Getting Started: I-8437-80/8837-80/ 8437/8837/8417/8817

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ICP DAS CO. , LTD. would like to congratulate you own your purchase of our ISaGRAF PACs : **I-8xx7/8x37-80 (that is, 8417/8817/8437/8837/8437-80/8837-80).** The ease to integration of the controller system and the power of the IEC 61131-3 ISaGRAF software program combine to make a powerful, yet inexpensive industrial process control system.

ISaGRAF PAC Series of ICP DAS includes :

µPAC:	µPAC-7186EG, µPAC-7186PEG, I-7188EG, I-7188XG, µPAC-5007/5107/5207/5307/5507
iPAC:	iP-8447, iP-8847, I-8437-80, I-8837-80, I-8417, I-8817,
WinPAC:	WP-8147, WP-8447, WP-8847 (WinCon: W-8347, W-8747)
ViewPAC:	VP-25W7, VP-23W7, VP-2117
XPAC:	XP-8047-CE6, XP-8347-CE6, XP-8747-CE6

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Technical Service

Please contact local agent or email problem-report to service@icpdas. com.
New information can be found at www. icpdas. com.

Please visit www. icpdas. com > FAQ > Software > ISaGRAF for Frequently Asked Questions.

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Reference Guide

ISaGRAF User's Manual:

CD-ROM: \napdos\isagraf\8000\english_manu\ user_manual_i_8xx7. pdf
http://www. icpdas. com/products/PAC/i-8000/getting_started_manual. htm

ISaGRAF (Chinese) User's Manual:

CD-ROM: \napdos\isagraf\8000\chinese_manu\chinese_user_manual_i_8xx7. pdf
http://www. icpdas. com/products/PAC/i-8000/getting_started_manual. htm

Hardware Manual:

Please refer to CD-ROM: \NAPDOS\8000\ 8000manual. pdf.
ftp://ftp. icpdas. com. tw/pub/cd/8000cd/napdos/8000/

Resource on the Internet:

Newly updated ISaGRAF IO libraries, drivers and manuals can be found at
http://www. icpdas. com/products/PAC/i-8000/isagraf. htm

ISaGRAF Web Information:

http://www. icpdas. com/products/PAC/i-8000/isagraf. htm

Related Products:

- Industrial Ethernet Switch: NS-205/NS-208
  http://www. icpdas. com > Products > Industrial Ethernet Switch > Unmanaged Industrial Ethernet Switch
- RS-232 to RS-422/485 Converter : I-7520R
  http://www. icpdas. com > Products > Industrial Communcation > Converter & Repeater
- Power Supply : DP-665/660, KA-52F
  http://www. icpdas. com > Products > Accessories > Power_Supply

FAQ:

Please refer to our website www. icpdas. com > FAQ > Software > ISaGRAF for Frequently Asked Question, or click directly on web http://www. icpdas. com/faq/isagraf. htm

Note: ISaGRAF PACs : **I-8xx7/8x37-80 (that is, 8417/8817/8437/8837/8437-80/8837-80).**

Performance Comparison Table of ISaGRAF PACs

Please click on the link [ISaGRAF Comparison Table] or follow the below steps:

Specifications: I-8437-80/8837-80/8437/8837/I-8417/8817 Embedded Controller

Note: I-8x37 has phased out; please select compatible I-8x37-80.

Models		I-8417	I-8817	I-8437-80	I-8837-80
System Software					
OS		MiniOS7 (DOS-like embedded operating system)			
Development Software					
ISaGRAF Software	ISaGRAF Ver. 3	IEC 61131-3 standard			
	Languages	LD, ST, FBD, SFC, IL & FC			
	Max. Code Size	64 KB			
	Scan Time	Normal program: 5 ~ 100 ms Complex or Large program: 25 ~ 500 ms (or more)		Normal program: 2 ~ 25 ms Complex or Large program: 10 ~ 125 ms (or more)	
CPU Module					
CPU		80188, 40 MHz		80186, 80 MHz	
SRAM		512 KB			
Flash		512 KB			
EEPROM		2 KB			
NVRAM		31 bytes (battery backup, data valid up to 10 years)			
RTC (Real Time Clock)		Provide second, minute, hour, date, day of week, month, year			
Watchdog Timer		Yes (0.8 second)			
DIP Switch		Yes (8 bits)			
Communication Ports					
Ethernet		-		RJ45 x 1, 10 Base-T	
COM1		RS-232 (TxD, RxD, GND)			
COM2		RS-485 (Data+, Data-) with internal self-tuner ASIC		-	
COM3		RS-232/RS-485 (RS-232: TxD, RxD, RTS, CTS, GND ; RS-485: Data+, Data-)			
COM4		RS-232: (Full modem signals) (TxD, RxD, RTS, CTS, DSR, DTR, CD, RI, GND)			
SMMI					
LED Display		Yes, 5-Digit			
Programmable LED Indicators		3			
Push Buttons		4			

Models	I-8417	I-8817	I-8437-80	I-8837-80
I/O Expansion Slots				
Slot Number	4	8	4	8
	Note: For I-8K and I-87K Modules Only			
Mechanical				
Dimensions (W x L x H)	230 mm x 110 mm x 75.5 mm: I-8417, I-8437-80 354 mm x 110 mm x 75.5 mm: I-8817, I-8837-80			
Environmental				
Operating Temperature	-25 ~ +75 °C			
Storage Temperature	-30 ~ +85 °C			
Ambient Relative Humidity	5 ~ 95% RH (non-condensing)			
Power				
Input Range	+10 ~ +30 V_{DC}			
Protection	Power reverse polarity protection			
Capacity	20 W			
Consumption	3.9 W	5.1 W	3.9 W	5.1 W
Protocols (some protocols need optional devices)				
Modbus RTU/ASCII Master	Max. 2 COM Ports: COM1 or COM3 or COM4 or COM5 (*). (To connect to other Modbus Slave devices)			
Modbus RTU Slave	Max. 2 COM Ports. (For connecting ISaGRAF, PC/HMI/OPC Server & MMI panels)			
	I-8x17: COM1/2		I-8x37-80: COM1/3	
Modbus TCP/IP Slave	-		Max. 4 connection. (For connecting ISaGRAF & PC/HMI)	
User-defined Protocol	User can write his own protocol applied at COM1, COM3, COM4 & COM5 ~ COM20 (*) by serial communication function blocks.			
Remote I/O	One of COM3 or COM4 supports I-7000 I/O modules & (I-87Kn or RU-87Pn + I-87K High Profile I/O boards) as Remote I/O. Max. 64 Remote I/O module for one PAC.			
Fbus	Built-in COM3 Port to exchange data between ICP DAS's ISaGRAF PACs.			
Ebus (for I-8x37-80)	-		To exchange data between ICP DAS's ISaGRAF Ethernet PACs via Ethernet port.	
SMS: Short Message Service	One of COM4 or COM5 (*) can link to a GSM modem to support SMS. User can request data/controller by cellular phone. The controller can also send data & alarms to user's cellular phone. Optional GSM modems: GTM-201-RS232 (850/900/1800/1900 GSM/GPRS External Modem)			
Modem Link	Supports PC to remotely download & monitor the controller through a normal modem.			
MMICON/LCD	One of COM3 or COM4 supports ICP DAS's MMICON. The is featured with a 240x 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 PACs 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. (FAQ-084)
Optional I/O Functions (Refer to ISaGRAF PAC I/O Selection Guide for I/O Module list)	
PWM Output	
Pulse Width Modulation Output	8-ch max. for one controller. 500 HZ max. for Off = 1 & On = 1 ms Output square wave: Off: 1 ~ 32767 ms, On: 1 ~ 32767 ms Optional DO boards: I-8037, 8041, 8042, 8054, 8055, 8056, 8057,8060, 8063, 8064, 8065, 8066, 8068, 8069. (Relay Output boards cannot generate fast square wave)
Counters	
Parallel DI Counter	8-ch. max. for 1 controller. Counter value: 32-bit. 500 HZ max. Min. pulse width > 1 ms Optional DI boards: I-8040, 8042, 8051, 8052, 8053, 8054, 8055, 8058, 8063, 8077
Serial DI Counter	Counter input: 100 Hz max. Counter value: 0 ~ 65535 (16-bit) Optional serial I-87k DI boards: I-87040, 87051, 87052, 87053, 87054, 87055, 87058, 87063
Remote DI Counter	All remote I-7000 & I-87K DI modules support counters. 100Hz max. value: 0 ~ 65535
High Speed Counter	I-87082: 100 kHz max. 32-bit, I-8080:450 kHz max. 32-bit
Motion	
Motion Control	Can integrate with one I-8091 (2-axis) or two I-8091 (4-axis) to do motion control. Ethernet communication is not available when doing motion control.
SRAM Expansion	
Battery Backup SRAM	With a S256/S512 (plug in the socket of the back-plane), data can also be stored in the S256/S512. PC can load these data via COM1 (or COM2 of I-8417/8817, or Ethernet Port of I-8437-80/8837-80). PC can also download pre-defined data to the S256/S512. Optional: S256: 256 KB, S512: 512 KB.
***Note:** COM5 ~ COM20 are resided at the expansion boards if they are plugged on slot 0 ~ 7 of I-8xx7-80. * **ISaGRAF FAQ:** http://www.icpdas.com/faq/isagraf.htm * Recommend to use NS-205/NS-208 Industrial Ethernet Switch.	

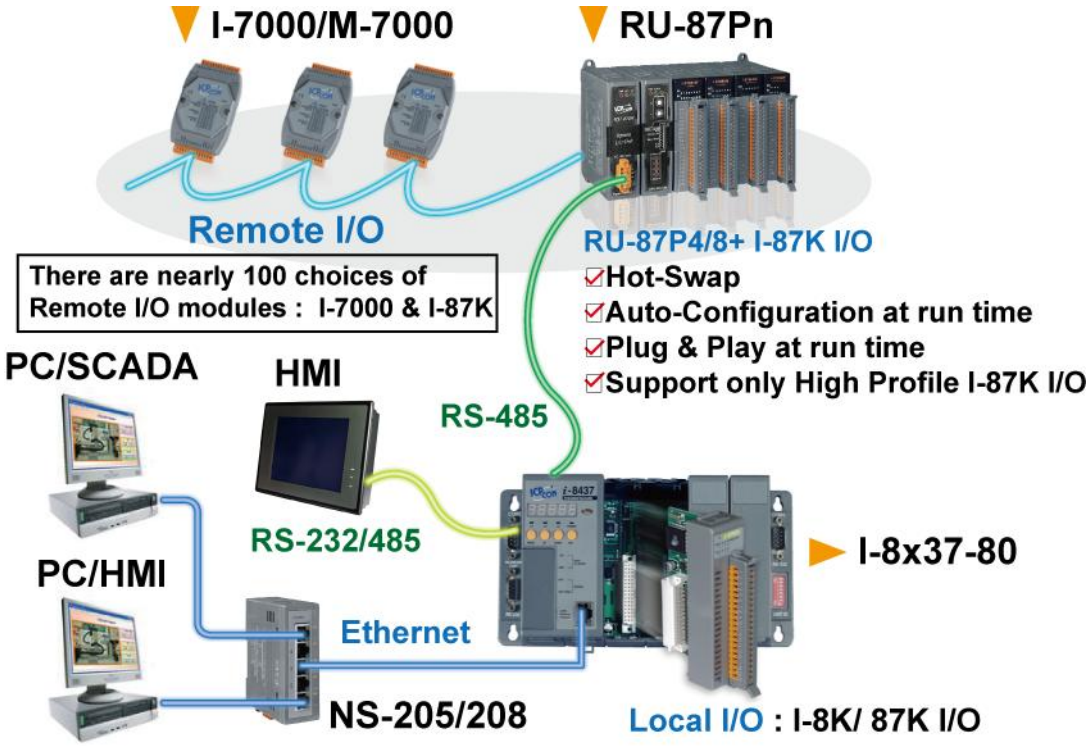
Chapter 1 Typical Application

1.1 iPAC-8x47 is better than I-8x37-80

iP-8447/8847 - the advanced I-8xx7 ISaGRAF based iPAC.

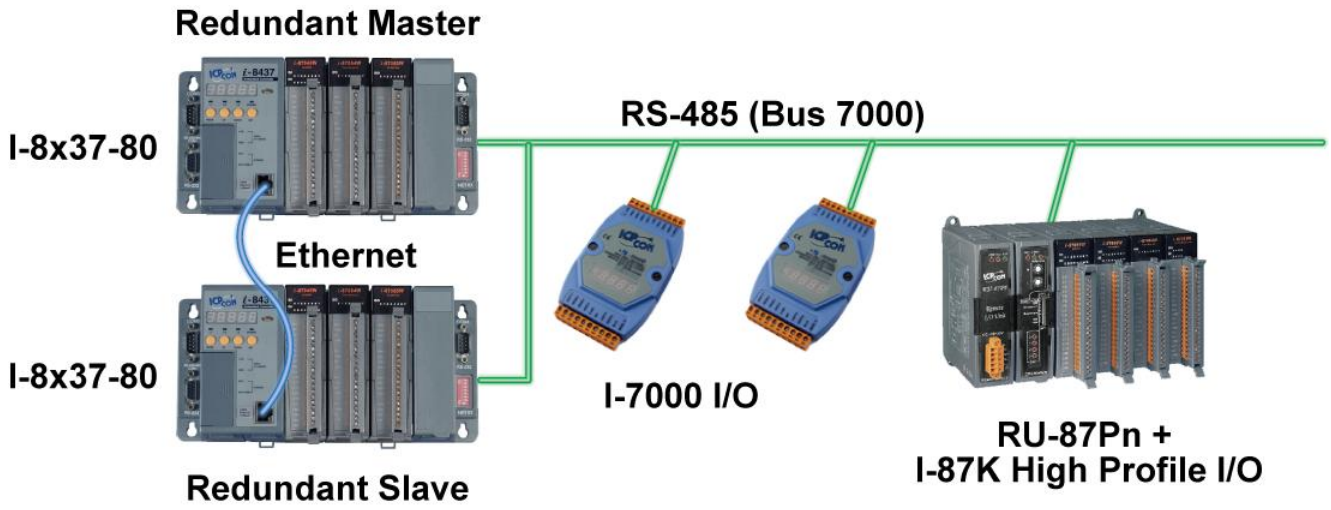
Features:
• **Support Dual Ethernet 10/100 Mbps**
• **768K memory for running program, 256K more than I-8437-80/8837-80**
• **Built-in 512K Battery backup SRAM**
• **Support sending E-mail with an attached file (Max. 488 KB)**
• **Support FRnet I/O**
• **Support CAN/CANopen**
• **Support VW Sensor**
• **Support Ethernet Port redundant system**

1.2 Multi-HMI & Local/Remote I/O



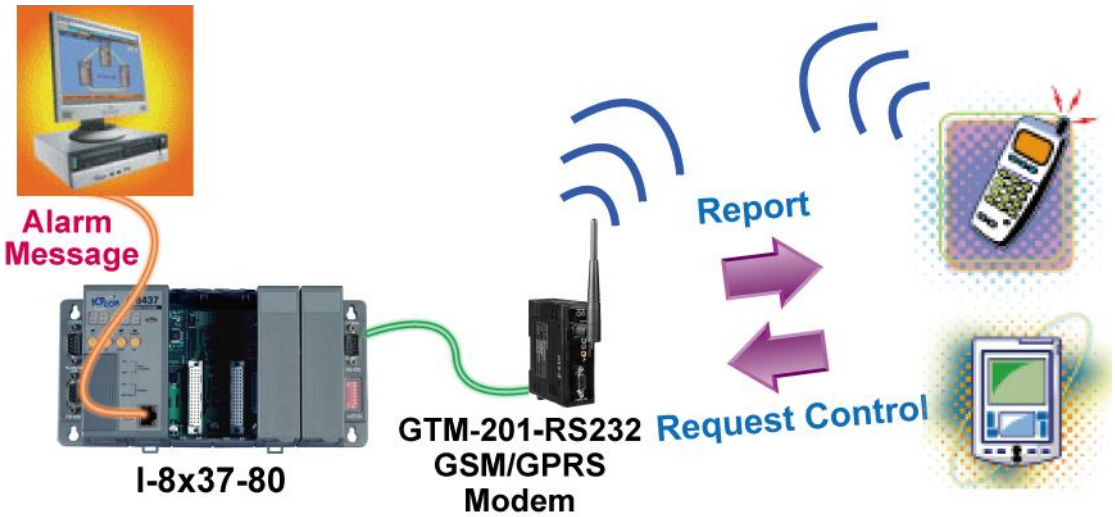
1.3 Redundant Bus7000

I-8437-80/8837-80:

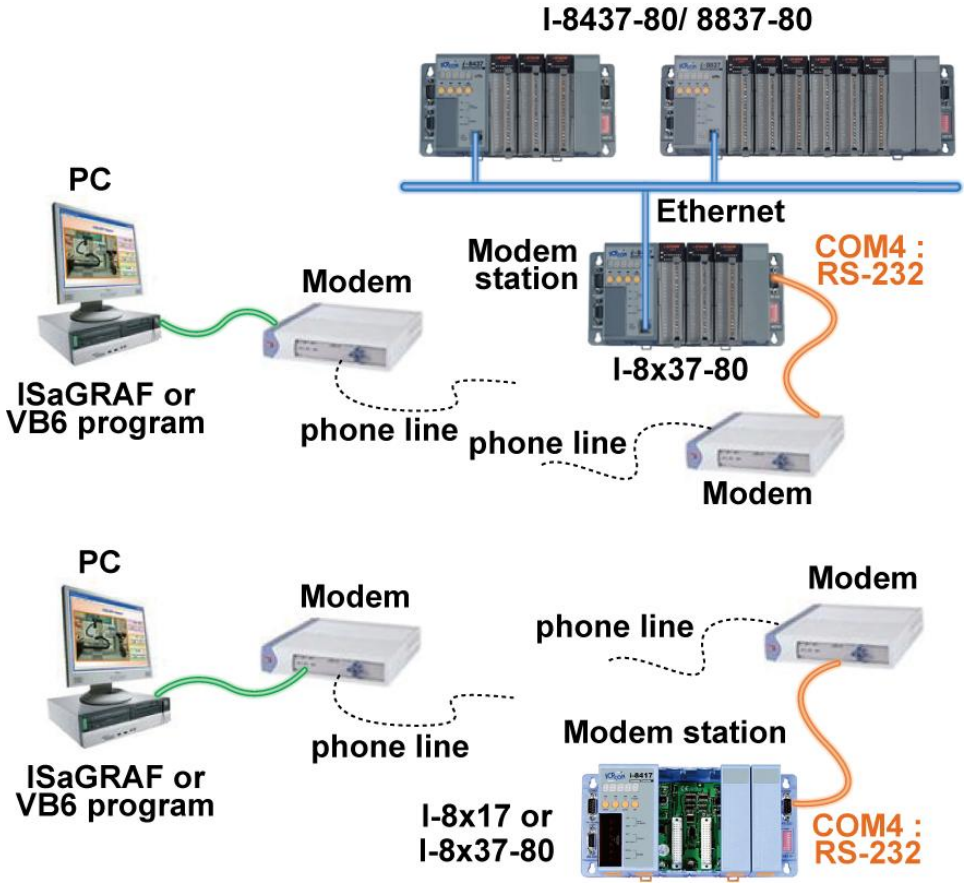


1.4 SMS: Short Message Service

Please refer to www. icpdas. com > FAQ > Software > ISaGRAF Ver. 3 (English) - [111](111) for more information.



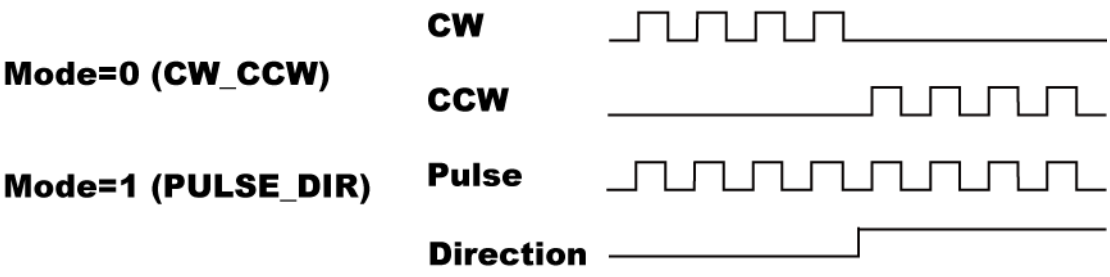
1.5 Download & Monitoring Via Modem_Link



1.6 Motion Control

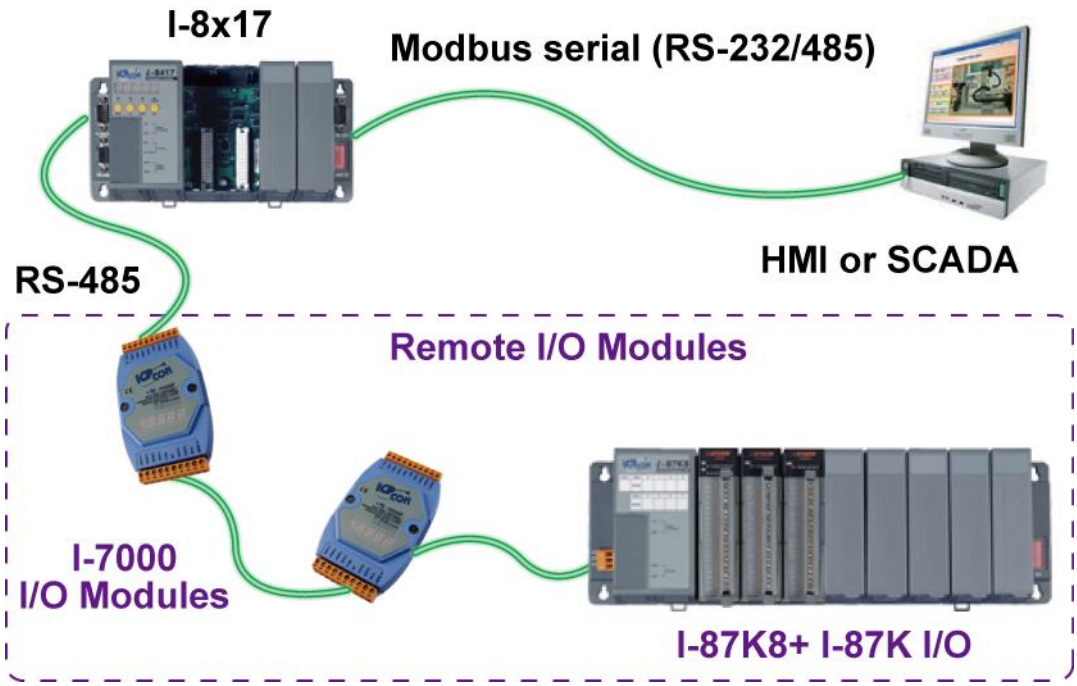
One I-8091 can control 2-axis: X-Y plane, or 2 axes independent
Two I-8091 can control 4-axis: X-Y plane + 2 axes independent or 4 axes independent

I-8417/8817/ 8437-80/8837-80 + **I-8091: 2 axes** + **I-8090: 3 axes Encoder**

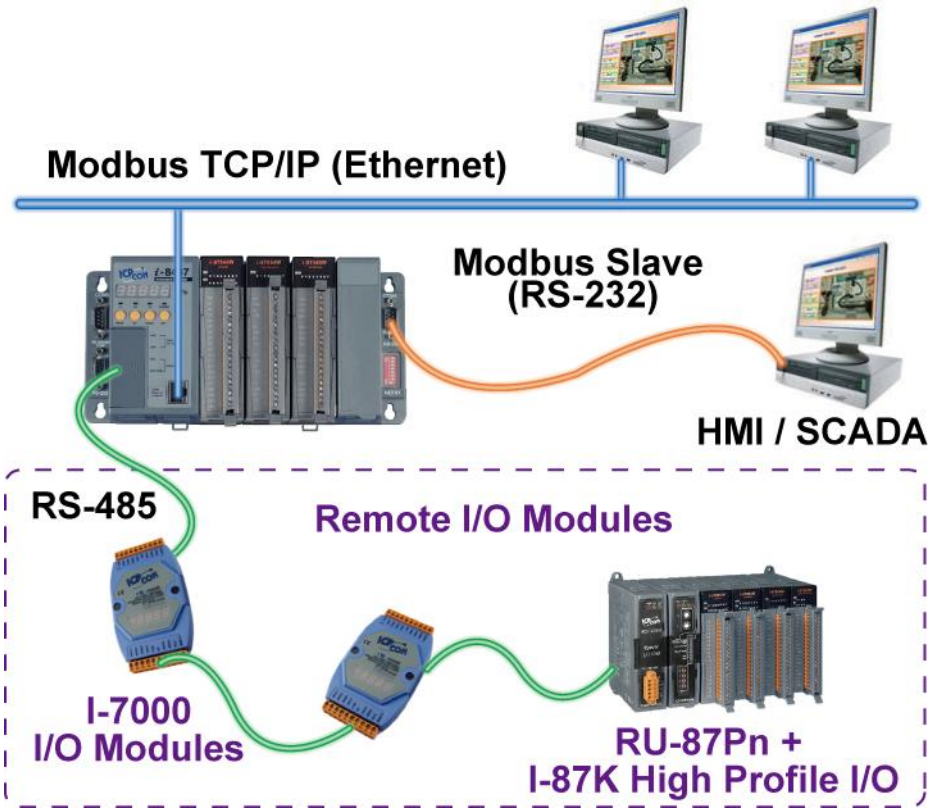


1.7 Modbus Converter of I-7000 & I-87K I/O

I-8417/8817 can be a Modbus RTU serial converter of I-7000 & I-87K series I/O modules.

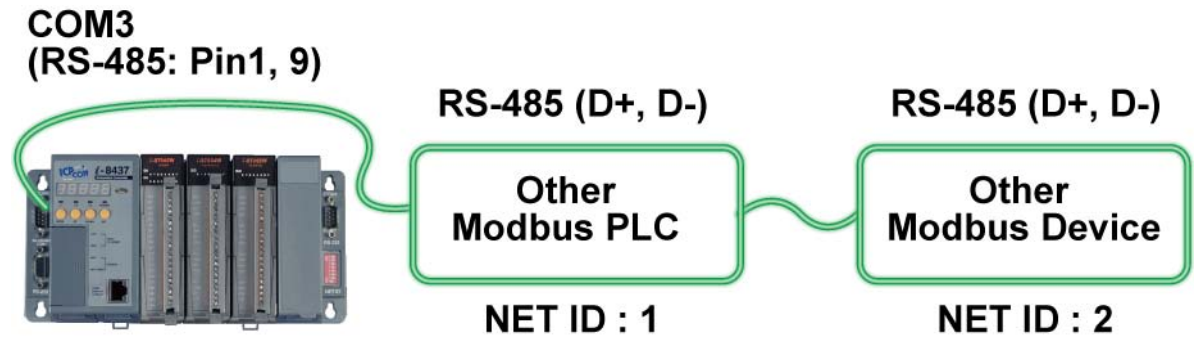


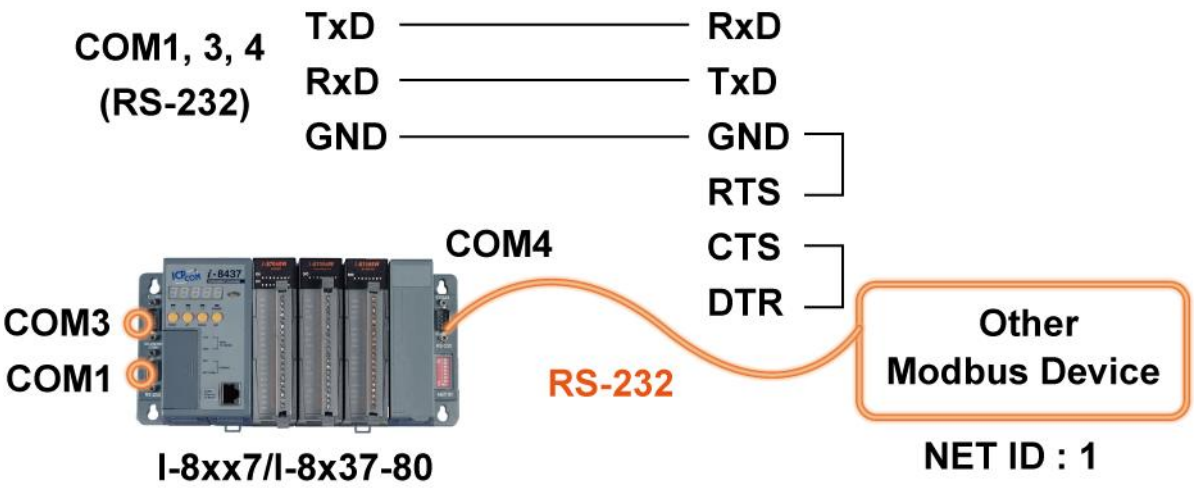
I-8437-80/8837-80 can be a Modbus RTU serial & TCP/IP converter of I-7000 & I-87K series I/O modules.



1.8 Modbus Master

Up to **2** COM Ports (COM1, COM3, COM4 and COM5 in multi serial port board) can support Modbus RTU Master or ASCII Master Protocol to connect to other Modbus Slave devices.





NOTE:

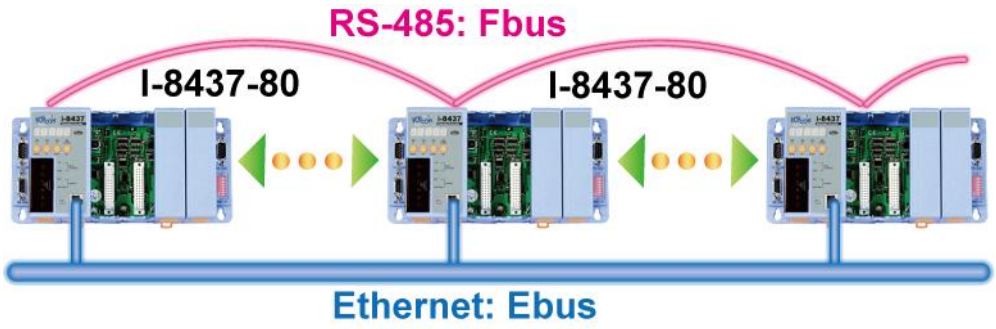
COM5 ~ COM20 is optional from the **I-8112/8114/8142/8144/8142i** expansion board.
http://www. icpdas. com/products/Remote_IO/i-8ke/selection_rs232_i8k. htm

1.9 Data Exchange through Ethernet & RS-485

Controller to Controller Data Exchange

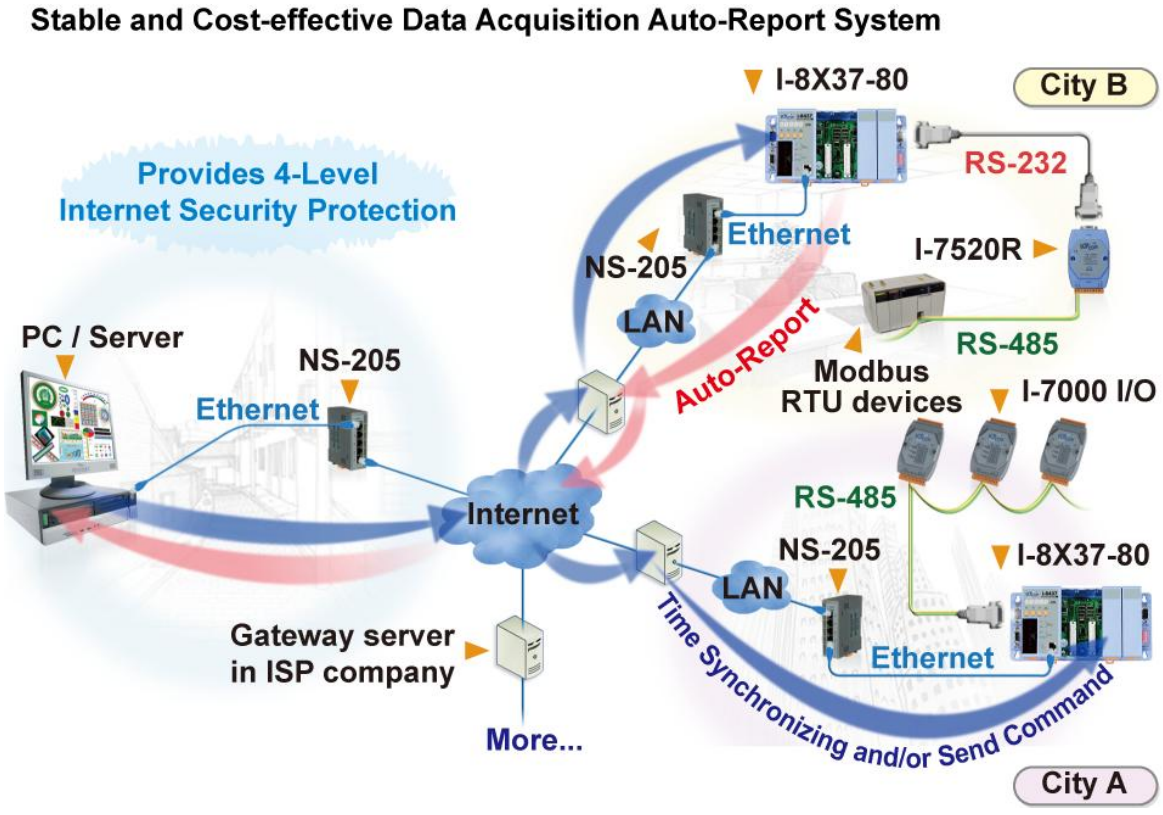
Ethernet : I-8437-80/8837-80

RS485 : I-8xx7/8x37-80



1.10 Active Control Data and I/O Acquisition Data Reporting System

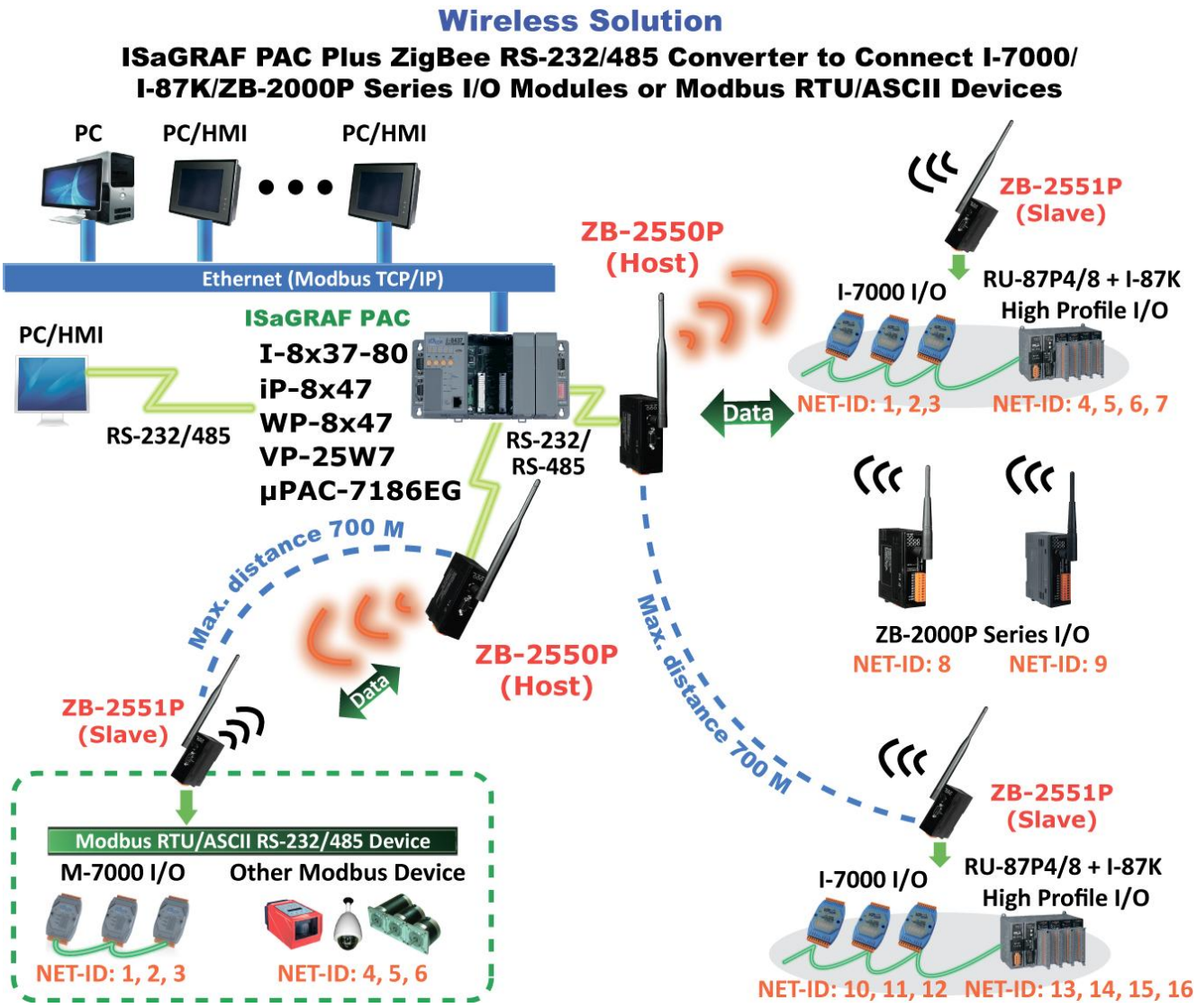
Please refer to www. icpdas. com > FAQ > Software > ISaGRAF Ver. 3 (English) - 065 for more information.



