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## Getting Started: iP-8417/8817/8447/8847

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“iP-8xx7” stands for “iP-8417, iP-8817, iP-8447, iP-8847”, and the iP-8x47 is the Ethernet PAC.

ICP DAS CO., LTD. would like to congratulate you own your purchase of our **ISaGRAF PACs - iP-8417/8817/8447/8847**. The ease to integration of the PAC 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:

Please visit the website: [www.icpdas.com/en/product/guide+Software+Development\\_\\_Tools+ISaGRAF](http://www.icpdas.com/en/product/guide+Software+Development__Tools+ISaGRAF)

μPAC:	μPAC-7186EG/PEG, I-7188EG, I-7188XG
iPAC:	iP-8xx7 Series, I-8xx7 Series
XPAC:	XP-8xx7-CE6 Series

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Please contact local agent or email problem-report to [service@icpdas.com](mailto:service@icpdas.com).

New information can be found at [www.icpdas.com](http://www.icpdas.com)

ISaGRAF webpage:

[https://www.icpdas.com/en/product/guide+Software+Development\\_\\_Tools+ISaGRAF](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>

Written by Chun Tsai, Spike Huang ; Edited by Janice Hong.

## 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"><li>• Update URLs to the new website</li><li>• Update some pictures</li><li>• Remove FTP URLs and the path of CD-ROM</li></ul>

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## Reference Guide

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### ISaGRAF Resource on the Internet:

Newly released ISaGRAF IO libraries, PAC drivers, demo, and manuals can be found on:

<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:

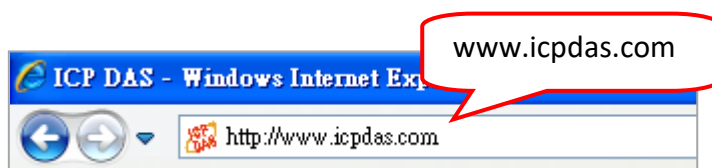
- Industrial Ethernet Switch:  
[http://www.icpdas.com/en/product/guide+Industrial\\_\\_Communication+Ethernet\\_\\_Communication+Ethernet\\_\\_Switch](http://www.icpdas.com/en/product/guide+Industrial__Communication+Ethernet__Communication+Ethernet__Switch)
- RS-232 to RS-422/485 Converter:  
[http://www.icpdas.com/en/product/guide+Industrial\\_\\_Communication+Serial\\_\\_Communication+Converter](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](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 iP-8xx7 series PAC supports the I-8K/I-87K High Profile I/O modules and RS-485 / FRnet 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](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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[Software Support](#) >
[I-8K/I-87K Software Support](#)

WinPAC/ViewPAC  
(WinCE 5.0/7.0 PAC)
XPAC (WinCE 6.0 PAC)
XPAC/iPPC (WinCE 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)

Module Name	iP-8411,iP-8811,iP-8441,iP-8841 iP-8411-FD,iP-8841-FD		iP-8xx7 VP-2117	VP-2111 VH-2110	
	8000 library (for MiniOS Library C Language)		eLogger	ISaGRAF	MiniOS Library
Analog I/O Modules					
I-8014W	Y	-	Y	Y	Y
I-8014CW	Y	-	-	-	-
I-8017HW	Y	-	Y	Y	Y
I-8017HCW	Y	-	-	Y	Y
I-8024W	Y	-	Y	Y	Y
I-8024UW	Y	-	-	-	-
I-8026W	Y	-	Y	Y	Y
I-8028UW	Y	-	-	-	-
Digital I/O Modules					
I-8037W	Y	-	Y	Y	Y
I-8040W	Y	-	Y	Y	Y
I-8040PW	Y	-	Y	Y	Y
I-8041W	Y	-	Y	Y	Y

# Specifications: iP-8417/8817/8447/8847

Models		iP-8417	iP-8817	iP-8447	iP-8847
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	2 ~ 25 ms for normal program 10 ~ 125 ms (or more) for complex or large program			
CPU Module					
CPU		80186, 80 MHz			
SRAM		512 KB	768 KB		
Flash		512 KB; with Write Protect Switch			
microSD Expansion		Yes, but ISaGRAF doesn't support			
Dual Battery Backup SRAM		512 KB; data valid up to 5 years (for retain variables)			
EEPROM		16 KB			
NVRAM		31 bytes (battery backup, data valid up to 5 years)			
RTC (Real Time Clock)		Provides seconds, minutes, hours, date, day of the week, month, year			
64-bit Hardware Serial Number		Yes, for Software Copy Protection			
Watchdog Timers		Yes (0.8 second)			
DIP Switch		Yes (8 bits)			
Communication Ports					
Ethernet		-	RJ-45 x 2, 10/100 Base-TX (Auto-negotiating, Auto MDI/MDI-X, LED indicators)		
COM 0		Internal communication with the high profile I-87K series modules in slots			
COM 1		RS-232 (to update firmware) (Rx/D, Tx/D and GND); non-isolated			
COM 2		RS-485 (Data+, Data-) with internal self-tuner ASIC; 3000 VDC isolated			
COM 3		RS-232/RS-485 (Rx/D, Tx/D, CTS, RTS and GND for RS-232, Data+ and Data- for RS-485); non-isolated			
COM 4		RS-232 (Rx/D, Tx/D, CTS, RTS, DSR, DTR, CD, RI and GND); non-isolated			
SMMI					
LED Display		Yes, 5-Digit			
Programmable LED Indicators		3			
Push Buttons		4			
Buzzer		-	-	Yes	
I/O Expansion Slots					
Slot Number		4	8	4	8
		Note: For High Profile I-8K and I-87K Modules Only			
Data Bus		8/16 bits			
Address Bus Range		2 K for each slot			
Mechanical					
Dimensions (W x L x H)		231 mm x 132 mm x 111 mm	355 mm x 132 mm x 111 mm	231 mm x 132 mm x 111 mm	355 mm x 132 mm x 111 mm
Installation		DIN-Rail or Wall Mounting			
Environmental					
Operating Temperature		-25 ~ +75°C			
Storage Temperature		-30 ~ +80°C			
Ambient Relative Humidity		10 ~ 90% RH (non-condensing)			
Power					
Input Range		+10 ~ +30 VDC			
Isolation		1 kV			
Redundant Power Inputs		Yes, with one power relay (1 A @ 24 VDC) for alarm			
Capacity		30 W	30 W	30 W	30 W
Consumption		6.7 W	7.2 W	6.7 W	7.2 W



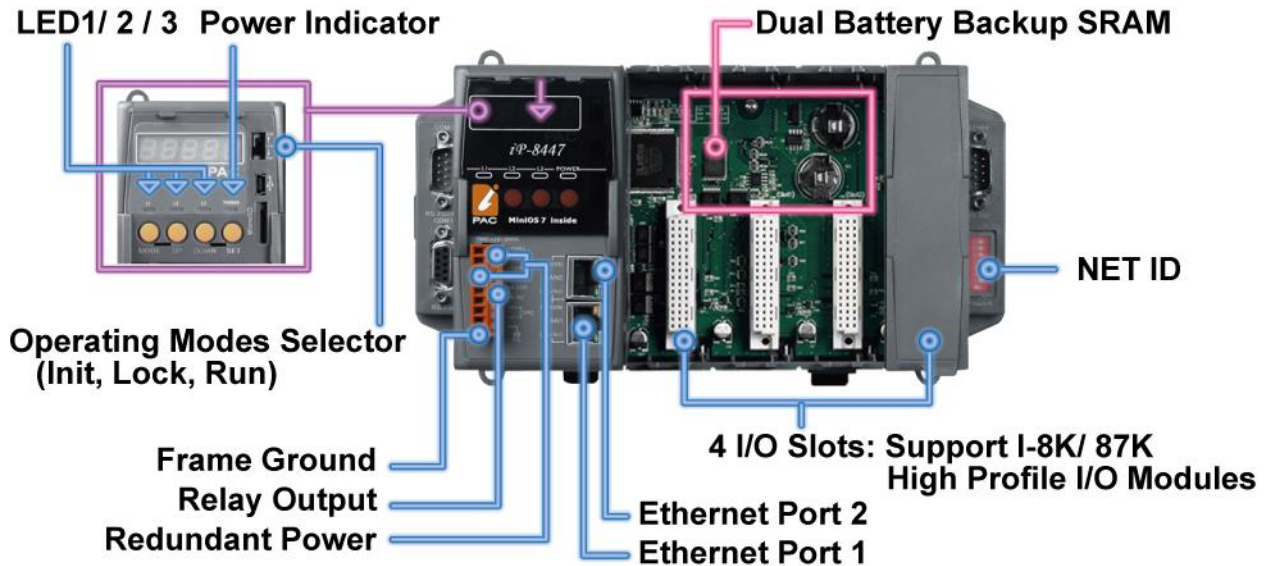
Protocols (Note that certain protocols require optional devices)		
NET ID		8 bits DIP switch to assign NET ID as 1 ~ 255
Modbus RTU/ASCII Master		A max. of 2 ports: COM1~5. (To connect to other Modbus Slave devices.) (*) A max. of Modbus_XXX Function Block amount for 2 ports: 128.
Modbus RTU Slave		A max. of 2 ports: COM1 and one of COM2~3. (For connecting ISaGRAF, PC/HMI/OPC Server and HMI panels.)
Modbus TCP/IP Slave		Two Ethernet ports support Modbus TCP/IP Slave Protocol for connecting ISaGRAF & PC/HMI up to 6 connections. (for IP-8x47 only)
User-defined Protocol		Custom protocols can be applied at COM1~20 using Serial communication function blocks. (*)
Remote I/O		One of COM2~4 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. (LAN2: upper port of IP-8x47 ONLY)
Send Email		Provide functions to send email to a max. of 10 receivers with a single attached file via the Ethernet port through internet. The max. of file size is about 488 KB. (for IP-8x47 only)
SMS: Short Message Service		One of COM4~5 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		COM4 can connect a general Modem. Supports PC to remotely download & monitor the controller.
MMICON/LCD		One of COM3 or COM4 supports ICP DAS's MMICON. The MMICON is featured with a 240 x 64 dot LCD and a 4 x 4 Keyboard. User can use it to display picture, string, integer, float, and input a character, string, integer and float.
Redundant Bus7000		Two ISaGRAF PACs can link to remote I-7000 & I-87K High profile 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.
CAN/CANopen		COM1 or COM3~12 can connect to one I-7530 (converter: RS-232 to CAN) to support CAN/CANopen devices and sensors. One IP-8xx7 supports a max. of 3 RS-232 ports to connect a max. of 3 I-7530. (*) (FAQ-086)
FRnet I/O		Enable a max. of 4 pcs. I-8172W boards to be used to connect to FRnet I/O modules, such as FR-2057, FR-32R. (Max. 1024-ch. DI + 1024-ch. DO) (FAQ-082, 154)
FTP Client		Enable the FTP Client to upload files from the PAC to a remote FTP server on a PC. (FAQ-151)
Optional I/O Functions (Refer to the ISaGRAF PAC I/O Selection Guide for I/O Module list)		
PWM Output	High Speed PWM Module	I-8088W: 8-ch PWM outputs, software support 1 Hz~100 kHz (non-continuous), duty cycle: 0.1 ~ 99.9%
	DO Module as PWM	Optional DO Boards: I-8037W, 8041W, 8041AW, 8042W, 8050W, 8054W, 8055W, 8056W, 8057W, 8060W, 8063W, 8064W, 8068W, 8069W. (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: 1~32766 ms, ON: 1~32766 ms.
Counters, Encoder, Frequency	Parallel DI Counter	Optional I-8K DI boards: I-8040W, 8040PW, 8042W, 8046W, 8048W, 8050W, 8051W, 8052W, 8053W, 8053PW, 8054W, 8055W, 8058W, 8063W. 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-87040W, 87046W, 87051W, 87052W, 87053W, 87053W-A5, 87054W, 87055W, 87058W, 87059W, 87063W. 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-87082W: 32-bit, 100 kHz ; Max. count/frequency for I-8084W: 32-bit, 250 kHz
	Encoder	I-8093W: 3-axis Encoder Module, max. 1M Hz for quadrant input mode, max. 4M Hz for Pulse/Direction and CW/CCW input mode. (FAQ-112) I-8084W: 250 kHz max. , 4-ch encoder, can be Pulse/Direction, or Up/Down or A/B Phase (Quad. mode); Not support Encoder Z-index. (FAQ-100)
	Frequency	I-87082W: 2-ch, 1 Hz ~ 100 kHz; I-87088W: 8-ch, 1 Hz ~ 100 kHz; I-8084W: 8-ch, 1 Hz ~ 250 kHz;
Motion	Motion Control	Can be integrated with one I-8091W (2-axis) or two I-8091W (4-axis). Ethernet communication is also available when doing motion control.
* Note: The COM5 ~ COM20 ports are located in the expansion boards if they are installed in slots 0~7 of IP-8xx7.		

