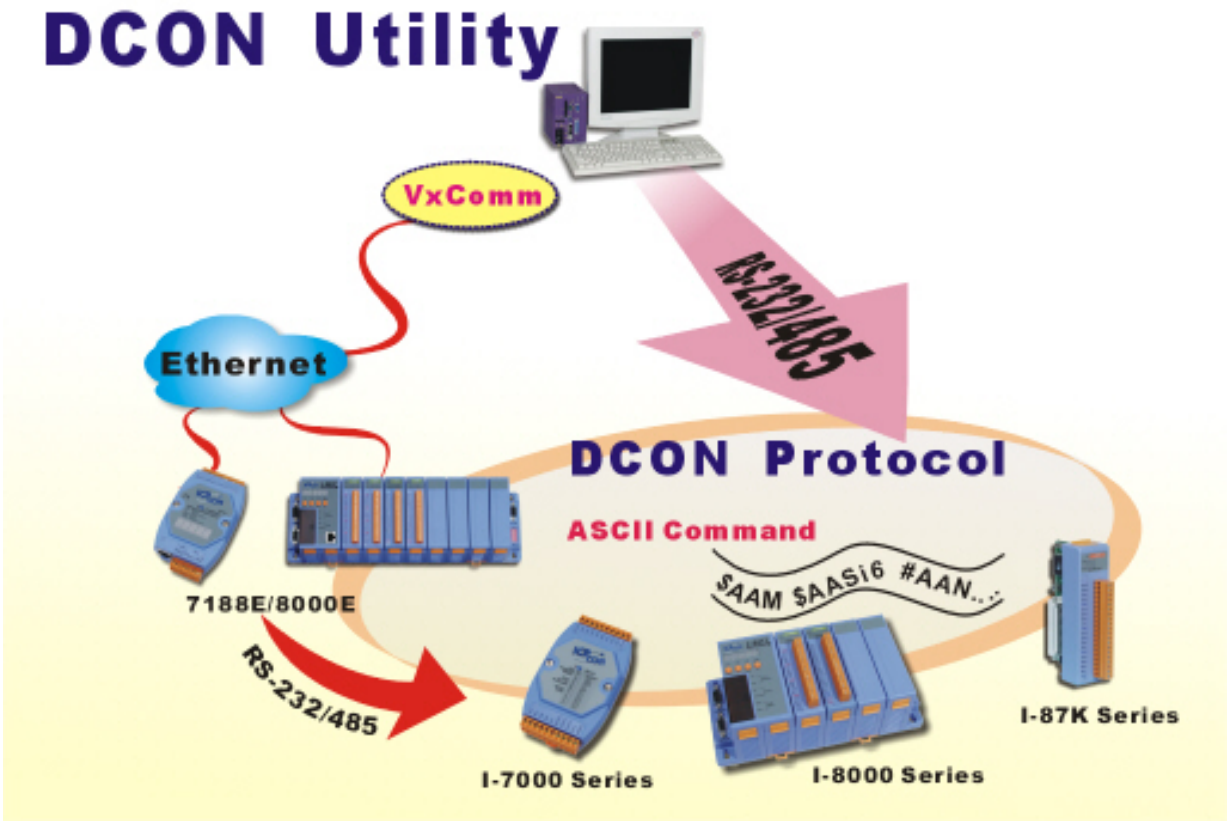
# I-87KX SERIES

# I/O EXPANSION UNIT

## User's Manual

### Version 1.0




ICP DAS, Co., LTD www.icpdas.com

# 87K4/87K5/87K8/87K9

Warranty

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Warning

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All information about this manual is for items as the table below.

| | |
|---|---|
| I-87K4 | 4-slot I/O Expansion Unit |
| I-87K5 | 5-slot I/O Expansion Unit |
| I-87K8 | 8-slot I/O Expansion Unit |
| I-87K9 | 9-slot I/O Expansion Unit |

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# Chapter1. Introduction

1. The 87K4/5/8/9 I/O Expansion unit is a plastic housing unit that provides one set power unit (10 V ~ 30 V DC) and one RS-485 interface and can be shared by those 87K I/O modules which are inserted into this I/O Expansion unit. This character can save time on wiring for power and RS-485 interface between 87K I/O modules. **(page 5 ~ 6)**

**2.** The 87K4/5/8/9 I/O Expansion unit does not have RS-485 address, and all the 87K I/O modules which inserted into this I/O Expansion unit have their own RS-485 address, baud rate and checksum independently. **(page 17)**

3. To Configure the 87K I/O modules which are inserted into the 87K4/5/8/9 I/O Expansion unit, it must install the DCON Utility first on PC (Windows 98/NT/2000/XP). **(page 15 ~17)**

4. To communicate the 87K I/O modules, it must have RS-485 connection between PC and 87K4/5/8/9 I/O Expansion unit. **(page 9)**

5. It must be one by one to configure the RS-485 address, baud rate and checksum settings of 87K I/O modules to avoid the confliction of communication parameters. **(page 16)**

6. It must adjust the INIT* pin to GND before change the baud rate and checksum settings. **(page 7 and 17)**

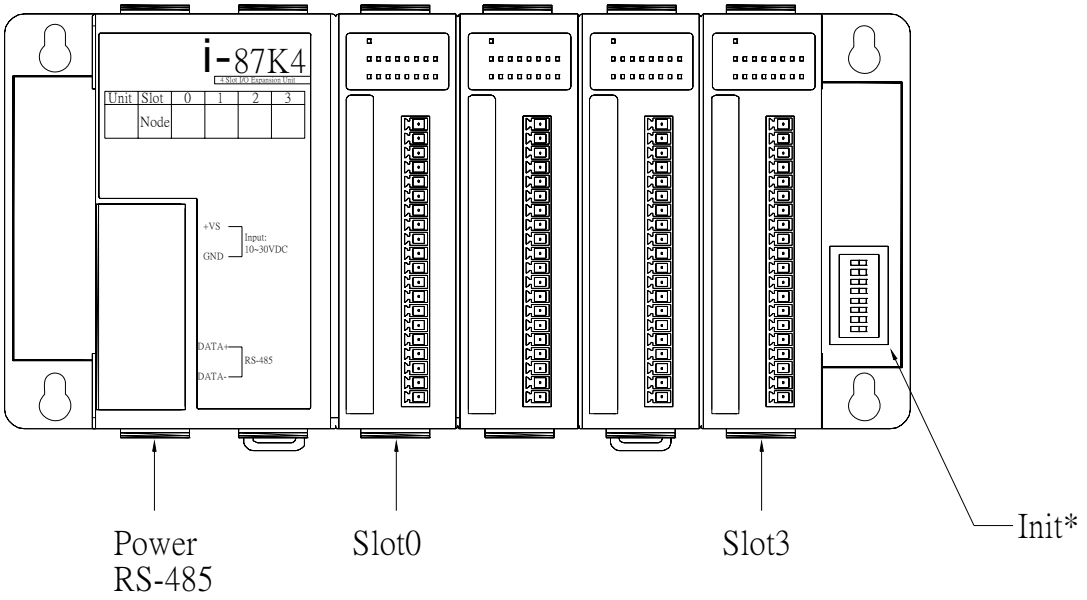
7. It provides DIN Rail clips and Screw pores to mount the I/O Expansion unit. **(page 14)**

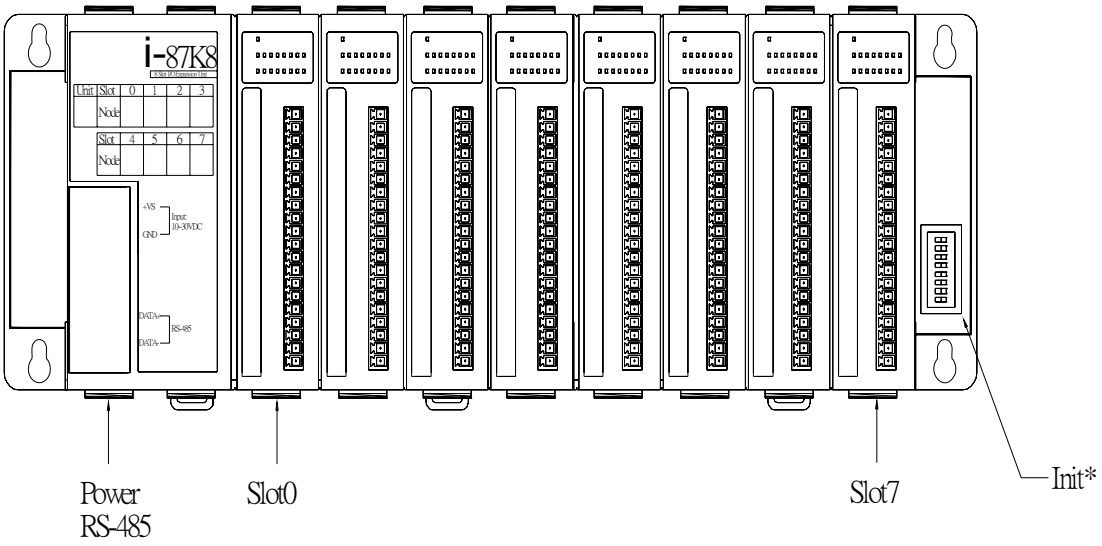
8. It provides Frame Ground for bypassing ESD. **(page 27)**

9. It provides various free tool kits for developing the application. **(page 28 ~ 29)**

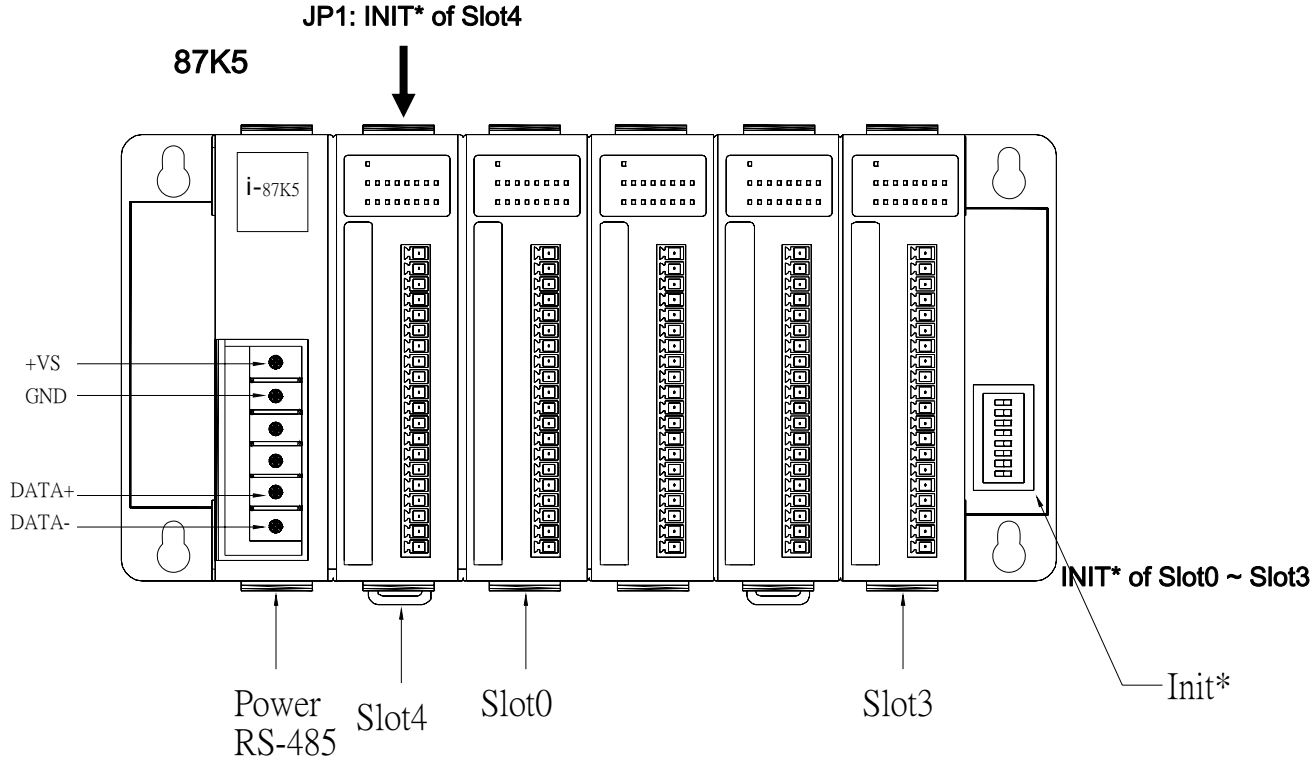
# Chapter2. The Hardware of I/O Expansion unit

