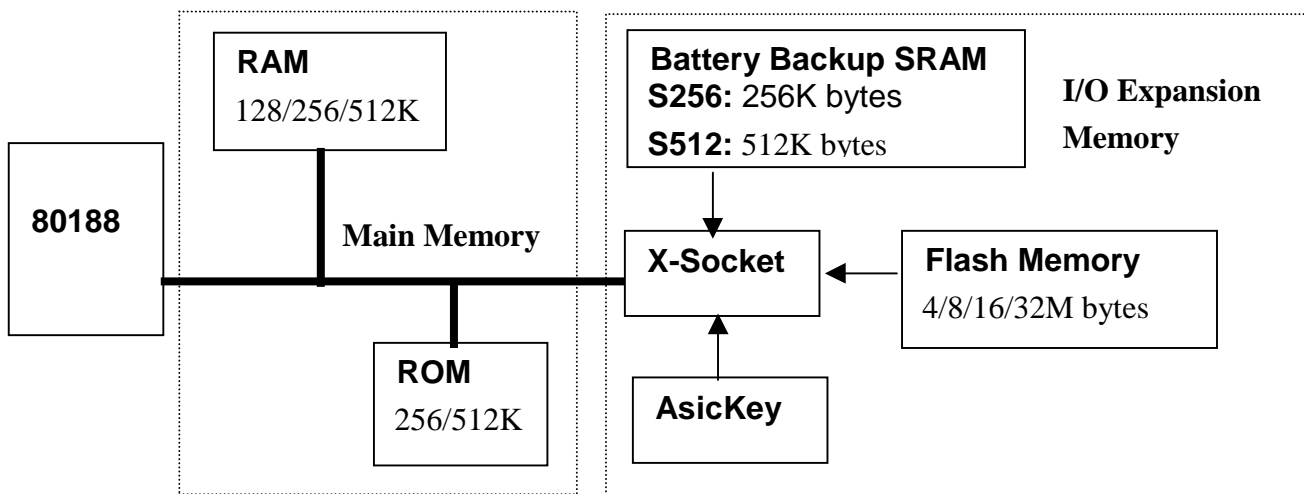
The model number of main control unit is given as following:



- **Master device:** can perform all control operations without Host
- **Slave device:** most of control operations are executed on Host
- Download new application program & AUTOEXEC.BAT to slave device can change it to master device.
- Master device link to host for read/execute command & send back the execution result.

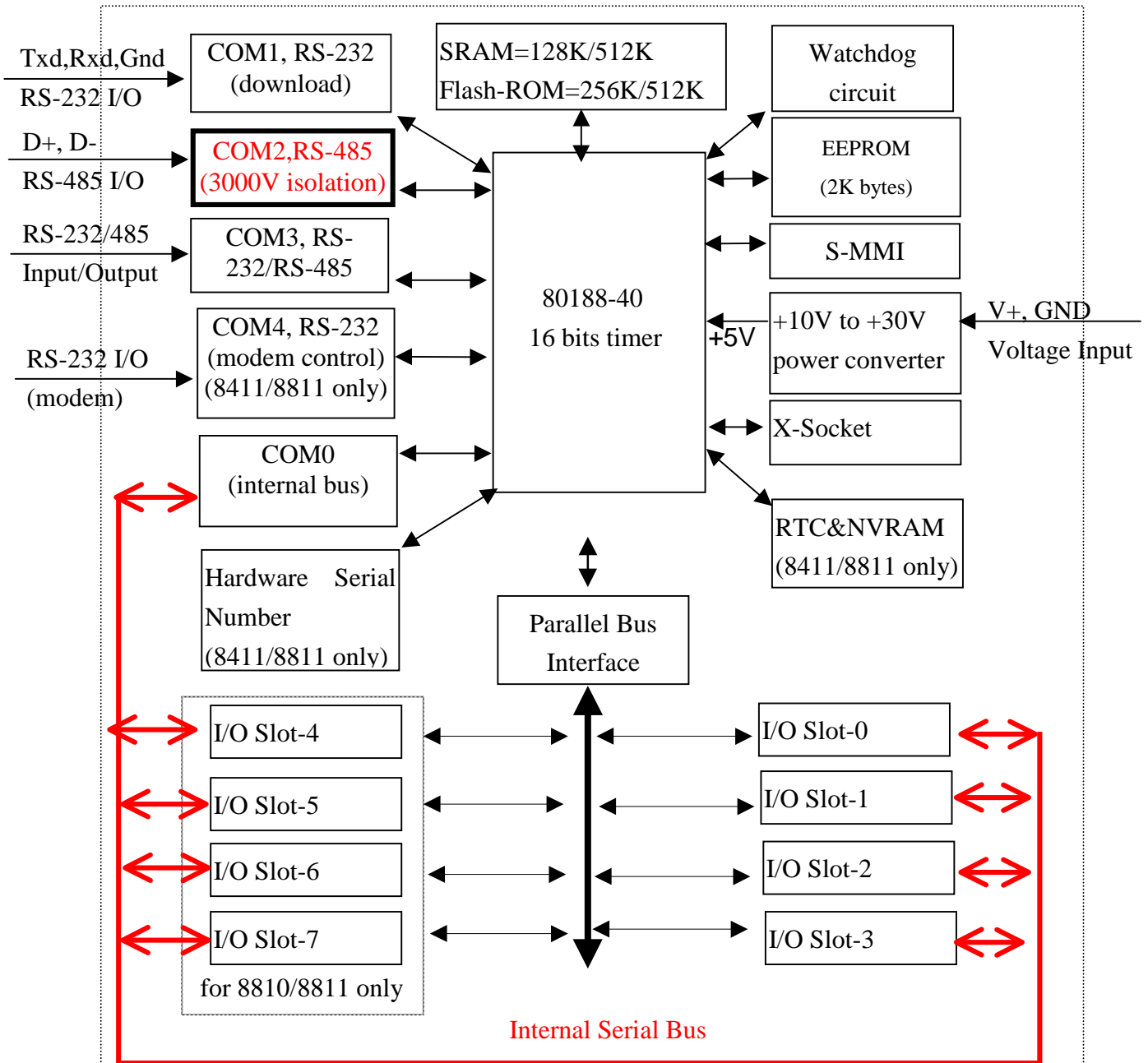
The 8410/8810 is default download two program, 8K485.EXE & AUTOEXEC.BAT, in the flash ROM. The 8K485.EXE is a utility which will make 8410/8810 work like 7000 family. So the 8410/8810 will act as a slave device since the first shipping. If the user download new user program & AUTOEXEC.BAT, the 8410/8810 can be changed to master device.

The memory configuration of main control unit are given as following:



- Note:
- 1: parallel I/O module, 8072, provide two X-Sockets & one printer port.
 - 2: four 8072 can be installed in 84XX & eight 8072 can be installed in 88XX.
 - 3: The max. size of I/O expansion memory is limited by number of X-Socket installed.

The block diagram of 841X/881X is given as follows:

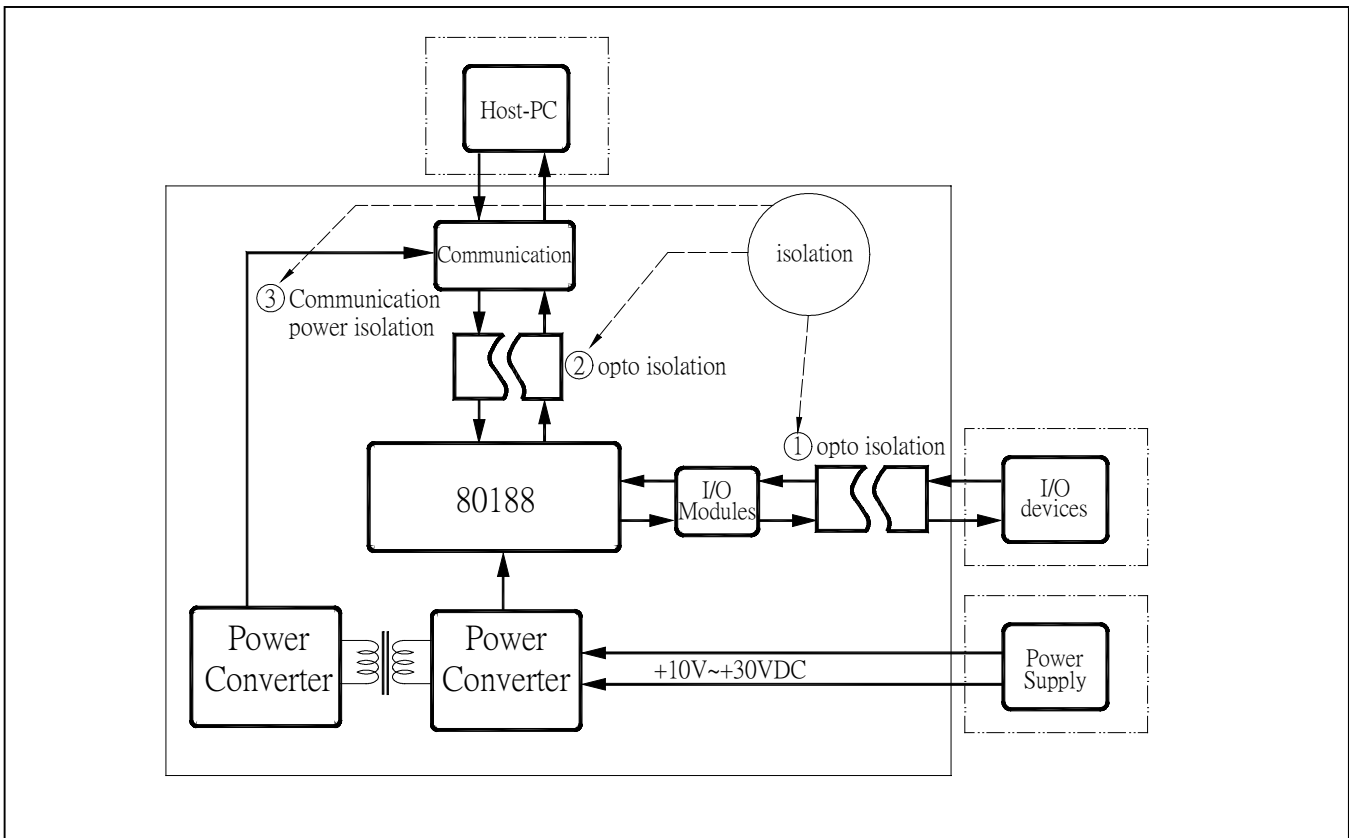


Block Diagram of 8410/8411/8810/8811

There are many transient electronic noises in the industry application. The system isolation design is used to protect these noises from communication line & I/O modules. The system isolation voltages of 841x/881x are given as following:

- I/O modules → 3000V DC
- COM2 communication line → 2500V rms
- COM2 power line → 3000V DC

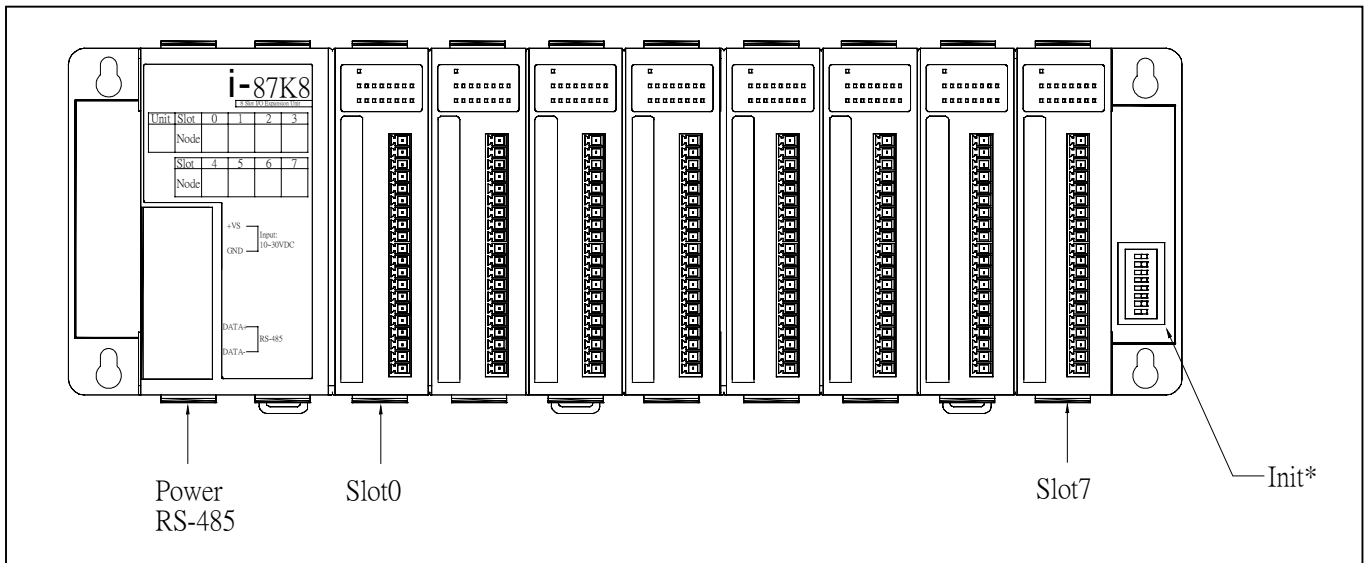
Note: 1: COM1/COM3/COM4 are non-isolated
 2: most of I/O modules are isolated
 3: some special I/O modules are non-isolated, for example, 8050
 4. the system isolation block diagram of main control unit is given as follows:



Note: some company calls it as “3-way isolation”.

8.2 Hardware of I/O Expansion Unit

There are four serial I/O expansion unit, 87K4/5/8/9. The front view of 87K8 is given as follows:



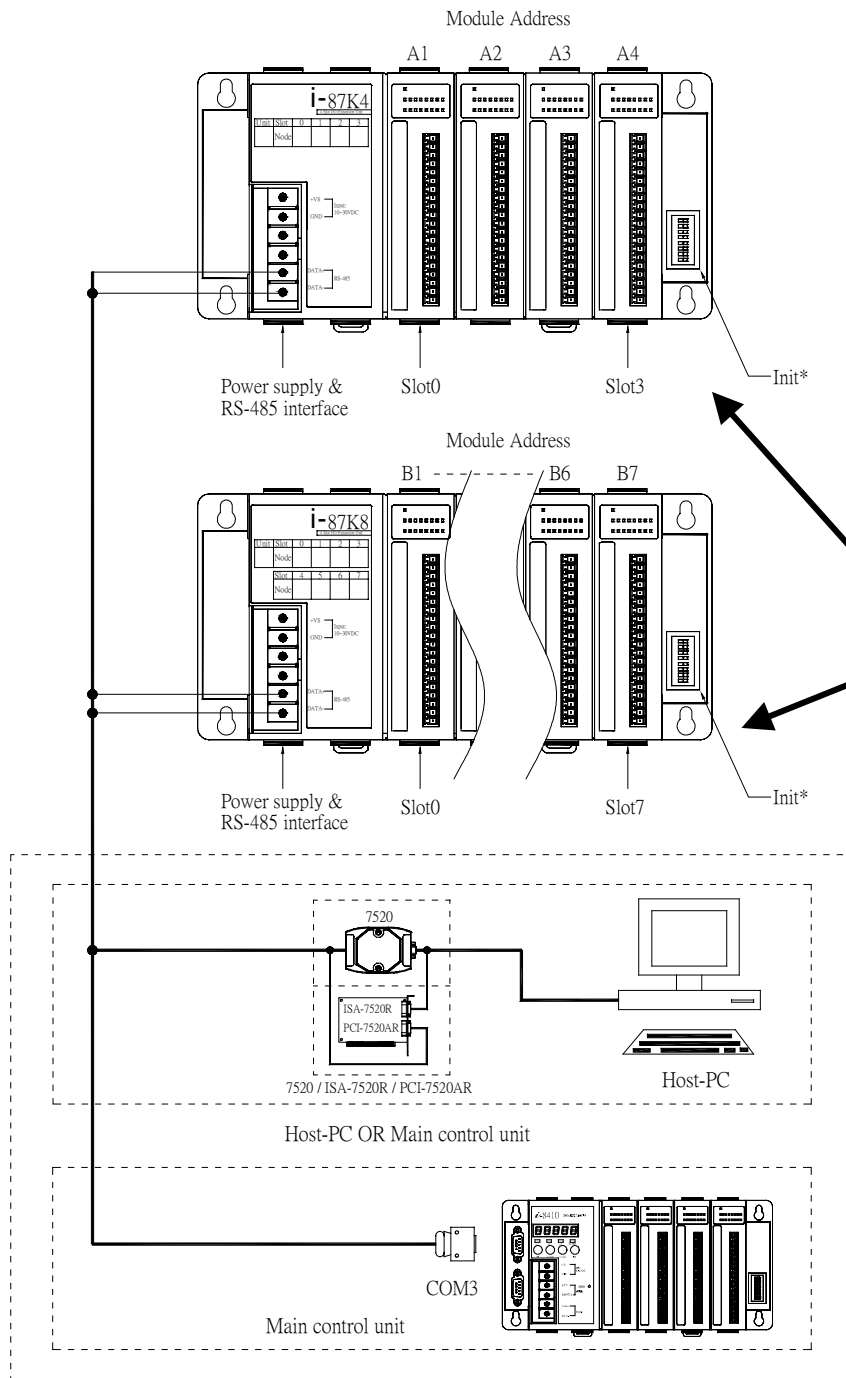
The key components of I/O expansion unit are given as following:

- Power converter & RS-485 module: convert +10V ~ +30V DC to 5V DC & converter isolated RS-485 signal to TTL signal.
- 87K4 supports slot0 to slot3
87K5 supports slot0 to slot4
87K8 supports slot0 to slot7
87K9 supports slot0 to slot8
- INIT* dip switch: set the serial I/O modules installed in the destination slot going to its initial state. (Refer to Section 1.3.1)

The 8K4/5/8/9 only provides hardware slots for serial I/O modules, it does not equip any address or communication related information. All configuration data, includes address & communication, are saved in the internal EEPROM of each serial I/O modules.