Visit to the ISaGRAF Download Center for the latest version of the 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.

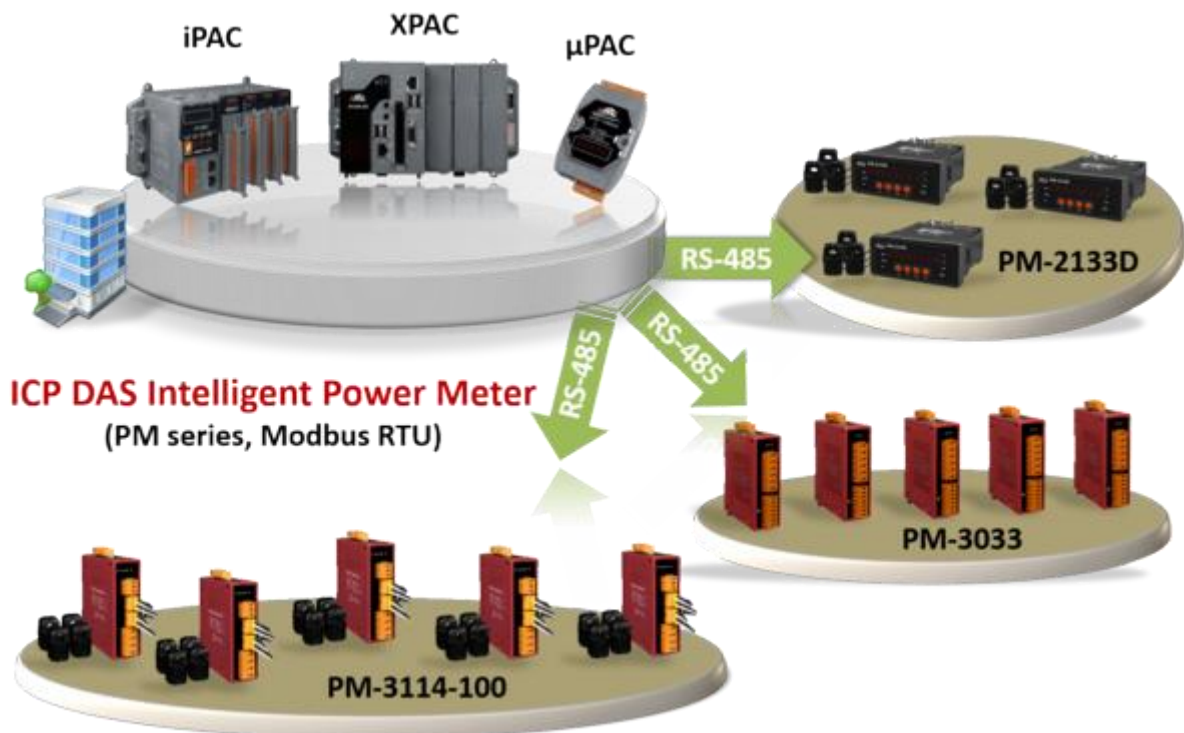


	iP-8x47	I-8x37-80
EEPROM	16 KB	2 KB
SRAM	768 KB	512 KB
Battery Backup SRAM	512 KB (Dual battery)	Need extra S256/512
COM2 (RS-485)	Yes	No
Ethernet	10/100 Mbps x 2	10 Mbps x 1
Modbus TCP/IP connection	Support two Ethernet Port, Max. 6 connections	Max. 4 connections
Support Hot-Swap	Yes	No
Support CAN/CANopen		
Support send E-mail with an attached file		
Support FRnet I/O		
Support Mbus24r and Mbus24r1 (Can read Max.24 word)		

**Note:** iP-8x47 only support I-8K, I-87K (Hot-swap) High Profile I/O modules plugged on slot 0 ~ 7.

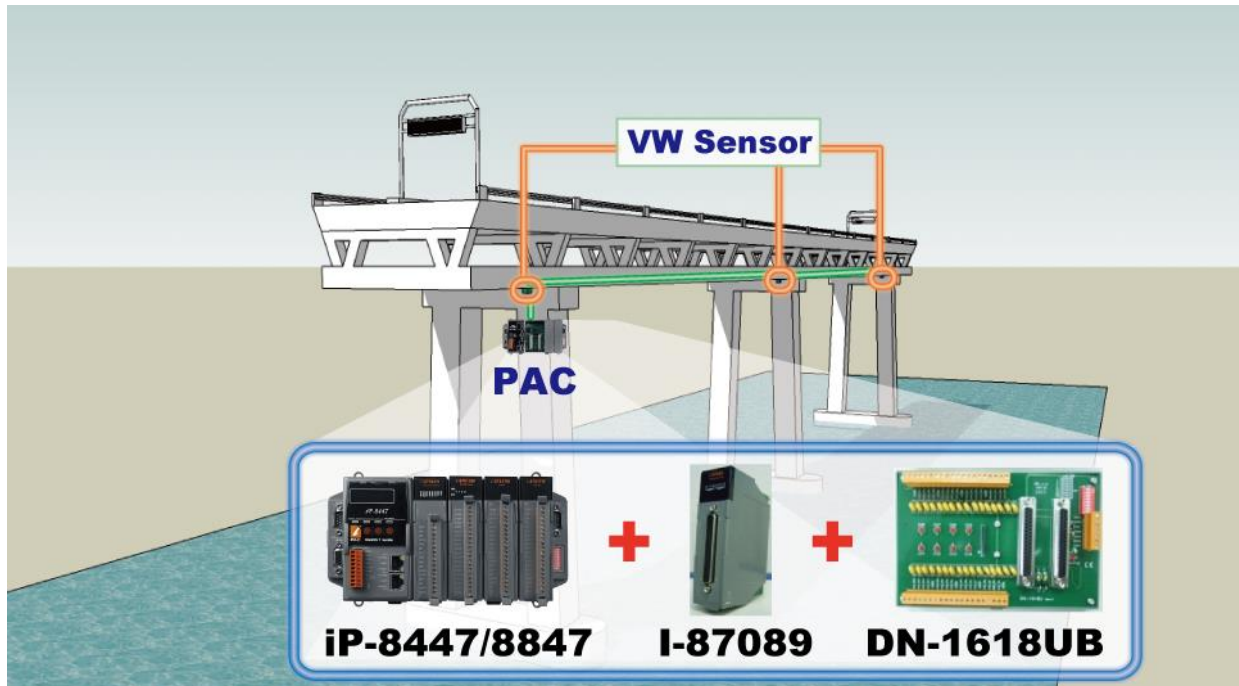
## 1.2 Connect the Smart Power Meter PM-2133/2134

- ISaGRAF PAC support standard Modbus protocol, support multiple RS-485 ports to connect to multiple PM-213x Smart meters.
- For the power measurement control systems in small/medium sized stores, buildings and factories with electric equipment.
- PM-213x smart meter with "Wh" pulse output is useful in the systems needing to connect the meter tester.
- PM-213x smart meter with wired clip-on CT is easily wiring for on-line installation, suitable for the uninterruptible power systems.
- PM-213x is a series of 3 Phase/4 Loops 1 Phase Compact Smart Meter with true RMS energy and power parameters measurement in a compact size. The ISaGRAF PACs combining with PM-213x can apply to various control/monitor systems about intelligent electric power measurement.
- More at <https://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-129](#).