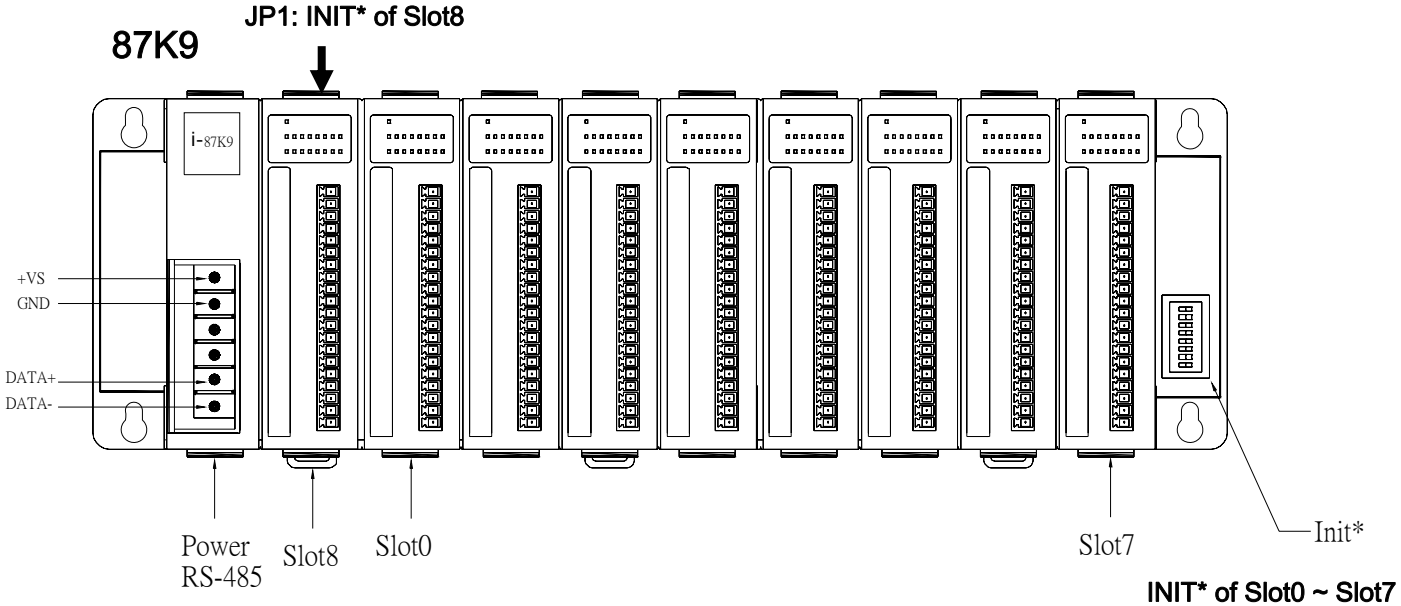
## 2.1 87K4, 87K8:



## 2.2 87K5, 87K9:


JP1: INIT* of Slot4
87K5
i-87K5
+VS
GND
DATA+
DATA-
INIT* of Slot0 ~ Slot3
Power
RS-485
Slot4
Slot0
Slot3
Init*


JP1: INIT* of Slot8
87K9
i-87K9
+VS
GND
DATA+
DATA-
Power
RS-485
Slot8
Slot0
Slot7
Init*
INIT* of Slot0 ~ Slot7

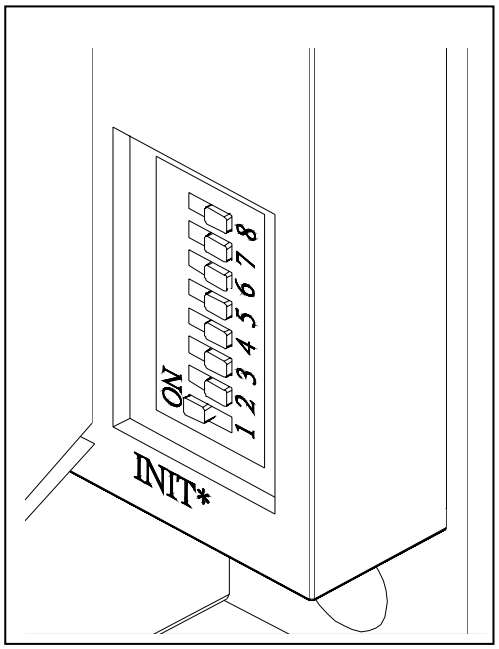
## 2.3 The INIT on the 87K4/5/8/9 I/O Expansion unit

When we need to change communication parameters ( baudrate 、checksum and protocol etc ) on the module,INIT* pin need connects to GND on this module .The INIT* pins of Slot0 to Slot7 are located at the right edge of i-87K I/O Expansion.

### 2.3.1 The INIT at the backplane

**Note 1:** When power on i-87K I/O Expansion, only one INIT*-Switch can be set to ON (INIT* pin connects to GND) at the same time.

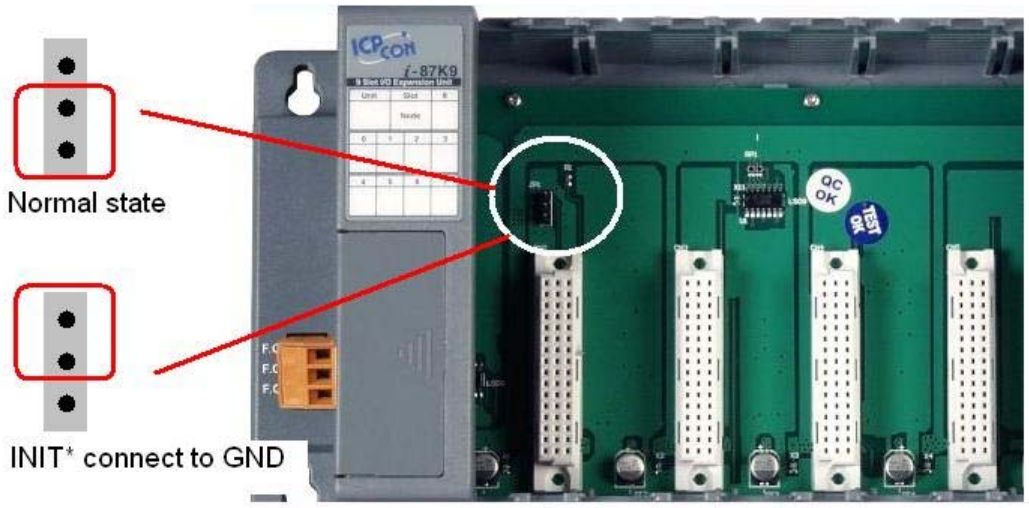
The table below shows how to map the INIT* pins to the slot I/O on i-87K I/O Expansion.




i·

| | 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** |

**Note 2:** The INIT* pin of i-87K5 is located at Slot4, and i-87K9 is at Slot8. The diagram below shows the INIT* pin location and how to use the jumper to short the INIT* to GND. If the module at this slot needs to connect the INIT* to GND, it will be better to do this job at another Slot

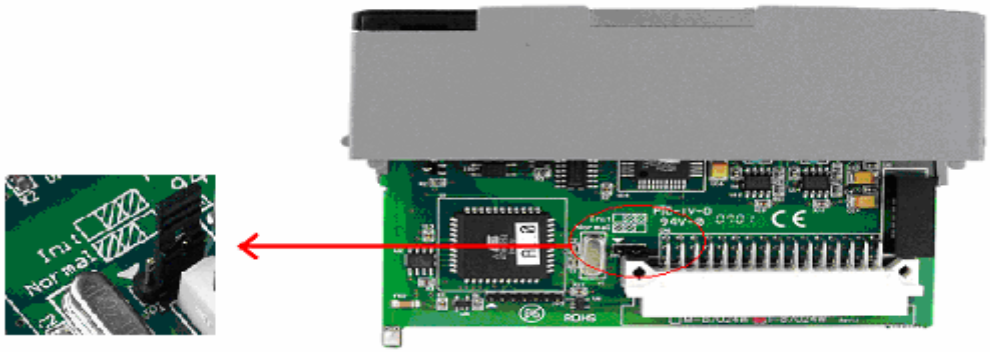



The location of INIT* pins are located at slot4 of i-87K5 and slot8 of i-87K9

**Note 3:** The Slot location (index of Slot) is not related to the Net Address of I/O modules, it only indicates the relative position of module on i-87K I/O Expansion unit.

### 2.3.2 The INIT* of i-87K High Profile I/O module between new and old backplane

Some of the I-87K High Profile series I/O modules have INIT Jumper on module itself. The INIT Jumper is located at module's PCB board, for example High Profile series I/O module 87024W：



INIT Jumper　　i-87024W module

And there are new i-87K I/O Expansion unit now.

The only difference between new and old i-87K I/O Expansion unit is that It must put the INIT jumper at “INIT” position, if want to connect INIT* to GND, if **i-87K high profile I/O with INIT Jumper** plug in **old i-87K I/O Expansion unit.**

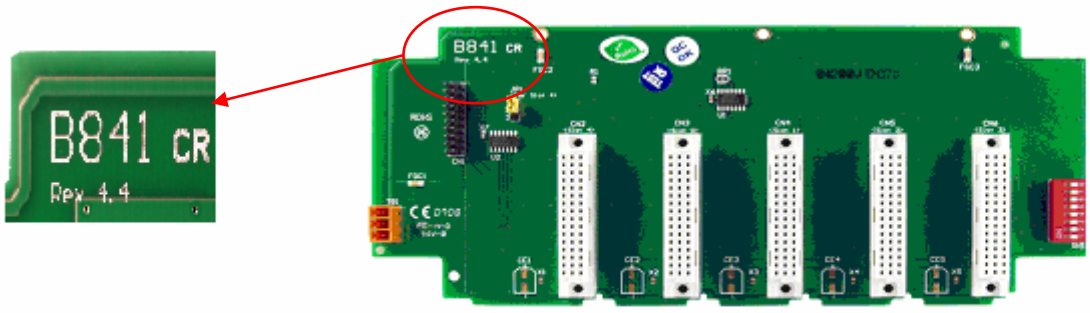
If i-87K high and low profile I/O inserted in new i-87K I/O Expansion unit, all steps are the same to connect INIT* to GND, that is to use the INIT dip switch at the right side of plastic house.