1.11 ZigBee Wireless Solution

ISaGRAF PAC plus ZB-2550P and ZB-2551P RS-232/RS-485 Converters can apply wireless communication, reduce the wiring cost, and achieve the mission of remote I/O control and data acquisition.

Please click [www. icpdas. com > FAQ > Software > ISaGRAF Ver. 3 (English)](#) - [110](#) for more information.



Chapter 2 Software Programming

Please refer to CD-ROM: \napdos\isagraf\8000\english_manu\ “user_manual_i_8xx7. pdf” for detailed ISaGRAF User’s Manual.

2.1 Step 1 - Installing the ISaGRAF Software

The user has to install two kinds of software before he can program on the ISaGRAF controller system. They are

A. ISaGRAF Workbench
B. ICP DAS Utilities for ISaGRAF

User has to purchase at least one pcs. of ISaGRAF workbench Version 3 (ISaGRAF-256) to install on his PC to edit, download, monitor & debug the controller system. Item (B) is free and it is burned inside the CD-ROM which is delivered with the I-8xx7/8x37-80.

Operating system Requirements:

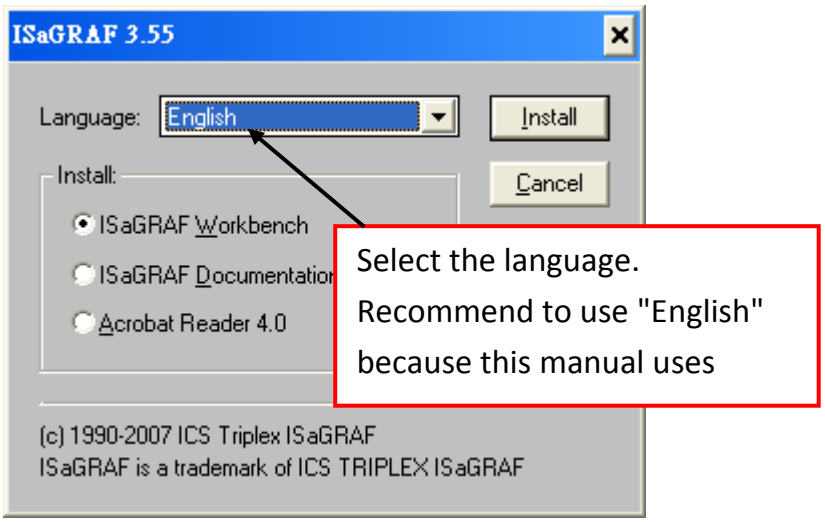
One of the following computer operating systems must be installed on the target computer system before you can install the ISaGRAF Workbench software program.

- Windows 95 / Windows 98 / Windows 2000
- Windows NT Version 3.51 or Windows NT Version 4.0
- Windows XP or Vista or Windows 7 (Please refer to www.icpdas.com > FAQ > Software >ISaGRAF Ver.3 > FAQ117)

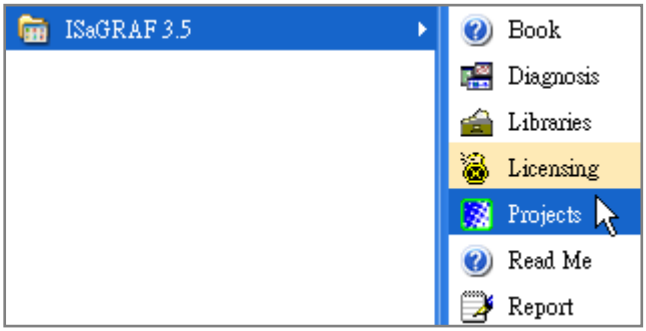
Steps to Installing the ISaGRAF Workbench:

If your operating system is Windows Vista or Windows 7 (32-bit), please refer to 2.1.4.
If your operating system is Windows 7 (64-bit), please refer to 2.1.5.

Insert the ISaGRAF Workbench CD into your CD-ROM drive. If your computer does not have the auto-start feature active, use the Windows Explorer and go to the CD-ROM drive where the Workbench CD is installed, then double-click on the “install.bat” file listed on the ISaGRAF CD. If the “install.bat” file is not found on your ISaGRAF CD, then double-click on the “ISaGRAF.exe” file to start the installation process.

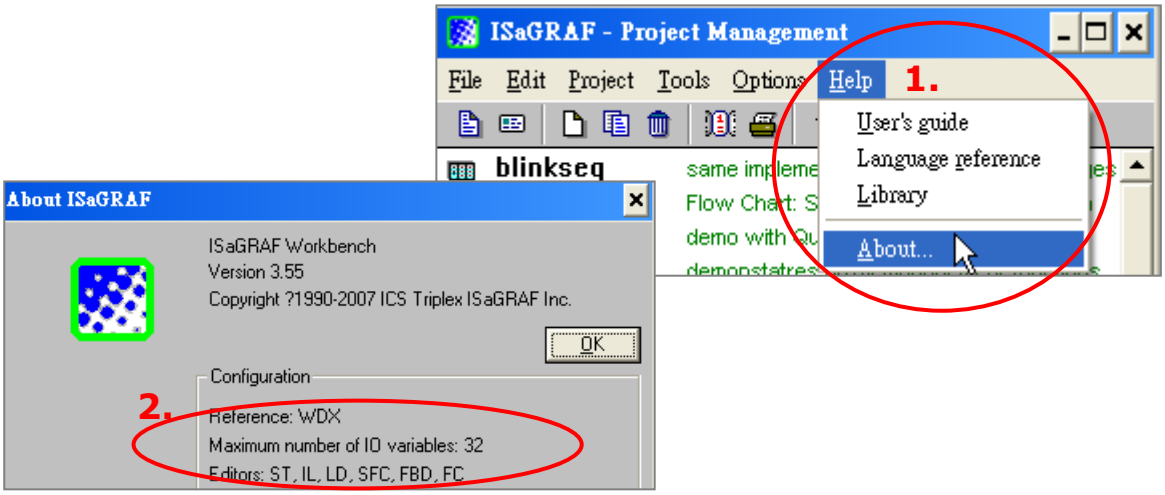


To begin the ISaGRAF 3.x software program, click on the Windows “Start” button, then on “Programs”, and you should see the ISaGRAF program group as illustrated below. You could click “Projects” to start the program.



2.1.1 The Hardware Protection Device (Dongle & USB Key-Pro)

You must install the hardware protection device (dongle) provided with the ISaGRAF software on your computers parallel port to for the ISaGRAF program to achieve fully authorized functionality. (ISaGRAF-32-E & ISaGRAF-32-C DO NOT need dongle or USB Key-Pro.)



While using ISaGRAF and the dongle is plugged well, if the “Help” – “About” says “Maximum number of IO variables: 32”, it means ISaGRAF workbench cannot find the dongle well. Please reset your PC and then check the “Help” – “About” again. If it still displays “Maximum number of IO variables: 32”, the driver may not be installed well. Please do the following steps.

Dongle Protection:

Please execute the ISaGRAF CD_ROM \Sentinel5382\setup.exe for ISaGRAF-80 or \Sentinel\setup.exe for other ISaGRAF version and then reset the PC again.

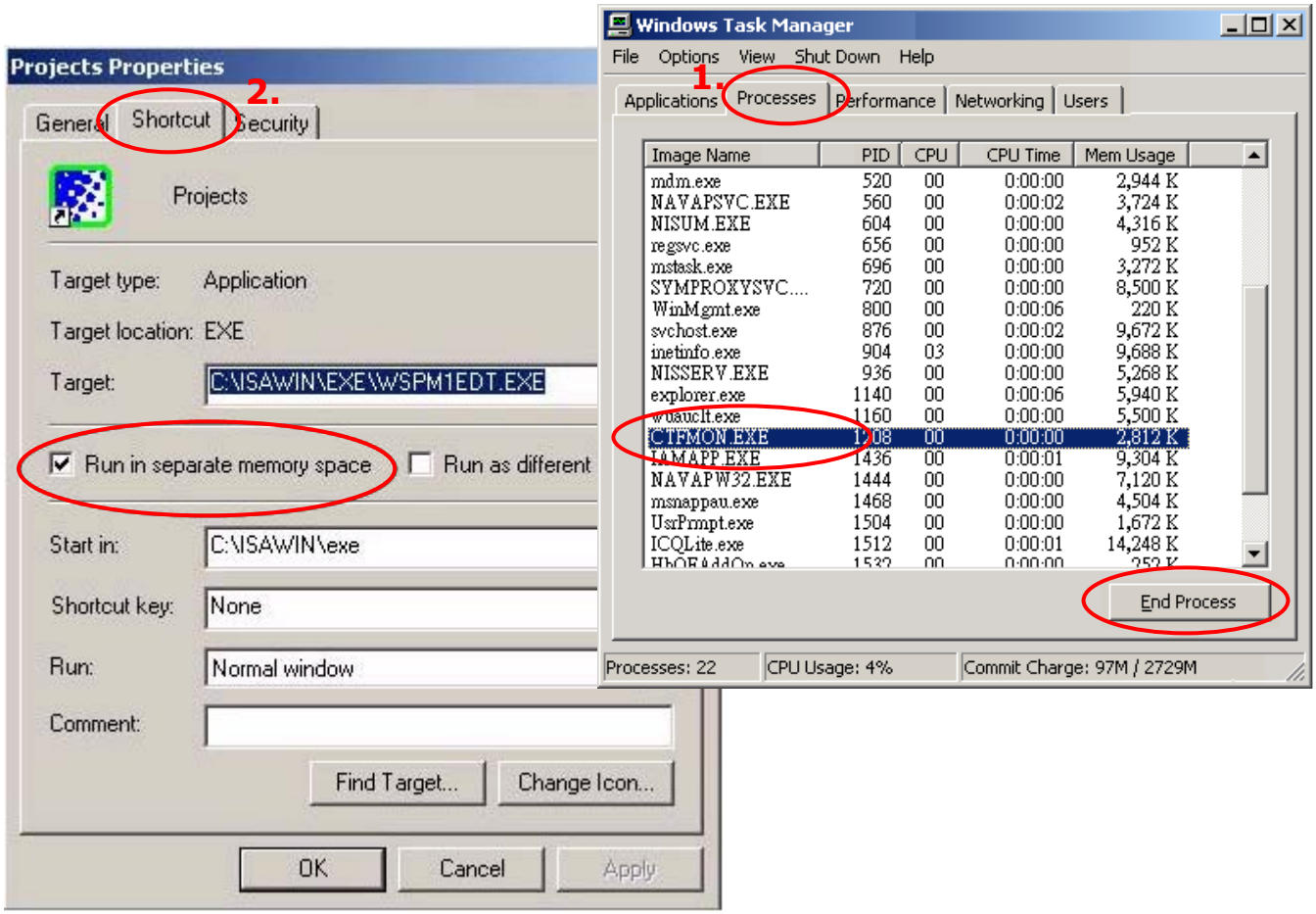
USB Key-Pro Protection:

1. To make your PC recognize the ISaGRAF USB protection-key, please un-plug the USB protection-key from your USB port first, then run **“\Sentinel\SSD5411-32bit.exe”** in the ISaGRAF 3.55 CD-ROM (or later version) after you have installed the ISaGRAF. Then please reset your PC.

2. To run ISaGRAF Ver. 3.5x, please always plug the USB protection-key in the PC’s USB port.

2.1.2 Important Notice for Window 2000 Users

If you close some ISaGRAF windows, it holds about 20 ~ 40 seconds (No response). This may caused by the procedure "CTFMON.EXE" of Windows 2000. First click on "Ctrl & Alt & Del" at the same time to stop the "CTFMON.EXE" process, and then you may create a short cut for the "ISaGRAF project manager". And then check on "run in separate memory space" option in the shortcut property.



2.1.3 Important Notice for Window NT Users

If your computer is using the Windows NT operating system, you will need to add one line to the "isa.ini" file in the ISaGRAF Workbench "EXE" subdirectory.

C:\ISAWIN\EXE\isa.ini

You can use any ASCII based text editor (such as Notepad or UltraEdit32) to open the "isa.ini" file. Locate the [WS001] header in the "isa.ini" initialization file (it should be at the top of the file). Anywhere within the [WS001] header portion of the "isa.ini" initialization file, add the entry shown below within the [WS001] header:

[WS001]
NT=1
Isa=C: \ISAWIN
IsaExe=C: \ISAWIN\EXE
Group=Samples
IsaApl=c: \isawin\smp
IsaTmp=C: \ISAWIN\TMP

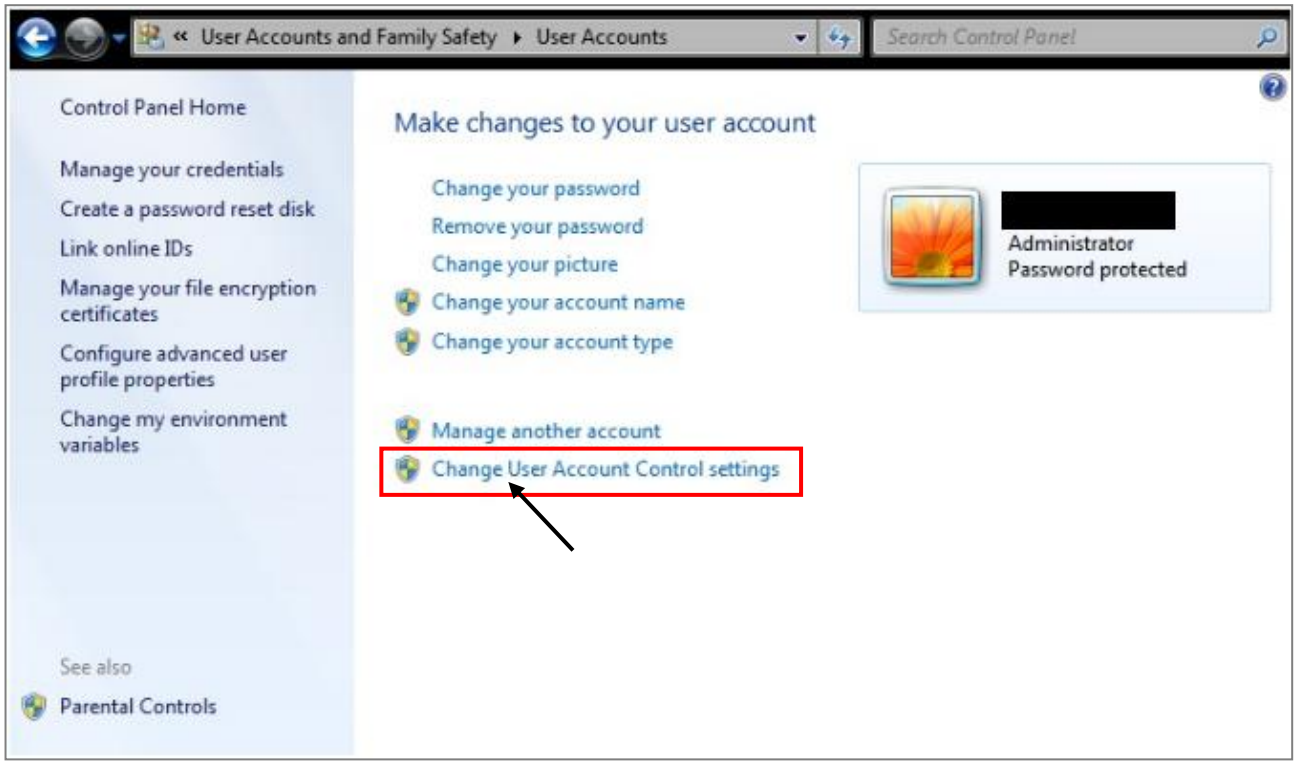
2.1.4 Important Notice for Windows Vista or Windows 7 (32-bit) Users

Before installing the ISaGRAF ; If your operating system is Windows Vista or Windows 7 (32-bit) , please change the User Account Control settings to avoid some of the setup restrictions.

How to disable "UAC" (User Account Control) ?

The "UAC" (User Account Control) setting requires administrator-level permission .

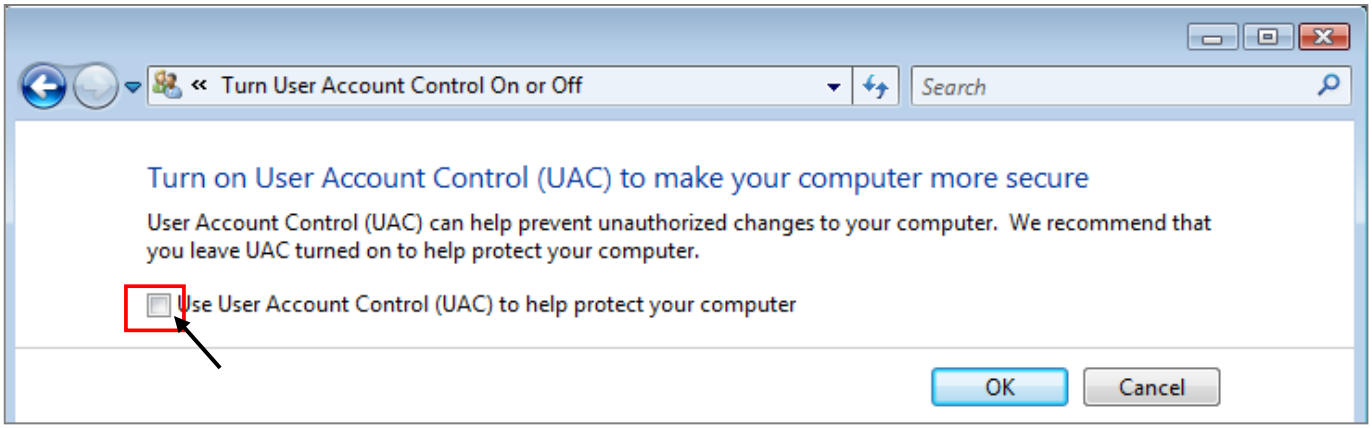
1. From the "Start" menu, choose "Control Panel > User Accounts and Family Safety > User Accounts", then click "Change User Account Control settings" or "Turn User Account Control on or off".



2. After clicking, it will show up the screen as below.

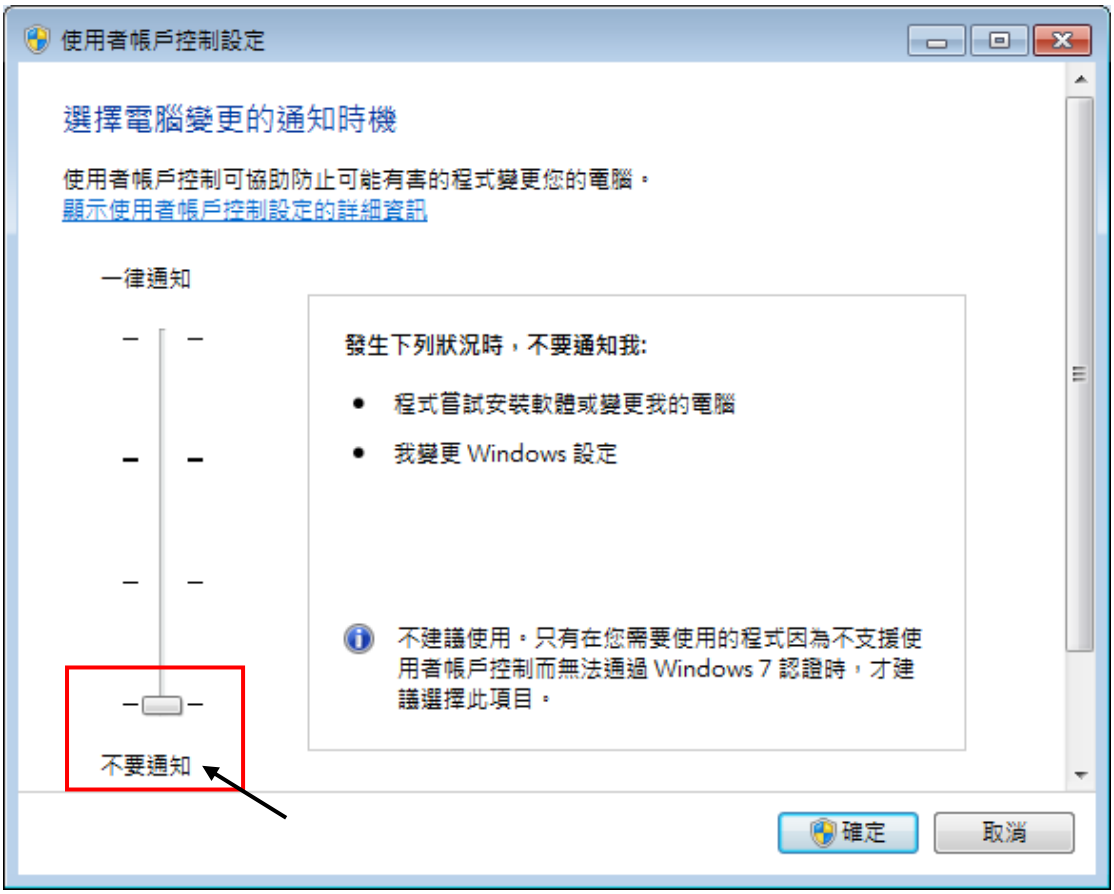
Windows Vista:

Uncheck the option – "Use User Account Control (UAC) to help you protect your computer"and then click on "OK".



Windows 7:

Move the slider down to “Never Notify” and then click on “OK”.



3. Reboot your computer to apply the change.
4. After rebooting, please refer to section 2.1 Installing the ISaGRAF Software.

2.1.5 Important Notice for Windows 7 (64-bit) Users

If your operating system is Windows 7 (64-bit) Professional, Enterprise, or Ultimate, the ISaGRAF must be installed under the XP Mode. Please do the following steps to install Virtual PC and XP Mode.

Installing the Virtual PC and XP Mode:

1. Download Windows Virtual PC and Windows XP Mode installers from the Windows Virtual PC Web site (http://go.microsoft.com/fwlink/?LinkID=160479)
2. Double-click on "WindowsXPMode_nn-NN.exe” (where nn-NN is the locale, e.g. en-US) and follow the instructions in the wizard to install Windows XP Mode.
3. Double-click on "Windows6.1-KB958559-x64.msu” to install Windows Virtual PC。
4. Reboot your computer.
5. After rebooting, click on "Star > All Programs > Windows Virtual PC” and then click Windows XP Mode.
6. Follow the instructions in the wizard to complete Windows XP Mode Setup and Configuration. Record the password that is provided during the Setup because it is required to log on to your virtual machine.
7. Now, go back to section 2.1 to install the ISaGRAF.

2.1.6 Important Setting for Using Variable Arrays

Please add two more lines on the top of the c:\isawin\exe\isa.ini file to enable the usage of variable arrays.

[DEBUG]
Arrays=1

2.2 Step 2 - Installing the ICP DAS Utilities for ISaGRAF

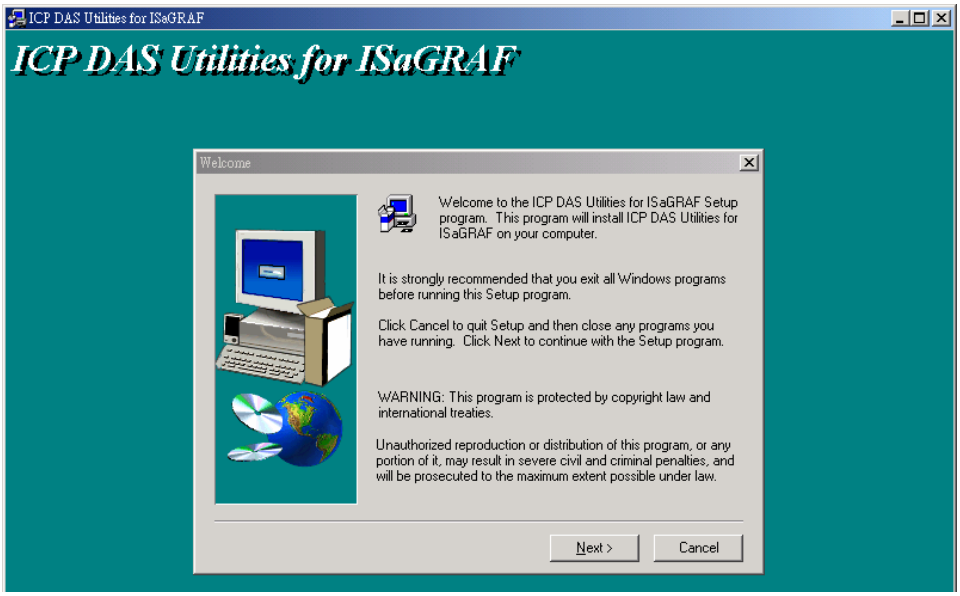
The "ICP DAS Utilities for ISaGRAF" consists of 3 major items.

- I/O libraries (For all ISaGRAF PAC)
- Modem_Link utility
- Auto-scan I/O utility

Note:

Make sure you have already installed the ISaGRAF Workbench program, IF NOT, please refer to Ch 2. 1 Step 1 before continuing.

There is a CD-ROM supplied with each of the I-8xx7/8x37-80 controllers with the "ICP DAS Utilities for ISaGRAF". Please insert the CD-ROM into your CD-ROM drive. Then run CD-ROM: \napdos\isagraf\setup. exe. Follow the steps to install it.



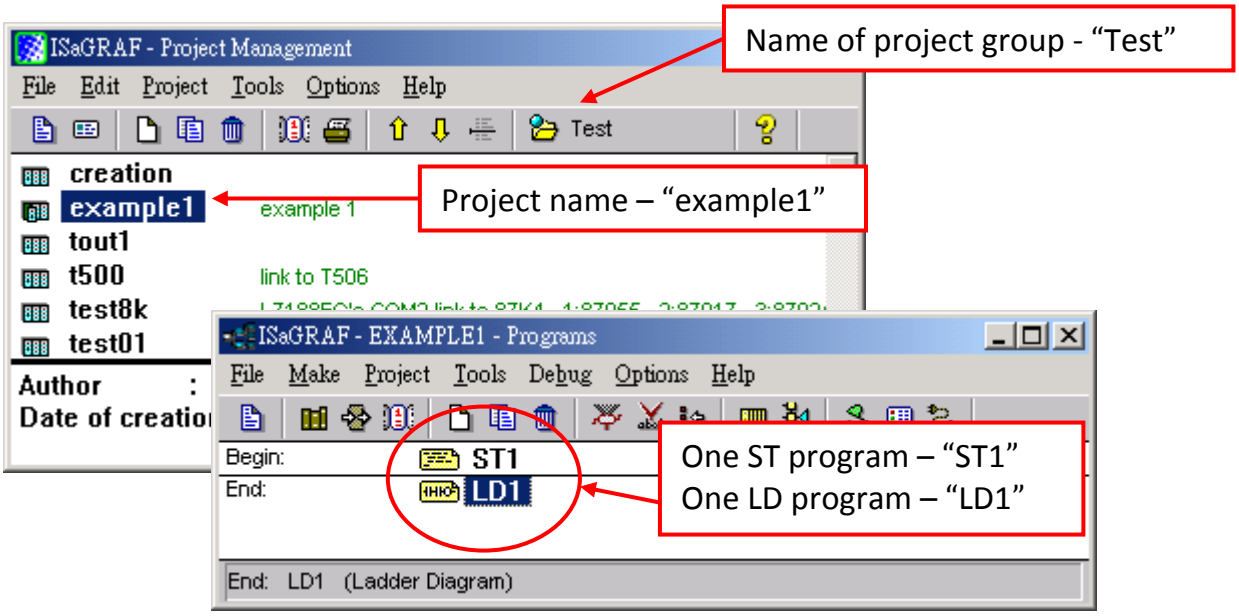
Note:

If "ICP DAS Utilities for ISaGRAF" is not in your CD-ROM, please refer to website of http://www. icpdas. com/products/PAC/i-8000/isagraf. htm , then click "**Driver"** icon to download "**io_lib. zip**". please save the file in path C:\ to ensure the completed access.

2.3 Step 3 - Writing a Simple ISaGRAF Program

We are going to use ISaGRAF to write a simple ISaGRAF example program and then download it to the I-8xx7/8x37-80 controller to make it work. If you haven't installed "ISaGRAF" & "ICP DAS Utilities for ISaGRAF", please go back to 2. 1:Step 1 & 2. 2:Step 2.

This example contains 2 programs. One is written in **Structured Text (ST)** and one in **Ladder Logic (LD)** language.



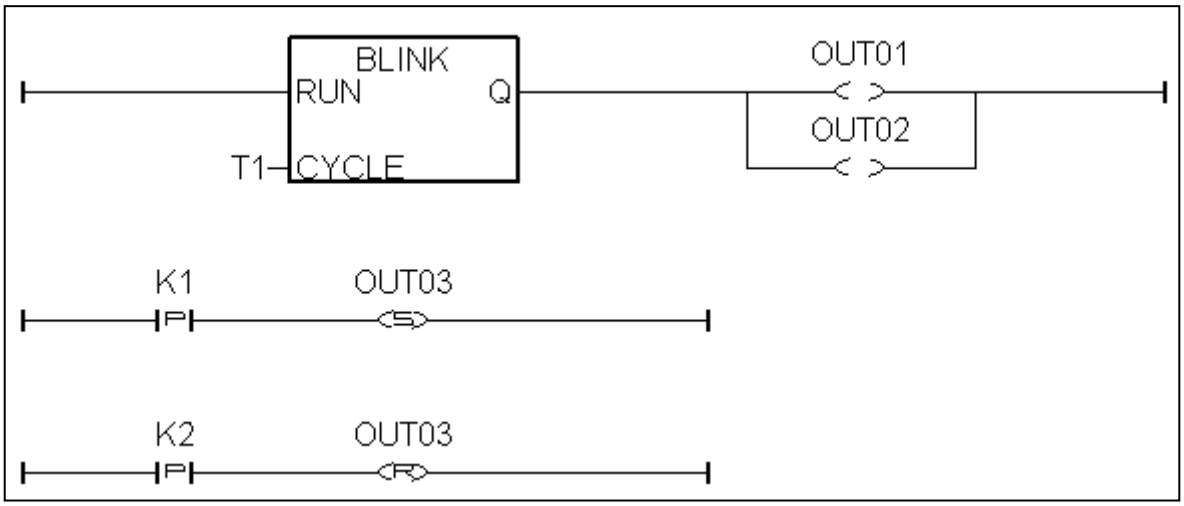
Variables declaration:

Name	Type	Attribute	Description
INIT	Boolean	**Internal**	**Initial value at "TRUE".** TRUE means 1st scan cycle
OUT01	Boolean	**Output**	Output 1
OUT02	Boolean	**Output**	Output 2
OUT03	Boolean	**Output**	Output 3
K1	Boolean	**Input**	Push button 1
K2	Boolean	**Input**	Push button 2
T1	Timer	**Internal**	Time period of blinking

ST program – "ST1" outline:

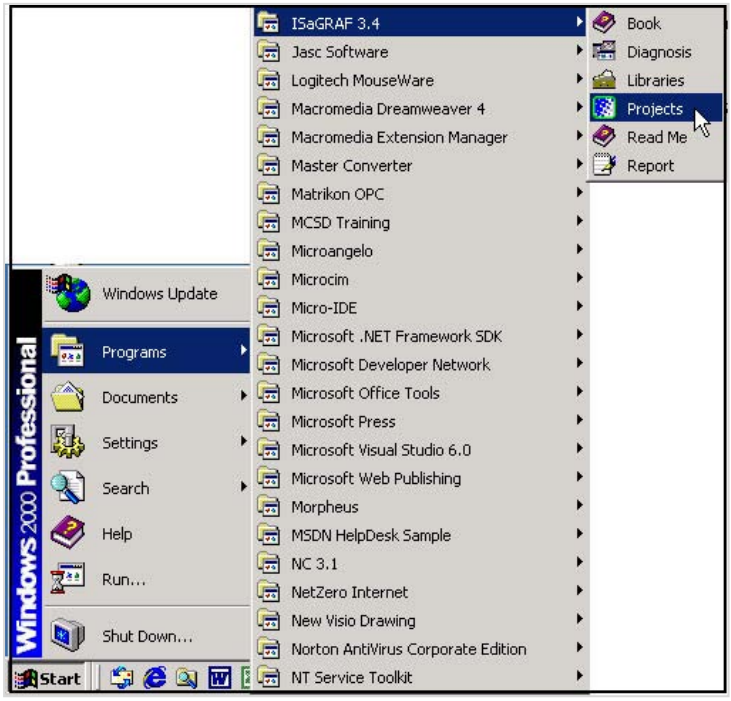
```
IF INIT THEN

  (* Do init steps here *)
  INIT:= False;
  T1:= T#1500ms;

END_IF;
```

Ladder Logic Program Outline:



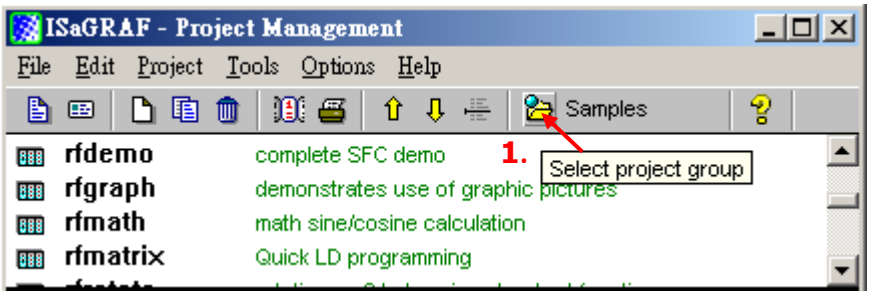
2.3.1 Open ISaGRAF-Project Management

Click on the Windows [Start] ➔ [Programs] ➔ [ISaGRAF 3. 4] ➔ [Projects] as shown below.