## 1.3 Constructions Monitoring Application (VW Sensor)

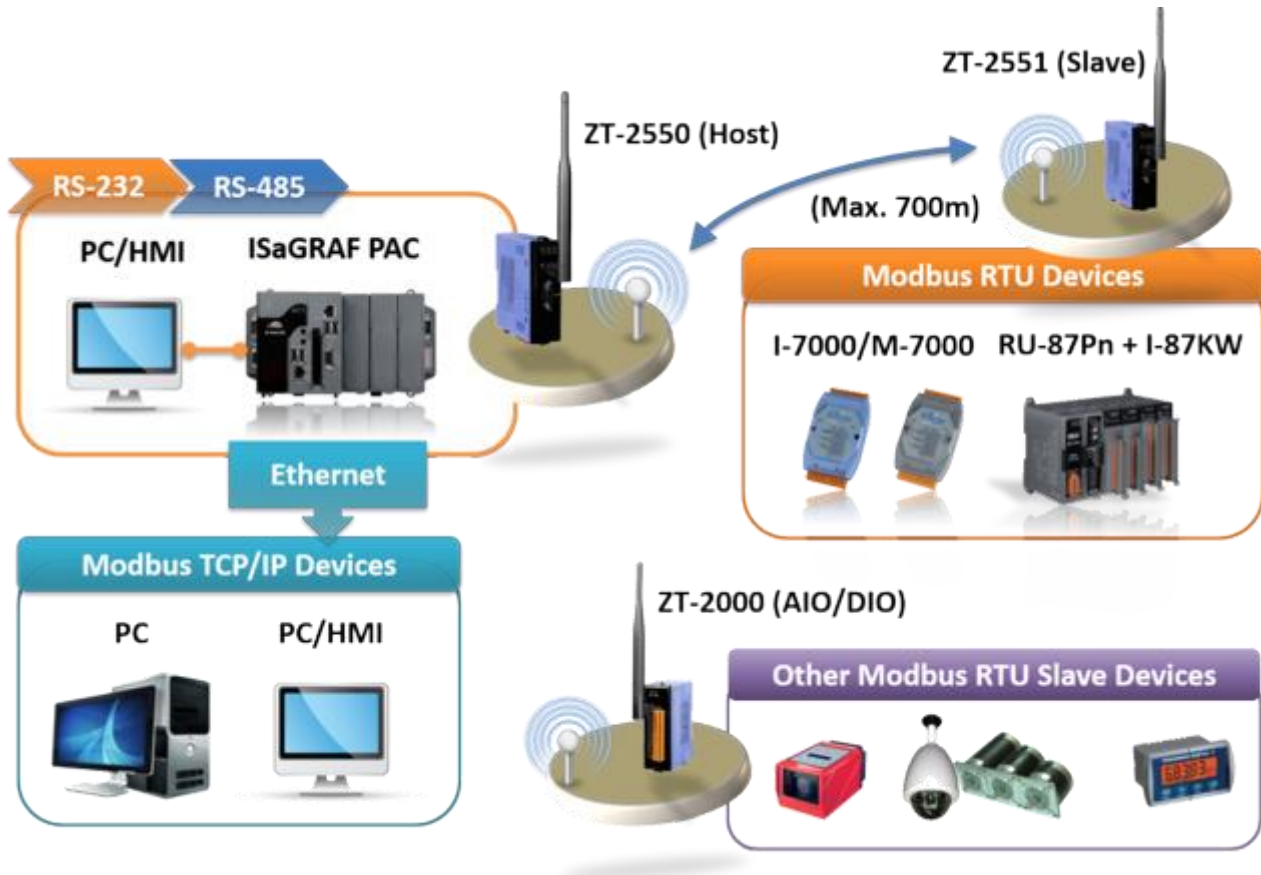
- Since 2020, ISaGRAF does not support the application.
- ICP DAS releases effective "VW Sensor" (Vibration Wire solution) and "Carlson Strain Gauge Inputs" solution. It's useful for measuring the stress of constructions like building, bridge, dam, etc.
- The iP-8xx7 supports the I-87089 (the VW master card) plus the DN-1618UB (daughter board) to achieve the "VW Sensor" application.





## 1.4 ZigBee Wireless Solution

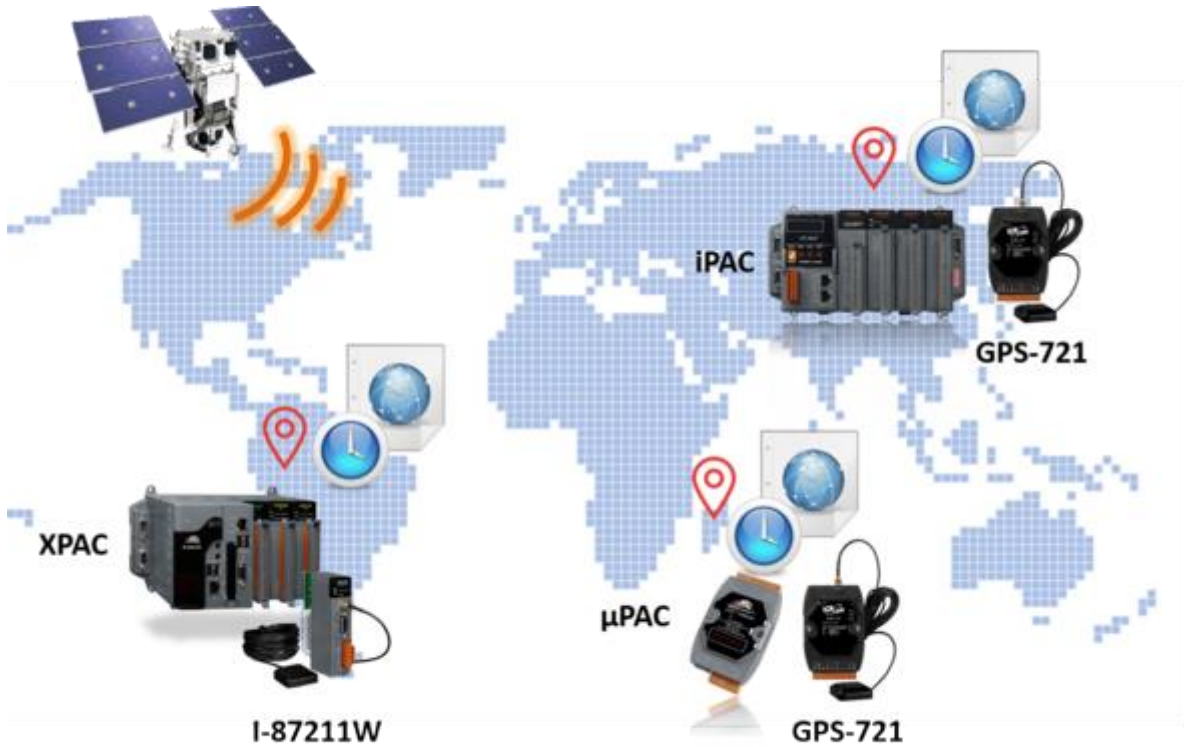
- **ZB-2000 series product has been phased out, users can choose ZT-2000 series product.**
- The iP-8xx7 plus ZB-2550P and ZB-2551P RS-232/RS-485 Converters can apply wireless communication, reduce the wiring cost, and achieve the mission of remote I/O control and data acquisition.
- More at <https://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-110](#).



## 1.5 GPS Applications: ISaGRAF PAC plus I-87211W

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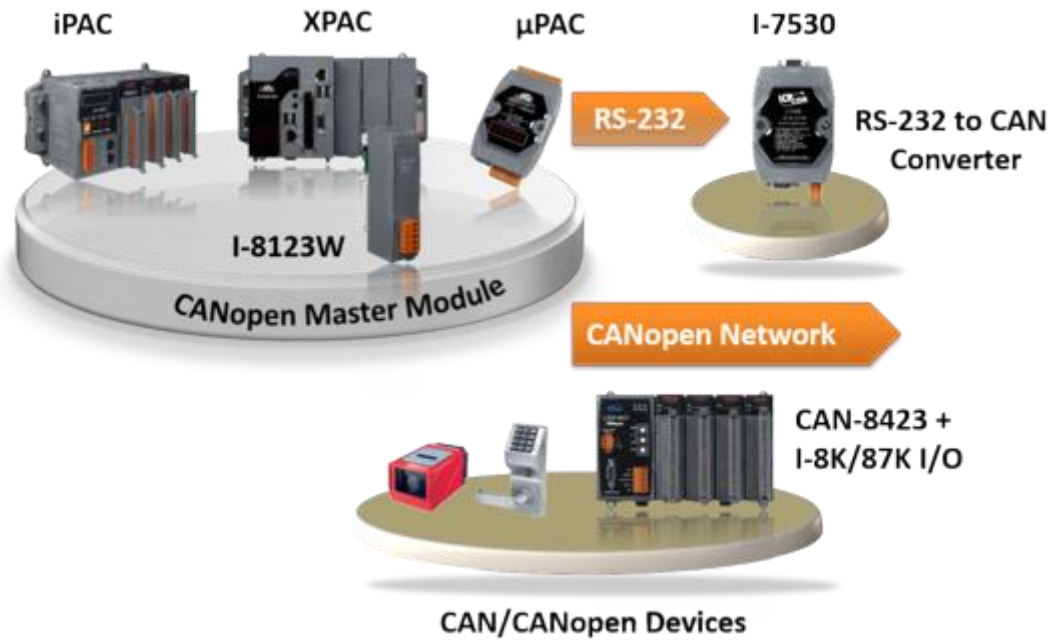
- The iP-8xx7 can support one GPS-721/I-87211W as GPS I/O.
- For doing auto-time-synchronization and getting local Longitude and Latitude.
- More at <https://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-107](#).



## 1.6 Integrate with CAN/CANopen Devices and Sensors

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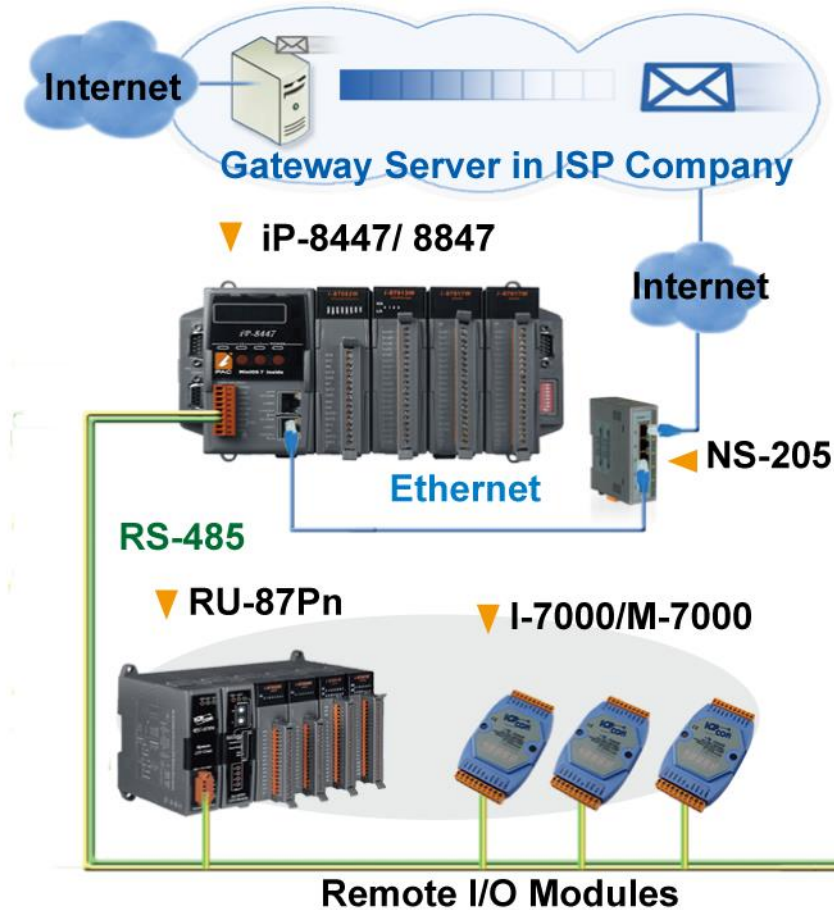
- The iP-8xx7 supports up to 3 I-7530 (RS-232 to CAN) converters.
- More at <https://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-086](#).