Note: When i-87K high profile I/O module applies to new i-87K I/O Expansion unit, the INIT jumper must put at “Normal” position or it will always be at INIT state.

The backplane version of i-87K I/O Expansion unit：

| | Old version | New version |
|---|---|---|
| **i-87k4/i-87k5** | B841 Rev 4.3 before | B841 Rev 4.4 later |
| **i-87k8/i-87k9** | B881 Rev 4.2 before | B881 Rev 4.3 later |

1. For the version of backplane, it is located the PCB board like below picture




The version of backplane B841 Rev 4.4

# Chapter3. Setup the Expansion unit and I/O modules.

The first thing is to make sure the I/O Expansion unit is correctly wired, the basic wiring includes **power supplier** and **communicate interface**.

## 3.1 Power Supplier:

ACE-540A

DIN-540A

Please refer to: http://www.icpdas.com/products/Accessories/power_supply/power_list.htm

1. The power supply must be **DC power between +10V to +30V**.

2. Wiring: **+Vs connects to +Vs**; **GND connects to GND**.

3. Carefully calculate the total watts or current consumption of the system.
   If the total watts were not enough, the system will become unstable and abnormal.

Total watts = Σ(supplied Voltage)*( Ampere consumed)

## 3.2 RS-485 Converter:

87K4/5/8/9 I/O Expansion unit supports **only i-87K** and **M-87K** I/O modules. It does not support i-8K series I/O module. The only communication interface of 87K4/5/8/9 I/O Expansion unit is its **RS-485 port**.

So, it often needs a RS-232 to RS-485 converter such as 7520 to converter the RS-232 signal to RS-485.

For more detail about the converter selection guide, please refer to:
http://www.icpdas.com/products/Industrial/communication_module/communication_list.htm

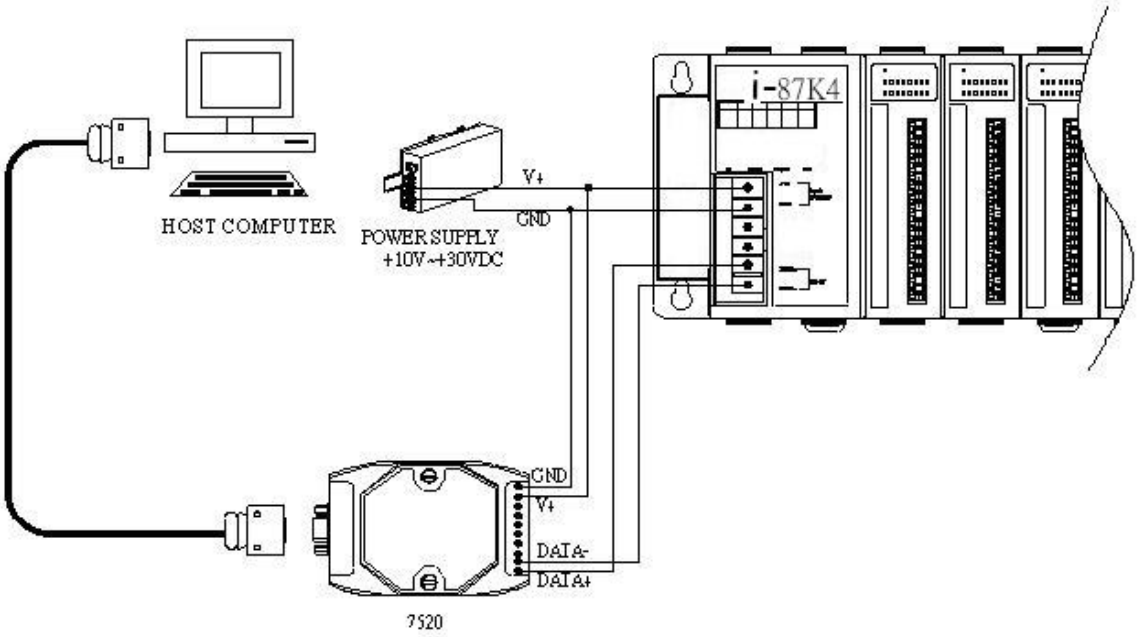
For using the i-7520, please refer to:
http://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/7000/manual/7520.pdf

For most personal computers also provide USB interface, it also can use 7561 (USB to RS-232/422/485) converter.

Note: When use 7561 as USB to RS-232/422/485 converter, the computer must install the USB driver first.

For USB Driver: ftp://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/7000/756x/i-7561/

## 3.3 The Wirings:



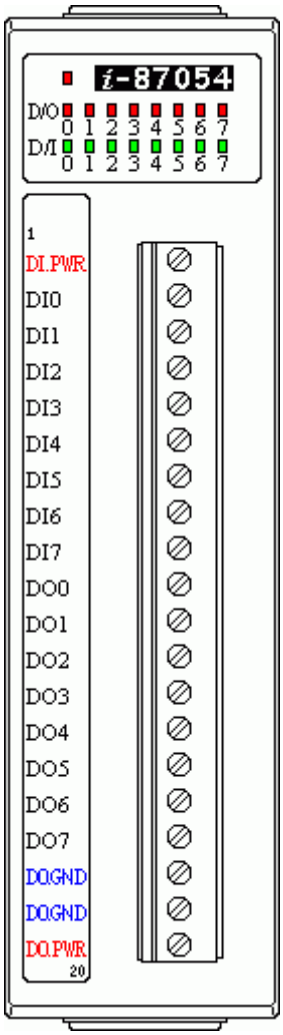
## 3.4 I/O module installation:

**Step1**: Read the document at the following location

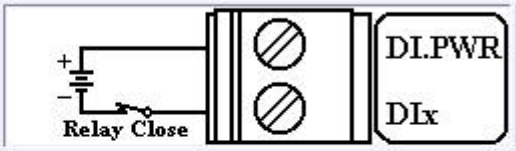
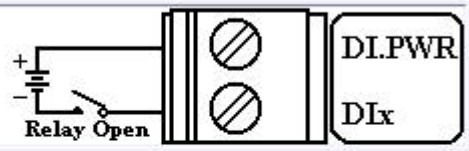
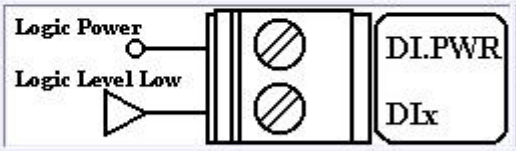
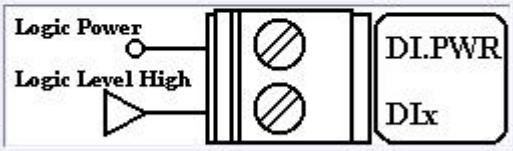
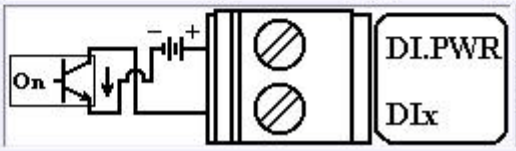
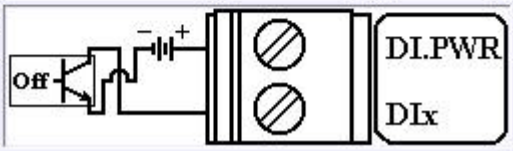
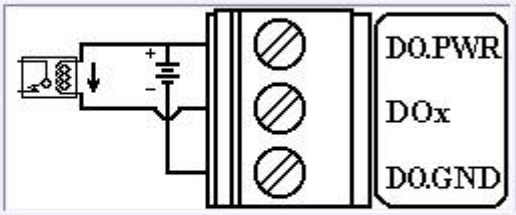
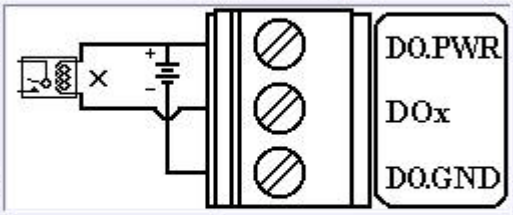
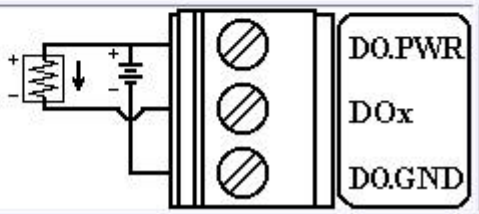
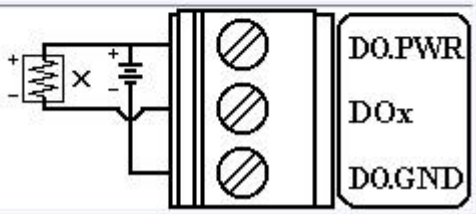
**For I-87K series modules the files are located at:**

CD:\ Napdos\DCON\IO_Module\hw_dcon_on_8KUnit\87k
ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/dcon/io_module/hw_dcon_on_8kunit/87k/

These *.chm files include the I/O module specifications, pin assignments, wire connections. For example, the pin assignments and wire connections are as follows.

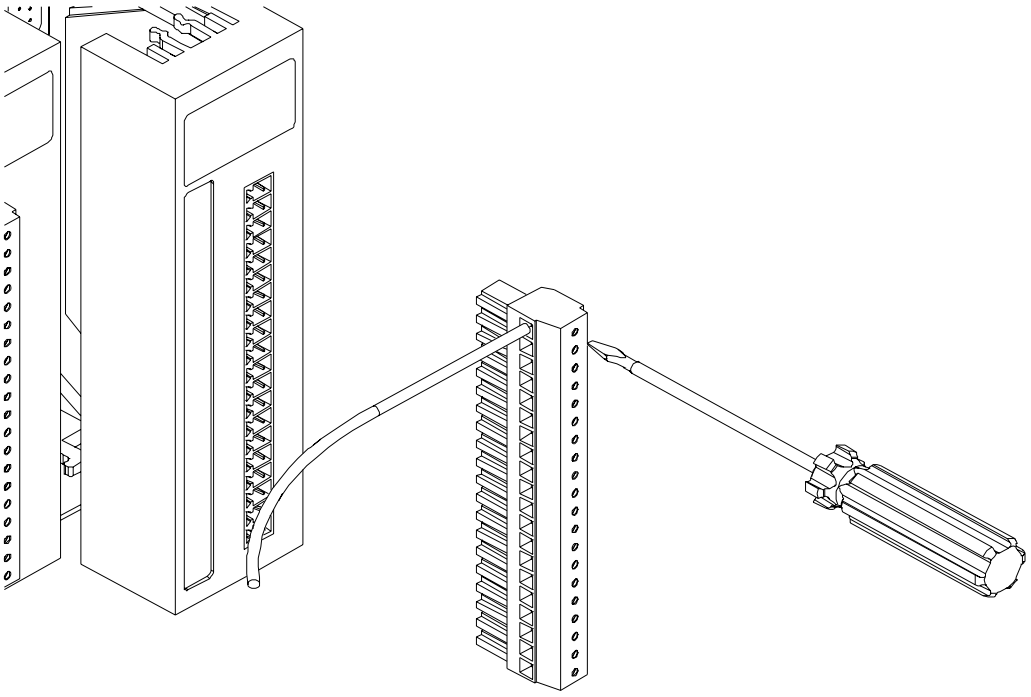



**Pin assignment**

| Input Type | ON State<br>LED ON<br>Readback as 1 | OFF State<br>LED OFF<br>Readback as 0 |
|---|---|---|
| Relay Contact |  |  |
| TTL/CMOS Logic |  |  |
| Open Collector |  |  |
| | | |
| **Output Type** | **ON State<br>LED ON<br>Readback as 1** | **OFF State<br>LED OFF<br>Readback as 0** |
| Drive Relay |  |  |
| Resistance Load |  |  |

