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

“I-8xx7” is the abbreviation of “I-8437-80/8837-80/8417/8817”, and the I-8x37 is the Ethernet PAC.

ICP DAS CO., LTD. would like to congratulate you own your purchase of our ISaGRAF PACs - **I-8437-80/8837-80/8437/8837/8417/8817**. The ease to integration of the PAC 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:

Please visit the website:

www.icpdas.com/en/product/guide+Software+Development__Tools+ISaGRAF

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iPAC:	iP-8xx7 Series, I-8xx7 Series
XPAC:	XP-8xx7-CE6 Series

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ISaGRAF webpage:

https://www.icpdas.com/en/product/guide+Software+Development__Tools+ISaGRAF

ISaGRAF FAQ : <https://www.icpdas.com/en/faq/index.php?kind=280#751>

ISaGRAF Download Center:

<https://www.icpdas.com/en/download/index.php?nation=US&kind1=&model=&kw=isagraf>

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Revision History

This chapter provides revision history information to this document.

The table below shows the revision history.

Revision	Date	Description
V2.0	Jul. 2020	<ul style="list-style-type: none">• Update URLs to the new website• Update some pictures• Remove FTP URLs and the path of CD-ROM

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Reference Guide

ISaGRAF Resource on the Internet:

Visit to the website to get the latest version of ISaGRAF IO libraries, drivers, demo, and manuals.

<https://www.icpdas.com/en/download/index.php?nation=US&kind1=&model=&kw=isagraf>

ISaGRAF User's Manual:

<https://www.icpdas.com/en/download/show.php?num=333>

iP-8000 (Hardware) Manual:

<https://www.icpdas.com/en/download/show.php?num=425>

Related Products:

- Industrial Ethernet Switch:

http://www.icpdas.com/en/product/guide+Industrial__Communication+Ethernet__Communication+Ethernet__Switch

- RS-232 to RS-422/485 Converter:

http://www.icpdas.com/en/product/guide+Industrial__Communication+Serial__Communication+Converter

- Power Supply :

http://www.icpdas.com/en/product/guide+Accessories+Power__Supplies+Power__Supply

- High Profile I-8K/87K Series I/O Modules

[http://www.icpdas.com/en/product/guide+Remote__I_O__Module__and__Unit+PAC__%EF%BC%86amp;__Local__I_O__Modules+I-8K_I-87K__Series__\(High__Profile\)](http://www.icpdas.com/en/product/guide+Remote__I_O__Module__and__Unit+PAC__%EF%BC%86amp;__Local__I_O__Modules+I-8K_I-87K__Series__(High__Profile))

ISaGRAF FAQ:


<https://www.icpdas.com/en/faq/index.php?kind=280#751>

I/O Modules Selection Guide

The I-8xx7 series PAC supports the I-8K/I-87K I/O modules and RS-485 remote I/O modules. Please refer to ICP DAS website:



http://www.icpdas.com/en/product/guide+Remote_I_O_Module_and_Unit+Software_Support__+I-8K_I-87K__Software__Support


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[HOME](#) > [PRODUCTS](#) > [Remote I/O Module and Unit](#) > [PAC & Local I/O Modules](#) > [Software Support](#) > [I-8K/I-87K Software Support](#)

WinPAC/ViewPAC (WinCE 5.0/7.0 PAC)	XPAC (WinCE 6.0 PAC)	XPAC/iPPC (WES 2009/7 PAC)	iPAC- 8000/ViewPAC (MiniOS7)	LinPAC (Linux PAC)	Remote I/O Expansion Unit (DCON)	Remote I/O Expansion Unit (Modbus)	I-8000 (MiniOS7)					
<table border="1"> <thead> <tr> <th rowspan="2">Module Name</th> <th>I-8411,I-8811, I-8431,I-8831 I-8431-80,I-8831-80</th> <th>I-8417,I-8817, I-8437-80,I-8837-80</th> </tr> <tr> <th>8000 library (for MiniOS Library C Language)</th> <th>ISaGRAF</th> </tr> </thead> </table>								Module Name	I-8411,I-8811, I-8431,I-8831 I-8431-80,I-8831-80	I-8417,I-8817, I-8437-80,I-8837-80	8000 library (for MiniOS Library C Language)	ISaGRAF
Module Name	I-8411,I-8811, I-8431,I-8831 I-8431-80,I-8831-80	I-8417,I-8817, I-8437-80,I-8837-80										
	8000 library (for MiniOS Library C Language)	ISaGRAF										
Analog I/O Modules												
I-8017H	Y	Y										
I-8024	Y	Y										
Digital I/O Modules												
I-8037	Y	Y										
I-8040	Y	Y										
I-8041	Y	Y										
I-8042	Y	Y										

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

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)		Provides seconds, minutes, hours, date, day of week, month, year			
Watchdog Timers		Yes (0.8 second)			
DIP Switch		Yes (8 bits)			
Communication Ports					
Ethernet		-		RJ-45 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		4			
Push Buttons		4			
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)		231 mm x 110 mm x 77 mm: I-8417, I-8437-80 355 mm x 110 mm x 77 mm: I-8817, I-8837-80			
Environmental					
Operating Temperature		-25 ~ +75°C			
Storage Temperature		-30 ~ +85 °C			
Ambient Relative Humidity		5 ~ 90% RH (non-condensing)		10 ~ 95% RH (non-condensing)	
Power					
Input Range		+10 ~ +30 Vdc			
Protection		Power reverse polarity protection			
Capacity		20 W			
Consumption		3.9 W	5.1 W	3.9 W	5.1 W

Protocols (Note that certain protocols require optional devices)	
Modbus RTU/ASCII Master	A max. of 2 ports: COM1 or COM3 or COM4 or COM5 (*). (To connect to other Modbus Slave devices.)
Modbus RTU Slave	A max. of 2 ports. (For connecting ISaGRAF, PC/HMI/OPC Server and HMI panels.) I-8x17: COM1/2 ; I-8x37-80: COM1/3
Modbus TCP/IP Slave	Max. 4 connection. (For connecting ISaGRAF & PC/HMI) (For I-8x37-80)
User-defined Protocol	Custom protocols can be 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-87K base + I-87K Serial I/O boards, or RU-87Pn + I-87K High Profile I/O boards as remote I/O. A max. of 64 I-7000/87K remote I/O modules can connect to one PAC.
Fbus	Built-in COM3 Port to exchange data between ICP DAS's ISaGRAF PACs.
Ebus	Used to exchange data between ICP DAS ISaGRAF Ethernet PACs via the Ethernet port. (For I-8x37-80)
SMS: Short Message Service	One of COM4 or COM5 (*) can link to a GSM Modem to support SMS. The user can request data or control the controller via a cellular phone. The controller can also send data and alarms to the user's cellular phone. Optional GSM Modem: 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 the ICP DAS MMICON. The is featured with a 240 x 64 dot LCD and a 4 x 4 Keyboard. User can use it to display picture, string, integer, float, and input a character, string, integer and float.
Redundant Bus7000	Two ISaGRAF 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 the ISaGRAF PAC I/O Selection Guide for I/O Module list)	
PWM Output	
Pulse Width Modulation Output	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) Support max. 8-ch for one PAC ; Max. frequency: 500 Hz for OFF = 1 & ON = 1 ms Output square wave: OFF: 1~32767 ms, ON: 1~32767 ms
Counters	
Parallel DI Counter	Optional I-8K DI boards: I-8040, 8042, 8051, 8052, 8053, 8054, 8055, 8058, 8063, 8077 Support max. 8-ch for one PAC ; Max. count/frequency: 32-bit, 500 Hz ; Min. pulse width > 1 ms
Serial DI Counter	Optional I-87K DI boards: I-87040, 87051, 87052, 87053, 87054, 87055, 87058, 87063 Max. count/frequency: 16-bit (0~65535), 100 Hz
Remote DI Counter	All remote I-7000 & I-87K DI modules support counters. Max. count/frequency: 16-bit (0~65535), 100 Hz.
High Speed Counter	Max. count/frequency for I-87082: 32-bit, 100 kHz ; Max. count/frequency for I-8080: 32-bit, 450 kHz
Motion	
Motion Control	Can integrate with one I-8091W (2-axis) or two I-8091W (4-axis) to do motion control. Ethernet communication is also 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: The COM5 ~ COM20 ports are located in the expansion boards if they are installed in slots 0 ~ 7 of I-8xx7-80.	

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

ISaGRAF Download Center: Refer to Data Sheet

<http://www.icpdas.com/en/download/index.php?nation=US&kind1=&model=&kw=isagraf>

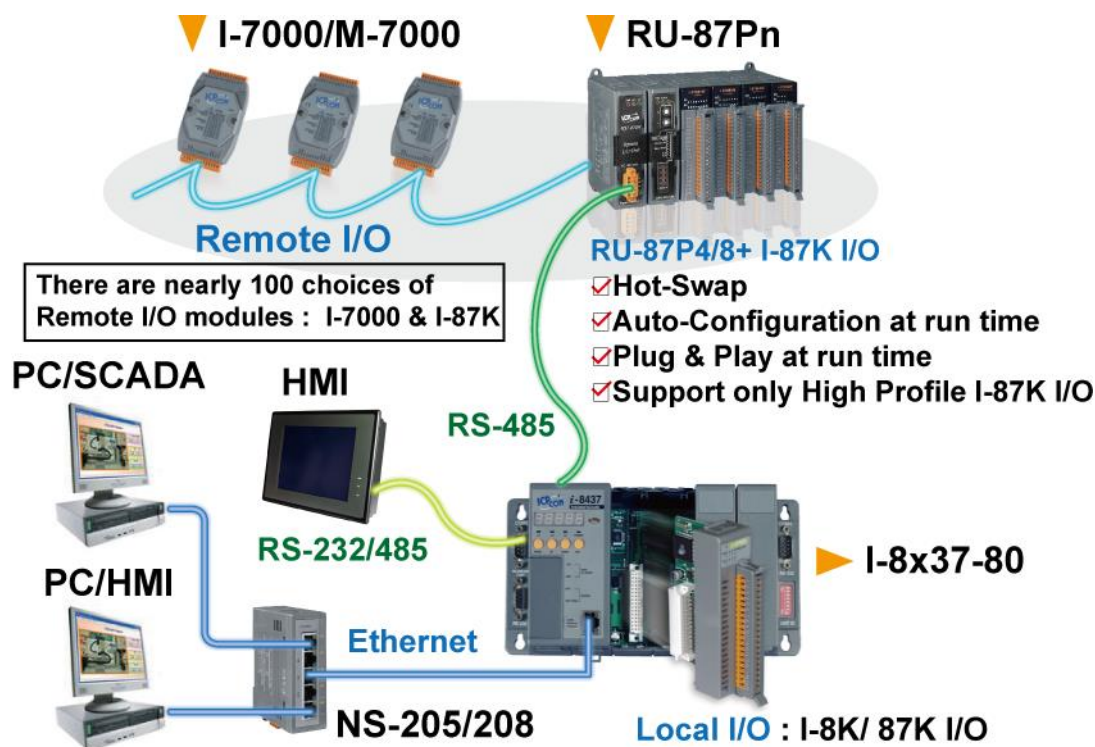
1.1 iPAC-8x47 is better than I-8x37-80

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

Features:

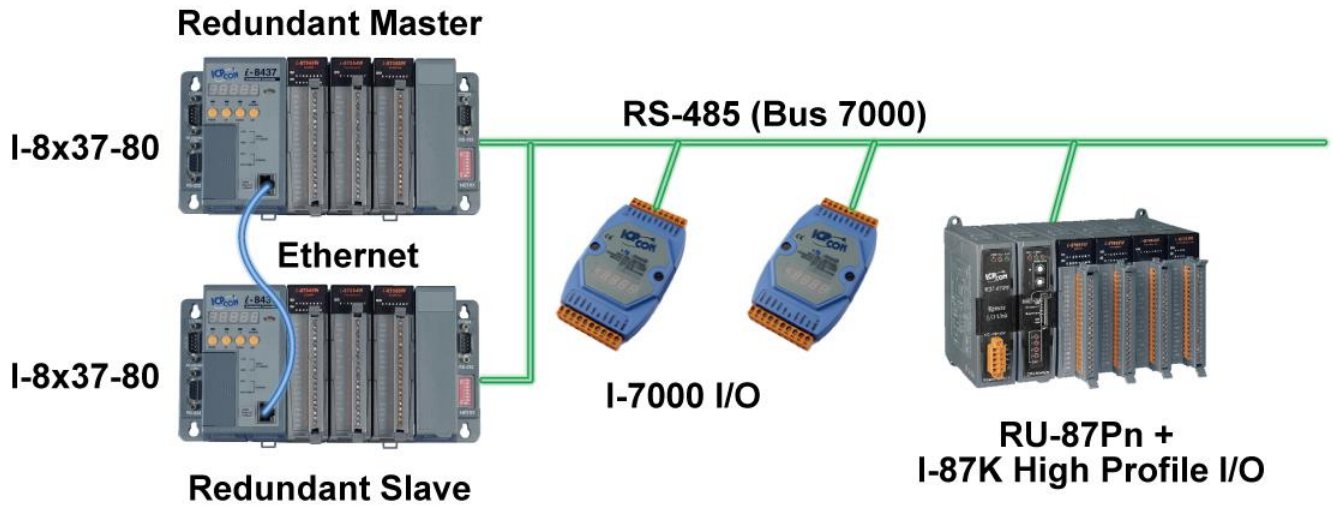
- Support Dual Ethernet 10/100 Mbps
- 768K memory for running program, 256K more than I-8437-80/8837-80
- Built-in 512K Battery backup SRAM
- Support sending E-mail with an attached file (Max. 488 KB)
- Support FRnet I/O
- Support CAN/CANopen
- Support VW Sensor
- Support Ethernet Port redundant system

1.2 Multi-HMI & Local/Remote I/O



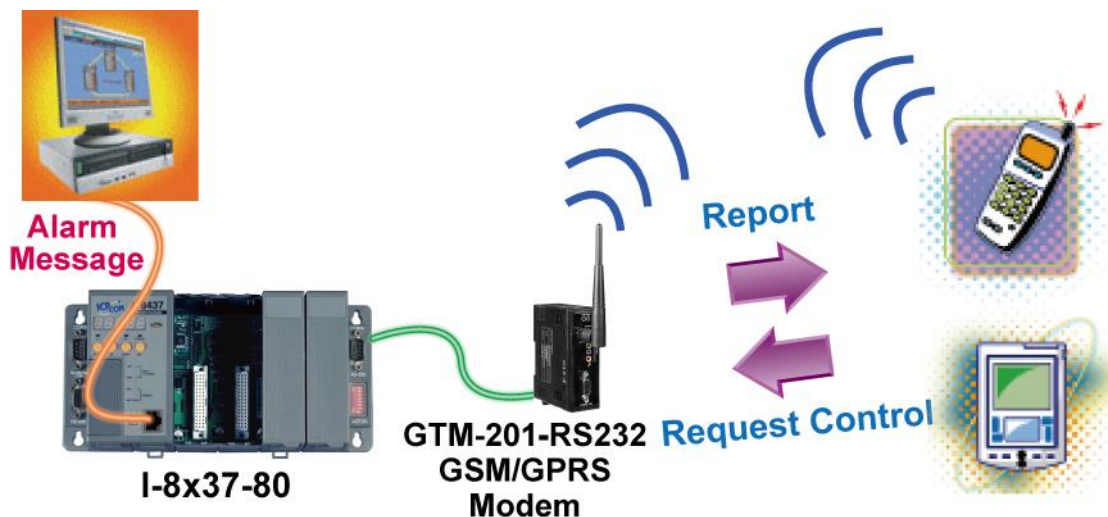
1.3 Redundant Bus7000

I-8437-80/8837-80:

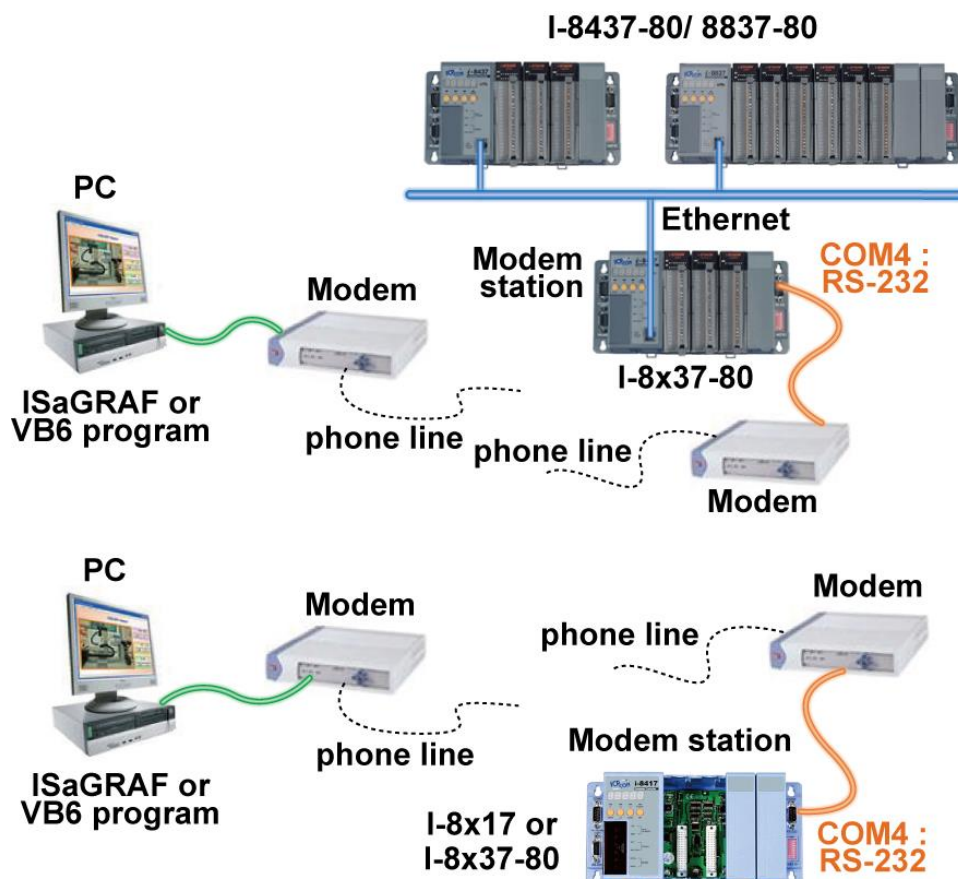


1.4 SMS: Short Message Service

More at <https://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-111](#)



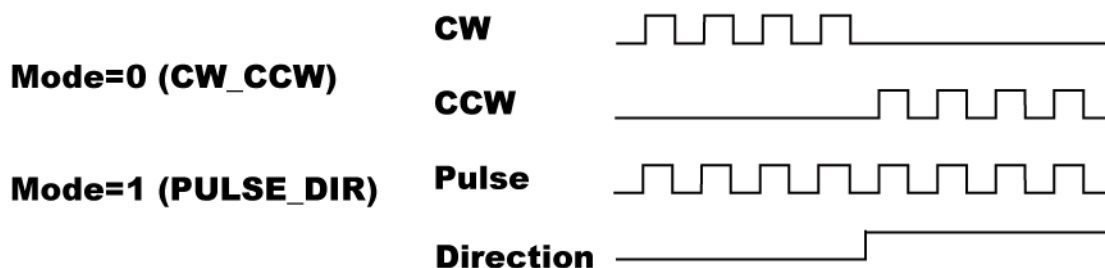
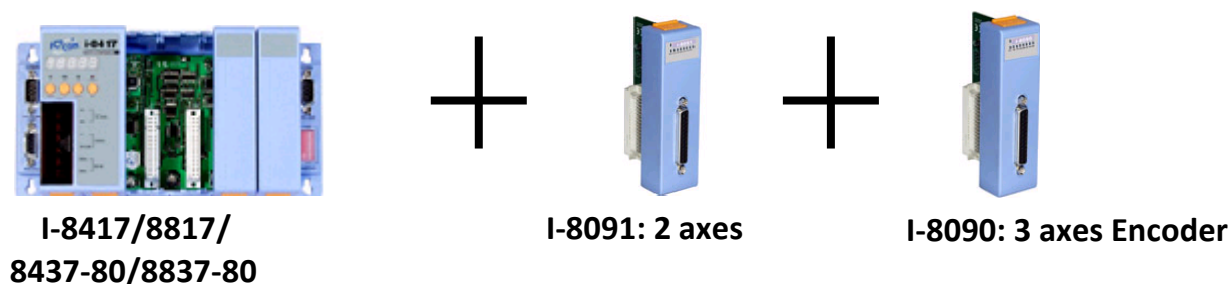
1.5 Download & Monitoring Via Modem_Link



1.6 Motion Control

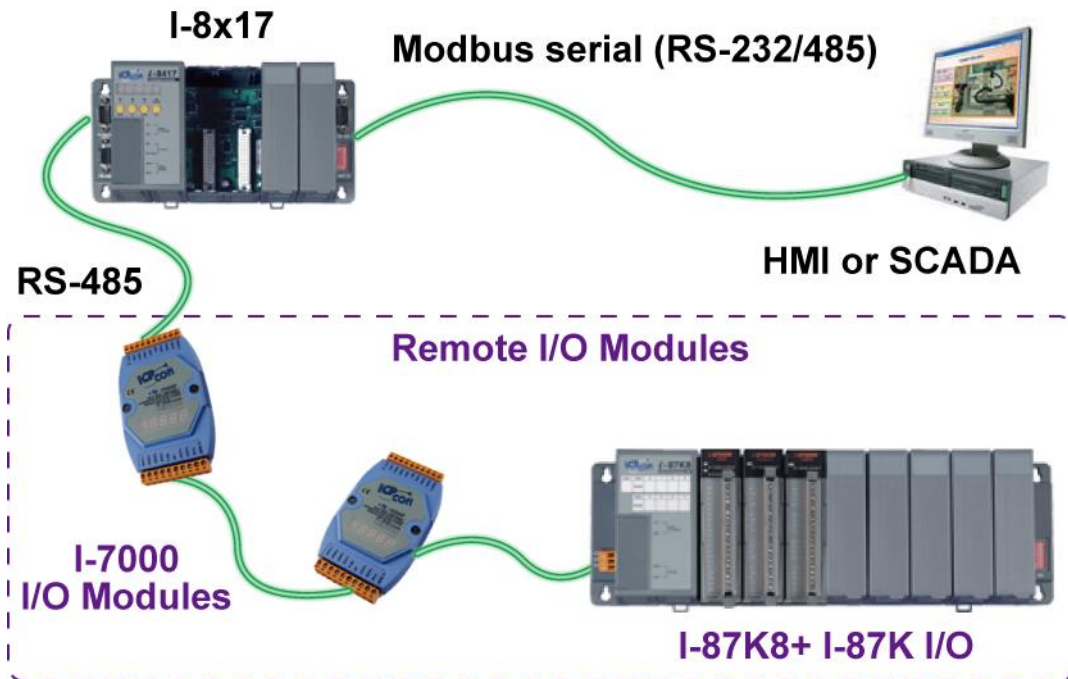
One I-8091 can control 2-axis: X-Y plane, or 2 axes independent

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

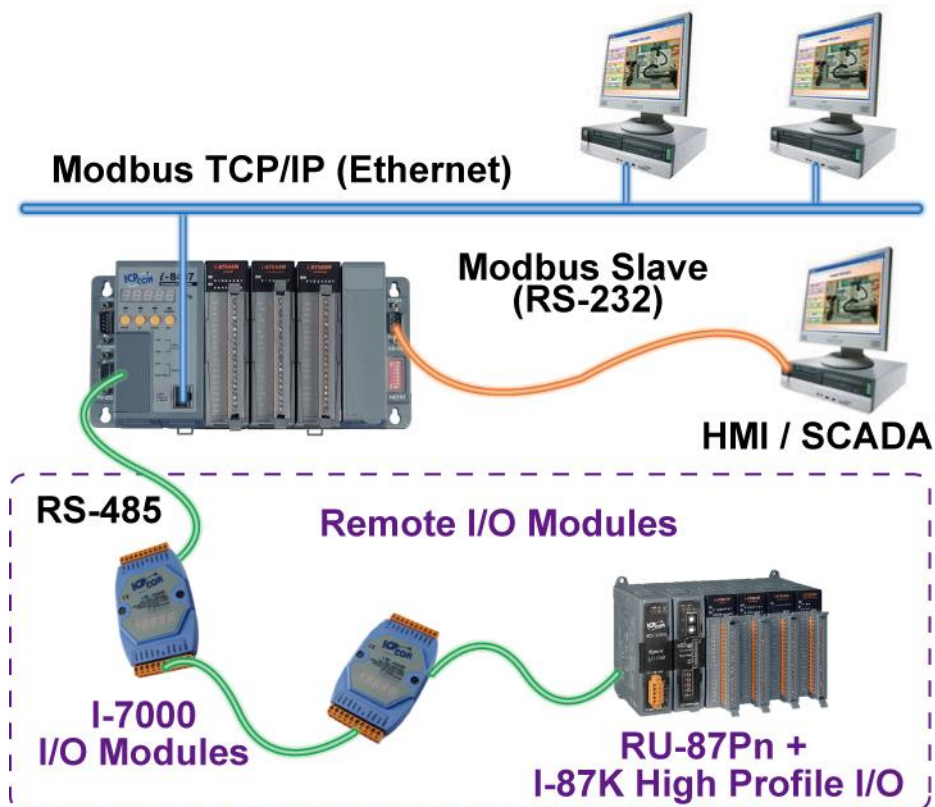


1.7 Modbus Converter of I-7000 & I-87K I/O

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

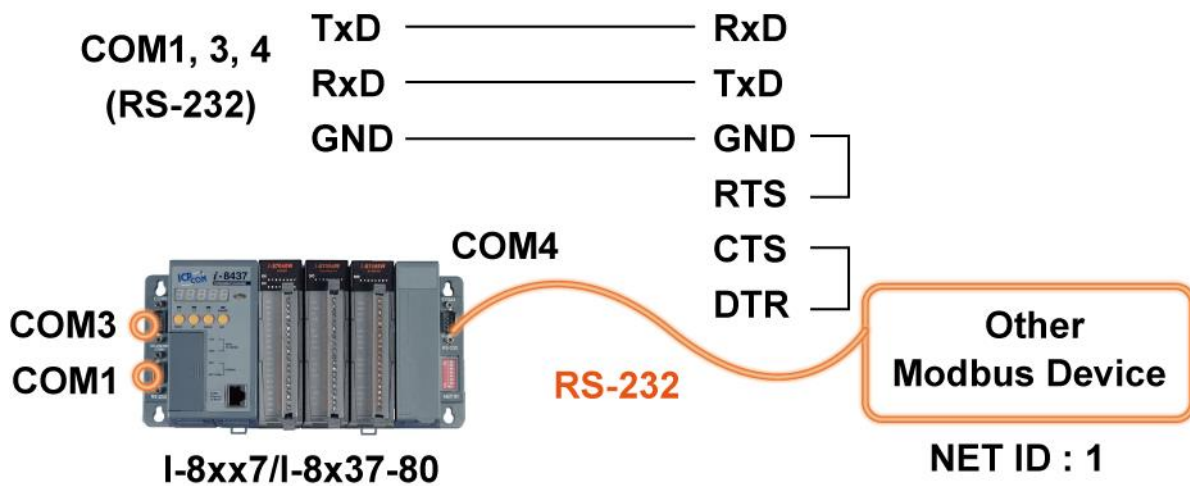
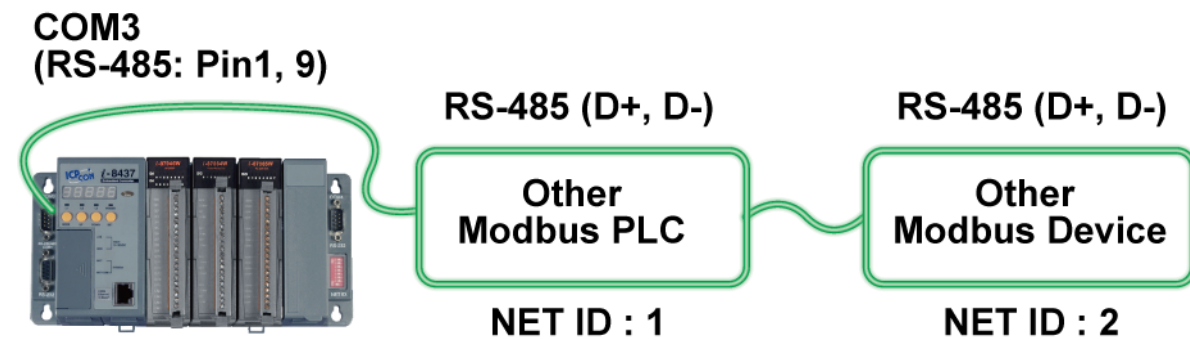


I-8437-80/8837-80 can be a Modbus RTU serial & TCP/IP converter of I-7000 & I-87K series I/O modules.



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:

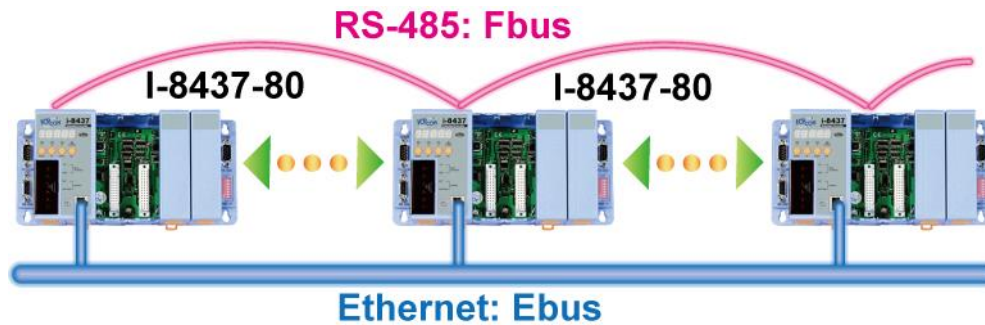
COM5 to COM20 is optional from the [I-8112/8114/8142/8144/8142i](#) expansion board.