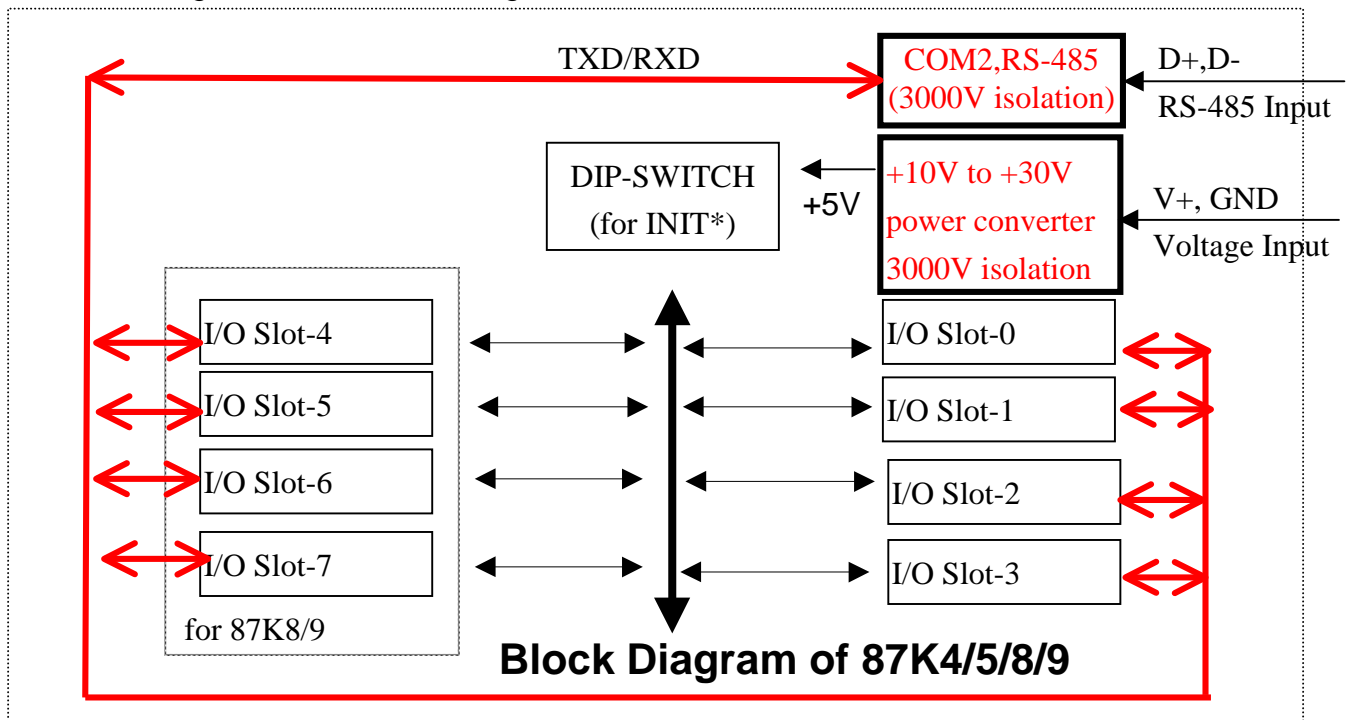
It is designed for serial I/O modules only. The parallel I/O modules can not be installed in 87K4/5/8/9.

The RS-485 of 87K4/5/8/9 is designed to link to COM3 of main control unit or 7520+Host-PC as following:



There can be multiple I/O expansion unit, 87K4/87K8, installed in the same RS-485 network.

The block diagram of 87K4/5/8/9 is given as follows:

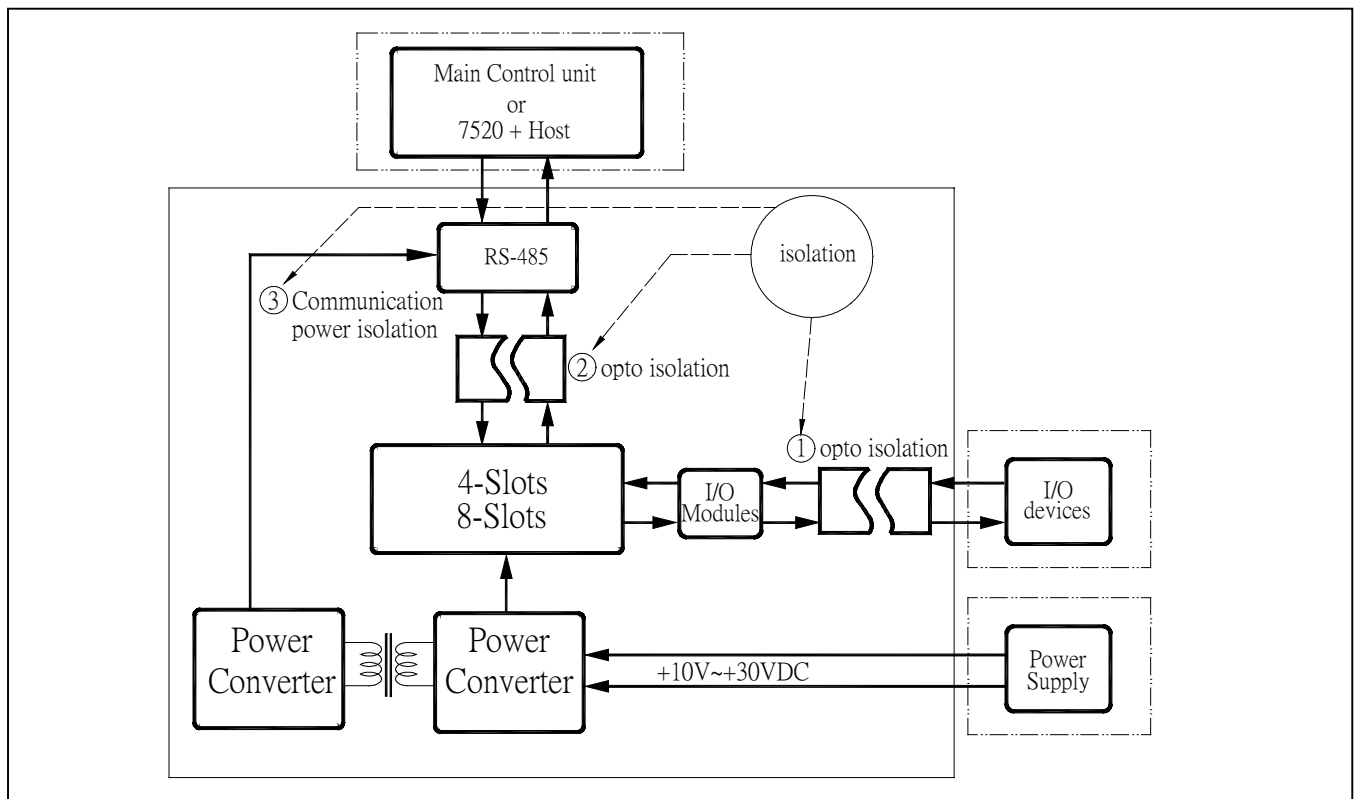


The 3-way isolation voltages of I/O expansion unit, 87K4/5/8/9, are given as following:

- I/O modules → 3000V DC
- RS-485 communication line → 2500V rms
- RS-485 power line → 3000V DC

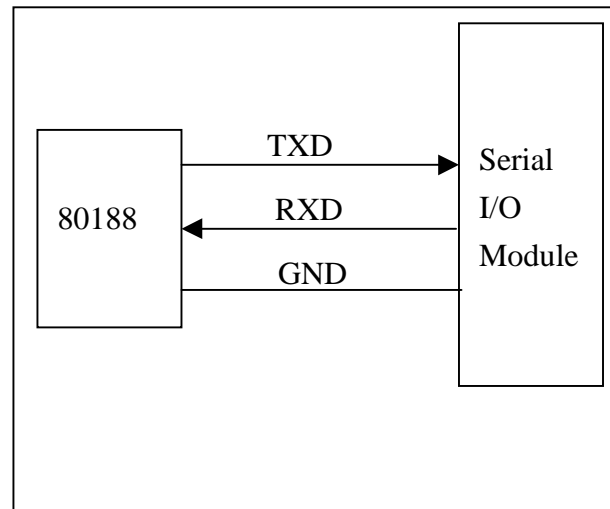
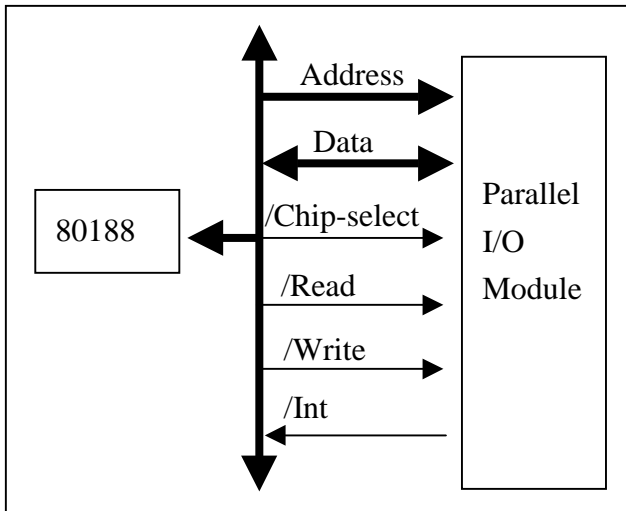
Note: Some special serial I/O modules are non-isolated, for example, 87051

The system isolation block diagram of I/O expansion unit is given as follows:



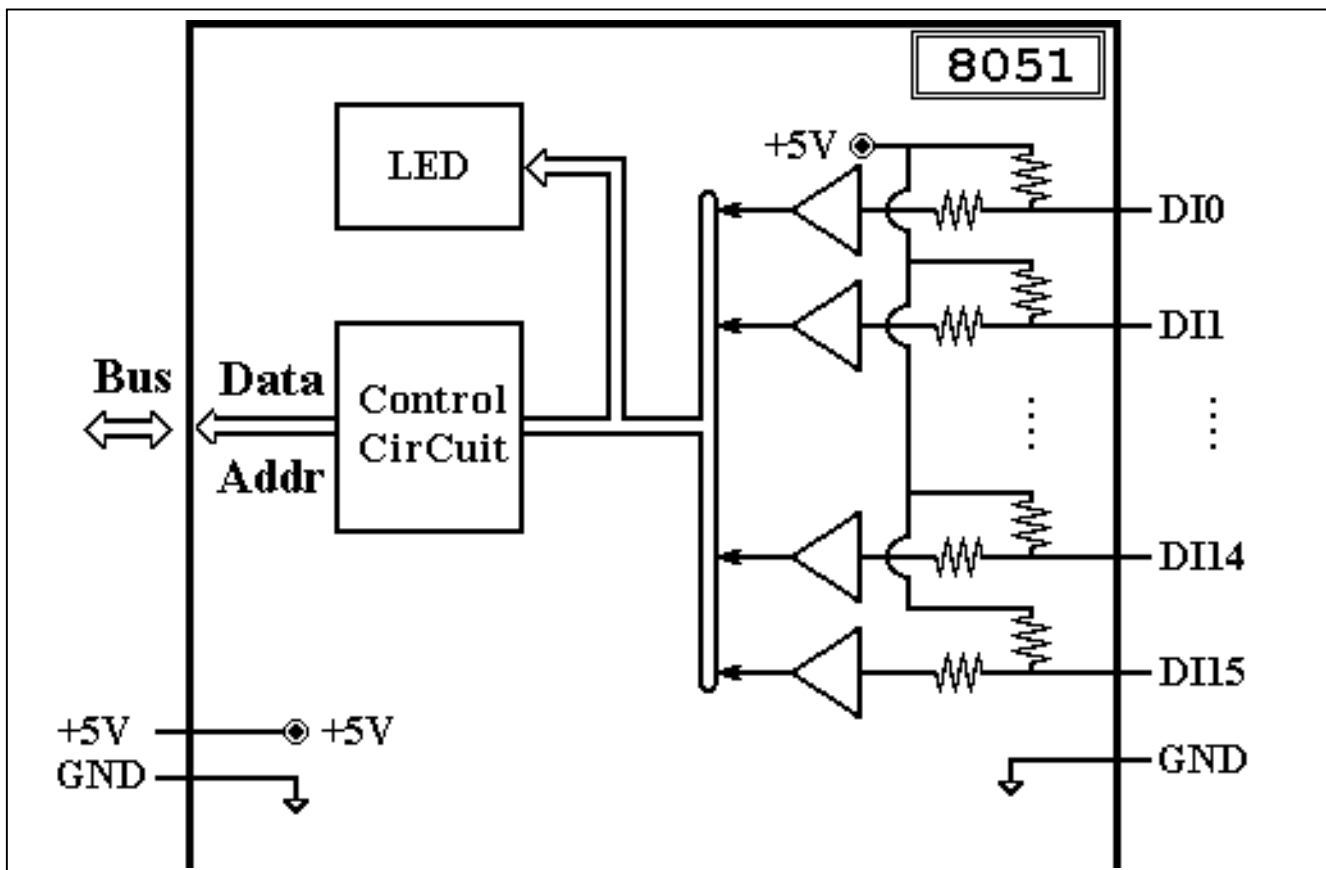
8.3 Hardware of Parallel I/O Module

The control signals between CPU module & serial/parallel I/O modules is given as following:

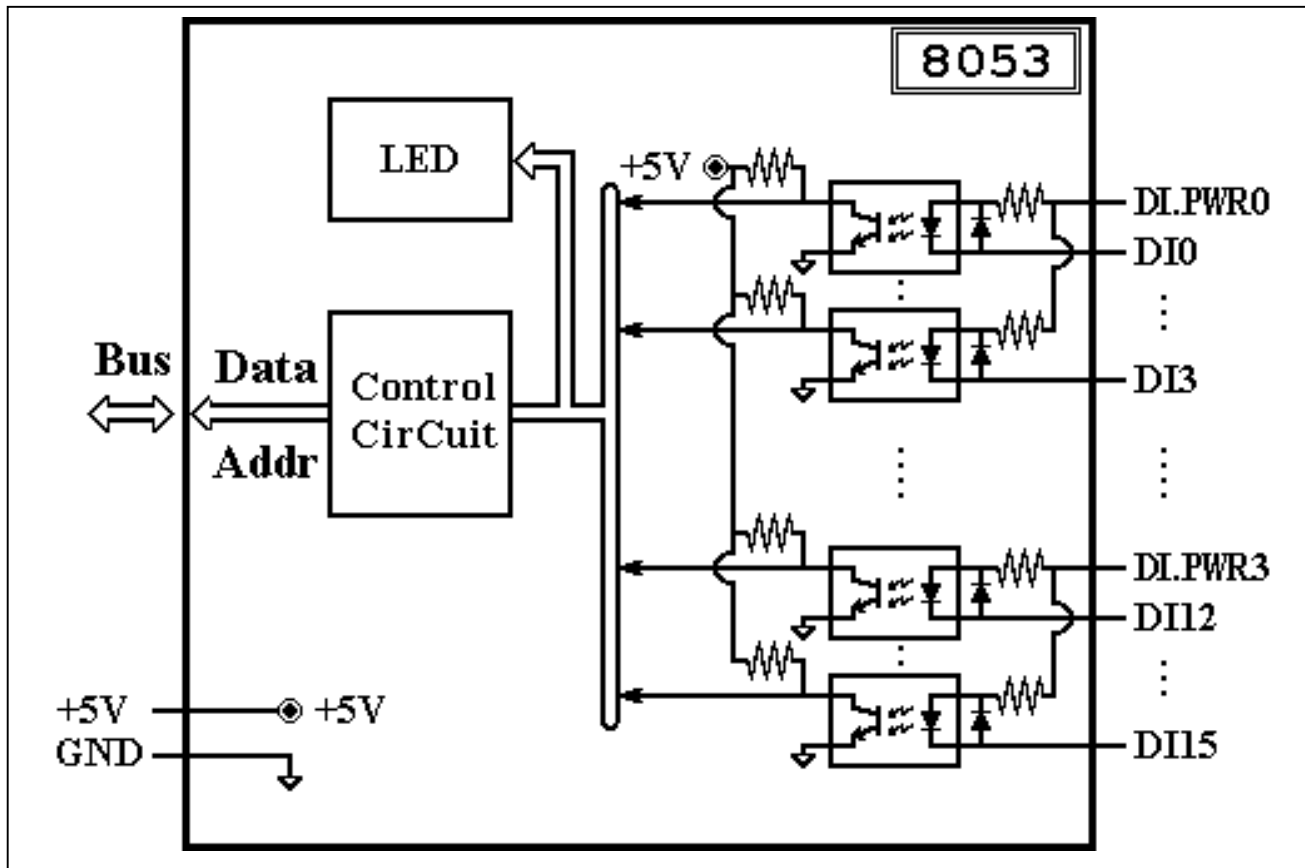


From above diagram, user can find the difference between parallel I/O modules & serial I/O modules as follows:

- parallel I/O modules → similar to ISA BUS I/O cards → high speed application
 - serial I/O modules → similar to 7000 family → low speed application
- 87K4/5/8/9 only provides TXD & RXD signals, so only serial I/O modules can be installed in it. The typical block diagram of non-isolated parallel I/O module is given as follows:

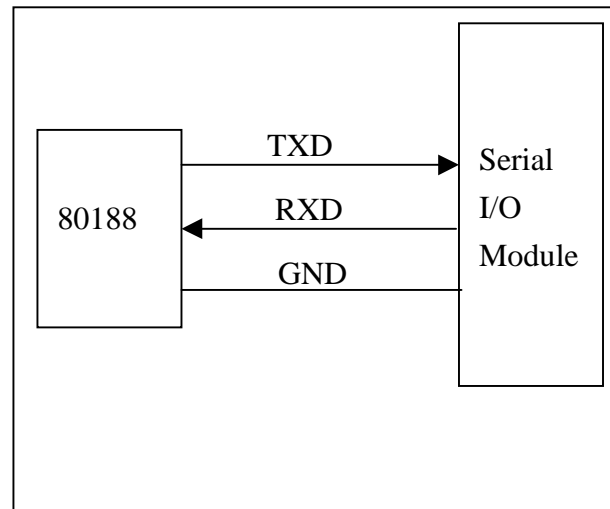
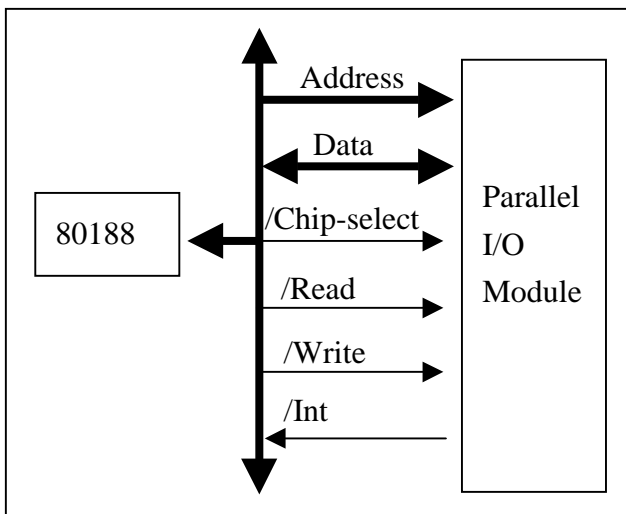


The typical block diagram of isolated parallel I/O module is given as follows:



8.4 Hardware of Serial I/O Module

The control signals between CPU module & serial/parallel I/O modules is given as following:

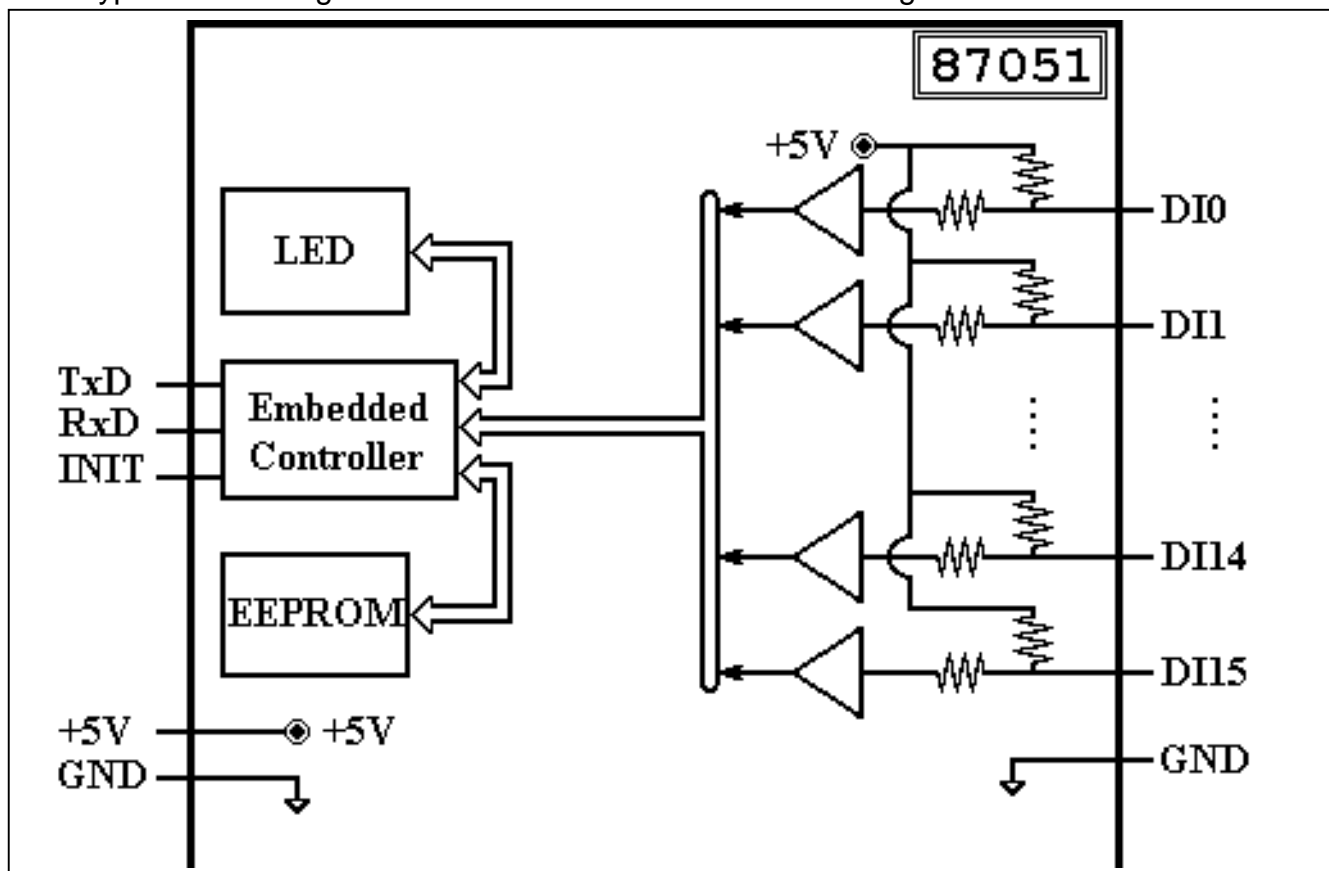


From above diagram, user can find the difference between parallel I/O modules & serial I/O modules as follows:

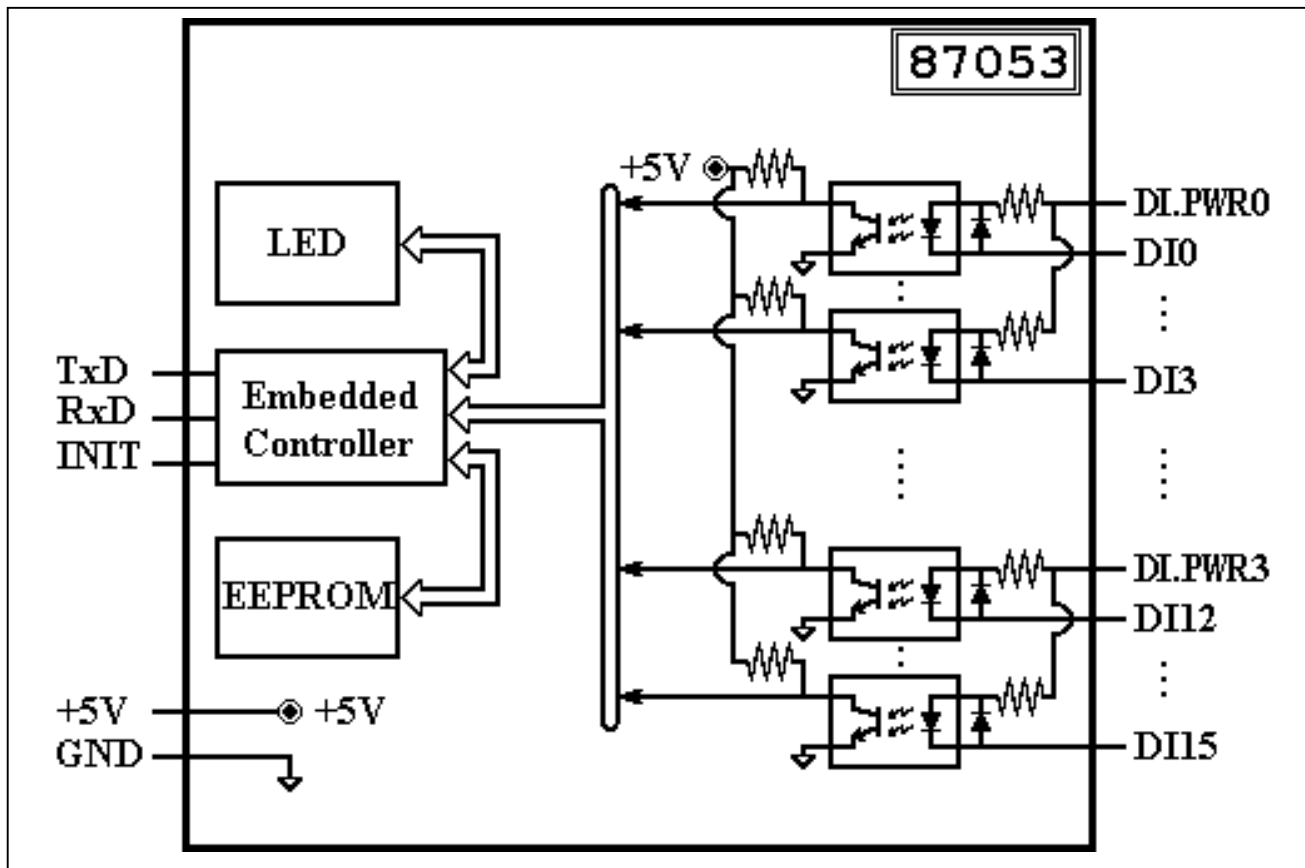
- parallel I/O modules → similar to ISA BUS I/O cards → high speed application
- serial I/O modules → similar to 7000 family → low speed application

87K4/5/8/9 only provides TXD & RXD signals, so only serial I/O modules can be installed in it.

The typical block diagram of non-isolated serial I/O module is given as follows:



The typical block diagram of isolated serial I/O module is given as follows:

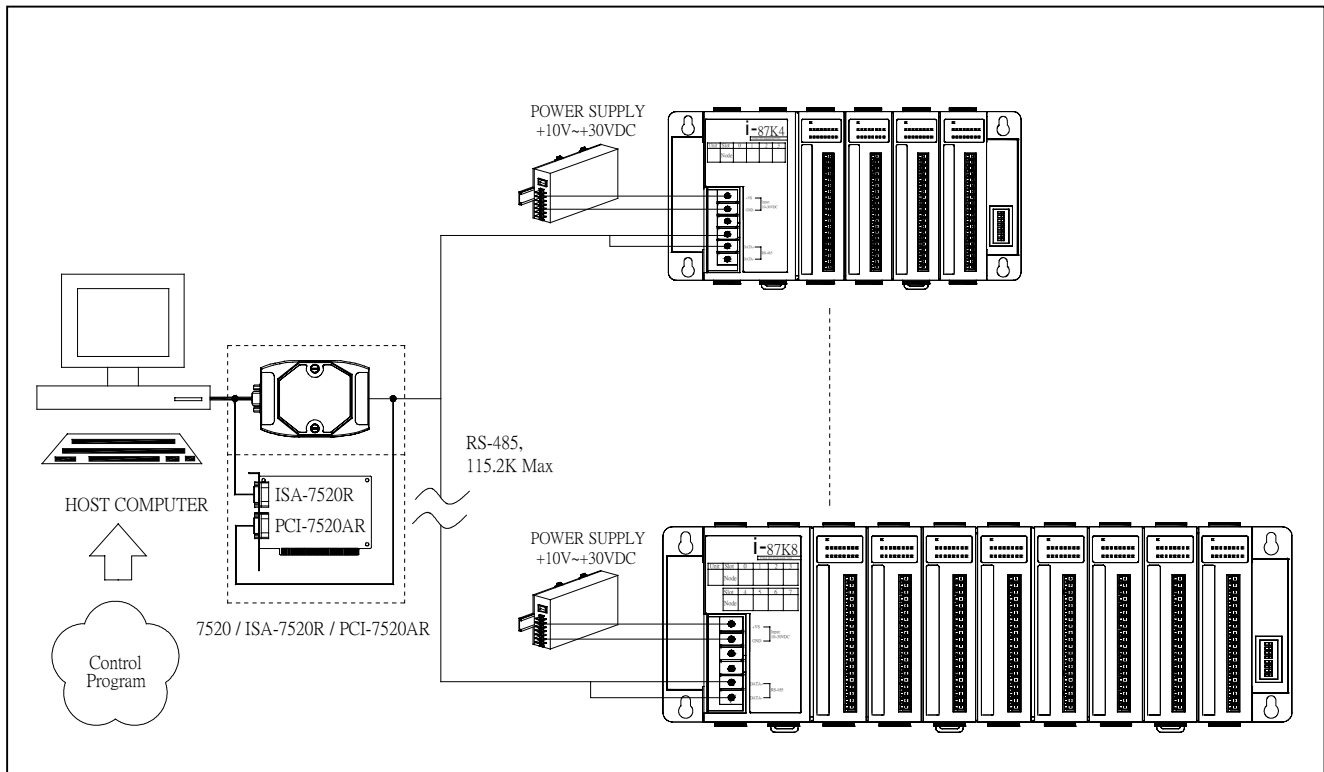


Chapter 9: Typical Applications Overview

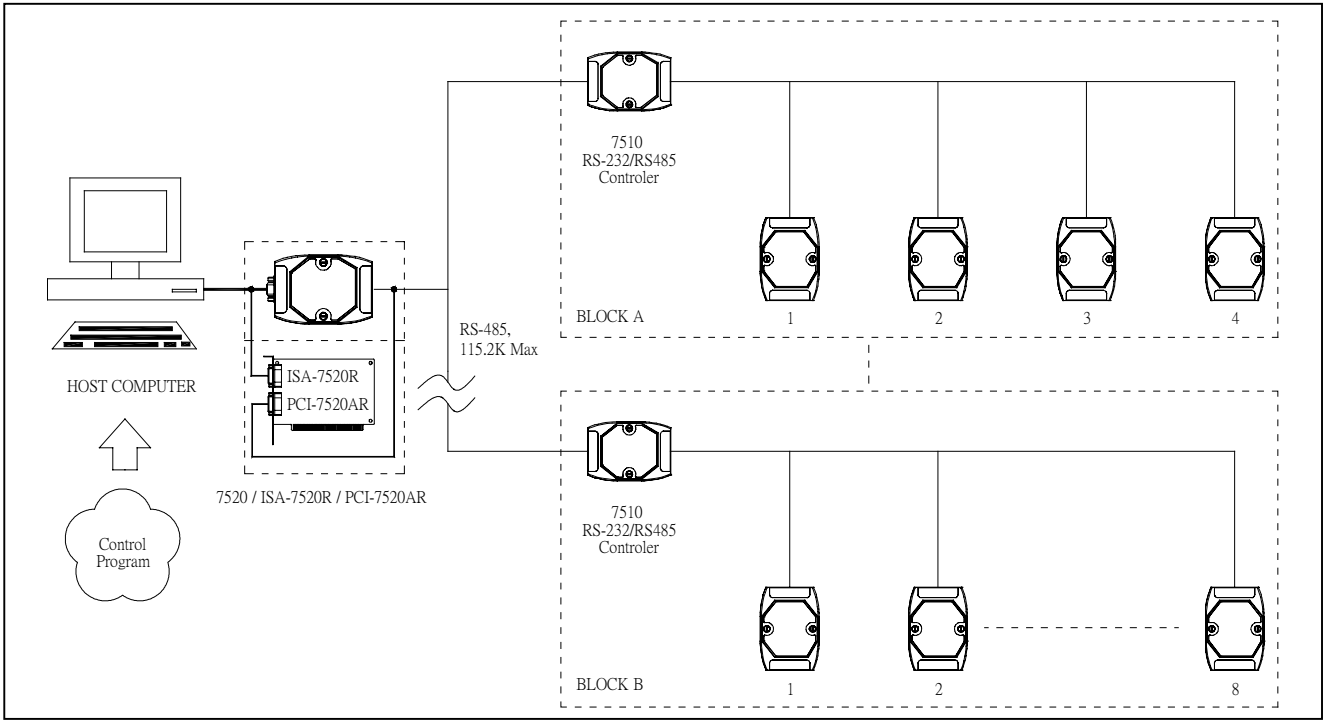
Before we get into the details, let's take a look at the basic system diagram. The typical applications can be divided into several configurations as following:

- configuration 1: Host-PC links to 87K4/5/8/9
- configuration 2: Using 841X/881X as a Slave Device
- configuration 3: Using 841X/881X as a Master Device
- configuration 4: High Density I/O Applications

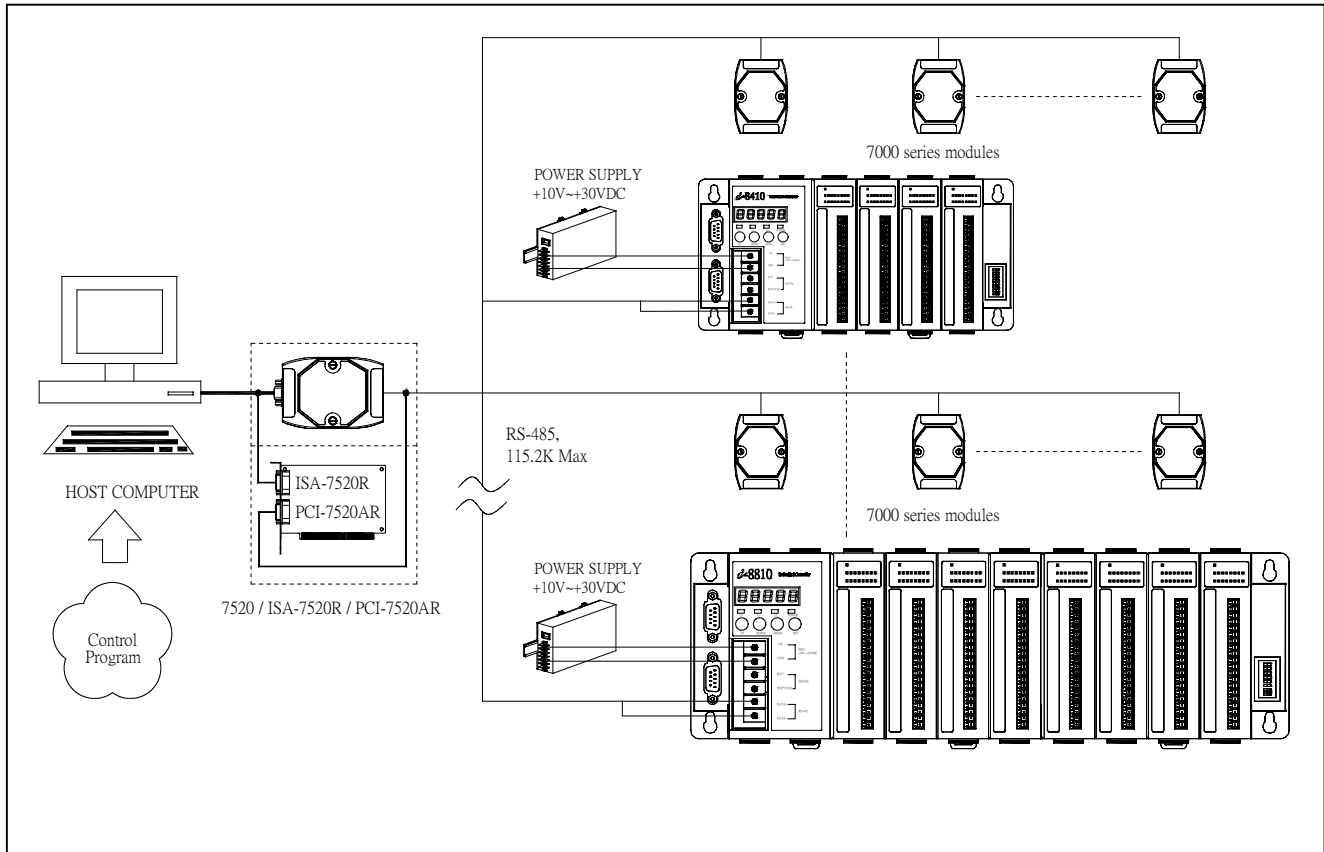
9.1 Using 87K4/5/8/9 Only



- The RS-232 of host-pc is link to a 7520 to convert the RS-232 signal to RS-485 signal.
- There can be multiple 87K4/5/8/9 installed in the same RS-485 network. Only the serial I/O modules, 87XXX, can be installed in the 87K4/5/8/9.
- All serial I/O modules must equip a unique module address. The module address of 87XXX can be set from 0x01 to 0xff. So the maximum number of 87XXX installed in this system is 255.
- The control program is stored in the host-pc.
- In this application, the 87XXX is equivalent to 7000 series as the following diagram:



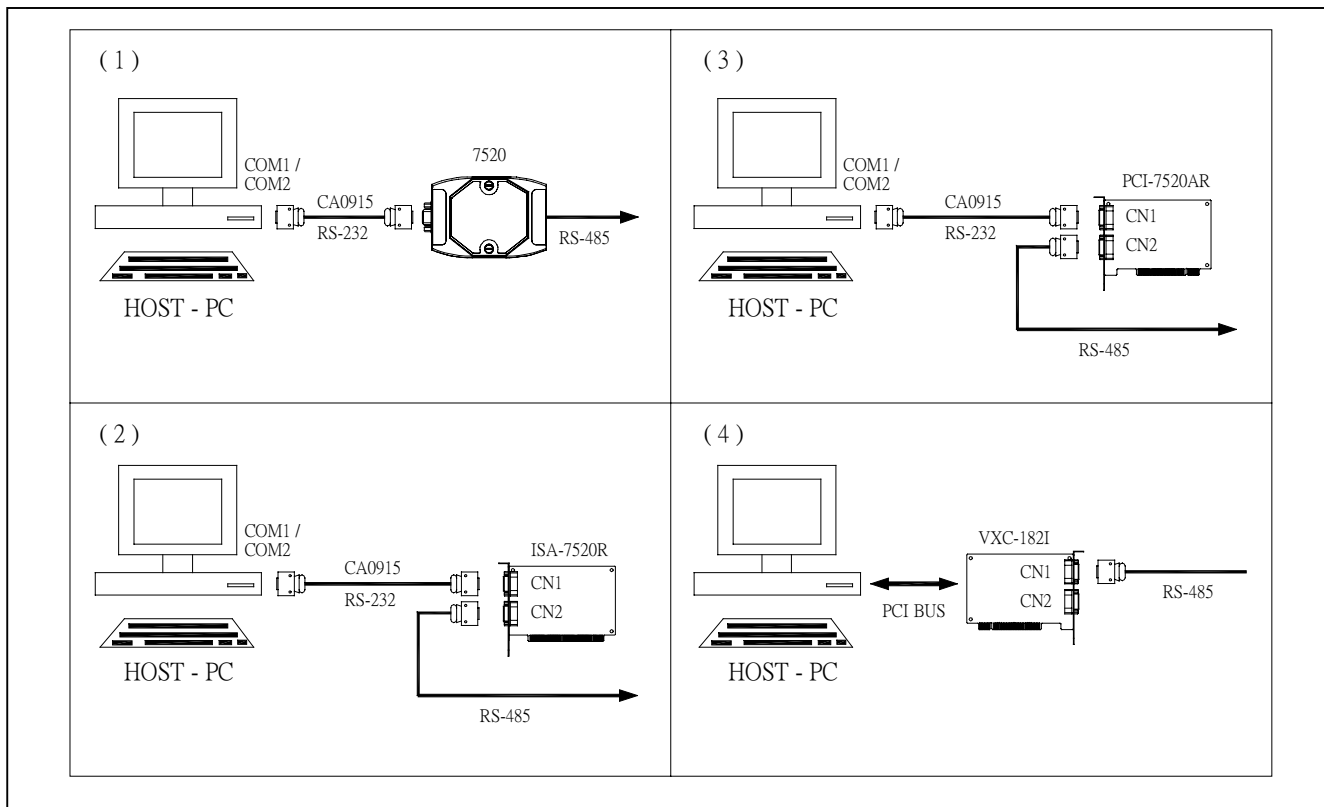
- Host-PC can control 87XXX & 7000 series in very similar way. The control program can send **\$AAM** command to read back the module ID, 87XXX & 7XXX will return different module ID.
- Host-PC can link to 87XXX & 7XXX at the same RS-485 network if all module IDs are different as follows:



The COM1 & COM2 of host-PC are RS-232 device. The 87K4/5/8/9 & 7000 series are RS-485 device. So the host-PC must convert the RS-232 to RS-485 as following:

- Configuration 1: COM1 or COM2 + 7520 → recommended solution for 7000 family
- Configuration 2: COM1 or COM2 + ISA-7520R → recommended solution for 8000 family
- Configuration 3: COM1 or COM2 + PCI-7520AR → recommended solution for 8000 family
- Configuration 4: VXC-182I → if both COM1 & COM2 are used by others

Note: The maximum speed of 87XXX & 7XXX modules is 115.2K BPS, so the speed of all these 4 configurations are limited to 115.2K BPS max.