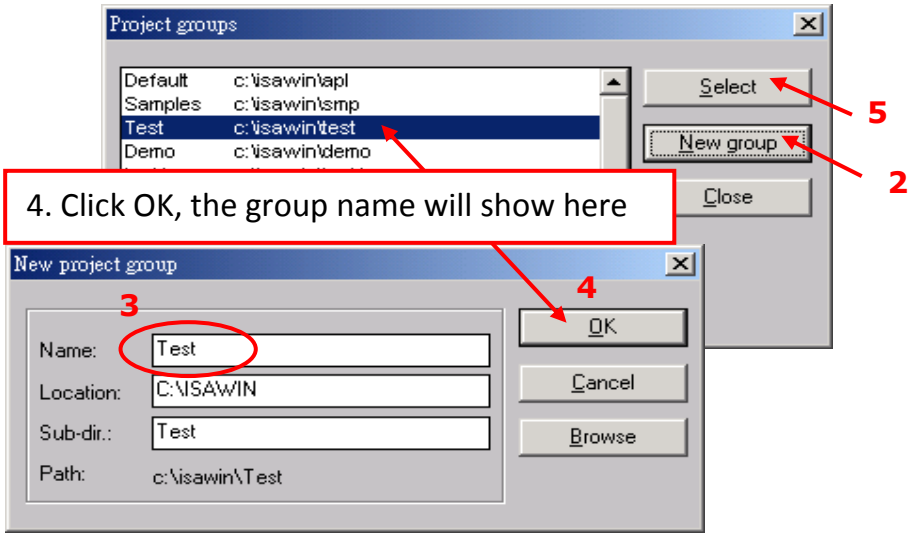


2.3.2 Creating An ISaGRAF User's Group

Click on the [Select Program Group] ➔ [New Group], then type in the name for the new user's group you wish to create, and last click on "OK".

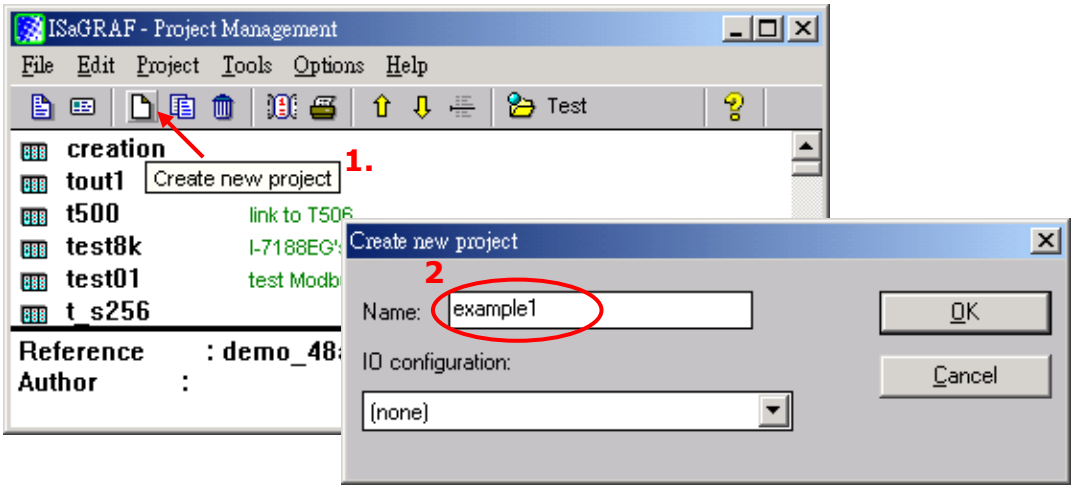


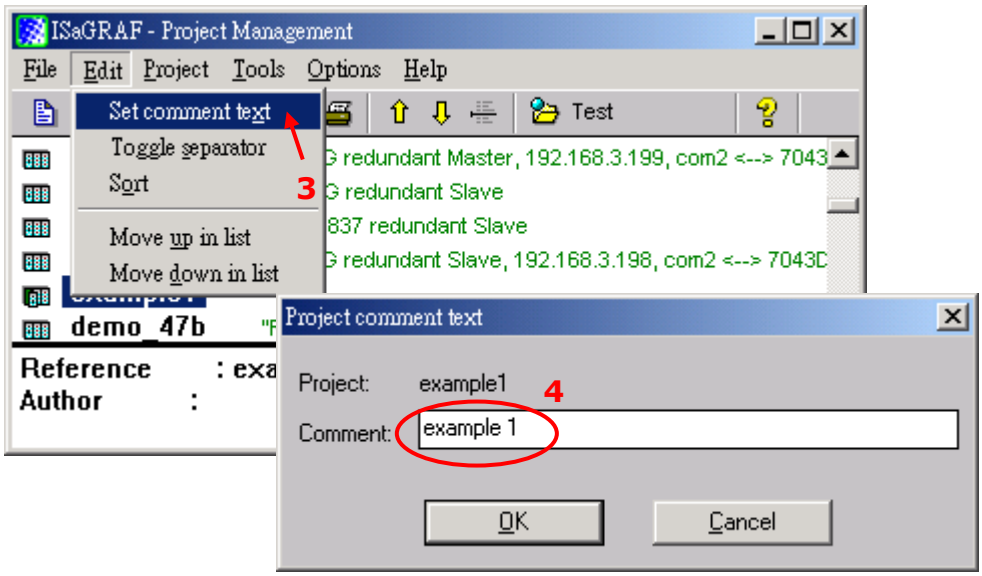
After click “OK”, the group name will show as below, please click “Select” to enter this group.



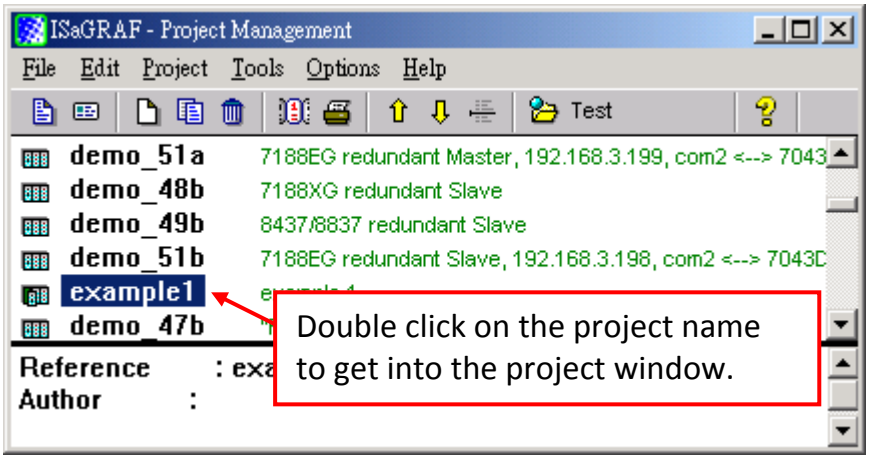
2.3.3 Creating a New ISaGRAF Project

To start a new ISaGRAF project, click on the “Create New Project” icon and then enter the name for the new project, you can then enter additional information for your project by clicking on the [Edit] > [Set Comment Text] as illustrated below.





You will now see the name of the new project in the “Project Management” window. Double click on the name of the new project to open the new project.

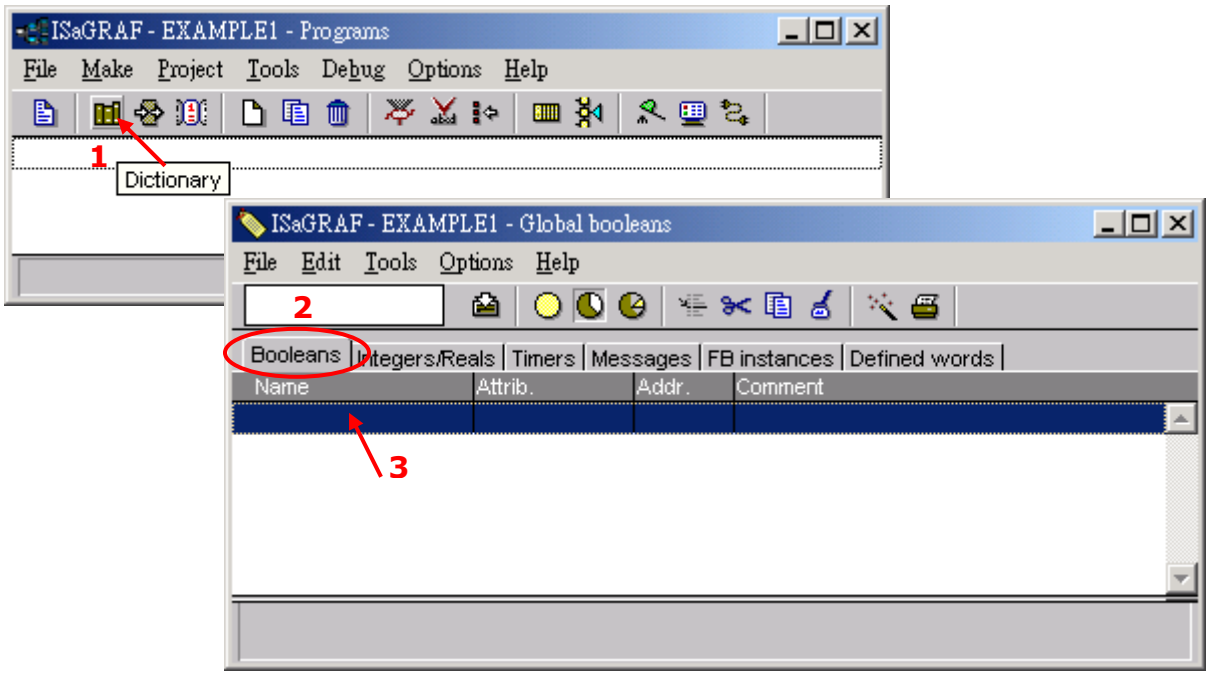


2.3.4 Declaring the ISaGRAF Project Variables

Before you can start creating an ISaGRAF program, you must first declare the variables that will be used in the ISaGRAF program.

Declaring Boolean:

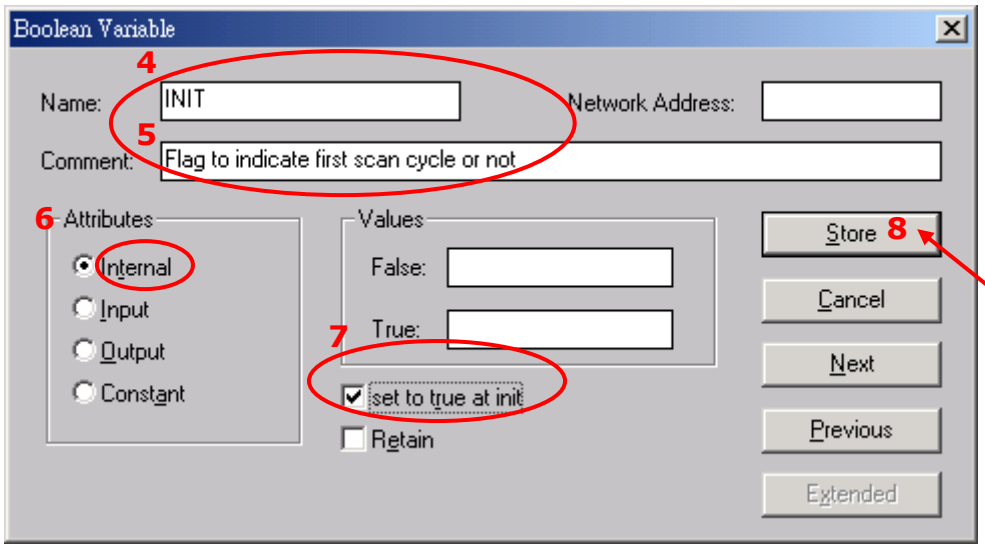
1. To begin this process, first click on the “Dictionary” icon
2. Click on the “Boolean” tab to declare the Boolean variables that will be used in our example program.
3. Double click on the colored area below the “Boolean” tab, and a “Boolean Variable” window will open.



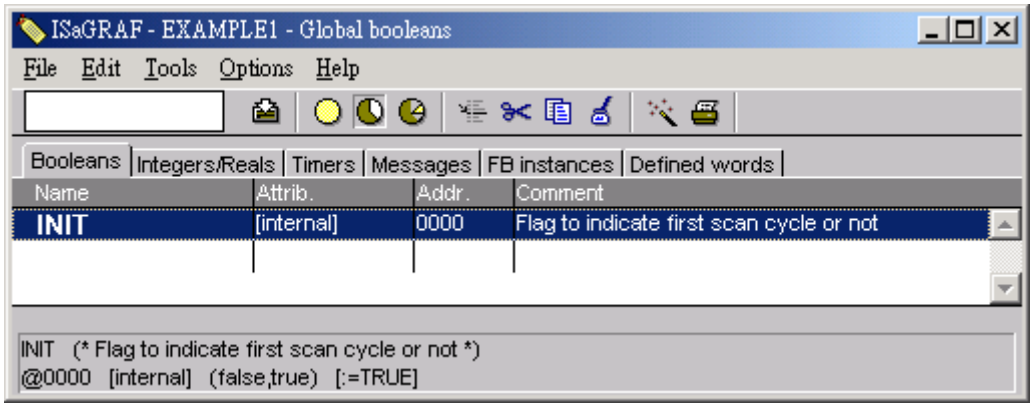
(Please refer to ch2. 3 Variables declaration)

4. In this example, enter “INIT” as the variable name.
5. Enter “Flag to indicate first scan cycle or not” as the comment.
6. The type of “Attributes” in this example program – ”INIT” will be an “Internal”.

7. Checked the “set to true at init” item, we need to set the initial value of “INIT“ as “TRUE” when the project is running.
8. Then press the “Store” button to save it.



The new Boolean variable has now been declared. The other information areas that are provided for the programmer to fully explain how the variable will be handled.



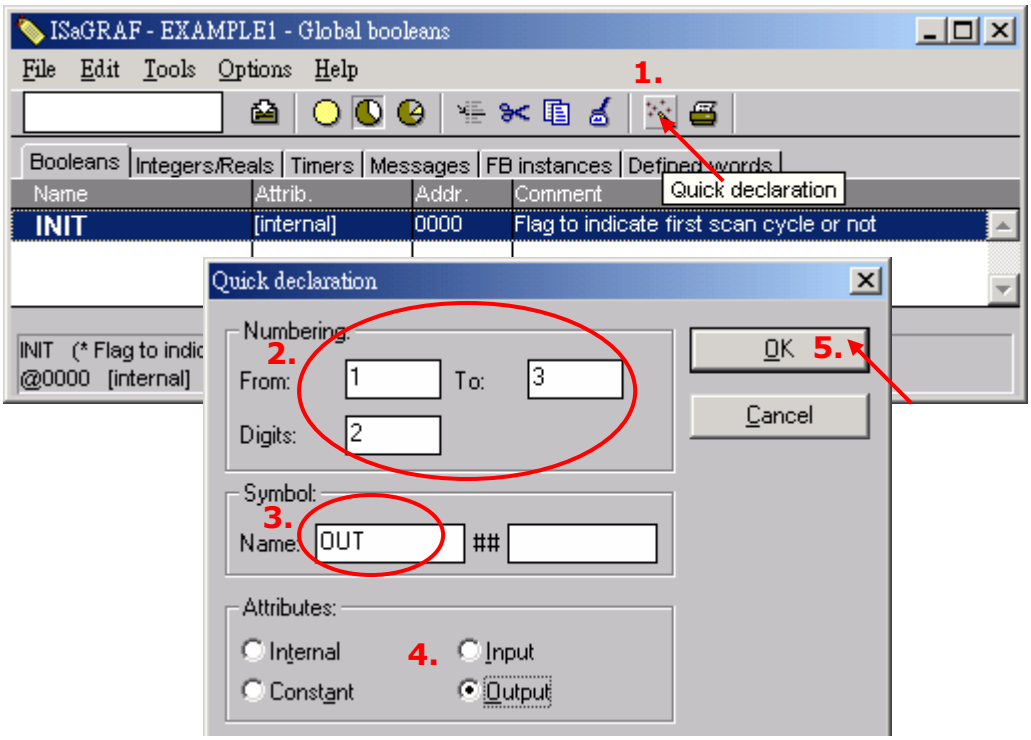
Note:

You MUST make sure that the variable you have declared has the desired Attribute assigned. If you decide that you want to change a project variable’s attribute, just double click on the variable name and you can reassign the attribute for the variable

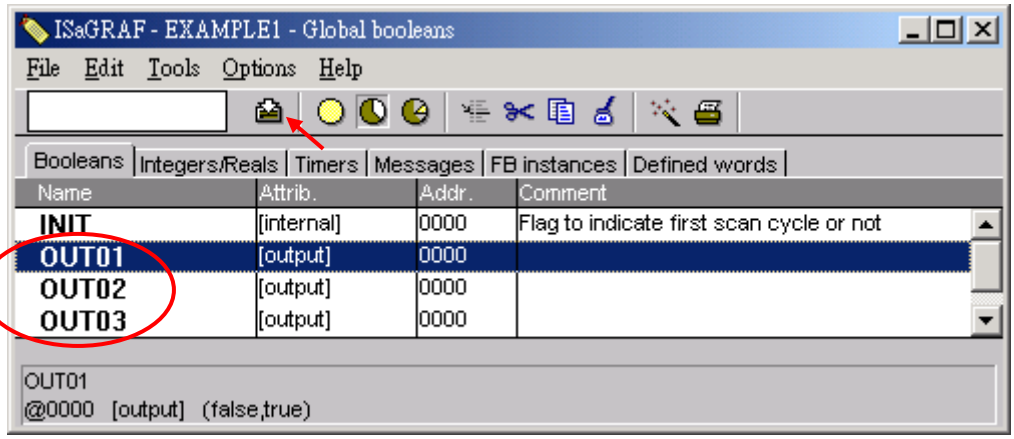
Quick Declaration:

There are three outputs used in this example program named “OUT01, OUT02, and OUT03”. ISaGRAF provides a quick and easy way to declare like variables that are sequentially ordered. To begin this process,

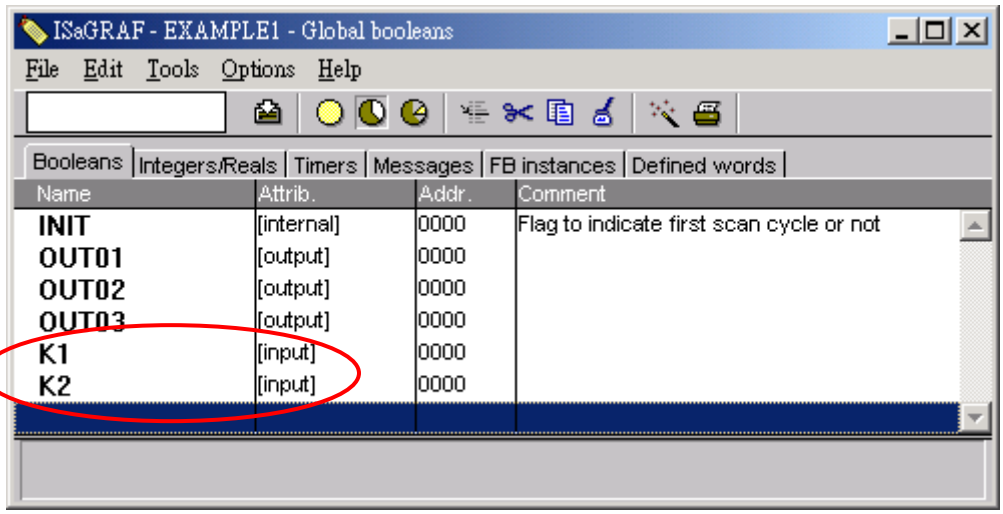
1. Click on the “Quick Declaration” icon.
2. Enter in the output number that you will start within the “Numbering” from and “To” field (this example uses from 1 to 3).
3. Enter the “Symbol” name for the output variables being declared.
4. Lastly, set the attribute to “Output and then press “OK”.



All three outputs will be immediately added to the “Global Boolean” window. Please click “Save” button to save them.

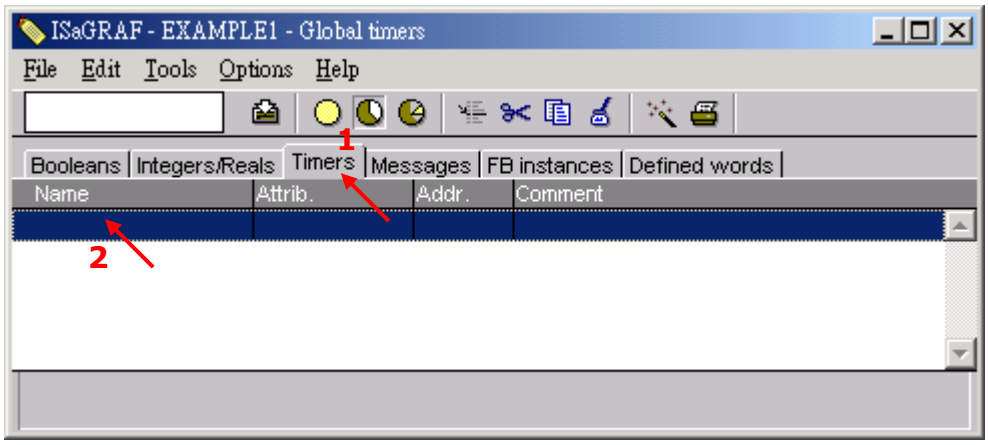


Use the same method as former to create another 2 variables – “K1” & “K2” however with “input” attribution.

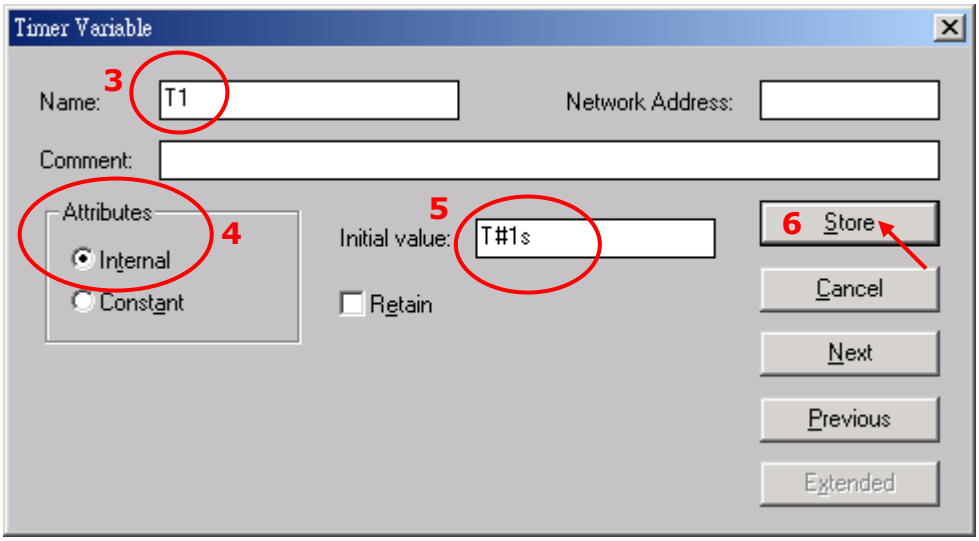


Declaring Timer

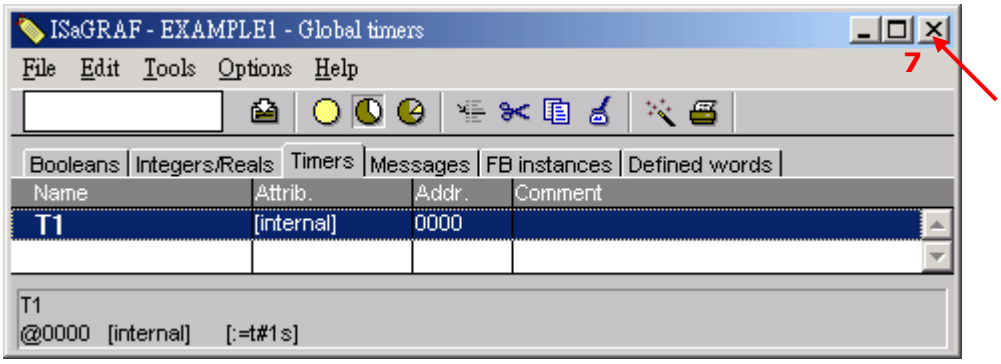
To declare the timer (T1) variable used in this example program, click on the “Timers” tab in the setup screen and double click on the colored area.



Enter the Name as “T1”, set the “Attributes” to “Internal”, the “Initial Value” to “T#1s”, and then click on the “Store” button.



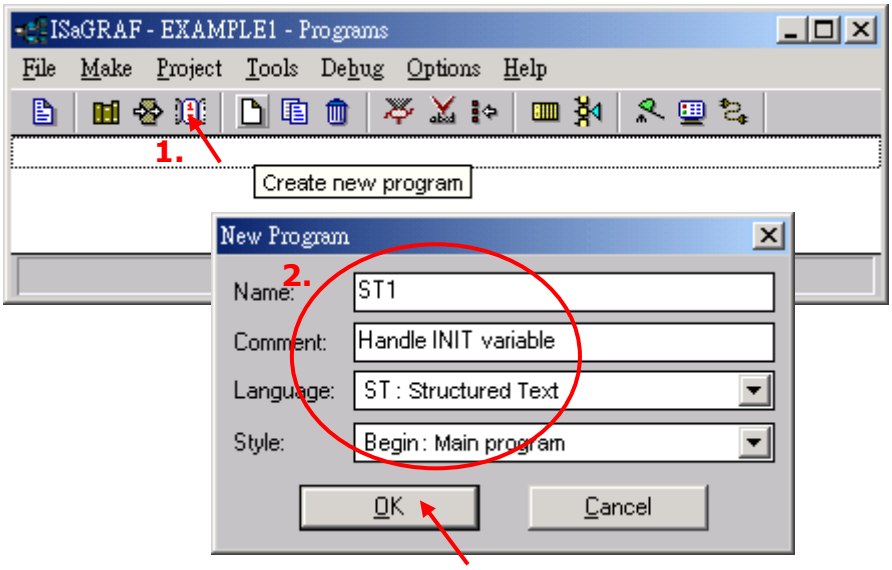
Then please click on “X” to close the “dictionary” window.



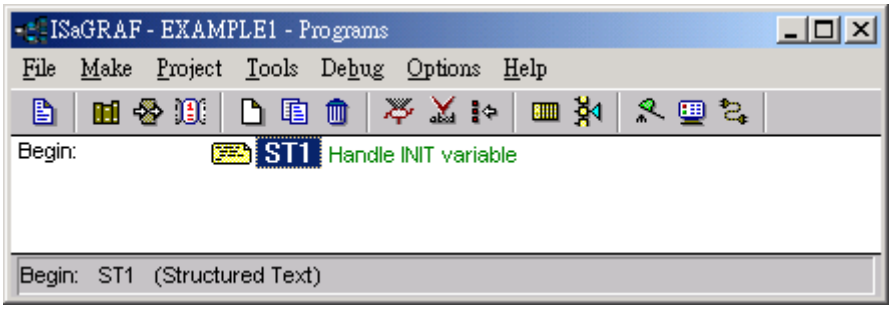
2.3.5 Create and Edit the ST - "ST1" Program

In this project we need an ST program to handle the "INIT" variable.

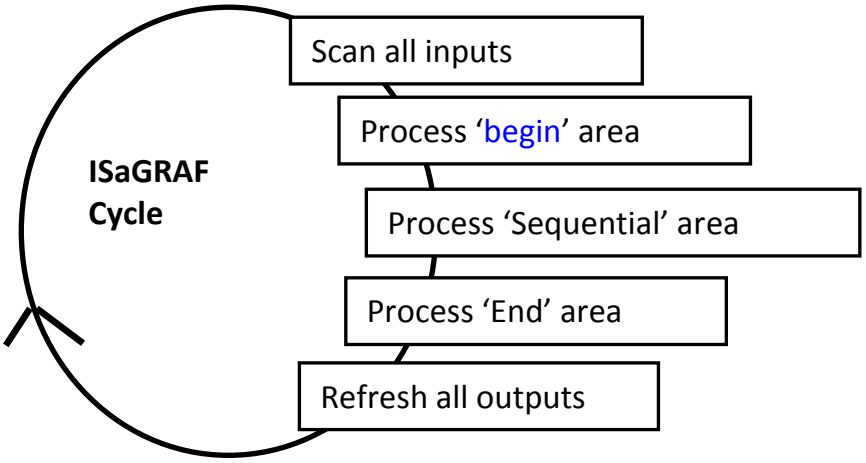
1. Click on "Create new program" in the window.
2. Given the Name as "ST1", Comment as "Handle INIT variable", Language as "ST: Structured Text", & Style as "Begin: Main program". Then click on "OK".



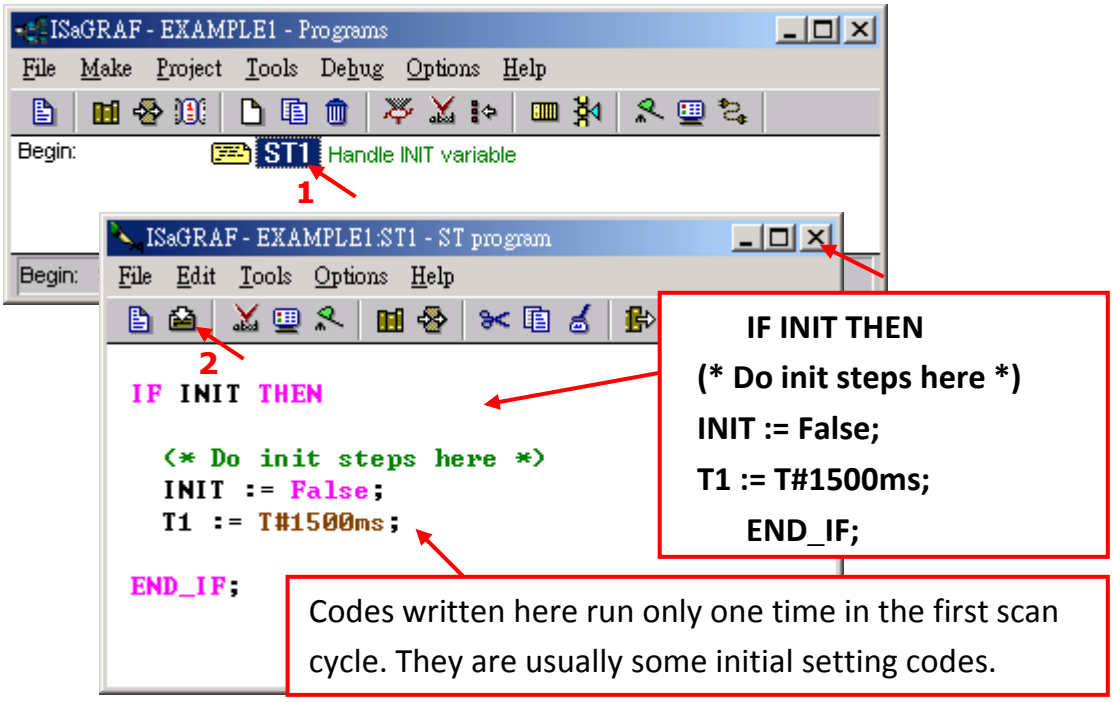
Now we have one program inside this project.



ISaGRAF will run every program one time in each PLC scan cycle. Programs in the "begin" area will run first, then the "Sequential" area, and last the "End" area. An ISaGRAF cycle run in the way as the below scheme.

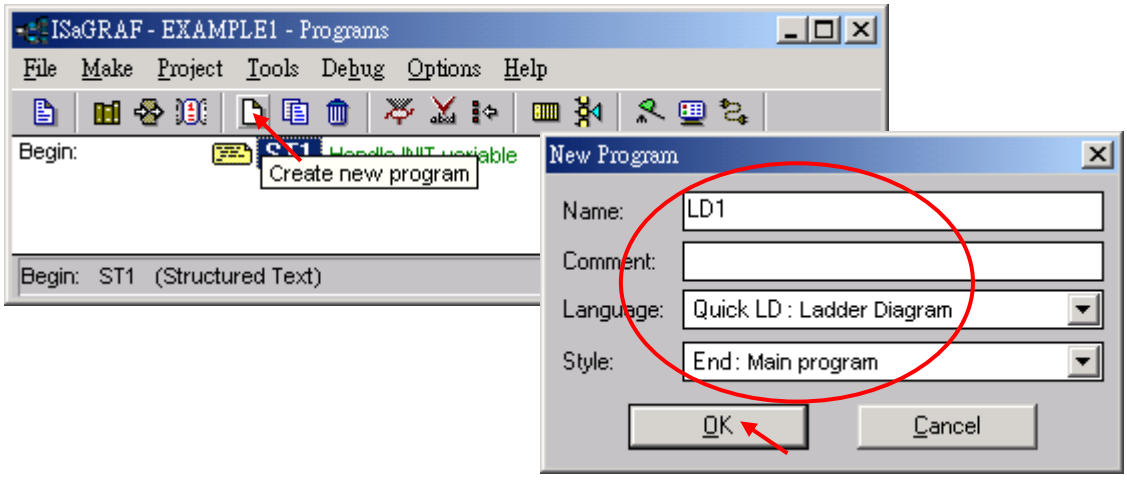


Double click on “ST1” program to edit it. Click on “save” and then exit when you finish it.
Note: Any character inside between (* and *) is the comment.

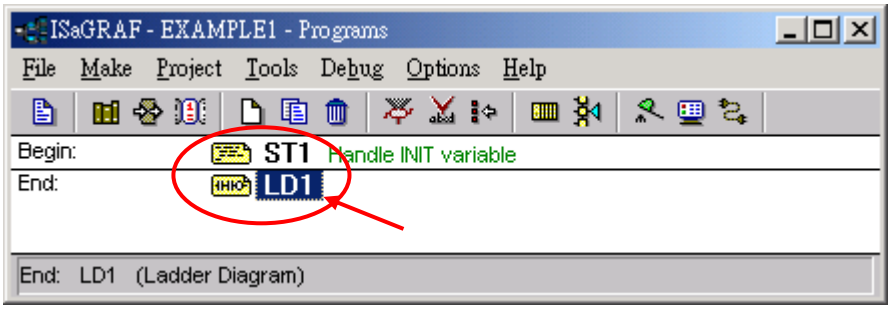


2.3.6 Create the LD - “LD1” Program

Click on the “Create New Program” icon and the “New Program” window will appear. Enter the “Name” as “LD1”. Next, click on the “Language” scroll button and select “Quick LD: Ladder Diagram” and make sure the “Style” is set to “End: Main Program”. You can add any desired text to the “Comment” section for the LD program, but it isn’t required.

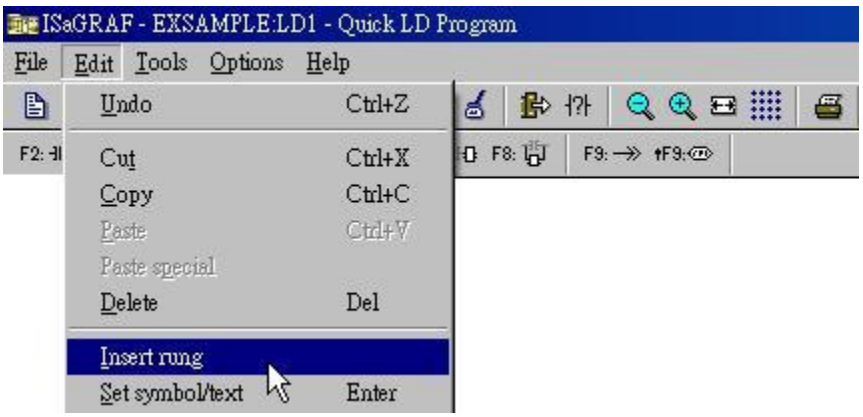


Now we have two programs inside this project. Please double click on the “LD1” to get into it.