## 1.7 Send Email with One Attached File

- The iP-8xx7 can send Email with one attached file via Ethernet Port. The maximum file size is about 488K bytes.
- One Email can send to 10 receivers at one sending.
- More at <https://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-067](#).

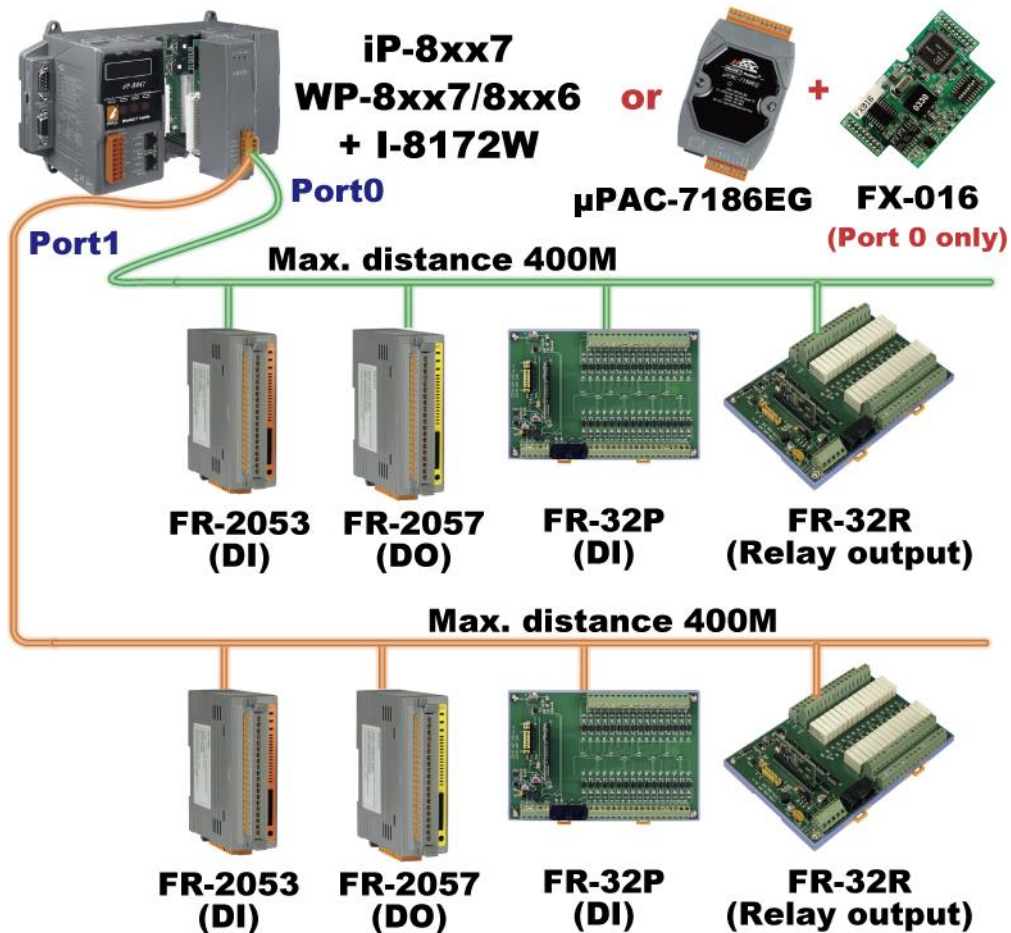
Note: The iP-8x17 does not support the feature.





## 1.8 Fast FRnet Remote I/O

- Fast I/O scan: About 3 ms per FRnet scan. (This depends on your ISaGRAF PLC program's scan time) (e.g. If the ISaGRAF PLC scan time is 9 ms, then the scan time for all will be 9 ms, instead of 3 ms.)
- More at <https://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-082](#).



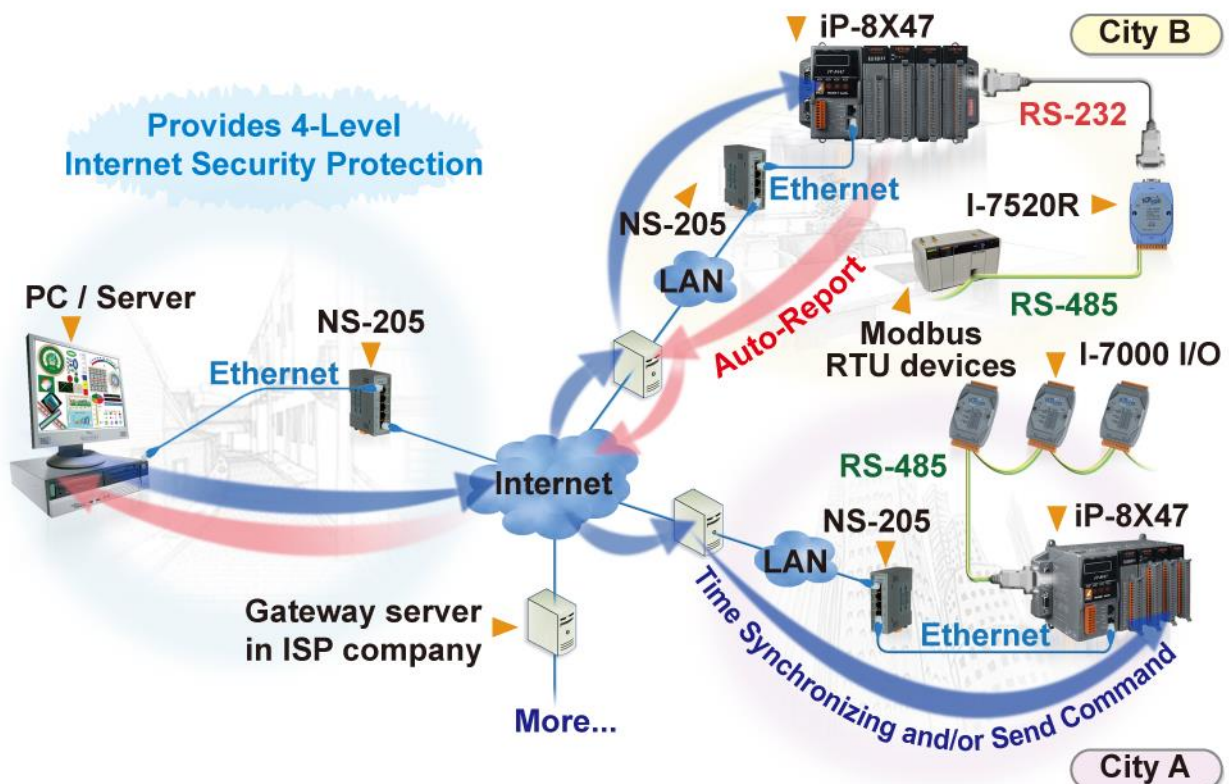
- Visit to the website for more information about FR series products:  
[http://www.icpdas.com/en/product/guide+Remote\\_I\\_O\\_Module\\_and\\_Unit+FRnet\\_I\\_O\\_Modules+FR-2000](http://www.icpdas.com/en/product/guide+Remote_I_O_Module_and_Unit+FRnet_I_O_Modules+FR-2000)

## 1.9 Active Control Data and I/O Acquisition Data Reporting System

- VC++ 6.0, VB 6.0 and ISaGRAF demo programs are available.
- ISaGRAF PACs can use UDP/IP Client protocol to auto-report acquisition data & control data to local or to remote internet PC/Server.  
**Advantage: Each PAC in the different location doesn't require a fixed Internet IP.**
- More at <https://www.icpdas.com/en/faq/index.php?kind=280#751> > [FAQ-065](#).

Note: The iP-8x17 doesn't support the feature.

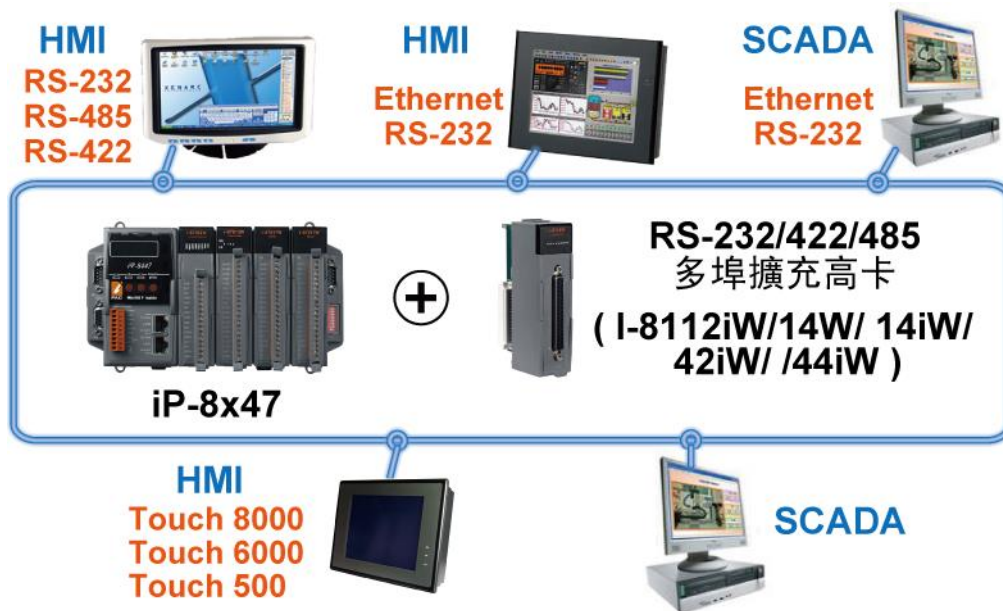
### Stable and Cost-effective Data Acquisition Auto-Report System



## 1.10 Modbus RTU/TCP Slave

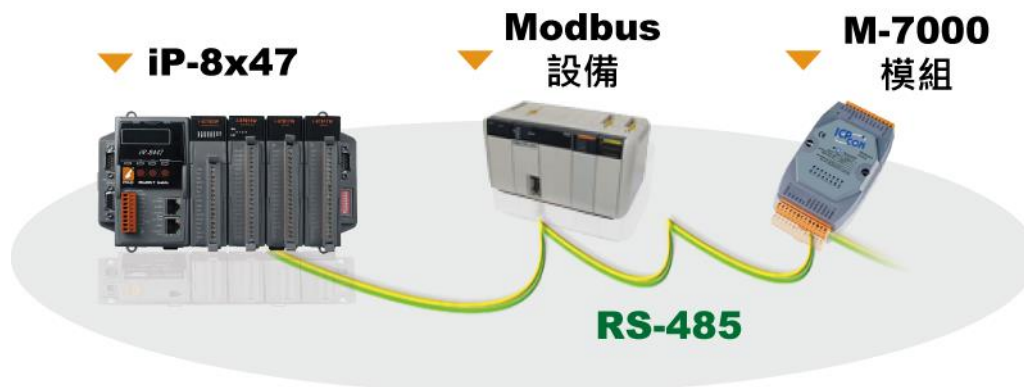
- Modbus RTU Slave (RS-232/485/422): Max. 2 ports.  
> COM1 and one of COM2, COM3.
- Modbus TCP/IP Slave: Max. 6 connections.