1.9 Data Exchange through Ethernet & RS-485

PAC to PAC Data Exchange

Ethernet: I-8437-80/8837-80

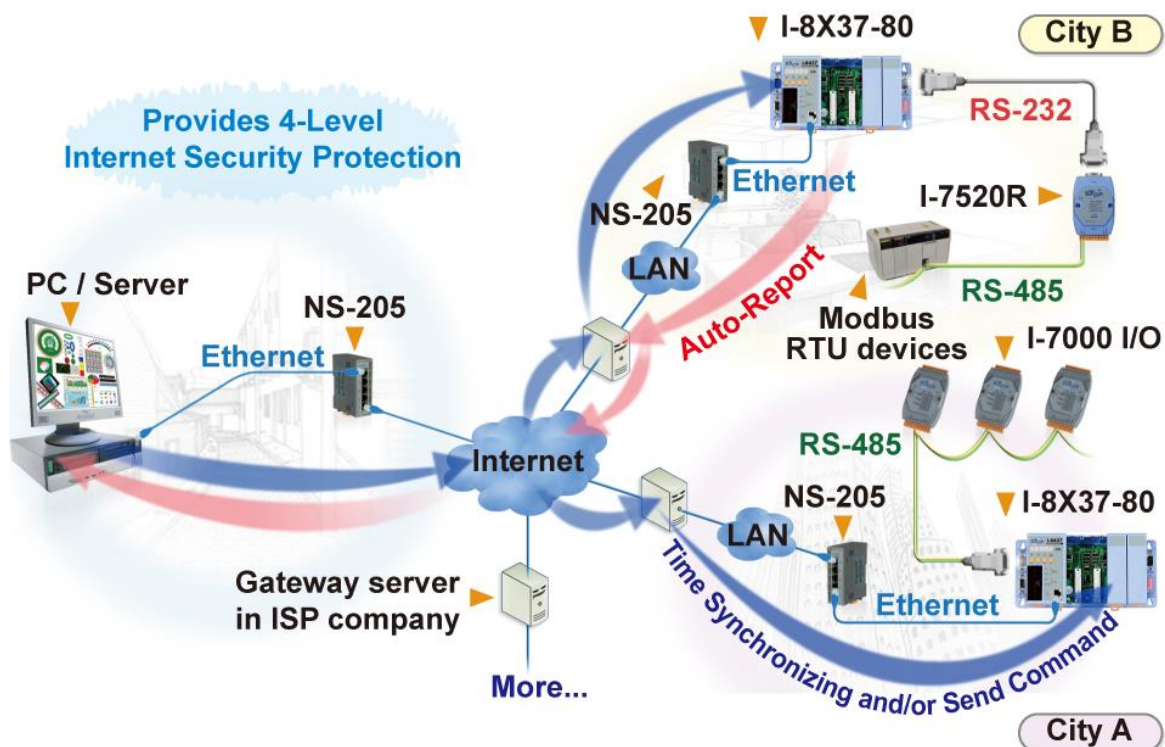
RS485: I-8xx7



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

More at <https://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-065](#)

Stable and Cost-effective Data Acquisition Auto-Report System

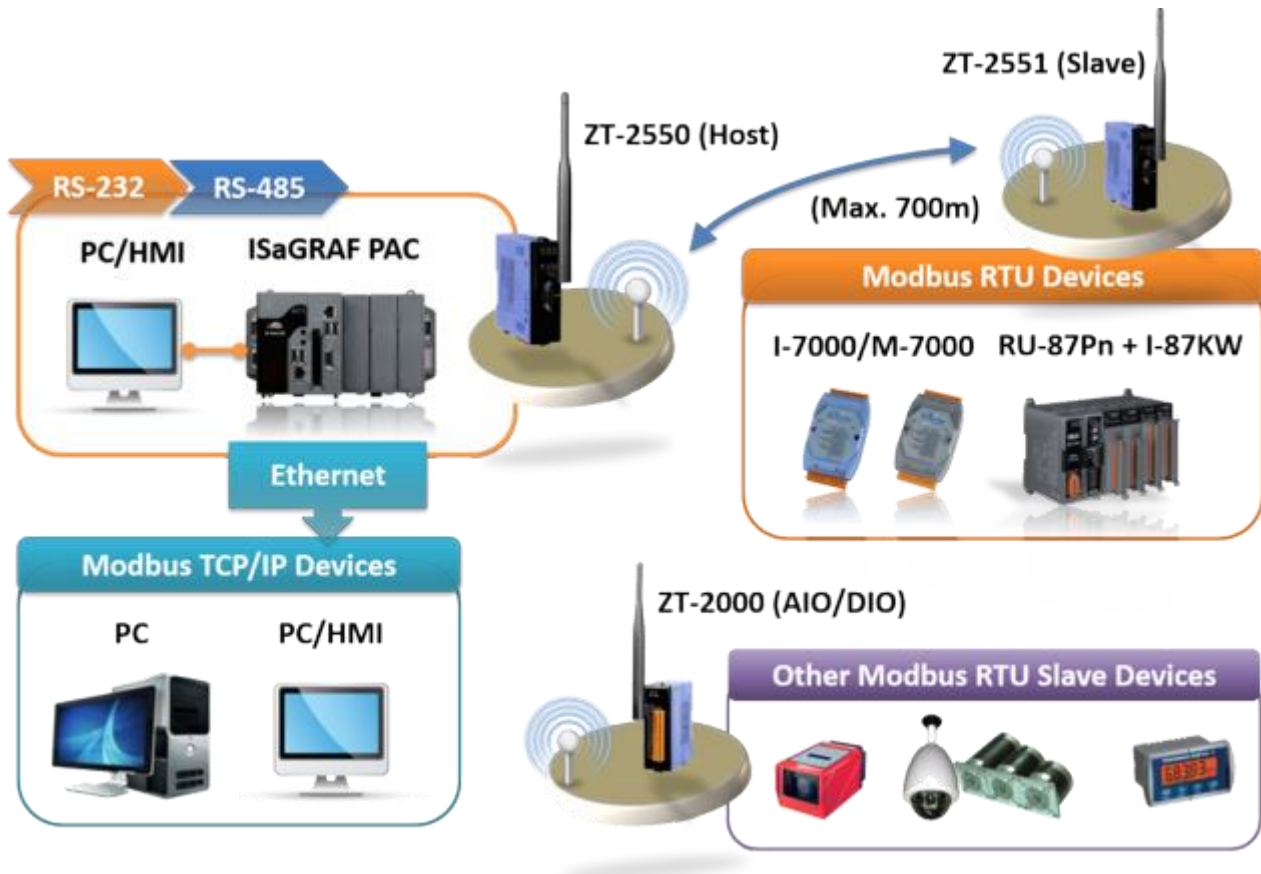


1.11 ZigBee Wireless Solution

- **ZB-2000** series product has been phased out, users can choose **ZT-2000** series product.

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.

More at <https://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-110](#)



2.1 Step 1 - Installing the ISaGRAF Software

The following software must be installed before programming for ISaGRAF PAC system.

<http://www.icpdas.com/en/download/show.php?num=368>

- 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 PAC.

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.

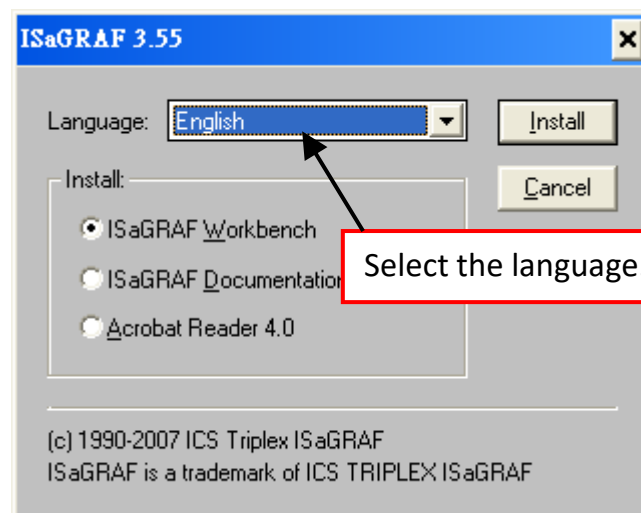
- Windows 95 / Windows 98 / Windows 2000
- Windows NT Version 3.51 or Windows NT Version 4.0
- Windows XP or Vista or XP mode in Windows 7 (refer to [FAQ-117](#))

Steps to Installing the ISaGRAF Workbench:

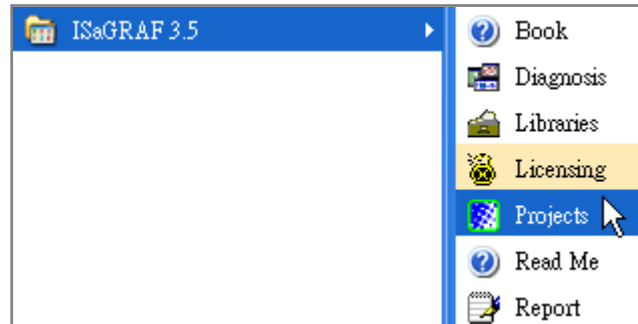


If your operating system is Windows Vista or Windows 7 (32-bit), please refer to [2.1.4](#).
If your operating system is Windows 7 (64-bit), please refer to [2.1.5](#).

Since 2020, ICP DAS no longer provides ISaGRAF Workbench CD. Please download the software on [ISaGRAF Download Center](#) and extract the zip file. Then, double-click on the "ISaGRAF.exe" file to start the installation process.

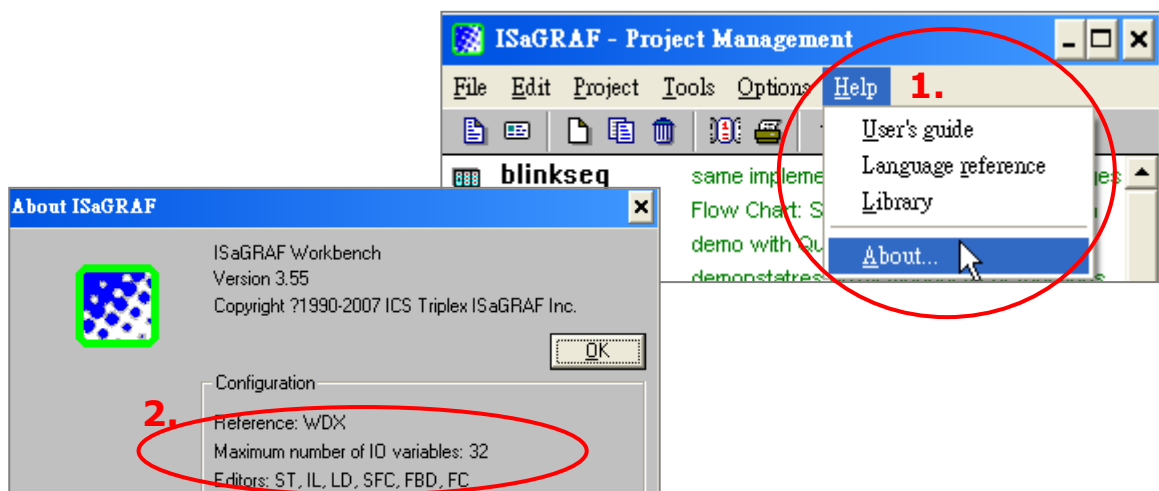


After the installation, click the Windows “Start” and point to “Programs” and “ISaGRAF 3.5”, then click “Project” to open the ISaGRAF.



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.



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:

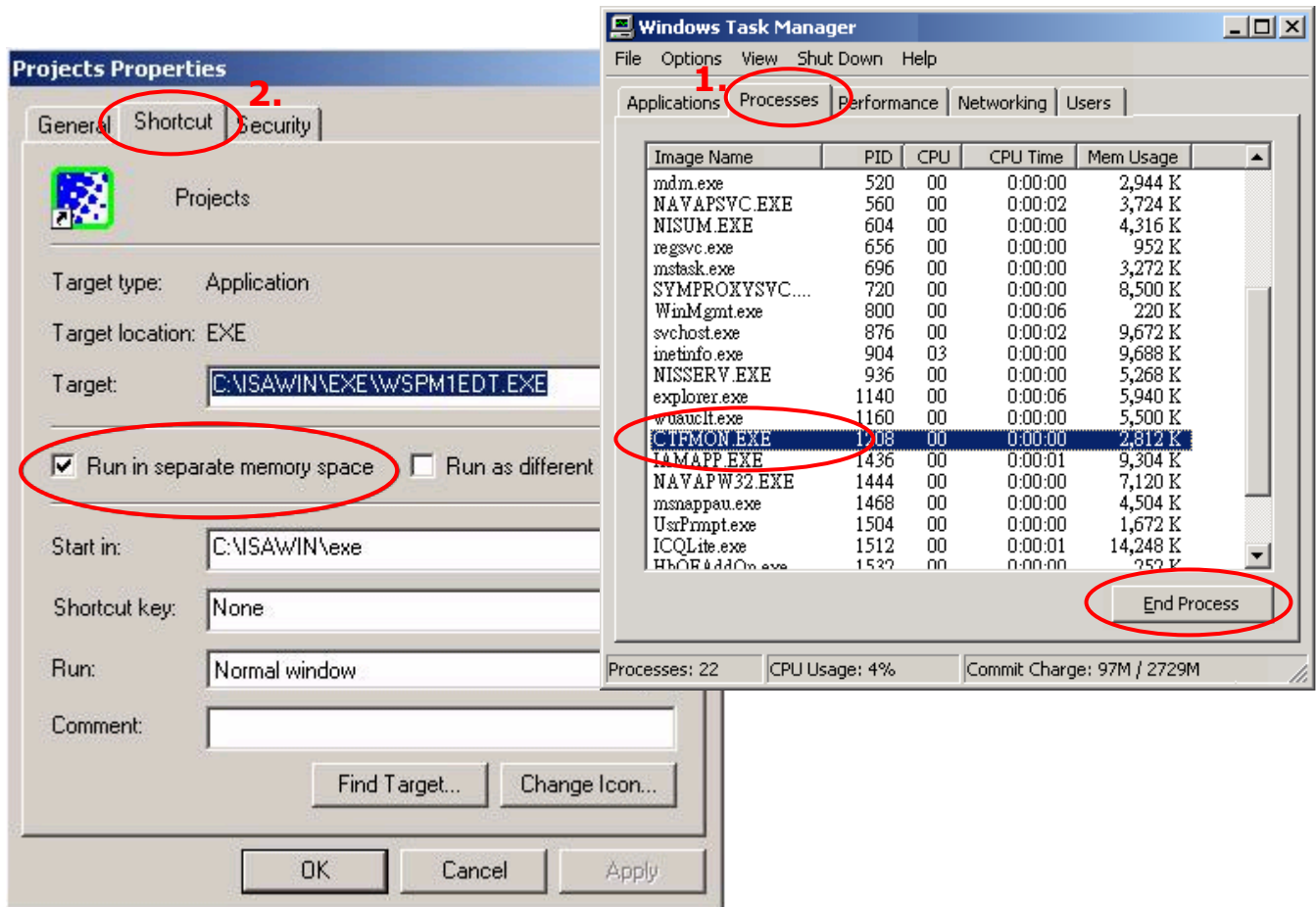
Please execute the `\Sentinel5382\setup.exe` for ISaGRAF-80 or `\Sentinel\setup.exe` for other ISaGRAF version in the ISaGRAF installation folder and then reset the PC again.

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 installation folder 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 cause 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

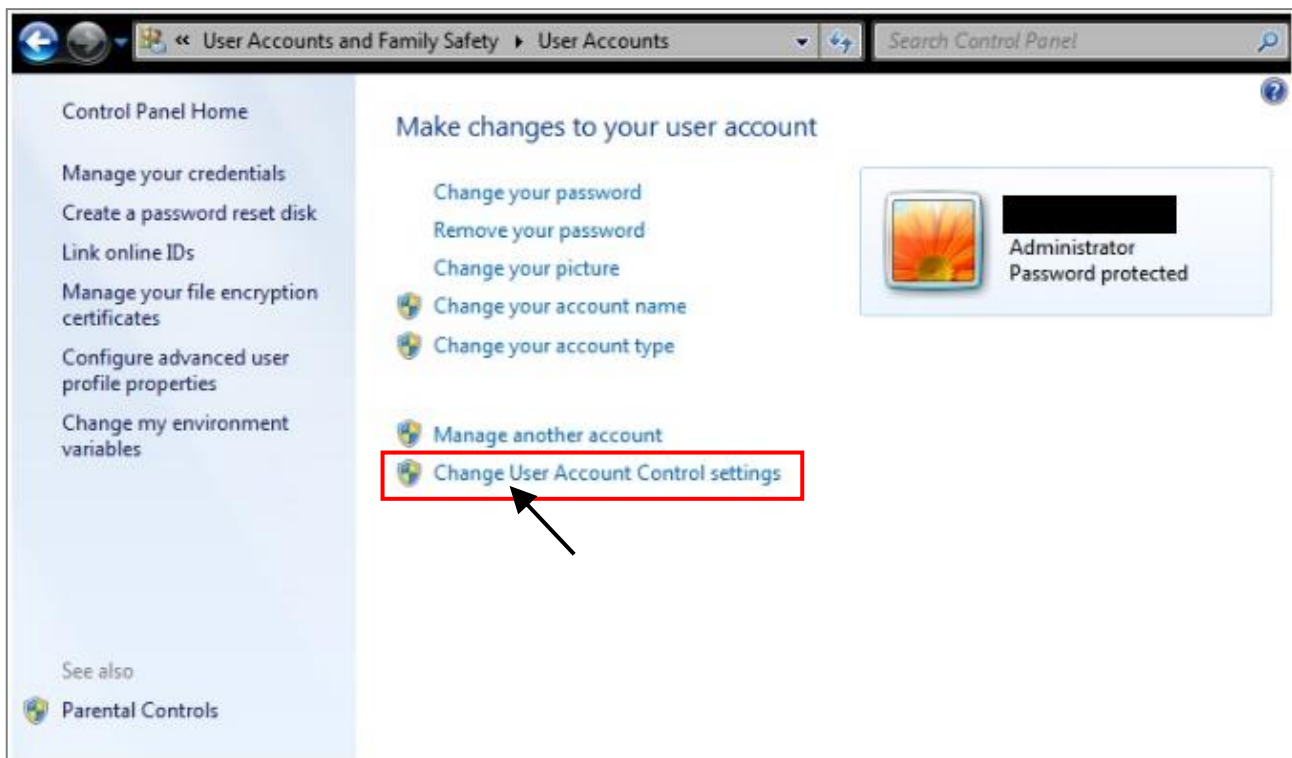
Before installing the ISaGRAF; If your operating system is Windows Vista or Windows 7 (32-bit), please change the User Account Control settings to avoid some of the setup restrictions.

How to disable “UAC” (User Account Control)?



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

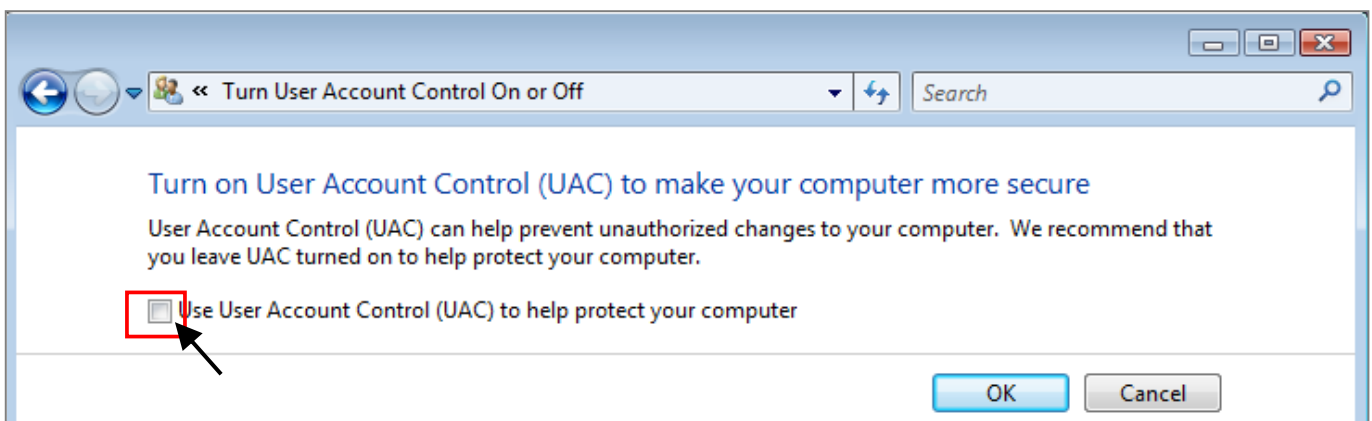
1. From the “Start” menu, choose “Control Panel > User Accounts and Family Safety > User Accounts”, then click “Change User Account Control settings” or “Turn User Account Control on or off”.



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

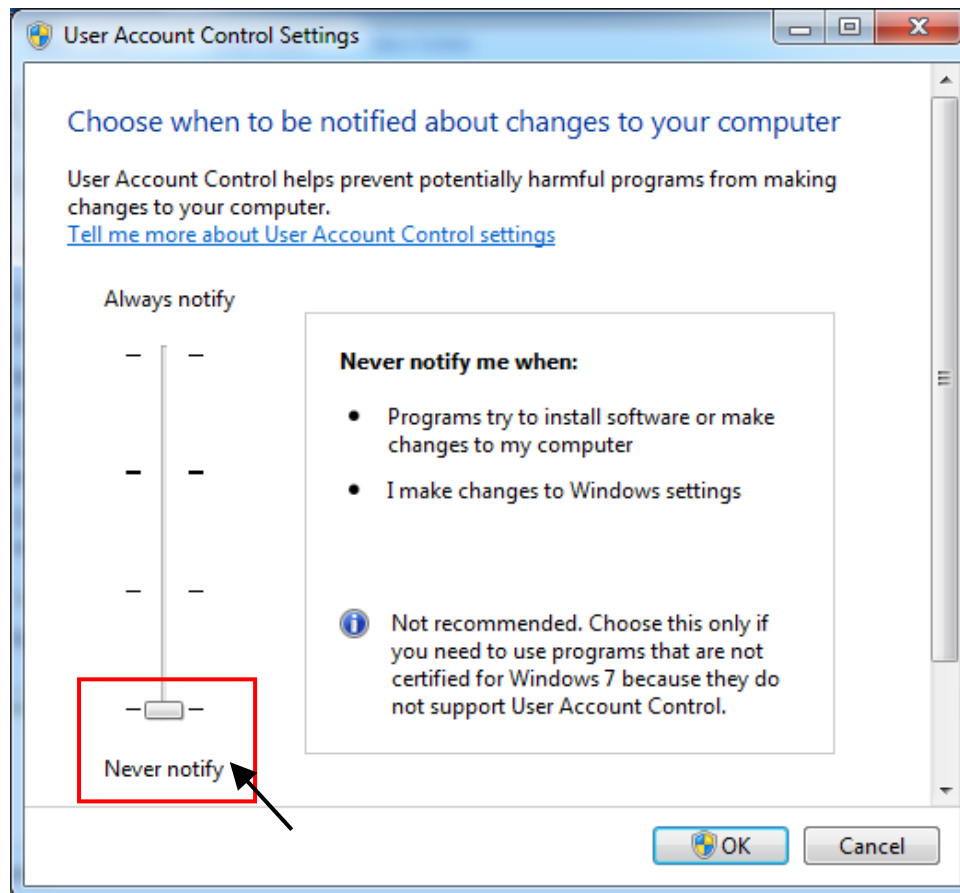
Windows Vista:

Uncheck the “Use User Account Control (UAC) to help you protect your computer” box 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 (64-bit) Users

Because ISaGRAF Workbench must be installed on a 32-bit version of Windows operating system, users can use the following ways to create a proper installation environment for the ISaGRAF Workbench 3.55. If using Windows XP Mode that can be installed on 64-bit version of Windows 7 Professional, Enterprise, and Ultimate editions. If using VMware Workstation/Player that can be installed on any 64-bit version of Windows OS (e.g., Windows 7 or Windows 8).

Using 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.

Using VMware Workstation/Player:

1. Download and install VMware Workstation 10 (trial version) on VMware website.
https://my.vmware.com/web/vmware/info/slug/desktop_end_user_computing/vmware_workstation/10_0
2. Create a virtual machine running Windows XP (32-bit, SP3).
3. Install ISaGRAF Workbench 3.55 on a virtual machine.
4. Install ISaGRAF I/O Library on a virtual machine.
5. The related settings for a virtual machine.
6. Install USB dongle driver on a virtual machine.

More at <https://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-174](#)

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

Visit to the website to download the latest version of “ICP DAS Utilities for ISaGRAF” (io_lib.zip).
<http://www.icpdas.com/en/download/show.php?num=368>

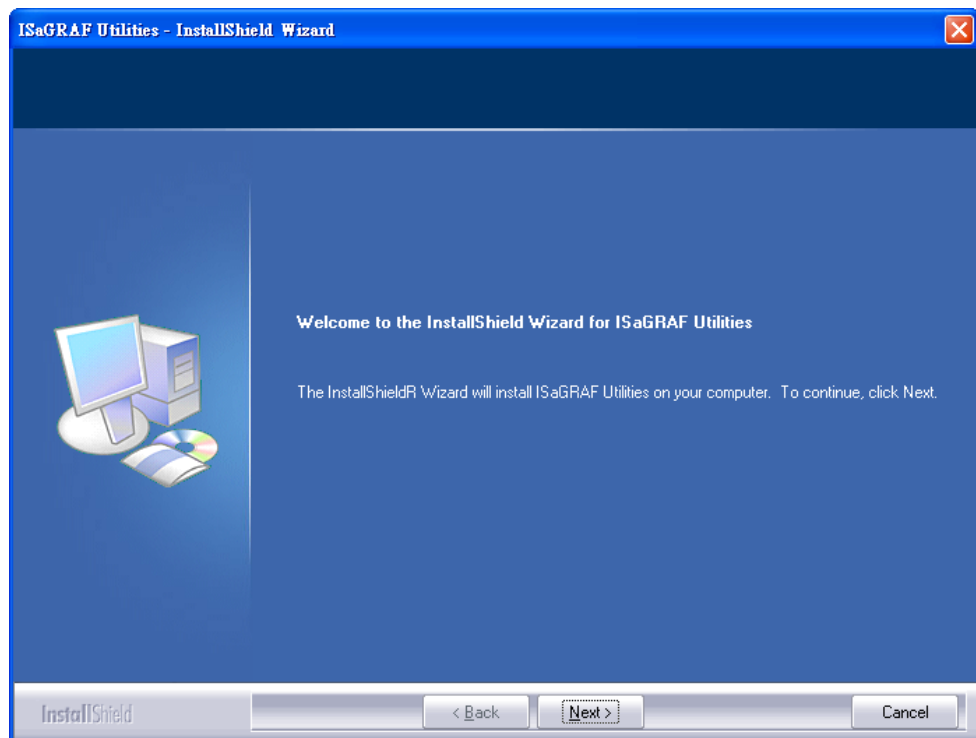
The “ICP DAS Utilities for ISaGRAF” consists of 3 major items.

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

Note:

Make sure that ISaGRAF Workbench has been installed, IF NOT, refer to [Ch 2. 1 Step 1](#) before continuing.

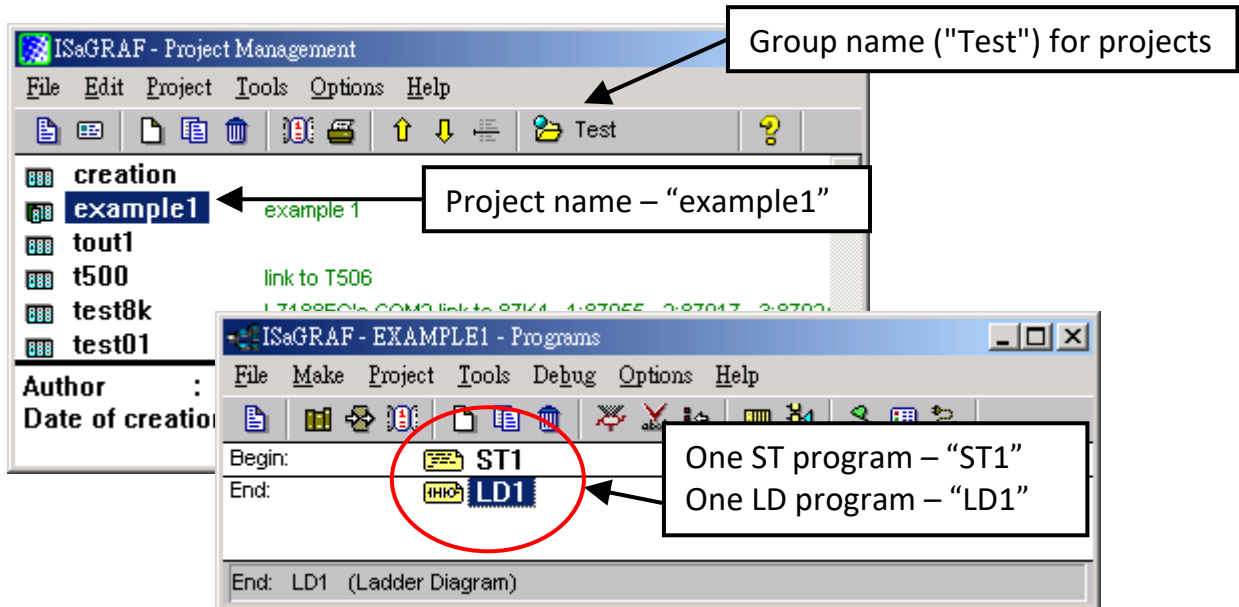
Execute **setup.exe** and follow the instructions of the InstallShield Wizard to install ISaGRAF Utilities.



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 PAC to make it work. If “ISaGRAF” and “ICP DAS Utilities for ISaGRAF” have not been installed, go back to [2. 1:Step 1](#) & [2. 2:Step 2](#).

This example contains two programs. One is **ST** program and the other is **LD** program.