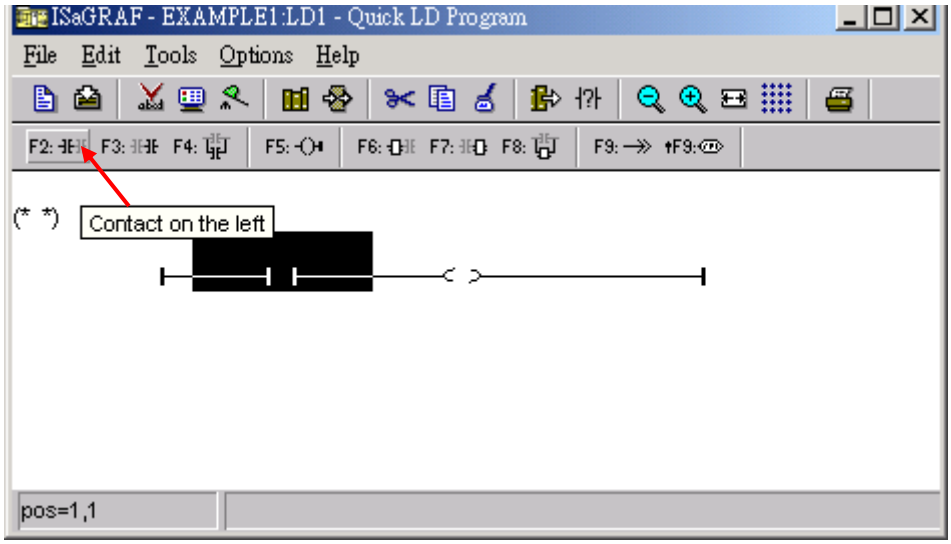


2.3.7 Edit the "LD1" Program

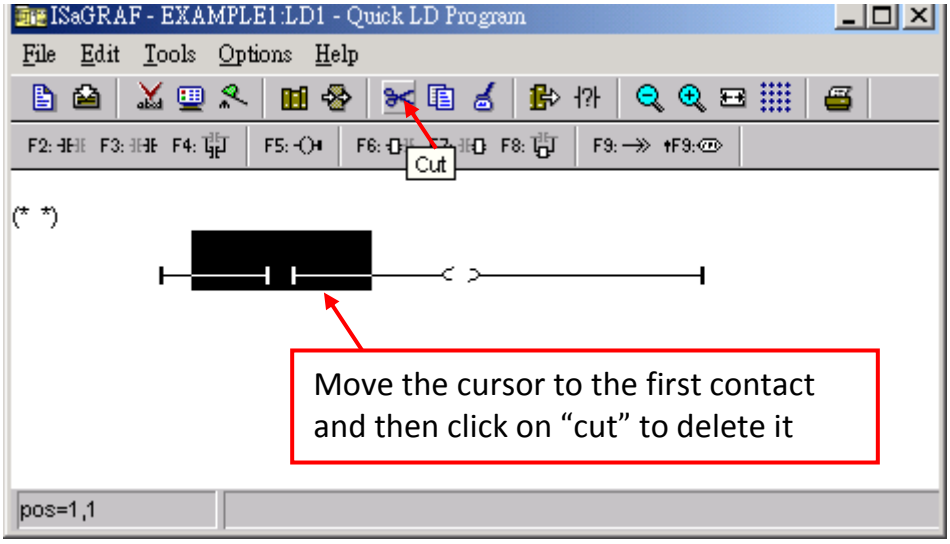
When you double click on the "LD1" name the "Quick LD Program" window will appear. To start programming our LD program, click on "Edit" from the main menu bar, and then click on "Insert Rung". "Insert Rung" means to insert a basic LD rung just above the current position.



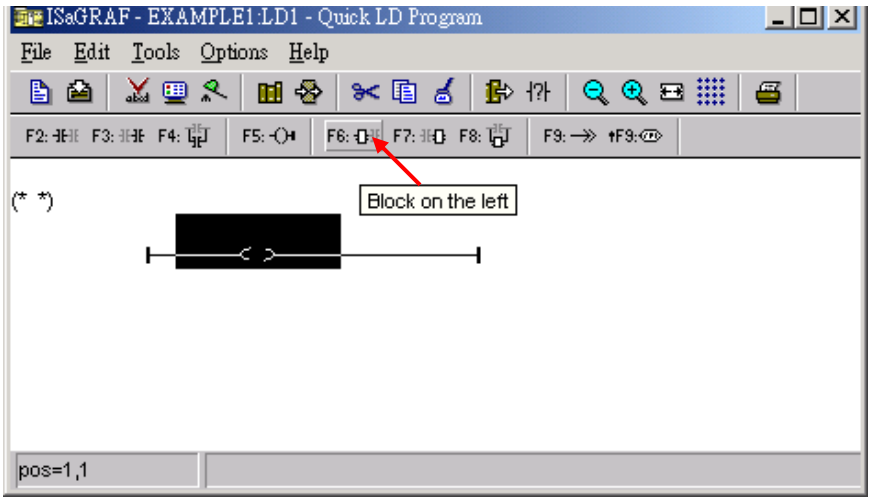
Or, you may just simply click on the "F2 (Contact on the Left)" icon, and the following will appear within the Quick LD Program window.



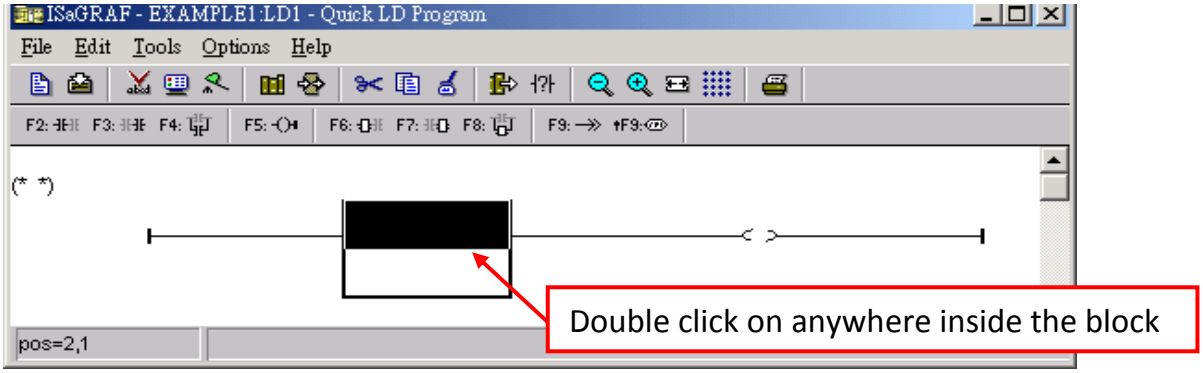
We are going to write the first line of the LD1 program. Move the cursor to the first "contact" and then click on "cut" to delete it.



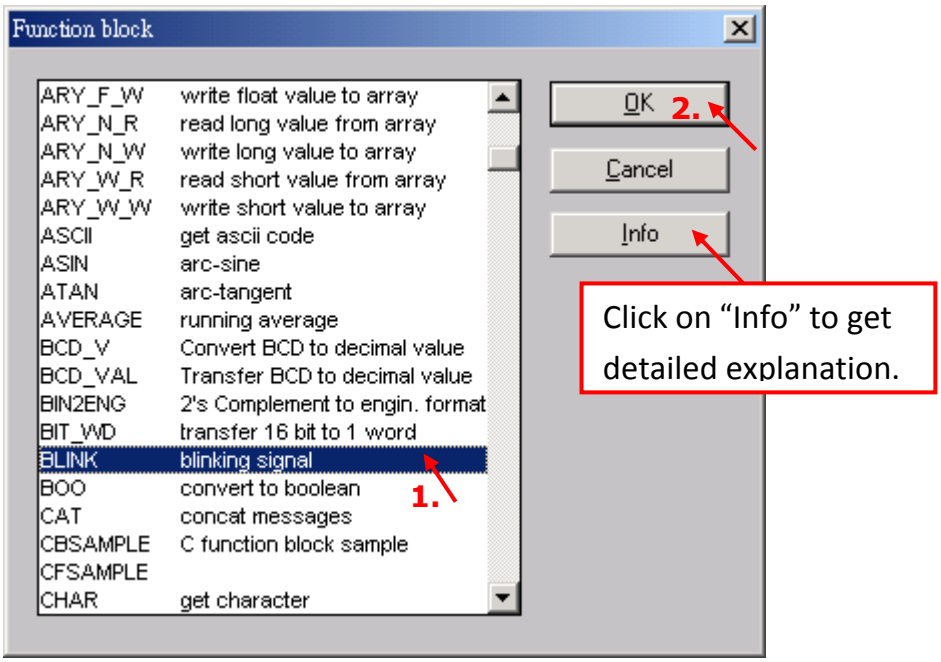
Click on the “F6 (Block on the left)” icon and you will create a block on the left of the “coil”.



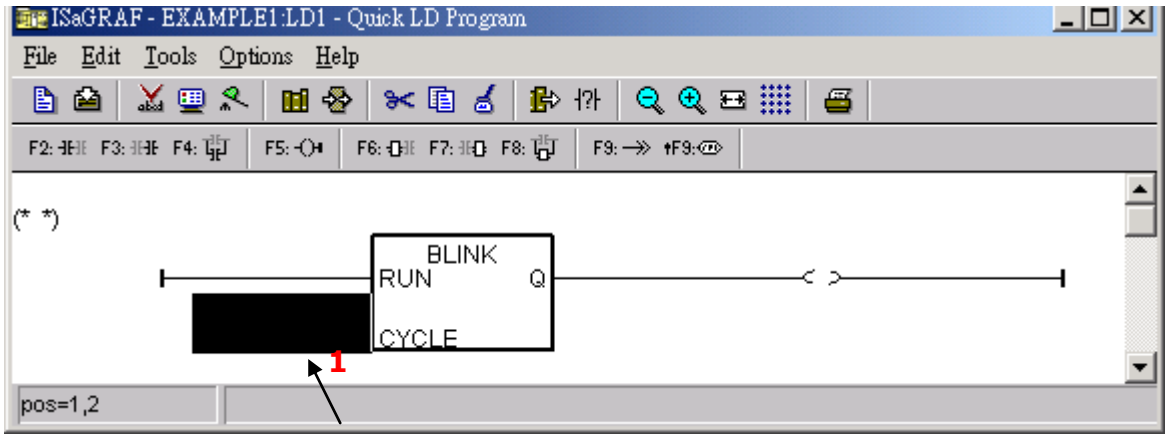
Now we are going to assign the associated variable & constant to each item. Double click anywhere inside the block and the “Function Block” assignment window appears.

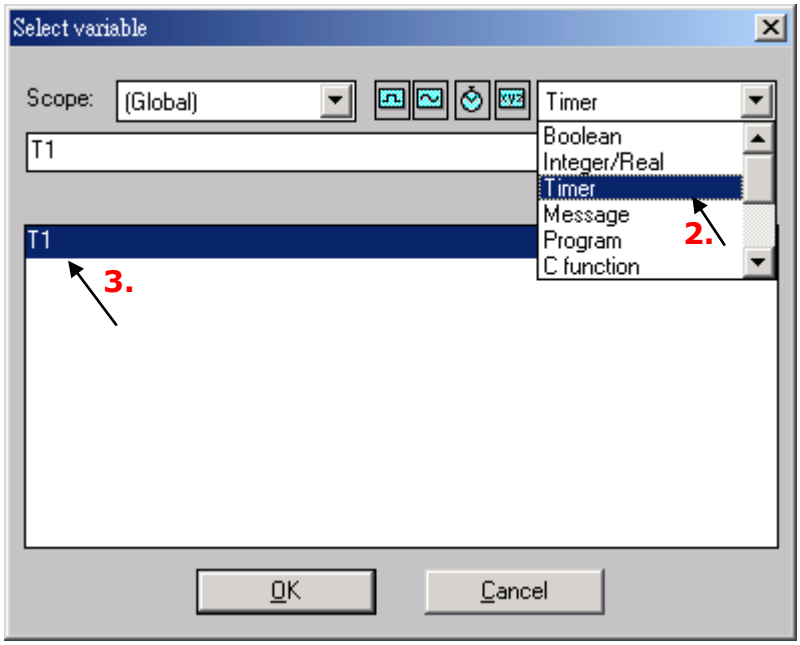


Select the “BLINK” type function block and press “OK”. To learn how the “BLINK” function operates you can click on the “Info” button for a detailed explanation of its functionality.

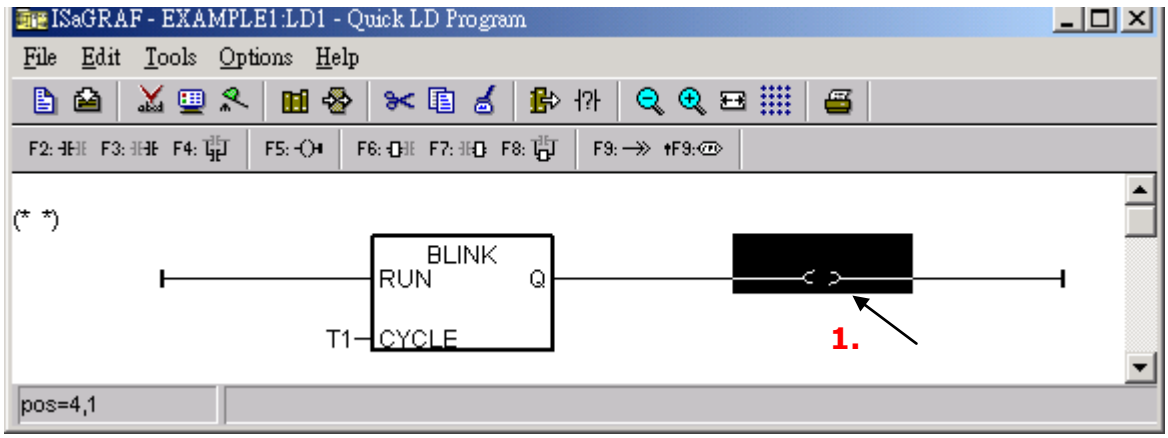


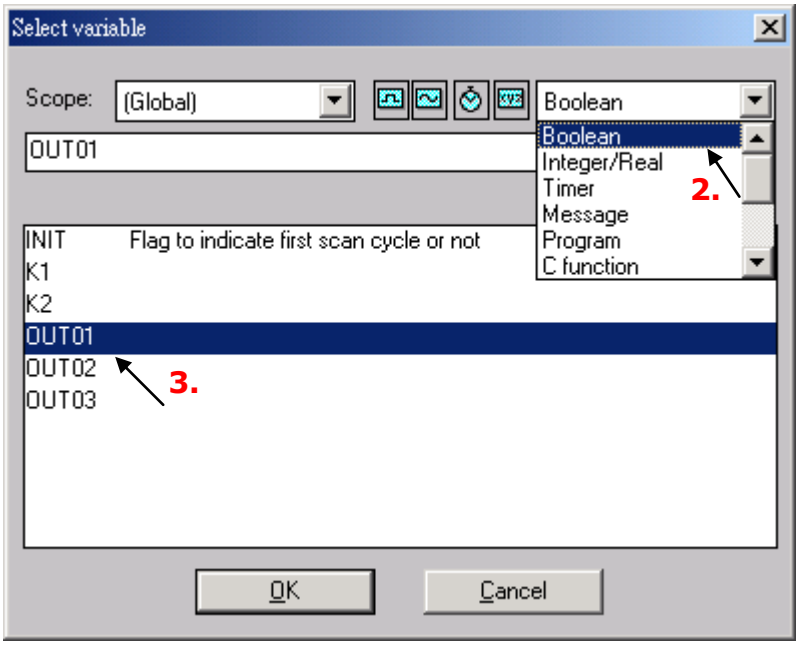
① Now move your cursor to the left of the parameter “CYCLE” of the “BLINK” block. Double click on it, ② select “Timer” and then ③ double click on variable name - “T1”



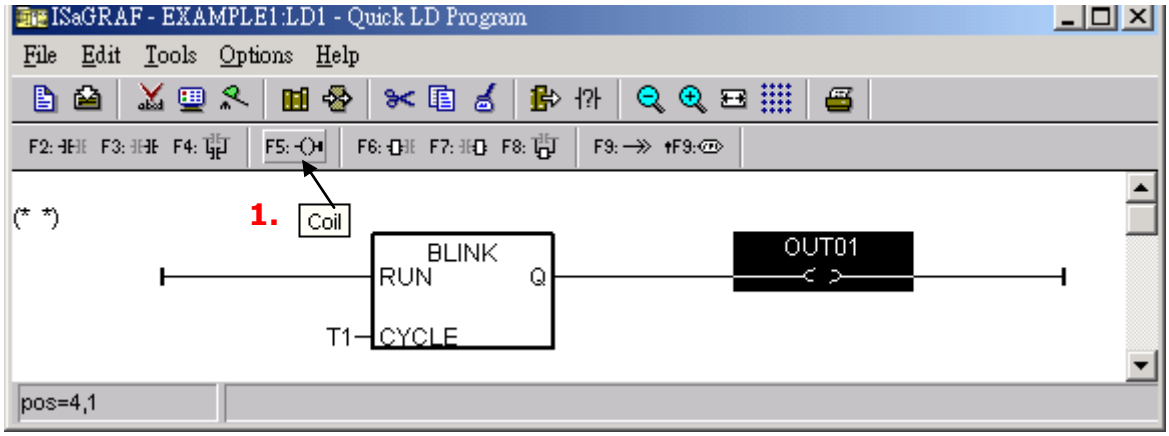


① Move your cursor to the “coil”. Double click on it, ② select “Boolean” and then ③ double click on variable name – “OUT01”.

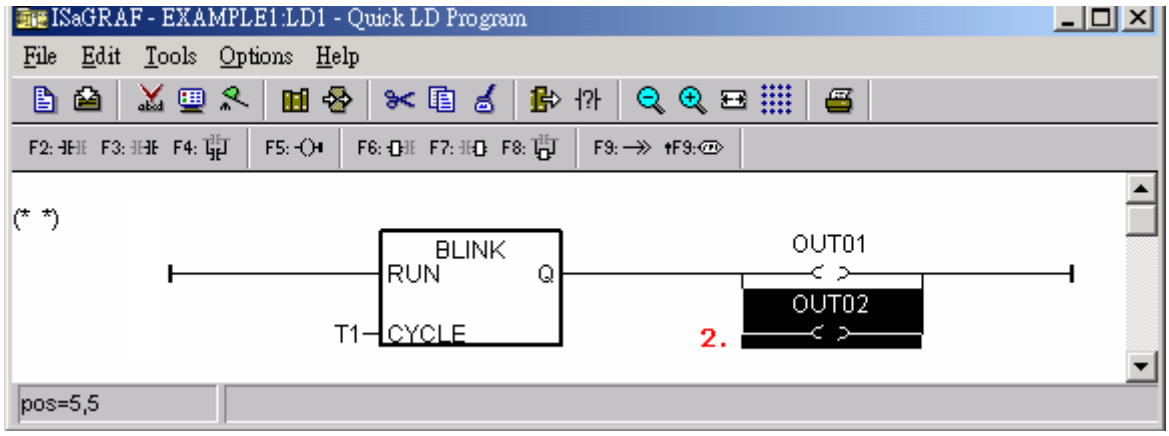




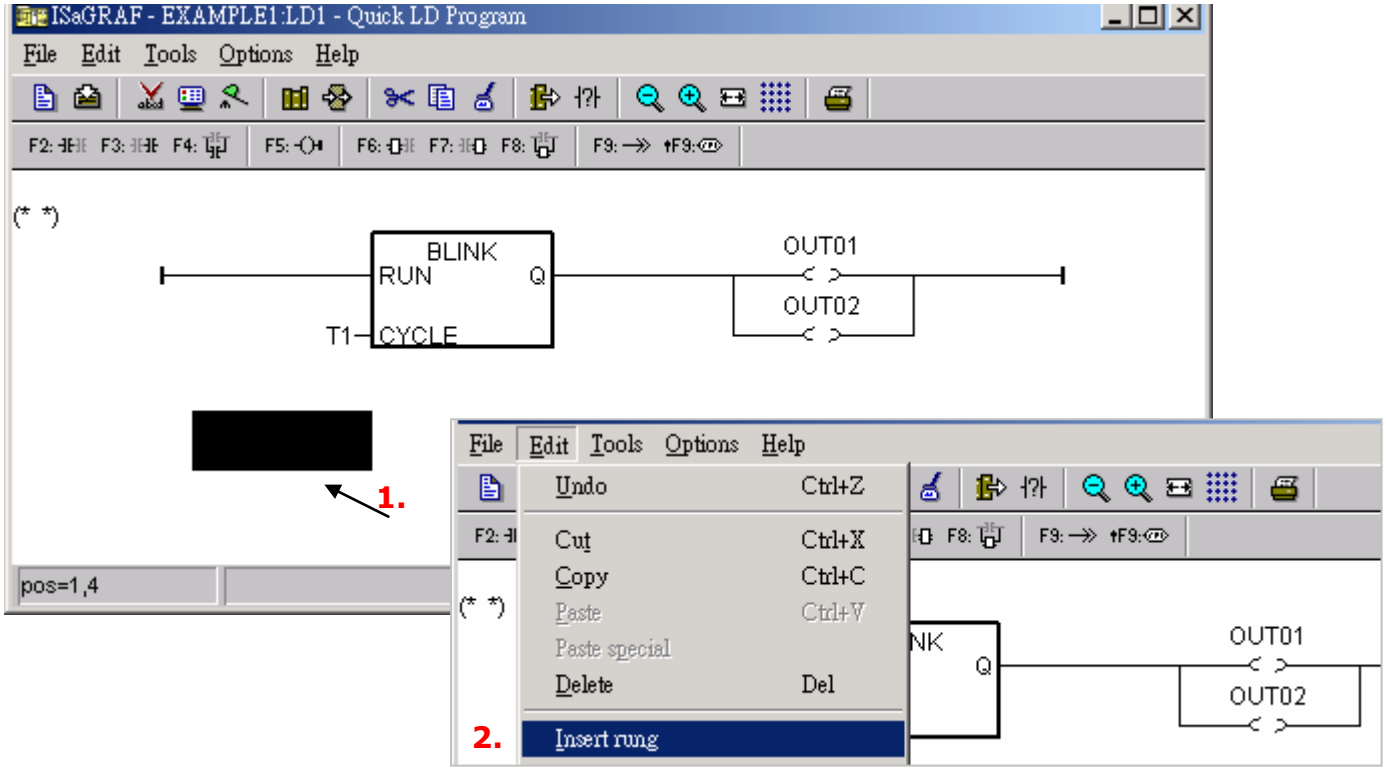
① Click on "coil" icon to create one another coil below the "OUT01", and then assign a Boolean name – "OUT02" to it.



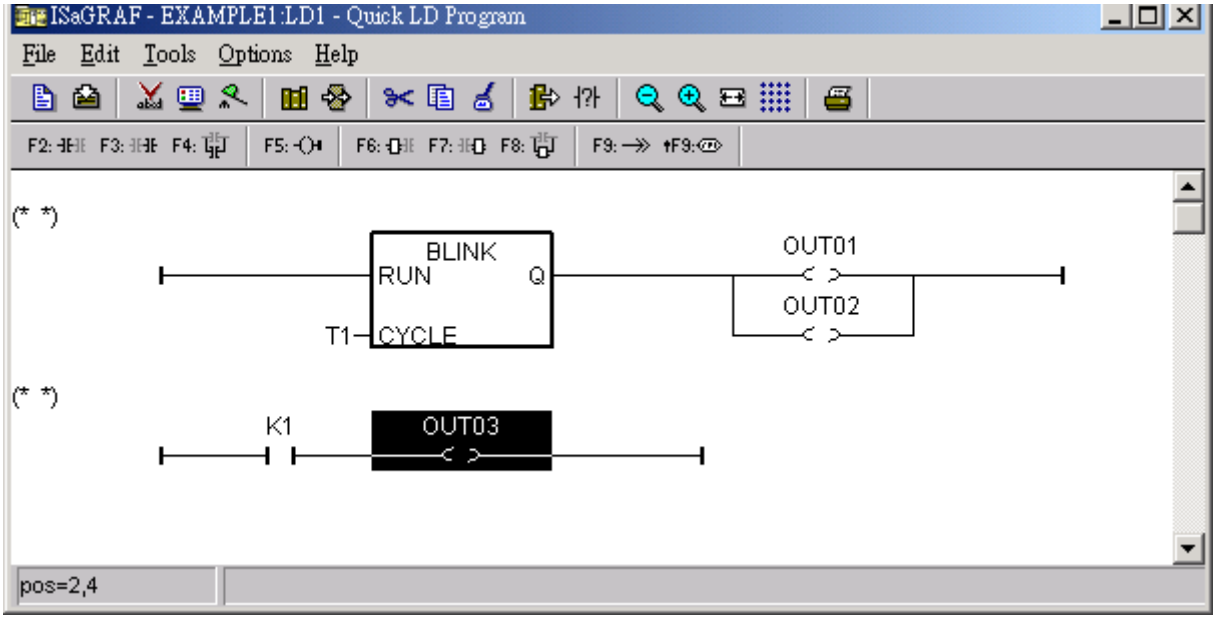
②Then we have the below window.



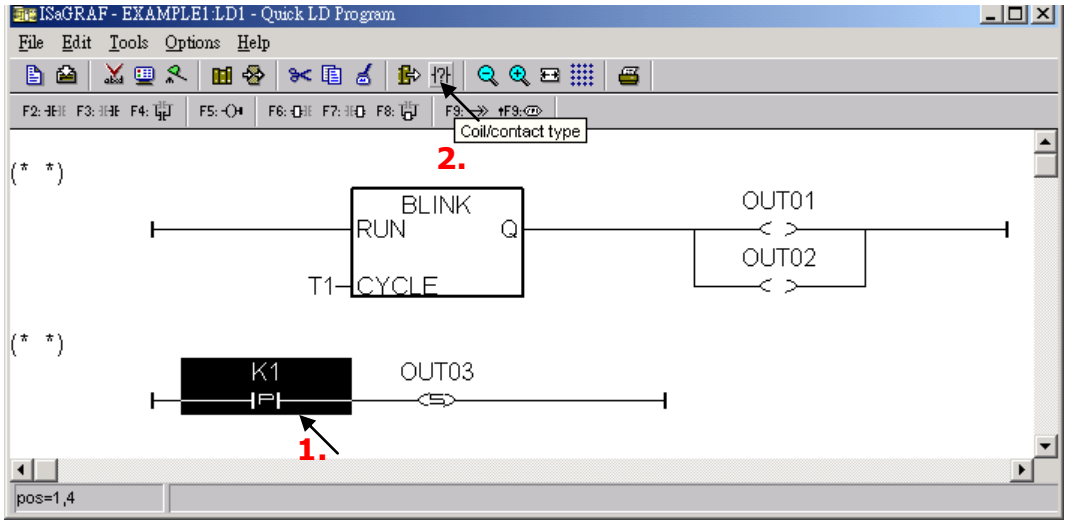
To insert the second LD rung, ① move the cursor to be under the first rung, ② then click on "Edit" – "Insert rung".



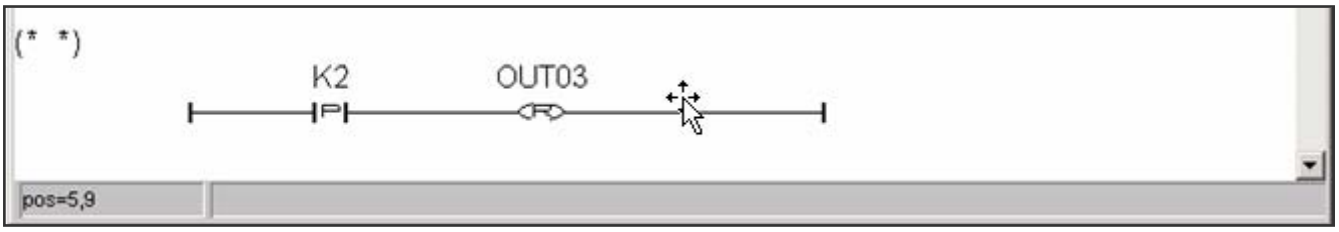
Using the same way as former to assign name “K1” and “OUT03” to the correct position.



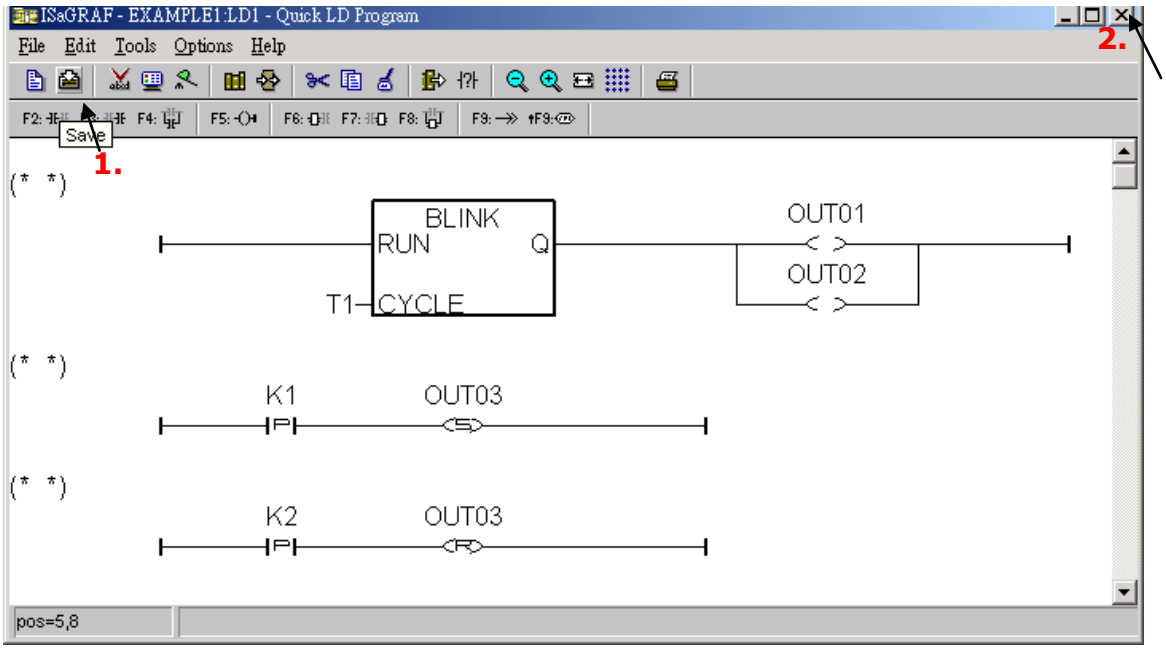
To assign proper type to the “contact” & “coil”, ① move the cursor to “K1” and then ②slowly click on “Coil/contact type” icon several times to get the correct type. In this example, K1 has type of “P” while OUT03 has type of “S”.



By the same way to create the third rung as below. Note that K2 has type of "P"; OUT03 has type of "R".



The LD1 program is finished now, ① click on the "Save" icon ② and then exit.

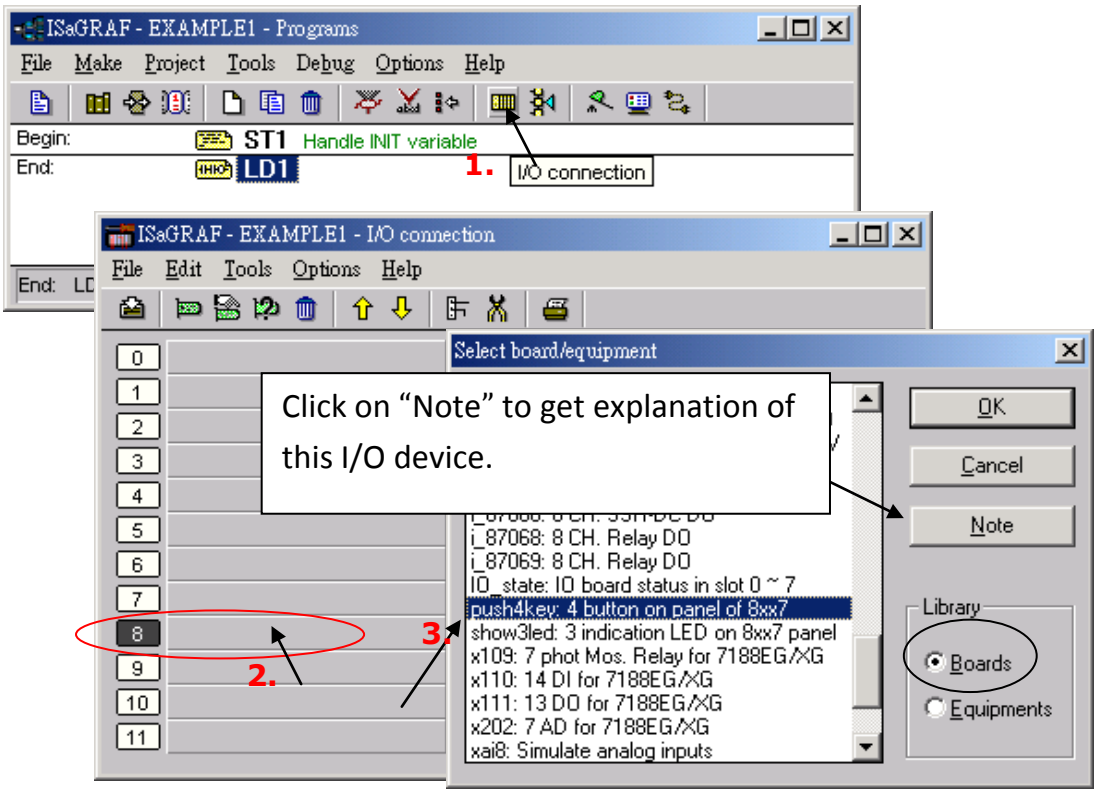


2.3.8 Connecting the I/O

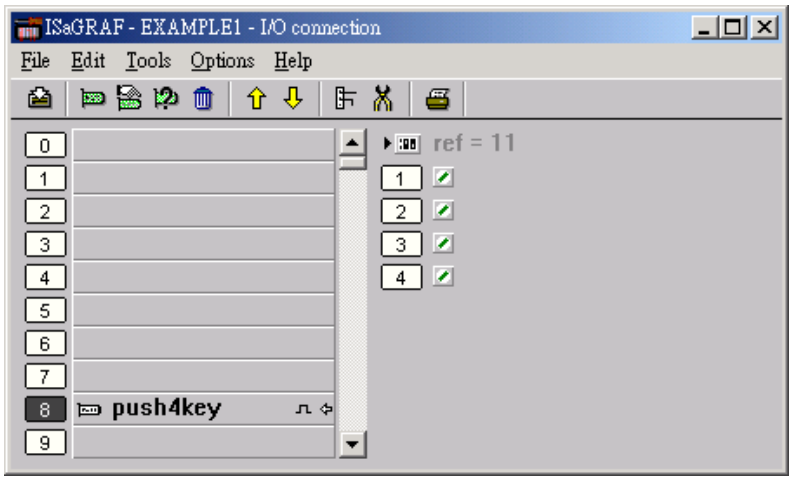
We have defined variables name of “OUT01”, “OUT02” & “OUT03” as “output” attribution, while “K1” & “K2” as “input” attribution in step 2. 3. 4.

These “input” & “output” variable should be map to physical I/O in the controller before they can work.

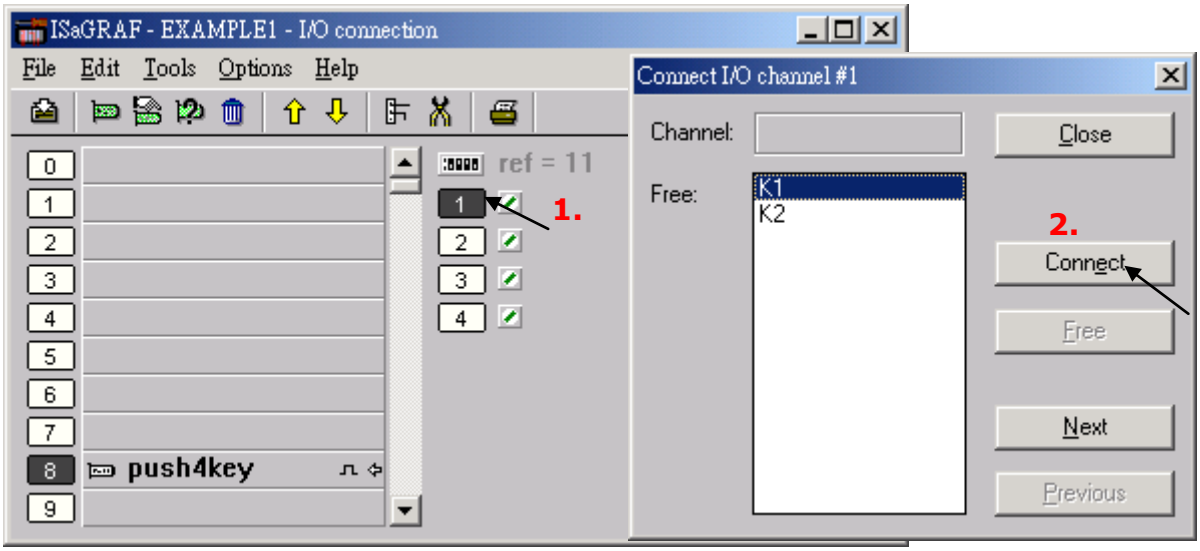
To do that, ① click on “I/O connection” to get into the I/O connection window. ② Double click on the No. 8 slot & then ③ check on the “Boards” & double click on the “push4key: 4 button on panel of 8xx7”.