Note: The iP-8x17 doesn't support Modbus TCP/IP Slave Port.



## 1.11 Modbus RTU/ASCII Master

- Modbus RTU/ASCII Master (RS-232/485/422): Max. 2 ports.  
> COM1 ~ COM4 and COM5 (\*).
- The iP-8xx7 can link to Modbus PLC or M-7000 I/O or Modbus devices (Power meter, temperature PAC, inverter etc.)

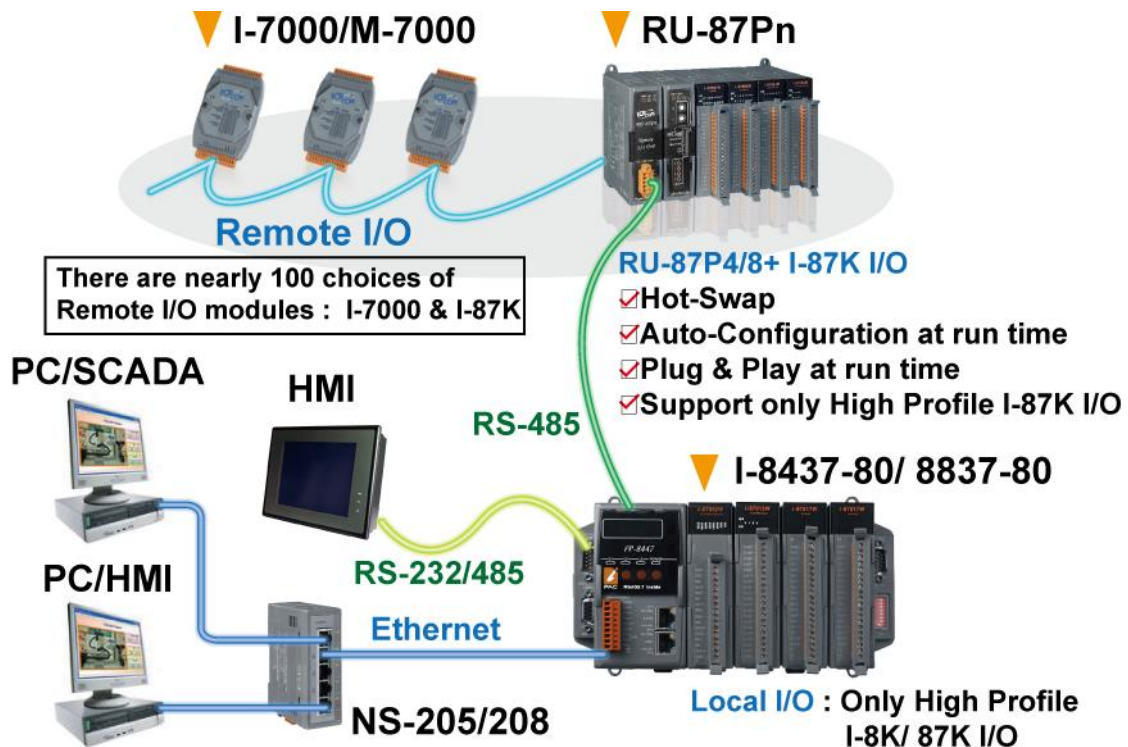


### NOTE (\*):

When the [I-8112iW/8114W/8114iW/8142iW/8144iW expansion board](#) is plugged in, COM5 ~ COM20 will be added.

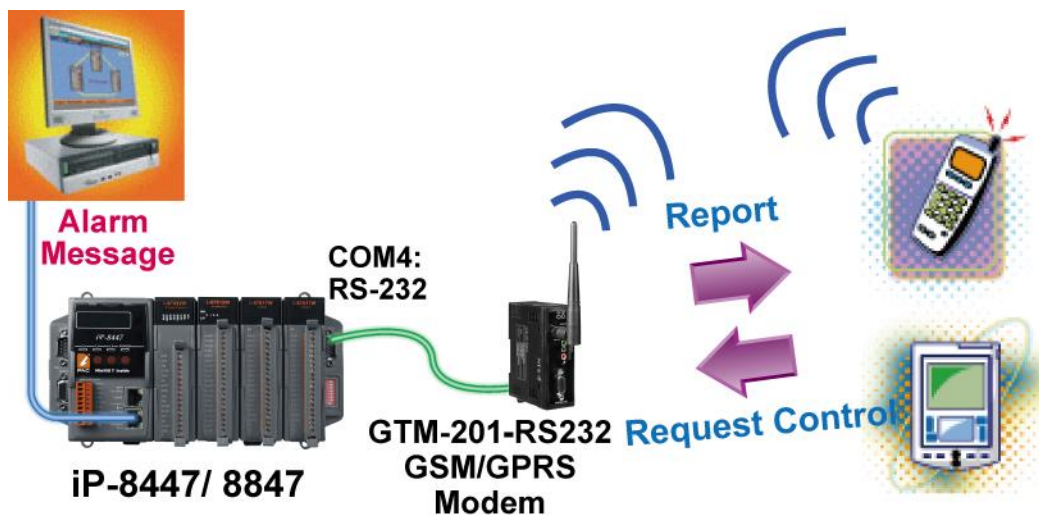
## 1.12 Multi-HMI & Local/Remote I/O

- Users can choose RS-485 Remote I/O modules (I-7000, M-7000) or expansion units (RU-87Pn, I-87Kn) plugged with I-87K high profile I/O modules.
- With Modbus TCP/IP protocol, up to 6 PCs can link to one iP-8x47.



## 1.13 SMS: Short Message Service

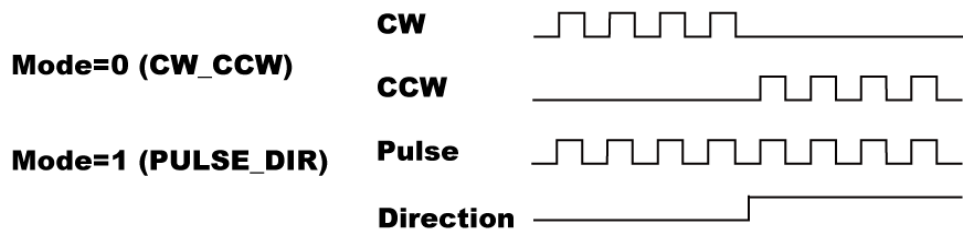
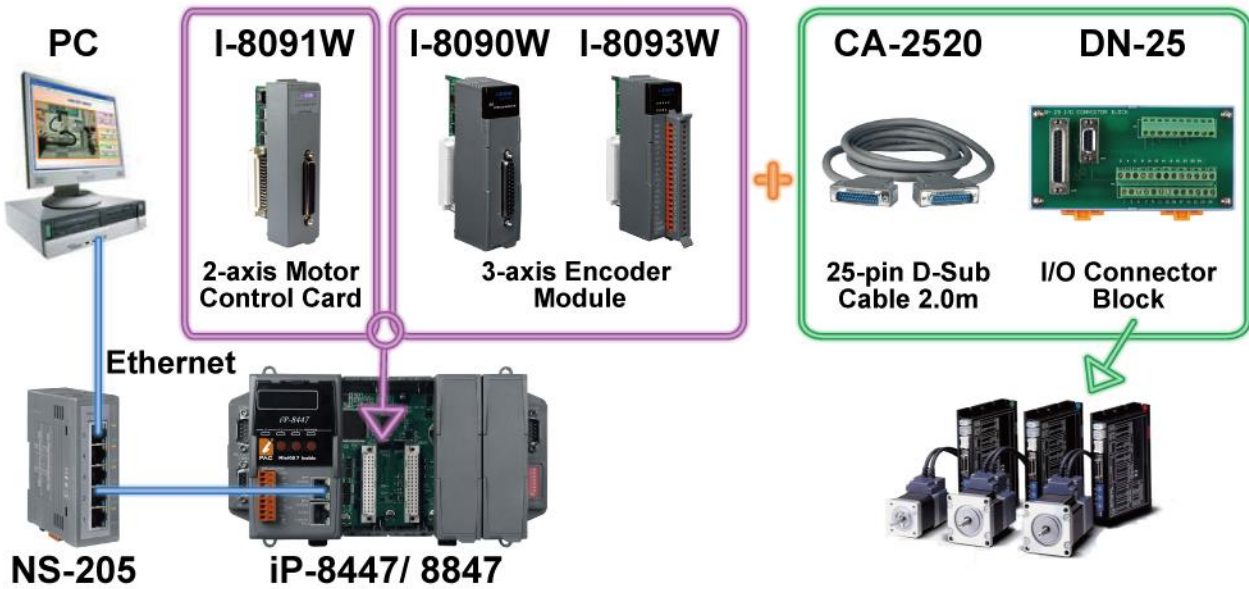
The iP-8xx7 can integrate with a GSM Modem to SMS: Short Message Service. This allows user to request information or perform control tasks for the ISaGRAF PAC via his personal cellular phone. In addition, the PAC can also send information and alarms to user's cellular phone.