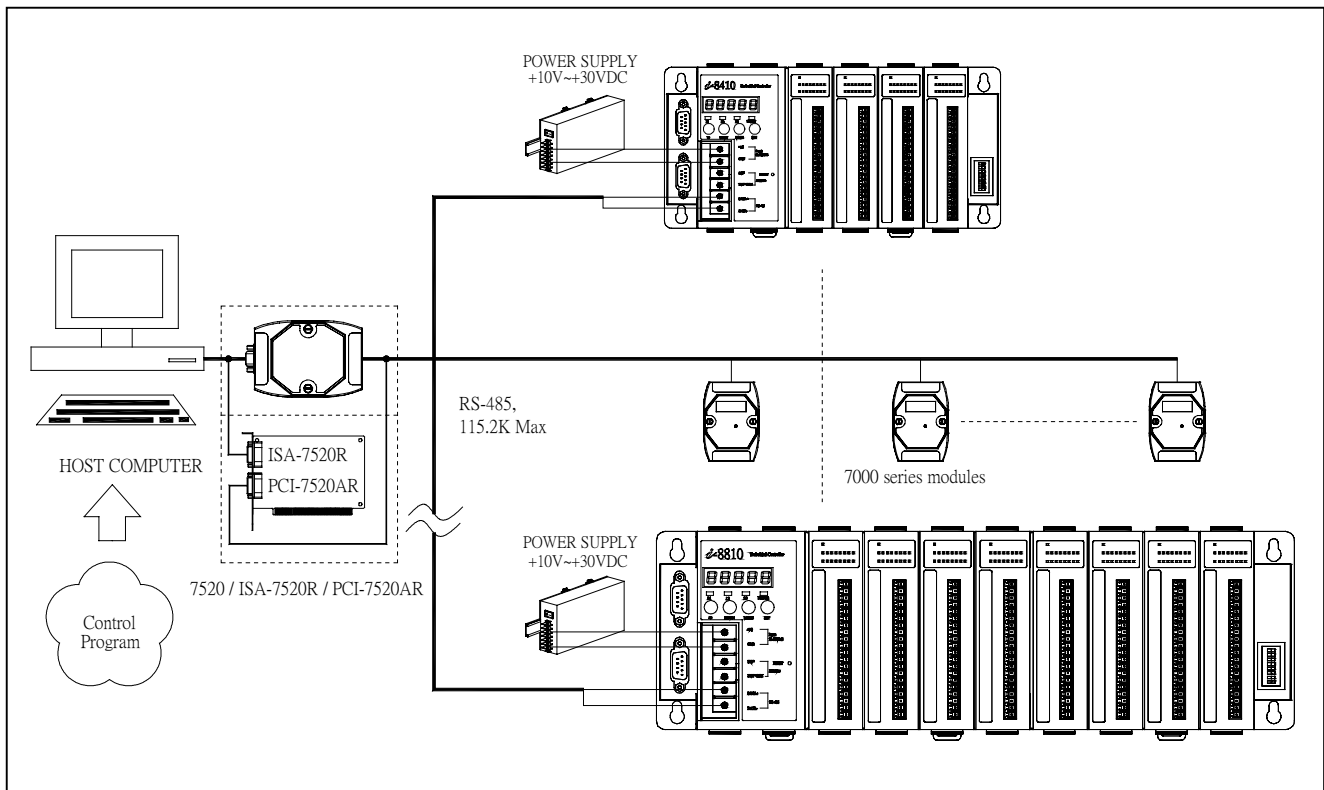
The configuration1 is designed for 7000 family. The 7520 & 7000 series are easy to mount together.

When 8000 family is used, the configuration 2 & 3 are easy for mounting & wiring. The configuration2 is designed for ISA bus & configuration 3 is designed for PCI bus.

If COM1 & COM2 of host-PC are used by other devices, the configuration 4 can provide an isolated COM3 for RS-485 interface & non-isolated COM4 for RS-232 interface. The VXC-182I is designed for PCI bus.

It is recommended to use configuration2 or configuration3 if COM1 or COM2 is free for linking to 8000 family.

9.2 Using 8410 & 8810 as Slave Device



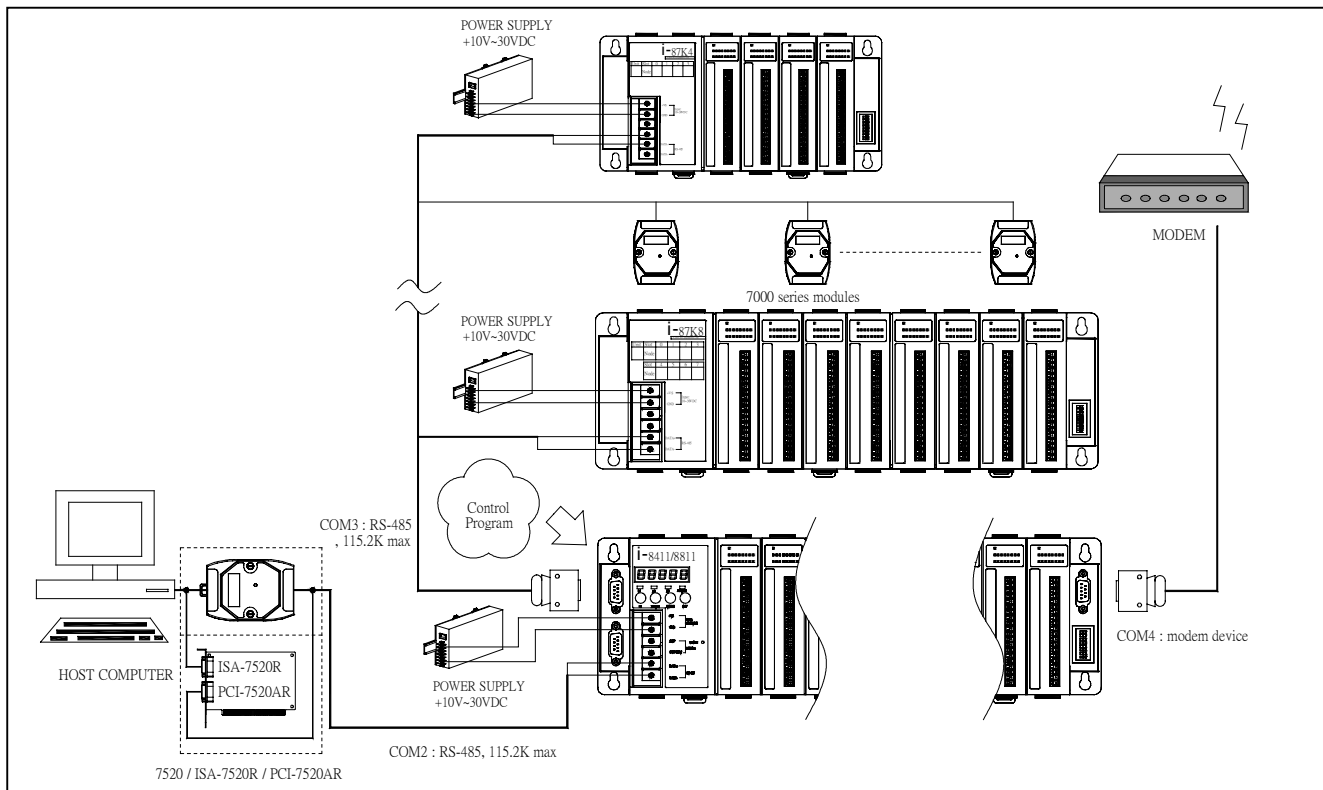
The 8K485.EXE is a SLAVE firmware, it can be download into the main control unit & make it act as a SLAVE device similar to 7000 series. When the 8410/8810 is shipping, it is download with AUTOEXEC.BAT & 8K485.EXE. So the 8410/8810 will automatically execute the 8K485.EXE when the power is applied. When the 8410/8810 execute the 8K485.EXE, it will work as a SLAVE device very similar to 7000 family. So the control program is stored in host-PC.

If the INIT* pin & INIT* COM pin are short together, the MiniOS7 will not execute the AUTOEXEC.BAT & 8K485.EXE when the power is applied. Then user can download new user program into 8410/8810 to make it act as a MASTER device. Refer to Sec. ??? for more information.

If user download AUTOEXEC.BAT & 8K485.EXE into 8411/8811, 8411/8811 will also work as a slave device as 8410/8810. But the 8K485.EXE only support all features of 8410/8810, so the extra features of 8411/8811 are useless. The price of 8411/8811 is higher than that of 8410.8810, so it is not recommended to download 8K485.EXE to 8411/8811.

In this application, the control program is stored in host computer. Only very few control operations are performed by 8410/8810, the host computer will read all input signals & control all output signals based on the internal control program. So the 8410/8810 is named as a **slave device**.

9.3 Using 841X & 881X as Master Device



The 8411/8811 is designed as a master device, it will read all input signals & control all output signals. The COM3 is used to link to 87K4/5/8/9 & 7000 for serial I/O expansion. The COM4 is used to link to modem device. The host computer is link to COM2 of 8411/8811 for the following functions:

- pass commands or data to 8411/8811
- read command result from 8411/8811
- read system statuses for system monitoring
- read system data collection for database management

Host computer can not direct control these I/O signals. It will pass command to 8411/8811, then 8411/8811 will interpret this command & control I/O signals based on this command.

The software environments of 8411/8811 are given as follows:

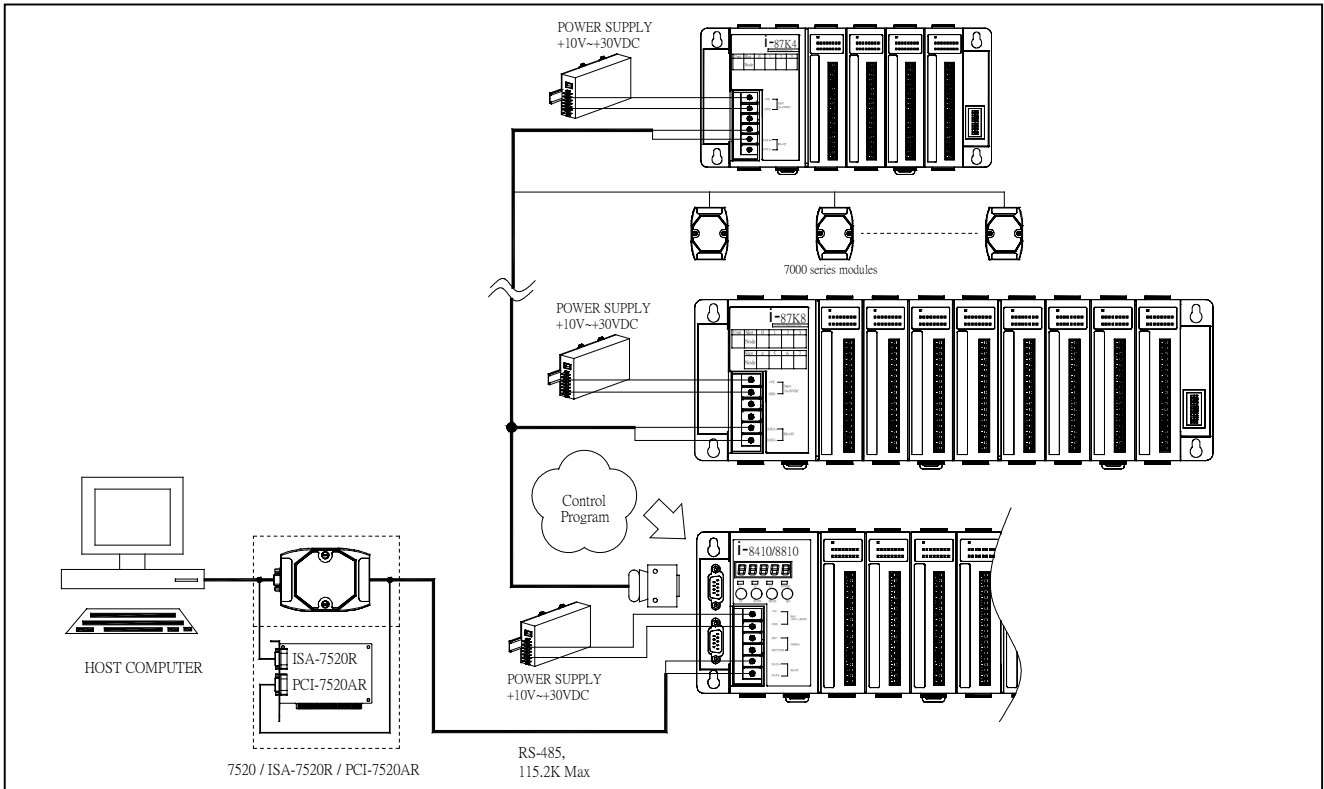
- O. S. → MiniOS7
- Compiler → TC, BC or MSC
- Library → small & large model
- Demo program → source codes of demo programs are given for user's modification

Many demo programs are provided for user's reference. User can modify these demo programs to fit his special requirements.

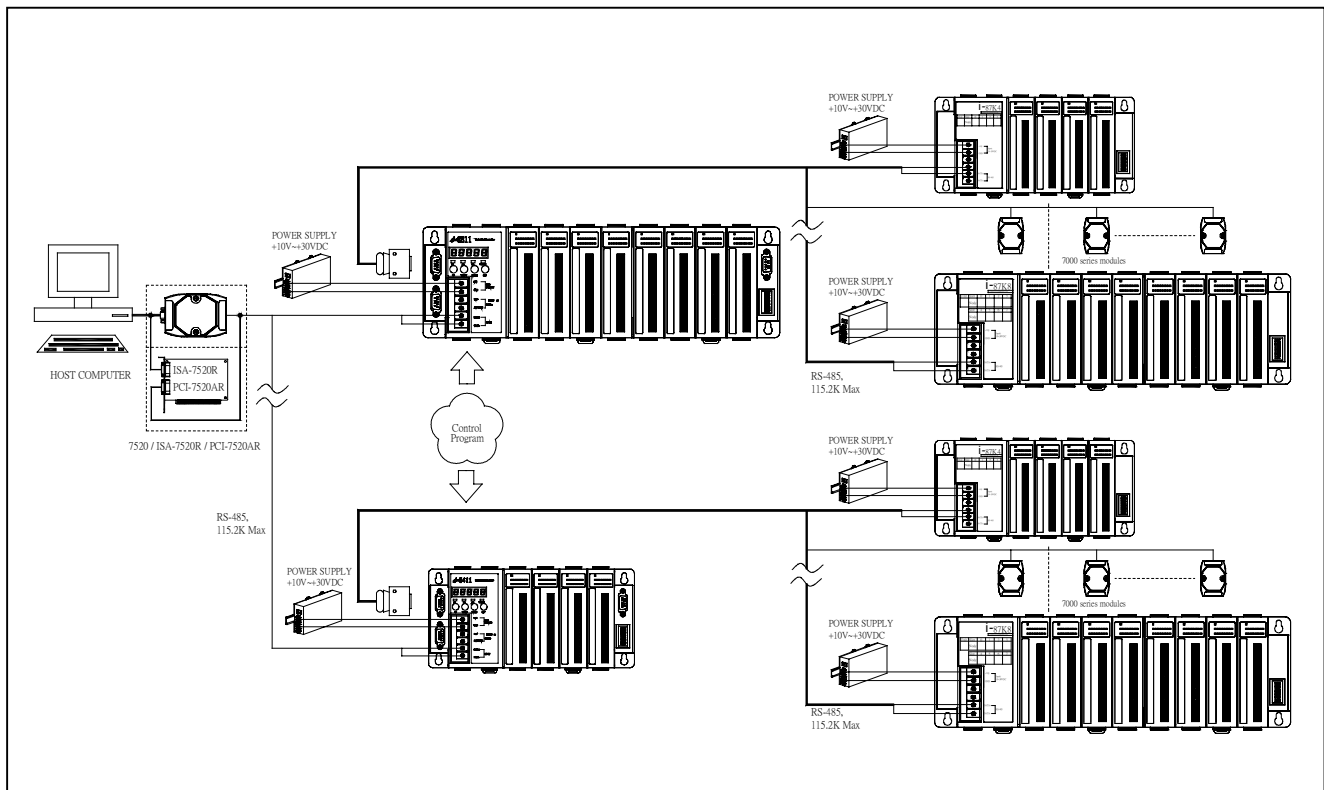
The MiniOS7 will automatically execute the AUTOEXEXC.BAT during the first power-up stage. User can download the user's program & AUTOEXEC.BAT into 8411/8811 first, then the user's program will be executed automatically.