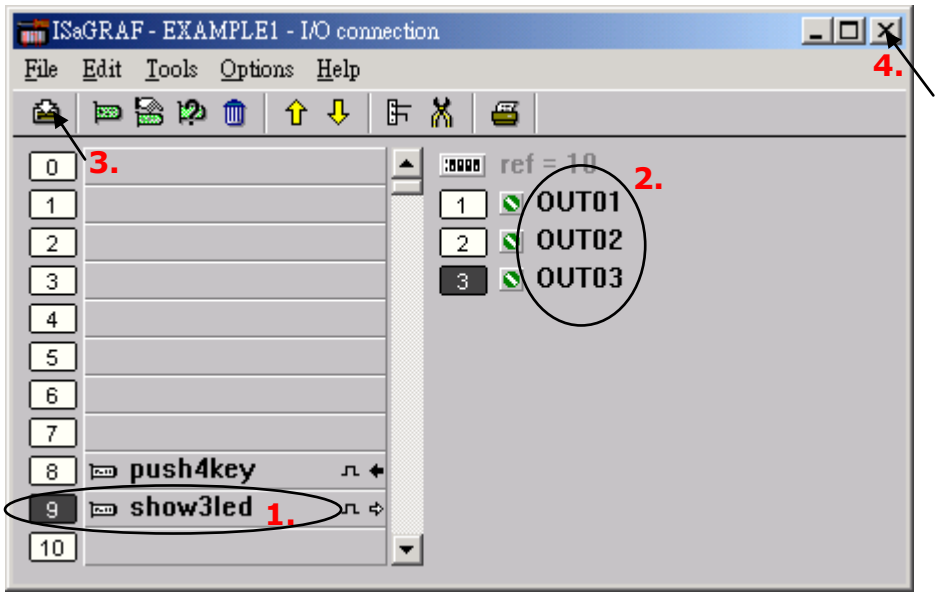
Then we have this window.



To map input variables “K1” & “K2” to the channel No. 1 & 2 of the “push4key”, ① double click on the channel 1 and then ② click on “Connect”. Then click on “Connect” again to connect channel 2.



By the same way, please ① connect output device “show3led” to slot 9 & ② its related channel 1, 2 & 3. Then we have below window. ③ Click on “Save” and ④ then exit.



IMPORTANT NOTICE:

1. I/O Slots 0 through 7 are reserved for REAL I/O boards that will be used in the I-8xx7 controller. You can use slot No. 8 and above for additional functionality as illustrated by the example program.

2. All of the variables with “Input” and “Output” attribute MUST be connected through the I/O connection as described above for any program to be successfully compiled.

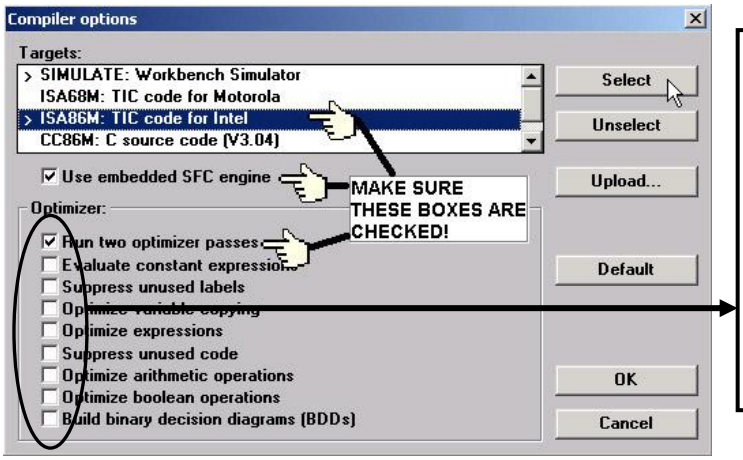
   Only the Input and Output attributed variables will appear in the “I/O Connections” window. In this example we have only 3 Boolean output variables - OUT01, OUT02 & OUT03 and 2 Boolean input variables – K1 & K2.

2.4 Step 4 - Compiling & Simulating the Example Project

★ **For ANY AND EVERY ISaGRAF program to work properly with any of the I-8xx7/8x37-80 controller systems, it is the responsibility of the programmer to properly select the correct "Compiler Options". You MUST select the "ISA86M: TIC Code for Intel" option as described below.**

To begin the compilation process, first click on the "MAKE" option from the main menu bar, and then click on "Compiler Options" as shown below.

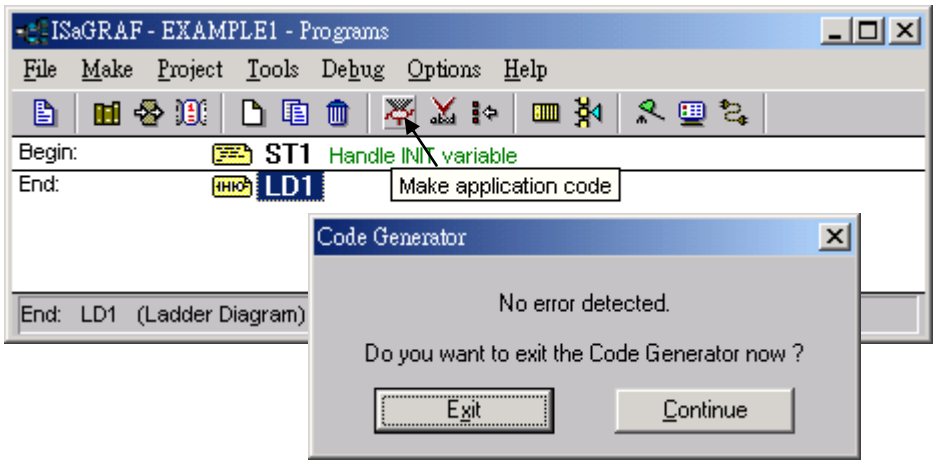
The "Compiler Options" window will now appear. Make sure to select the options as shown below then press the "OK" button to complete the compiler option selections.



If using "Variable Array" in the program, please **DO NOT** check the 2nd , 7th , 8th and 9 th Optimizer options, or the value of the Variable array will be incorrect.
Recommend to check only the 1st – "Run two optimizer passes" option.

2.4.1 Compiling the LD Project

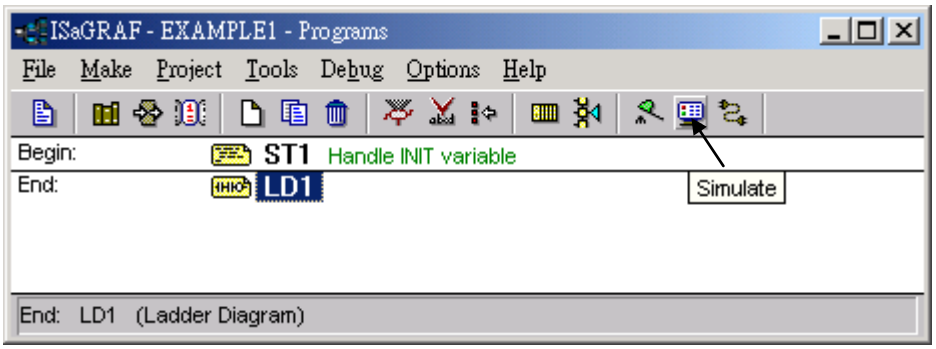
Now that you have selected the proper compiler options, click on the "Make Application Code" icon to compile the example project. If there is no compiler errors detected during the compilation process, CONGRATULATIONS, you have successfully created our example program.



If errors are detected during the compilation process, just click on the "Continue" button to review the error messages. Return to the Project Editor and correct the errors as outlined in the error message window.

2.4.2 Simulating the LD Project

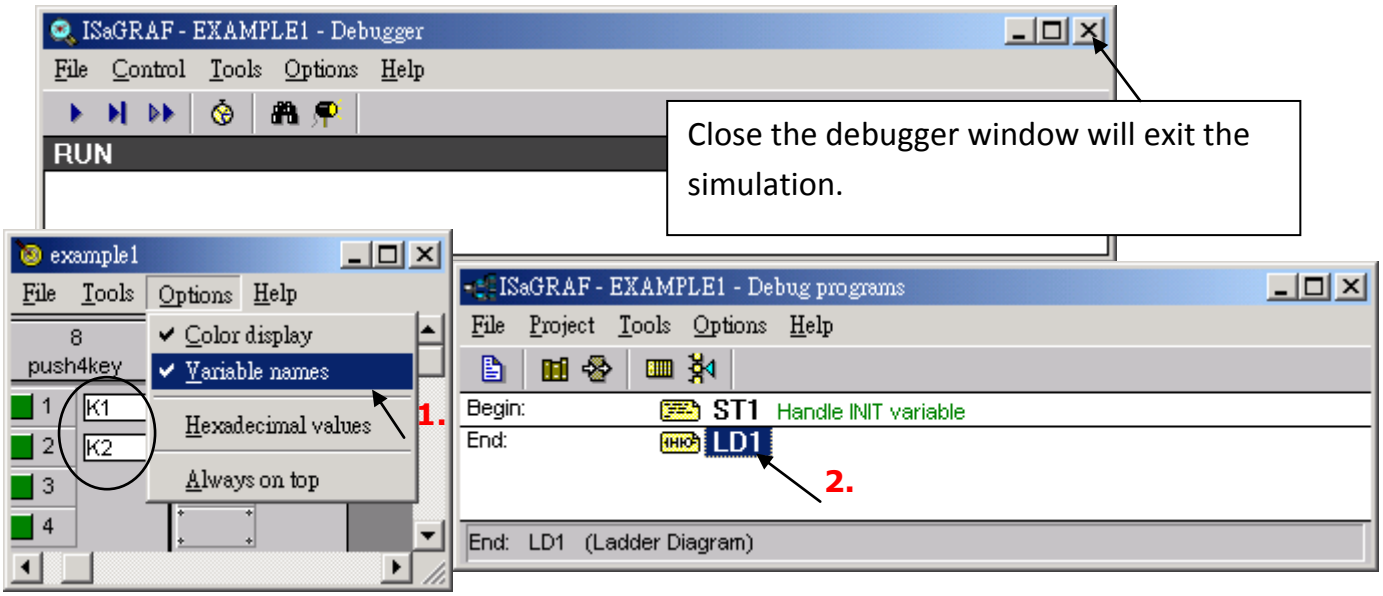
If the compilation is Ok, you may simulate the project on the PC to see how the program works without the controller. To do that, click on the "Simulate" icon.



When you click on the "Simulate" icon three windows will appear. The windows are the "ISaGRAF Debugger", the "ISaGRAF Debug Programs", and the "I/O Simulator" windows.

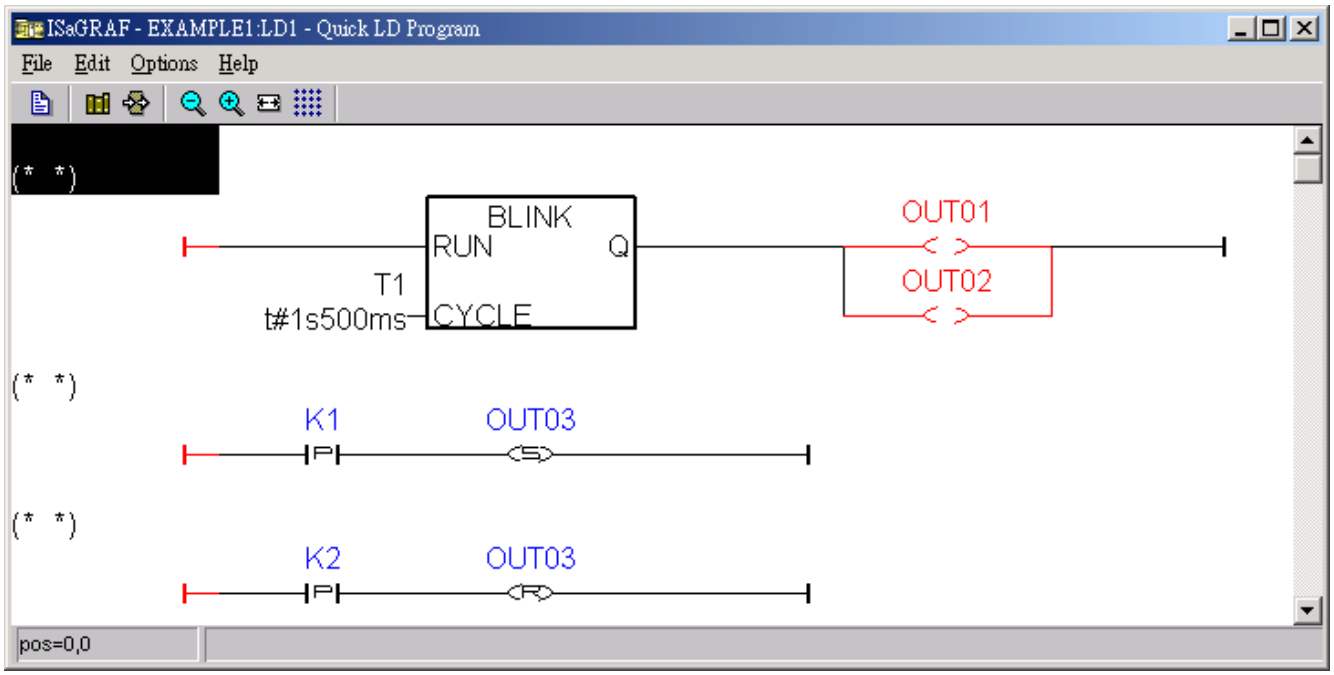
If the I/O variable names you have created DO NOT appears in the I/O simulator window, just ① click on the "Options" ➔ "Variable Names" selection and the variable names you have created will now appear next to each of the I/O's in the simulator window.

In the "ISaGRAF Debug Program" window, ② double click on the "LD1" where the cursor below is positioned. This will open up the ISaGRAF Quick LD Program window and you can see the LD program you have created.

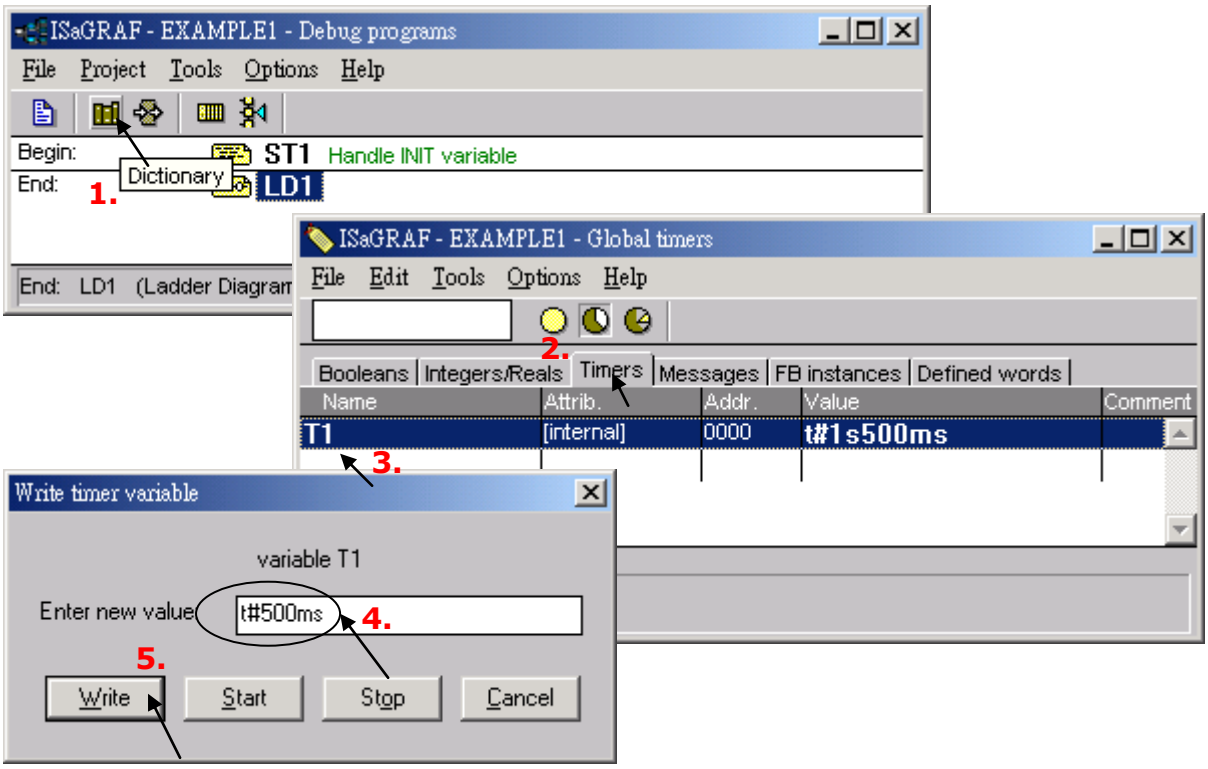


2.4.3 Running the Simulation Program

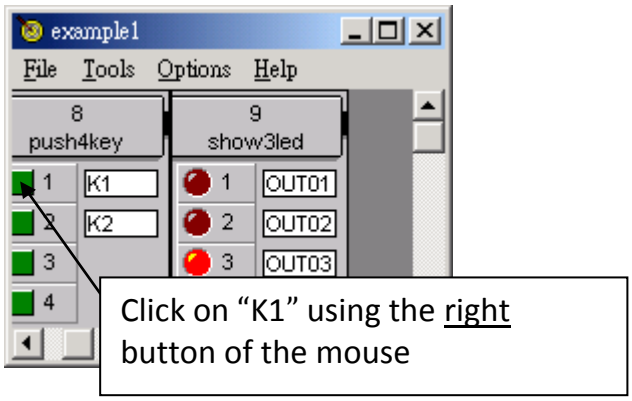
When you double click on “LD1” in the “ISaGRAF Debug Programs” window, the follow window should appear. You can see outputs “OUT01” thru. “OUT03” will blink in the period of 1500ms.



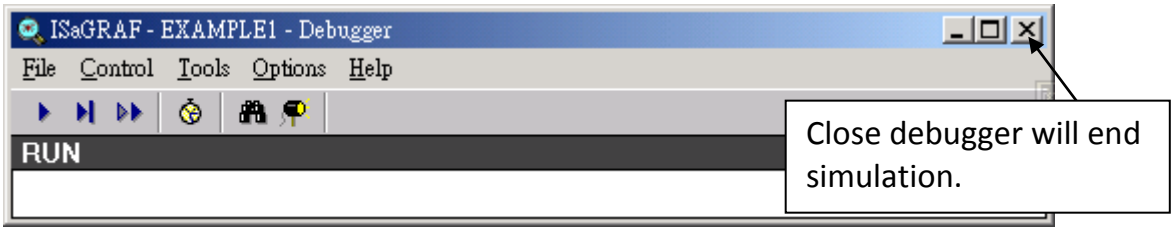
You can adjust the “T1” variable while the program is running. To accomplish this, ① click on the “Dictionary” icon which will open the “ISaGRAF Global Variables” window as shown in the first two pictures below. ② Click on “Timer” tab and then ③ double click on “T1” to ④ change the timer value to “T#500ms” (this means 0. 5 second). ⑤Then click on “Write”.



Now we are going to simulate the “K1” & “K2” input. Click on “K1” using the right button of the mouse. You will see “OUT03” is lighted. Please try “K2” by yourself.

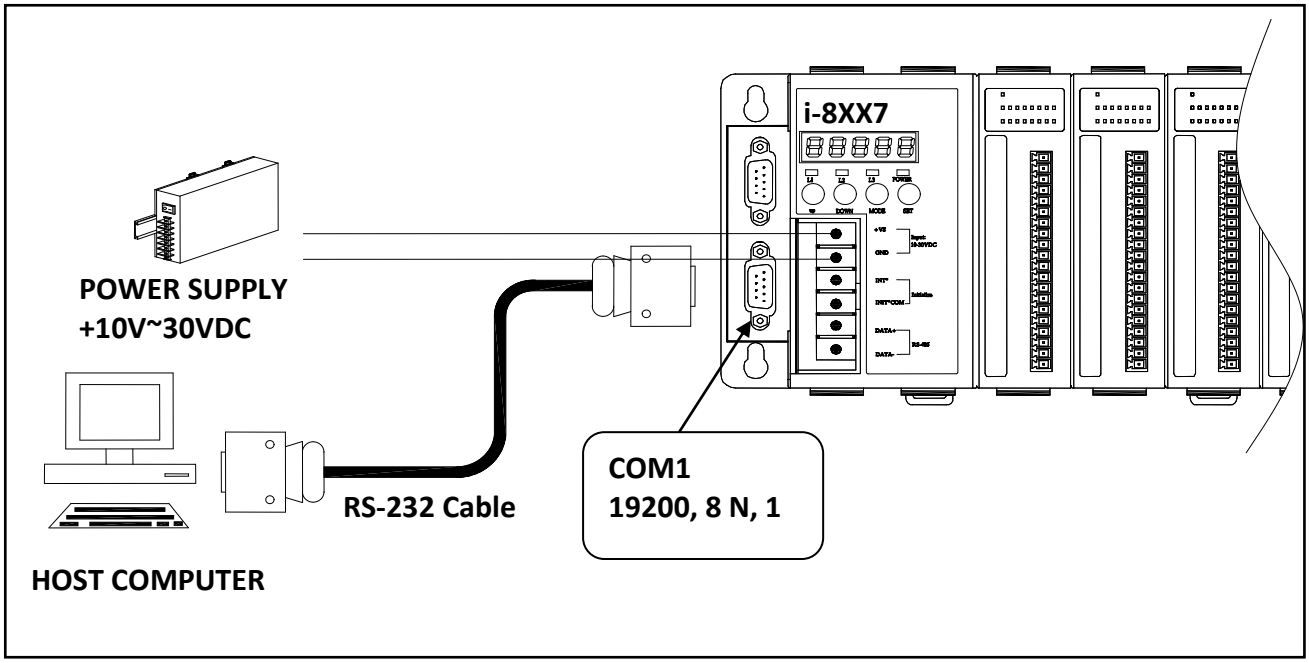


To exit simulation, please close the debugger window.



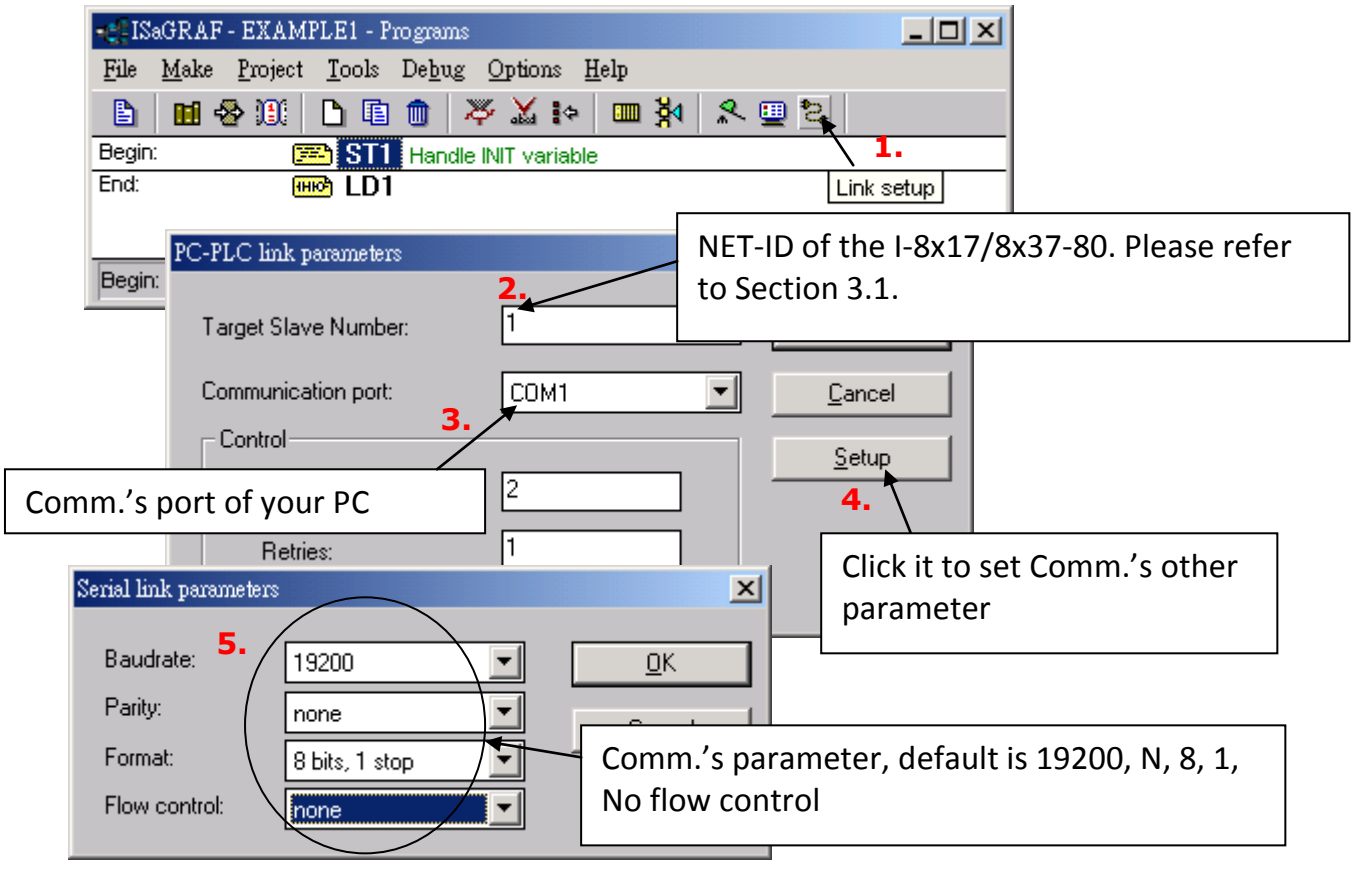
2.5 Step 5 - Download & Debugging the Example Project

To begin this process, please install the hardware as below.



The RS-232 cable is coming with the I-8xx7/8x37-80 controller, it is for linking PC's COM1 or COM2 to controller's COM1.

Click on the "Link Setup" icon in the "ISaGRAF Programs" window. When you click on the "Link Setup" icon, the following window will appear. Please set the proper value.

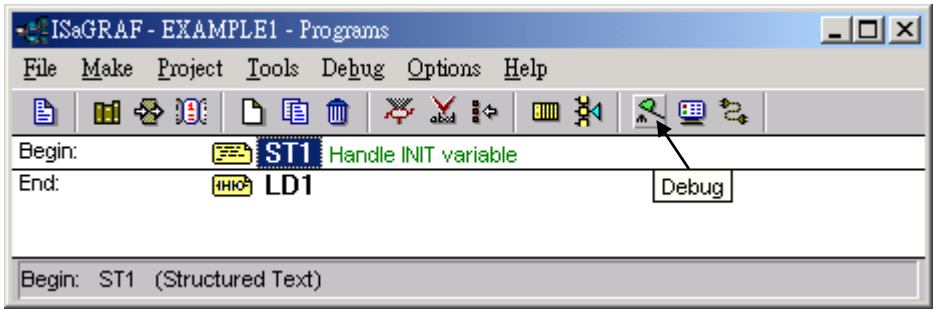


The communication parameters for the target I-8xx7/8x37-80 controller MUST be set to the same serial communication parameters for the development PC. For I-8x17/8x37 controllers (serial port communications), the default parameters for COM1 (RS-232) and COM2 (RS-485) Ports are:

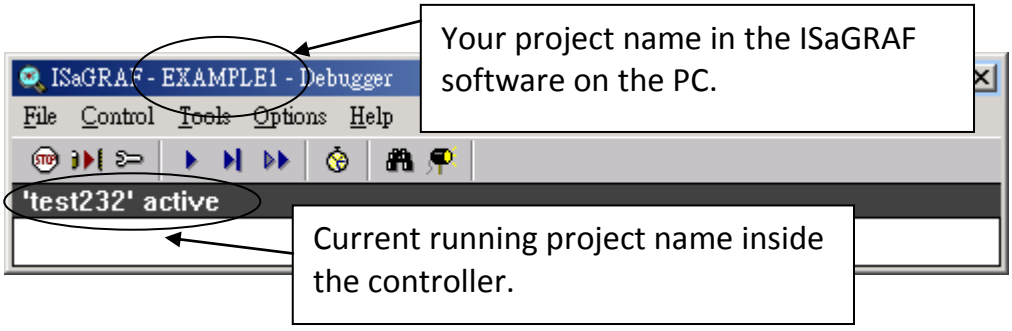
Baud rate:	19200
Parity:	none
Format:	8 bits, 1 stop
Flow control:	none

2.5.1 Downloading the Project

Before you can download the project to the I-8xx7/8x37-80 controller system, you must first verify that your development PC and the controller system are communicating with each other. To verify proper communication, click on the "Debug" icon in the "ISaGRAF Programs" window as shown below.



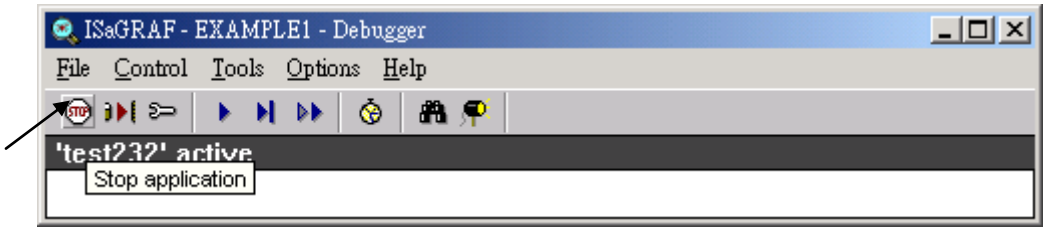
If the development PC and the I-8xx7/8x37-80 controller system are communicating properly with each other, the following window displayed below will appear (or if a program is already loaded in the controller system, the name of the project will be displayed with the word "Active" following it.



If the message in the "ISaGRAF Debugger" says "Disconnected", it means that the development PC and the controller system have not established communications with each other.

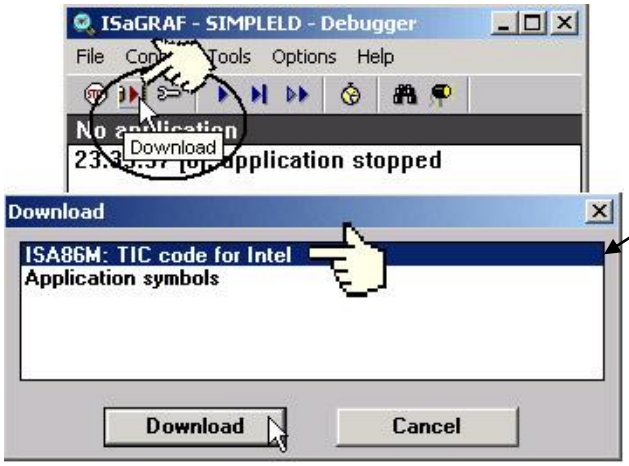
The most common causes for this problem is either the serial port cable not being properly configured, or the development PC's serial port communications DO NOT match that of the I-8xx7/8x37-80 controller system.
You may have to either change the serial port communication settings for the development PC (which may require changing a BIOS setting) or change the "Serial Link Parameters" in the ISaGRAF program.

If there is a project already loaded in the controller system you will need to stop that project before you can download the example project. Click on the "STOP" icon as illustrated above to halt any applications that may be running.



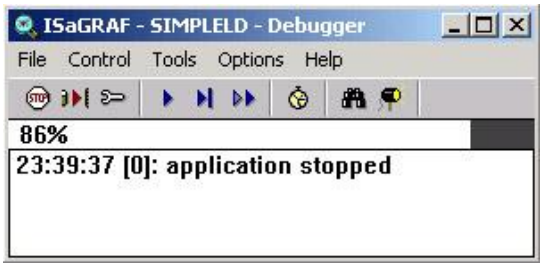
Starting the Downloading Process

From the "ISaGRAF Debugger" window click on the "Download" icon, then click on "ISA86M: TIC Code for Intel" from the "Download" window as shown below.

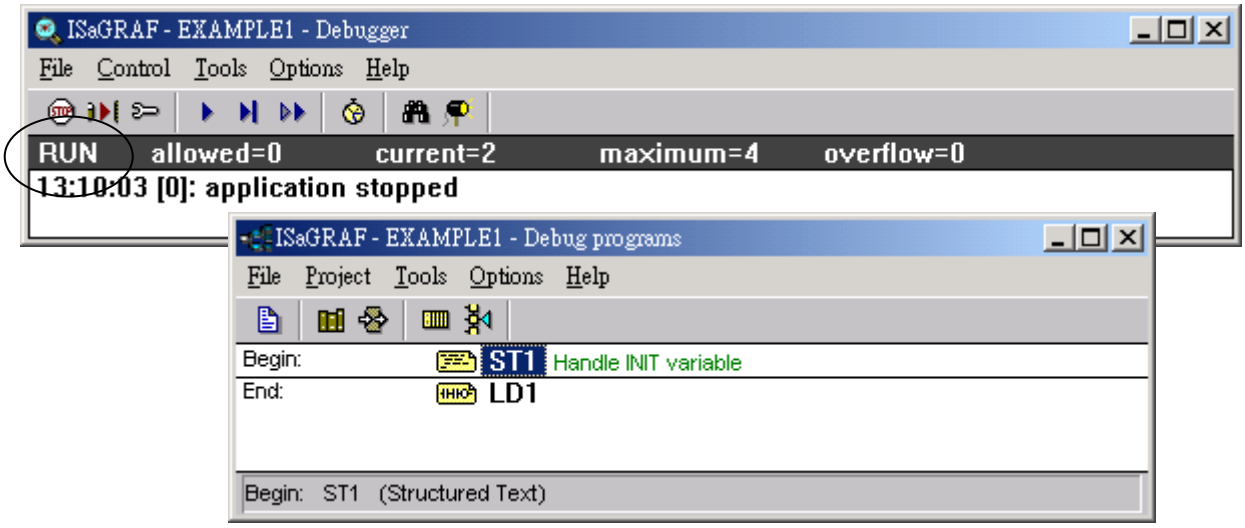


If "ISA86M: TIC code for Intel" is not found here, Please refer to **ch 2.4 : Step 4** to check the option & compile the project again.

The example project will now start downloading to the I-8xx7/8x37-80 controller system. A progress bar will appear in the "ISaGRAF Debugger" window showing the project downloading progress.