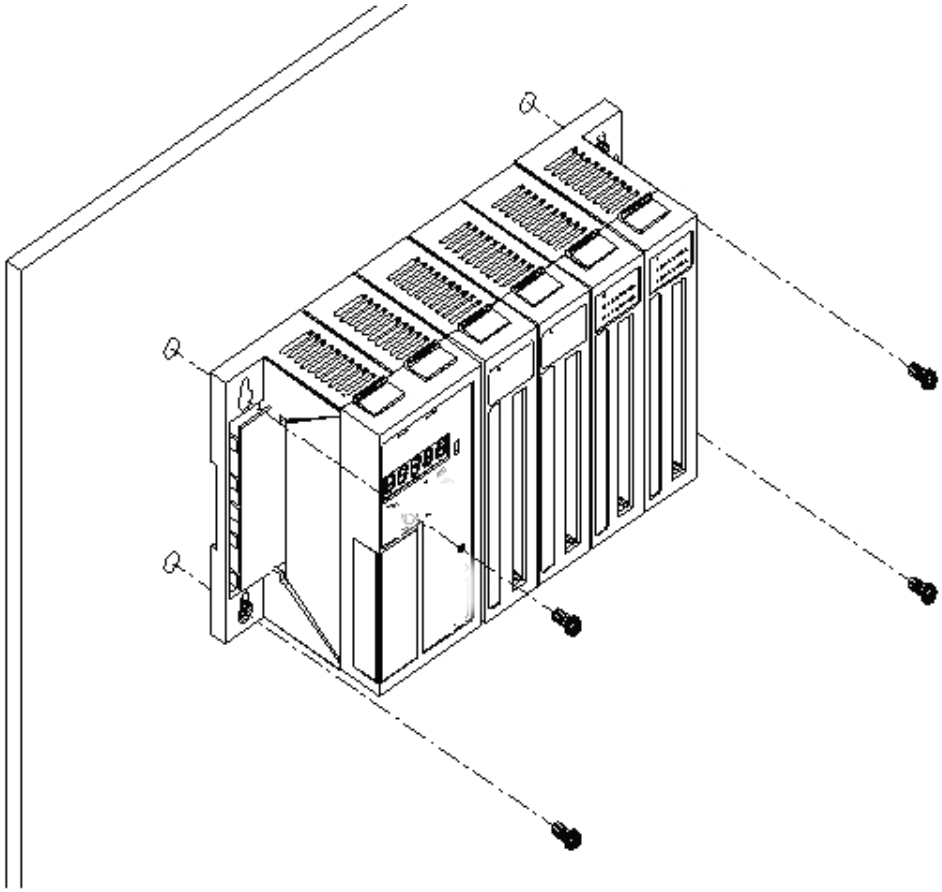
**Wire Connection**

**Step2**: Connect the wire Insert the I/O module into the 87K4/5/8/9 Expansion unit

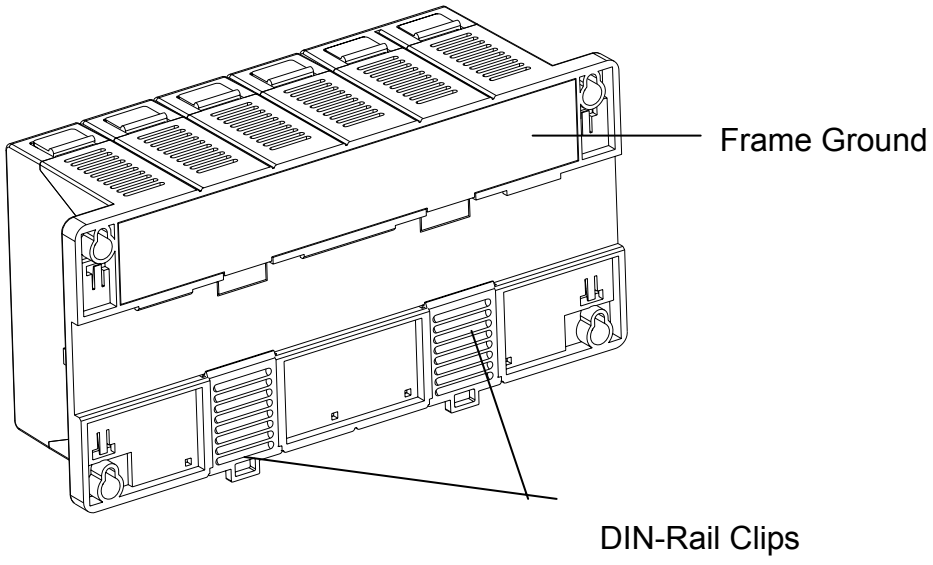


**Step3**: Mount the I/O unit

Method (a): using screw panel mounting



Method (b): DIN-Rail mounting



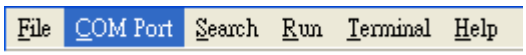
# Chapter4. Configure the I/O modules with DCON Utility.

## 4.1 Search 87K I/O with DCON Utility:

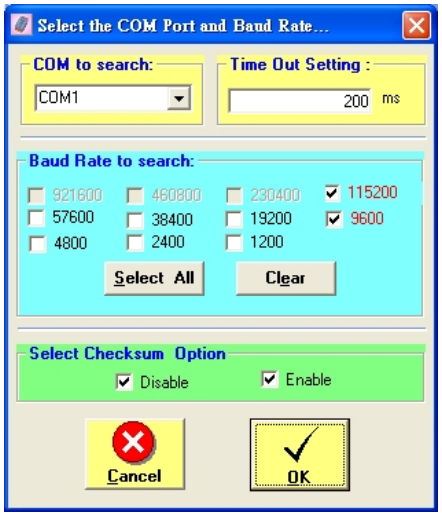
DCON Utility is a program based on Serial interface I/O, it can search **DCON Protocol** and **Modbus RTU Protocol** modules and support checksum disable and enable.

### 4.1.1 COM Port and Searching Conditions:

Step 1: Choose the COM port and select the searching parameters.




If user does not know the modules' communication baud rate or the network consists of I/O modules with different baud rates, it can choose multi baud rates, both checksum disable and enable condition for searching condition.




If the response may have many characters or the module use low speed baud rate, it is better to increase the timeout setting.

### 4.1.2 Searching Principles:

**Search and configure the I/O one by one**. If there are several I/O modules with unknown Net Address, Baud rate, Checksum and Protocol, they have to be searched and configured one by one.

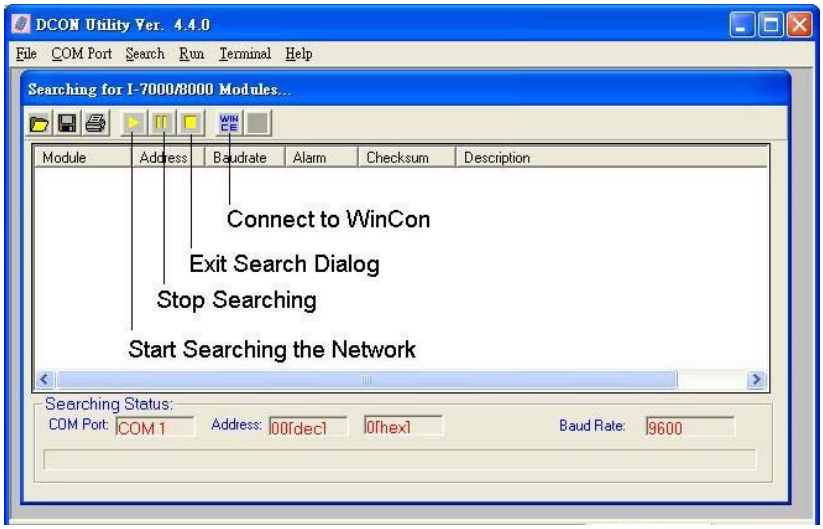
If failed to find the I/O module, it is better to **Power on the I/O module with INIT* pin connects to the GND to get the I/O module's initial communication settings**.

Initial communication settings of 7000 series and 87K series are list at the table below.

| | 7000 series (i-7000 and M-7000) | 87K series |
|---|---|---|
| Address | 0 | 0 |
| Baud rate | 9600 | 115200 |
| Checksum | Disabled | Disabled |
| Protocol | DCON Protocol | DCON Protocol |

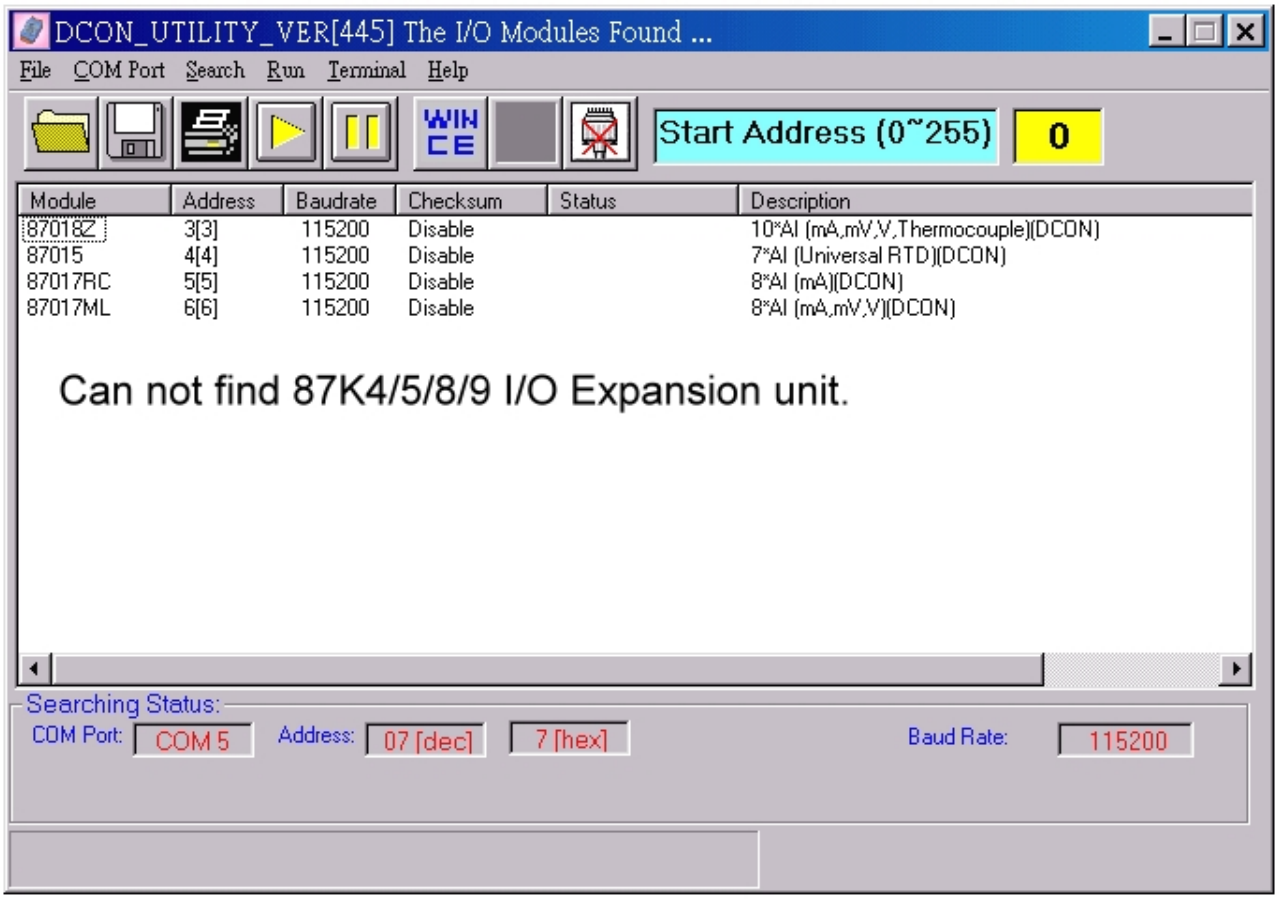
Note: The default settings and initial settings are different.