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

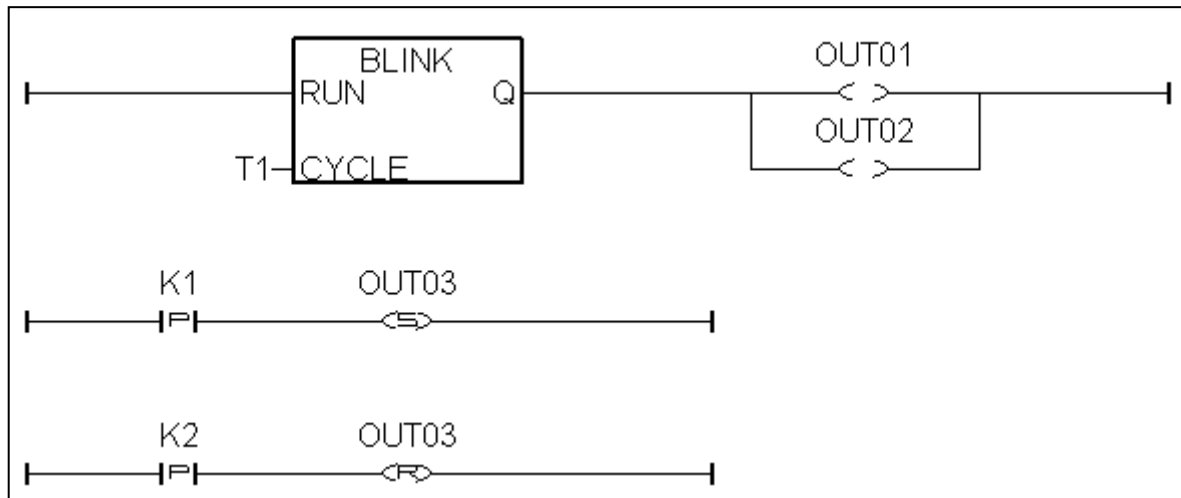
ST program – "ST1" outline:

```
IF INIT THEN

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

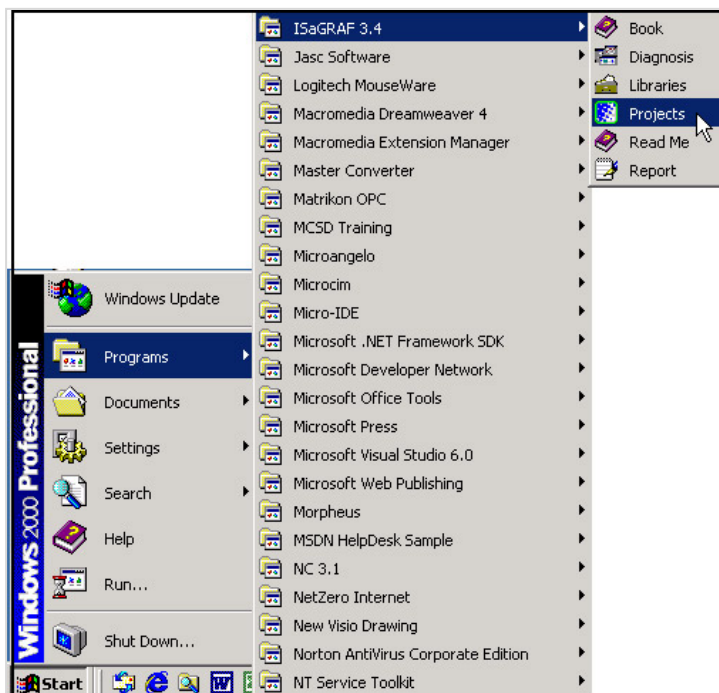
END_IF;
```


Ladder Logic Program Outline:



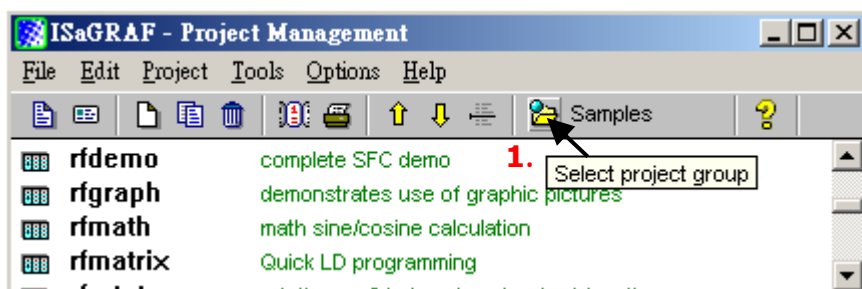
2.3.1 Open ISaGRAF-Project Management

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



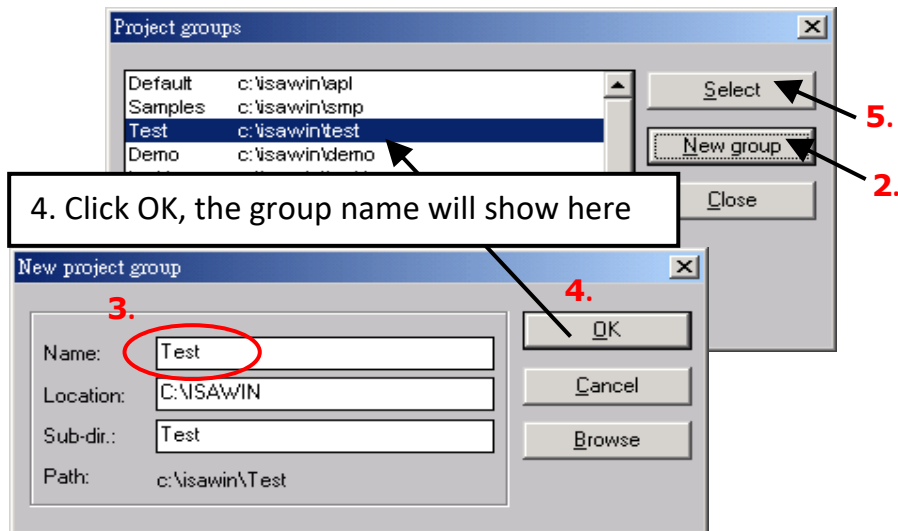
2.3.2 Creating an ISaGRAF User's Group

Click on the [Select Program Group] to open the Project Groups window.



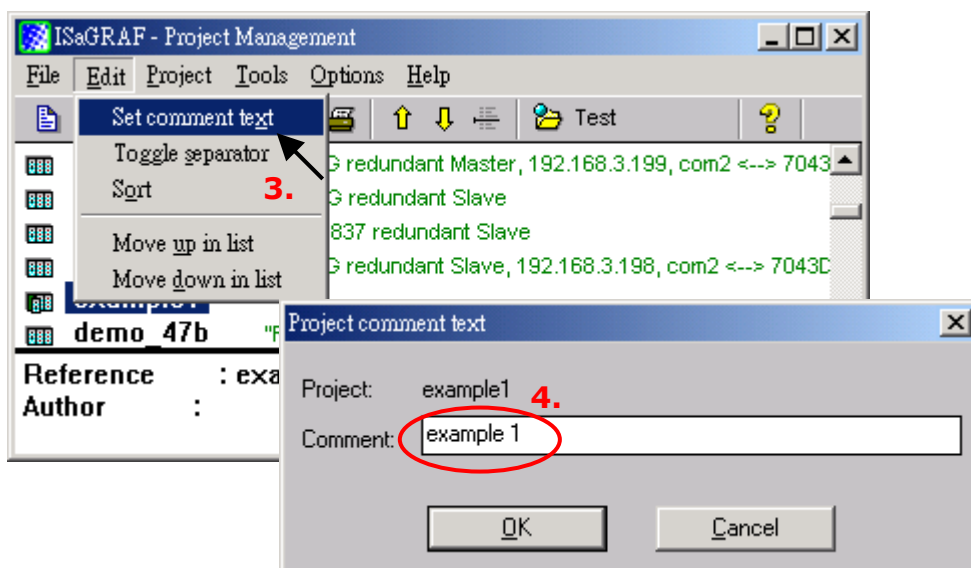
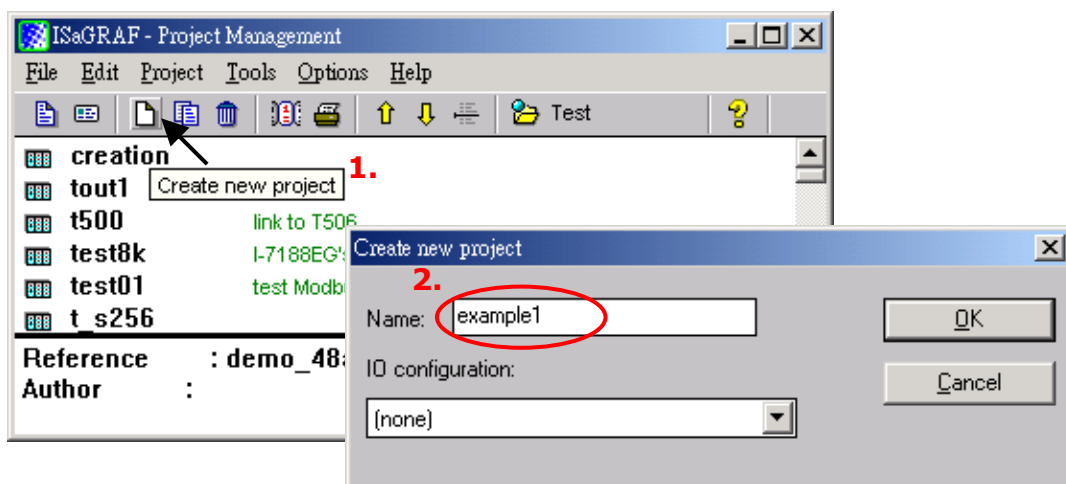
As the figure below, click [New Group] and enter a group name, then click on “OK”.

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

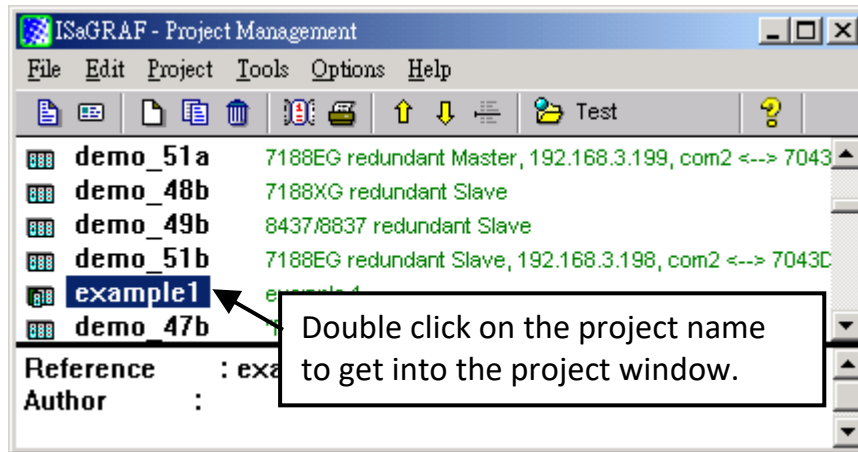


2.3.3 Creating a New ISaGRAF Project

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



You can see the new project name in the "Project Management" window. Double-click on it to open the project.

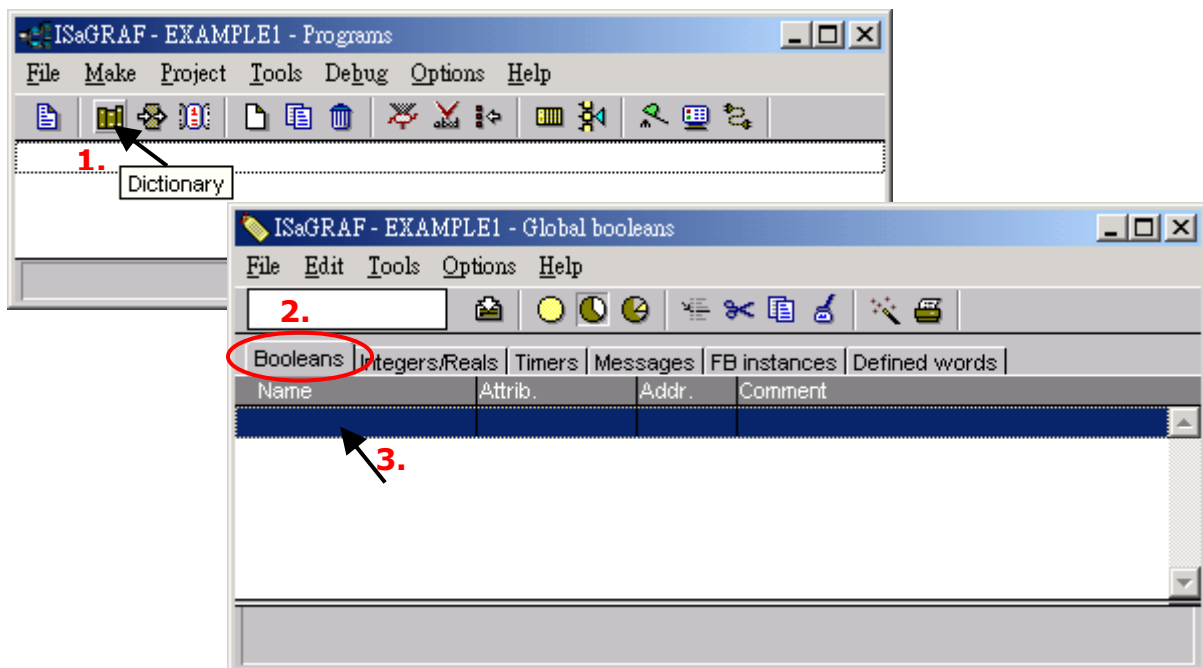


2.3.4 Declaring the ISaGRAF Project Variables

When editing an ISaGRAF program, variables should be declared before to use.

Declaring Boolean:

1. To begin this process, click on the "Dictionary" button.
2. Click on the "Booleans" tab to declare the Boolean.
3. Double-click the first blank row below the "Booleans" tab to open the "Boolean Variable" window.



([Please refer to ch2. 3 Variables declaration](#))

4. As the figure below, enter a name in the Name field (e.g., "INIT").
5. Add notes in the Comment field (e.g., "Flag to indicate first scan cycle or not").
6. Set the attribute for the "INIT" variable (e.g., "Internal").

7. Check the "set to true at init" box to set the initial value as 'TRUE'.
8. Click the "Store" button to save it. A new Boolean variable has now been declared.

Boolean Variable

Name: Network Address:

Comment:

Attributes:

- ☒ Internal
- ☐ Input
- ☐ Output
- ☐ Constant

Values:

False:

True:

☒ set to true at init

☐ Retain

Buttons: Store, Cancel, Next, Previous, Extended

Also, click on the variable name to view the information about the variable on the message bar.

ISaGRAF - EXAMPLE1 - Global booleans

File Edit Tools Options Help

Booleans | Integers/Reals | Timers | Messages | FB instances | Defined words

Name	Attrib.	Addr.	Comment
INIT	[internal]	0000	Flag to indicate first scan cycle or not

INIT (* Flag to indicate first scan cycle or not *)
@0000 [internal] (false,true) [:=TRUE]

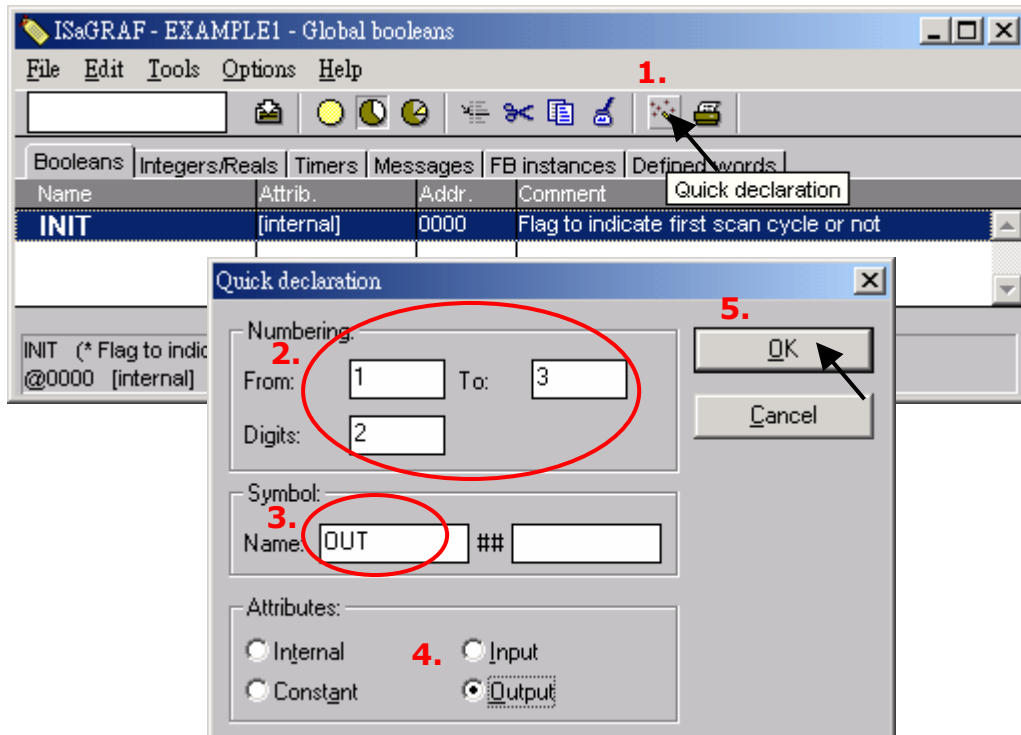
Note:

Make sure that each variable has the proper attribute assigned. Also, you can double-click the variable name to change the setting.

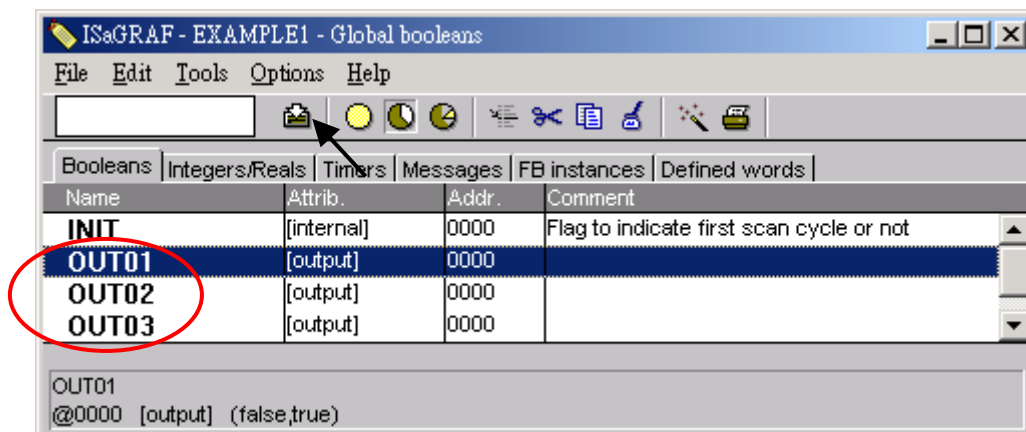
Quick Declaration:

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,

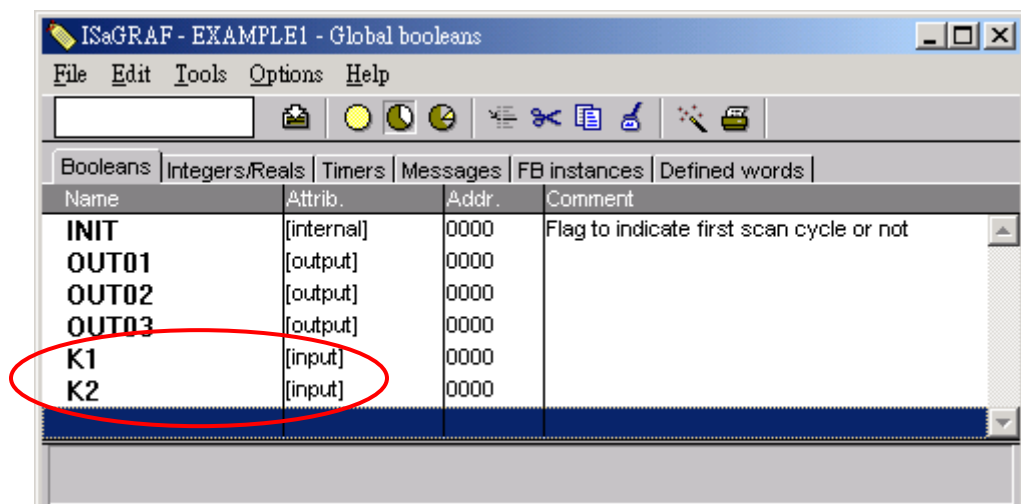
1. Click on the "Quick Declaration" button.
2. Enter in the output number that you will start within the "Numbering" from and "To" field (this example uses from 1 to 3).
3. Enter the "Symbol" name for the output variables being declared.
4. Lastly, set the attribute to "Output" and then press "OK".



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



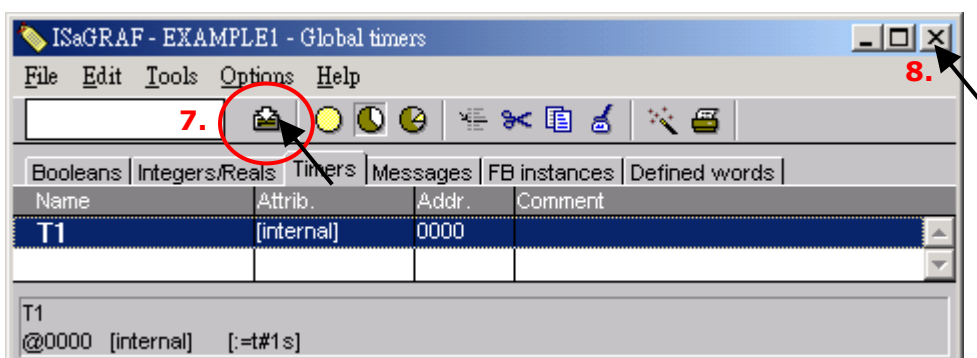
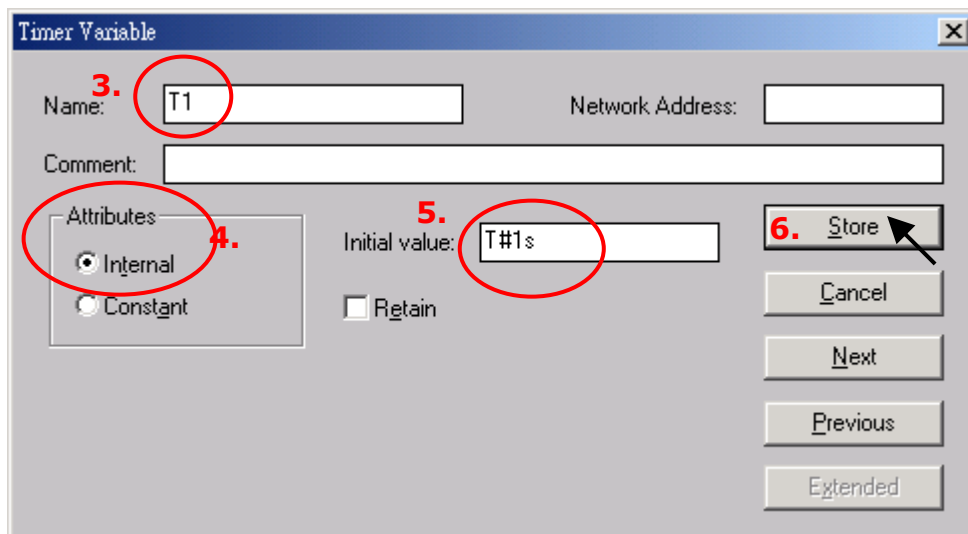
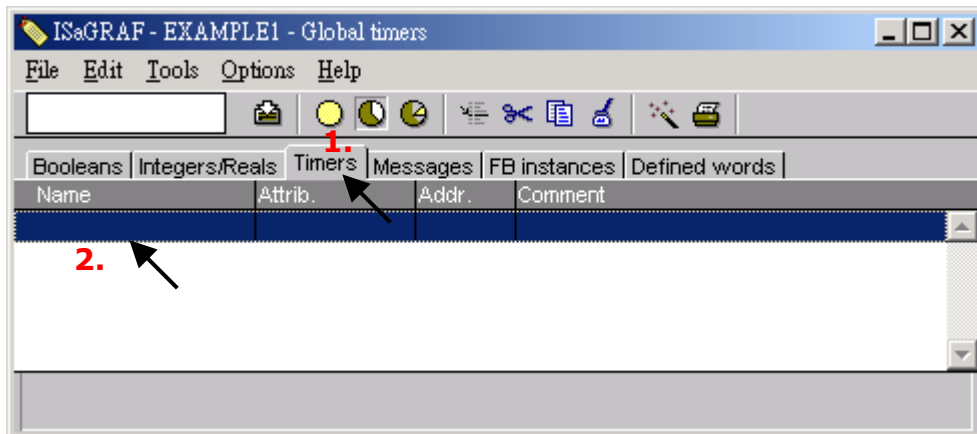
Use the same method as former to create another 2 variables – “K1” & “K2” however with “input” attribution.



Declaring Timer

To declare the timer (T1) variable used in this example program:

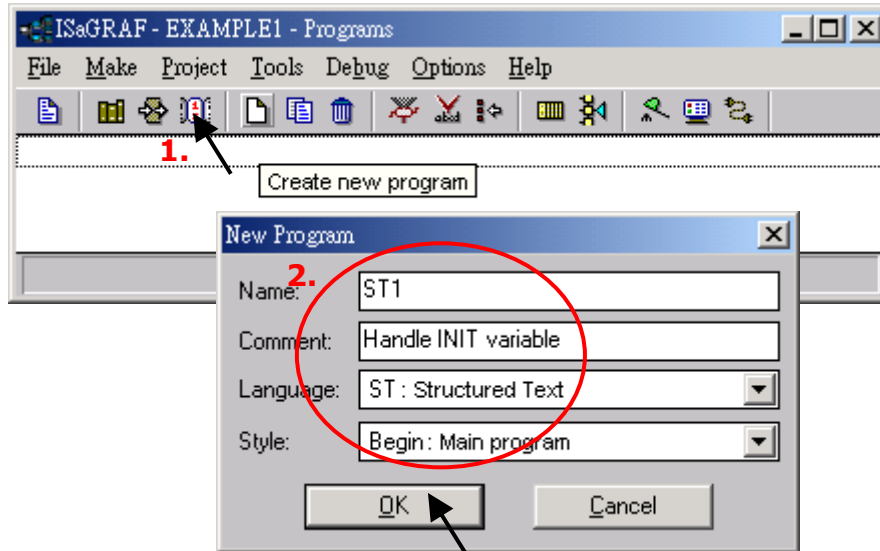
1. Click the "Timers" tab in the setup screen and double-click on the colored area.
2. Enter the Name as "T1" and set the "Attributes" to "Internal".
3. Set the "Initial Value" to "T#8s", then click on the "Store" button.
4. Click the "Save" button and click on "X" to close the window.



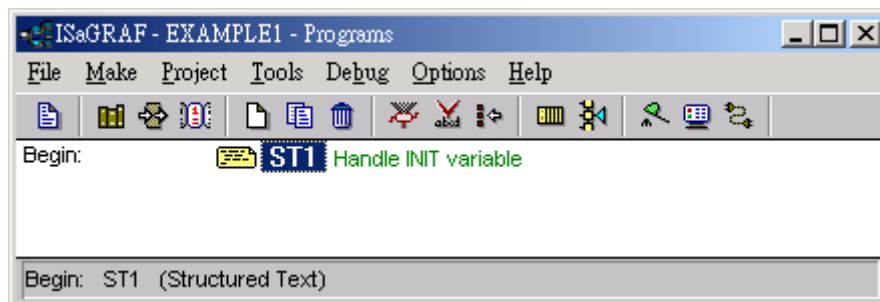
2.3.5 Create and Edit the ST - “ST1” Program

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

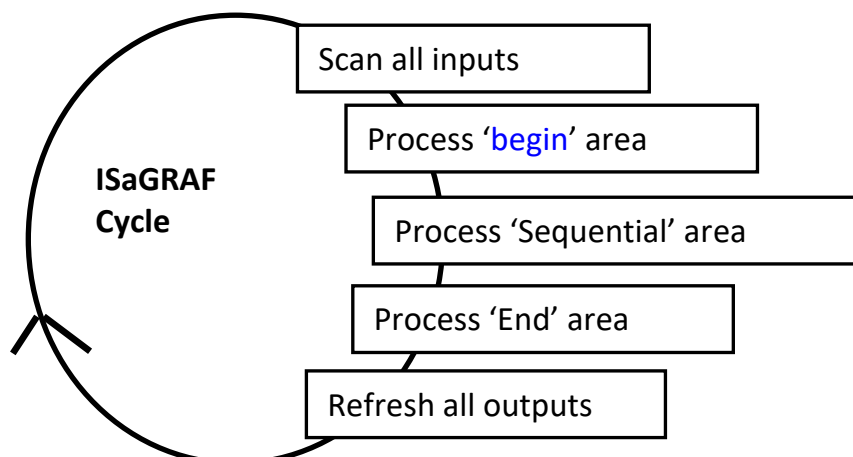
1. Click on “Create new program” in the window.
2. Given the Name as “ST1”, the Comment as “Handle INIT variable”, the Language as “ST: Structured Text”, and then Style as “Begin: Main program”. Then click on “OK”.



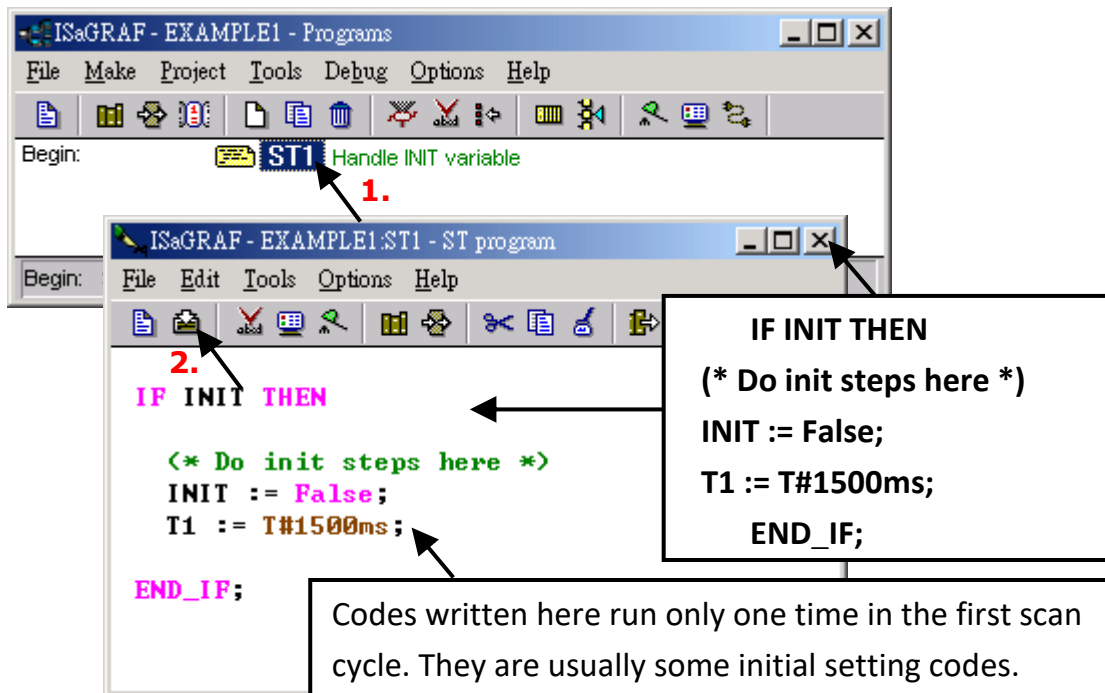
Now we have one program inside this project.



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.

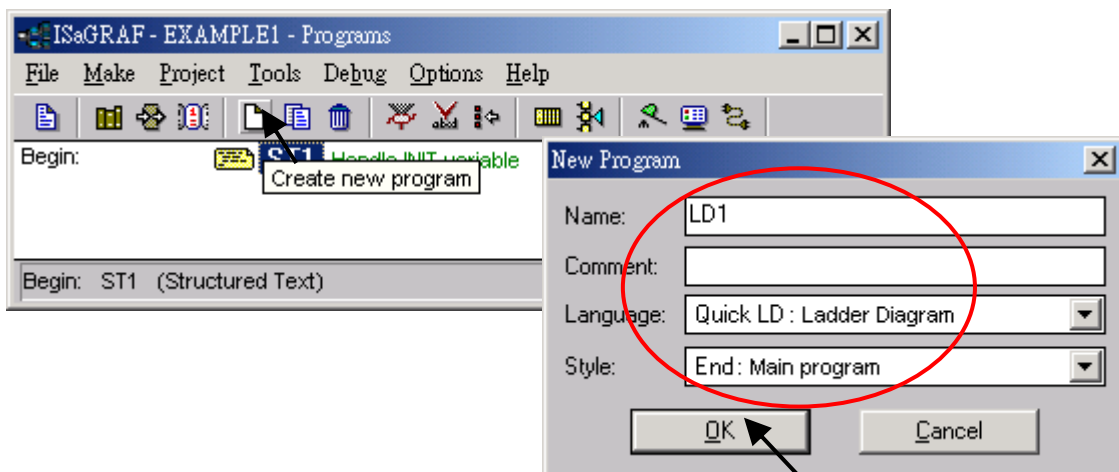


Double-click on “ST1” program to edit it. Click on “save” and then exit when you finish it.
Note: Any character inside between (* and *) is the comment.