## 1.14 Motion Control

- One I-8091W can control 2-axis: X-Y plane or 2-axis independent
- Two I-8091W can control 4-axis: X-Y plane + 2-axis independent or 4-axis independent
- Encoder Modules - I-8093W : 3-axis ([FAQ-112](#)) ; I-8084W: 4-axis, without Z-index ([FAQ-100](#)) ; I-8090W: 3-axis



## 1.15 Data Exchange: Fbus or Ebus

---

- **Fbus ( RS-485 Network )**

Each ISaGRAF PAC can use its RS-485 port to talk to each other via the Fbus communication mechanism. Fbus can be used to broadcast data to each PAC or each PAC can request to send or receive data from any other PAC on the same Fbus network.

- **Ebus ( Ethernet Network)**

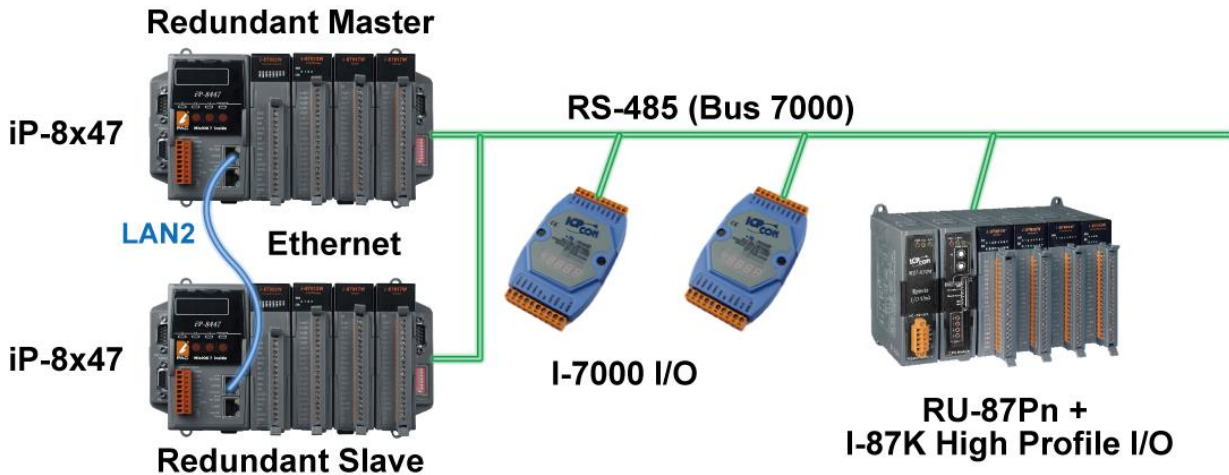
Each ISaGRAF PAC can use its Ethernet port to talk to each other via the Ebus communication mechanism. When PC is talking with PACs via Ethernet, the PACs can also talk to each other via the same Ethernet; It makes the configuration more flexible and faster.

**Note:** The iP-8x17 doesn't support Ebus.



## 1.16 Redundant Bus7000

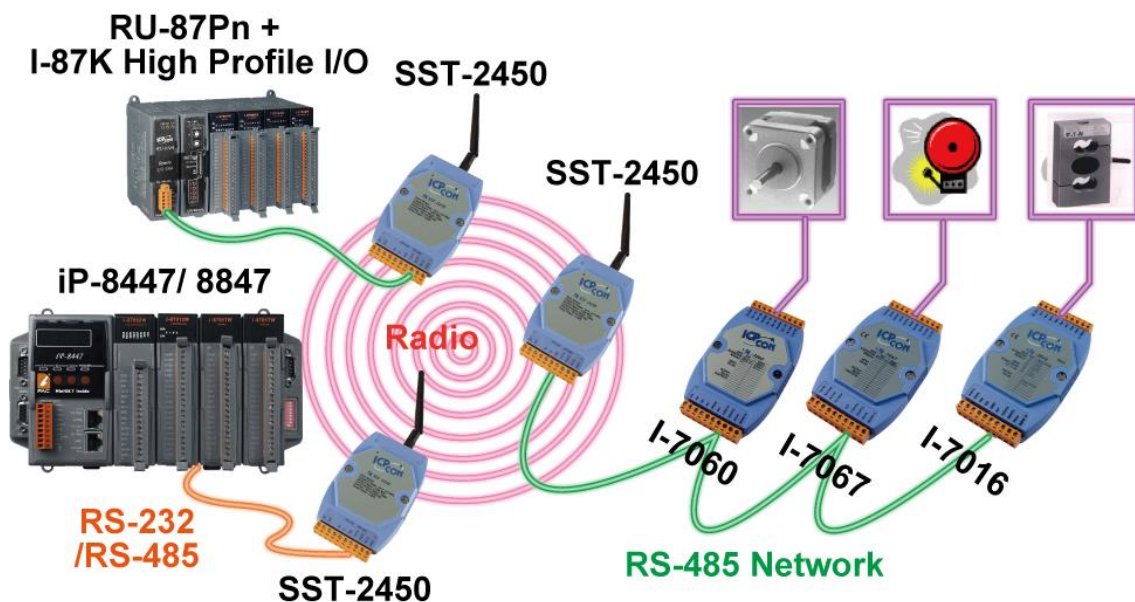
iP-8447/8847:



Note: The iP-8x17 doesn't support the feature.

## 1.17 Wireless I/O Solution

User can use iP-8xx7 with two or more SST-2450 wireless communication modules to data acquisition and control applications between a host and remote I/O modules.

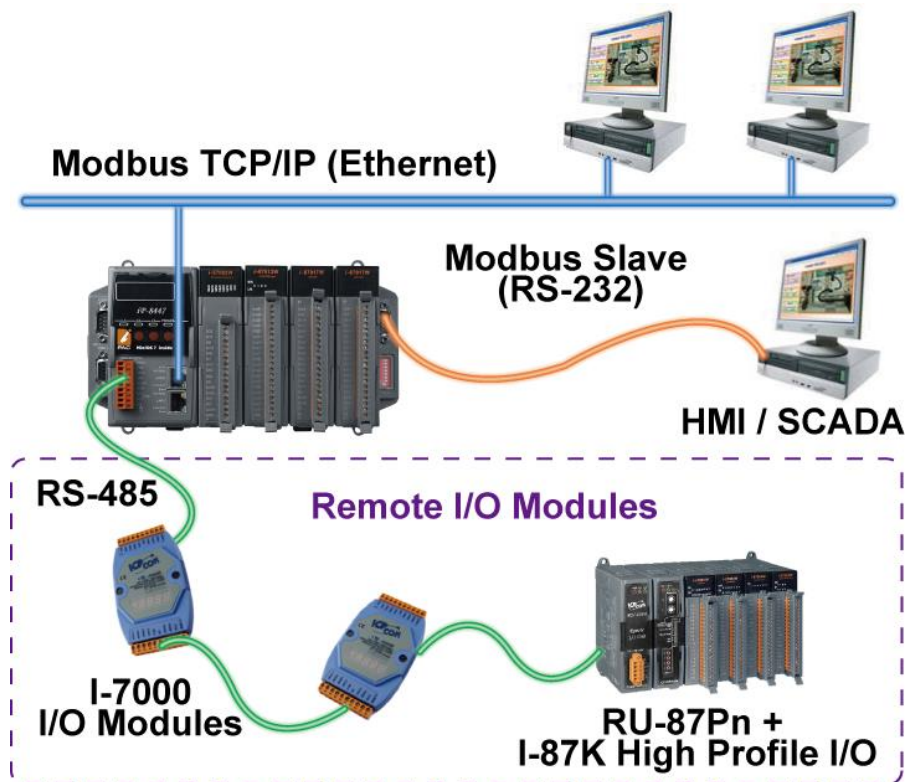


SST-2450 has been phased out, visit to the website for new information about products.

[http://www.icpdas.com/en/product/guide+Wireless\\_\\_Communication+3G\\_4G\\_\\_Products+Modem#596](http://www.icpdas.com/en/product/guide+Wireless__Communication+3G_4G__Products+Modem#596)

## 1.18 Modbus Converter of I-7000 & I-87K I/O

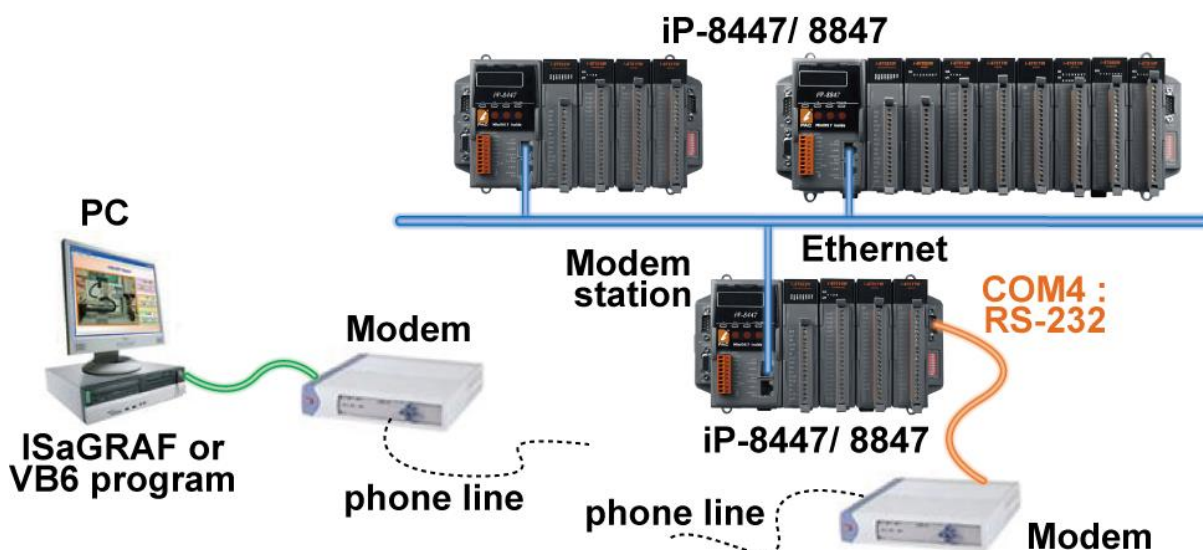
iP-8447/8847 can be a Modbus RTU serial & TCP/IP converter of I-7000 & I-87K Remote I/O modules.



Note: The iP-8x17 doesn't support the feature.

## 1.19 Download & Monitoring Via Modem\_Link

The Modem\_Link provides you an easy way to remotely download your ISaGRAF program to the iP-8x47 via a general Modem. And also you can monitor every I/O, data and if the program allows, you can control it via the Modem.





### 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 ver. 3.4x or 3.5x) to install on his PC to edit, download, monitor & debug the PAC system.