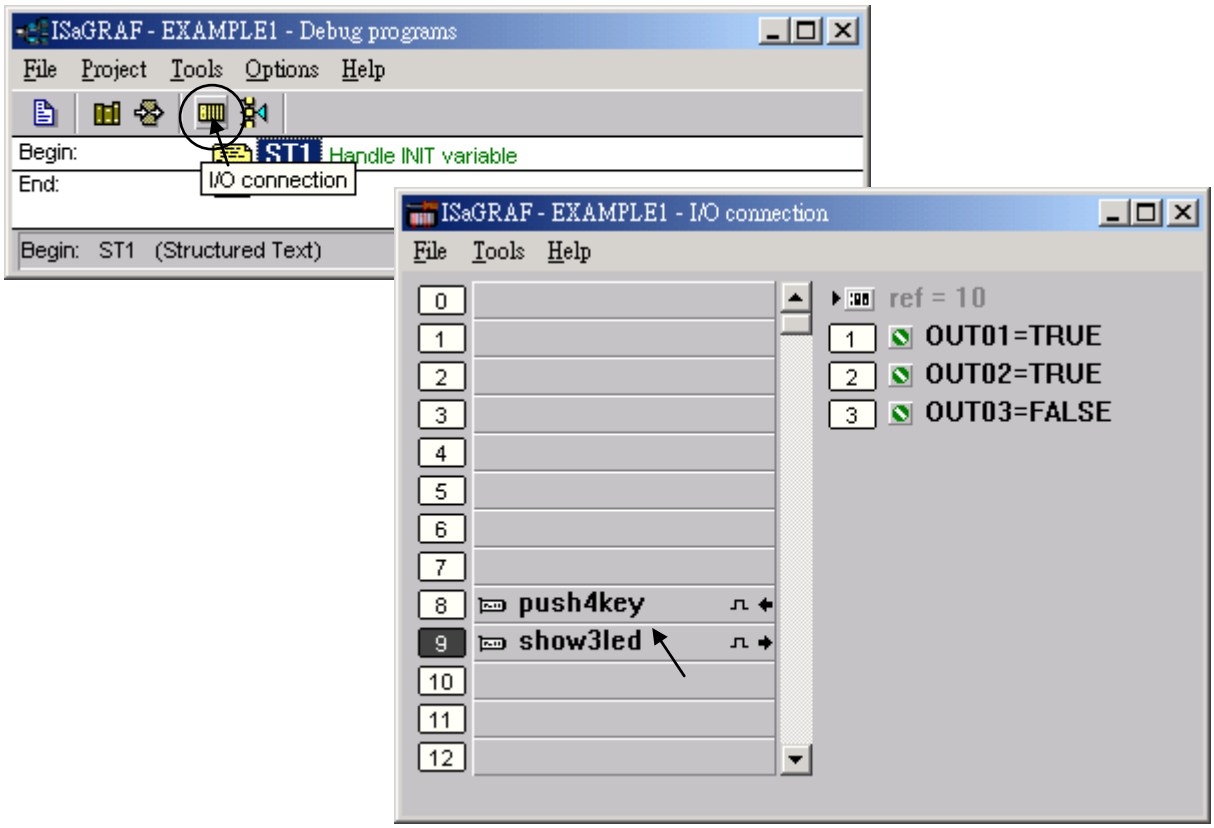
When the example project has successfully completed the downloading process to the I-8xx7/8x37-80 controller system the following two windows will appear.



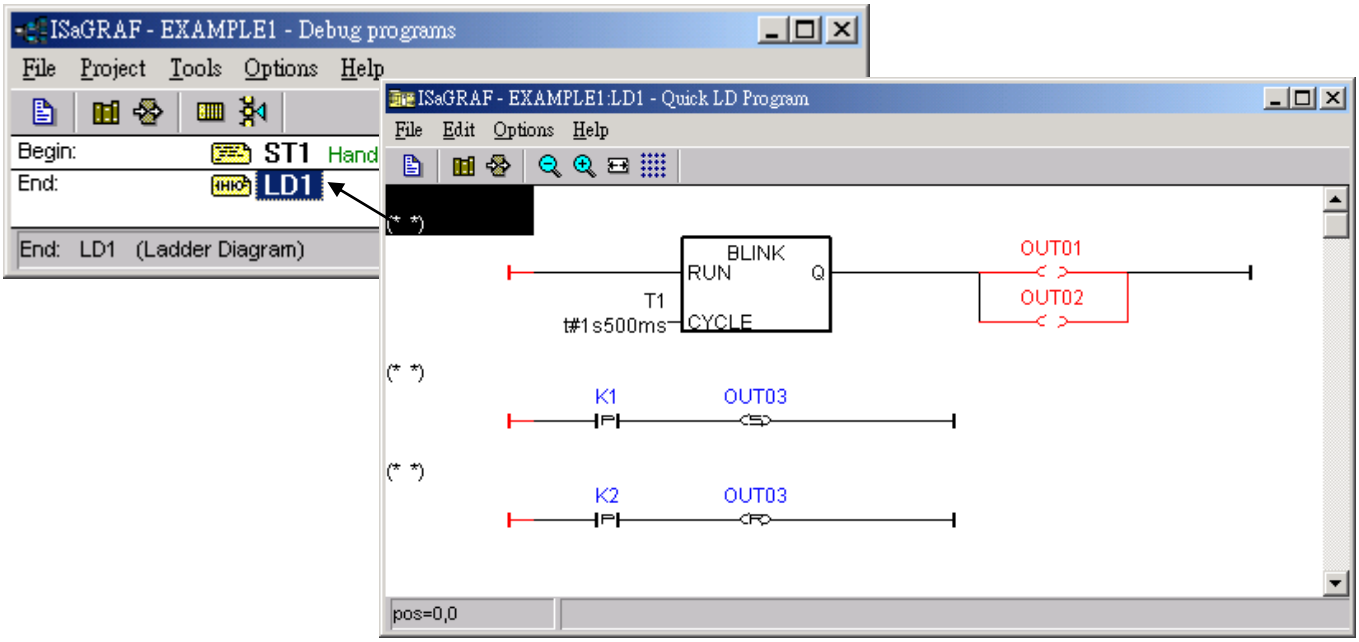
2.5.2 Running the Example Program

You can observe the real time I/O status from several ISaGRAF windows while you are running the example project. One of the windows is the "I/O Connections" window, which shows each of the inputs and outputs as assigned.

Click on the "I/O Connections" icon in the ISaGRAF Debugger window to open the "I/O Connections" screen.



Another VERY helpful window you can open is the "Quick LD Program" window. From this window you can observe the LD program being executed in real time. You may push the first button and second button on the front panel of the I-8xx7/8x37-80 controller to test it.



Though there are numerous steps involved in creating and downloading an ISaGRAF program, each step is quick and easy to accomplish, and the end result is a powerful and flexible control development environment for the I-8xx7/8x37-80 controller systems.

PRACTICE, PRACTICE, PRACTICE!

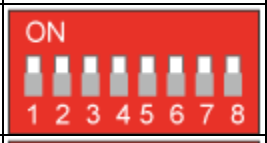
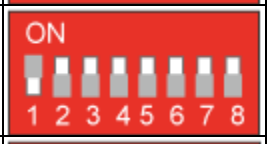
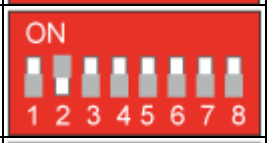
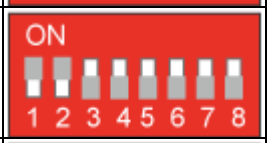
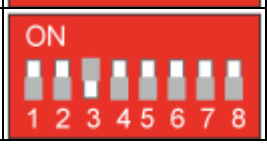
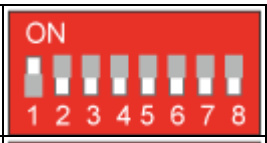
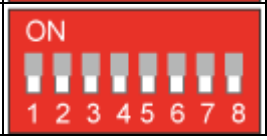
Now that you have successfully created and ran your first ISaGRAF program with the I-8xx7/8x37-80 controller system, you should practice creating more elaborate and powerful programs. Like any other computer development environment, practice and experimentation is the key to understanding and success, GOOD LUCK!

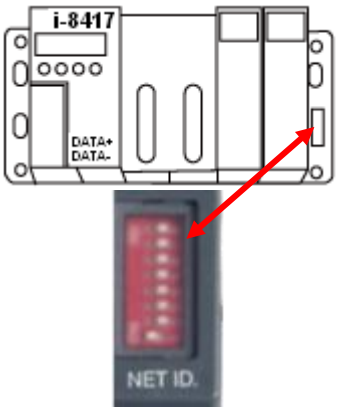
Chapter 3 Hardware System & Setting

Please refer to CD-ROM: \napdos\isagraf\8000\english_manu\ "user_manual_i_8xx7. pdf" for detailed ISaGRAF User's Manual.

3.1 Setting the NET-ID for the I-8xx7/8x37-80

For the I-8xx7/8x37-80 to properly operate, it must first be addressed correctly.

Hex.	DIP Switch	1	2	3	4	5	6	7	8
NET-ID=00									
NET-ID=01		ON							
NET-ID=02			ON						
NET-ID=03		ON	ON						
NET-ID=04				ON					
	≀								
NET-ID=FE			ON	ON	ON	ON	ON	ON	ON
NET-ID=FF		ON	ON	ON	ON	ON	ON	ON	ON



Default setting → NET-ID=01

★ For ISaGRAF workbench , it can only recognize NET-ID from 01 to FF (1~255).

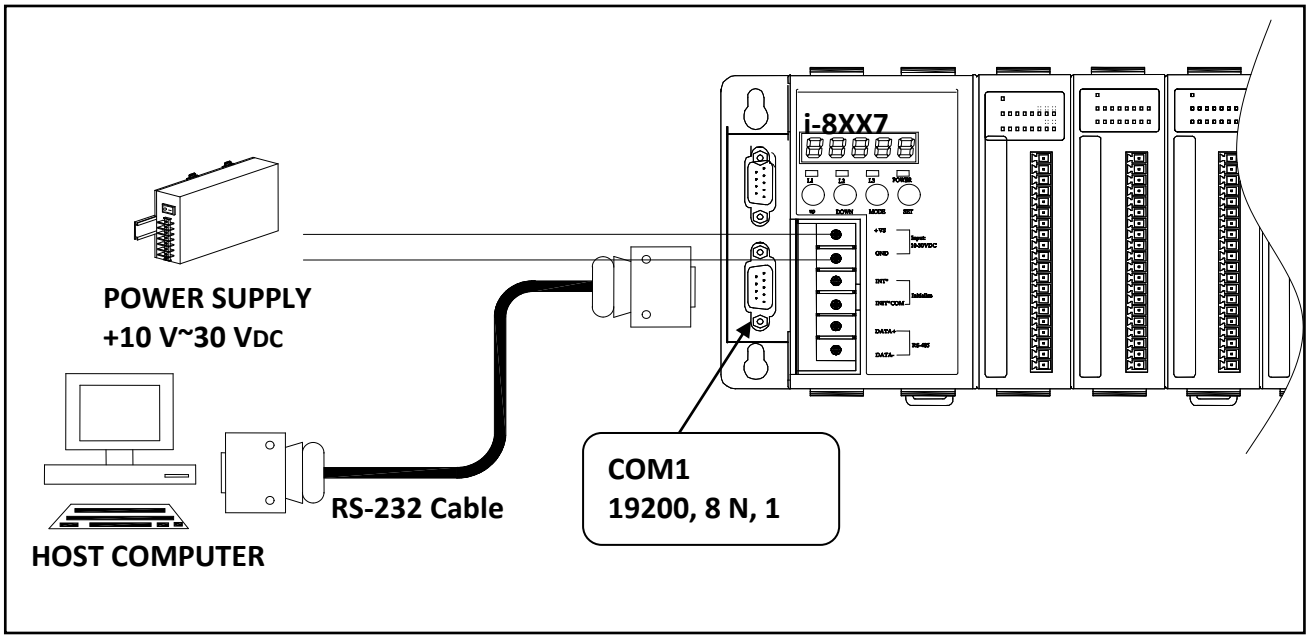
★ The NET-ID of every Main Control Unit in the same network must be unique (different from each other).

The Net-ID is expressed as Hexadecimal (Hex) and the DIP 1 to 8 were expressed as 2^0 ~ 2^7 ， If Net-ID=**01** (2^0=1)，please setup the DIP**1** to ON. If Net-ID=**02** (2^1=2)，please setup the DIP**2** to ON. If Net-ID=**03** (2^0+2^1=3)，please setup the DIP **1**、**2** to ON. If Net-ID=**04** (2^2=4)，please setup the DIP **3** to ON. If Net-ID=**05** (2^0+2^2=5) ， please setup the DIP **1** 、**3** to ON. If Net-ID=**FE**(16)= 254(10) ($2^1+2^2+2^3+2^4+2^5+2^6+2^7$=254) ， please setup the DIP **2 ~ 8** to ON. If Net-ID= **FF**(16)= 255(10) ($2^0+2^1+2^2+2^3+2^4+2^5+2^6+2^7$=255) ， please setup the DIP **1 ~ 8** to ON.

DIP 1	2	3	4	5	6	7	8
2^0=1	2^1=2	2^2=4	2^3=8	2^4=16	2^5=32	2^6=64	2^7=128

3.2 Connecting PC to the I-8xx7/8x37-80's COM1

When you receive your controller system, there is one (1) RS-232 communications cable provided with the system. The cable is used to connect your PC to the I-8xx7/8x37-80 or to an I-7520R (RS-232/RS-485 converter) that can be purchased from ICP DAS.



The communication parameters for the I-8xx7/8x37-80 COM1 Port is set to 19200 baud rate, 8 data bits, no stop bits, and one parity bit ("19200, 8, N, 1") by default. Normal RS-232 Pin Wiring Assignments

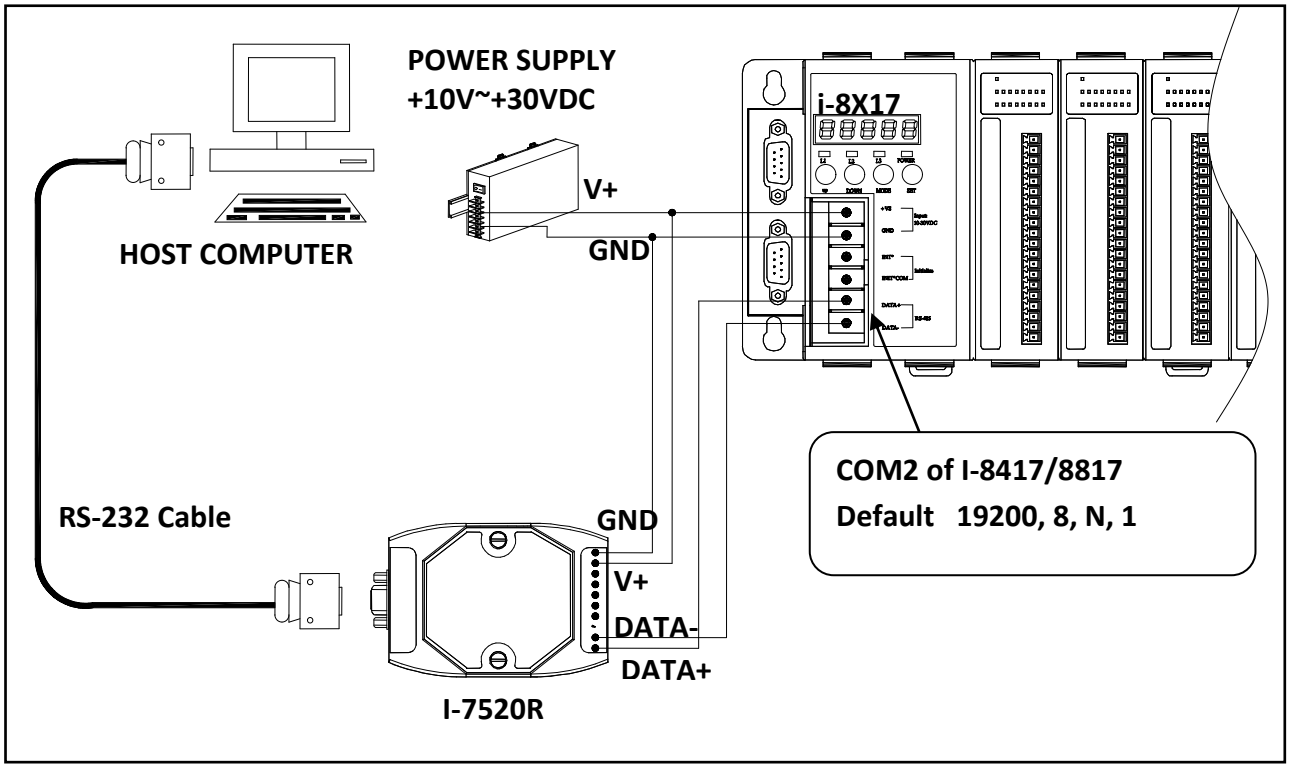
PC 9-Pin D-Sub		I-8xx7 COM1
RxD 2	———	TxD 2
TxD 3	———	RxD 3
GND 5	———	GND 5

For the ISaGRAF Workbench RS-232 communications to operate properly, only the RxD, TxD, and the GND signals are used. If your PC is running a hardware device or software program that uses the CTS and DSR signals, you will need to wire the RTS-CTS and DTR-DSR signals together as shown below.

PC 9-Pin D-Sub		I-8xx7 COM1
RxD 2	———	TxD 2
TxD 3	———	RxD 3
GND 5	———	GND 5
DTR 4	⌐	
DSR 6	⌙	
RTS 7	⌐	
CTS 8	⌙	

3.3 Connecting PC to I-8417/8817's COM2

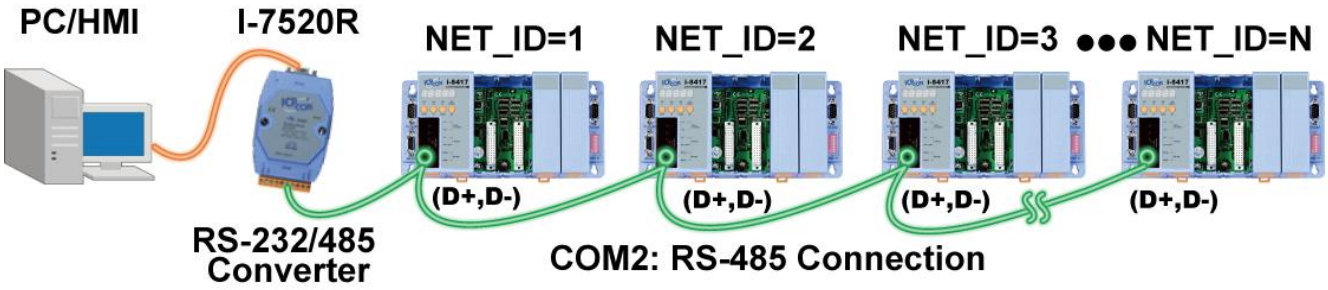
If your PC is connecting to an I-8417/8817's COM2 Port (RS-485), the maximum distance between the I-7520R (the RS-232/RS-485 converter) and the I-8417/8817 controller is up to 1,200 meters (4,000 feet). The distance between these two is dependent on the baud rate; the rule to follow is the lower you set the baud rate, the longer the distance can be.



3.4 Connecting PC to Several I-8417/8817's COM2

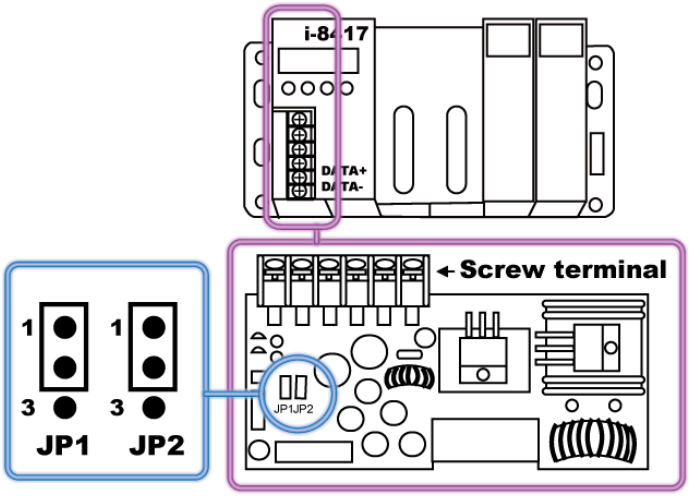
An additional feature of using the COM2 Port of the I-8417/8817 is that you can configure an RS-485 network from one PC to link to numerous I-8417/8817 controllers.

The PC can download ISaGRAF applications to each controller on the RS-485 network. The maximum number of controllers that can be networked via the RS-485 network is 255 (Not recommended to use so many).

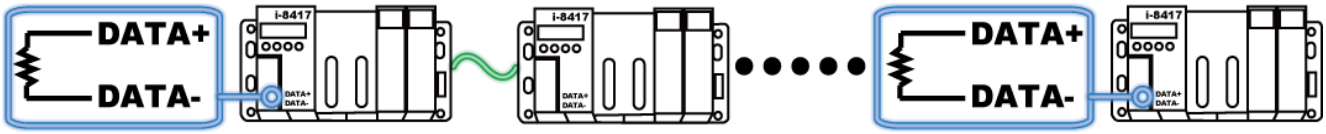


To create an RS-485 network you must first insure that each I-8417/8817 controller has a unique NET-ID address, and each of the controllers link the "DATA+" to the "DATA+" signal and the "DATA-" to the "DATA-" signal.

Lastly, you must plug ONE of the I-8417/8817's JP-1 and JP-2 on the power board to position 1 to 2, (resistance applied to the network). The other I-8417/8817's JP-1 and JP-2 plugs should be left at the default setting of connecting 2 to 3 (no resistance).



It is recommended to add two terminal resistors (try 220Ω, then 110Ω, and then 330Ω if the RS-485 communication is not stable) on the nearest I-8x17 and farthest I-8x17 for long distance RS-485 connection.

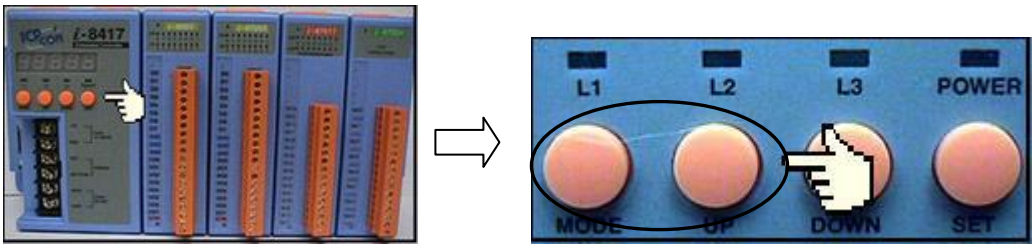


3.5 How to change Modbus RTU Baud Rate & Setup COM3 as Modbus Slave Port

The ports which support Modbus Slave & their default setting:
I-8417/8817: COM1 (RS-232 is 19200) and COM2 (RS-485 is 19200)
I-8x37/8x77: COM1 (RS-232 is 19200) and
COM3 (RS-485/RS-232 is "-" , Default: None- Modbus Slave)

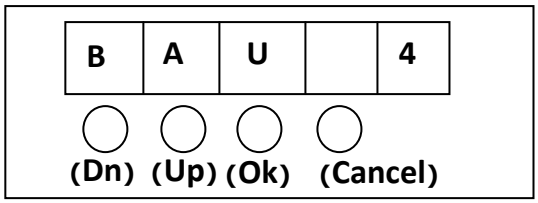
The baud rate can be set between 300、600、1200、2400、4800、9600、19200、38400、57600、115200 bps (bit per second).

To change the baud rate setting on the COM1 & I-8417/8817's COM2 Port, first power off the controller. Then press in and hold in the **first two buttons** on the front panel of the controller and then power back up the controller system as shown below.



The first read out to appear is the “SEL 0” or “SEL 1”. (“SEL 0” is to set the first Slave Port: COM1’s baud rate, while “SEL 1” is to set the second Slave Port:
COM2 or COM3’s baud rate).

Press the “Up” or “Dn” to change selection, then press the “OK” button (third button on the panel), and the “BAU x” setting will appear.



You can now change the baud rate setting by pressing the “UP” or “Down” button to the desired baud rate setting.

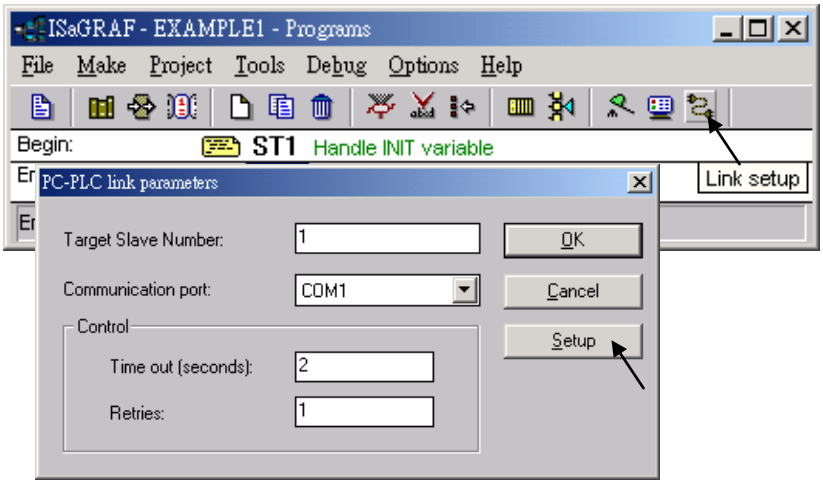
The settings for the **COM1/COM2 /COM3** baud rate are as follows:
(0) 1200, (1) 2400, (2) 4800, (3) 9600, (4) 19200, (5) 38400, (6) 57600, (7) 115200, (8) 300 (9) 600 (-) None-Modbus Slave Port. The setting “(-)” is only for the **COM3**! (You can select one of the baud rates to setup COM3 as Slave Port).

Press “OK” to save the selected setting. And then press some “Cancel” to exit the hardware setting.

IMPORTANT NOTICE:

The ISaGRAF workbench’s default setting for PC’s COM1 & COM2 is 19200, 8, N, 1. If you have changed the I-8xx7/8x37-80 COM1/COM2/COM3’s baud rate to other value.

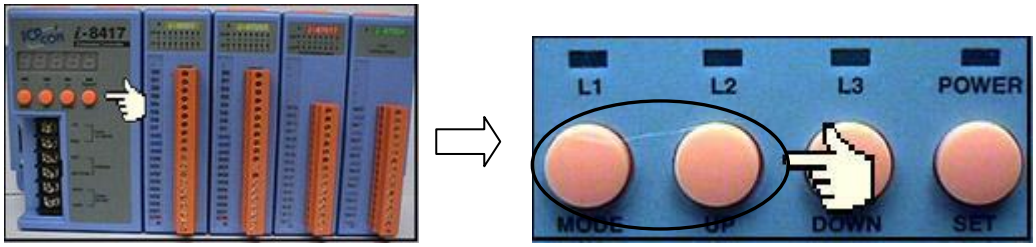
You should change your ISaGRAF Workbench’s COMM to the same setting before they can link to each other. (Please refer to Section 2. 5)



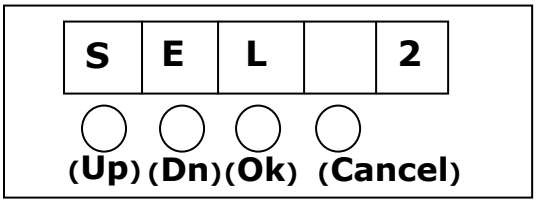
3.6 Deleting an ISaGRAF Project from the Controller

There may be occasions when you will need to delete the ISaGRAF project from the controller system. To begin this, you follow the same control start up routine as changing the baud rate. You first

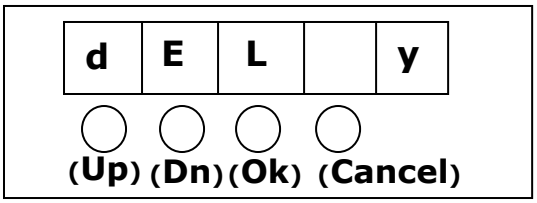
① press and hold the **first two buttons** on the front panel of the controller and then ② power back up the I-8xx7/8x37-80 controller to gain the ability to change the parameters.



When the first display appears, press the “Up” or “Down” button until “SEL 2” (Select 2) appears in the LED readout.



Press the “Up” or “Down” buttons until “dEL” appears in the LED readout.



Press the “Up” or “Down” buttons until “y” appears in the LED readout then press the “OK” button. This will delete the currently installed ISaGRAF project from the controller system. After that press some “Cancel” to exit the hardware setting.

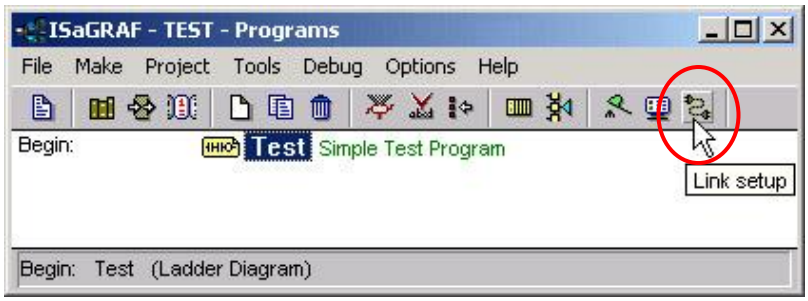
3.7 Connecting PC to the I-8437-80/8837-80 Ethernet Port

The I-8437-80/8837-80 controller systems feature a built in Ethernet Port. The COM2 Port is replaced from an RS-485 to Ethernet.

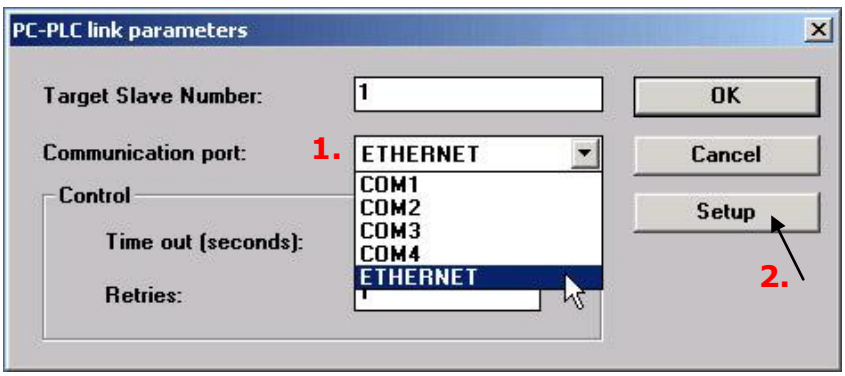
Before you can download an ISaGRAF application to the I-8437-80/8837-80 controller using the Ethernet Port, you must first setup the Ethernet Port to properly communicate with the host PC.

On the I-8437-80/8837-80, Set IP, Mask and Gateway address:
Please refer to section 3. 9 to do this setting.

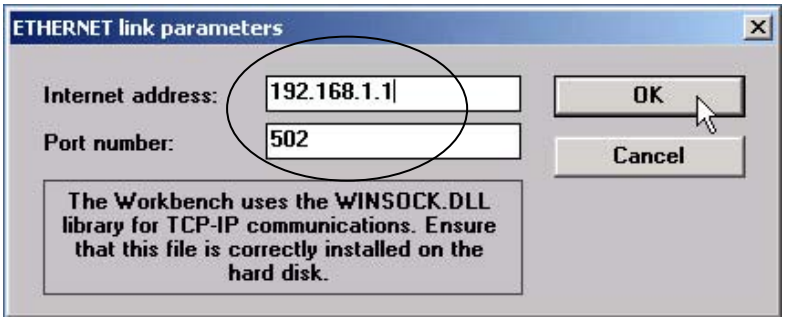
On your PC:
First open an ISaGRAF project and select a program you wish to communicate between your PC and the I-8437-80/8837-80 controller system. Next, select the "Link Setup" button on the project screen as shown below.



A "PC-PLC Link Parameters" dialog box will appear as shown below. From here select the "Ethernet" communications option and click on the "Setup" button.

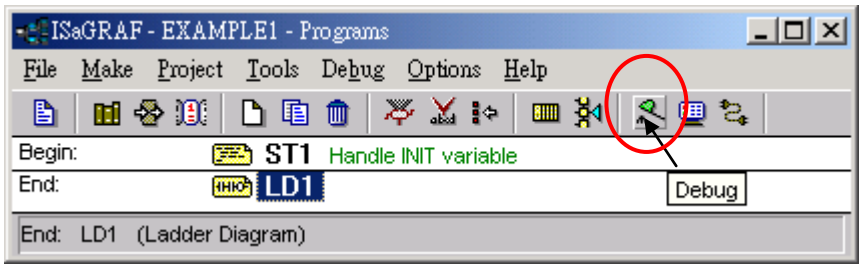


Once you have clicked on the "Setup" button, an "Ethernet Link Parameters" dialog box will appear.
Set the "Port Number" to "502" and enter in the Internet address (IP) of the I-8437-80/8837-80 controller, Please refer to section 3. 9



Once you have entered the appropriate information, click on the "OK" button, and now you have configured your PC to communicate with the I-8437-80/8837-80 through the Ethernet Port.

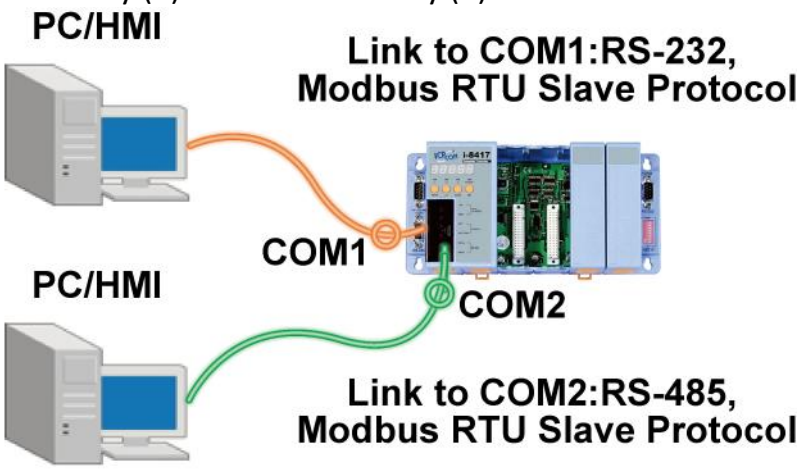
Click on "Debug" to link to the controller.



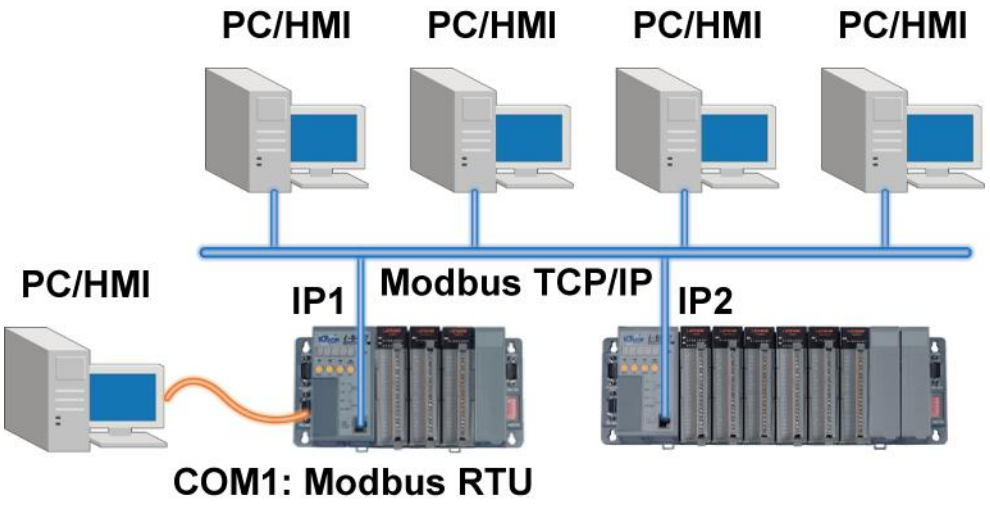
3.8 Modbus Connection to the I-8xx7/8x37-80

The COM1: RS-232 & COM2: RS-485 of the I-8417/8817 controller supports Modbus RTU Slave protocol by default. They can be linked by

(1) ISaGRAF Workbench or by (2) HMI devices or by (3) SCADA software as below.



The COM1: RS-232 & COM3: RS-232/RS-485 of the I-8437-80/8837-80 controller supports Modbus RTU Slave protocol by default.
The Ethernet Port of the I-8437-80/8837-80 controller supports Modbus TCP/IP Slave protocol. They can be linked by (1) ISaGRAF Workbench or by (2) HMI devices or by (3) SCADA software as below.