If the wirings are correctly connected and communication parameters are correct too. Clicks to start searching.



## 4.2 Search Result:

When use DCON Utility to search 87K4/5/8/9 I/O Expansion unit and the 87K I/O modules, only 87K I/O modules can be found.




## 4.3 To Configure i-87K I/O modules:

There are DCON Protocol and Modbus Protocol I/O module, for most general settings, they need to choose the wanted property and click setting to make it effect.

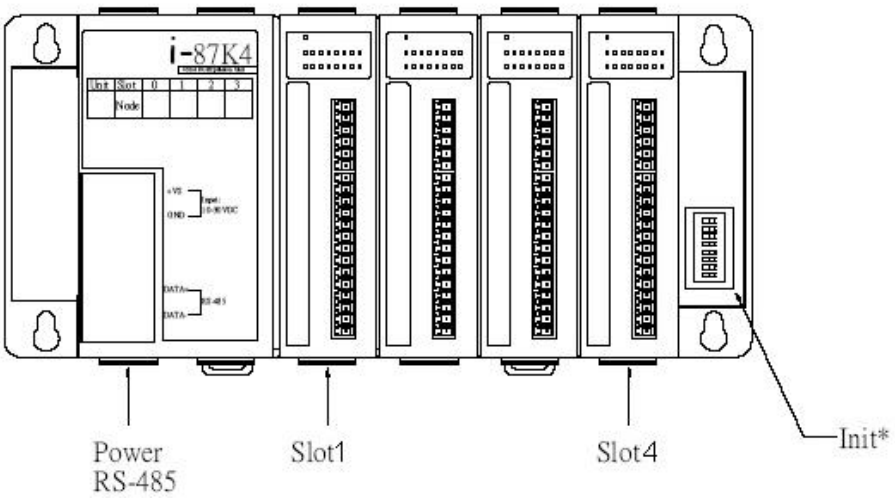
If attempted to change the Baud Rate, Checksum and Protocol, the **INIT* pin needs to connect to GND**. After successfully configuring these properties, the I/O modules must be **reset the Power** to bring the settings into effect.

For more detail about using DCON Utility to Configure I/O modules, please refer to the CD:\NAPDOS\Driver\DCON_Utility\Manual or
ftp://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/driver/dcon_utility/manual/

There are some types of INIT* and they are at different position.

- i-87K4, i-87K8 I/O Expansion unit:

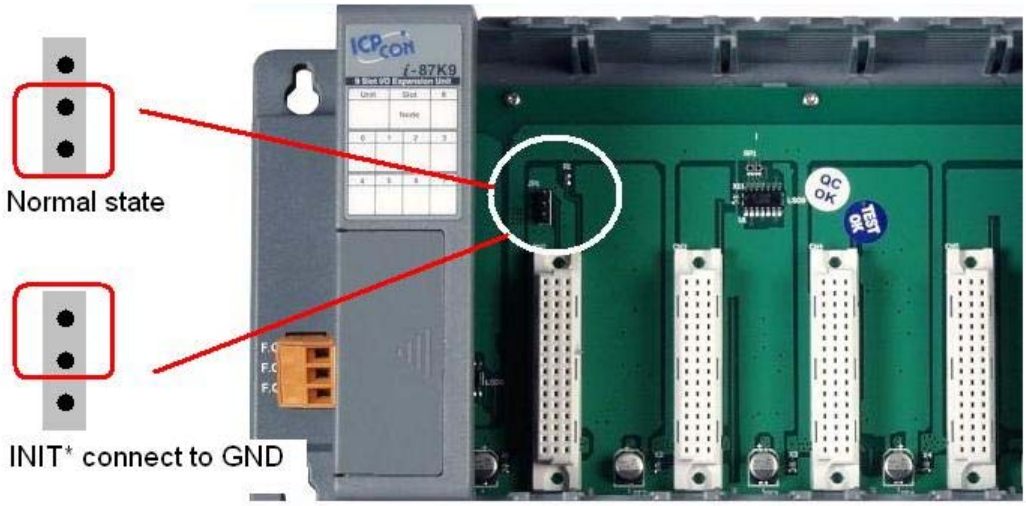
The INIT* pins of Slot0 to Slot7 are located at the right edge of i-87K I/O Expansion.




- i-87K5, i-87K9 I/O Expansion unit:

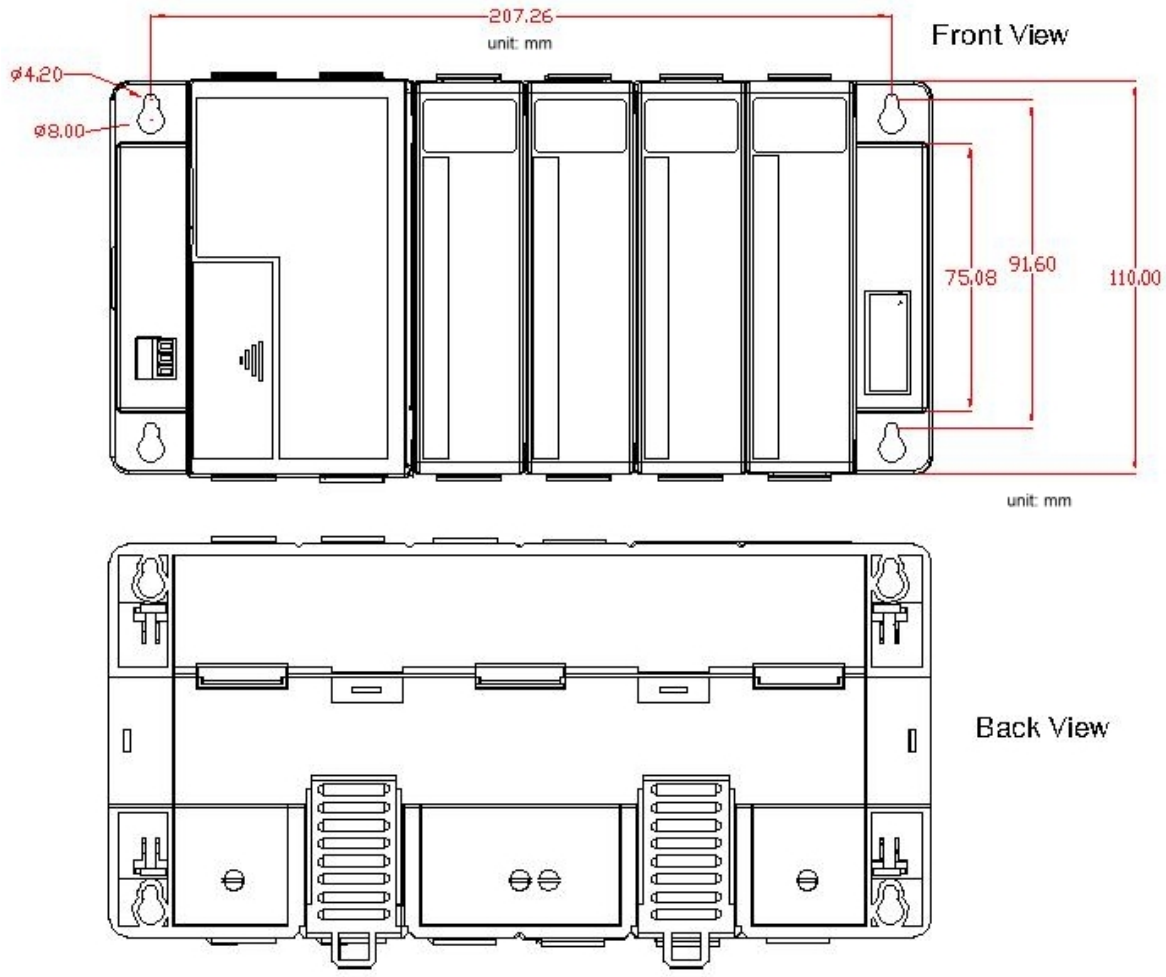
The INIT* pins of Slot0 to Slot7 are located at the right edge of i-87K I/O Expansion.

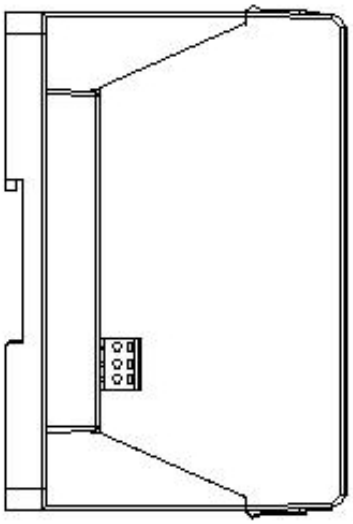
But the INIT* pins of slot4 for 87K5 and slot8 for 87K9 are located at the first slot of Expansion unit.