#### **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.

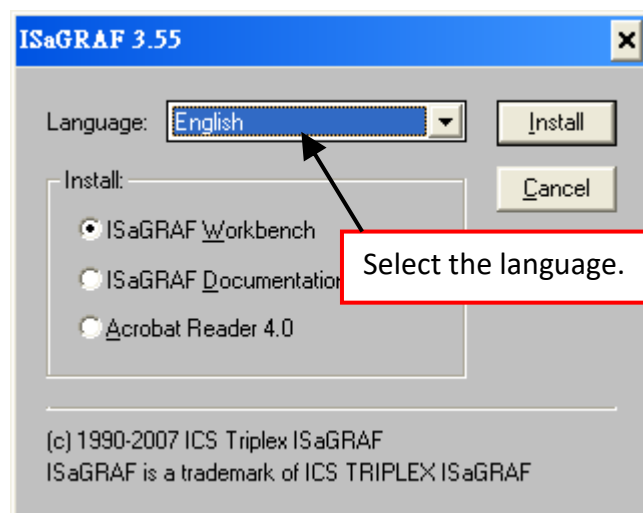
- Windows 95 / Windows 98 / Windows 2000
- Windows NT Version 3.51 or Windows NT Version 4.0
- Windows XP or Vista or XP mode in Windows 7 (refer to [FAQ-117](#))

#### **Steps to Installing the ISaGRAF Workbench:**

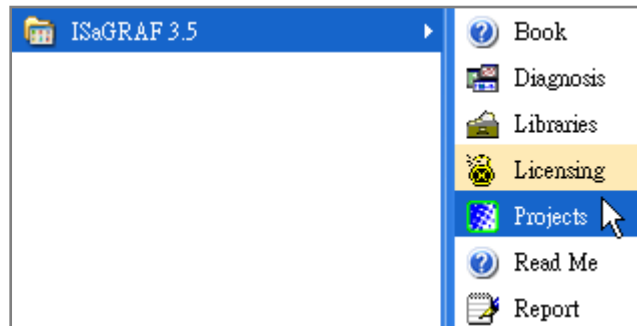


If your operating system is Windows Vista or Windows 7 (32-bit), please refer to [2.1.4](#).  
If your operating system is Windows 7 (64-bit), please refer to [2.1.5](#).

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.



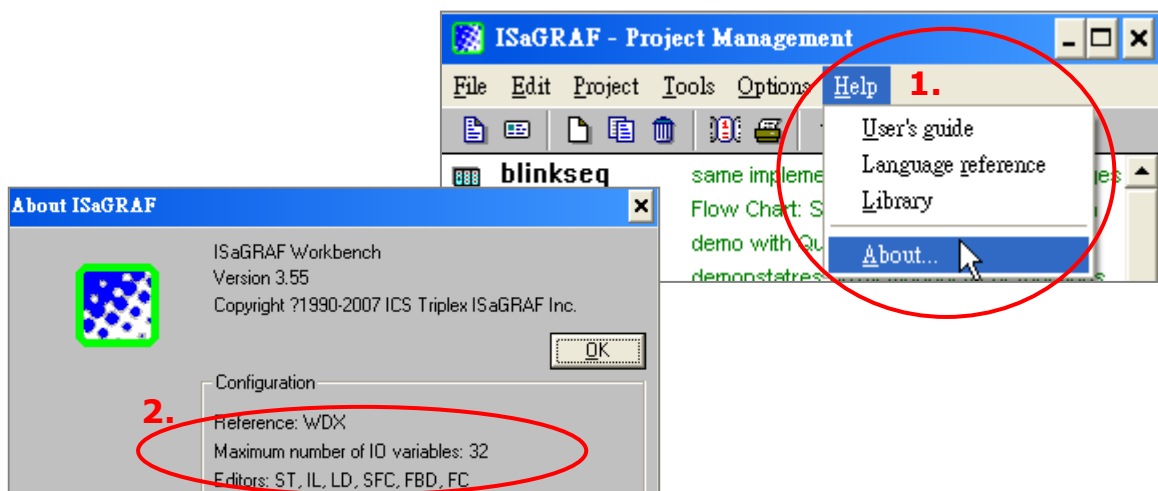
After the installation, click the Windows “Start” and point to “Programs” and “ISaGRAF 3.5”, then click “Project” to open the ISaGRAF.



### 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:**

Execute the following drivers in the ISaGRAF installation folder and restart the PC.

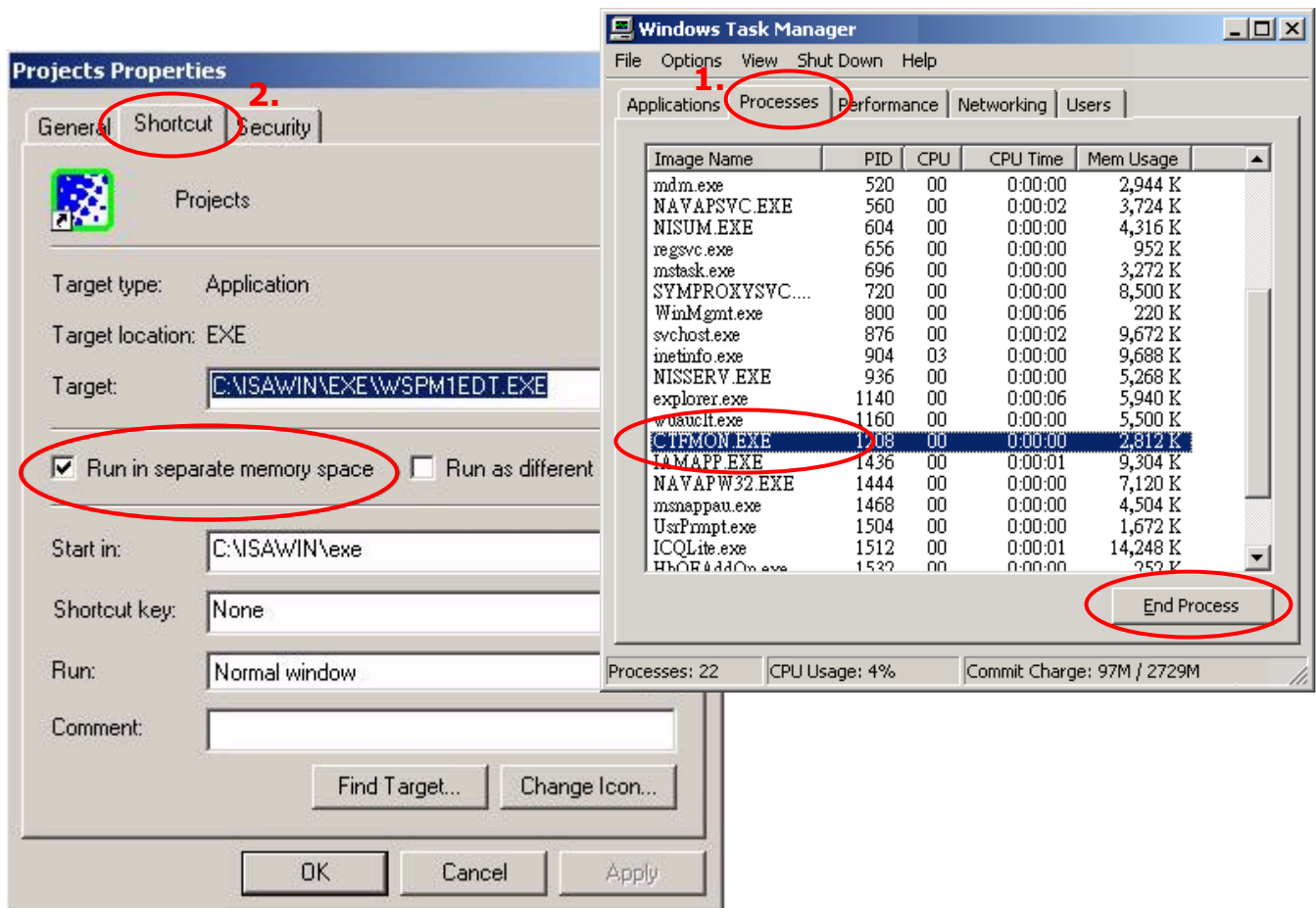
- For ISaGRAF-80: \Sentinel5382\setup.exe or
- For other versions: \Sentinel\setup.exe

#### **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 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.

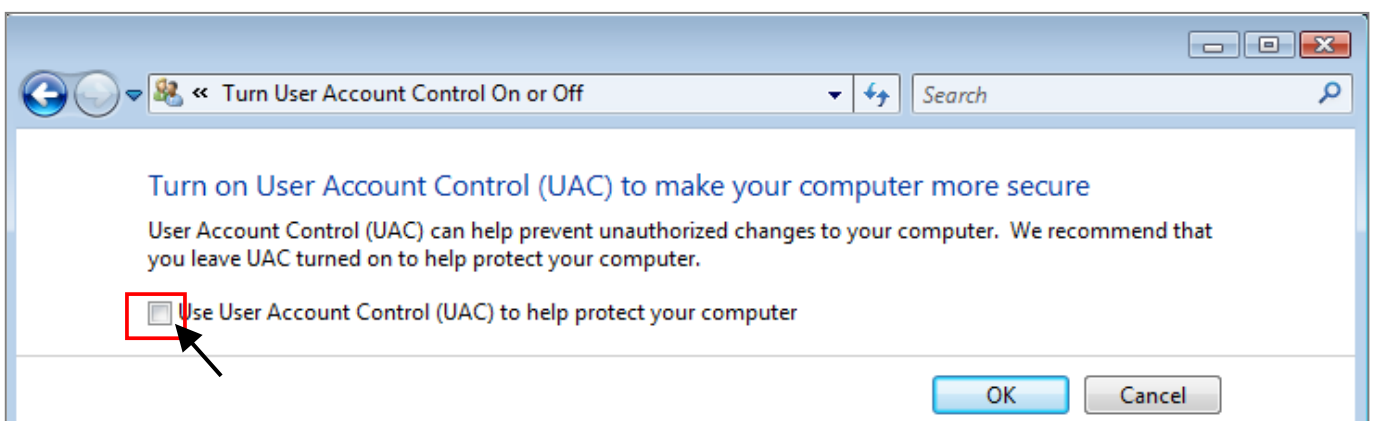
1. From the “Start” menu, choose “Control Panel > User Accounts and Family Safety > User Accounts”, then click “Change User Account Control settings” or “Turn User Account Control on or off”.