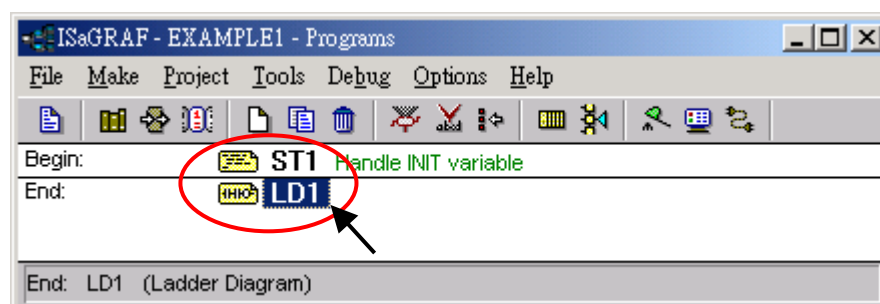


2.3.6 Create the LD - “LD1” Program

Click on the “Create New Program” button 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”. Also, add any desired text in the “Comment” field.

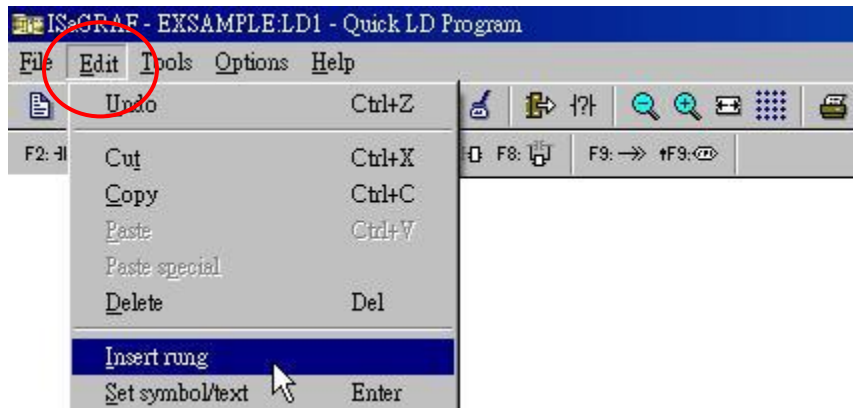


Now we have two programs inside this project. Double-click on the “LD1” to get into it.

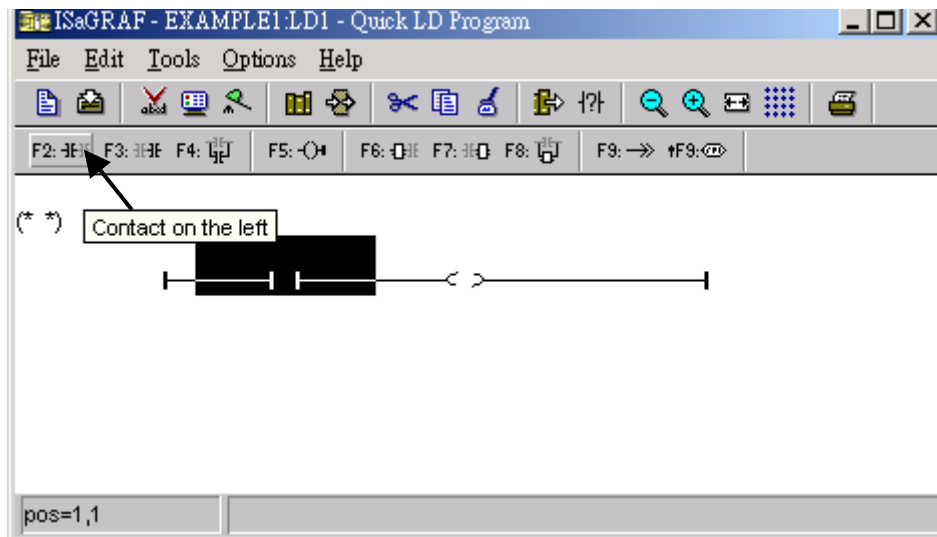


2.3.7 Edit the “LD1” Program

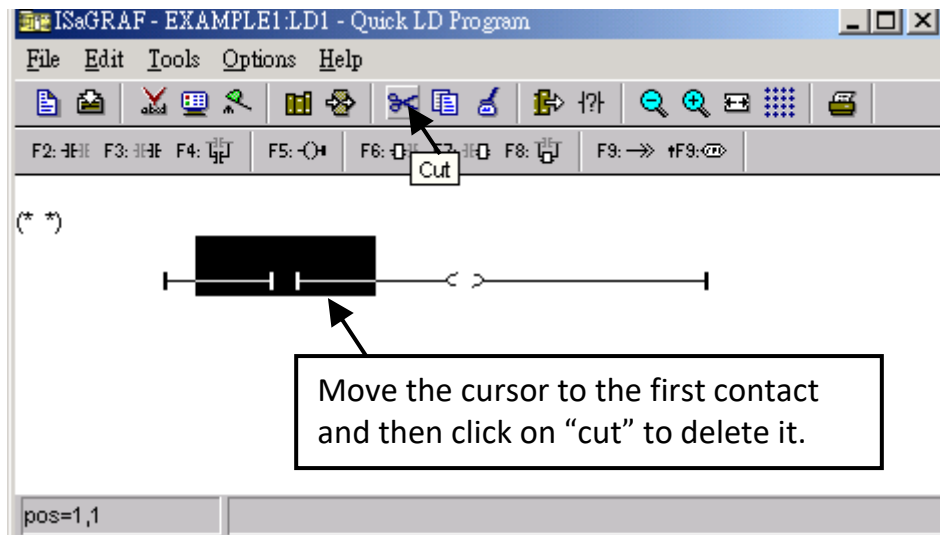
Once double-click on the “LD1”, the “Quick LD Program” window will appear. To begin editing, click “Edit” on the menu bar and then click on “Insert Rung”. “Insert Rung” means to insert a basic LD rung just above the current position.



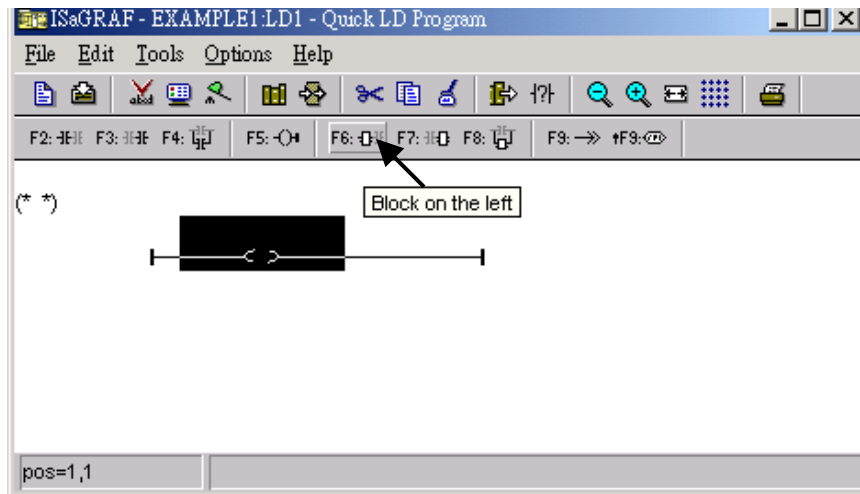
Or, you may just click on the “F2 (Contact on the Left)” button, and the following will appear within the Quick LD Program window.



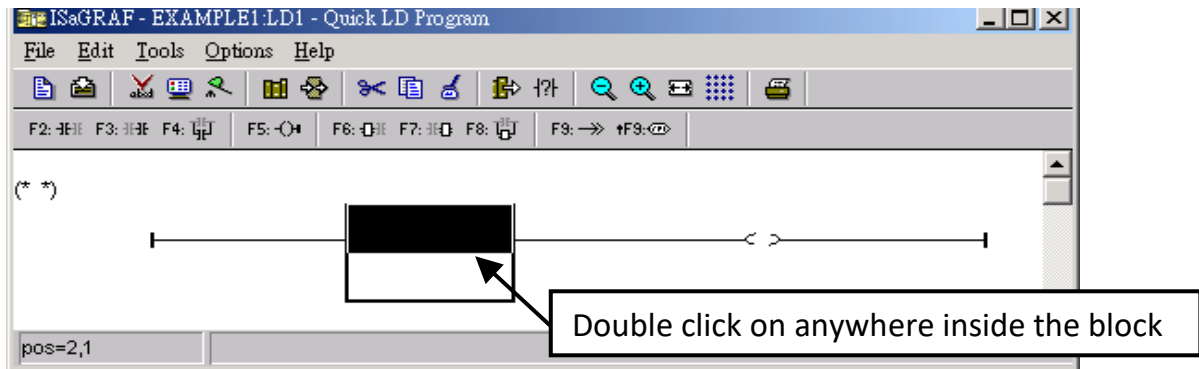
We are going to write the first line of the LD1 program. Move the cursor to the first “contact” and then click on “cut” to delete it.



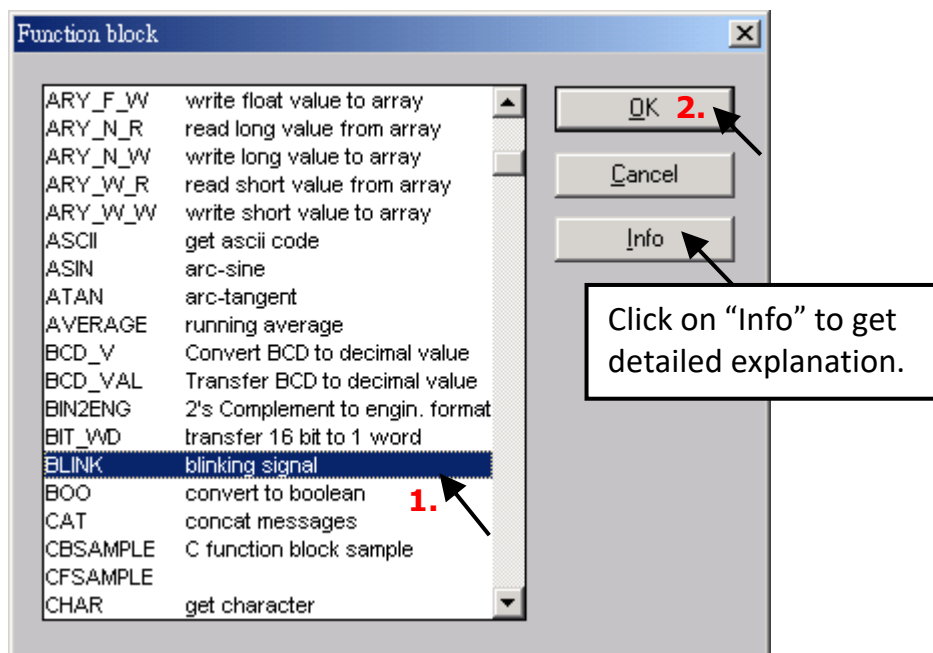
Click on the “F6 (Block on the left)” button and you will create a block on the left of the “coil”.



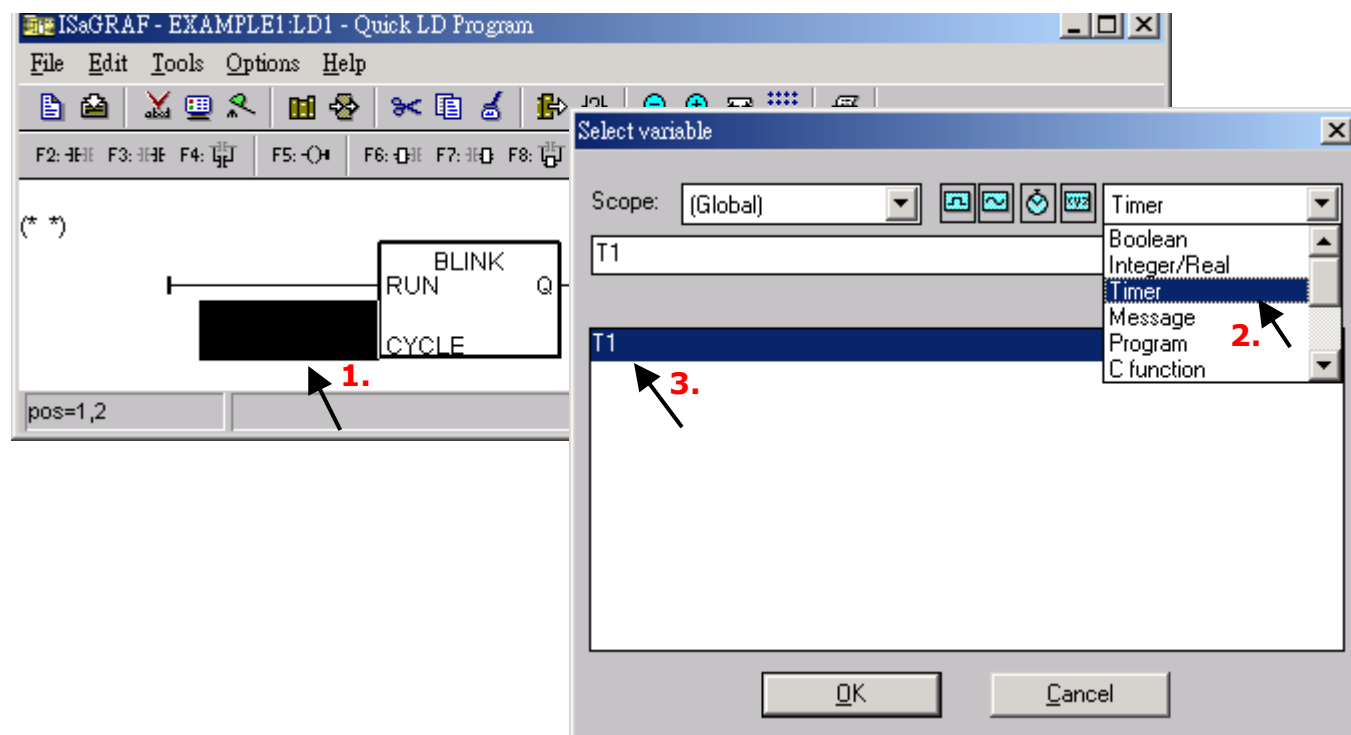
Now we are going to assign the associated variable & constant to each item. Double-click anywhere inside the block and the “Function Block” assignment window appears.



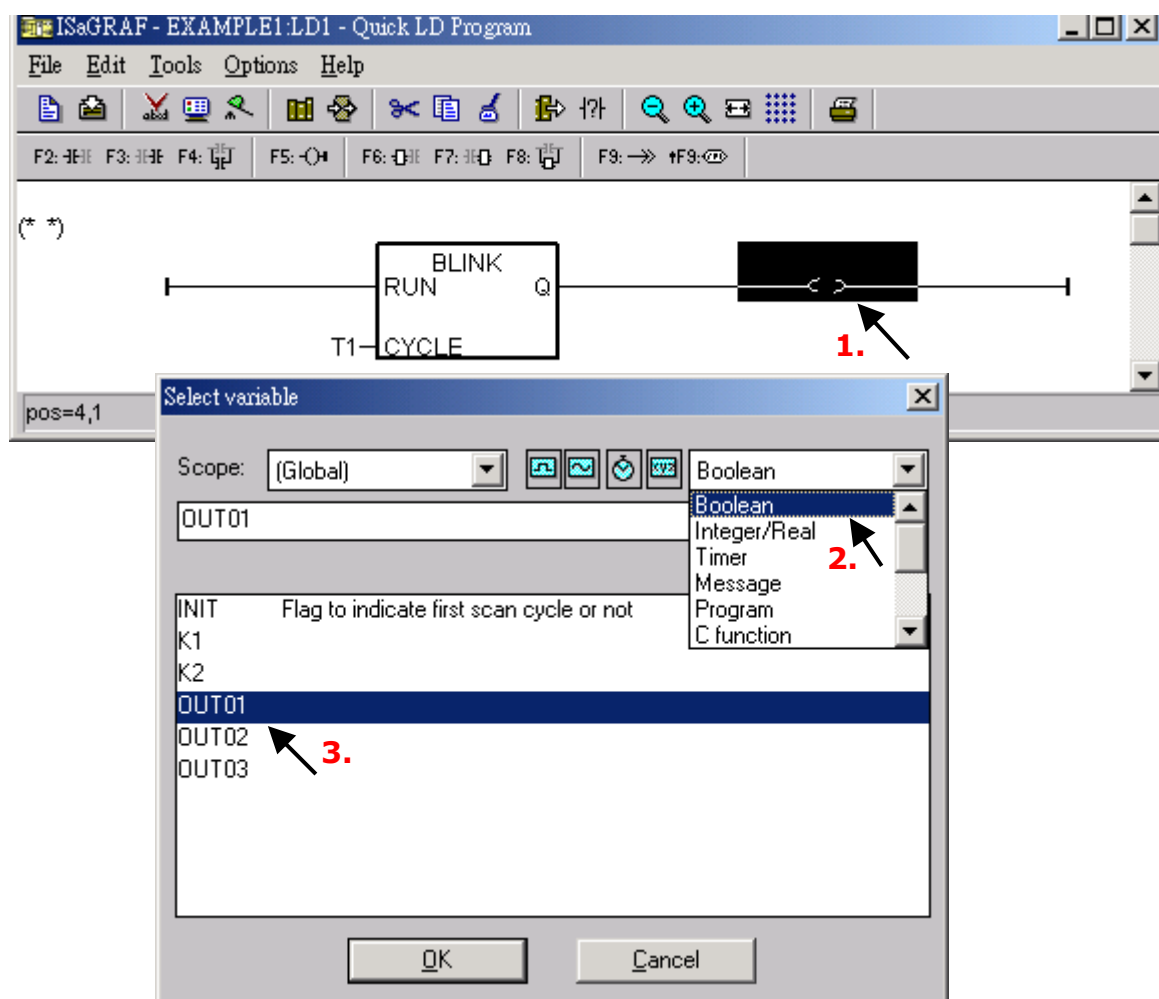
Select the “BLINK” type function block and press “OK”. To learn how the “BLINK” function operates you can click on the “Info” button for a detailed explanation of its functionality.



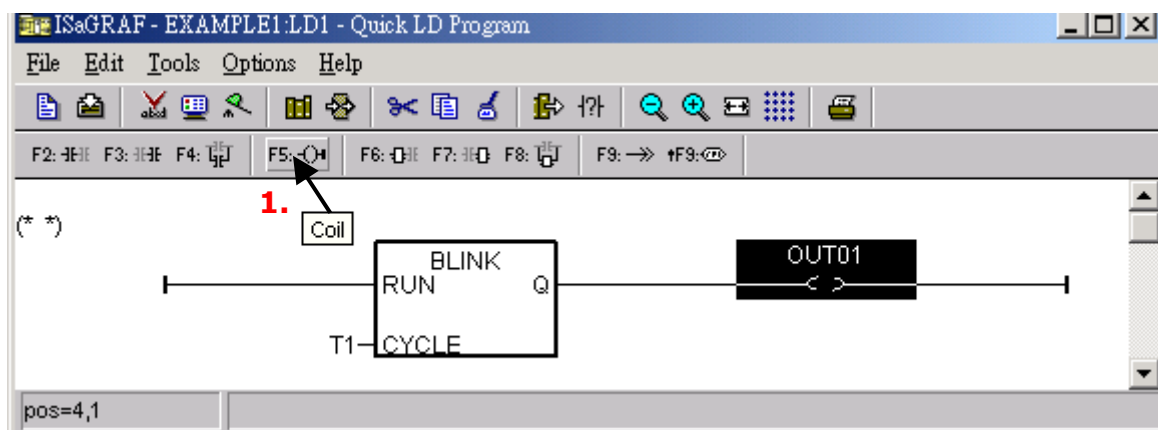
Now move your cursor to the left of the parameter “CYCLE” of the “BLINK” block. Double-click on it, select “Timer” and then double-click on variable name - “T1”



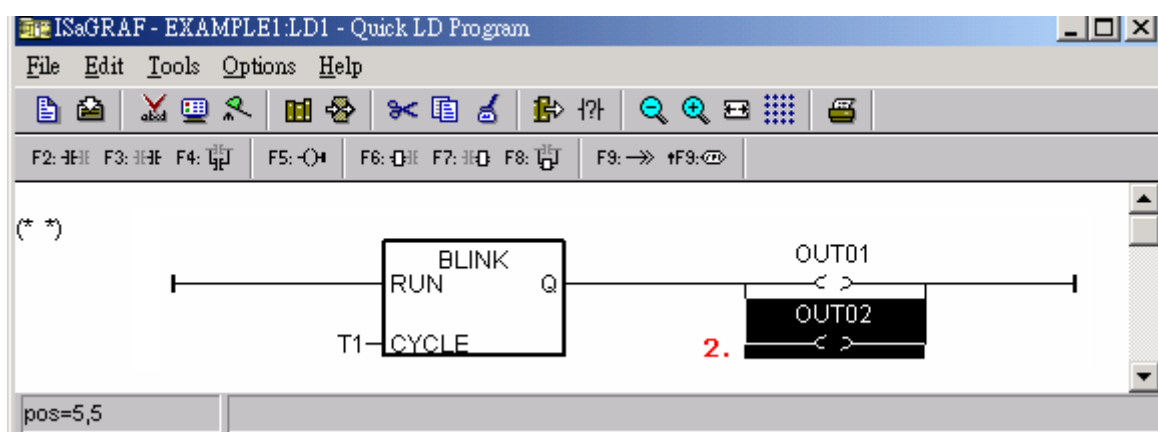
Move your cursor to the “coil”. Double-click on it, select “Boolean” and then double-click on variable name – “OUT01”.



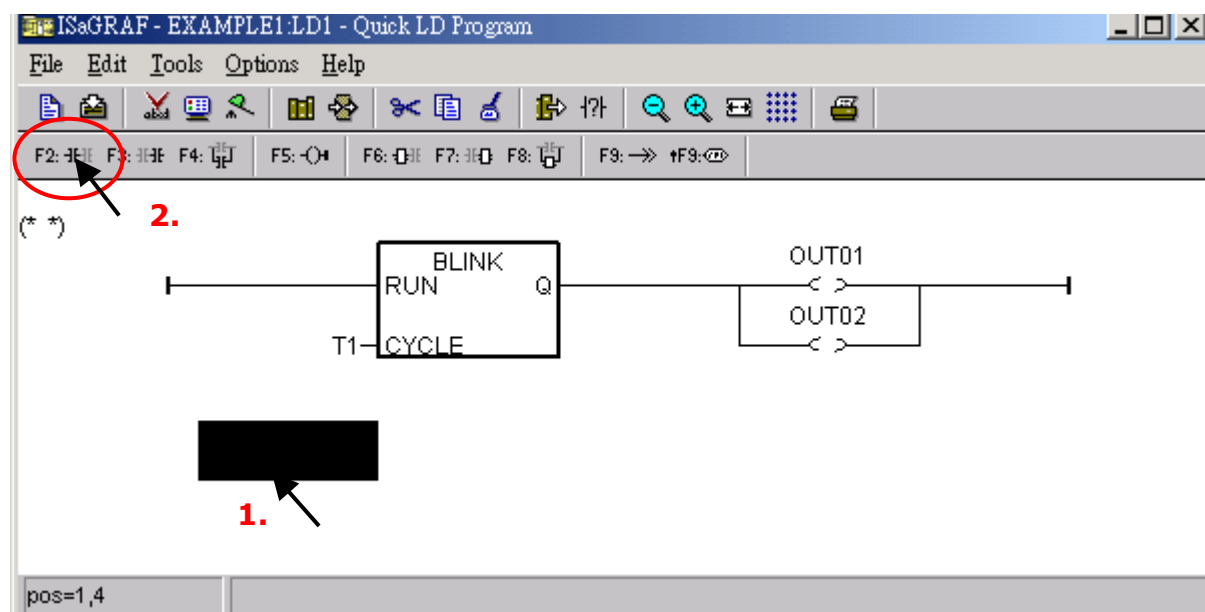
Click on “coil” button to create one another coil below the “OUT01”, and then assign a Boolean name – “OUT02” to it.



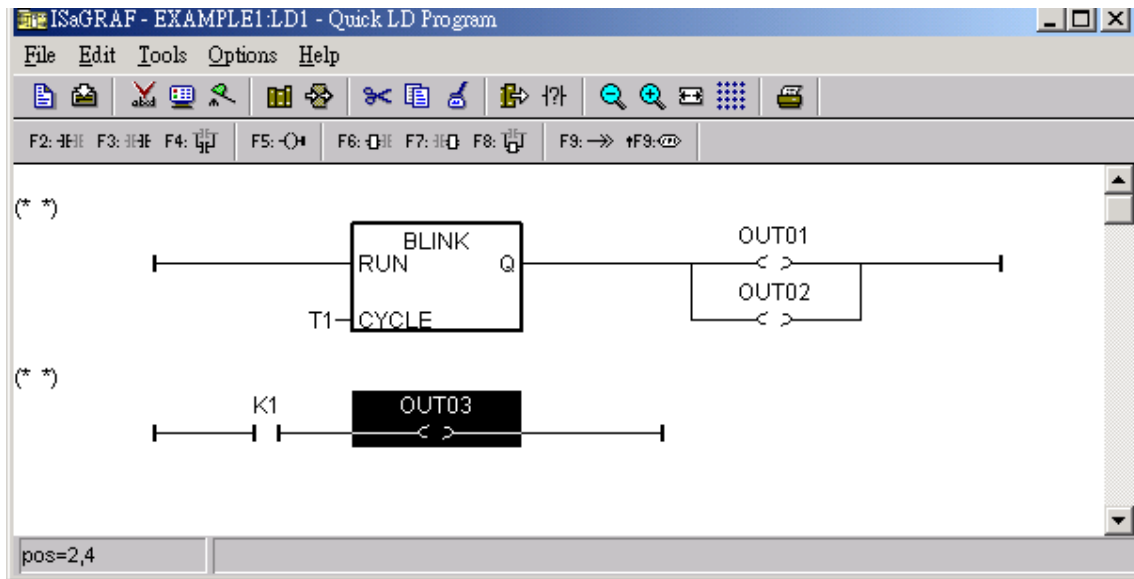
Then we have the below window.



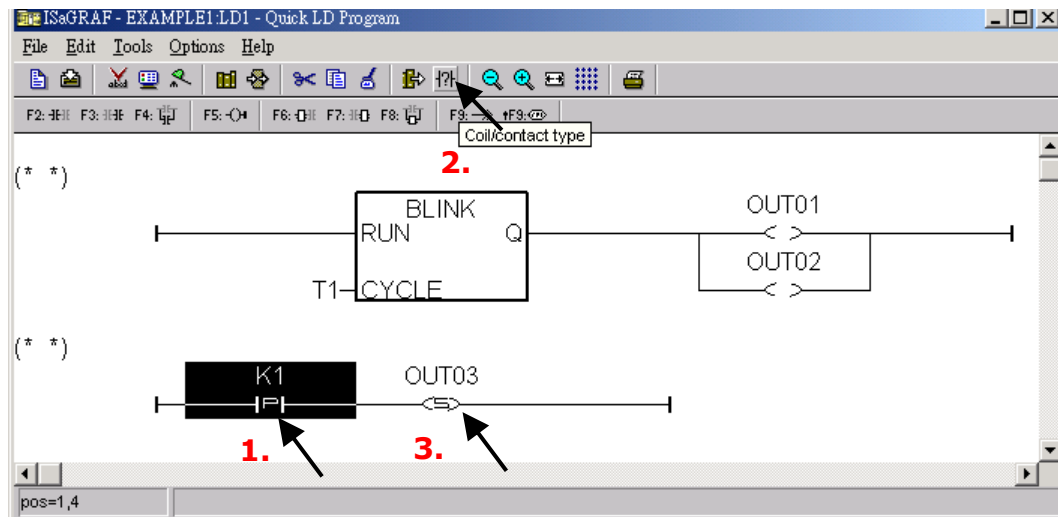
To insert the second LD rung, move the cursor to be under the first rung, then click on “Edit” – “Insert rung”.



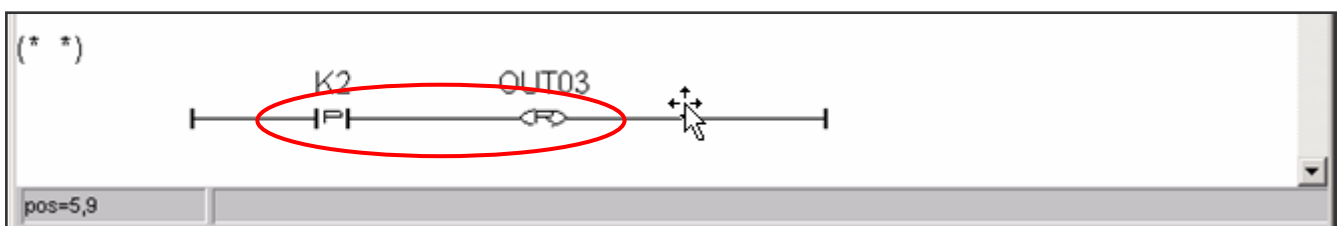
Using the same ways as former to assign name “K1” and “OUT03” to the correct position.



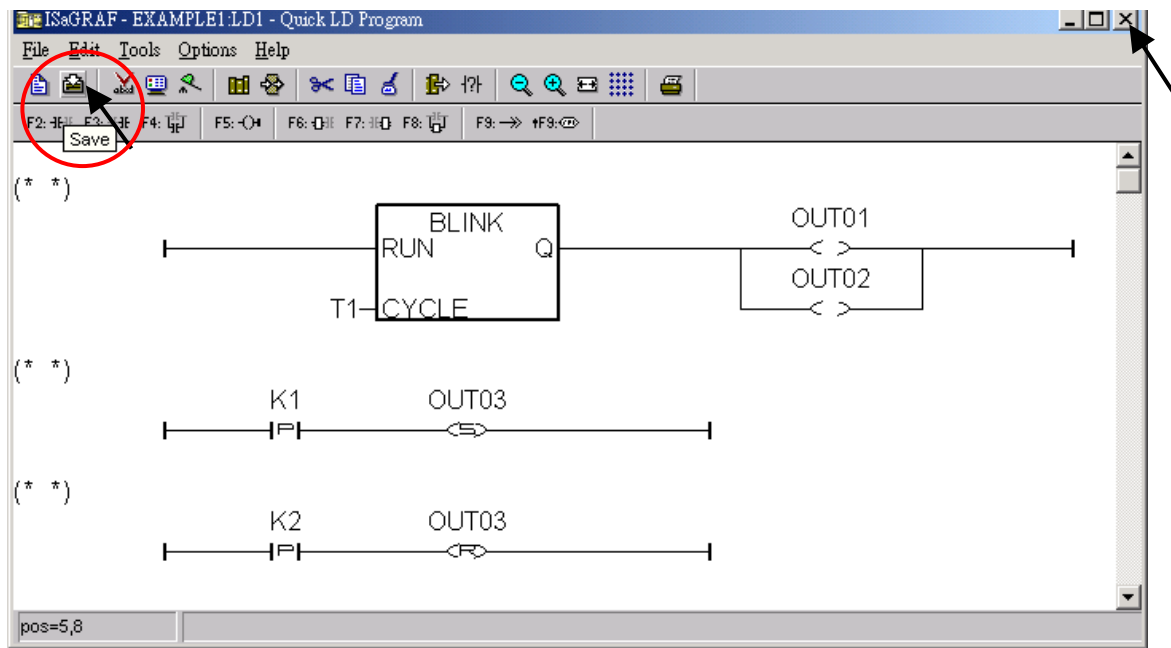
Move the cursor to “K1” and then click on “Coil/contact type” several times to set the type of K1 to “P” and then set the type of OUT03 to “S”.