The 8410/8810 is default shipped as a slave device. If the INIT* pin & INIT* COM pin of 8410/8810 are short together, the MiniOS7 will not execute the AUTOEXEC.BAT & 8K485.EXE

when the power is applied. Then user can download new user program into 8410/8810 to make it act as a MASTER device. Refer to Sec. 4.3 for more information. So both 8X10 & 8X11 can be used as a master device as follows:



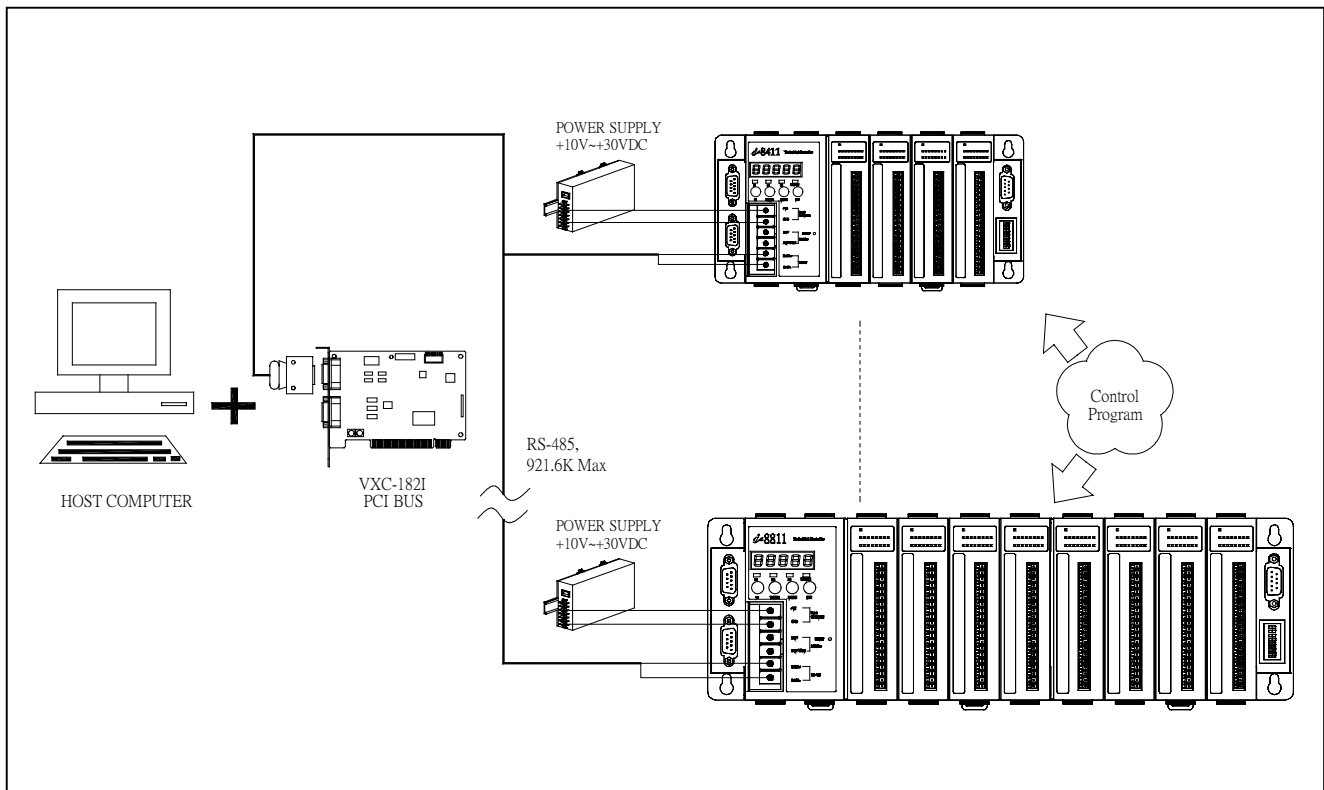
9.4 High Density I/O Applications



The features of the above application are given as following:

- Single host-pc is link to multiple main control units
- Every main control unit equips a unique NET-ID
- Every main control unit can control hundreds of I/O signals by linking to 87K4/5/8/9
- Every main control unit can execute its control program to control these local I/O.
- Host-pc can not directly control the local I/O of main control unit
- Host-pc can send command with NET-ID to the destination main control unit or read data from the destination main control unit
- Single host-pc can handle thousands of I/O in this application.

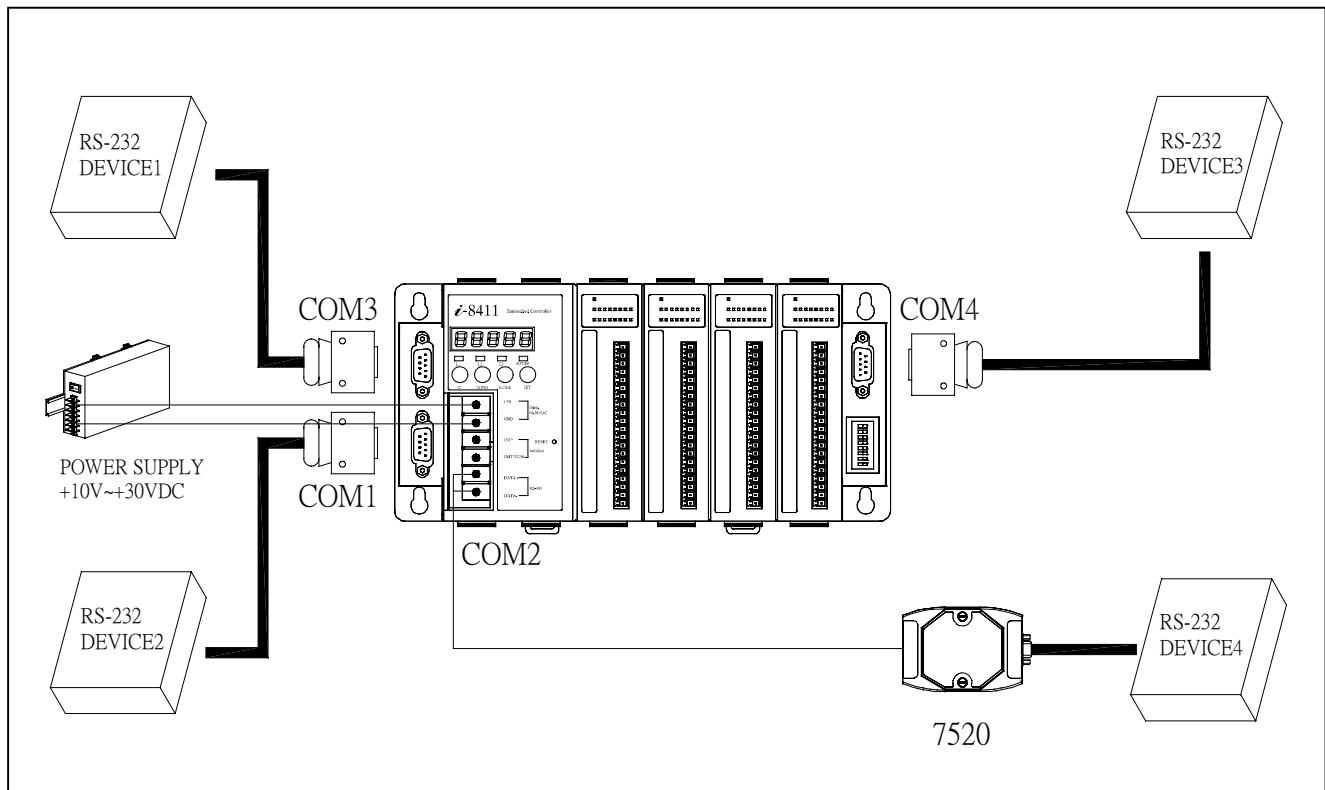
9.5 High Speed RS-485 Applications



The COM2 of 841x/881x is RS-485 & 115.2 BPS max. The COM1 & COM2 of host-pc is RS-232 & 115.2K BPS max. The 7520/ISA-7520R/PCI-7520AR can convert the RS-232 to RS-485 & 115.2K BPS max.

The VXC-1821 is a PCI bus card which will provide COM3 & COM4. This COM3 is RS-485, 3000V isolation & up to 921.6K BPS for linking to COM2 of 841X/881X. This COM4 is RS-232, non-isolated & up to 921.6K for linking to high speed RS-232 device.

9.6 Connecting to RS-232 Devices



The COM1 of main control unit is a RS-232 port designed for program development & debug. After the program develop/debug stage, it can be link to MMI or general RS-232 device. It provides TXD, RXD, GND & 115.2K BPS max.

The COM2 of main control unit is RS-485 port designed for linking to host-pc. If there is no host-pc, it can be used to link to RS-485 device. In this condition, it provides DATA+, DATA- , 3000V isolation & 115.2K BPS max. It also can link to a 7520 to provide a linking to general RS-232 device. In this condition, it provides TXD, RXD, GND, 3000V isolation & 115.2K max.

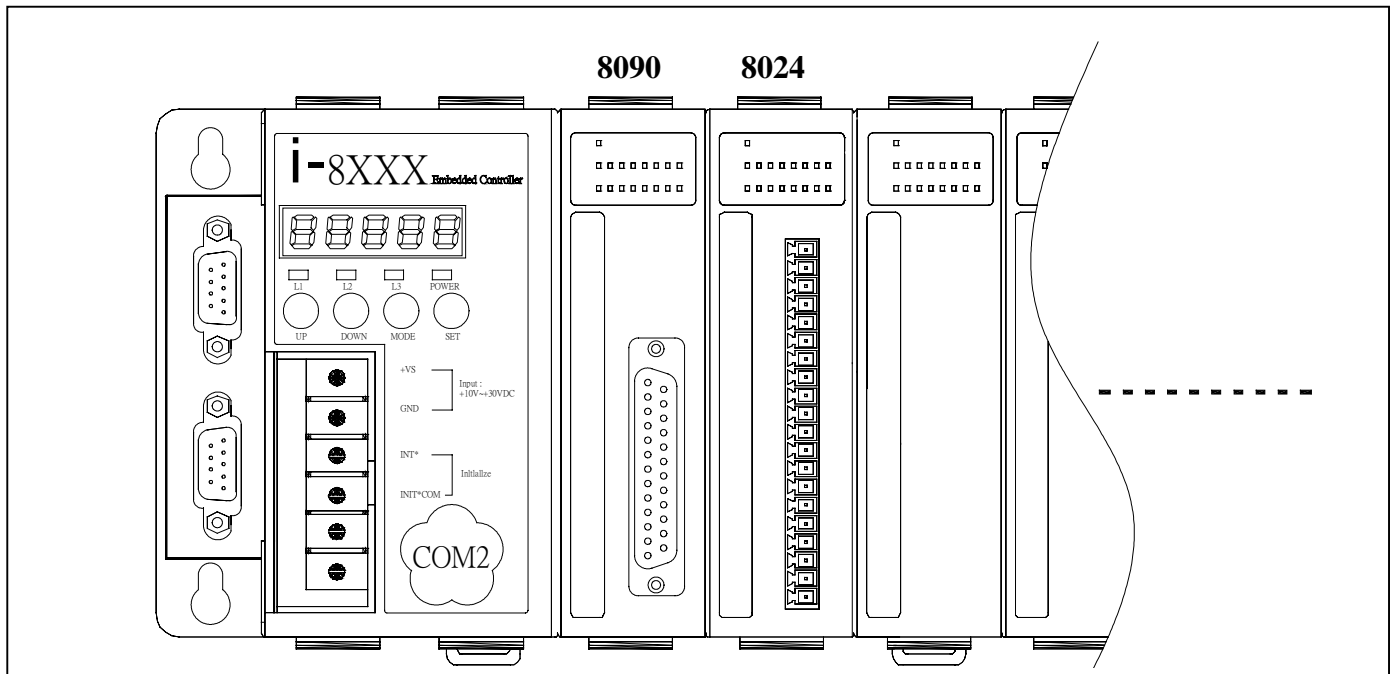
The COM3 of main control unit can be RS-485 or RS-232 port. But only one interface can used at the same time. If use COM3 as a RS-232 application, it provides TXD, RXD, RTS, CTS, GND , non-isolated & 115.2K BPS max.

The COM4 of main control unit is RS-485 port designed for linking to modem device.

9.7 Motion Controller Application

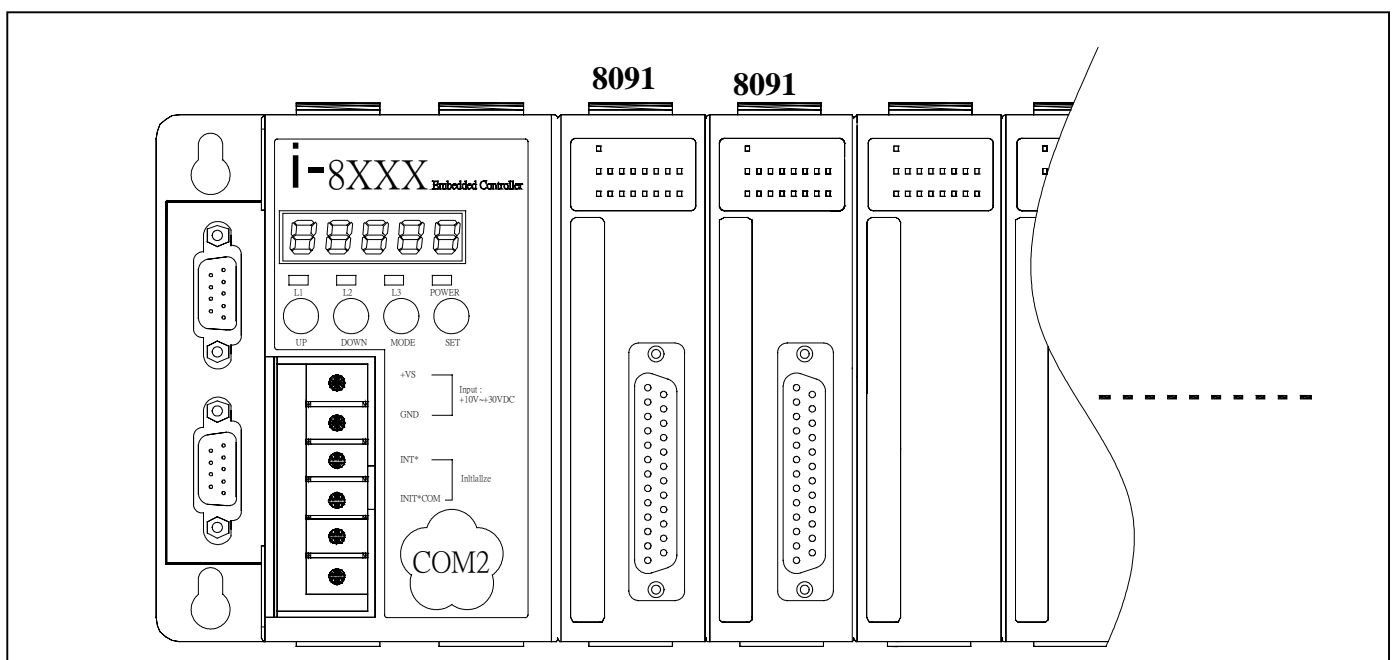
The key components of V_Command motion controller are given as follows:

- cpu: main controller unit
- encoder interface: 8090 & D/A voltage output: 8024
- I/O modules: parallel I/O modules



The key components of Pulse_Command motion controller are given as follows:

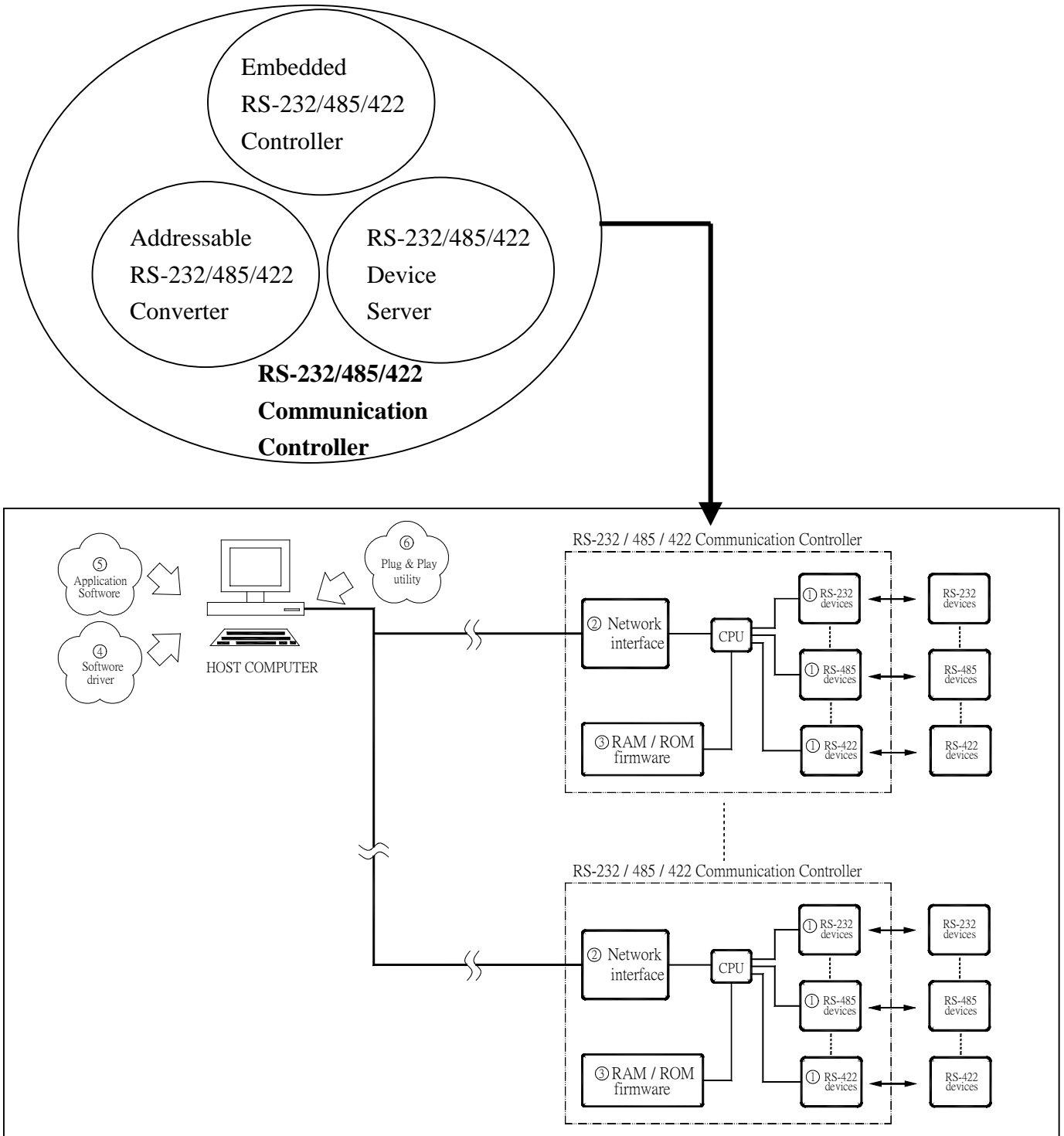
- cpu: main controller unit
- pulse output: 8091 (Please refer to CD:\napdos\8000\motion\i8091>manual\)
- I/O modules: parallel I/O modules



Note: I-8417/8817 provides soft-logic programming to do motion control. Please refer to Chapter 18 of CD:\napdos\isagraf\8000\english_manu\ "User_Manual_I_8xx7.pdf"

9.8 Communication Controller application

There exist a great many applications where RS-232/485/422 devices are the best or only solution in industry applications. A RS-232/485/422 communication controller is a specialized network-based hardware device designed to link all these RS-232/RS-485/422 devices to the host computer by providing an easy & economical way. There are various different types of communication controller given as following:



The key components are given as following:

1. RS-232/485/422 interface → link to external RS-232/485/422 device
2. Network interface → link to host-pc, can be RS485, Ethernet 10M, 10/100M or other network
3. RAM/ROM firmware → store the firmware of communication controller
4. Software driver → DLLs for host-PC
5. Application software → User's application program
6. Plug&Play utility → provide MS-COMM standard for device server

The comparison table of these 3 types of communication controller is given as follows:

| | Embedded RS-232/485/422 Controller | Addressable RS-232/485/422 Controller | RS-232/485/422 Device Server |
|----------------------------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| 1 RS-232/485/422 interface | RS-232 or RS-485 or RS-422 | Same | same |
| 2: network interface | RS-485 or Ethernet 10M or Ethernet 10/100M or Other network | same | same |
| 3: RAM/ROM firmware | User must write his special application program | Well-design firmware & Source codes are open for user's modification to fit his special requirement. | Well-design firmware & Source codes are open for reference. It is very difficult to modify for user's special requirement. |
| 4: software driver | DLLs | DLLs | DLLs |
| 5: application software | User must write his special application program | User's old application program must be modified to fit the protocol defined by (3) firmware. | User's old application program can work without modification |
| 6: Plug&Play Utility | No need | No need | MS-COMM standard |
| Easy Using | Low | Middle | Most |
| Flexibility | High | Middle | Most |

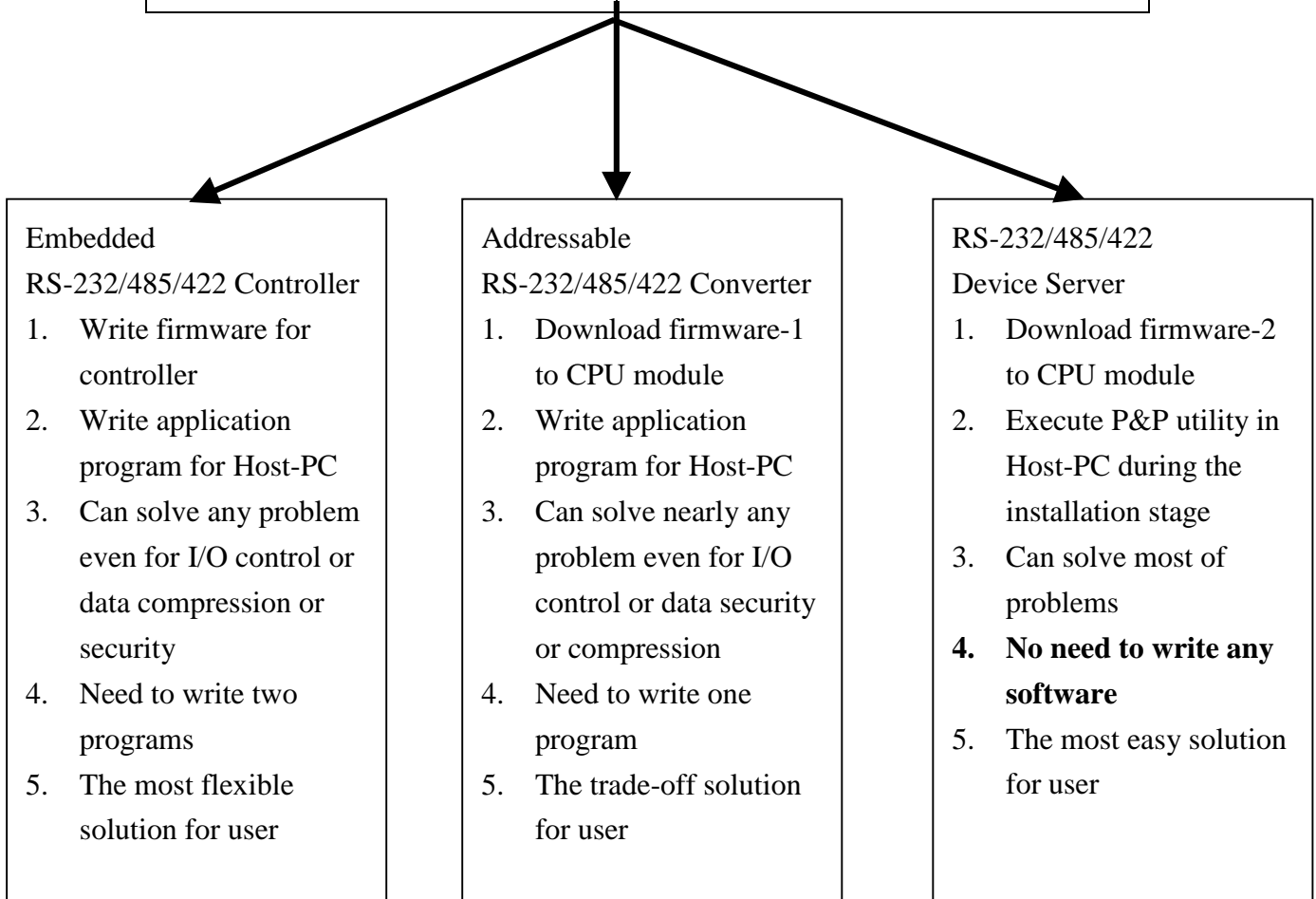
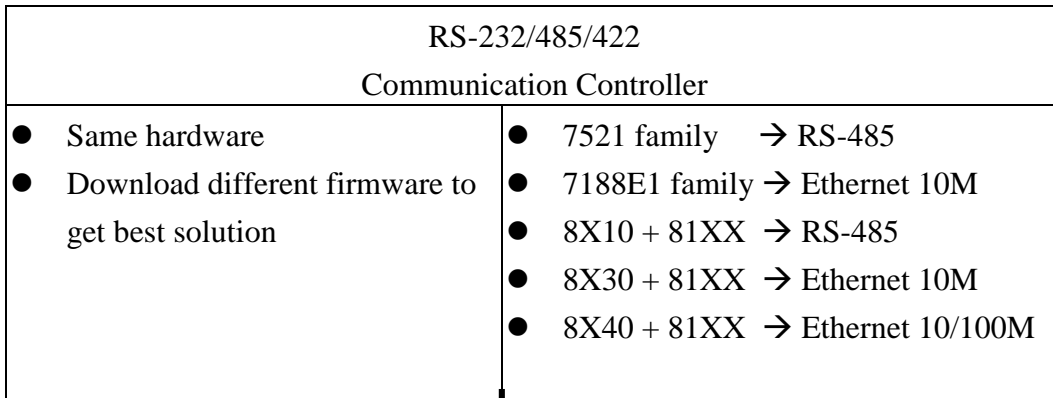
Which type of communication controller is the best one ?

It depends on the applications. In general, The **RS-232/485/422 device server** is very easy to use. The **embedded RS-23/485/422 controller** can do anything includes I/O control & data compression & security, but only well-training programmer can use it. The **addressable RS-232/485/422 converter** is a tradeoff solution. In our solution, user can download different firmware into the CPU module to make the same hardware act as the most proper device. So buy the same hardware & choose the proper firmware can get the best solution.

We can provide completely solution for RS-232/485/422 communication controller as follows:

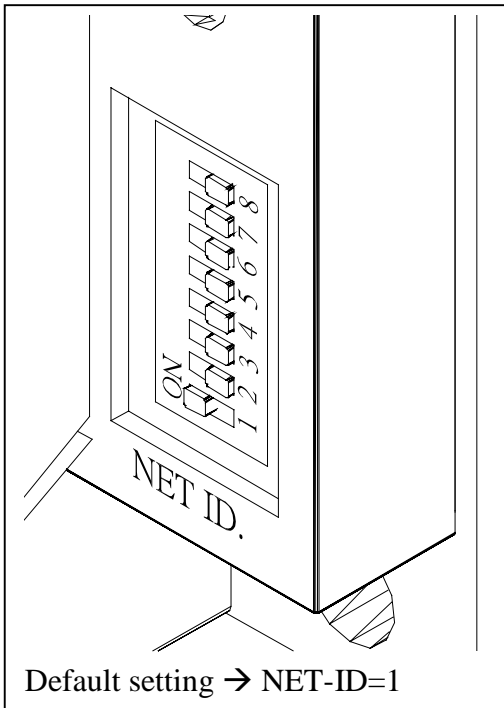
- 7521 family → distributed & RS-485 networking
- 7188E1 family → distributed & Ethernet 10M networking
- 8X10+81XX → compact distributed & RS-485 networking
- 8X30+81XX → compact distributed & Ethernet 10M networking
- 8X40+81XX → compact distributed & Ethernet 10/100M networking

The family diagram of our RS-232/485/422 Communication Controller is given as follows:



Refer to “RS-232/485/422 Communication Controller User’s Manual” for more information

Appendix A: Net ID setting for 84XX/88XX



| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| NET-ID=00 | Off | Off | Off | Off | Off | Off | Off | Off |
| NET-ID=01 | ON | Off | Off | Off | Off | Off | Off | Off |
| NET-ID=02 | Off | ON | Off | Off | Off | Off | Off | Off |
| NET-ID=03 | ON | ON | Off | Off | Off | Off | Off | Off |
| NET-ID=04 | Off | Off | ON | Off | Off | Off | Off | Off |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| NET-ID=FF | ON | ON | ON | ON | ON | ON | ON | ON |

- Default setting → NET-ID=01
- NET-ID can be from 01 to FF
- **The NET-ID of every Main Control Unit in the same network must be unique(different from each other).**

The 8000 family is designed for distributed application. So many main control units can be installed in the factory. The host computer can link all these main control units together through COM2 as following:

- 8410/8411/8810/8811 → COM2=RS-485
- 8420/8421/8820/8821 → COM2=8420/8820: DeviceNet, 8421/8821: CANopen
- 8430/8431/8830/8831 → COM2=Ethernet 10M
- 8441/8841 → COM2=Ethernet 10/100M

The host computer can send command to main control unit & the execution result can be passed back to host computer through COM2. So there must equip a unique NET-ID in every main control unit to allow one host computer linking to multiple main control units.

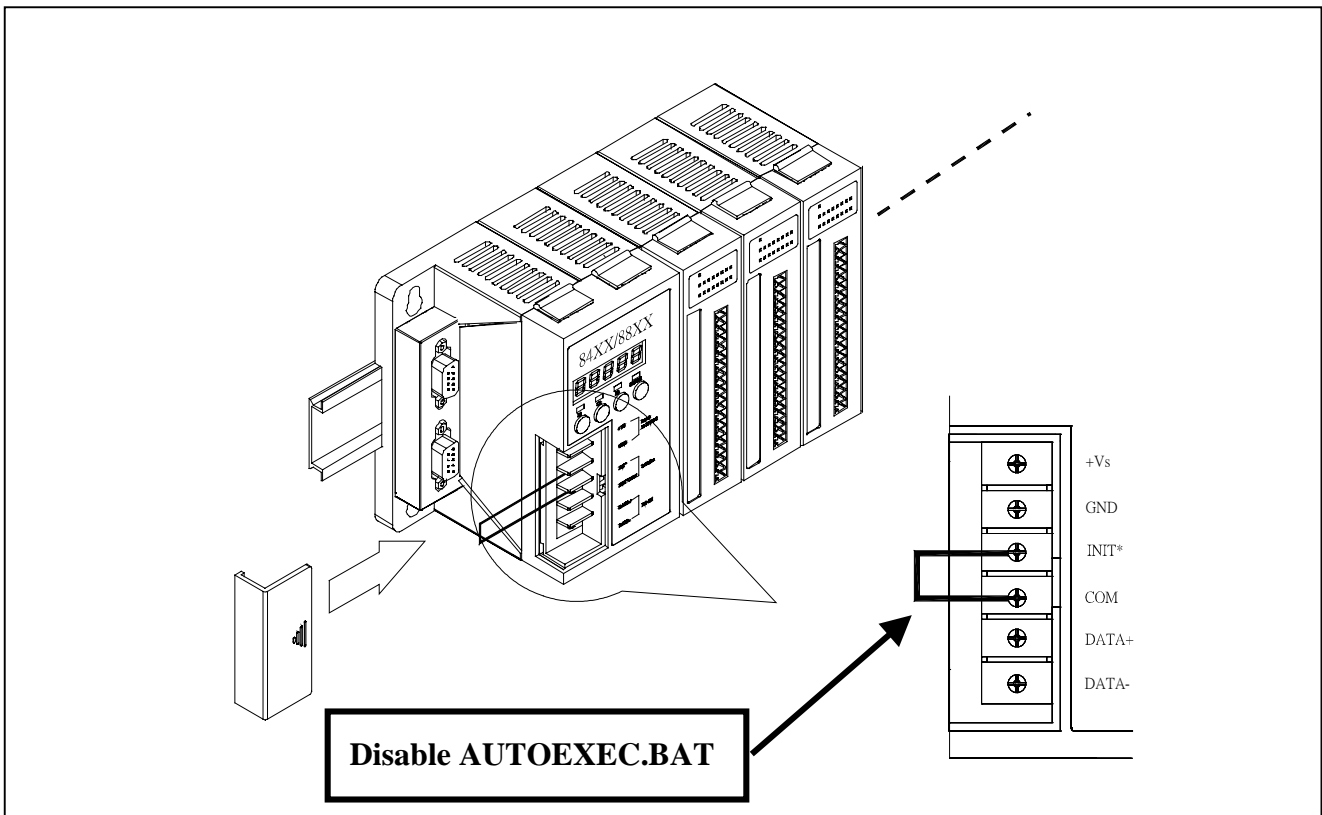
In the application of COM2=RS-485, the communication protocol must be half-duplex. All main control units installed in the same RS-485 network will receive the command sent from host computer, only the destination main control unit will execute this command & send the execution result back to host computer. The NET-ID is defined in the power-up stage. The steps to change the NET-ID are given as following:

- change NET-ID dip switch
- power off the main control unit
- power-up the main control unit to load the new NET-ID

NOTE: For programming with c, please use below functions to get NET-ID.

MSC & MSVC++ compiler: ~inp(0x100)
 Turbo C compiler : ~inportb(0x100)

Appendix B: Go to initial state of 84XX/88XX



When the main control unit is first power-up, the MiniOS7 will check the status of **INIT*** & **INIT*COM**. If these two pins are short together, the MiniOS7 will skip AUTOEXEC.BAT & go to command mode for program debug or download. If these two pins are OPEN to each other, the MiniOS7 will search AUTOEXEC.BAT & execute it. If these is no AUTOEXEC.BAT, the MiniOS7 will go to command mode for program debug or download.

Appendix C: Features & Specifications

I-87K4/5/8/9

COM2 :

RS-485, 115.2K BPS max. Data+, Data-,
16550 compatible, 16 bytes FIFO ,
max. distance: 4000 feet (1.2 Km)
Isolation voltage : 3000Vdc

I/O Expansion Slot :

Support only 87k serial I/O boards
4 slots for I-87K4
5 slots for I-87K5
8 slots for I-87K8
9 slots for I-87K9

Power Supply :

Unregulated +10Vdc to +30Vdc, 20W

Environment :

Operating temp.: -20°C to +75°C.
Storage Temperature: -30°C to +85°C.
Humidity: 0 ~ 95%, non-condensing

I-8410/8810

Processor :

CPU: AMD 80188, 40M Hz

SRAM : 128K bytes

Flash Memory: 256K bytes, 100,000 erase/write cycle, erase unit is 64K bytes

EEPROM: 2K bytes , 1,000,000 erase/write cycle

Built-in Watchdog Timer

NET-ID: 8 dip-switch to set NET-ID as 1 to 255

COM0: Internal use for I-87K I/O boards

COM1: RS-232/Program download port

RXD, TXD, GND, 115200 Max.

COM2: RS-485

DATA+, DATA-, 115.2K Max.

COM3: RS-232/485

RS232: RXD, TXD, GND, RTS, CTS, 115200 Max.

RS485: DATA+, DATA-, 115200 Max.

S-MMI: Small Man Machine Interface

I/O Expansion Slot :

Support both 8k parallel & 87k serial I/O boards

4-slot for I-8410

8-slot for I-8810

Power Supply :

20W

Unregulated +10Vdc to +30Vdc

Environment :

Operating Temp.: -25°C to +75°C.

Storage Temp.: -30°C to +85°C

Humidity: 0 ~ 95%,non-condensing

Dimensions :

354 x 110 x 75.5 mm (8 slot)

230 x 110 x 75.5 mm (4 slot)

I-8430/8830

Processor :

CPU : 80188, 40M Hz

SRAM: 256K bytes

Flash Memory: 512K bytes, 100,000 erase/write cycle, erase unit is 64K bytes

EEPROM: 2K bytes , 1,000,000 erase/write cycle

Built-in Watchdog Timer

NET-ID: 8 dip-switch to set NET-ID as 1 to 255

COM0: Internal use for I-87K I/O boards

COM1: RS-232/Program download port

RXD, TXD, GND, 115200 Max.

COM2: 10 Base T ethernet, NE2000 compatible

COM3: RS-232/485

RS232: RXD, TXD, GND, RTS, CTS, 115200 Max.

RS485: DATA+, DATA-, 115200 Max.

S-MMI: Small Man Machine Interface

I/O Expansion Slot :

Support both 8k parallel & 87k serial I/O boards

4-slot for I-8430

8-slot for I-8830

Power Supply:

20W

Unregulated +10Vdc to +30Vdc

Environment :

Operating Temp.: -25°C to +75°C.

Storage Temp.: -30°C to +85°C

Humidity: 0 ~ 95%, non-condensing

Dimensions :

354 x 110 x 75.5 mm (8 slot)

230 x 110 x 75.5 mm (4 slot)

I-8411/8811

Processor :

CPU: AMD 80188, 40M Hz

SRAM: 512K bytes

Flash Memory: 512K bytes, 100,000 erase/write cycle, erase unit is 64K bytes

EEPROM: 2K bytes , 1,000,000 erase/write cycle

64-bit hardware unique serial number

Built-in Watchdog Timer

Real Time Clock: given hour, minute, sec, date of week, date, month, year (to 2079)

NVRAM: 31 bytes, battery backup

NET-ID: 8 dip-switch to set NET-ID as 1 to 255

COM0: Internal use for I-87K I/O boards

COM1: RS-232/Program download port

RXD, TXD, GND, 115200 Max.

COM2: RS-485

DATA+, DATA-, 115.2K Max.

COM3: RS-232/485

RS232: RXD, TXD, GND, RTS, CTS, 115200 Max.

RS485: DATA+, DATA-, 115200 Max.

COM4: RS-232 (full Modem signals)

RXD, TXD, GND, RTS, CTS, DTR, DSR, RI, CD

S-MMI: Small Man Machine Interface

I/O Expansion Slot :

Support both 8k parallel & 87k serial I/O boards

4-slot for 8411

8-slot for 8811

Power Supply:

20W

Unregulated +10Vdc to +30Vdc

Environment :

Operating Temp.: -25°C to +75°C.