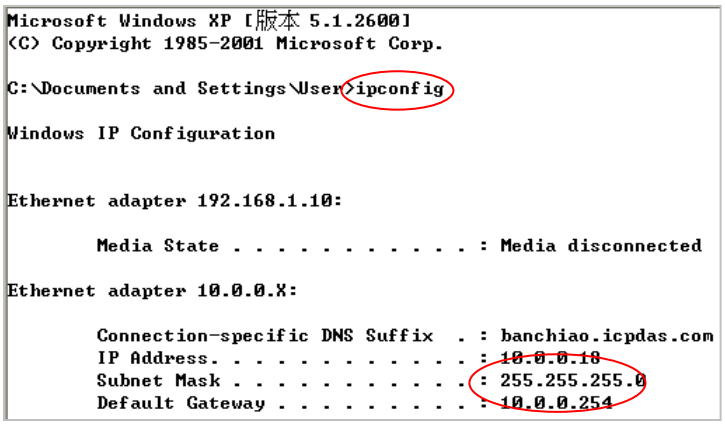
The Modbus TCP/IP protocol's Ethernet Port No. is fixed as **502.**
Up to 4 PCs can link to one I-8437-80/8837-80 throughout Ethernet Port. Another PC or HMI can link to COM1: RS-232 Port (Modbus RTU Slave protocol) of the controller. Therefore the maximum number of clients can be linked is 5.

3.9 Setting I-8437-80/8837-80's IP & MASK & Gateway

1. Create a file folder named "8000" in your hard drive. For example, "c:\8000".
2. Copy CD-ROM: \Napdos\ISaGRAF\8000\Driver\. . . . \7188xw. exe, 7188xw. ini from the CD_ROM into your "8000" folder.
3. Run "\8000\7188xw. exe" in your hard drive. A "7188xw" screen will appear.
4. Link from COM1 or COM2 of PC to COM1 of the I-8437-80/8837-80 controller by a RS-232 cable. (If you use other COM Port (ex. COM5), please refer to ch3. 11 step4)
5. Power off the I-8437-80/8837-80 controller, connect pin "INIT" to "INIT COM", then power it up.
6. If the connection is Ok, messages will appear on the 7188xw screen.

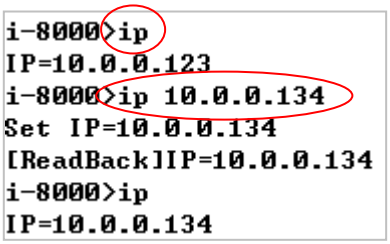
```
ICP_DAS MiniOS7 for I-8000 Ver. 2.00 build 002,Apr 08 2005 17:06:02
SRAM:512K, FLASH MEMORY:512K
[CPU=Am188ES]
Serial number= 09 63 4A 60 03 00 00 76

i-8000>
```

7. Use DOS command (ipconfig) to search out the setup of network.



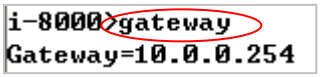
Please according as your computer to following setup (IP/MASK/GATEWAY)

8. Type “ip” to see the current IP address of the I-8437-80/8837-80.
   Type “ip 10. 0. 0. xxx” to setup a new IP address



9. Type “mask” to see the current address mask of the I-8437-80/8837-80.
   Type “mask 255. 255. 255. 0” to setup a new address mask.

10. Type “gateway” to see the current gateway address.
    Type “gateway 10. 0. 0. 254” to setup a new gateway address.



11. Press **ALT_X** to exit “7188xw”, or COM1/COM2 of the PC will be occupied.

12. Remove the connection between “INIT” - “INIT COM”; recycle the power of I-8437-80/8837-80 controller.

3.10 Setting COM1 as None-Modbus-Slave Port

COM1 of the I-8xx7/8x37-80 supports Modbus RTU Slave protocol by default. User may change it to a None-Modbus-Slave Port for other usage. For example, user may write his own defined protocol on COM1 or use COM1 as a Modbus Master Port.

1. Create a file folder named "8000" in your hard drive. For example,"**c:\8000**".
2. Copy CD-ROM: \Napdos\ISaGRAF\8000\Driver\. . . \7188xw. exe, 7188xw. ini from the CD_ROM into your "8000" folder.
3. Run "\8000\7188xw. exe" in your hard drive. A "7188xw" screen will appear.
4. Link from COM1 or COM2 of PC to COM1 of the I-8xx7 by a RS-232 cable.
5. If you use other COM Port (ex. COM5), please refer to **ch3. 11 step4**.
6. Power off the I-8xx7/8x37-80, connect pin "INIT" to "INIT COM", then power it up.
7. If the connection is Ok, "I-8000>" messages will appear on the 7188xw screen.
8. Type "isa *f=1" to free COM1 (set COM1 as none-Modbus-Slave Port)

```
i-8000>isa *f=1

 Com1 is free now
```

9. Press ALT+X to exit "7188xw", or COM1/COM2 of the PC will be occupied.
10. Remove the connection between "INIT" - "INIT COM"; recycle the power of the controller.

IMPORTANT NOTICE:

If user wants COM1 to be back to a Modbus RTU Slave Port again, follow the same step 1 to 6 & then type "**isa *f=0**".

If the command doesn't support, please refer to the next section to update the hardware driver.

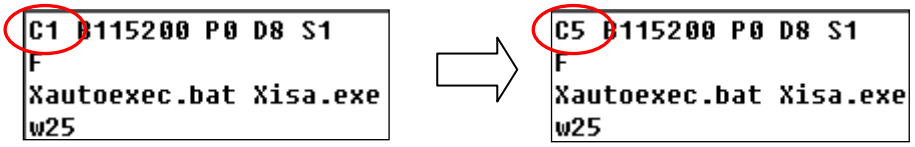
3.11 Update I-8xx7/8x37-80's Hardware Driver

Our newly released driver can also be obtained from the below website:
http://www. icpdas. com/products/PAC/i-8000/isagraf. htm or
http://www. icpdas. com/products/PAC/i-8000/isagraf-link. htm
(Please extract the zip file)

To Know The Current Driver Version (We use driver 3. 16 as an example)

1. Create a file folder named "8000" in your hard drive. For example, "**c:\8000**".
2. Copy Napdos\ISaGRAF\8000\Driver\40m\3. 16\Napdos\ISaGRAF\8000\Driver\40m\3. 16\ ① **7188xw. exe,** ② **7188xw. f4,** ③ **7188xw. ini,** ④ **8k050408. img,** ⑤ **autoexec. bat,** ⑥**isa. exe**, ⑦ **isa_data. exe** from the CD_ROM into your "**8000**" folder.

3. Run "\8000\7188xw. exe" in your hard drive. A "7188xw" screen will appear (Press F1 for help).
4. Link COM1 or COM2 of your PC to COM1 of the controller through a RS-232 cable. If you use other COM Port (ex. COM5), please modify the first line of "7188xw. ini".



5. Power off I-8X417/8X37, connect pin "INIT" to "INIT COM" and then power it up.
6. If the connection is Ok, "I-8000>" messages will appear on the 7188xw screen.

```
ICP_DAS MiniOS7 for I-8000 Ver. 2.00 build 002,Apr 08 2005 17:06:02
SRAM:512K, FLASH MEMORY:512K
[CPU=Am188ES]
Serial number= 09 63 4A 60 03 00 00 76

i-8000>
```

7. Type "ver" to see the current OS version & date.
8. Type "isa *p=" to see the current driver version No. & setting of the controller.

```
i-8000>ver

ICP_DAS MiniOS7 for I-8000 Ver. 2.00 build 002,Apr 08 2005 17:06:02
SRAM:512K, FLASH MEMORY:512K
[CPU=Am188ES]
Serial number= 09 63 4A 60 03 00 00 76

i-8000>isa *p=

 Driver  : I-8xx7 : isa.exe - 3.16,Oct.25,2006
 MiniOS7 : Must use 8k050408.img
 isa_data.exe - 1.8,Oct.25,2006
 NED-ID  : 1
 COM1 is Modbus RTU slave port,19200,8,N,1
 COM3 is Modbus RTU slave port,19200,8,N,1
 Use 'isa *f=1' to free COM1, 'isa *f=0' to set COM1 as Modbus RTU

(C)Copyright:ICP DAS  CO. , LTD.      Taiwan Id:84517297_
```

To Upgrade an ISaGRAF Embedded Driver

1. Power off the controller, connect pin "INIT" to "INIT COM" and then power it up.
2. Press "**F4**" to auto download the following files and reboot system.
   (isa_data. exe, autoexec. bat, isa. exe, 8k050408. img)

```
i-8000>del /y
Total File number is 2, do you really want to delete(y/n)?

i-8000>LOAD
File will save to 8000:0000
StartAddr-->7000:FFFF
Press ALT E to download file!
Load file:isa_data.exe[crc=E70F,0000]
Send file info. total 287 blocks
Block 287
Transfer time is: 12.844000 seconds
```

Wait about 60 sec. to update ISaGRAF system & DO NOT REMOVE THE POWER

```
i-8000>bios1
MiniOs7 for 8000 Ver 2.00.002, date=04/08/2005
Checking CRC-16...OK.
Update the OS code. Please wait the message <<Write Finished>>
Erase Flash [F000]
Write Flash
[FF]
<<Write Finished>>OK
Wait WDT reset system...
ICP_DAS MiniOS7 for I-8000 Ver. 2.00 build 002,Apr 08 2005 17:06:02
SRAM:512K, FLASH MEMORY:512K
[CPU=RDC 8820-D]
Serial number= 5A 5A 5A 5A 5A 5A 5A 5A
```

3. Type “dir” to make sure “autoexec. bat” and “isa. exe” are well burned

```
i-8000>DIR

 0)autoexec.bat 05/21/2003 06:40:00     22[00016]8002:0000-8003:0006
 1)isa.exe      10/25/2006 10:28:00 180678[2C1C6]8005:0006-AC21:000C
Total File number is 2  Free space=277956 bytes
```

4. Press ALT+X to exit “7188xw”.
5. Remove the connection between “INIT” - “INIT COM”; recycle the power of the controller.

3.12 Backup & Restore an ISaGRAF Project

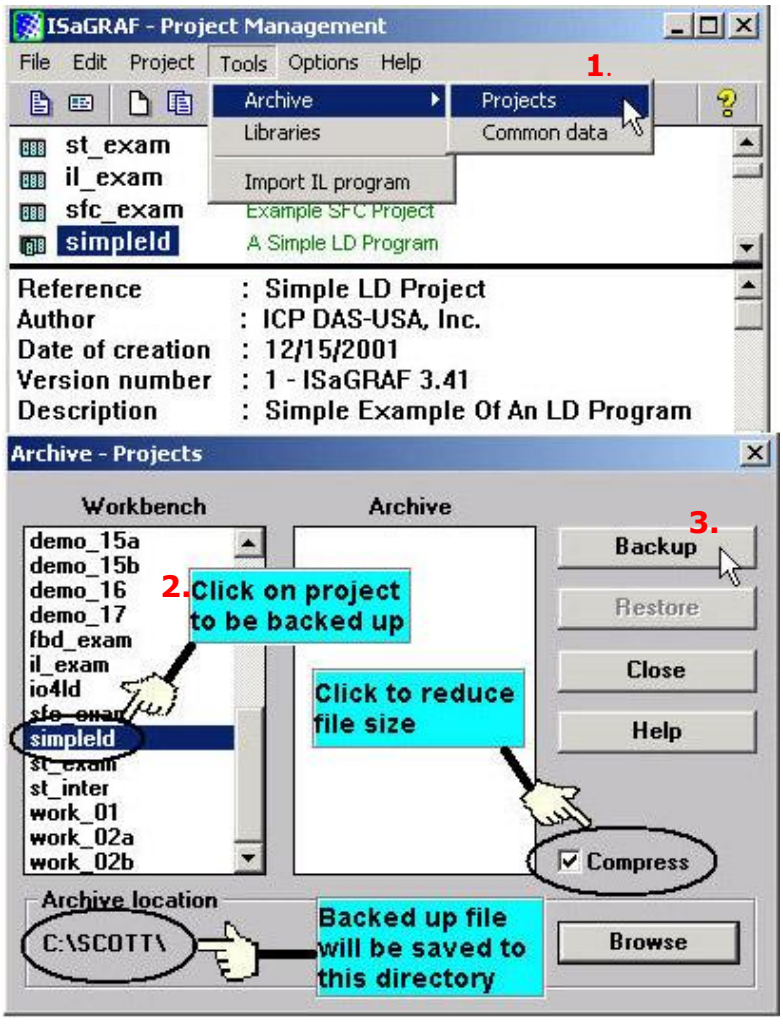
For archiving purposes you can "Back Up" and "Restore" an ISaGRAF project.

For example, you may want someone to test your program or email to service@icpdas. com for ICP DAS's ISaGRAF service.

Backing Up an ISaGRAF Project

Open the "ISaGRAF Project Management" window, ① select "Tools" from the menu bar, click on "Archive", and then click on "Projects". An "Archive Projects" window will open which allows you to designate where you want to save the ISaGRAF project to.

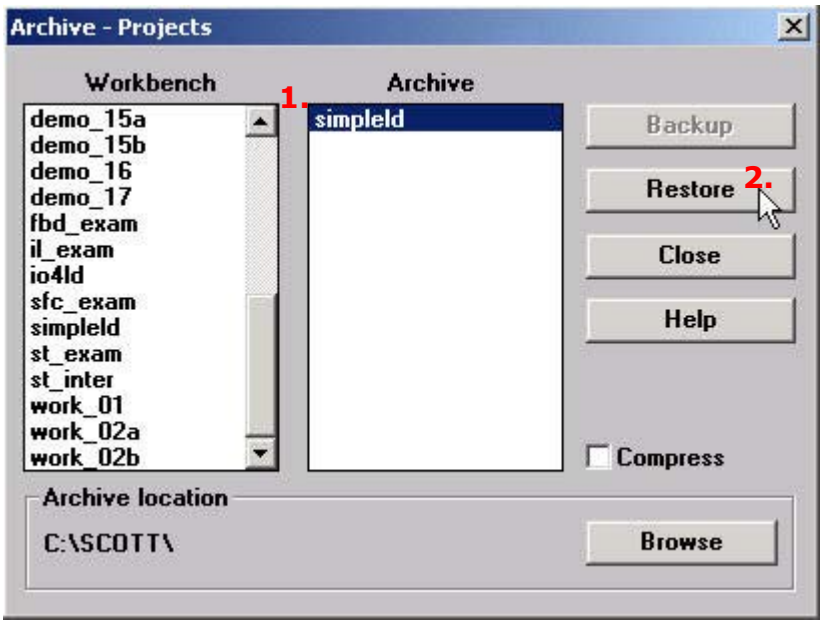
② Click on the name of the ISaGRAF project you want to backup, and then ③ click on the "Backup" button. You can compress the size of the file you have backed up by clicking on the "Compress" checkbox BEFORE you click on the "Backup" button.



You will now find the backed up ISaGRAF project file in the "Archive" location you have designated. In the example above, the name of the backed up file is "simpleld. pia".

Restoring an ISaGRAF Project

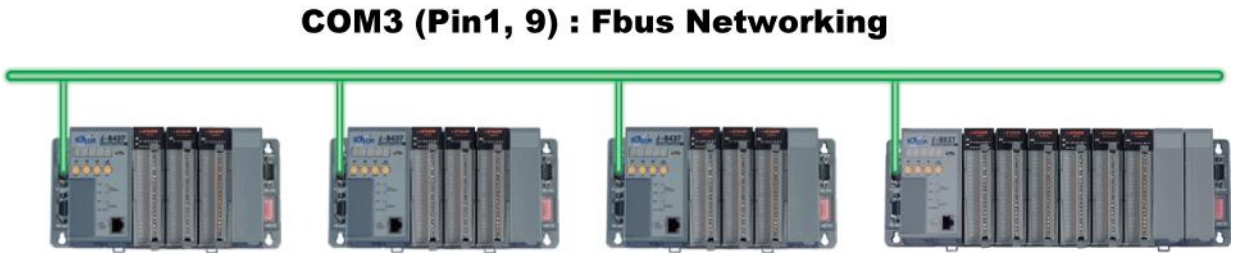
To restore an ISaGRAF project from a backed up file, use the same method as above to access the "Archive Projects" window, ① click on the name of the backed up file from the "Archive" window, then ② click on the "Restore" button. The ISaGRAF project will now be restored to the sub-directory you designated.



You can now open, edit and download the restored ISaGRAF project file.

3.13 Pin assignment Of the Fbus

Please refer to CD-ROM: \napdos\isagraf\8000\english_manu\ "user_manual_i_8xx7. pdf " For detailed ISaGRAF User's Manual. The Fbus is listed in Chapter 7.



3.14 Setting I-7000 and I-87K Remote I/O by DCON Utility

I-8xx7/8x37-80 controller system can link up to 64 pcs ICP DAS's Remote I/O modules - "I-7000" and "I-87K" series Remote I/O modules.

TO DO:

Before linking I-7000 and I-87K modules for Remote I/O, you must use DCON Utility to pre-set each I-7000 and I-87K remote module to have a unique address (NET-ID), and set them to the same baud rate as the I-8xx7 controller system.

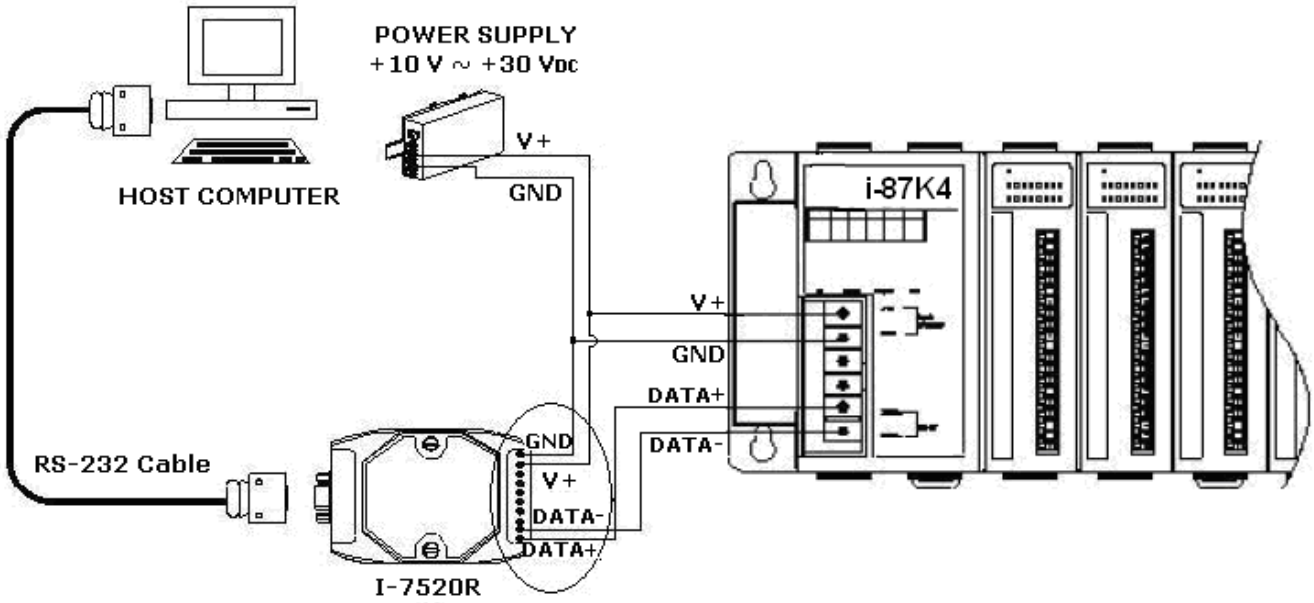
The DCON Utility is a toolkit that helps user to search the network, easily to configure and test the I/O modules. For DCON Utility program and manual please reach to http://www. icpdas. com/products/dcon/introduction. htm.

NOTE:

1. Make sure the hardware connection is correct.
2. Configure I/O modules with I-87Kn or RU-87Pn.
3. Search and configure the modules one by one.
4. Connect the INIT* to GND and Power on the module.

Step 1: Hardware connection

1. The power supply must be DC power between +10 ~ +30 V.
2. Wiring diagram for connecting to I-87K4: (one module for each time)



NOTE:

For I-87K4 I/O module, you have to prepare an I-7520R (RS-232 to RS-485) converter. For other wiring diagram please refer to "DCON Utility User's Manual".

Step 2: Initialize I/O module

If the module is a new one, factory have set a default settings for user's convenient. If you don't know the configuration of the module, please initialize the I/O module.

The default state from factory:

I/O Module	I-7000	M-7000	87K series
Address	1	1	1
Baud rate	9600	9600	115200
Checksum	Disabled	Not defined	Disabled
Protocol	DCON Protocol	Modbus Protocol	DCON Protocol

★ To initialize I-7000 module is to wire connect the INIT* to GND and Power on the module. After initialization, the module will become initial state.

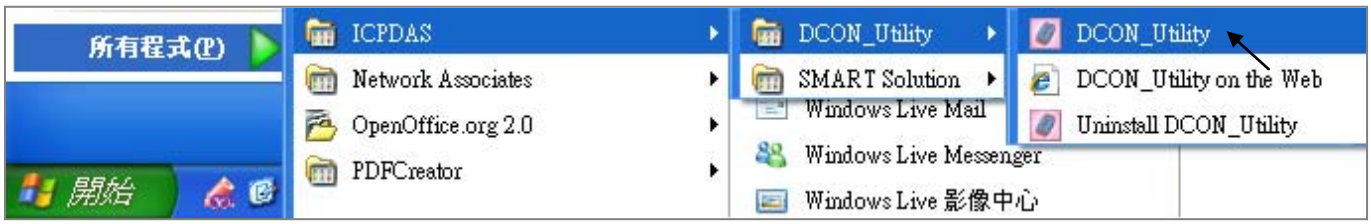
★ To initialize I-87K module, please switch the DIP switch of I-87Kn. (Ex. Switch Dip-2 to "ON" and restart I-87Kn, the Slot2 will setup to initial.

The initial state after initialization:

I/O Module	7000 series (I-7000 and M-7000)	87K series
Address	0	0
Baud rate	9600	115200
Checksum	Disabled	Disabled
Protocol	DCON Protocol	DCON Protocol

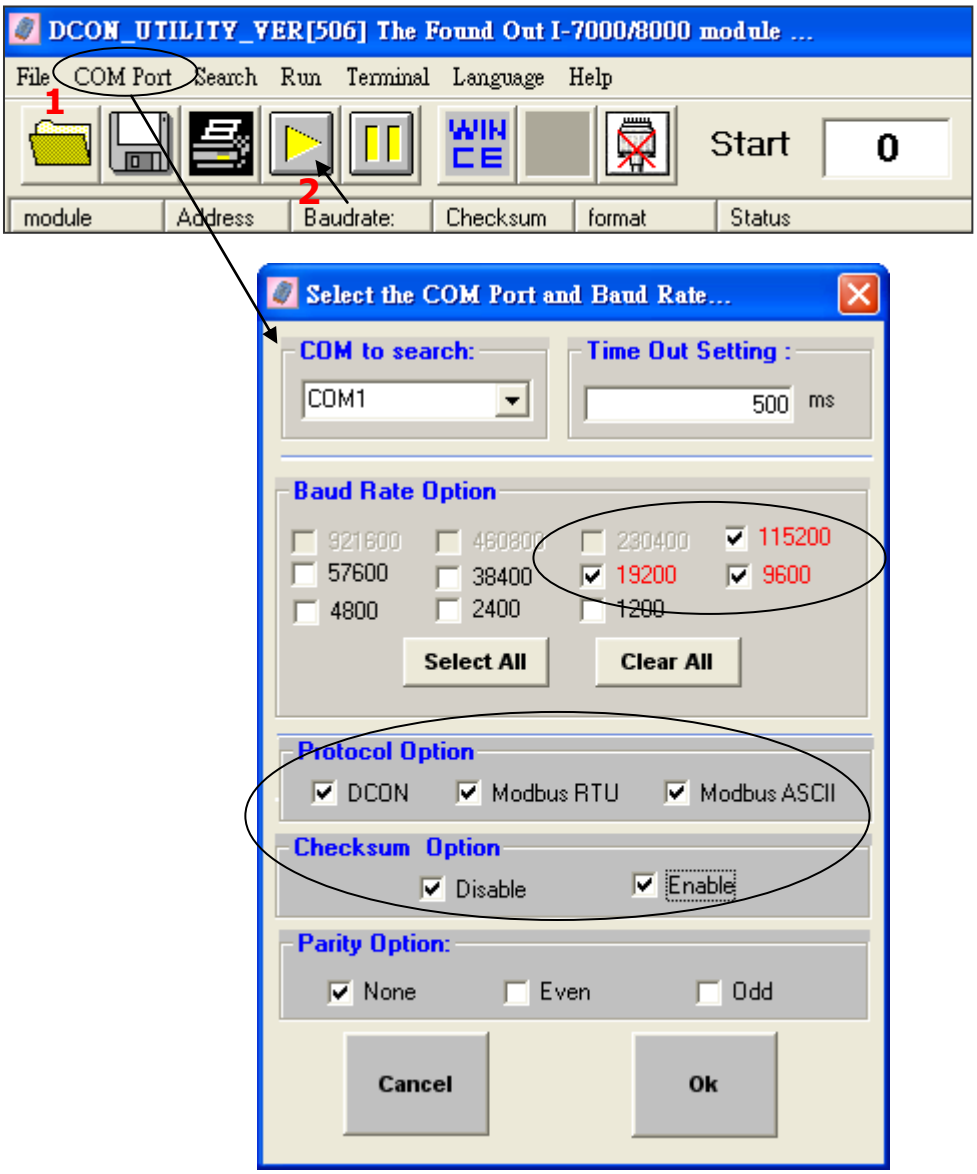
Step 3: Select COM Port and Baud Rate to search

Execute the DCON Utility from "Start>programs>ICPDAS>DCON Utility>".



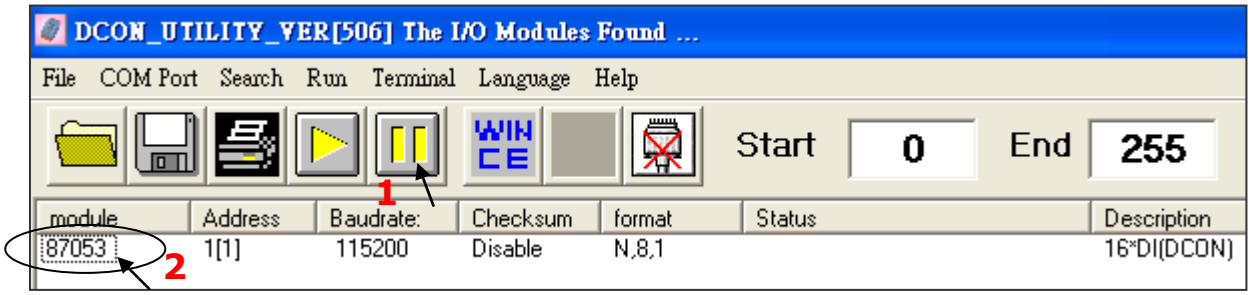
1. Click "COM Port" menu to select the COM Port and Baud Rate to search. You can select multi-Baud Rate, Protocol or Checksum conditions if you do not know the module's setting, but it will spend more time to scan the network. After selection, click "OK".

2. Click "Start Search" icon to begin search module.

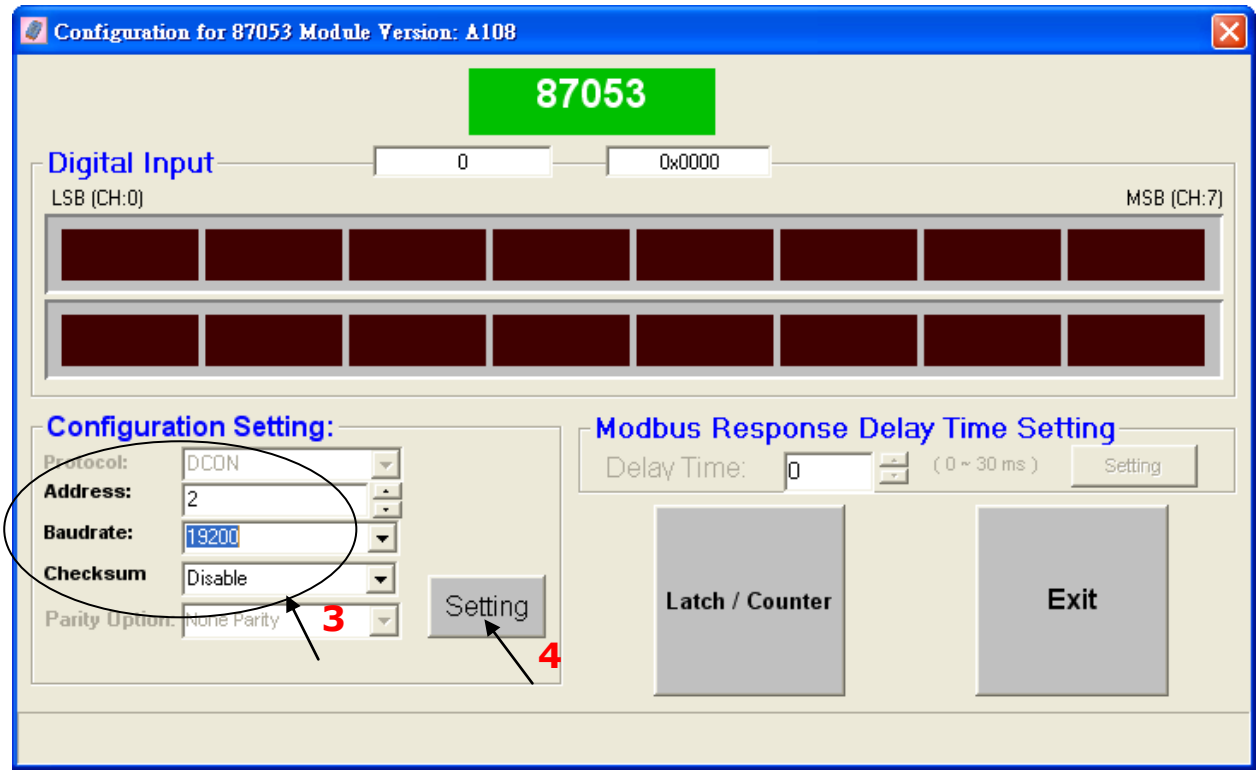


Step 4: Click Searched module ID and give the new configuration

Click when it is searched and double click module number to enter the setup screen.

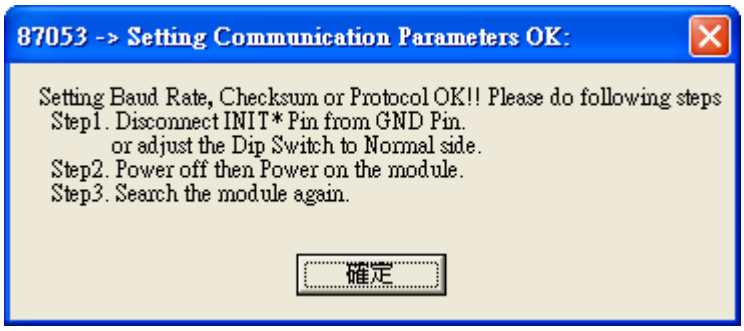


In the screen, you can setup the Address, Baud rate, Checksum, and then click “Setting” to save.

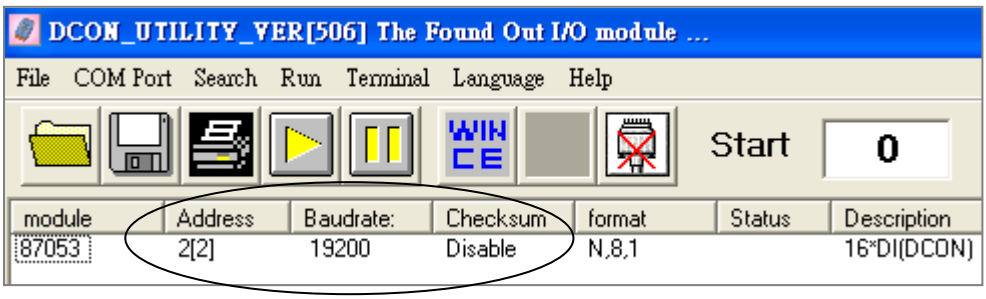


if you didn't connect the INIT, It will show the message window, please follow the step and click "Setting" button again.

In this screen, you have completed the settings, please disconnect the INIT and reboot the power.



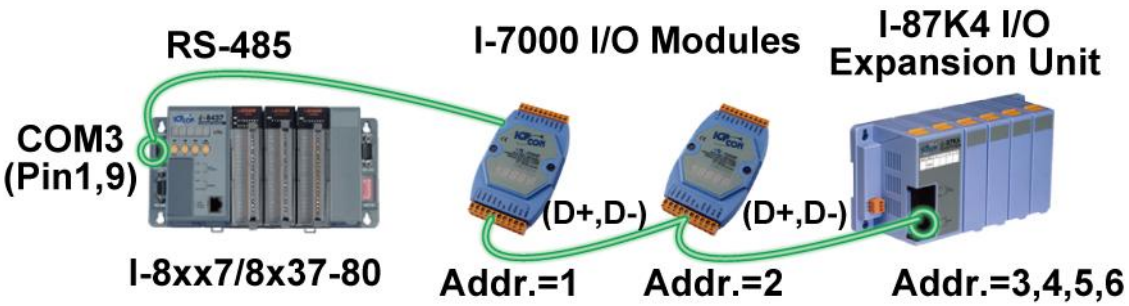
Finally, you can search the module again and check the settings.



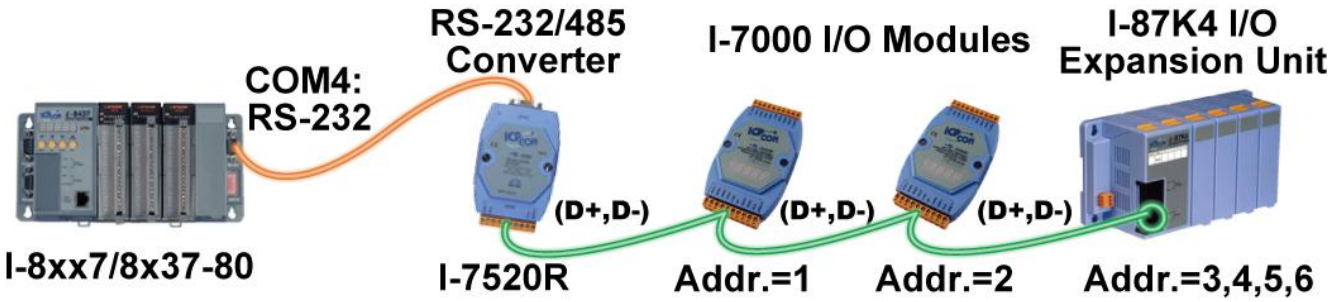
3.15 Linking I-7000 and I-87K Modules for Remote I/O

Please refer to CD-ROM: \napdos\isagraf\8000\english_manu\ “user_manual_i_8xx7. pdf”

For detailed ISaGRAF User’s Manual. It is listed in Chapter 6.



If you choose to utilize the COM4 Port, connect the COM4 Port to the I-7520R's RS-232 Port, and also connect the “DATA+” to the “DATA+” signal, and the “DATA-” to the “DATA-” signal as shown below.