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



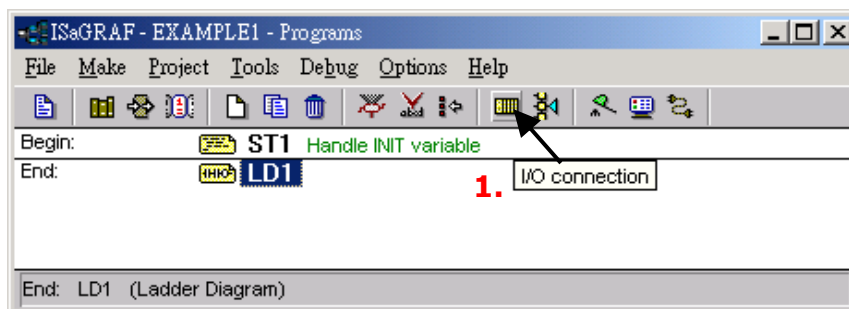
By now, we have completed the LD1 program, click the “Save” button to save the program and click “x” to exit the window.



2.3.8 Connecting the I/O

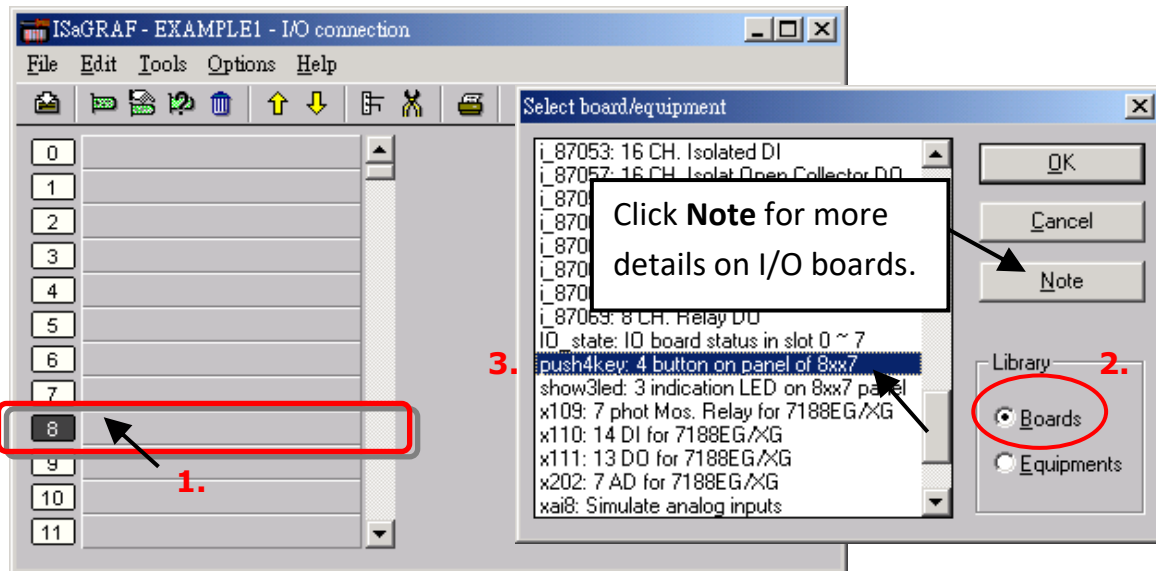
In the Section 2.3.4, We have declared “output” variables (i.e., “OUT01”, “OUT02”, and “OUT03”) and “input” variables (i.e., “K1” & “K2”). These “input” & “output” variables should be mapped to I/O channels or function keys on the PAC before they can work.

To do that, click on “I/O connection” to get into the I/O connection window.

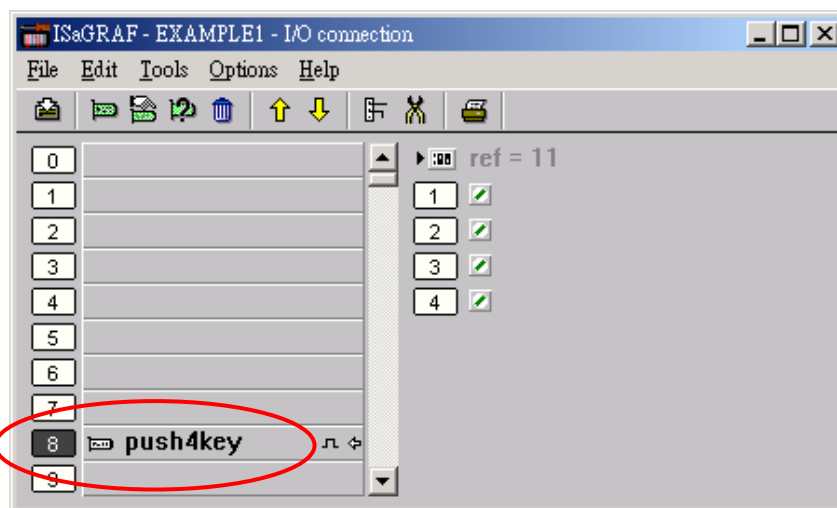


As the figure below, double-click the slot 8 and select “Boards” and then double-click the “push4key: 4 button on panel of 8xx7” to select the function.

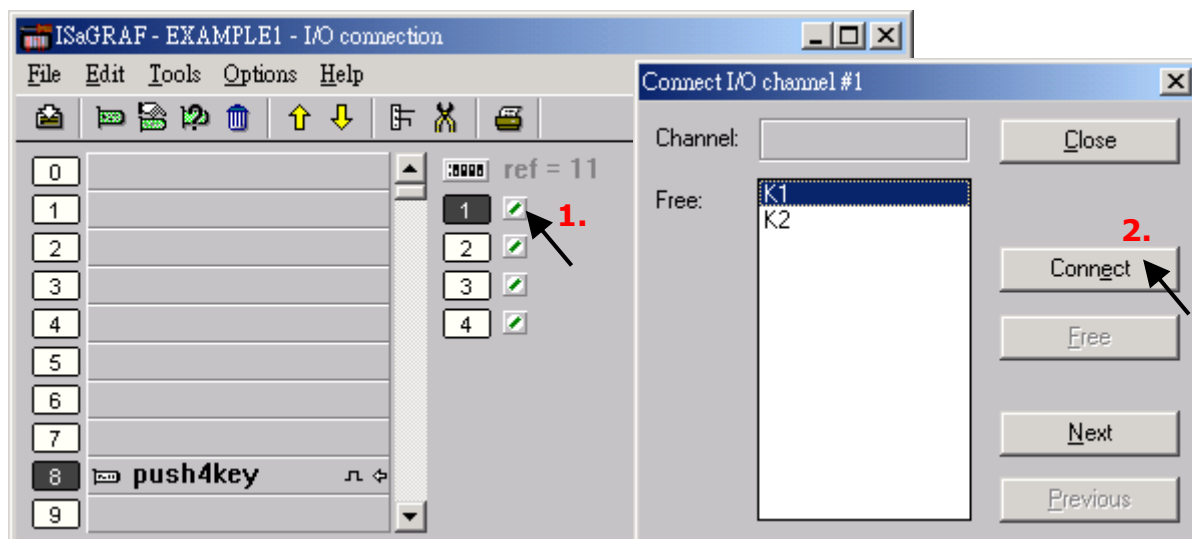
Slot 0 to 7 is used to connect I/O modules on the PAC, in this case, add the DI function on slot 8.



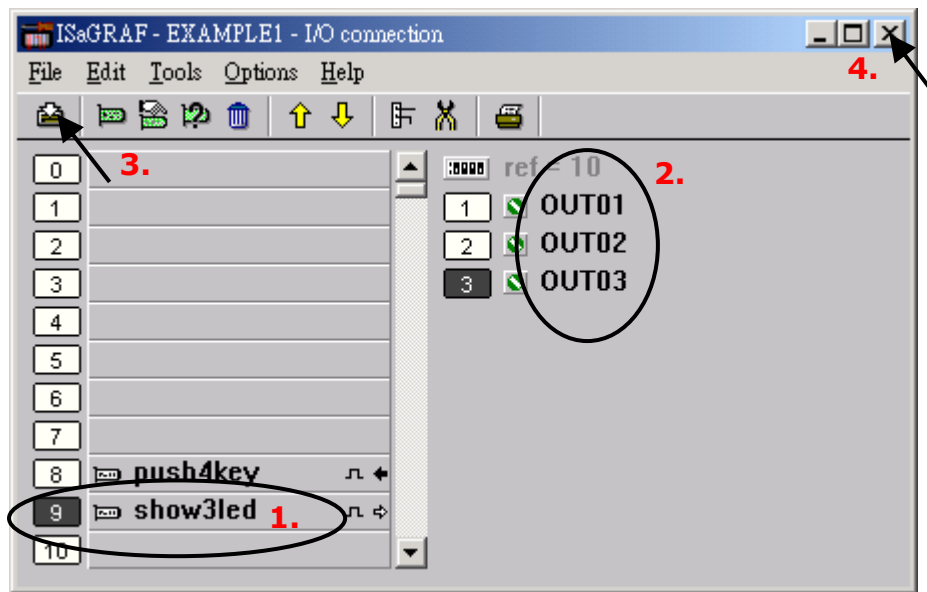
Then we have this window.



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



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



IMPORTANT NOTICE:

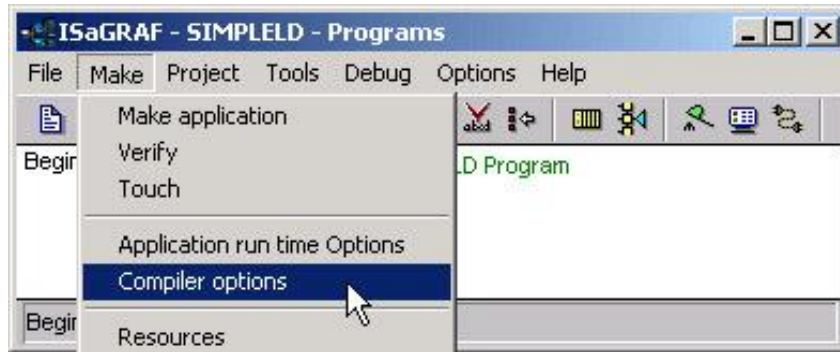
1. I/O Slots 0 through 7 are reserved for REAL I/O boards that will be used in the I-8xx7 PAC. You can use slot No. 8 and above for additional functionality as illustrated by the example program.
2. All of the variables with “Input” and “Output” attribute MUST be connected through the I/O connection 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.

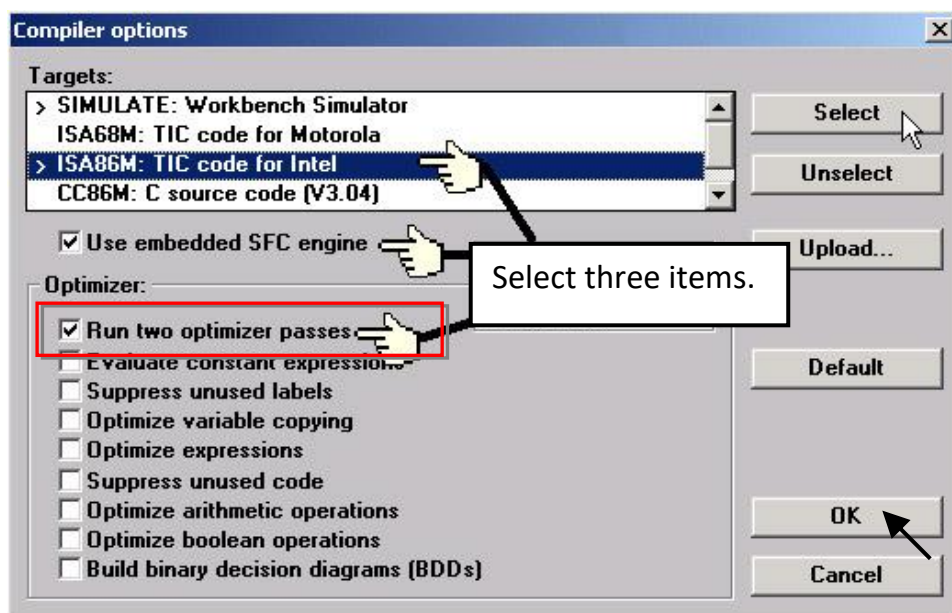
2.4 Step 4 - Compiling & Simulating the Example Project

- ★ For the ISaGRAF program can work properly on the PAC, the user must choose the correct ISaGRAF "Compiler Options", i.e., the **"ISA86M: TIC Code for Intel"** option.

To begin the compilation process, click "Compiler Options" from the "Make" menu.



Make sure that three items illustrated in the figure below are selected and then click the "OK" button.



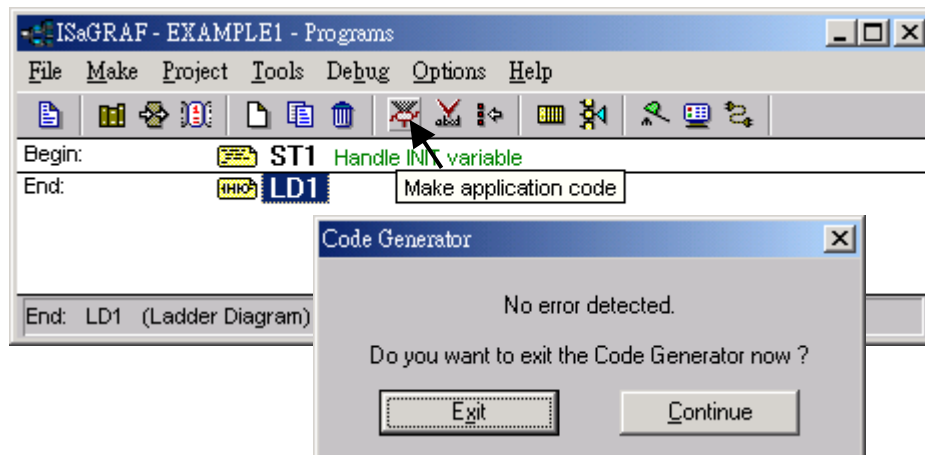
Note:

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

2.4.1 Compiling the LD Project

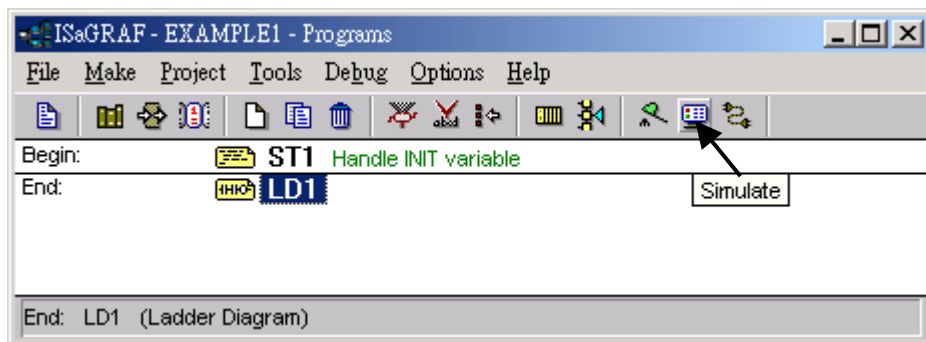
Click on the “Make Application Code” button to compile the example project. If there are no compiler errors detected during the compilation process, CONGRATULATIONS, you have successfully created our example program.

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

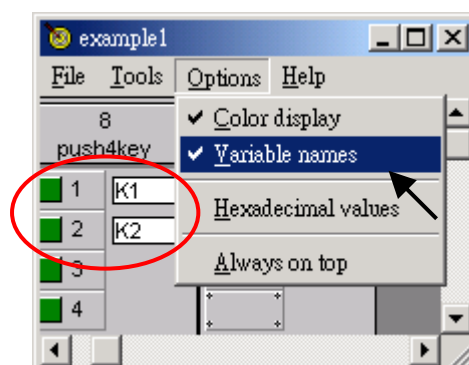


2.4.2 Simulating the LD Project

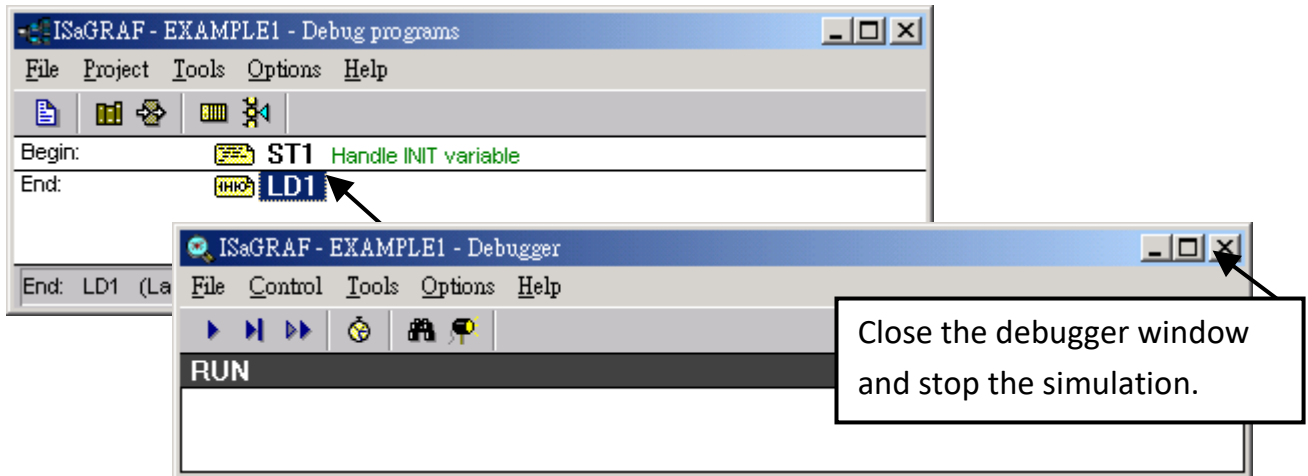
If the compilation is Ok, you may simulate the project on the PC to see how the program works without the PAC. To do that, click on the “Simulate” button.



Once you click on the “Simulate” button, the “ISaGRAF Debugger”, “ISaGRAF Debug Programs”, and “I/O Simulator” windows will be shown. If the names of I/O variables DO NOT appear in the I/O simulator window, just click “Options” on the menu bar, then click “Variable Names” to display variable names.

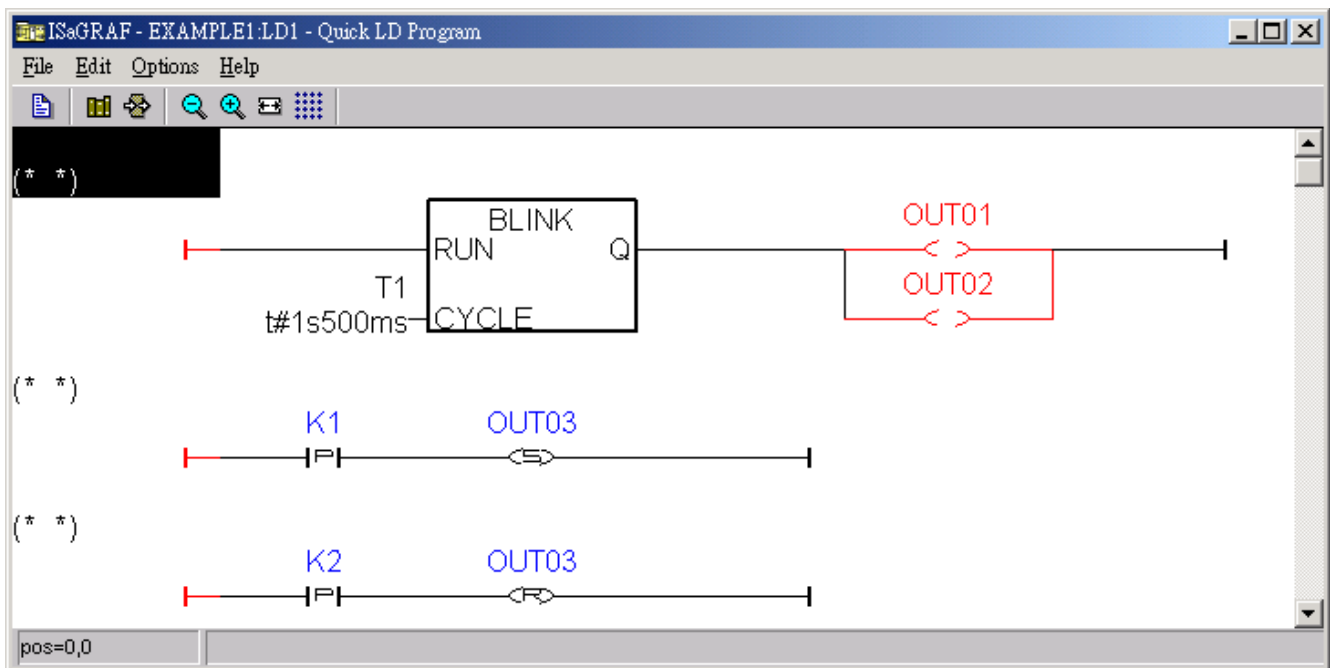


In the "ISaGRAF Debug Program" window, double-click on the "LD1" can see the simulation of LD program.

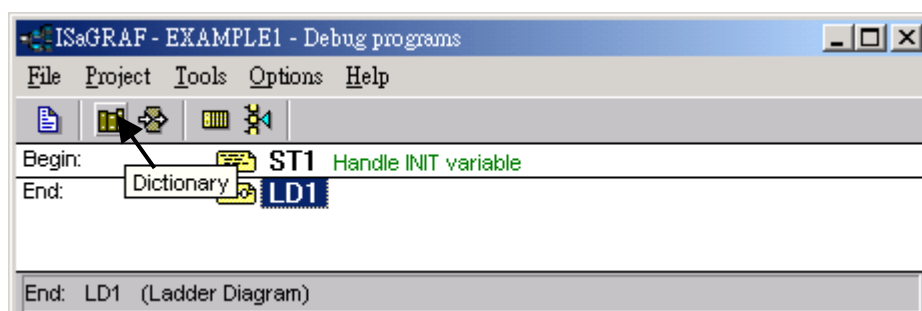


2.4.3 Running the Simulation Program

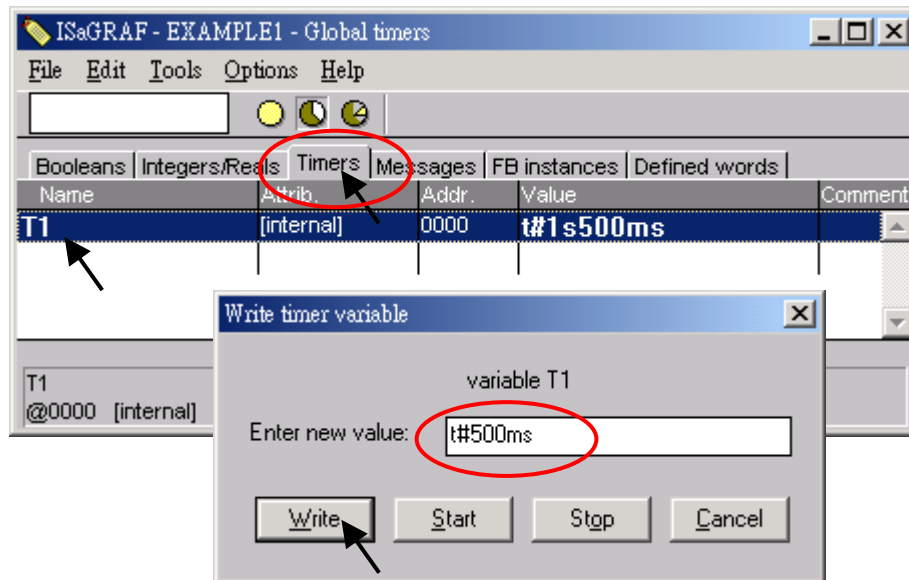
After double-clicking on "LD1" in the "ISaGRAF Debug Programs" window, you can see "OUT1" and "OUT2" is blinking every 1.5 seconds.



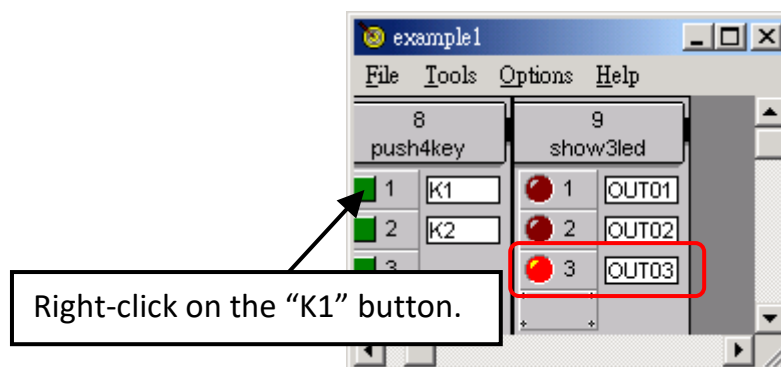
Users can adjust the value of the "T1" variable during the simulation. In this case, change the setting to blink every 0.5 second. To accomplish this, click the "Dictionary" button.



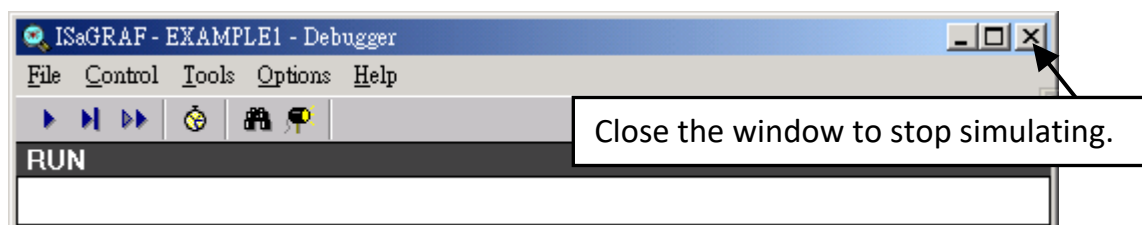
Double-click "T1" below the Timers tab in the " ISaGRAF Global Timers" window. Then, set the "T1" as "t#500ms" in the "Write Timer Variable" dialog box and click "Write" to set the value.



Now we are going to simulate the "K1" & "K2" input. Right-click on the "K1" button will light up the "OUT03". Also, try to click the "K2" button.

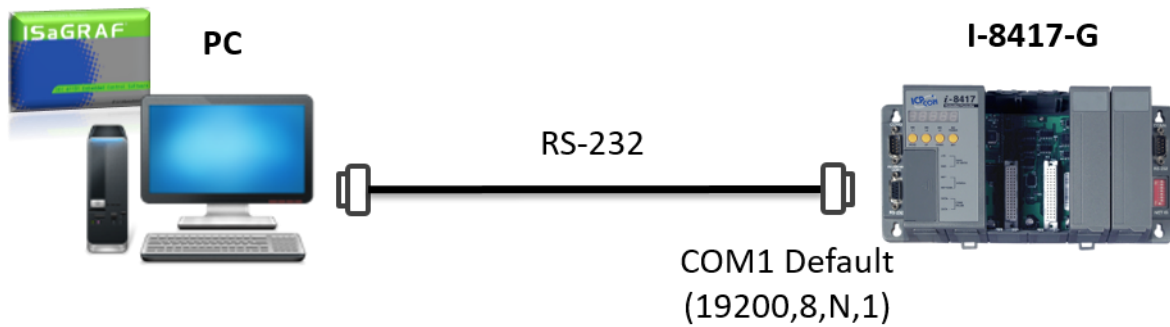


To exit the simulation, please close the debugger window.



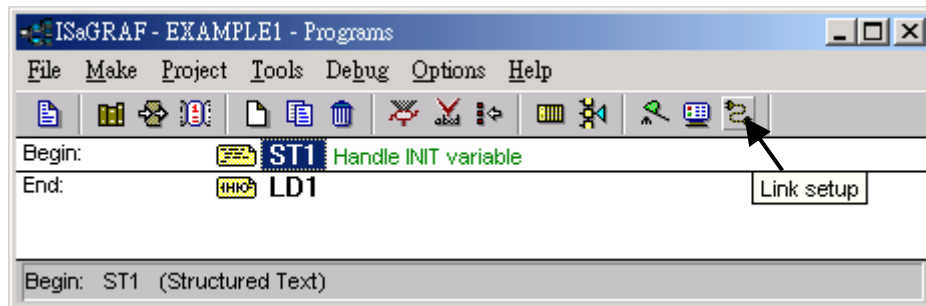
2.5 Step 5 - Download & Debugging the Example Project

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

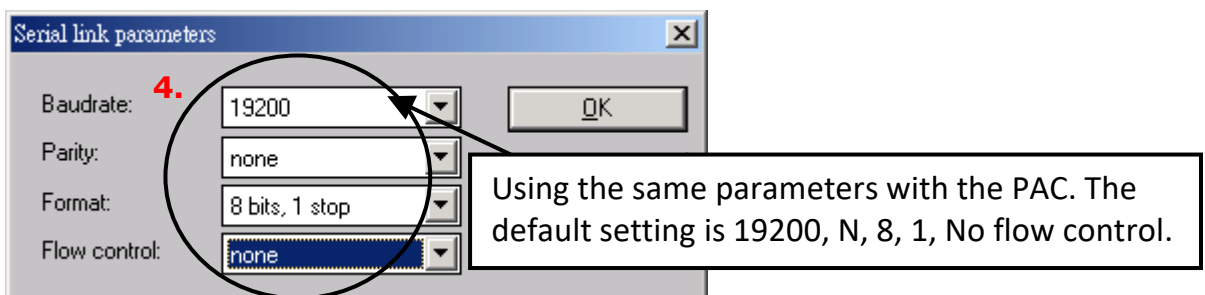
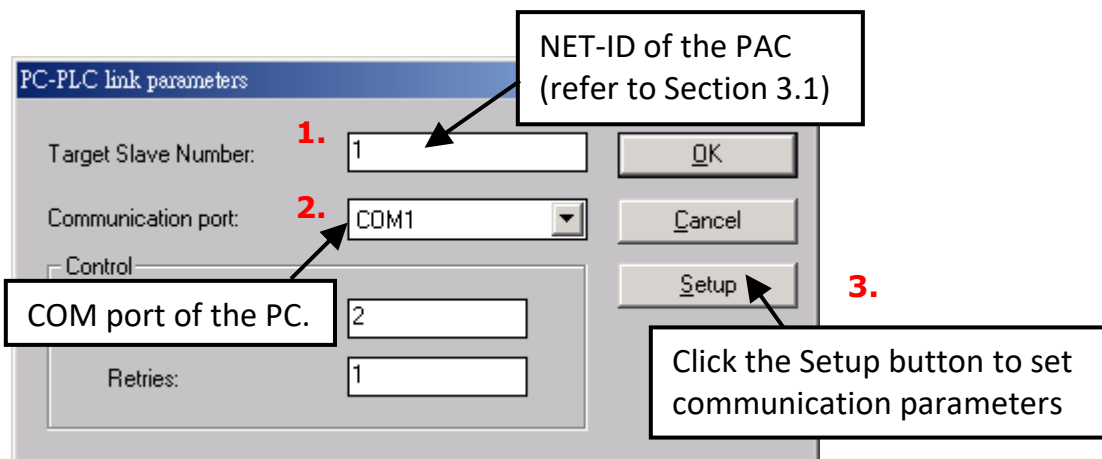


Note: The I-8xx7 shipping box includes one RS-232 cable that can be used to connect both COM1 (or COM2) of the PC and COM1 of the PAC.