Storage Temp.: -30°C to +85°C

Humidity: 0 ~ 95%,non-condensing

Dimensions :

354 x 110 x 75.5 mm (8 slot)

230 x 110 x 75.5 mm (4 slot)

I-8431/8831

Processor :

CPU: 80188, 40M Hz

SRAM: 512K bytes

Flash Memory: 512K bytes, 100,000 erase/write cycle, erase unit is 64K bytes

EEPROM: 2K bytes , 1,000,000 erase/write cycle

64-bit hardware unique serial number

Built-in Watchdog Timer

Real Time Clock: given hour, minute, sec, date of week, date, month, year (to 2079)

NVRAM: 31 bytes, battery backup

NET-ID: 8 dip-switch to set NET-ID as 1 to 255

COM0: Internal use for I-87K I/O boards

COM1: RS-232/Program download port

RXD, TXD, GND, 115200 Max.

COM2: 10 Base T ethernet, NE2000 compatible

COM3: RS-232/485

RS232: RXD, TXD, GND, RTS, CTS, 115200 Max.

RS485: DATA+, DATA-, 115200 Max.

COM4: RS-232 (full Modem signals)

RXD, TXD, GND, RTS, CTS, DTR, DSR, RI, CD, 115200 Max.

S-MMI: Small Man Machine Interface

I/O Expansion Slot :

Support both 8k parallel & 87k serial I/O boards

4-slot for 8431

8-slot for 8831

Power Supply:

20W

Unregulated +10Vdc to +30Vdc

Environment :

Operating Temp.: -25°C to +75°C.

Storage Temp.: -30°C to +85°C

Humidity: 0 ~ 95%, non-condensing

Dimensions :

354 x 110 x 75.5 mm (8 slot)

230 x 110 x 75.5 mm (4 slot)

I-8430/8830/8431/8831-MTCP

Hardware specifications & features:

I-8430-MTCP : same as I-8430

I-8830-MTCP : same as I-8830

I-8431-MTCP : same as I-8431

I-8831-MTCP : same as I-8831

I-8417/8817

| | |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power supply | |
| Power requirements | 10 to 30VDC (unregulated) |
| Power consumption | 20W (when I/O slots are empty) |
| Protection | Built-in power protection & network protection circuit |
| General environment | |
| Operating temperature | -25°C to +75°C |
| Storage temperature | -30°C to +85°C |
| Humidity | 0 to 95 % (non-condensed) |
| System | |
| CPU | Am188™ES,40MHz, or compatible |
| Watchdog timer | 0.8 second |
| Real time clock | Year-2000 compliance. Gives hour, minute, sec, date of week, date of month, month & year (1980 to 2079) |
| SRAM | 512Kbytes |
| FLASH ROM | 512Kbytes, Erase unit is 64K bytes, 100,000 erase/write cycles |
| NVSRAM | 31 bytes, battery backup, data valid up to 10 years |
| EEPROM | 2048 bytes, retention > 100 years. 1,000,000 erase/write cycles |
| SMMI | Five 7-Seg. Led, four push buttons & three Led on the front panel. It can display message, value, input value, simulate input & ouput. |
| I/O slots | 4 empty slots for I-8417, 8 empty slots for I-8817 Accept parallel & serial I/O boards |
| NET ID | 8 dip switch to set NET ID as 1 to 255 |
| Serial ports | |
| COM1 | RS232: TXD,RXD,GND, Speed: 115200 bps max. Program download port. |
| COM2 | RS485: Data+, Data-, Speed: 115200 bps max. Self-tuner ASIC inside, Program download port. |
| COM3 | Can be configed as RS232 or S485, Speed: 115200 bps max. RS232: TXD,RXD,RTS,CTS,GND, RS485: Data+, Data- |
| COM4 | RS232: Full modem signals, Speed: 115200 bps max. TXD,RXD,RTS,CTS,DSR,DTR,CD,RI,GND. |
| Development software | |
| ISaGRAF | IEC61131-3 standard. Languages: LD, ST, FBD, SFC, IL & FC |
| Motion control | |
| | The I-8417/8817/8437/8837 can integrate with one I-8091(2-axes) or two I-8091(4-axes) motion board to do motion control. When doing motion control, Ethernet communication is not available. |
| PWM output | |
| Pulse Width Modulation output | 8 channels max. for one controller. 1kHz max. for Off=0.5 & On=0.5 ms Output square curve: Off: 0.5 to 32767 ms, On: 0.5 to 32767 ms Optional parallel D/O boards: i-8037, 8041, 8042, 8054, 8055, 8056, 8057, 8060, 8063, 8064, 8065, 8066,8068, 8069 |

| Counters | |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parallel D/I counter | 8 ch. max. for one controller. Counter value: 32 bit 1kHz max. Min. pulse width > 0.5ms Optional parallel D/I boards: i-8040, 8042, 8051, 8052, 8053, 8054, 8055, 8058, 8063, 8077 |
| Serial D/I counter | Counter input: 100Hz max. Counter value: 0 to 65535 (16 bit) Optional serial I-87K D/I boards: i-87051, 87052, 87053, 87054, 87055, 87058, 87063 |
| Remote D/I counter | All remote I-7000 & I-87K D/I modules support counters. 100Hz max. Counter value: 0 to 65535 (16 bit) |
| High speed counter | i-87082: 100kHz max. 32 bit, i-8080: 5kHz max. 32 bit |
| Protocols | |
| Modbus serial protocol | COM1 & COM2 supports Modbus serial protocol for connecting PC/HMI & MMI panels. |
| Remote I/O | COM3 & COM4 supports I-7000 I/O modules & (I-87K base + I-87K serial I/O boards) as remote I/O. Max. 64 I/O module for one controller |
| Modbus slave I/O devices | COM3 & COM4 supports Modbus master protocol to connect to other Modbus slave I/O devices |
| Fbus | A software mechanism built in COM3 port to exchange data between ICP DAS's ISaGRAF controllers. |
| SMS: Short Message Service | COM4 can link to a GSM modem to support SMS. User can request data or control the controller by cellular phone. The controller can also send data & alarms to user's cell. phone. Optional GSM modems: M1203A: GSM 900/1800 MHz M1213A: GSM 900/1900 MHz |
| User defined protocol | User can write his own protocol applied at COM3, COM4 (& COM5 to COM20 if multi-serial port boards are plugged). |
| Modem_Link | Supports PC remotely download & monitor I-8417/8817/8437/8837 through a normal modem. |
| MMICON / LCD | COM3 & COM4 supports ICP DAS's MMICON. The MMICON is featured with a 240 x 64 dot LCD and a 4 x 4 Keyboard. User can use it to display picture, string, integer, float, and input a character, string, integer and float. |
| Redundant Bus7000 | Two ISaGRAF controllers can link to remote I-7000 & I-87K I/O modules at the same time. Only one controller is active to control these remote I/Os. If one is dead, the other one will take over the control of remote I/Os. |
| Battery backup SRAM | |
| | Data, date & time can be stored at S256/S512, and then PC can load these data via COM1 or COM2. PC can also download pre-defined data to the S256/S512. Optional: S256: 256kbytes, S512: 512kbytes |
| PID | |
| | Software provides PID function |

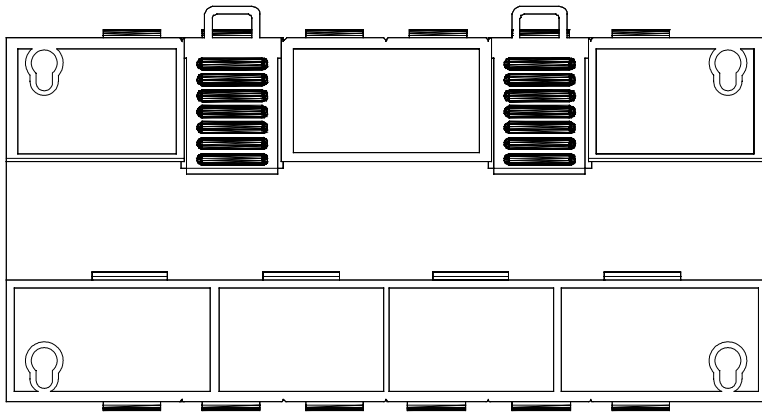
I-8437/8837

| | |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power supply | |
| Power requirements | 10 to 30VDC (unregulated) |
| Power consumption | 20W (when I/O slots are empty) |
| Protection | Built-in power protection & network protection circuit |
| General environment | |
| Operating temperature | -25°C to +75°C |
| Storage temperature | -30°C to +85°C |
| Humidity | 0 to 95 % (non-condensed) |
| System | |
| CPU | Am188™ES,40MHz, or compatible |
| Watchdog timer | 0.8 second |
| Real time clock | Year-2000 compliance. Gives hour, minute, sec, date of week, date of month, month & year (1980 to 2079) |
| SRAM | 512Kbytes |
| FLASH ROM | 512Kbytes, Erase unit is 64K bytes, 100,000 erase/write cycles |
| NVSRAM | 31 bytes, battery backup, data valid up to 10 years |
| EEPROM | 2048 bytes, retention > 100 years. 1,000,000 erase/write cycles |
| SMMI | Five 7-Seg. Led, four push buttons & three Led on the front panel. It can display message, value, input value, simulate input & ouput. |
| I/O slots | 4 empty slots for I-8437, 8 empty slots for I-8837 Accept parallel & serial I/O boards |
| NET ID | 8 dip switch to set NET ID as 1 to 255 |
| Ethernet port | |
| | 10M bps, NE2000 compatible, 10 BaseT, Program download port. |
| Serial ports | |
| COM1 | RS232: TXD,RXD,GND, Speed: 115200 bps max. Program download port. |
| COM3 | Can be configed as RS232 or S485, Speed: 115200 bps max. RS232: TXD,RXD,RTS,CTS,GND, RS485: Data+, Data- |
| COM4 | RS232: Full modem signals, Speed: 115200 bps max. TXD,RXD,RTS,CTS,DSR,DTR,CD,RI,GND. |
| Development software | |
| ISaGRAF | IEC61131-3 standard. Languages: LD, ST, FBD, SFC, IL & FC |
| Motion control | |
| | The I-8417/8817/8437/8837 can integrate with one I-8091(2-axes) or two I-8091(4-axes) motion board to do motion control. When doing motion control, Ethernet communication is not available. |
| PWM output | |
| Pulse Width Modulation output | 8 channels max. for one controller. 1kHz max. for Off=0.5 & On=0.5 ms Output square curve: Off: 0.5 to 32767 ms, On: 0.5 to 32767 ms Optional parallel D/O boards: i-8037, 8041, 8042, 8054, 8055, 8056, 8057, 8060, 8063, 8064, 8065, 8066,8068, 8069 |

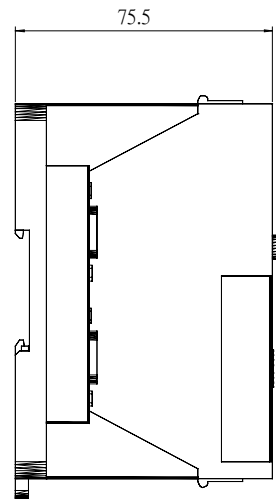
| | |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Counters | |
| Parallel D/I counter | 8 ch. max. for one controller. Counter value: 32 bit 1kHz max. Min. pulse width > 0.5ms Optional parallel D/I boards: i-8040, 8042, 8051, 8052, 8053, 8054, 8055, 8058, 8063, 8077 |
| Serial D/I counter | Counter input: 100Hz max. Counter value: 0 to 65535 (16 bit) Optional serial I-87K D/I boards: i-87051, 87052, 87053, 87054, 87055, 87058, 87063 |
| Remote D/I counter | All remote I-7000 & I-87K D/I modules support counters. 100Hz max. Counter value: 0 to 65535 (16 bit) |
| High speed counter | i-87082: 100kHz max. 32 bit, i-8080: 5kHz max. 32 bit |
| Protocols | |
| Modbus serial protocol | COM1 supports Modbus serial protocol for connecting PC/HMI & MMI panels. |
| Modbus TCP/IP protocol | Ethernet port supports Modbus TCP/IP protocol for connecting PC/HMI. |
| Remote I/O | COM3 & COM4 supports I-7000 I/O modules & (I-87K base + I-87K serial I/O boards) as remote I/O. Max. 64 I/O module for one controller |
| Modbus slave I/O devices | COM3 & COM4 supports Modbus master protocol to connect to other Modbus slave I/O devices |
| Fbus | A software mechanism built in COM3 port to exchange data between ICP DAS's ISaGRAF controllers. |
| Ebus | A software mechanism built in Ethernet port to exchange data between ICP DAS's ISaGRAF Ethernet controllers. |
| SMS: Short Message Service | COM4 can link to a GSM modem to support SMS. User can request data or control the controller by cellular phone. The controller can also send data & alarms to user's cell. phone. Optional GSM modems: M1203A: GSM 900/1800 MHz M1213A: GSM 900/1900 MHz |
| User defined protocol | User can write his own protocol applied at COM3, COM4 (& COM5 to COM20 if multi-serial port boards are plugged). |
| Modem_Link | Supports PC remotely download & monitor I-8417/8817/8437/8837 through a normal modem. |
| MMICON / LCD | COM3 & COM4 supports ICP DAS's MMICON. The MMICON is featured with a 240 x 64 dot LCD and a 4 x 4 Keyboard. User can use it to display picture, string, integer, float, and input a character, string, integer and float. |
| Redundant Bus7000 | Two ISaGRAF controllers can link to remote I-7000 & I-87K I/O modules at the same time. Only one controller is active to control these remote I/Os. If one is dead, the other one will take over the control of remote I/Os. |
| Battery backup SRAM | |
| | Data, date & time can be stored at S256/S512, and then PC can load these data via COM1 or COM2. PC can also download pre-defined data to the S256/S512. Optional: S256: 256kbytes, S512: 512kbytes |
| PID | Software provides PID function |

Appendix D: Dimensions

For 4-slots

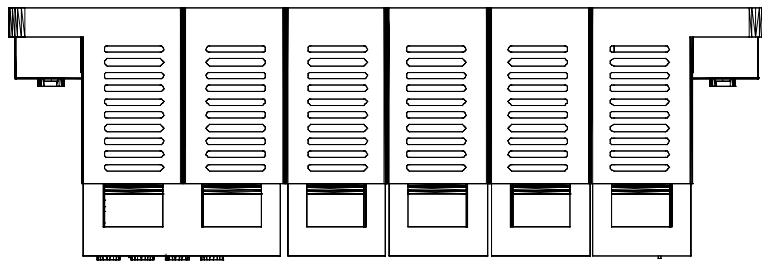


Back View

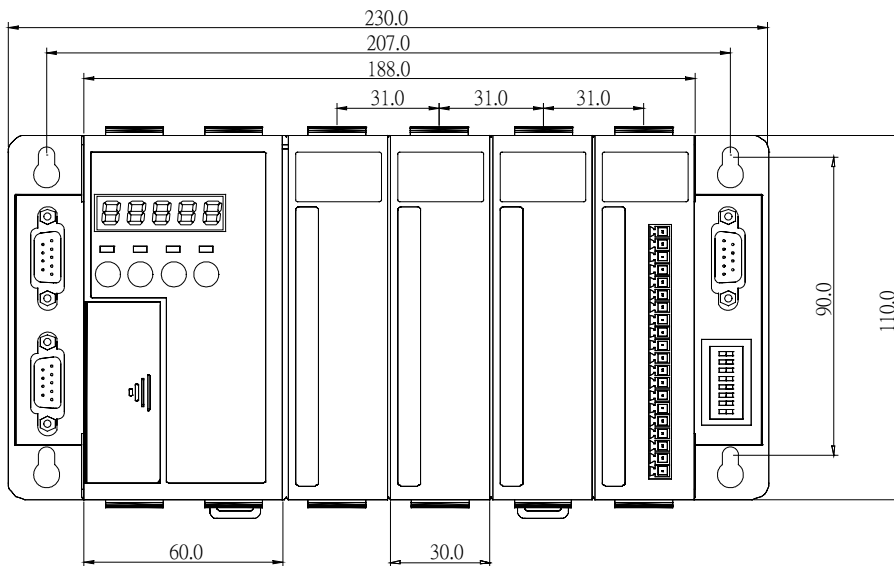


Side View

Unit : mm

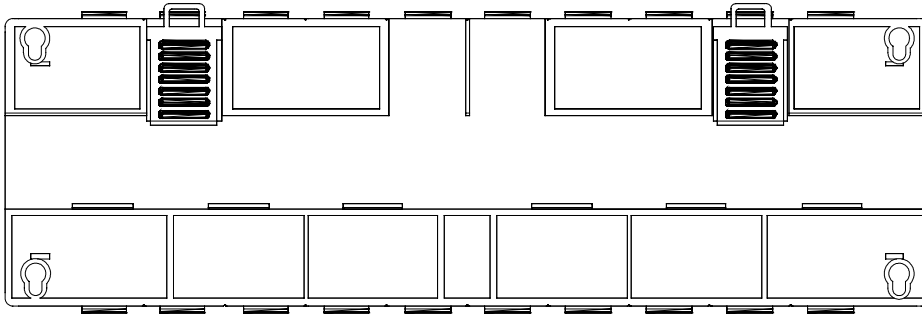


Top View

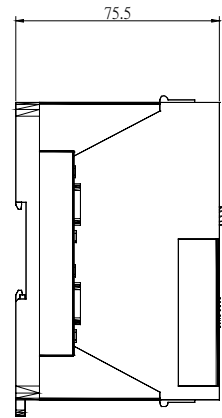


Front View

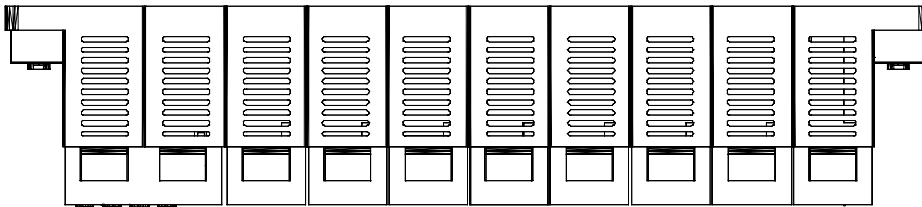
For 8-slots



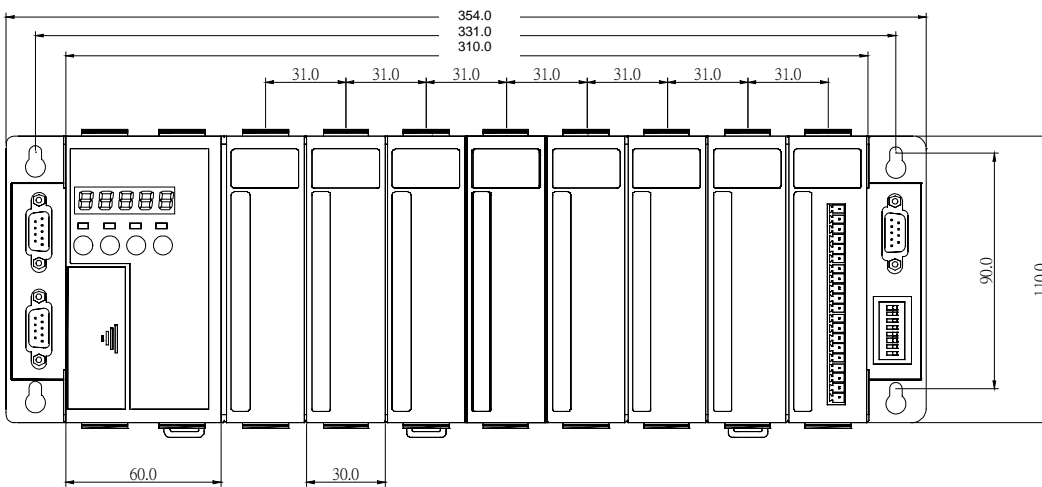
Back View



Unit : mm



Top View



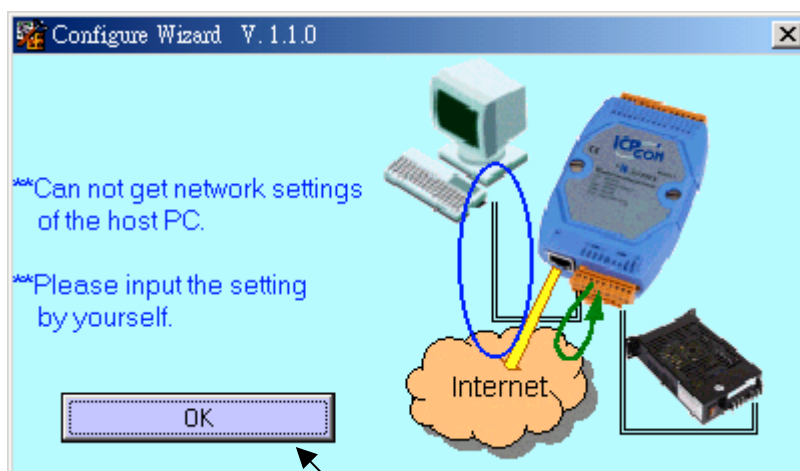
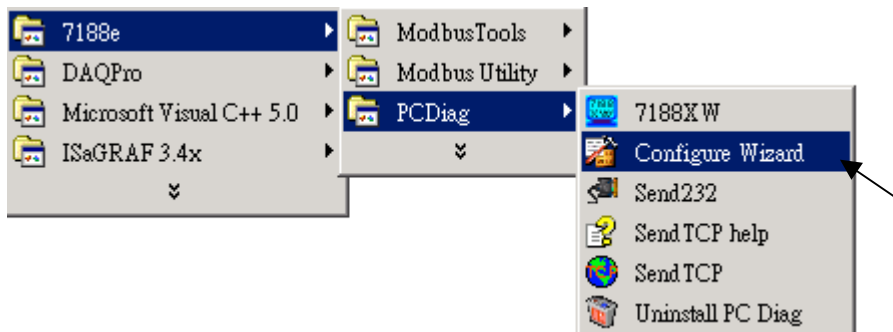
Front View