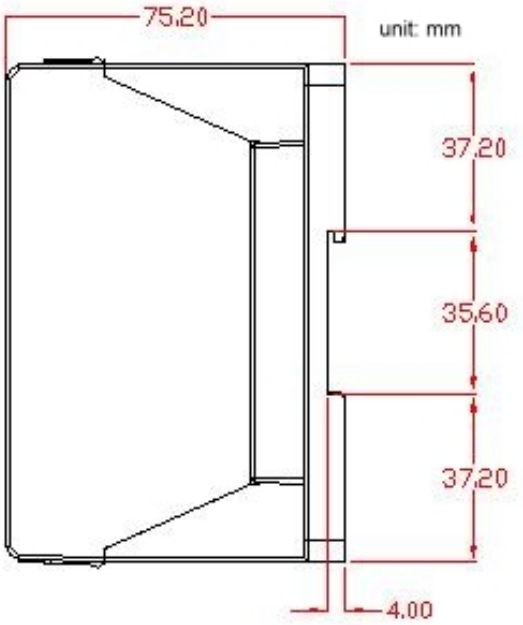

The location of INIT* pins are located at slot4 of i-87K5 and slot8 of i-87K9

# Appendix A: Dimensions

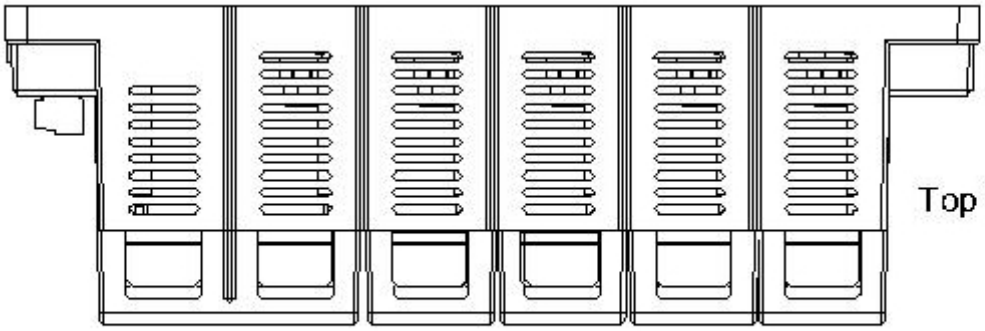




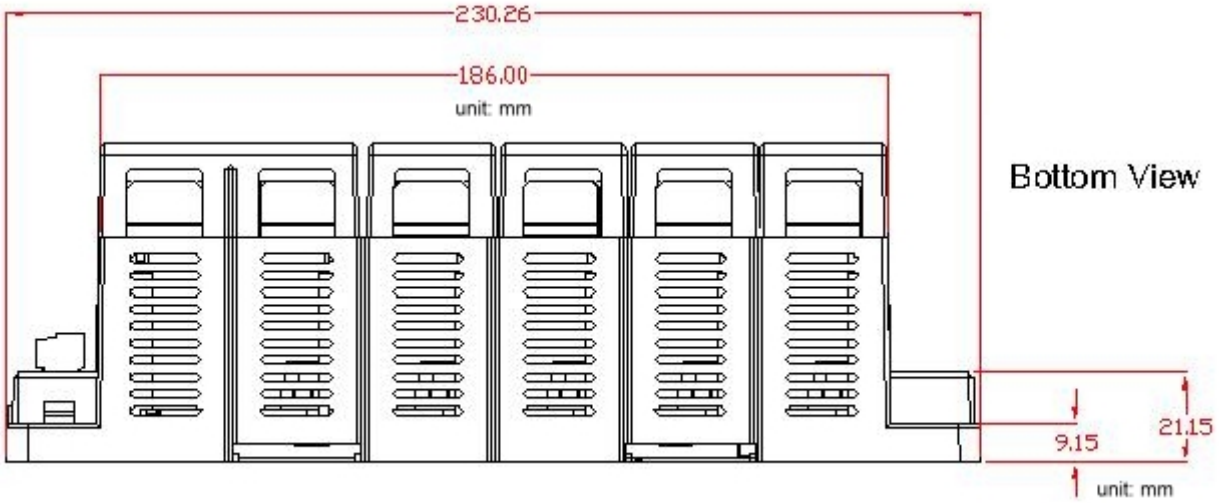
Left Side View



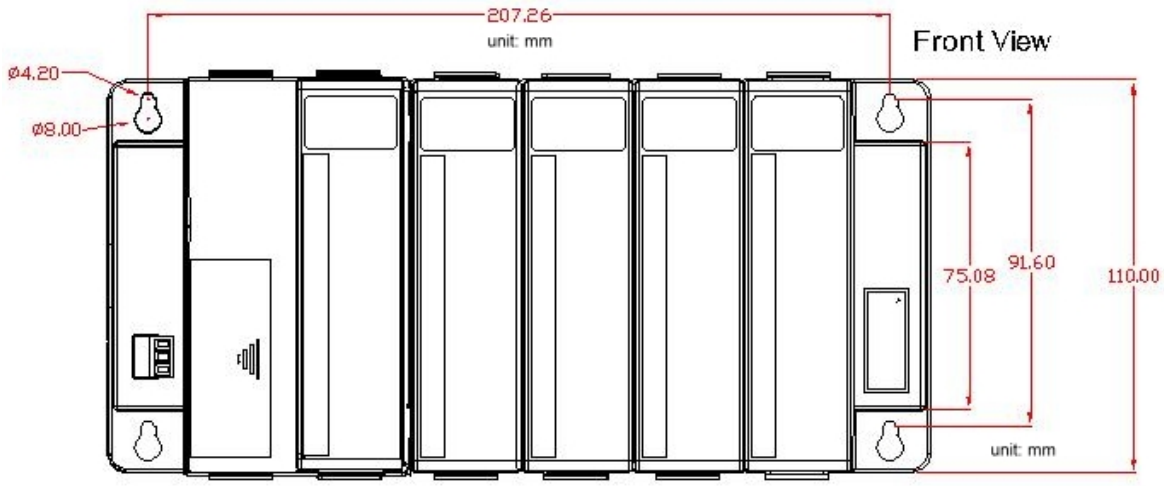

Right Side View

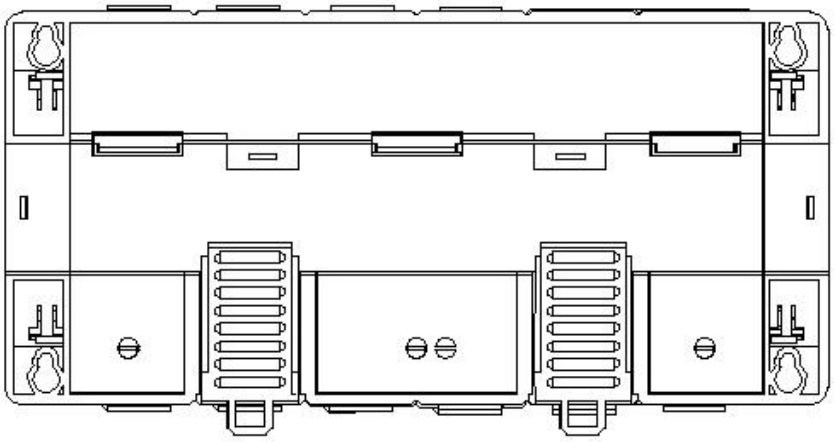


Top View

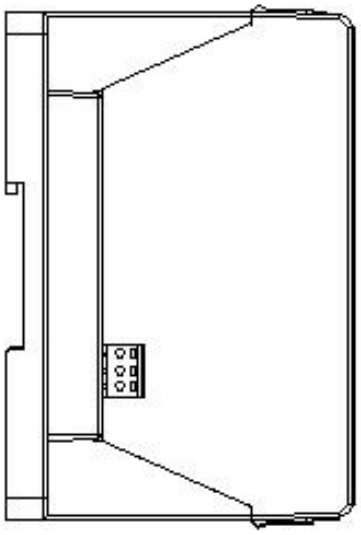



Bottom View

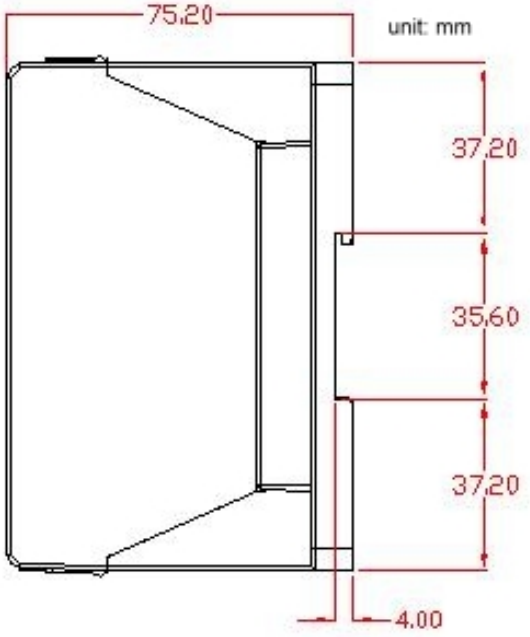


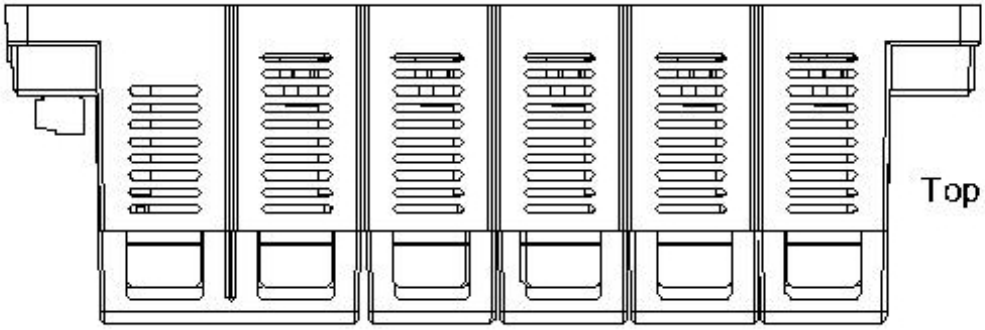
Back View

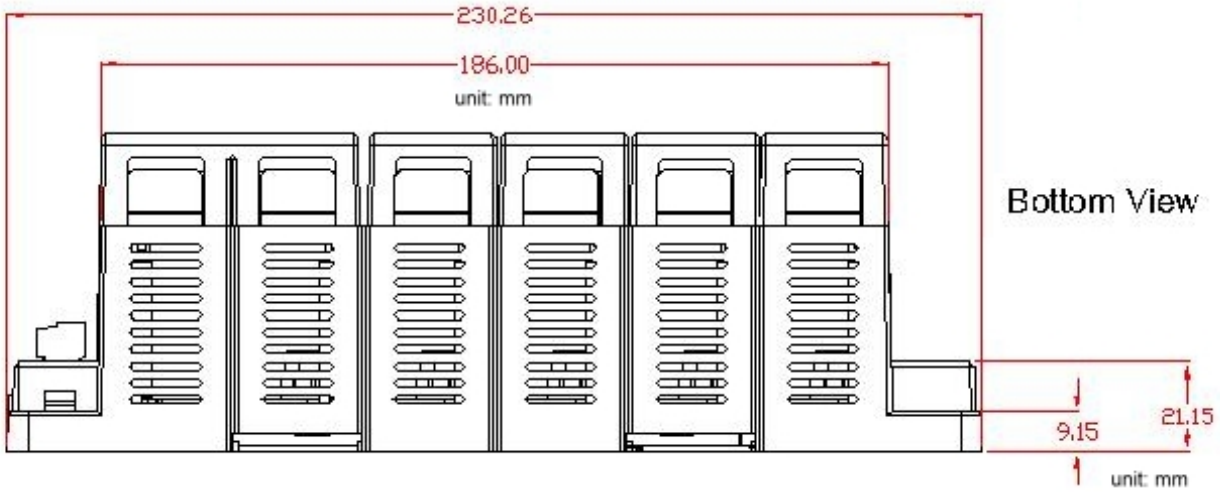


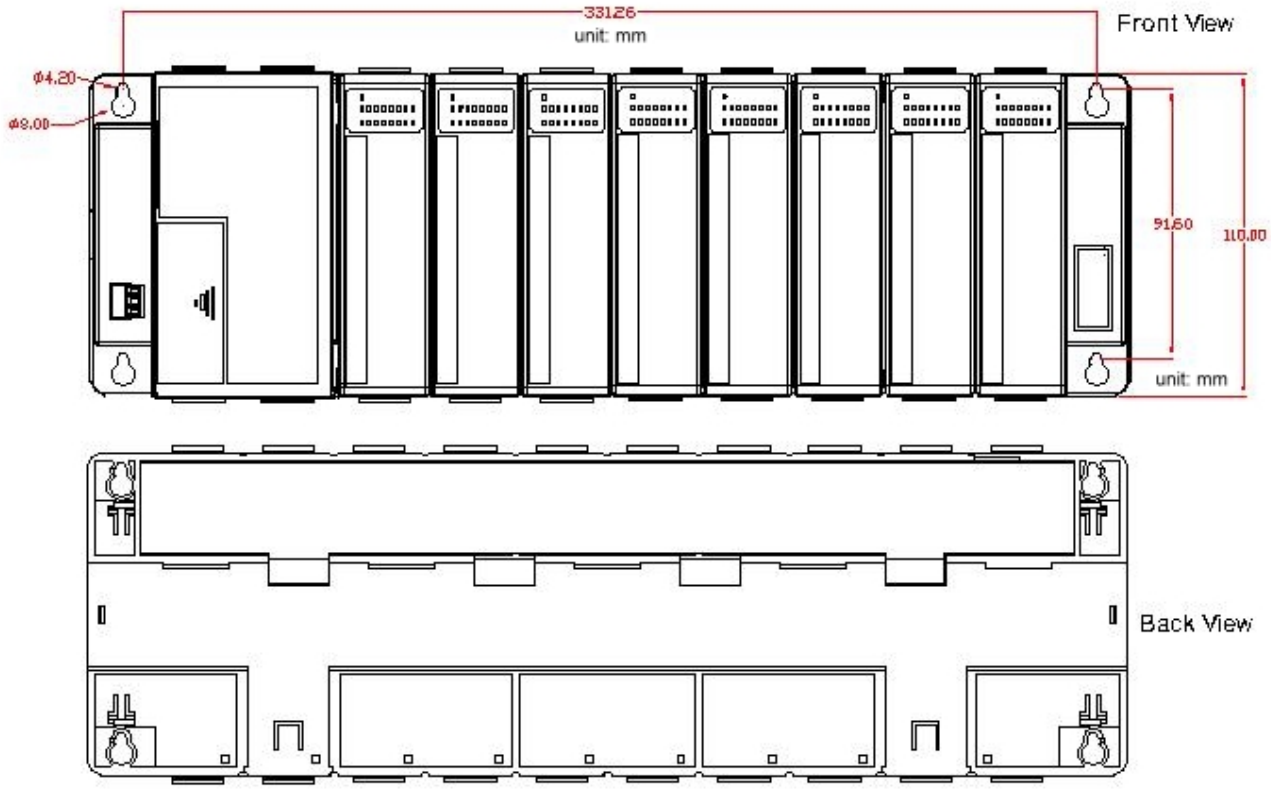
Left Side View



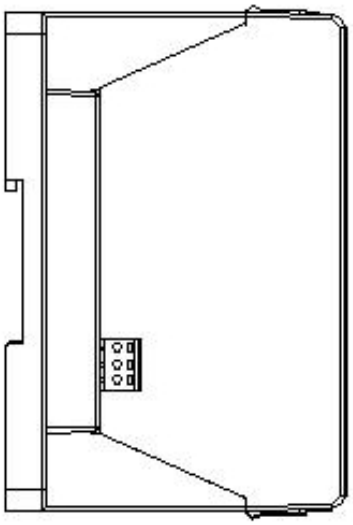

Right Side View


Top View

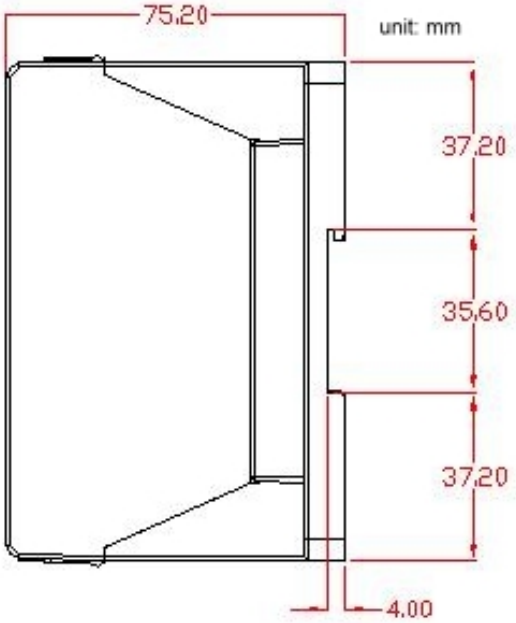

230.26
186.00
unit: mm
Bottom View
9.15
21.15
unit: mm


331.26
unit: mm
Front View
ϕ4.20
ϕ8.00
91.60
110.00
unit: mm

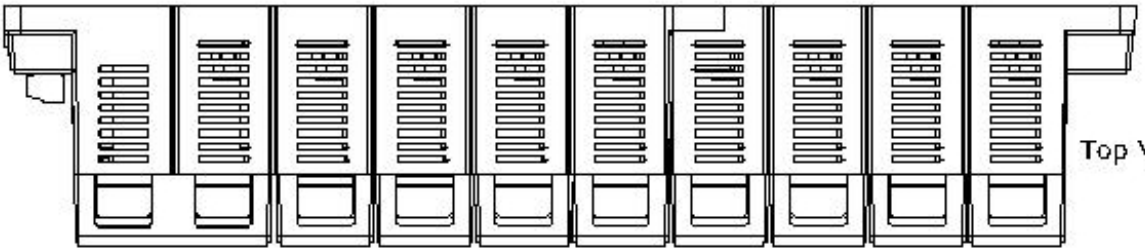

Back View



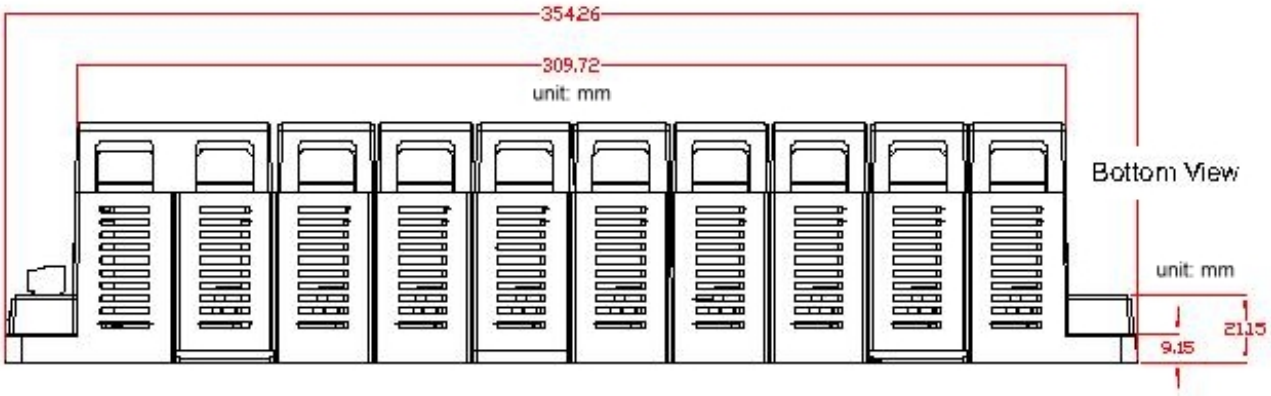
Left Side View

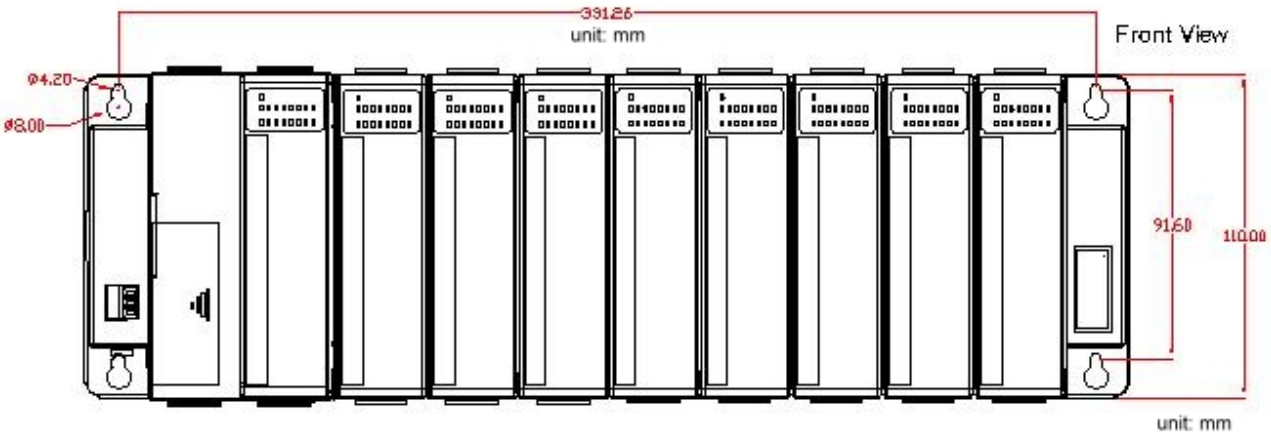


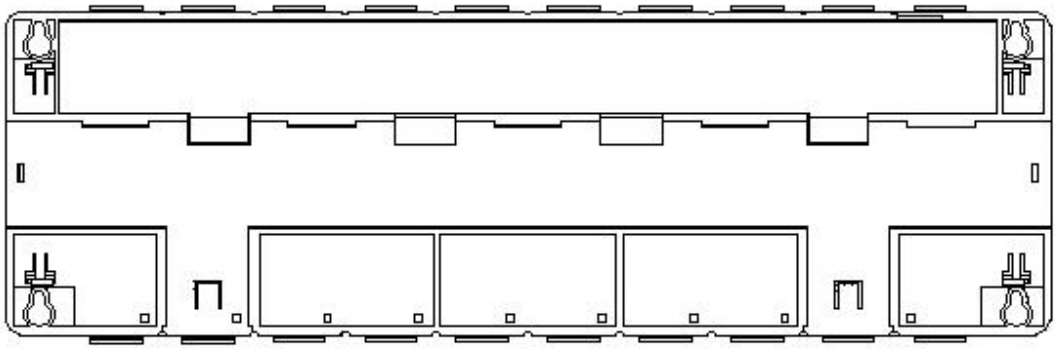

Right Side View

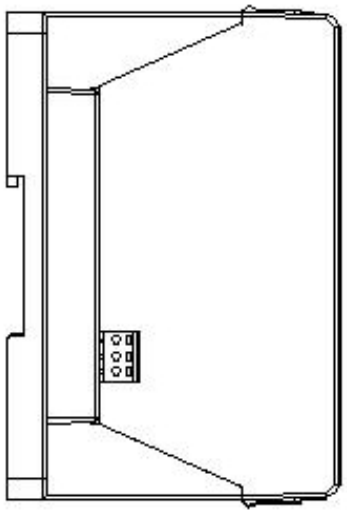


Top View

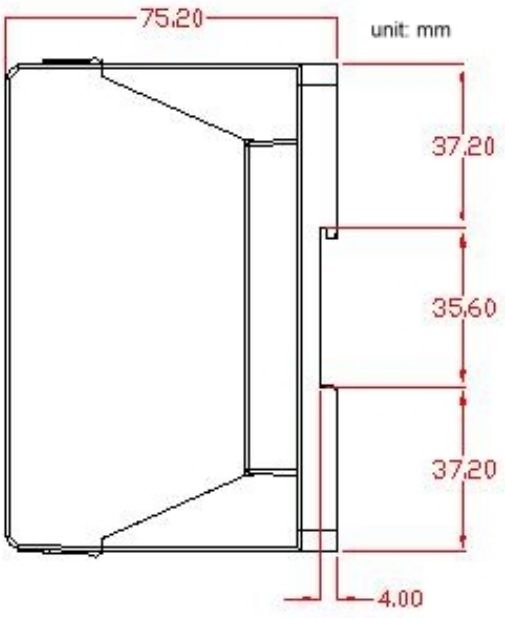




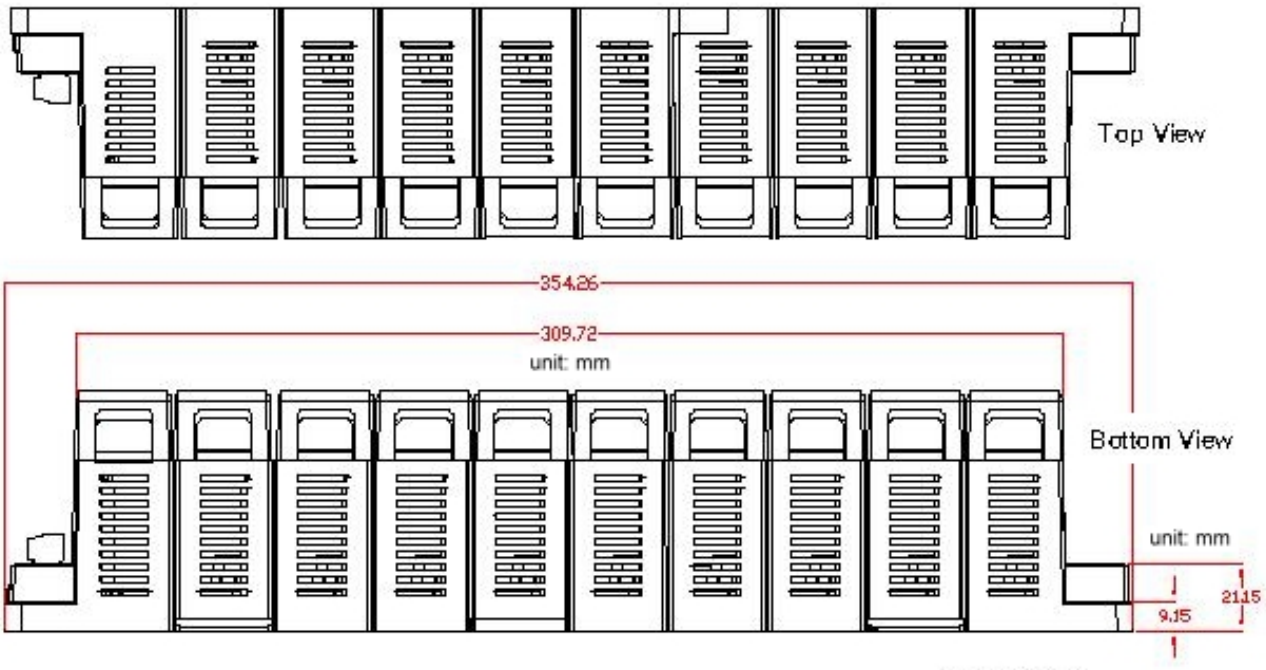