Click the “Link Setup” button in the “ISaGRAF Programs” window.

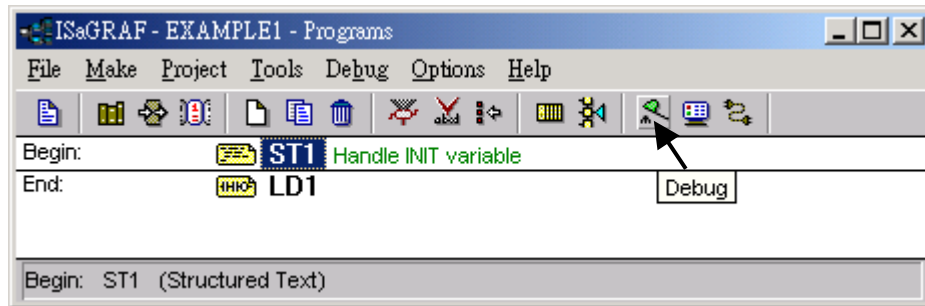


In the "PC-PLC Link parameters" window, set the communication parameters properly.

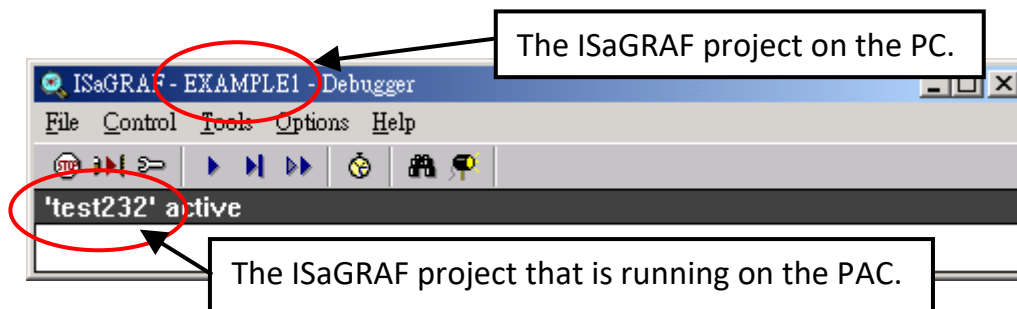


2.5.1 Downloading the Project

Before downloading the project to the PAC, make sure that the connection between the development PC and the PAC is functioning. The method is to click the "Debug" button in the "ISaGRAF Programs" window.



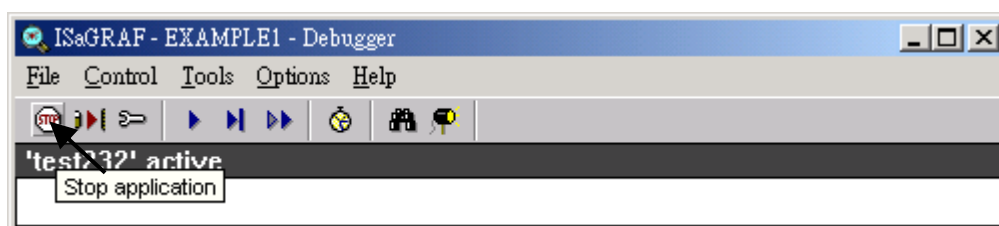
If the connection between a PC and a PAC is working, the project name which is running on the PAC will be displayed in the Debugger window.



If the message in the "ISaGRAF Debugger" window says "Disconnected" which means the connection between the PC and the PAC is not functioning.

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 PAC. Check the wired cable on both sides and refer to [section 2.5](#) to modify the COM port settings in the ISaGRAF "Serial Link Parameters" window.

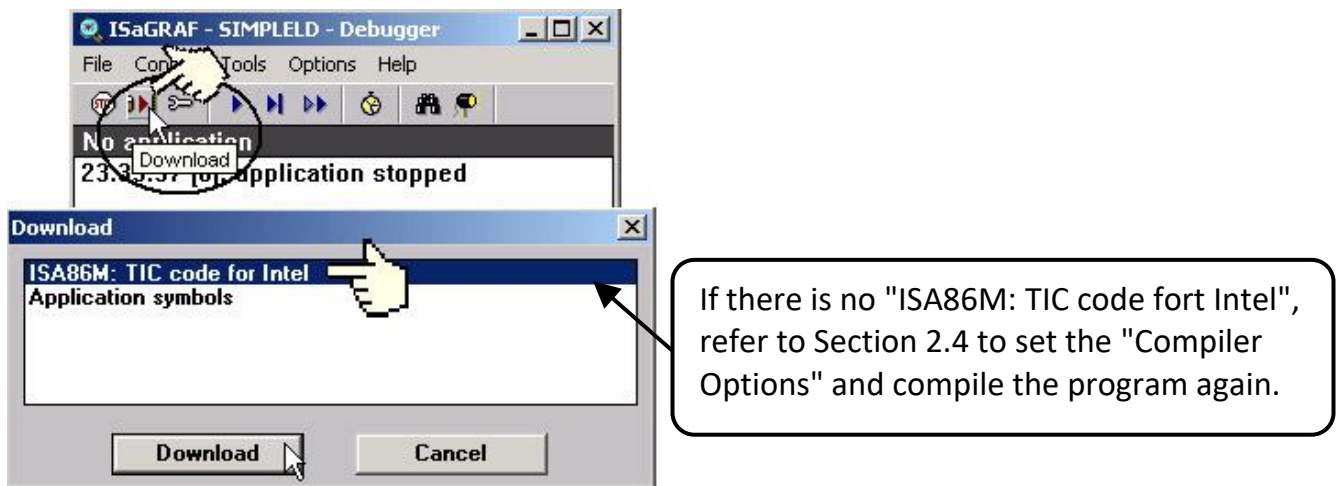
If there is a project running on the PAC, you need to stop that project before downloading a new one. The way is to click the "Stop application" button in the "ISaGRAF Debugger" window.



Then, the Example1 project can be downloaded to the PAC.

Starting the Downloading Process

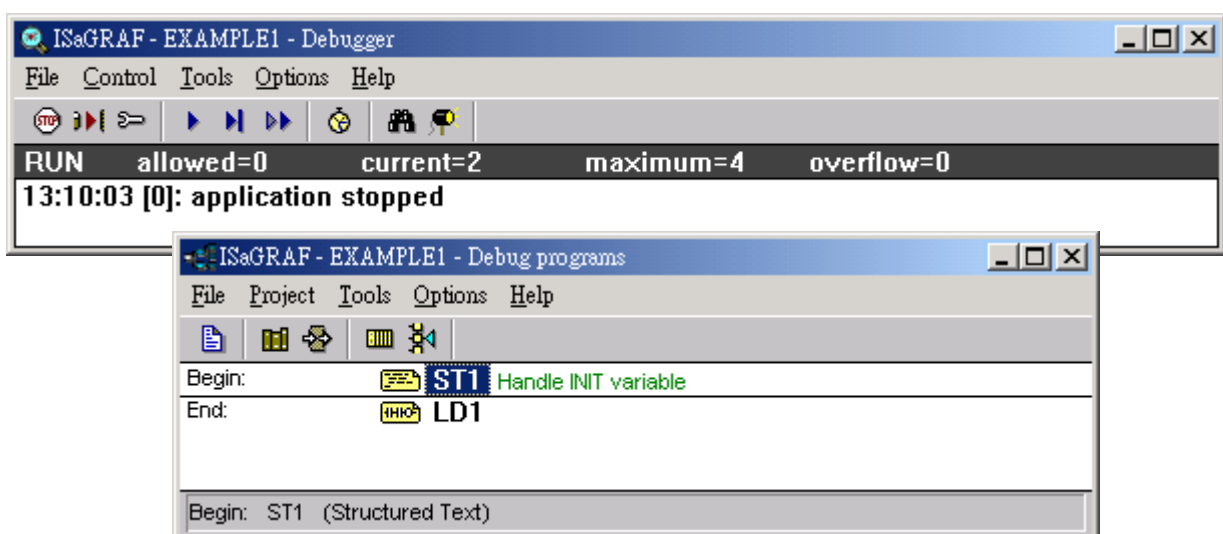
Click the "Download" button in the "ISaGRAF Debugger" window, then select "ISA86M: TIC Code for Intel" in the "Download" dialog box.



Click the Download button to download the project to the PAC. Then, a progress bar will appear in the "ISaGRAF Debugger" window to show the downloading progress.

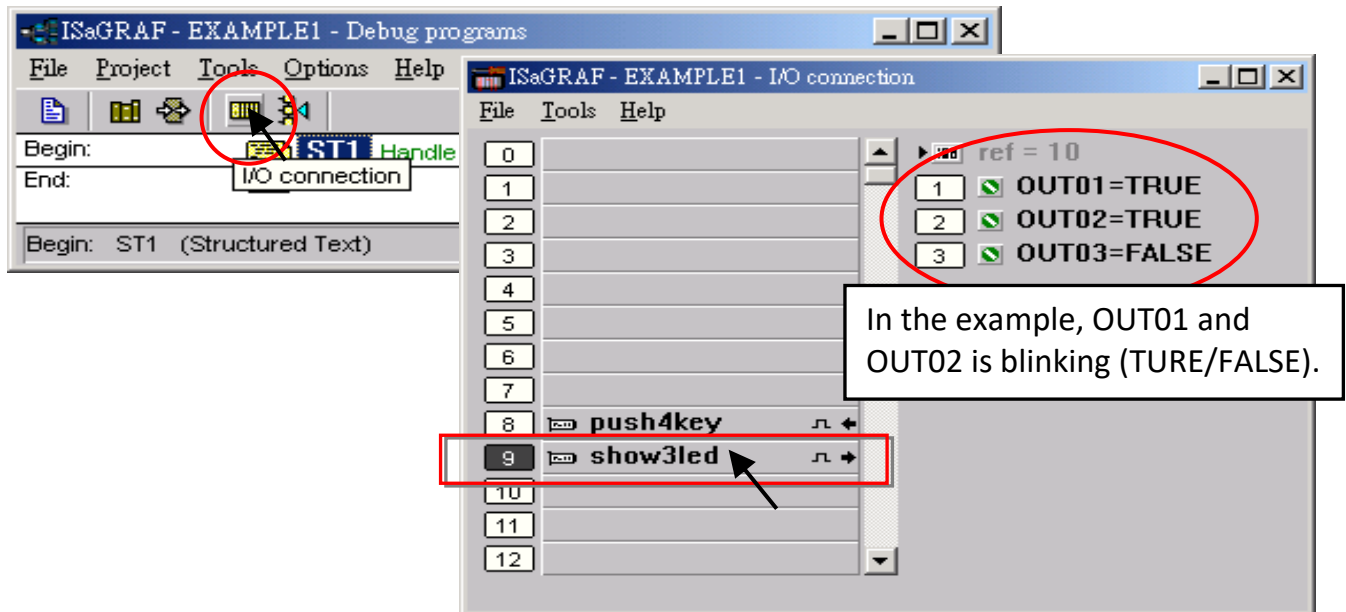


If the download is completed, you can see the window below.

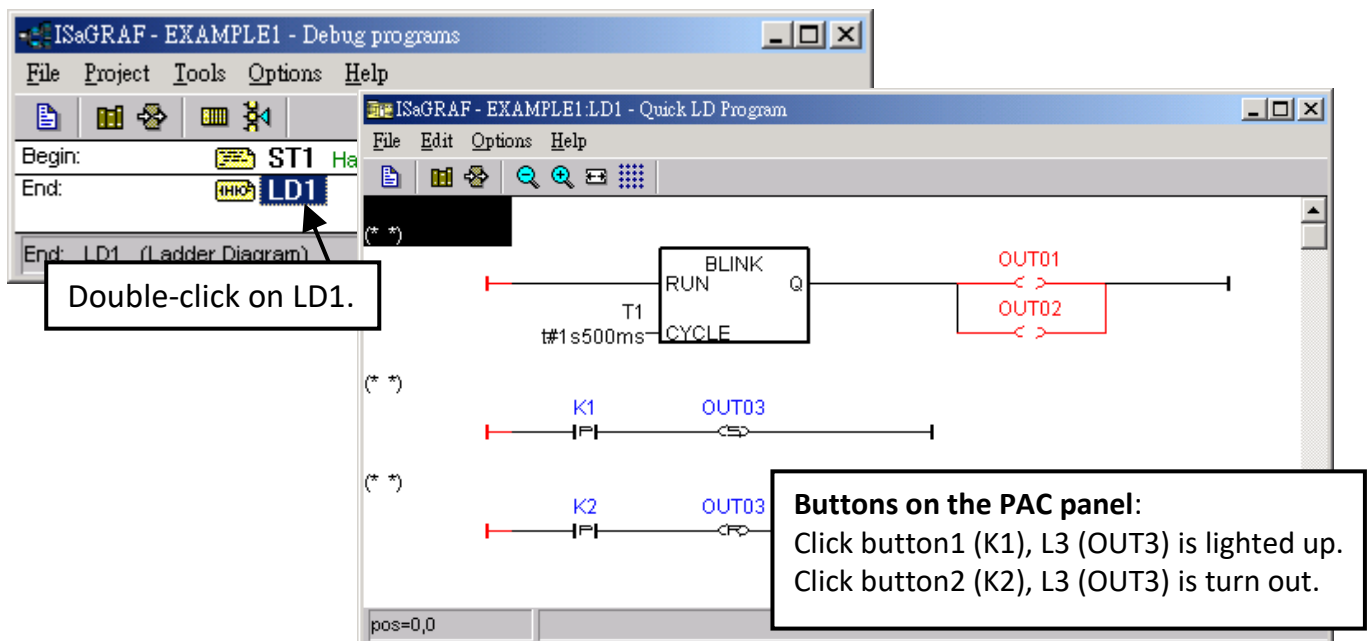


2.5.2 Running the Example Program

The user can observe the I/O status while the project is running. The way is to click the "I/O Connection" button in the ISaGRAF "Debug Programs" window and then you can see the status of I/O variables in the "I/O Connection" window.



Another helpful window for observing the running status of the LD program is the "Quick LD Program" window. You can try to press one of the first two buttons (or click K1 / K2) on the front panel of the PAC, then to view the status of "OUT03".

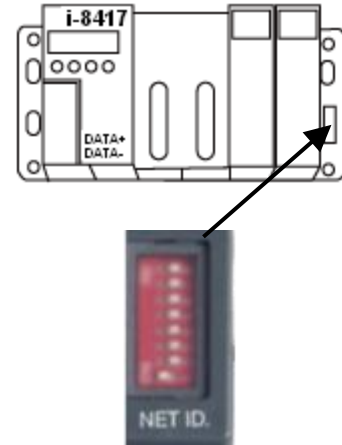


Though there are numerous steps involved in creating and downloading an ISaGRAF program, each step is quick and easy to accomplish. ISaGRAF provides a powerful and flexible software environment to develop the PAC control system.

3.1 Setting the NET-ID for the I-8xx7

For the I-8xx7 can work properly, you must set an appropriate address (NET-ID).

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



Default setting → NET-ID=01

- ★ The valid range of ISaGRAF network address (Net-ID) is 01 to FF (1 to 255).
- ★ The NET-ID of every PAC in the same network must be unique, i.e., different from each other.

The Net-ID is expressed as Hexadecimal (Hex) and the DIP 1 to 8 were expressed as $2^0 \sim 2^7$.

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

If Net-ID=01 ($2^0=1$), set the DIP1 to ON. If Net-ID=02 ($2^1=2$), set the DIP2 to ON.

If Net-ID=03 ($2^0+2^1=3$), set the DIP 1, 2 to ON. If Net-ID=04 ($2^2=4$), please setup the DIP 3 to ON.

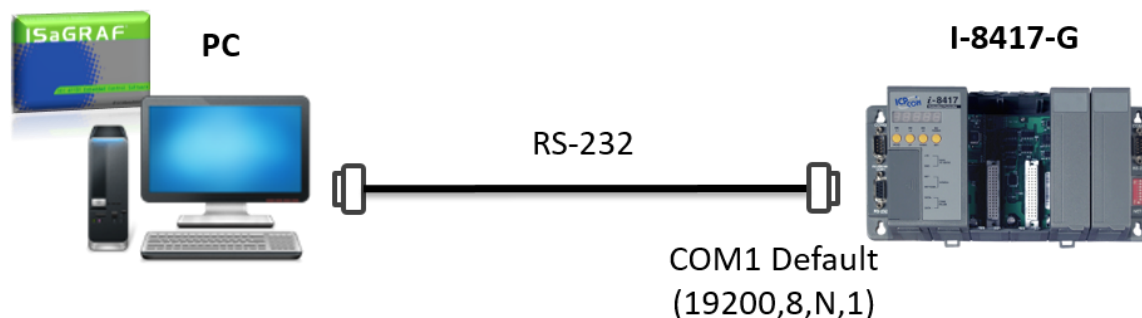
If Net-ID=05 ($2^0+2^2=5$), set the DIP 1, 3 to ON.

If Net-ID=FE₍₁₆₎ = 254₍₁₀₎ ($2^1+2^2+2^3+2^4+2^5+2^6+2^7=254$), set the DIP 2 to 8 to ON.

If Net-ID= FF₍₁₆₎ = 255₍₁₀₎ ($2^0+2^1+2^2+2^3+2^4+2^5+2^6+2^7=255$), set the DIP 1 to 8 to ON.

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

There is one RS-232 communications cable (CA-0915) included in the I-8xx7 shipping box. The cable is used to connect a PC to a PAC or an I-7520R (ICP DAS RS-232/RS-485 converter).



The default setting for the COM1 of the I-8xx7 is “19200, 8, N, 1”, that is 19200 baud rate, 8 data bits, no stop bits, and one parity bit. The following figure shows commonly used RS-232 pin assignments.

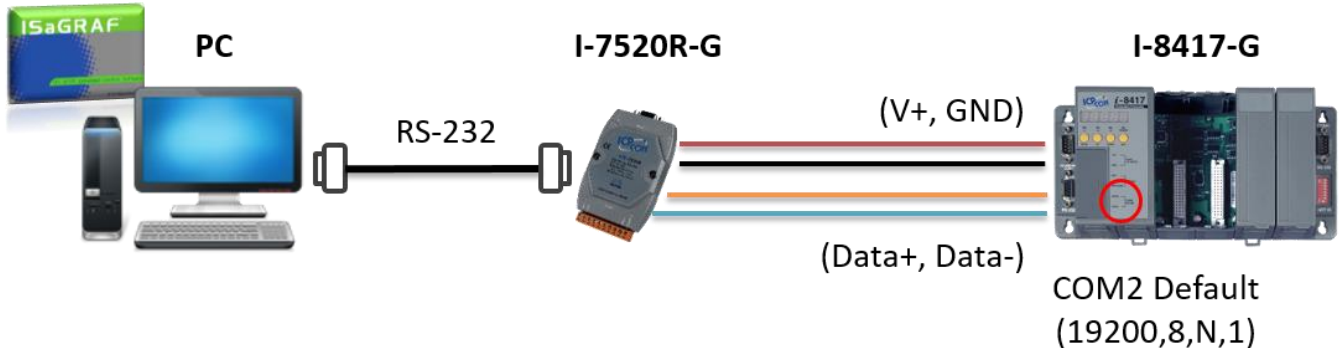
PC 9-Pin D-Sub		I-8xx7 COM1
RxD 2	_____	TxD 2
TxD 3	_____	RxD 3
GND 5	_____	GND 5

When ISaGRAF doing RS-232 communications, only the RxD, TxD, and GND data signals are used. If the CTS and DSR signals are required for the software or the hardware that is running on the PC, wiring 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	_____	

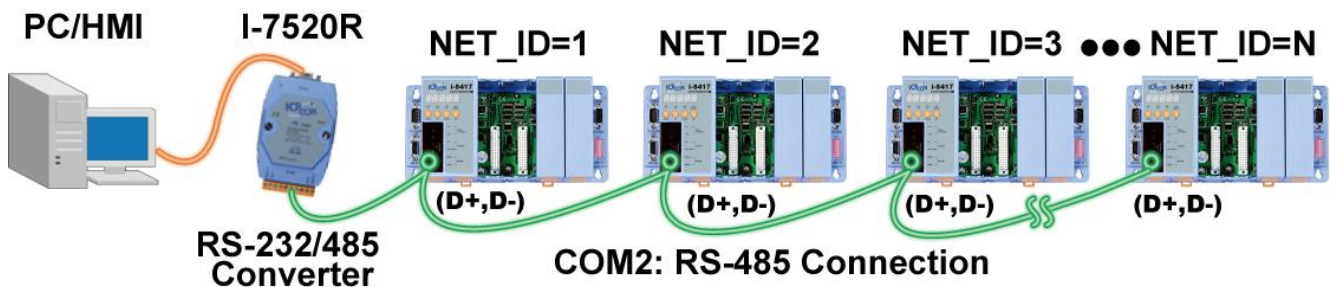
3.3 Connecting PC to I-8417/8817's COM2

If the user wants to connect the PC to the COM2 of I-8xx7, an I-7520R (RS-232/RS-485 converter) is required. The maximum valid distance between I-7520R and the PAC is 1, 200 meters (4, 000 feet). The distance is related to the baud rate that means the lower baud rate is set, the longer transmission distance can be.



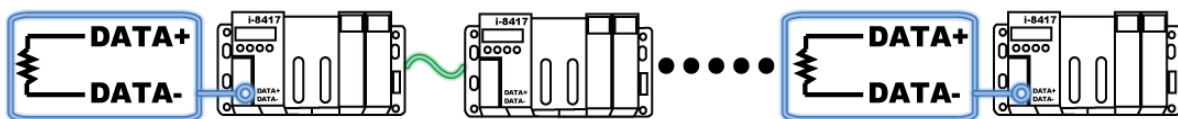
3.4 Connecting PC to Several I-8417/8817's COM2

The benefit of using the COM2 port (RS-485) is that you can use one PC to connect several PACs to form an RS-485 network. In this way, the PC can download ISaGRAF project to each PAC via the RS-485 network. Up to 255 I-8xx7 can be connected each other. We do not recommend connecting so many PACs if not necessary.

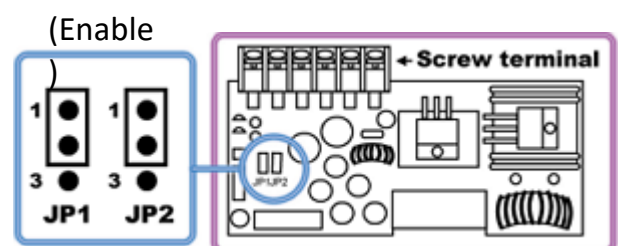


To create an RS-485 network you must first insure that each I-8417/8817 PAC has a unique NET-ID address, and each of the PACs link the "DATA+" to the "DATA+" signal and the "DATA-" to the "DATA-" signal.

If the RS-485 communication is unstable, it is recommended to wire a terminal resistor (try 220Ω, 110Ω, or 330Ω, in order) on COM2 on the first and the last PACs



By default, the pull-high (JP1) and pull-low (JP2) resistor inside the PAC are set to "Disable" (i.e., Pin2-3). When using I-8417/8817 as a Modbus Master, you need to set both the JP1 and JP2 to "Enable" (i.e., Pin1-2).



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

The baud rate of COM1/2/3 can be set from the PAC panel. Once you choose one of baud rates, the COM port is set to a Slave port. You can also set the COM2/3 as non-Modbus Slave port.

The following COM ports support Modbus Slave (Default baud rate setting: 19200)

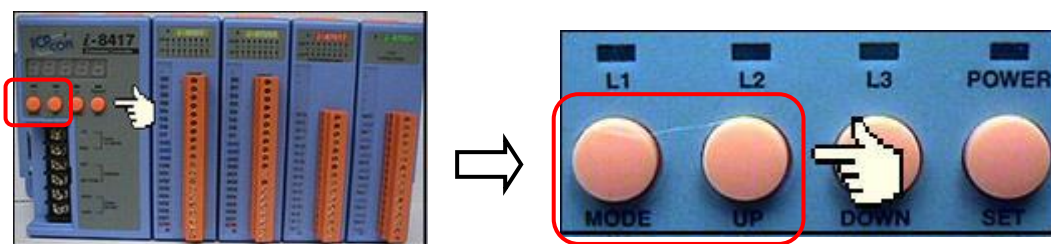
I-8417/8817: COM1 (RS-232) and COM2 (RS-485)

I-8x37/8x77: COM1 (RS-232) and

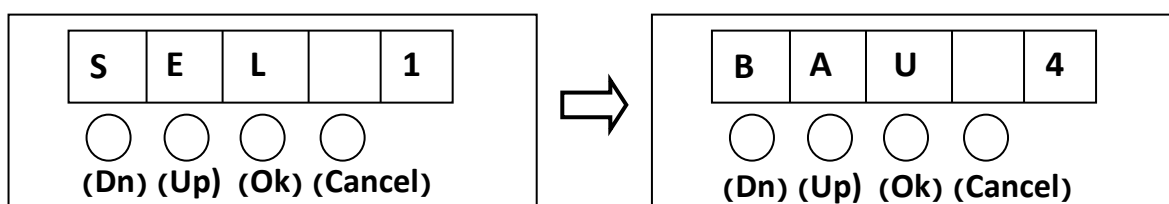
COM3 (RS-485/RS-232, Defaults: [None-Modbus Slave](#))

The baud rate can be set to 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 bps (bit per second). To change the baud rate setting on the COM1/COM2/COM3 port, first power off the PAC. Next, press and hold on the first two buttons on the PAC panel and then power up the PAC until the "SEL 0" or "SEL 1" appears on the LED display.

Notice: If there is no operation within one minute, buttons will not work (L1 turn off), please restart the PAC as described above.



"SEL 0" is used to set the baud rate of first Slave port (i.e., COM1), while "SEL 1" is used to set the baud rate of the second Slave port (i.e., COM2 or COM3). Press the "Up" or "Dn" to change selection, then press the "OK" button, and the "BAU x" (e.g., BAU 4=19200 bps) will appear.



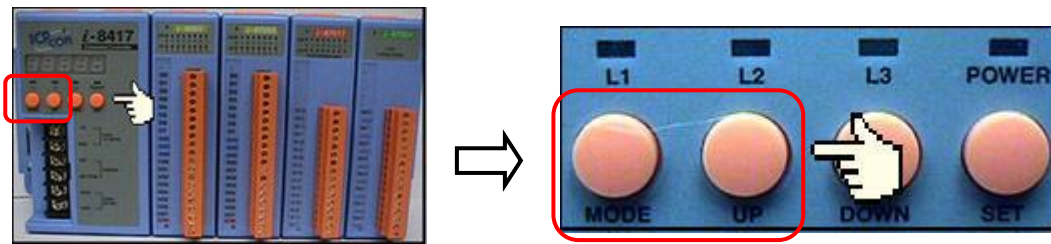
Press "Up" or "Dn" to change the baud rate. The settings can be:

(0) 1200, (1) 2400, (2) 4800, (3) 9600, (4) 19200, (5) 38400, (6) 57600, (7) 115200, (8) 300, (9) 600, and [\(-\) None-Modbus Slave Port \(for COM3 only. When choosing one of baud rates, it will be set to Modbus Slave port\)](#). Press "OK" to save the settings and press "Cancel" to exit.

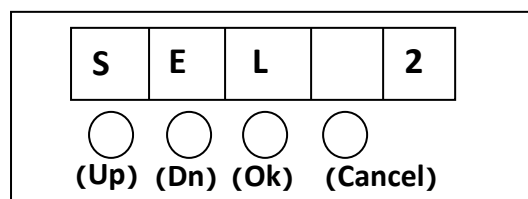
Note: The default setting of PC's COM 1 to 9 in the ISaGRAF "Link Setup" function is '19200, 8, N, 1'. For the communication between PAC and PC works properly, if the baud rate setting of COM1 and COM2/3 on the PAC is changed, the settings of PC MUST be set to be the same. ([Please refer to Section 2.5](#))

3.6 Deleting an ISaGRAF Project from the PAC

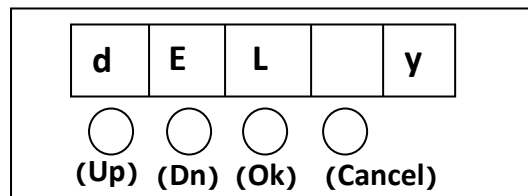
The user can remove the ISaGRAF project from the PAC panel, similar to changing the baud rate, first turn off the PAC. Then, press and hold on the first two buttons and power on the PAC until the setting mode appears on the LED display.



First, press the “Up” or “Dn” button until “SEL 2” (Select 2) appears and press the “OK” button.



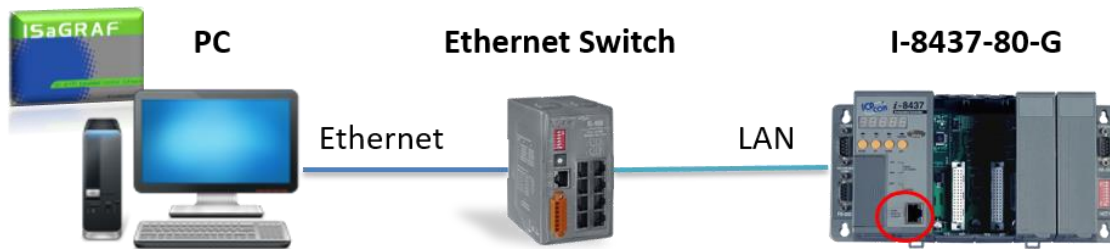
You can see "dEL n" show in the LED readout, press the “Up” or “Dn” button until "dEL y" appears, then press the “OK” button.



This will delete the currently installed ISaGRAF project from the PAC. After that press some “Cancel” to exit the setting.

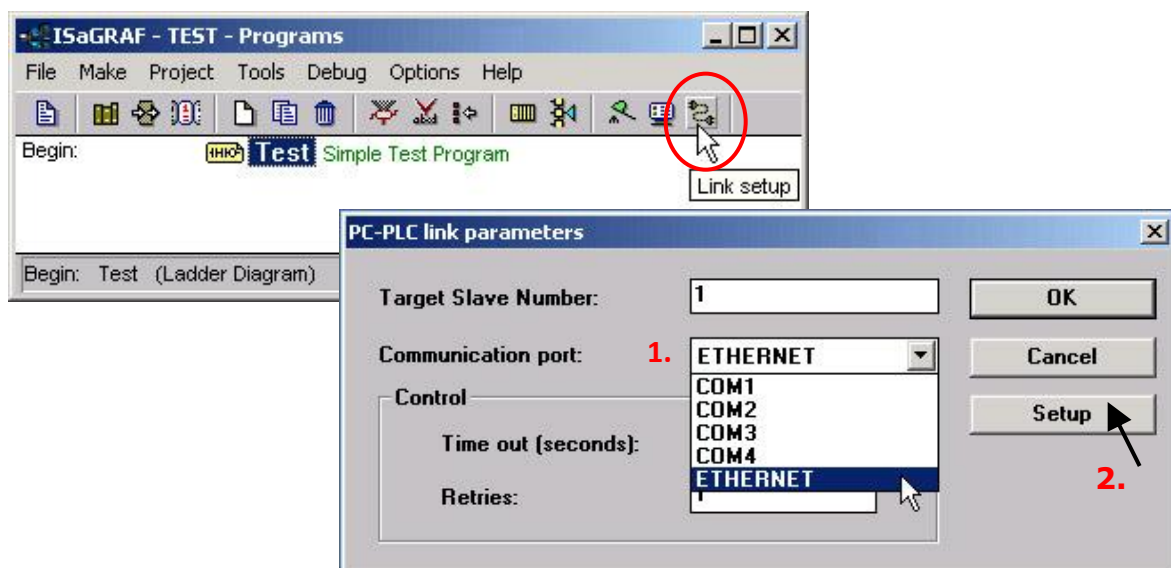
3.7 Connecting PC to the I-8437-80/8837-80 Ethernet Port

The I-8437-80/8837-80 PACs provides a single Ethernet port can be used to connect to the PC. The COM2 Port is replaced from an RS-485 to Ethernet.