Appendix E: PCDiag Utility

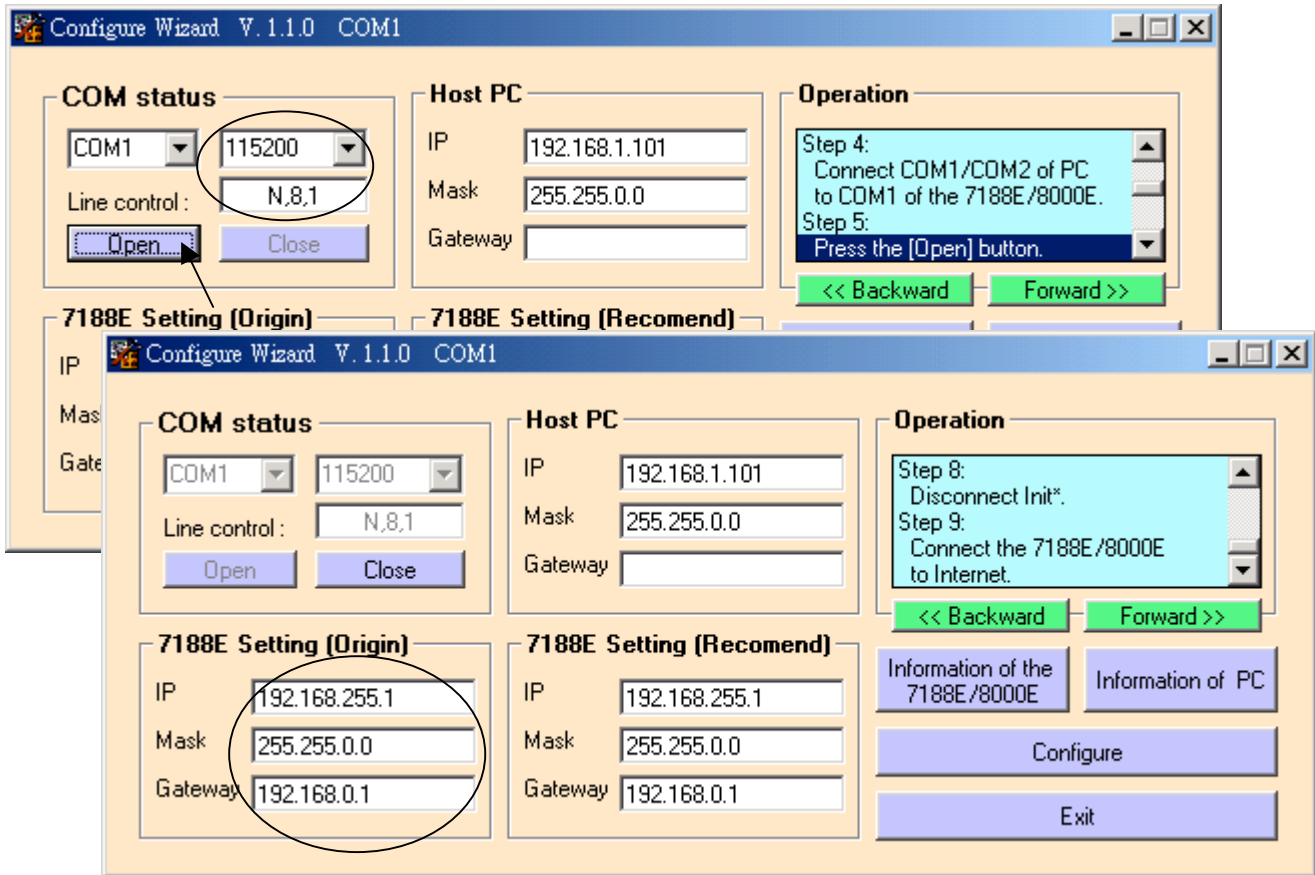
Installation: Double click on CD:\napdos\7000e\TCP\PCDiag\Setup\setup.exe

Operation steps:

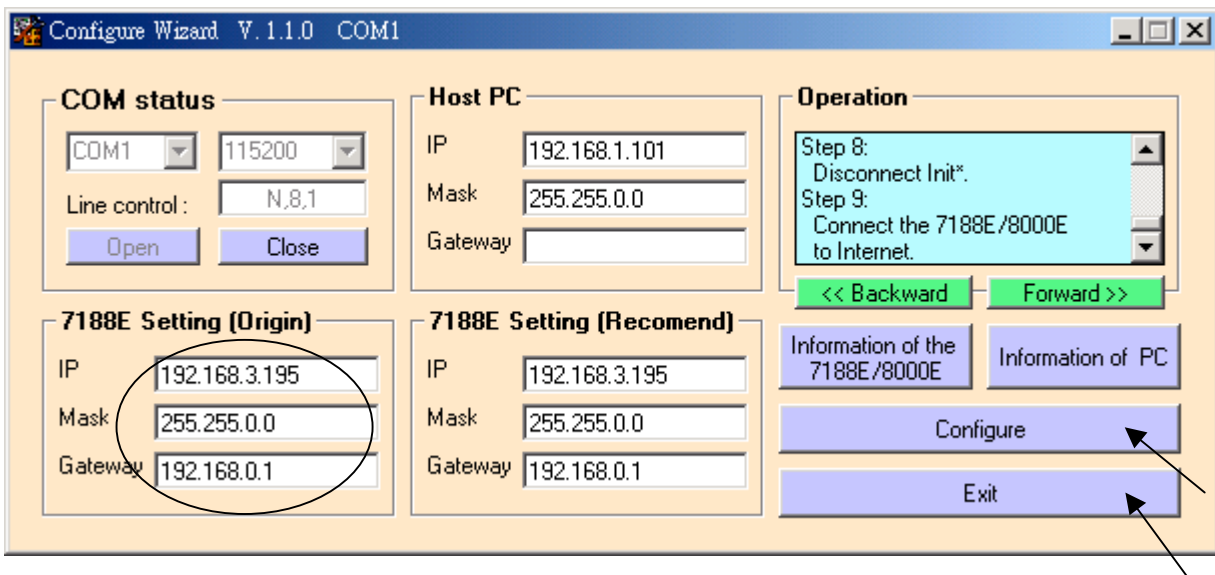
1. Link from COM1 of your PC to COM1 of the 843x / 883x controller by a RS232 cable.
2. Power off the 843x/883x controller, connect pin "INIT" to "INIT COM", and then power it up.
3. Run "7188e – PCDiag - Configure Wizard"



4. When the "Configure Wizard" window appeared, click on "Open" (115200, N, 8, 1)
 If the communication is OK, The Origin Setting will be displayed.



5. Given the new IP Mask & Gateway(if necessary), then click on "Configure"



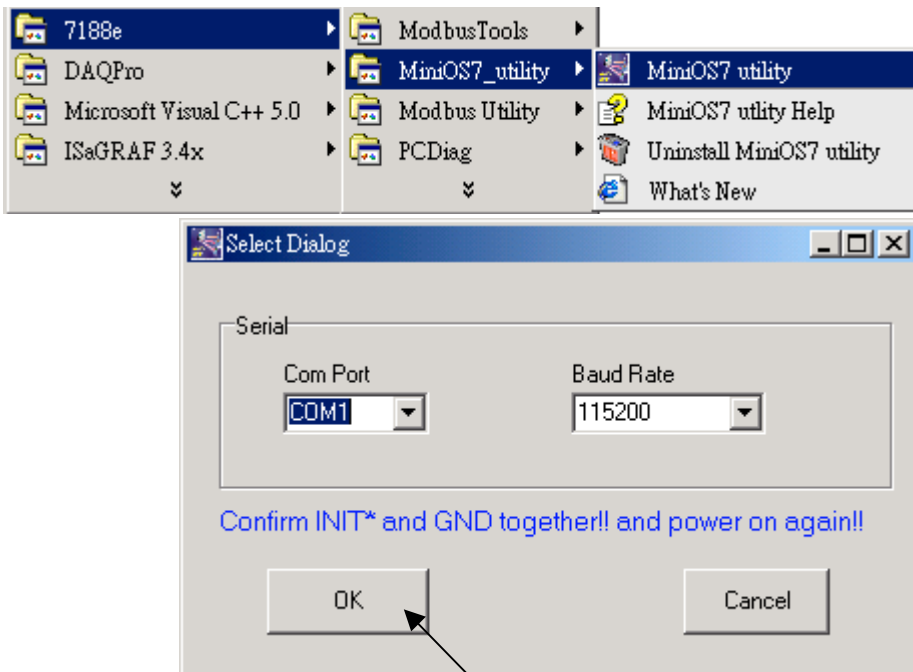
6. Power off the controller, then remove connection between "INIT" to "INIT COM", and then power up the controller again.

Appendix F: MiniOS7 Utility

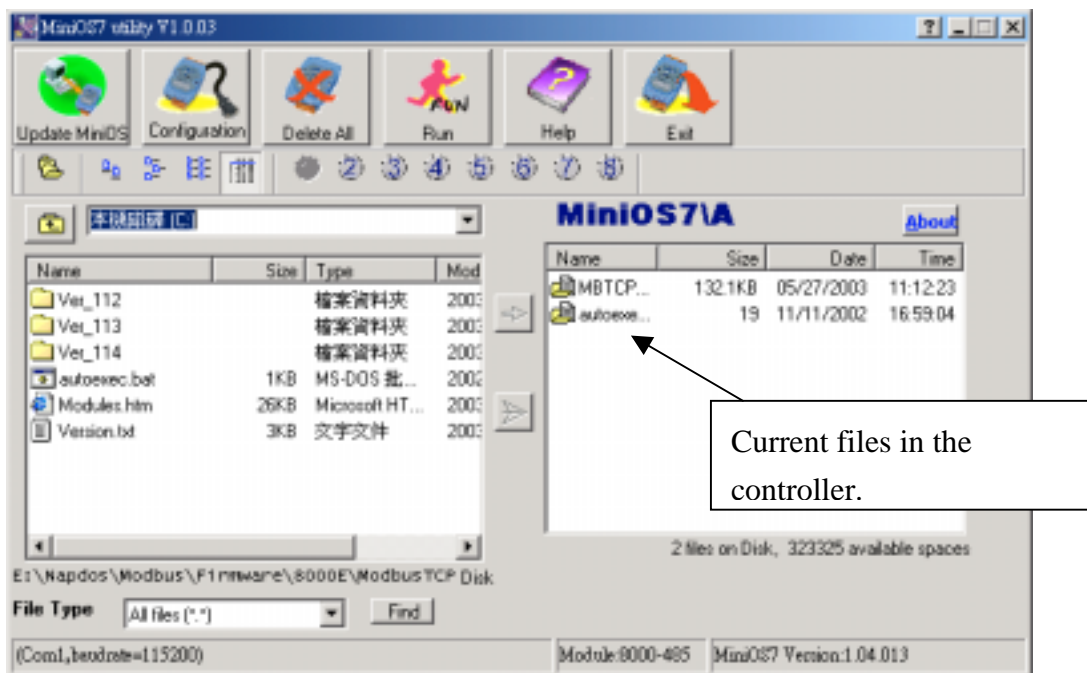
Installation: Double click on CD:\napdos\MiniOS7\utility\ MiniOS7_utility\ MiniOS7utility.exe

Operation steps:

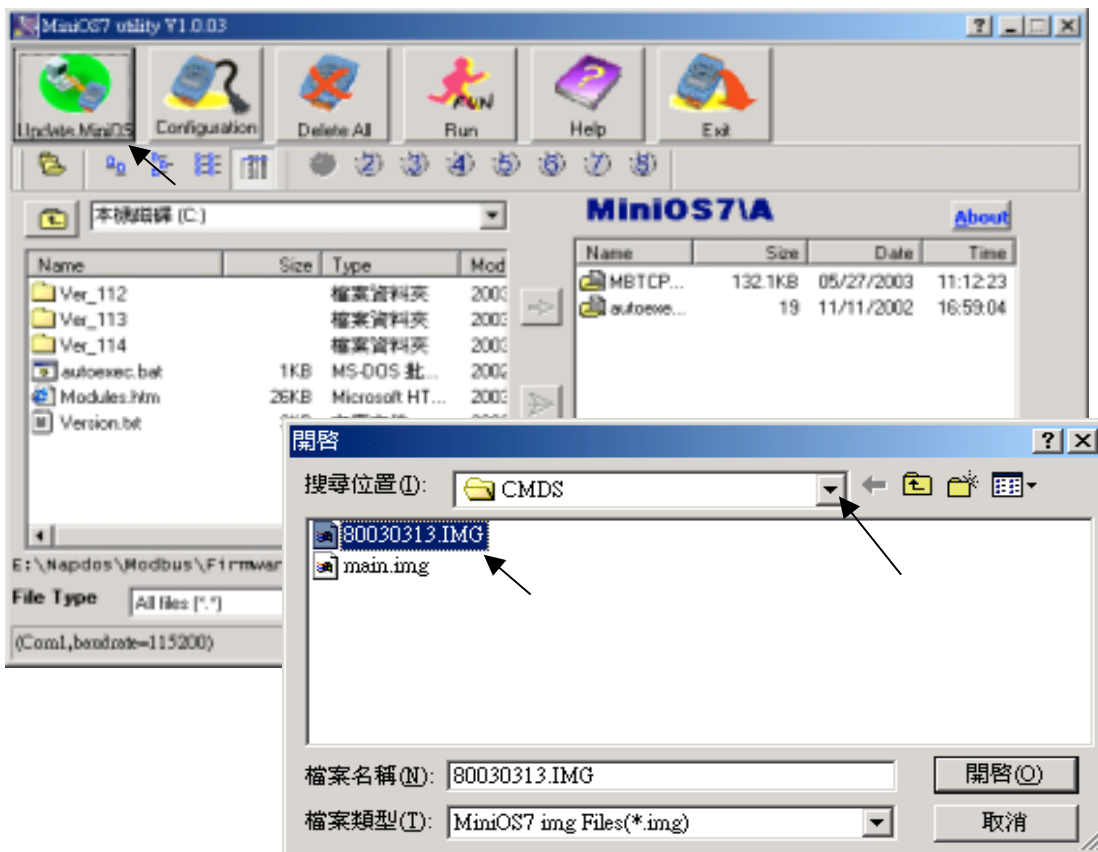
1. Link from COM1 of your PC to COM1 of the 8000 controller by a RS232 cable.
2. Power off the 8000 controller, connect pin "INIT" to "INIT COM", and then power it up.
3. Run "7188e - MiniOS7_utility – MiniOS7 utility". Click on "OK" (115200)



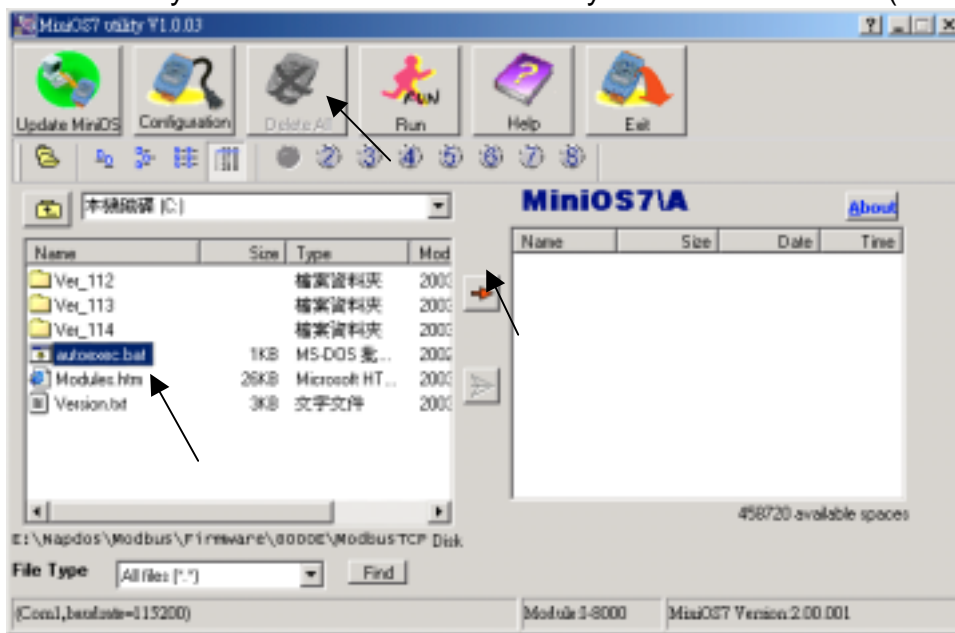
If communication is OK, a window will display as below



4. To update MiniOS, click on “Update MiniOS”, then browse the correct image file. It takes about 40 seconds to finish. (Do not Power off the controller during these 40 seconds)



5. To update new firmware (or files) to the controller, click on “Delete All” to delete all current files inside the controller. Then select the new file on the left, click on “→” to burn it into the controller. Normally there are two files necessary for 8000 controller. (autoexec.bat & ...)



6. Power off the controller, then remove connection between "INIT" to "INIT COM", and then power up the controller again.