Left Side View




Right Side View


Top View
354.26
309.72
unit: mm
Bottom View
unit: mm
21.15
9.15

# Appendix B: Frame Ground

Electronic circuits are constantly vulnerable to Electro-Static Discharge (ESD), which become worse in a continental climate area. Some I-7000 ,M-7000 and I-8000 series modules feature a new design for the frame ground, which provides a path for bypassing ESD, allowing enhanced static protection (ESD) capability and ensures that the module is more reliable.

The following options will provide a better protection for the module:

The i-8000 controller has a metallic board attached to the back of the plastic basket as shown in the Figure 2-1 below. When mounted to the DIN rail, connect the DIN rail to the earth ground because the DIN rail is in contact with the upper frame ground as shown in the Figure 2-2 below.

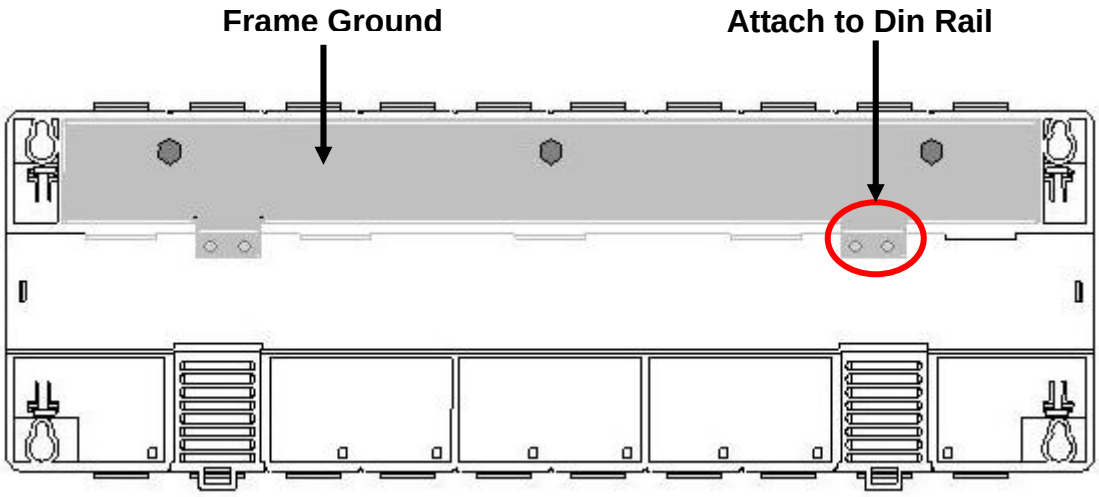



Figure B-1

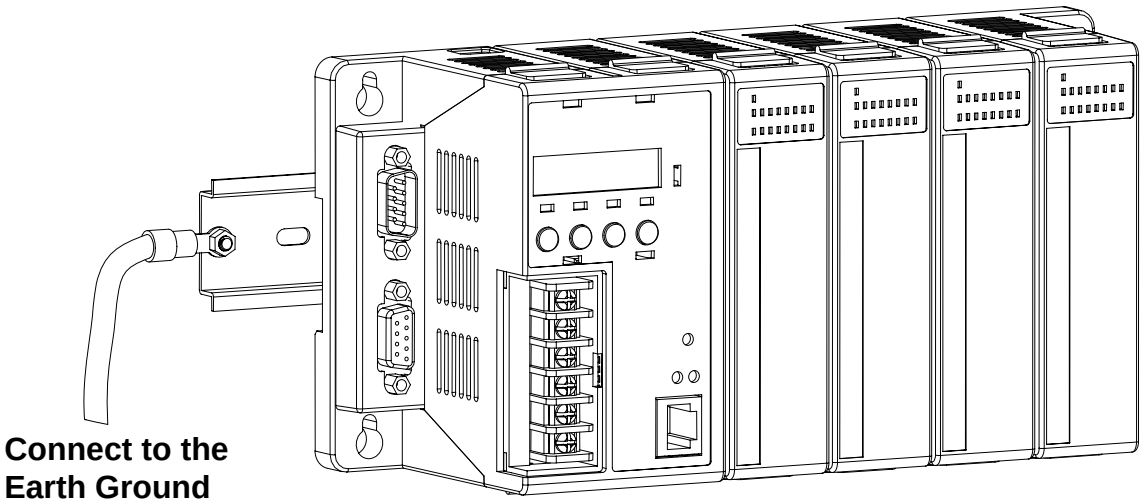
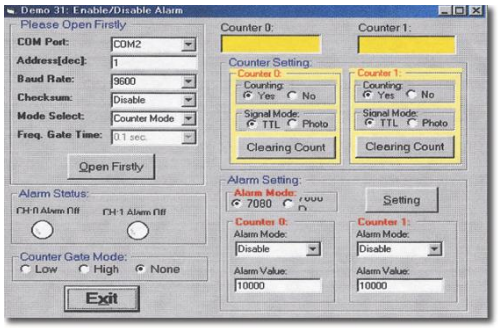



Figure B-2

# Appendix C: DCON Protocol and Software Development ToolKit (free)




***DCON DLL***

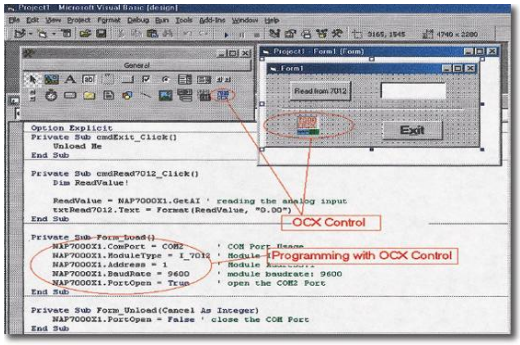
DLL library

**Supported modules:**
i-7000/8000/87K series