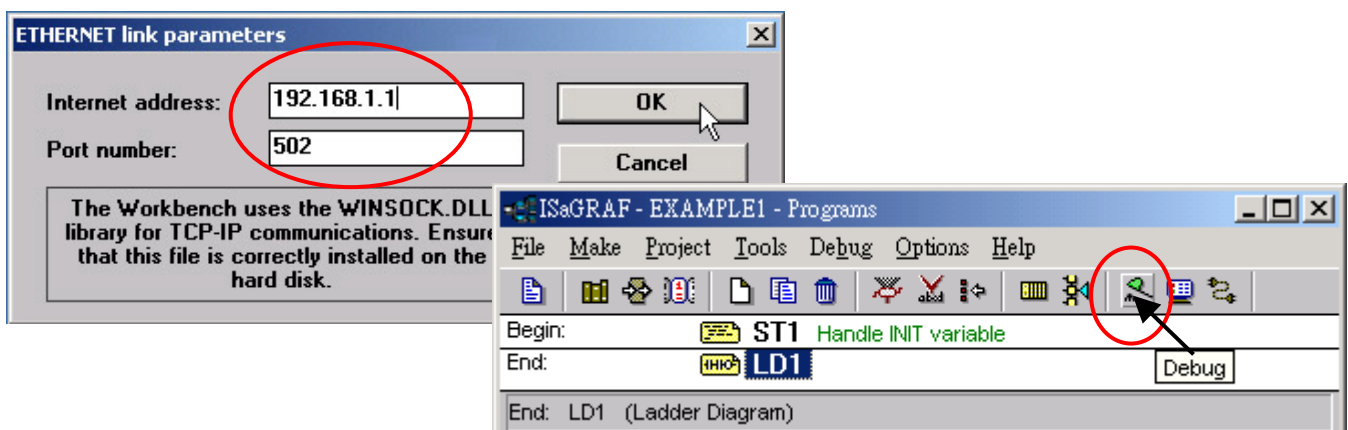


The user must set the Ethernet communication parameters correctly for successfully downloading the ISaGRAF project to the PAC over the network. Refer to [section 3.9](#) to set IP, Mask and Gateway address.

First, open an ISaGRAF project on PC and click the "Link Setup" button. In the "PC-PLC Link Parameters" window, select the "Ethernet" as the communication port and click the "Setup" button.



In the "Ethernet Link Parameters" window, enter the IP address of the PAC and make sure the "Port Number" is 502 and then click OK. Click on "Debug" in the "Programs" window to connect to the PAC.



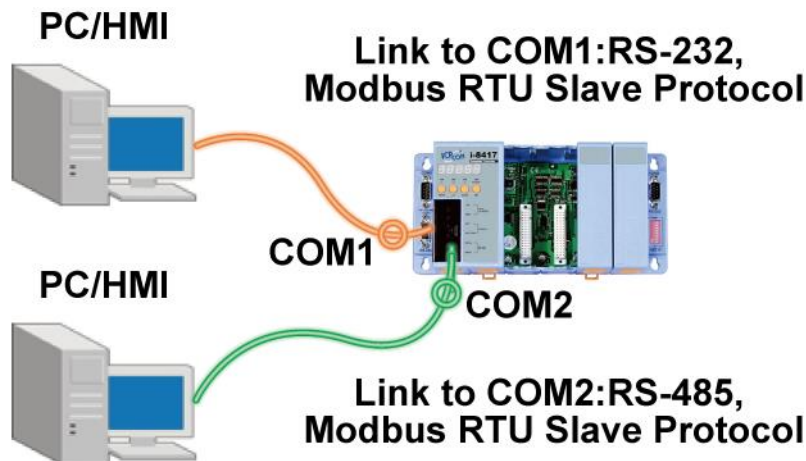
3.8 Modbus Slave Connection to the I-8xx7

The I-8xx7 supports Modbus RTU Slave and Modbus TCP/IP Slave protocols that allow connecting to ISaGRAF, SCADA, or HMI through the COM port or Ethernet port.

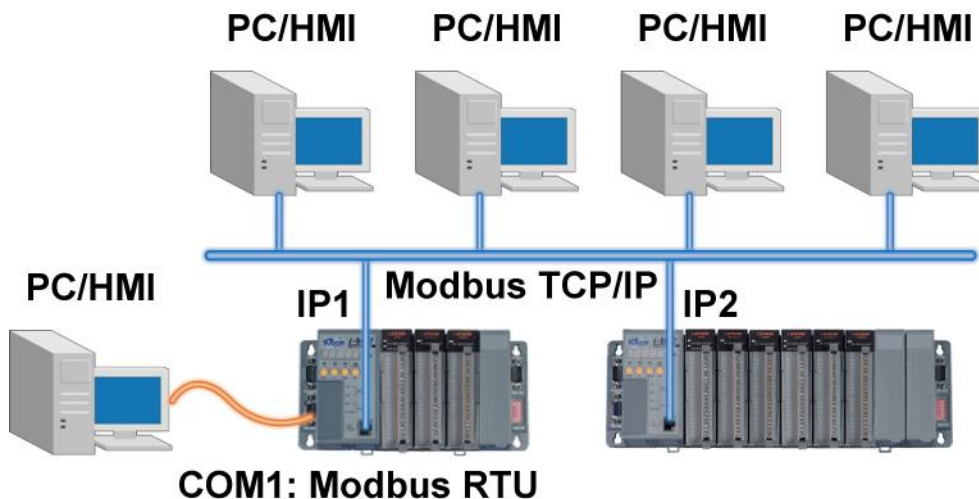
One I-8xx7 supports up to two Modbus RTU Slave ports.

I-8417/8817 supports COM1 (RS-232) and COM2 (RS-485);

I-8437-80/8837-80 supports COM1 (RS-232) and COM3 (RS-232/485). Note that the default setting of the COM3 is “non-Modbus Slave Port”, also refer to Section 3.5 to change the setting.



I-8437-80/8837-80 provides a single Ethernet port that supports Modbus TCP/IP Slave protocol. The user can set the IP address and TCP port number (fixed 502) for each PAC. One PAC can connect up to **4** PCs through the Ethernet port.



The others PC or HMI can connect to the COM1 and COM3 (RS-232/485) on the PAC. Therefore, one I-8437-80/8837-80 can connect to up to 6 devices.

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

Download ISaGRAF driver for the PAC on the website and then extract the zip file:

<https://www.icpdas.com/en/download/show.php?num=368>

1. Create a folder named "8000" in the hard drive (e.g., "c:\8000").
2. Copy "7188xw.exe", "7188xw.ini", "7188xw.f4", "isa.exe", "autoexec.bat", and "8k050408.img" from the driver folder to the "8000" folder.
3. To check that the serial connection (e.g., 'COM1') between a PC and a PAC is functional through a RS-232 cable. Refer [Section 3.11 step4](#) to modify the "7188xw.ini" file if using other COM port (e.g., 'COM5').
4. Launch the Command Prompt window and type "ipconfig" to display the network configuration of the PC.

```
Microsoft Windows XP [版本 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\User>ipconfig

Windows IP Configuration

Ethernet adapter 192.168.1.10:

    Media State . . . . . : Media disconnected

Ethernet adapter 10.0.0.X:

    Connection-specific DNS Suffix  . : hanchiao.icpdas.com
    IP Address. . . . . : 10.0.0.18
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 10.0.0.254
```

5. Power off the PAC, connect pin "INIT" to "INIT COM", and restart the PAC.
6. Run "7188xw.exe" on PC and a "7188xw" screen will be displayed. If the connection is Ok, "i-8000>" will be shown on the screen. (Also, press Enter to check the connection.)

```
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>
```

Note that configure the following settings (IP/Mask/Gateway) according to the network configuration of the PC.

7. Type "ip" to see the current IP address of the PAC.
Type "ip 10. 0. 0. xxx" to setup a new IP address.

```
i-8000>ip
IP=10.0.0.123
i-8000>ip 10.0.0.134
Set IP=10.0.0.134
[ReadBack]IP=10.0.0.134
i-8000>ip
IP=10.0.0.134
```

8. Type “mask” to see the current mask address of the PAC.
Type “**mask 255. 255. 255. 0**” to setup a new address mask.

```
i-8000>mask  
MASK=255.255.255.0
```

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

```
i-8000>gateway  
Gateway=10.0.0.254
```

10. Press **ALT_X** to exit “7188xw”, or COM1/COM2 of the PC will be occupied.
11. Remove the connection between “INIT” and “INIT COM” pins and restart the PAC.

3.10 Setting COM1 as Non-Modbus-Slave Port

By default, the COM1 of the I-8xx7 is a Modbus RTU Slave port. It can be set as a non-Modbus Slave port for other usages. For example, using “COMxxx” functions to write a user-defined protocol on COM1 or using COM1 as a Modbus Master Port.

1. Create a folder named “8000” in the hard drive (e.g., “c:\8000”).
2. Copy “7188xw.exe”, “7188xw.ini”, “7188xw.f4”, “isa.exe”, “autoexec.bat”, and “8k050408.img” from the driver folder to the “8000” folder.
3. To check that the serial connection (e.g., ‘COM1’) between a PC and a PAC is functional through a RS-232 cable. Refer [Section 3. 11 step4](#) to modify the “7188xw.ini” file if using other COM port (e.g., ‘COM5’).
4. **Power off the PAC, connect pin “INIT” to “INIT COM”, and restart the PAC.**
5. Run “7188xw. exe” on PC and a “7188xw” screen will be displayed. If the connection is Ok, “I-8000>” will be shown on the screen.
6. Type “**isa *f=1**” command to release COM1 (i.e., set COM1 as non-Modbus-Slave Port).

```
i-8000>isa *f=1  
  
Com1 is free now
```

7. Press ALT+X to exit “7188xw”, or COM1/COM2 of the PC will be occupied.
8. Remove the connection between “INIT” and “INIT COM” pins and restart the PAC.

Note:

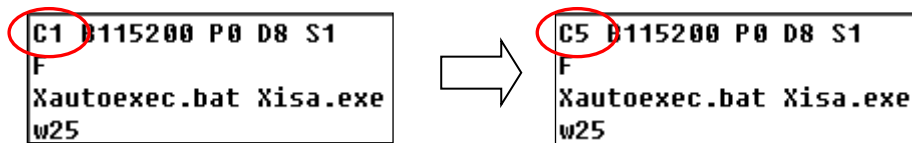
Users can type “**isa *f=0**” command to set COM1 back to a Modbus RTU Slave. If the command is invalid, refer to the next section to update the PAC driver.

3.11 Update I-8xx7's Hardware Driver

Visit to the website to download the latest version of ISaGRAF driver and extract the zip file:
<https://www.icpdas.com/en/download/show.php?num=368>

To Know the Current Driver Version (We use driver 3.16 as an example)

1. Create a folder named "8000" in the hard drive (e.g., "c:\8000").
2. Copy "7188xw.exe", "7188xw.ini", "7188xw.f4", "isa.exe", "isa_data.exe", "autoexec.bat", and "8k050408.img" from the driver folder to the "8000" folder.
3. To check that the serial connection (e.g., 'COM1') between a PC and a PAC is functional through a RS-232 cable. If using other COM port (e.g., 'COM5'), modify the command in the first line in the "7188xw.ini" file.



4. Power off the PAC, connect pin "INIT" to "INIT COM", then power it up.
5. Run "7188xw.exe" on PC and a "7188xw" screen will be displayed. If the connection is Ok, "i-8000>" will be shown on the 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>
```

6. Type "ver" to see the current OS version & date.
7. Type "isa *p=" to see the current version of driver and information about the PAC.

```
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 Driver

8. Press “**F4**” to auto load 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 seconds to update ISaGRAF system and 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
```

9. 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
```

10. Press ALT+X to exit “7188xw”, or COM1/COM2 of the PC will be occupied.
11. Remove the connection between “INIT” and “INIT COM” pins and restart the PAC.

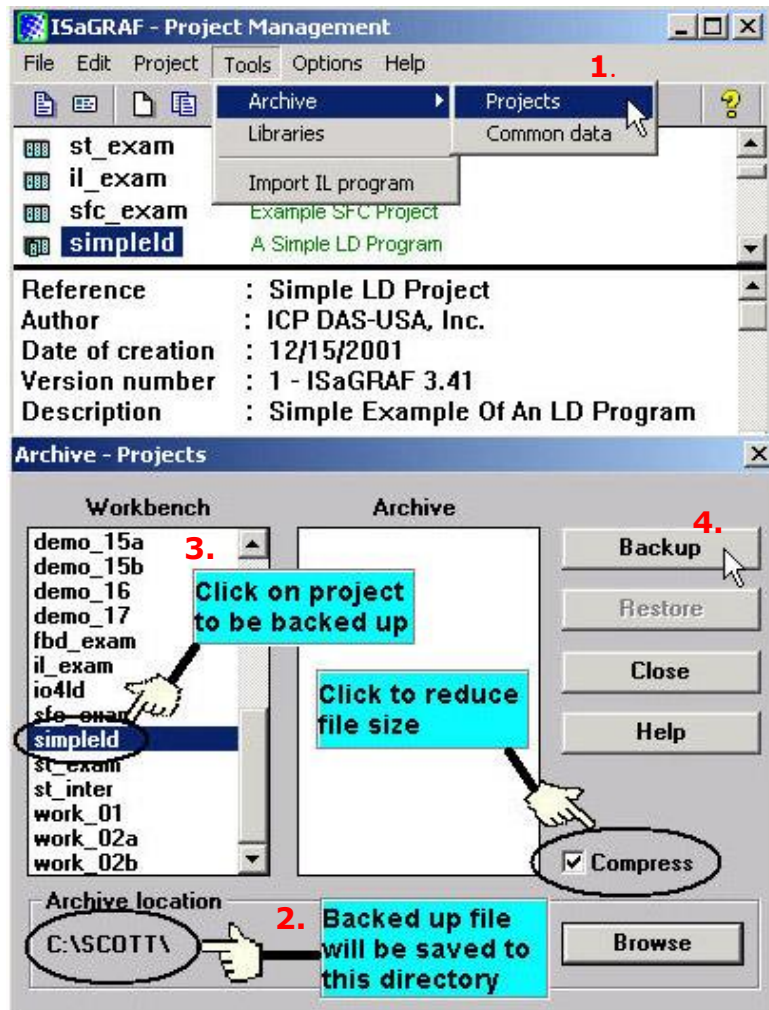
3.12 Backup & Restore an ISaGRAF Project

For archiving purposes, you can “Back Up” or “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

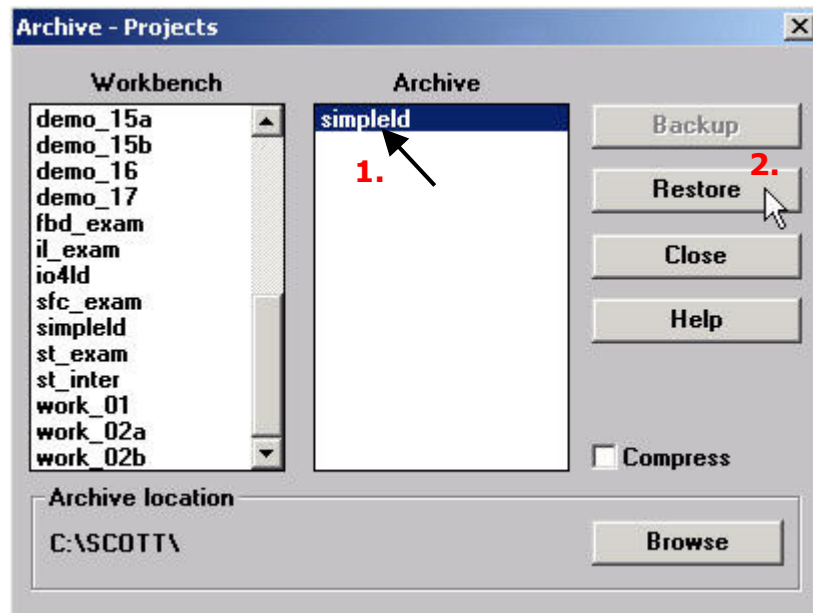
1. Open the “ISaGRAF Project Management” window. On the **Tools** menu, point to **Archive**, and then click **Projects**.
2. In the **Archive-Projects** window, click **Browse** to designate where you want to save the ISaGRAF project (e.g., ‘C:\SCOTT’). Also, check the Compress box if you want to reduce the size of the file.
3. In the **Workbench** section, choose the project you want to back up.
4. Click **Backup** to store the file to the specified location.



Restoring an ISaGRAF Project

Follow the same ways as noted before to open “Archive Projects” window, and restore the ISaGRAF project from the backup file.

1. In the **Archive** section, choose the project you want to restore.
2. Click **Restore** to restore the file to the ISaGRAF Workbench.



3.13 Pin assignment of the Fbus

For more details about Fbus, refer to Chapter 7 of the ISaGRAF user manual.

<http://www.icpdas.com/en/download/show.php?num=333>

COM3 (Pin1, 9) : Fbus Networking



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

PAC can link up to 64 pcs ICP DAS's I-7000 and I-87K series remote I/O modules.

Important Notice:

Before the I-7000 or I-87K I/O modules are connected to the PAC, the user needs to set the unique address (NET-ID) and the same baud rate with the PAC for each I/O module by using DCON Utility.

DCON Utility is a toolkit that can be used to search, configure, and test the I/O modules.

Visit to the website to download the software and the user manual:

https://www.icpdas.com/en/product/guide+Software+Utility_Driver+DCON__Utility__Pro

NOTE:

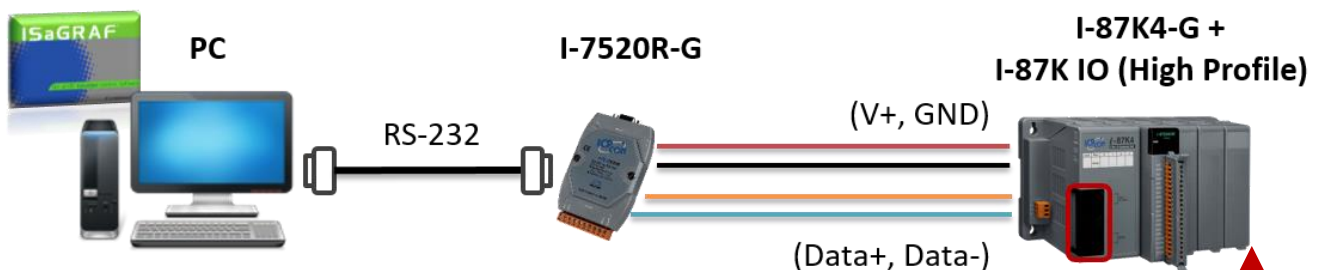
1. Make sure the hardware connection is correct.
2. Configure I-87K I/O modules with [I-87Kn or RU-87Pn](#).
3. Search and configure the modules one by one.
4. Set the module as the INIT mode and power it up.

Step 1: Hardware connection

1. The power supply must be DC power between +10 ~ +30 V.
2. The figure below shows the way to connect the I-87K4 and I-87K module. Note that only connect one module for each time.

NOTE:

For using I-87K4 I/O module, you have to prepare an I-7520R (RS-232 to RS-485) converter. Also, refer to "[DCON Utility User's Manual](#)" for more information about wiring the module.



I-87Kn User Manual:

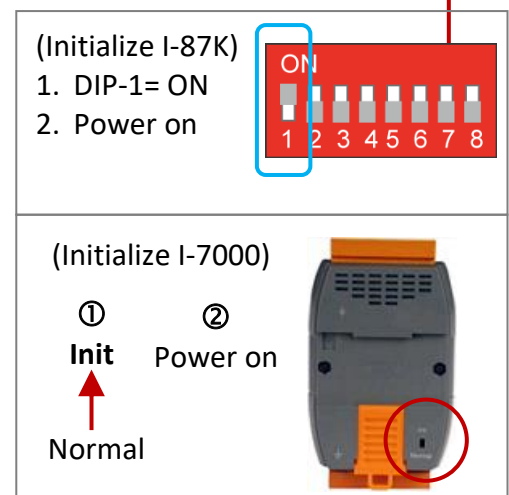
<http://www.icpdas.com/en/download/show.php?num=408>

I-7000 User Manual:

<http://www.icpdas.com/en/download/show.php?num=1860>

Note:

In INIT mode, the setting of I/O module will be initialized.



Step 2: Initialize I/O module

The factory settings of I/O modules are listed in the first table. If the current settings of the module are unknown, only initialize the module to reset the settings as listed in the second table.

The factory settings:

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

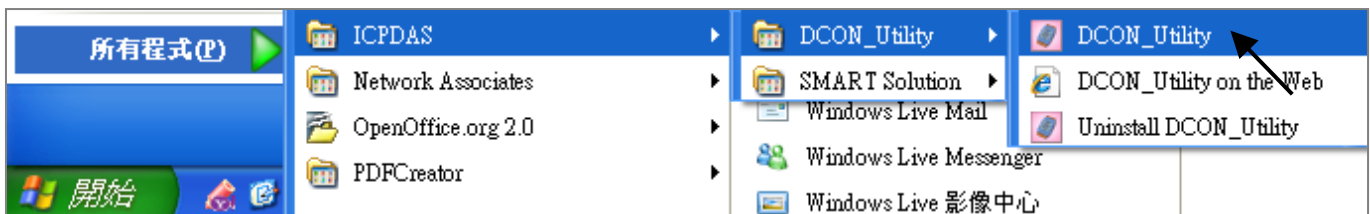
The initial settings:

- To initialize an I-7000 module, set the DIP switch to INIT (or connect the INIT* pin to the GND pin) and power on the module. This status also called “INIT mode”.
- To initialize an I-87K module, set the DIP switch on the I-87K4/5/8/9. For example, adjust the Dip-2 to “ON” and restart the I-87Kn to initialize the module on slot2.


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

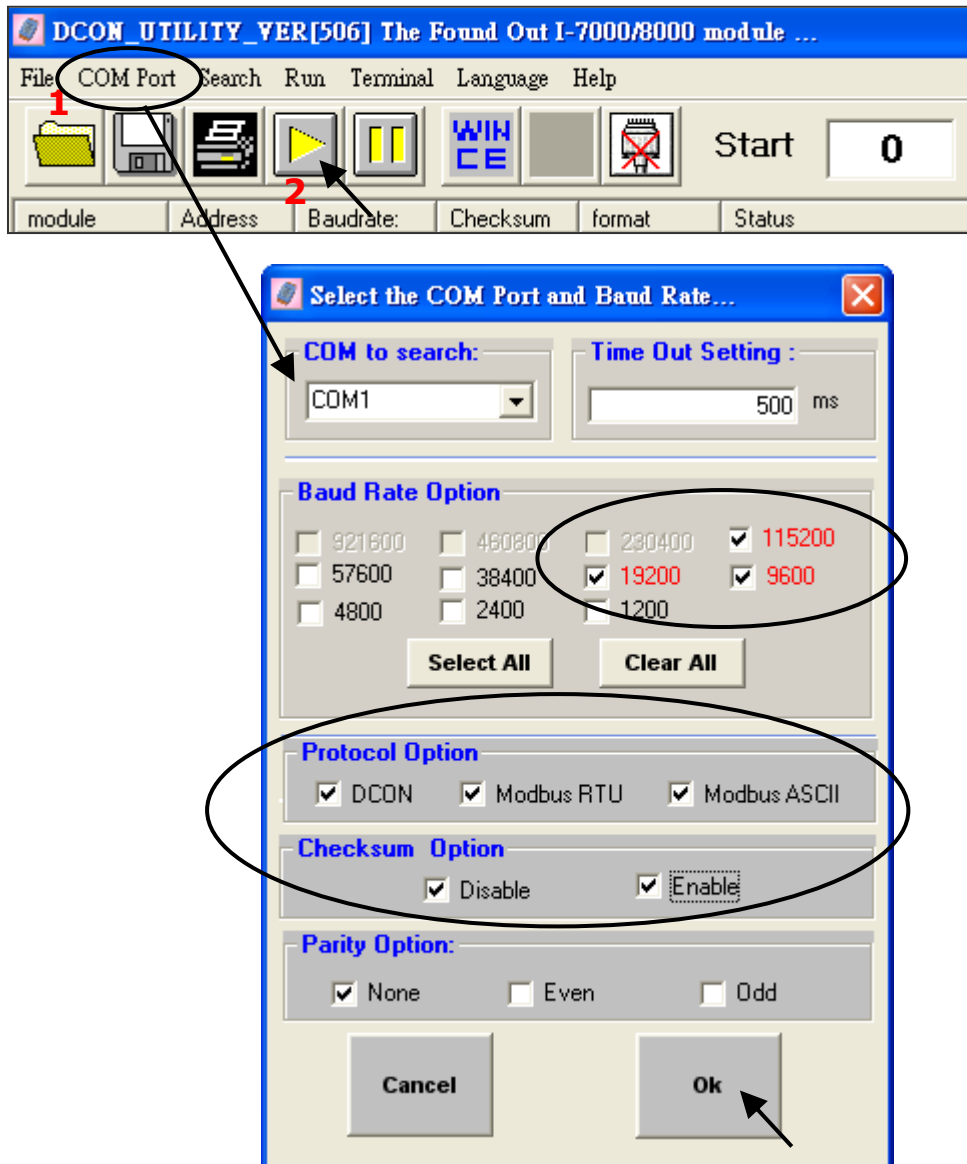
Step 3: Select COM Port and Baud Rate to search

Click Windows “Start” and point to “programs”, “ICPDAS”, and “DCON_Utility”. Then, click **DCON_Utility** to execute the software.



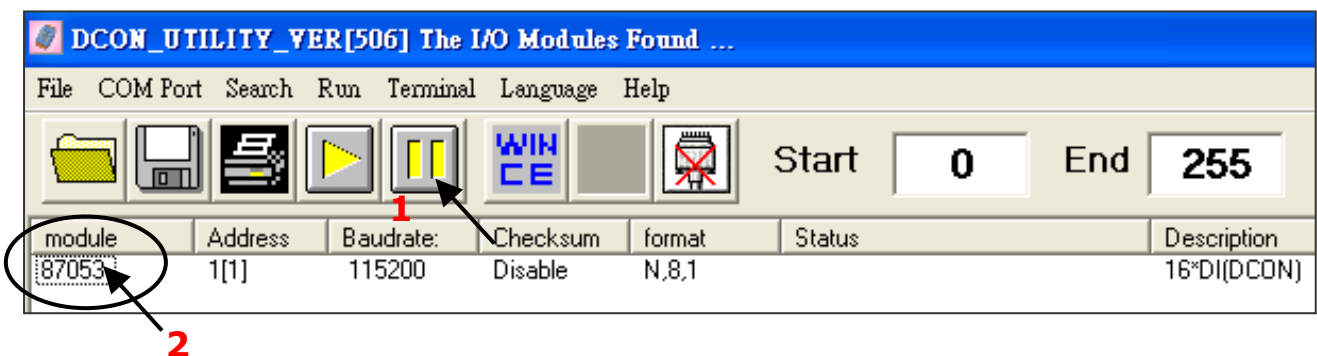
1. Click the “COM Port” menu to select the COM Port and Baud Rate to search. You can select multiple Baud Rate, Protocol, or Checksum if you do not know the module’s setting, but it will spend more time searching the module. After selection, click “OK”.

2. Click  “Start Search” button to begin search module.

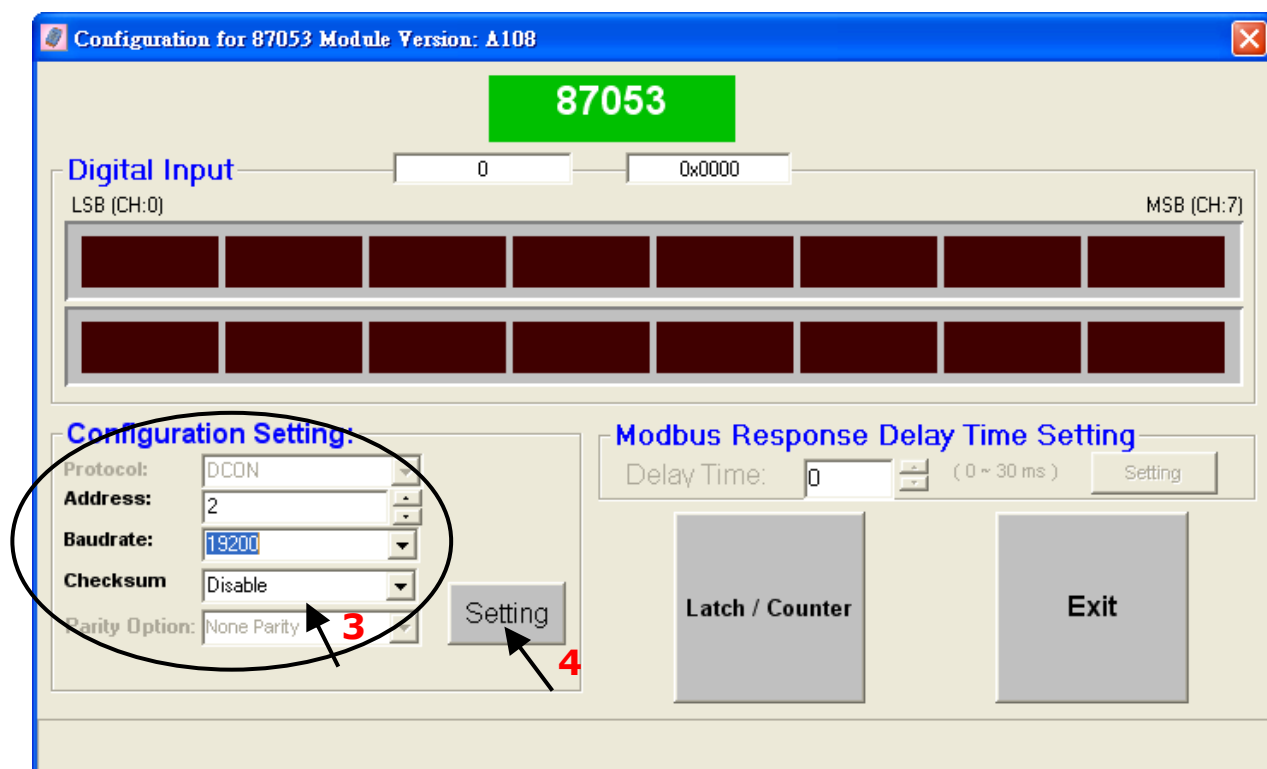


Step 4: Click Searched module ID and give the new configuration

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



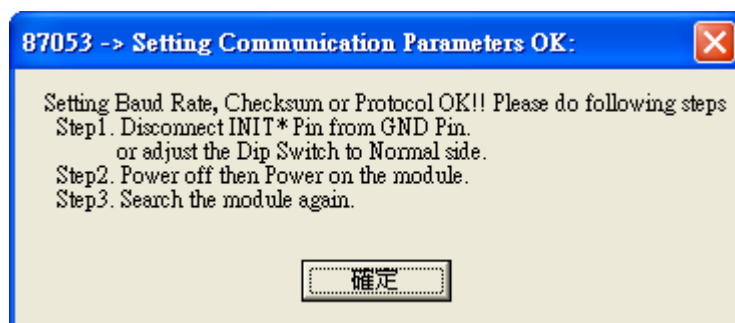
In the screen, you can setup the Address, Baud rate, Checksum, and then click “Setting” to save.