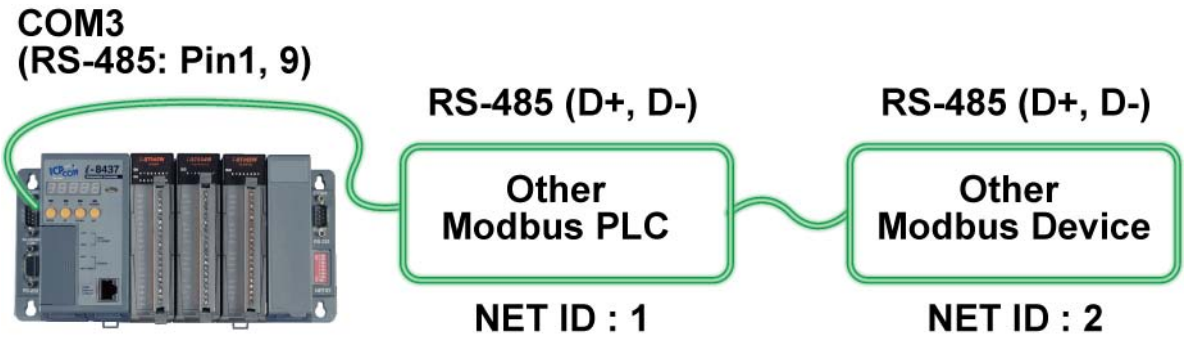
You can link up to 64 I-7000 or I-87K series remote modules to one I-8x17/ 8x37-80 controller. You must remember to set each I-7000 and I-87K remote module must have a unique address, and be set to the same baud rate as the I-8xx7/8x37-80 controller.

For more information regarding setting up and programming an I-7000/I-87K remote module, please refer to ISaGRAF User’s Manual Chapter 6 - “Linking To I-7000 and I-87K Modules”.

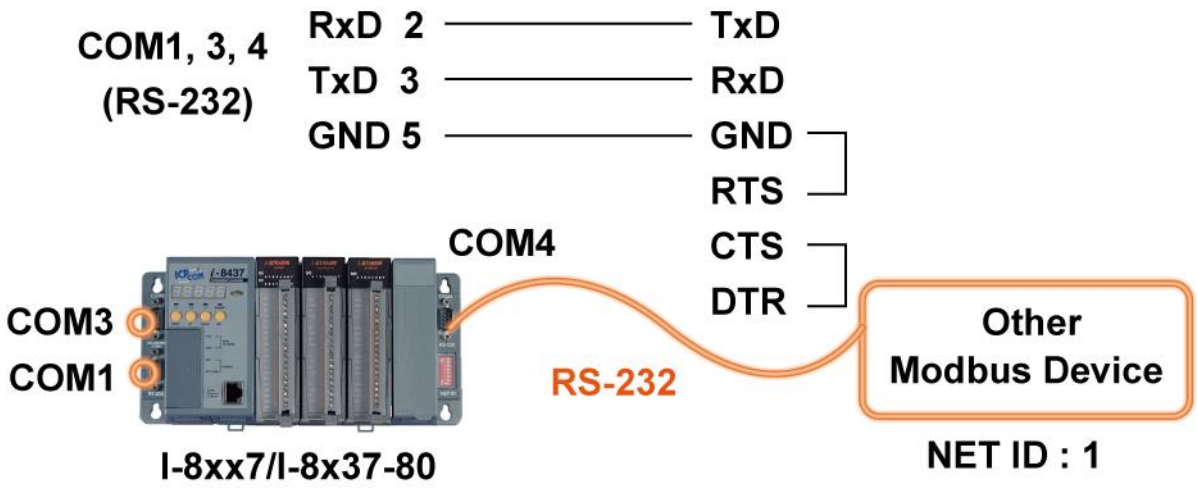
3.16 Creating a Modbus Link with the Controller

Please refer to CD-ROM: \napdos\isagraf\8000\english_manu\ “user_manual_i_8xx7. pdf” For detailed ISaGRAF User’s Manual. It is listed in Chapter 8.

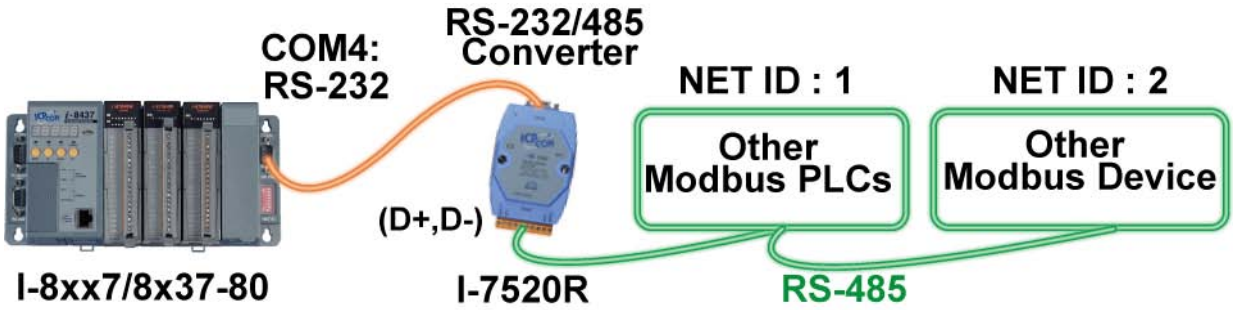
If the COM3:RS-485 Port is used for Modbus Master, one I-8x17/8x37-80 can connect to many other devices. Each device on the link must have a unique NET ID (1 ~ 255) address, and communicate at same baud rate settings.



If COM1/COM3/COM4 : RS-232 is used, you can only link one I-8x17/8437-80 to one other Modbus device. To use the COM1 as Modbus Master Port, please disable the default Modbus RTU Slave setting in it. Please refer to section 3. 10.



If the COM4 Port of the controller is used to connect to one I-7520R (RS-232/RS-485 converter), then the controller can network to numerous Modbus devices.



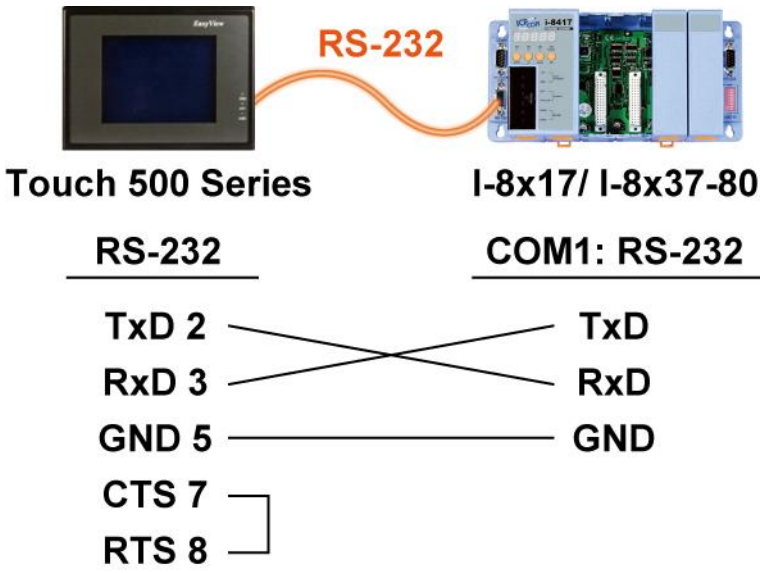
3.17 Linking To an MMI Interface Device

Please refer to CD-ROM: \napdos\isagraf\8000\english_manu\ "user_manual_i_8xx7. pdf"

For detailed ISaGRAF User's Manual. It is listed in Section 4. 4 &

CD-ROM:
\napdos\others\touch\manual\" touch200_link_to_i8xx7_7188eg_7188xg. pdf" &
touch500_link_to_i8xx7_7188eg_7188xg. pdf

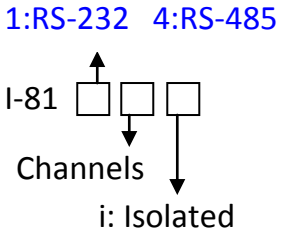
If you are using any of the "Touch" series of MMI devices to connect to a controller, you can only interface the devices to the COM1 Port on the I-8xx7/8x37-80 controller.



Touch LCD Monitor: http://www. icpdas. com/products/HMI/touch_lcd/touch_list. htm

3.18 Using N-Port COM

There are some N-Port COM boards that can be used to extend communication ability of the I-8xx7/8x37-80 controller. The model No. available is as below.



I-8112:	2-ch RS-232 Expansion Module
I-8114:	4-ch RS-232 Expansion Module
I-8142:	2-ch RS-422/485 Expansion Module
I-8144:	4-ch RS-422/485 Expansion Module
I-8142i:	2-ch Isolated RS-422/485 Expansion Module

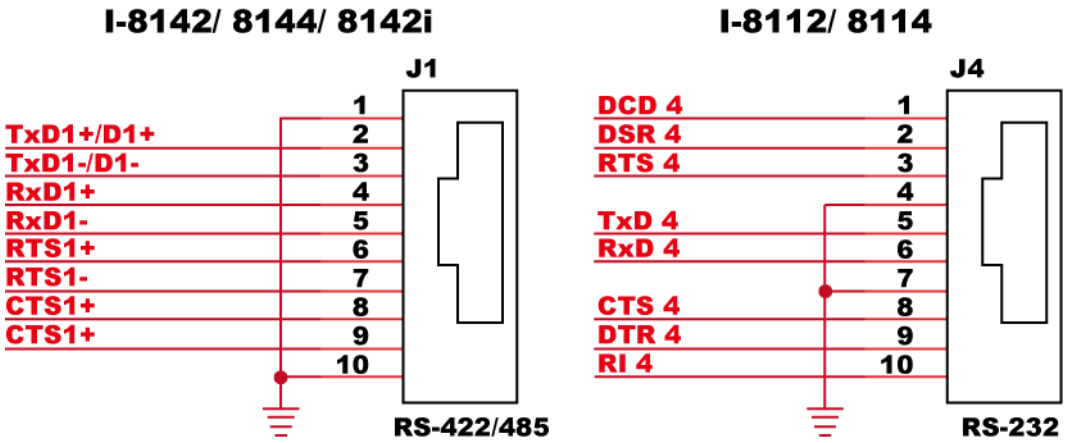
Please refer to: http://www. icpdas. com/products/Remote_IO/i-8ke/selection_rs232_i8k. htm

Note:
These N-Port COM boards can only be plugged into slot 0 to slot 3. It doesn't support slot 4 to slot 7. That means user can use only COM5 ~ COM20 of N-Port COM boards.

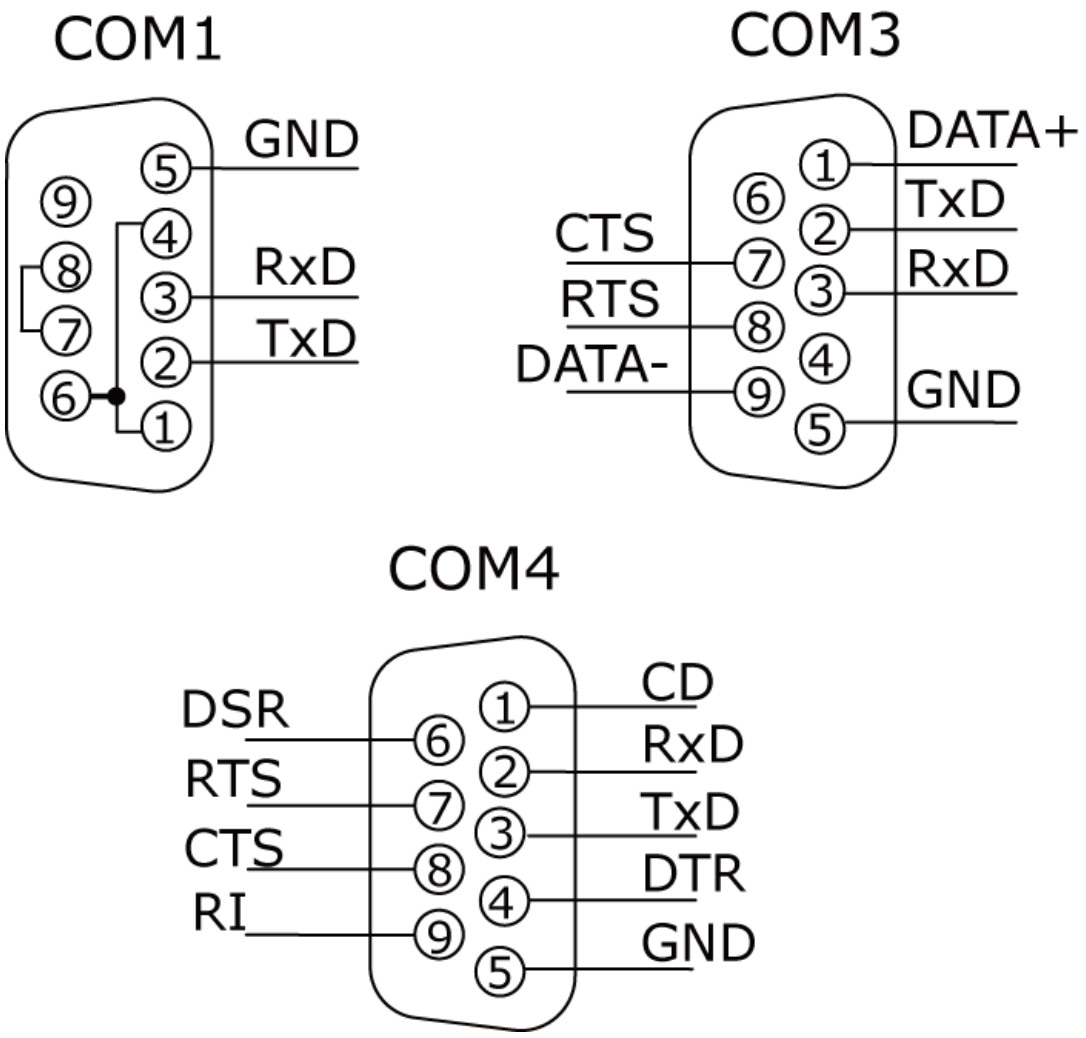
Some functions can be used to read/write these COM Ports. Please refer to CD-ROM: \napdos\isagraf\8000\english_manu\ "user_manual_i_8xx7. pdf" for detailed ISaGRAF User's Manual.

They are listed in Appendix A. 4 for "COMOPEN", "COMCLOSE", "COMREADY", "COMARY_R", "COMARY_W", "COMREAD", "COMSTR_W", "COMWRITE" and "COMCLEAR".

Pin assignment:

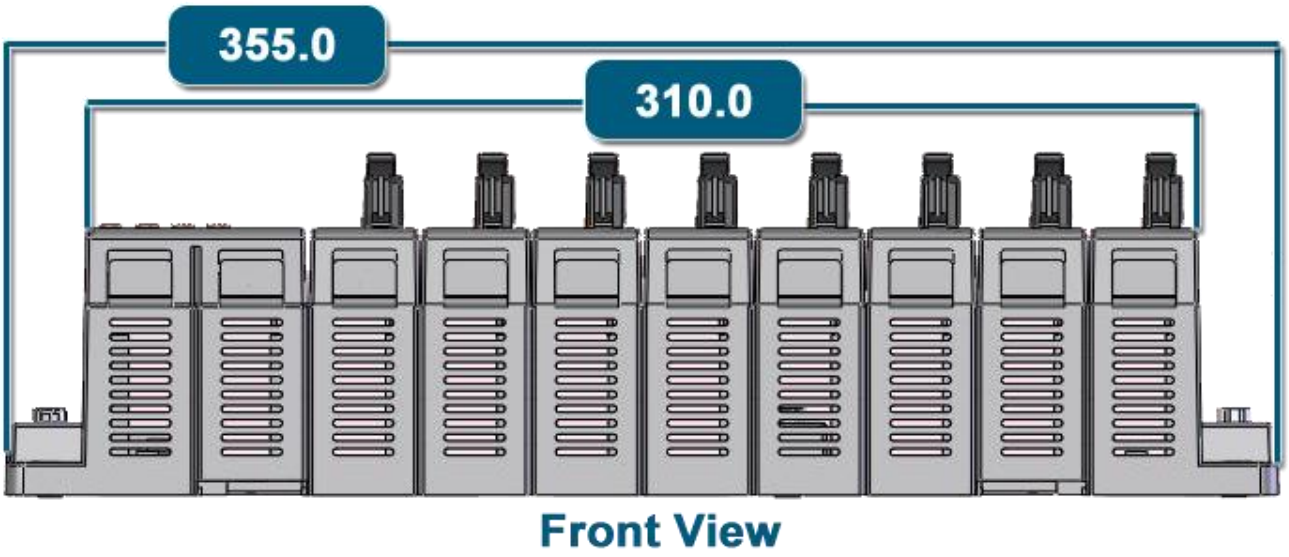


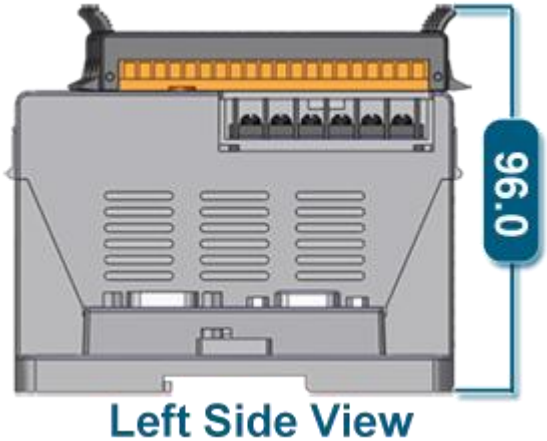
3.19 Pin Assignment of Communication Ports



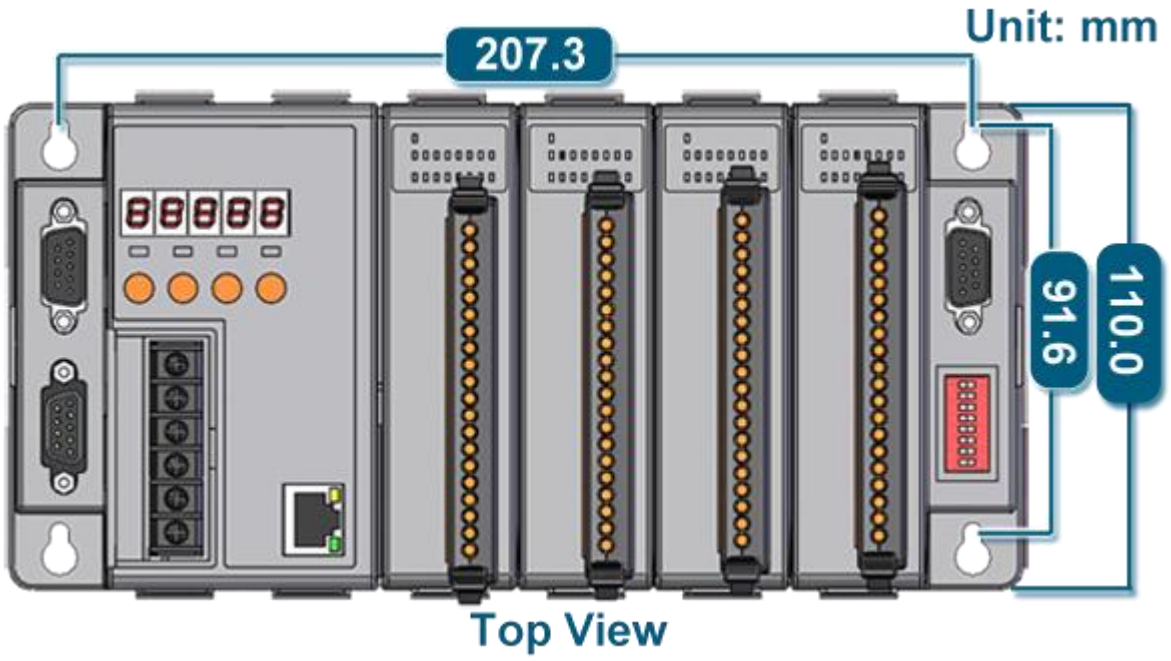
3.20 Dimension

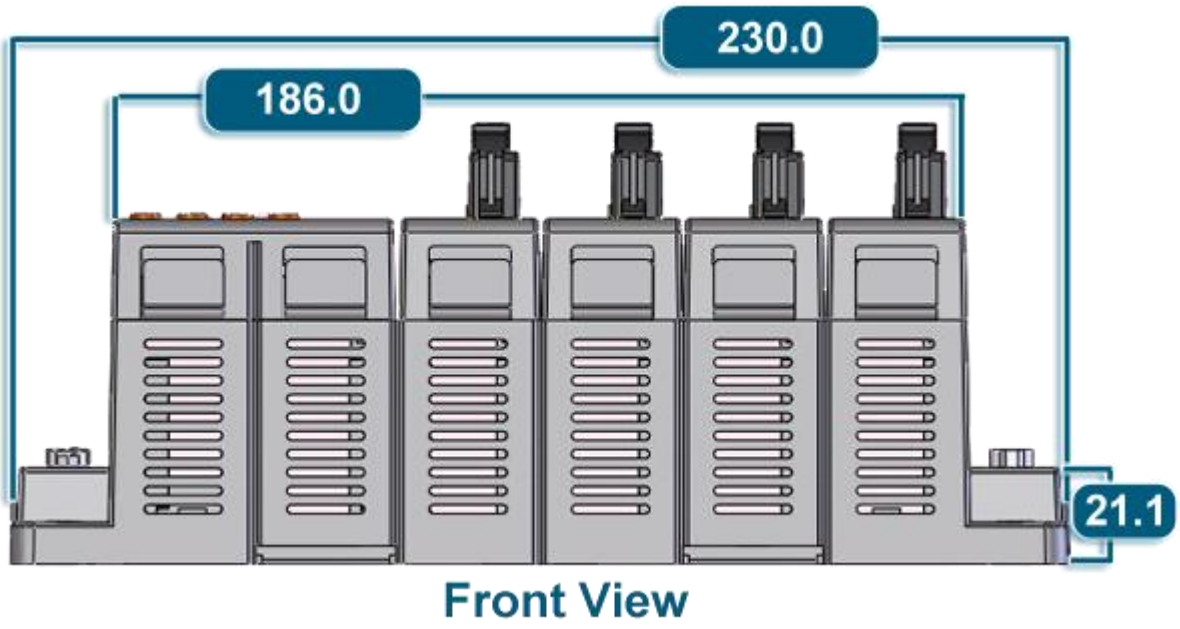
8 Slots:

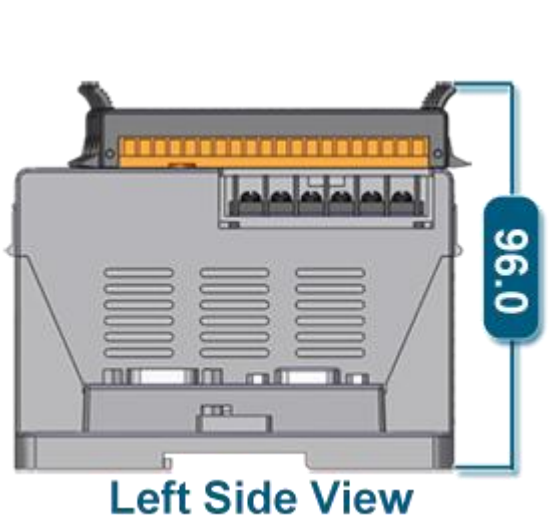




4 Slots:


Unit: mm
207.3
91.6
110.0
Top View


230.0
186.0
21.1
Front View


96.0
Left Side View

75.5
35.6
Right Side View

Appendix

A : ISaGRAF User Manual & Demo Program & FAQ

The related ISaGRAF manuals and demo programs are all in your I-8000 CD. You can also follow the steps below to view the latest information and FAQ in ISaGRAF website.

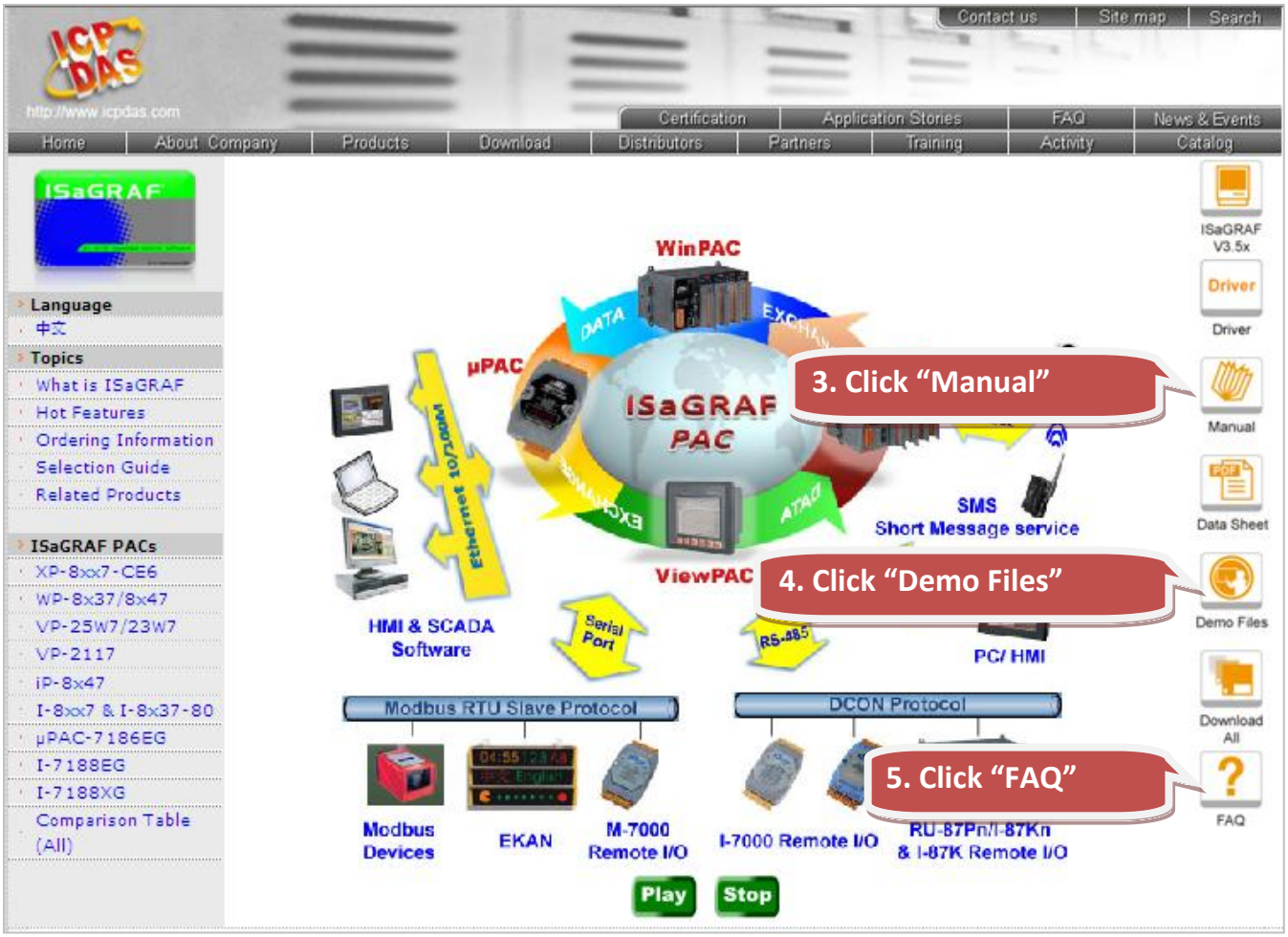
A. 1 The Download Page for ISaGRAF Resource

1. First, type the ICP DAS's web address http://www.icpdas.com/home.htm in the browser.
2. Click the "ISaGRAF SoftLogic PAC" icon to get into the ISaGRAF website.

Manual:

3. Click the "Manual" icon to download the related ISaGRAF manual. (As diagram below)

   "ISaGRAF User's Manual" is an advanced manual for using ISaGRAF as the embedded controller software. Please refer to this manual for more and detail information about how to use the ISaGRAF PACs.



Demo Files:

4. Click the "Demo Files" icon to download the ISaGRAF demo program.
   You can download all the files in CD or FTP:
   I-8000 CD-ROM: \napdos\ISaGRAF\8000\demo or
   ftp://ftp. icpdas. com. tw/pub/cd/8000cd/napdos/isagraf/8000/demo/

FAQ

5. Click the "FAQ" icon to view the latest ISaGRAF frequently asked questions.
   You can also refer to: www. icpdas. com > FAQ > Software > ISaGRAF

A. 2 Using Modbus TCP/IP protocol to control ISaGRAF controllers with VB?

1. VB. net 2005 Demo program using Modbus TCP/IP protocol to control ISaGRAF controllers.
   Please refer to below website:
   www. icpdas. com > FAQ > Software > ISaGRAF Ver. 3 (English) - 051

2. VB 6. 0 Demo program using Modbus TCP/IP protocol to control ISaGRAF controllers. Please refer to below website:
   www. icpdas. com > FAQ > Software > ISaGRAF Ver. 3 (English) - 052

B : 10-ch Thermocouple Input Module

10-ch Thermocouple input module is a brand new designed module different from the 8-ch normal module in the industrial area. ICP DAS supply I-7018Z and I-87018Z of 10-ch Thermocouple Input Module and they all meet the RoHS Standard. They are the best Thermocouple Input Module choices for iPAC-8xx7 and I-8xx7.

I-7018Z

I-87018Z

Advantages

1. It is special designed for thermocouple inputs. The innovative design makes the thermocouple measurement more accurate than the previous design.
2. It supports voltage and current inputs. The voltage input ranges can be ±15 mV ~ ± 2. 5 V. The current input ranges can be 4 ~ 20 mA, 0 ~ 20 mA, and ± 20 mA.
3. Up to 10 analog inputs of different types can connected to one module.
4. Up to 240 V_{rms} over voltage protection is provided.
5. It features per-channel open wire detection for thermocouple and 4 ~ 20 mA inputs

For more details, please visit the web site listed below:
I-7018Z: http://www. icpdas. com/products/Remote_IO/i-7000/i-7018z. htm
I-87018Z: http://www. icpdas. com/products/Remote_IO/i-87k/i-87018z. htm

C : RU-87P1/2/4/8

Introduction

RU-87Pn (n: means 1/2/4/8 slots) series is a remote intelligent I/O expansion unit that used to expand I-87K series I/O modules over the RS-485 for industrial monitoring and controlling applications. There are more than 30 I/O modules supported with the unit, including analog input/output, digital input/output, and counter/frequency I/O modules. RU-87Pn is the best choice for ISaGRAF PACs (I-8xx7, µPAC-7186EG, I-7188EG/XG, W-8xx7) connecting to I-87K Remote I/O modules.

RU-87Pn is designed to be used in harsh and noisy environment, so the hardware is manufactured with wide power input range (10 ~ 30 VDC) and operating temperature (-25 ~ +75 °C). It simplifies installation and maintenance of I/O modules with hot swappable and auto configuration, fault and error detection, dual watchdog, programmable power on and safe values.

Various software development kits (SDK) and demos are provided, such as DLL, ActiveX, Labview driver, Indusoft driver, Linux driver, OPC Server, etc. The ISaGRAF PACs can connect to the RU-87Pn directly. The I-87K series I/O modules plugged in the RU-87Pn can be easily integrated into variant software system.

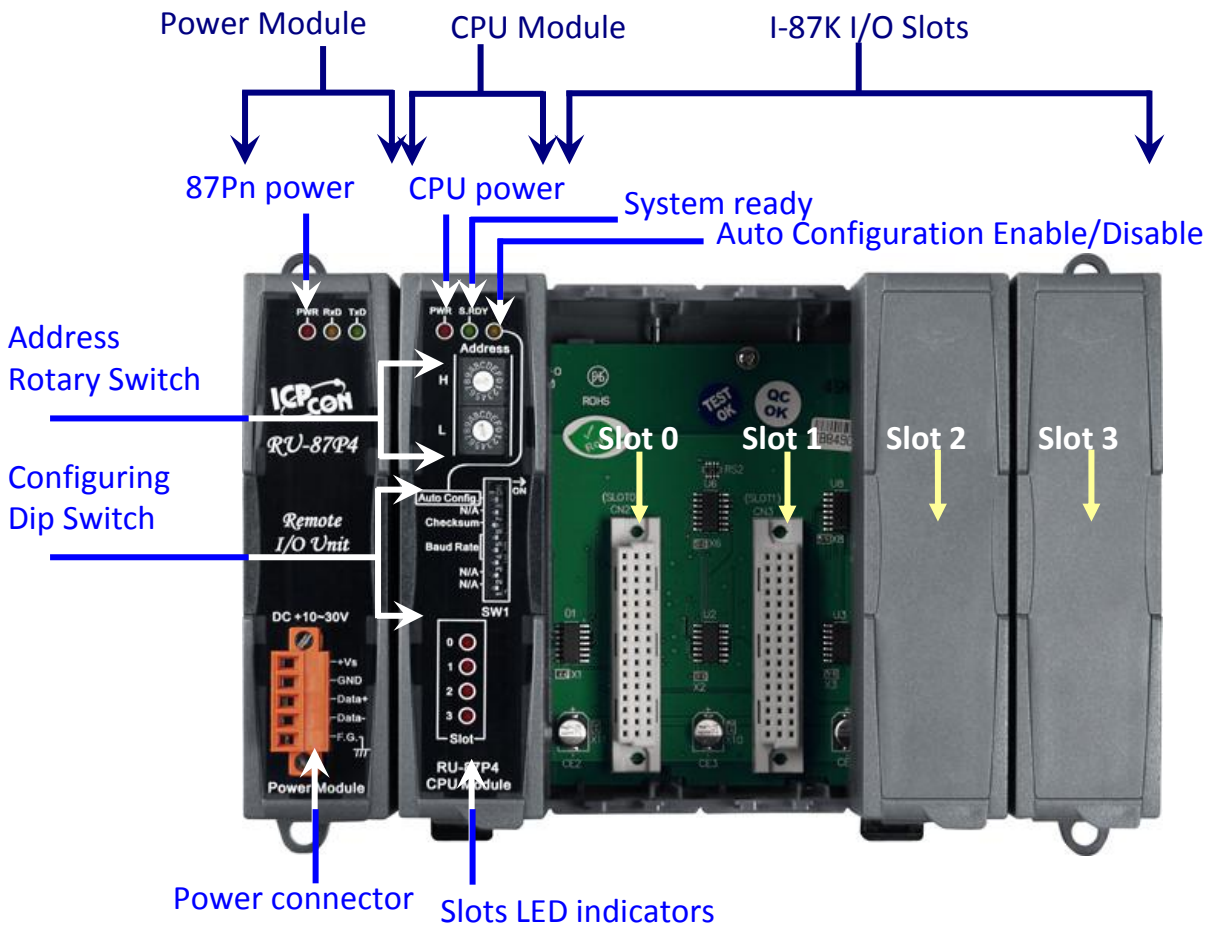


Fig. 1 RU-87P4

Features

Hot Swap

The RU-87Pn doesn't need to shut down its power to replace or plug I-87K I/O modules. Therefore, the whole system can keep operating without any interruption.

Auto-Configuration

Configurations of I-87K I/O modules can be pre configured and stored in the nonvolatile memory of the RU-87Pn. When the RU-87Pn is power on or an I-87K I/O module is plug in, the RU-87Pn automatically check and restore these configurations to each I-87K I/O modules on it.

Easy Duplicate System

Using the DCON Utility, you can easily make a backup of the I-87K module configurations and write to another RU-87Pn. This design can easily and quickly duplicate many RU-87Pn.

Easy Maintenance and Diagnostic

The basic configurations (includes station number, baud rate) are set by the Rotary and DIP switch. The operator can use only one screwdriver to set the RU-87Pn. And there are several LED status indicators to show whether I-87K modules are configured and work properly.

If one I-87K module is damaged, the operator just need to get one good I-87K module with the same item number to replace the damaged one. And then check the LED indicators to know whether the replacement is performed correctly. The switch and LED design makes it easy for maintenance. There is no PC and Notebook needed.

Fully Software Support

The variant development kits and free charge software utility:

- **DCON Utility: for configuration**
- **OPC Servers**
- **EZ Data Logger**
- **Support Variant Software Develop Toolkits**

  Free DLL, ActiveX, Labview driver, Indusoft driver, DasyLab driver, Linux driver
- **ISaGRAF PACs can connect to the RU-87Pn directly**