(with DCON protocol)

**Supported demos:**
VB/VC/BCB/Delphi

**Supported OS:**
Windows 98/NT/2K/XP

**File location:**
CD:\Napdos\Driver\DCON_DLL




***DCON ActiveX***

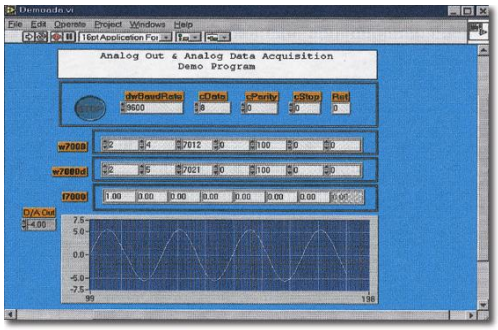
ActiveX (ocx) component

**Supported modules**:
i-7000/8000/87K series
(with DCON protocol)

**Supported demos**:
VB/VC/BCB/Delphi

**Supported OS**:
Windows 98/NT/2K/XP

**File location:**
CD:\Napdos\Driver\DCON_ActiveX



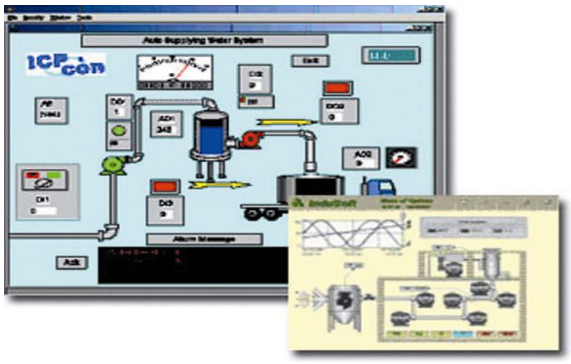
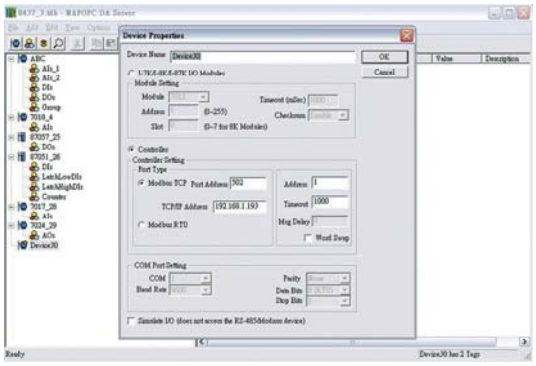

***DCON LabVIEW***

Bundled driver for LabVIEW

**Supported modules:**
i-7000/8000/87K series
(with DCON protocol)

**Supported OS:**
Windows 98/NT/2K/XP

**File location:**
CD:\Napdos\Driver\DCON_Labview

| | |
|---|---|
|  | ***DCON Indusoft***<br>**Supported Module:**<br>i-7000/8000/87K series<br>(with DCON protocol)<br>**Supported OS:**<br>Windows 98/NT/2K/XP/CE<br>**File location:**<br>CD:\Napdos\Driver\DCON_Indusoft |
|  | ***NAP OPC server***<br>**Supported module:**<br>i-7000/8000/87K series<br>(with DCON protocol)<br>Modbus embedded controller<br>ISaGRAF embedded controller<br>**Supported OS**:<br>Windows 98/NT/2K/XP/CE<br>**File location:**<br>CD:\Napdos\NapOPCSvr |