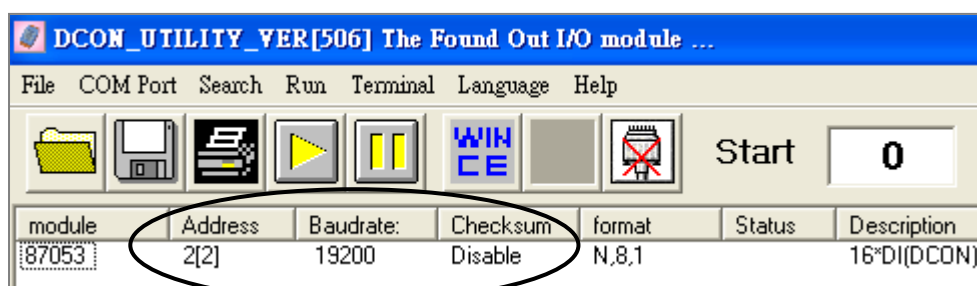
If the I-7000 module is not configured in INIT mode, the message window will be shown. Refer to [Step2](#) and set the module again.



After completing the settings, disconnect the INIT and the GND (or adjust the DIP switch to the 'Normal' position and reboot the module.



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

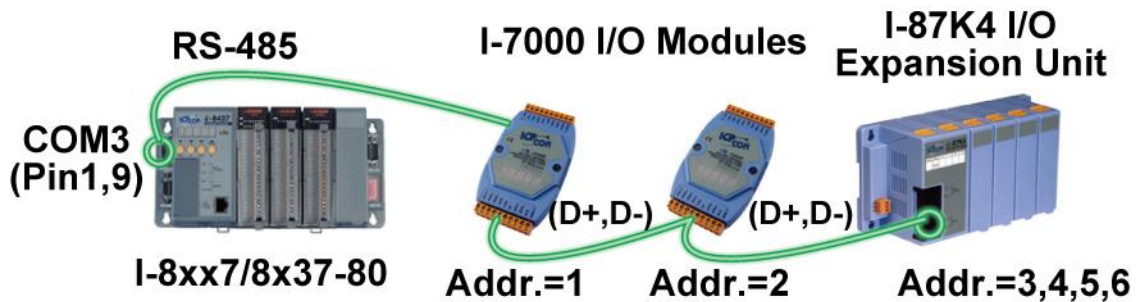


3.15 Linking I-7000 and I-87K Modules for Remote I/O

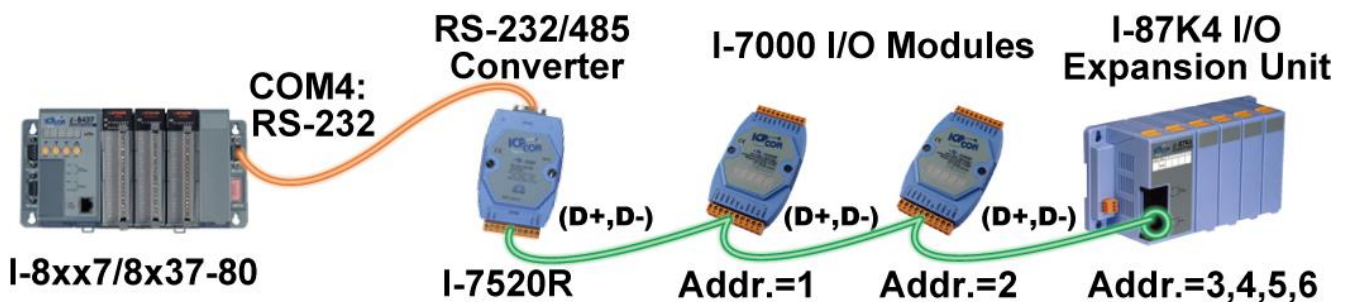
For more details, refer to Chapter 6 of the ISaGRAF user manual.

<http://www.icpdas.com/en/download/show.php?num=333>

One of COM3 (RS-232/485) and COM4 (RS-232) can be used to connect to remote I/O modules. (As the figure below, the COM3 is used)



When using the COM4 port to connect I/O modules, the I-7520R (RS-232 to RS-485 Converter) is needed to connect both the PAC and remote I/O modules.



One I-8xx7 can connect up to 64 remote I/O modules, but we suggest not more than 40. In addition, each module must be set a unique address and the same baud rate with the PAC.

For more information regarding setting up and programming an I-7000/I-87K remote module, refer to [Section 3.14](#) or Chapter 6 of [the ISaGRAF user manual](#) - "Linking to I-7000 and I-87K Modules".

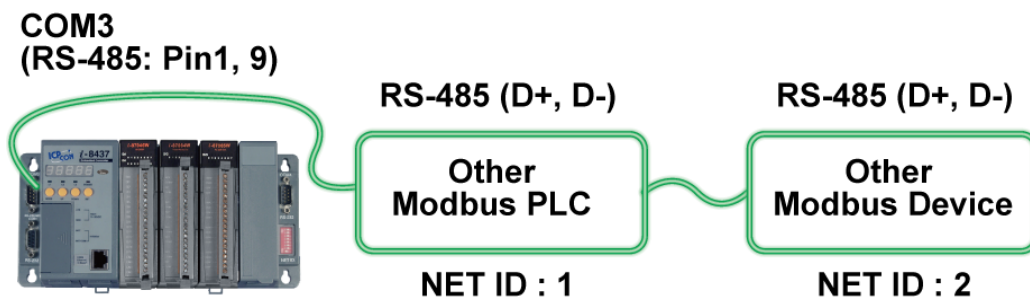
3.16 Creating a Modbus Link with the PAC

For more details, refer to Chapter 8 of the ISaGRAF user manual.

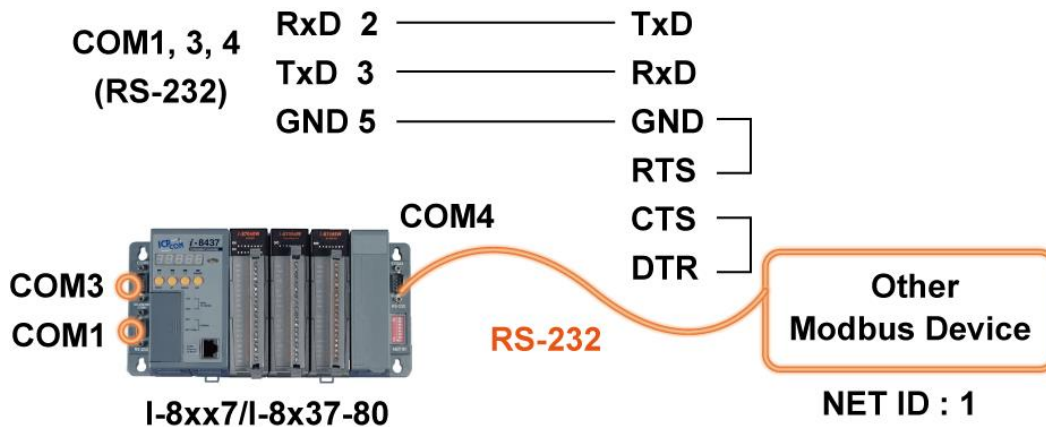
<http://www.icpdas.com/en/download/show.php?num=333>

Two of COM1 (RS-232), COM3 (RS-232/485), COM4 (RS-232) or expended COM5 can be used as the Modbus Master port. When using COM3 (RS-485), one iP-8x47 can connect to several devices.

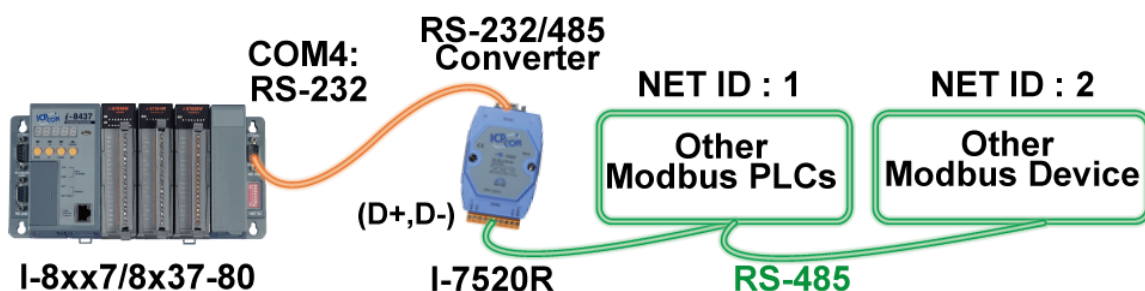
Note: Each device on the same RS-485 network must has a unique address (i.e., NET ID: 1 to 255) and the same baud rate settings.



When using COM1, COM3, or COM4 (RS-232) as the Modbus Master port, one I-8xx7 can connect to one Modbus device. Note that COM1 is a Modbus Slave port by default so the user can refer to section [3.10](#) to change the setting.



Also, connect the COM4 port of the PAC to an I-7520R (RS-232/RS-485 converter). In this way, one PAC can connect to several devices.



3.17 Linking to an MMI Interface Device

Visit to the following webpage for more information:

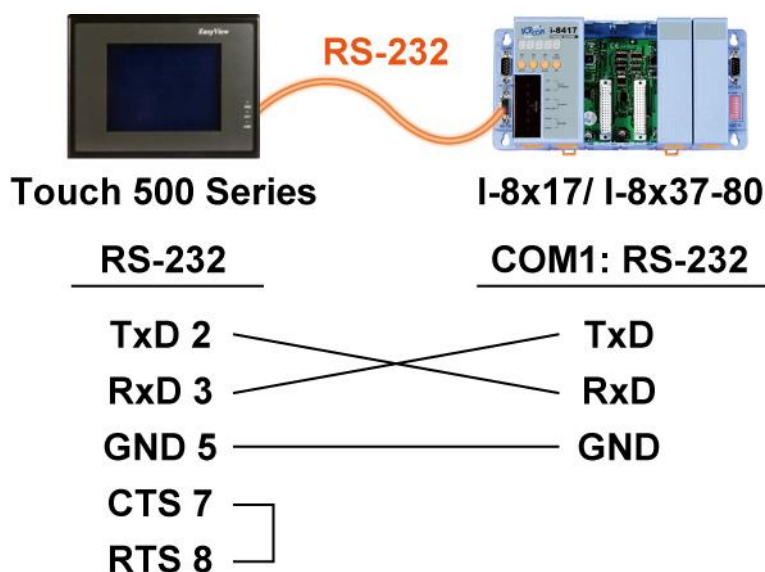
1. ISaGRAF User's Manual. It is listed in Section 4.4
<http://www.icpdas.com/en/download/show.php?num=333>
2. Touch Panel Monitor User Manual
<http://www.icpdas.com/en/download/show.php?num=432>

Note: Touch 500 series products have been phased out, visit the website for new information about products.

Touch Monitor:

http://www.icpdas.com/en/product/guide+Panel__Products+Display+Touch__Monitor

When using any of the Touch series of MMI devices (e.g., Touch506L/506S/510T, etc.) to connect to a PAC, you can only interface the devices to the COM1 port on the PAC.

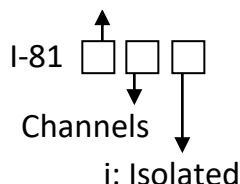


3.18 Using N-Port COM

Using I-81xx (Low Profile) serial communication module on the I-8xx7 can add multiple COM ports.



1: RS-232 4: RS-485



- 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

Note:

I-81xx series modules can only be plugged in slot 0 to 3 of the I-8xx7, the rest of the slots are not available. Thus, only COM5 to 20 can be added, a total of 16 COM ports.

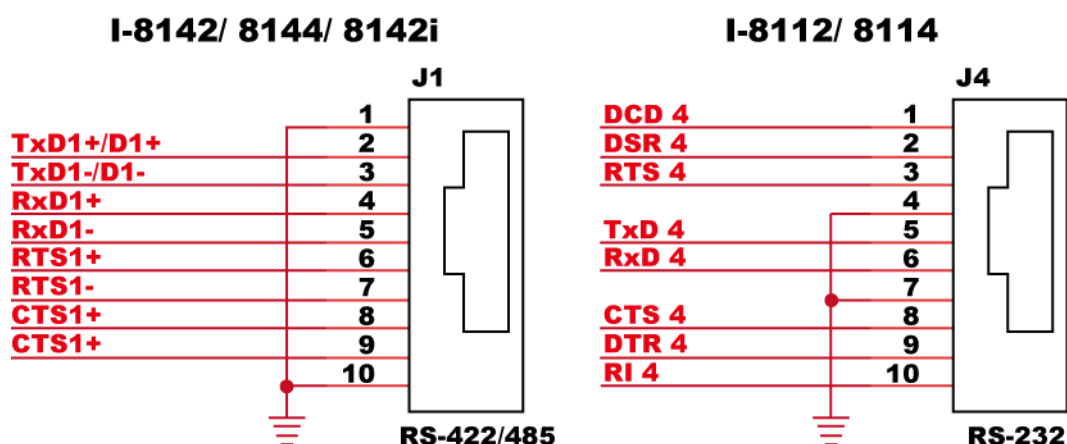
The following ISaGRAF functions can be used to read/write these COM Ports.

"COMOPEN", "COMCLOSE", "COMREADY", "COMARY_R", "COMARY_W", "COMREAD", "COMSTR_W", "COMWRITE" and "COMCLEAR".

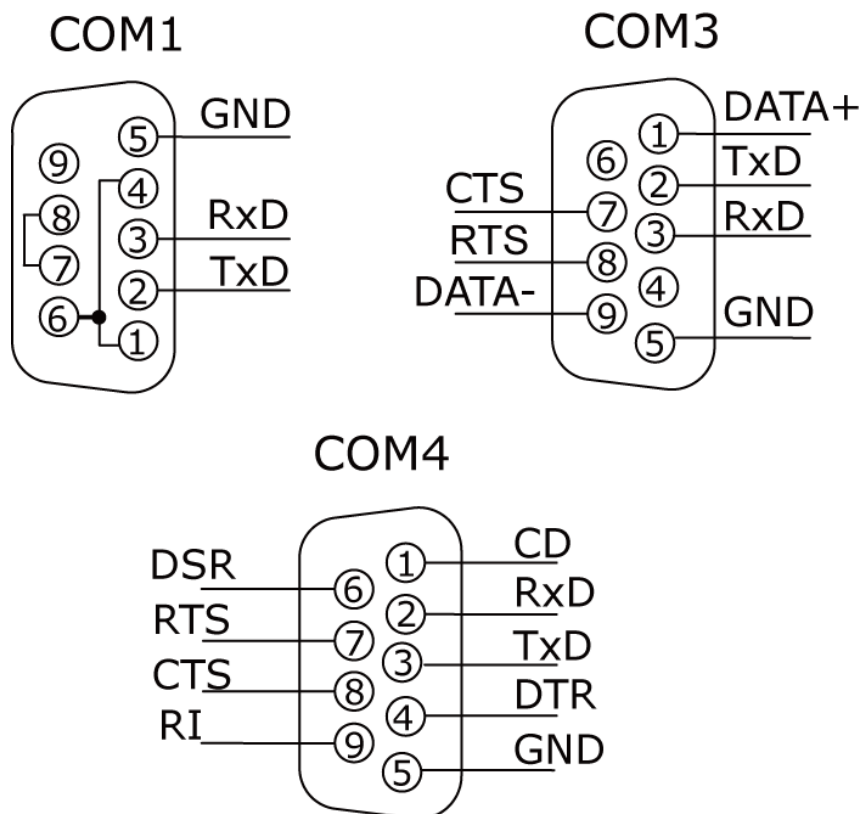
Visit to the website to download the ISaGRAF User's Manual, and refer to **Appendix A.4** for more details. <https://www.icpdas.com/en/download/show.php?num=333>

Pin assignment:

Visit the website for more information about [serial communication modules](#) (Low Profile).

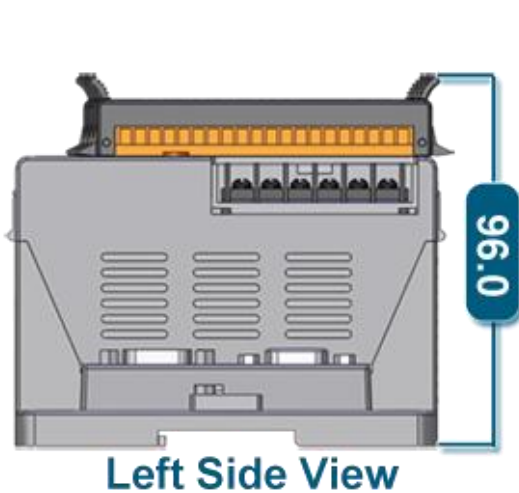
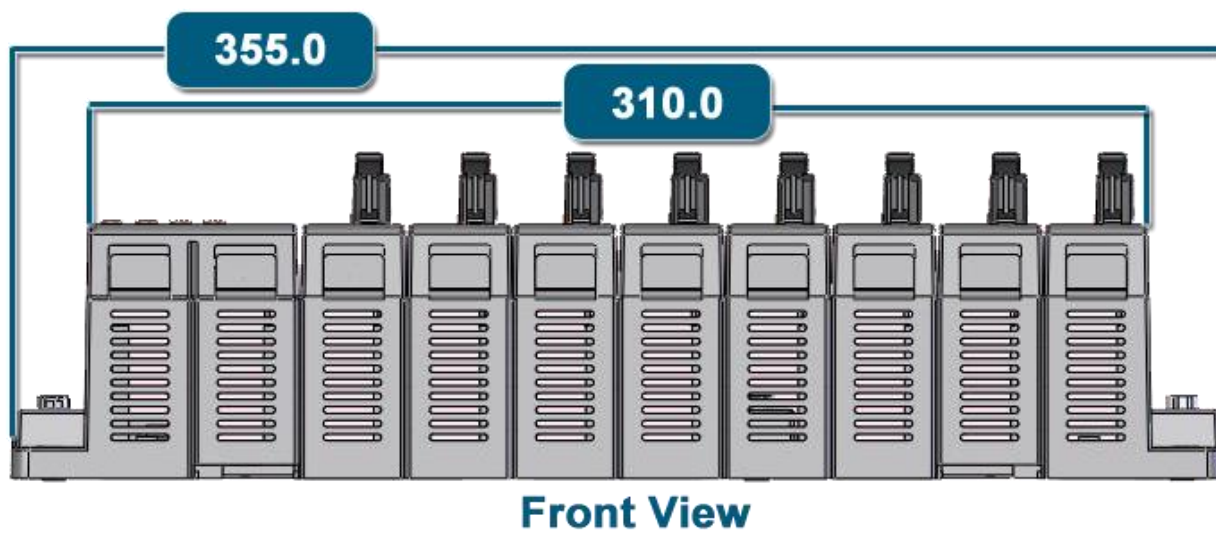


3.19 Pin Assignment of Communication Ports

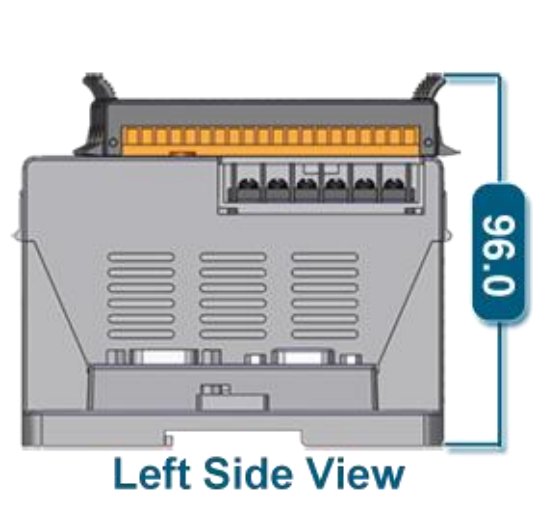
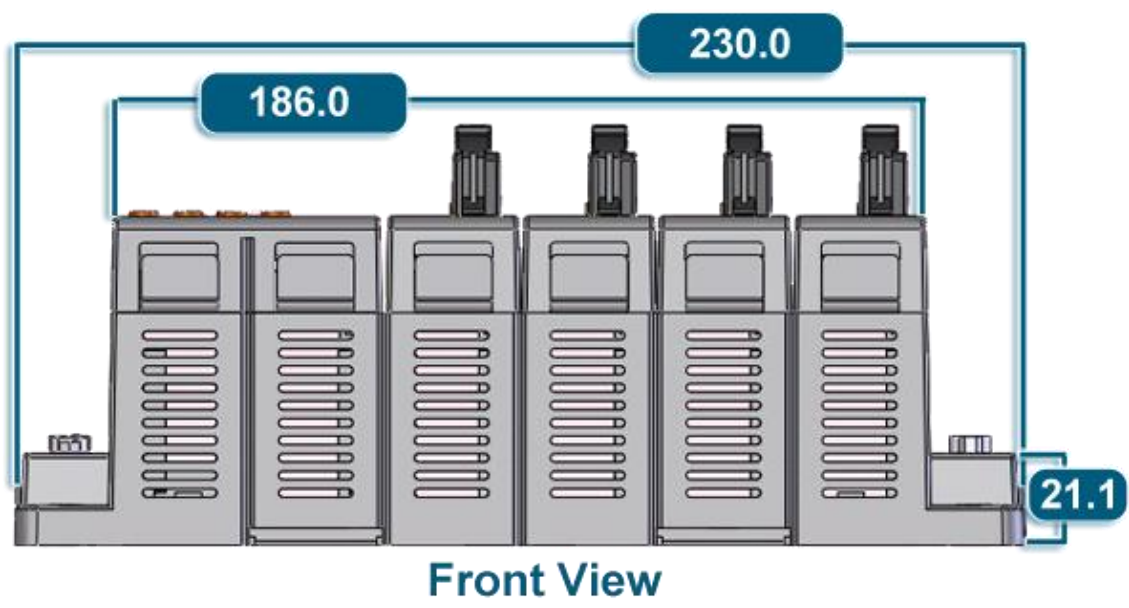
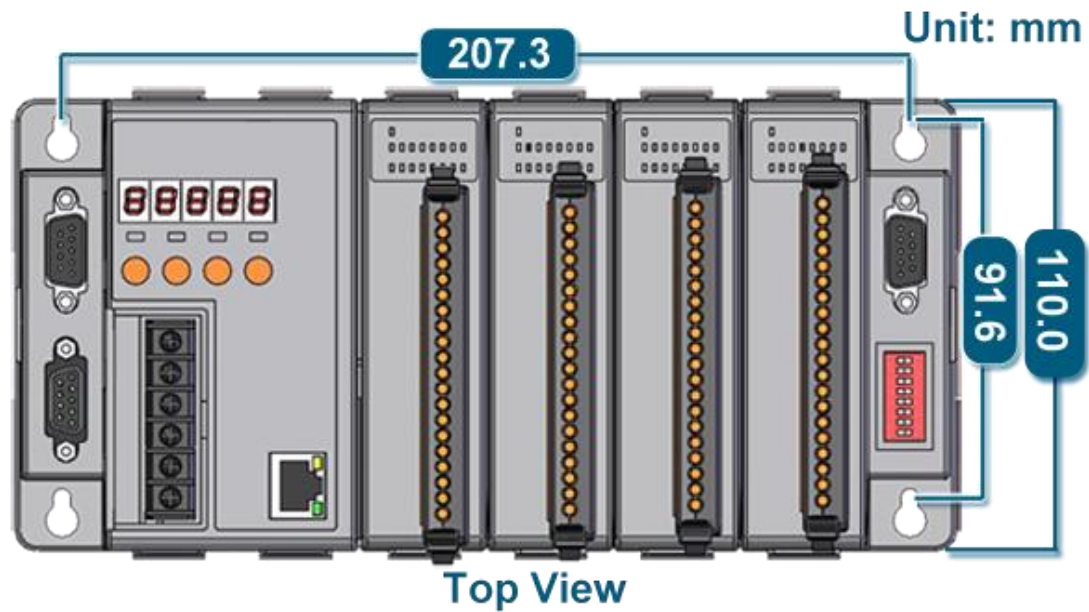


3.20 Dimension

8 Slots:



4 Slots:



Appendix

A: ISaGRAF User Manual & Demo Program & FAQ

The related ISaGRAF manuals and demo programs are all on the website. You can follow the steps below to view the latest information and FAQ on the ISaGRAF webpage.

A.1 The Download Page for ISaGRAF Resource

- Click the “Download Center” on the ISaGRAF webpage to go to ISaGRAF Download Center.
http://www.icpdas.com/en/product/guide+Software+Development__Tools+ISaGRAF

[Introduction](#) [Features](#) [Selection Guide](#) [Application](#) [Download Center](#) [ISaGRAF FAQ](#)

What is ISaGRAF?

ISaGRAF is the most powerful SoftLogic package on the market. ISaGRAF is a PLC-like software running on Windows 95, 98, NT 2000, XP, Vista and Windows7.

It supports IEC 61131-3 standard PLC programming languages - Quick Ladder (LD), Function Block Diagram (FBD), Sequential Function Chart (SFC), Structured Text (ST), Instruction List (IL) plus Flow Chart (FC) and can run the application generated by the workbench on any ISaGRAF PACs. Additionally, for the ultimate in power and flexibility, ISaGRAF supports off-line simulation, on-line debugging, monitoring, and control.



HOME > SUPPORT > Download Center

Utility & Tools

FILE NAME	DESCRIPTION	MODEL	LAST UPDATE	DETAIL
ISaGRAF-256	ISaGRAF Workbench ver. 3 (256 I/O tags)		2020-03-25	Q

Demo Sample

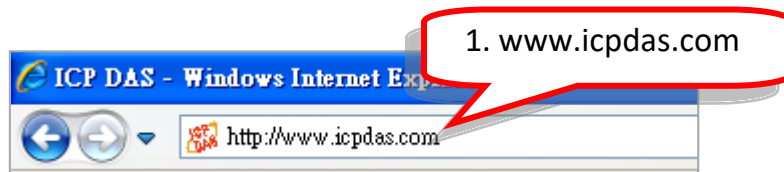
FILE NAME	DESCRIPTION	MODEL	LAST UPDATE	DETAIL
ISaGRAF Demo	For ISaGRAF PACs		2020-04-21	Q

Driver

FILE NAME	DESCRIPTION	MODEL	LAST UPDATE	DETAIL
ISaGRAF PAC Driver & Lib	For ISaGRAF PAC		2020-05-26	Q

TOP

- Also, type the ICP DAS's web address <http://www.icpdas.com> in the browser.



- Click the "SUPPORT" and "Download Center" to go to the webpage.



- Type "ISaGRAF" in the **Keywords** field and click **Search** to search related files.

Download Center
About Product
PACTECH
Catalog/Flyer
Partner Zone

Download Center

Search for Subjects

File Category1 :

Product/Model :

Keywords :

Please enter any search criteria!

Search

HOME > SUPPORT > Download Center

ISaGRAF IP-8000 Getting Started	For ISaGRAF iPAC-8000 Series	2020-04-22	Q
------------------------------------	------------------------------	------------	---

Quick Start

FILE NAME	DESCRIPTION	MODEL	LAST UPDATE	DETAIL
ISaGRAF-256	For ISaGRAF Workbench ver.3		2020-05-18	Q
ISaGRAF XP-8x37-CE6	For ISaGRAF XPAC (0/1/3/7 slots)		2020-04-22	Q

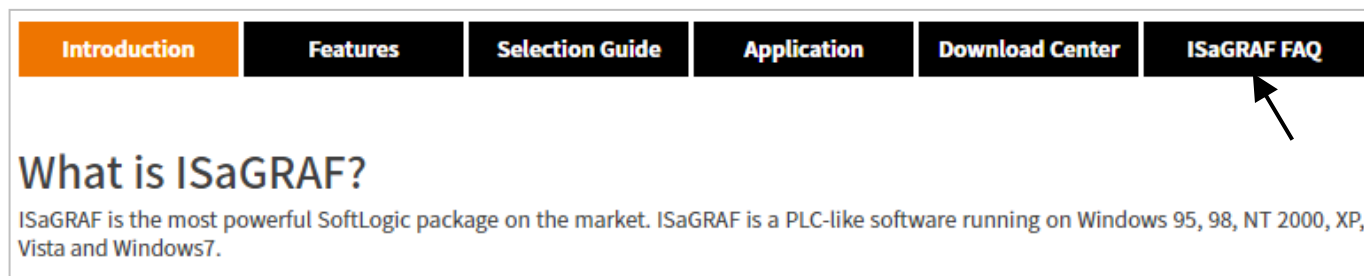
TOP

Data Sheet

FILE NAME	DESCRIPTION	MODEL	LAST UPDATE	DETAIL
ISaGRAF XP-8x37-CE6	For ISaGRAF XP-8000-CE6 Series		2020-04-22	Q



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

- Click the “ISaGRAF FAQ” on the ISaGRAF webpage to go to the FAQ webpage.
http://www.icpdas.com/en/product/guide+Software+Development__Tools+ISaGRAF



Refer to the following ISaGRAF FAQ:

- VB.net 2005 Demo program using Modbus TCP/IP protocol to control ISaGRAF PACs.
Please refer to the website:
<http://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-051](#)
- VB 6.0 Demo program using Modbus TCP/IP protocol to control ISaGRAF PACs.
Please refer to the website:
<http://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-052](#)

HOME > SUPPORT > Product FAQ > Software > Development Tools > ISaGRAF	
FAQ-052: VB 6.0 Demo program using Modbus TCP/IP protocol to control ISaGRAF PACs	
FAQ-051: VB.net 2005 Demo program using Modbus TCP/IP protocol to control ISaGRAF PACs	

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 iP-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 $\pm 15 \text{ mV} \sim \pm 2.5 \text{ V}$. The current input ranges can be $4 \sim 20 \text{ mA}$, $0 \sim 20 \text{ mA}$, and $\pm 20 \text{ mA}$.
3. Up to 10 analog inputs of different types can connected to one module.
4. Up to $240 \text{ V}_{\text{rms}}$ over voltage protection is provided.
5. It features per-channel open wire detection for thermocouple and $4 \sim 20 \text{ mA}$ inputs

For more details, please visit the web site listed below:

I-7018Z: http://www.icpdas.com/en/product/I-7018Z-G_S

I-87018Z: http://www.icpdas.com/en/product/I-87018ZW-G_S

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**