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

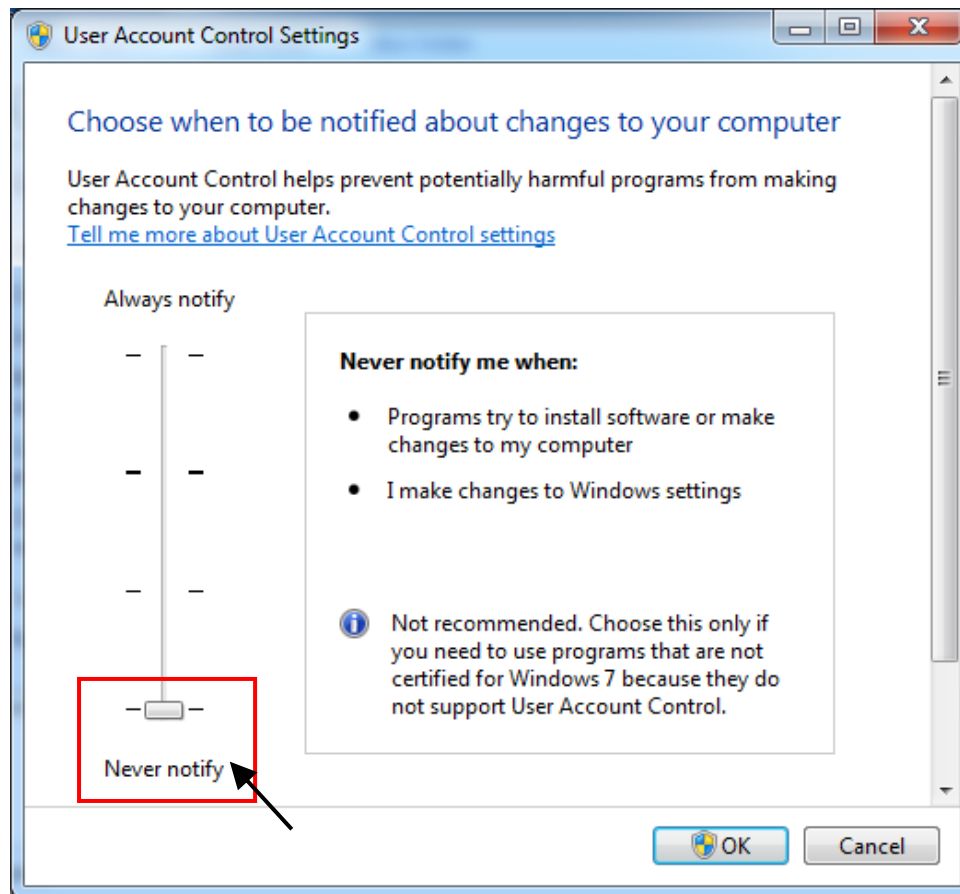
#### Windows Vista:

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 (64-bit) Users

Because the ISaGRAF Workbench can only 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 "Start > 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](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>

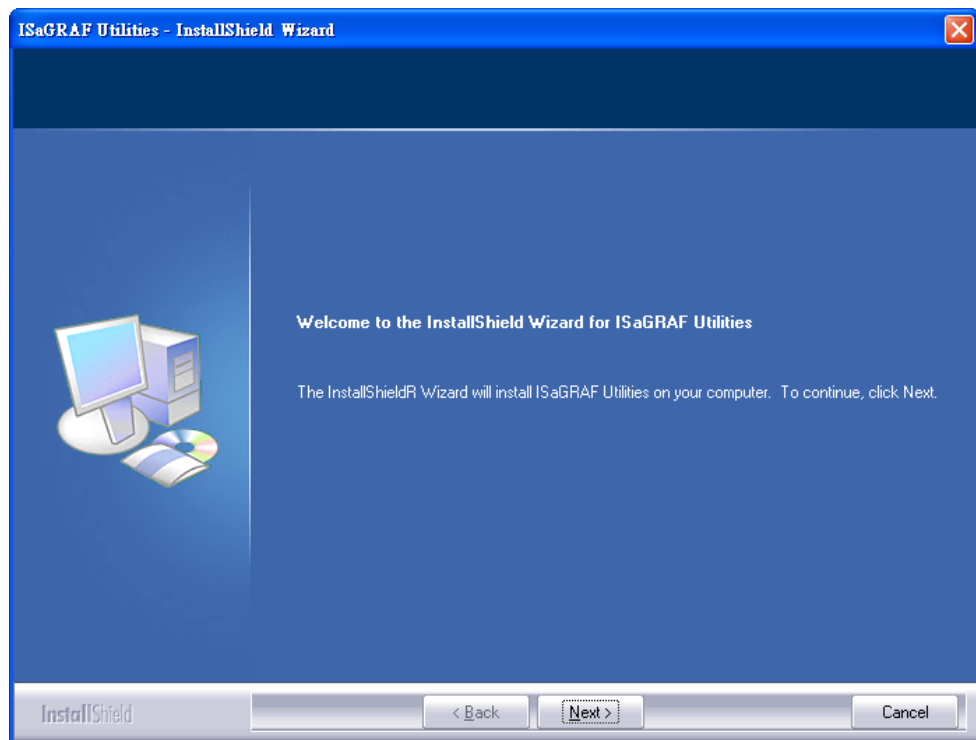
The “ICP DAS Utilities for ISaGRAF” consists of 3 major items.

- I/O libraries (for all ISaGRAF PAC)
- Modem\_Link utility
- Auto-scan I/O utility

### **Note:**

Make sure you have already installed the ISaGRAF Workbench program, IF NOT, please refer to [Ch 2.1 Step 1](#) before continuing.

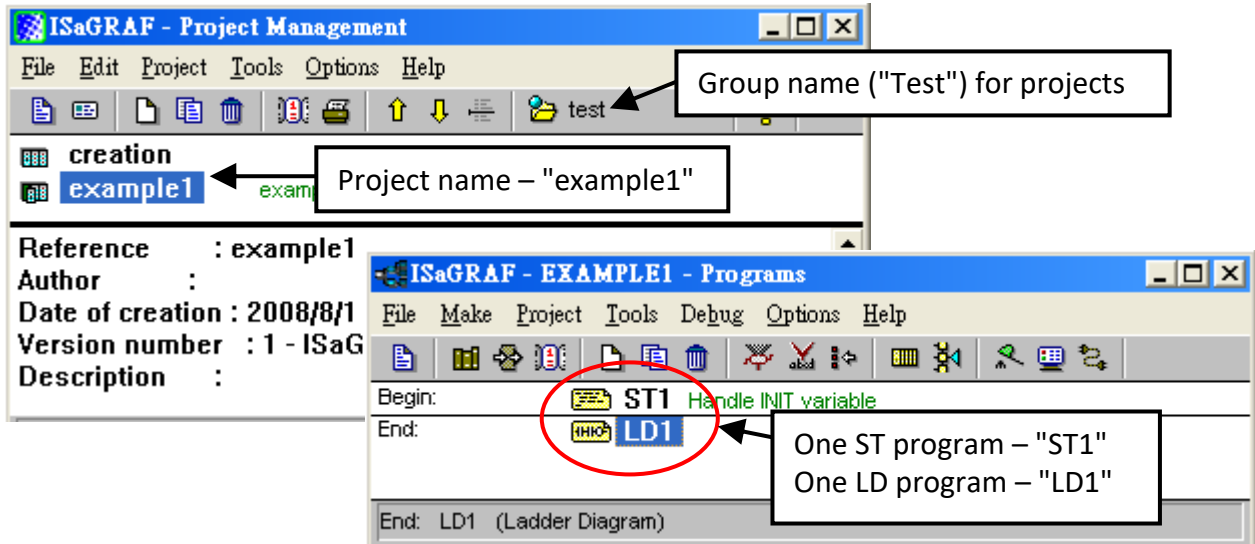
Execute **setup.exe** and follow the instructions of the InstallShield Wizard to install ISaGRAF Utilities.



## 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 iP-8xx7 PAC 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
OUT1	Boolean	Output	Output 1
OUT2	Boolean	Output	Output 2
OUT3	Boolean	Output	Output 3
K1	Boolean	Input	Push button 1
K2	Boolean	Input	Push button 2
T1	Timer	Internal	Time period of blinking

**"ST1" program:**

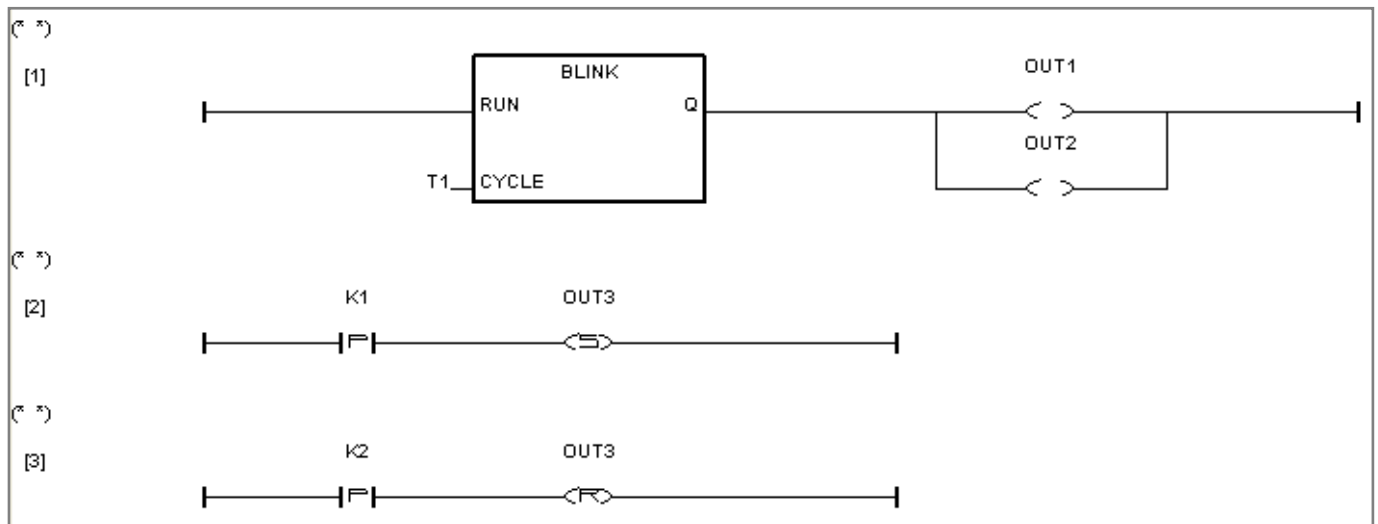
```
IF INIT THEN

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

END_IF;
```

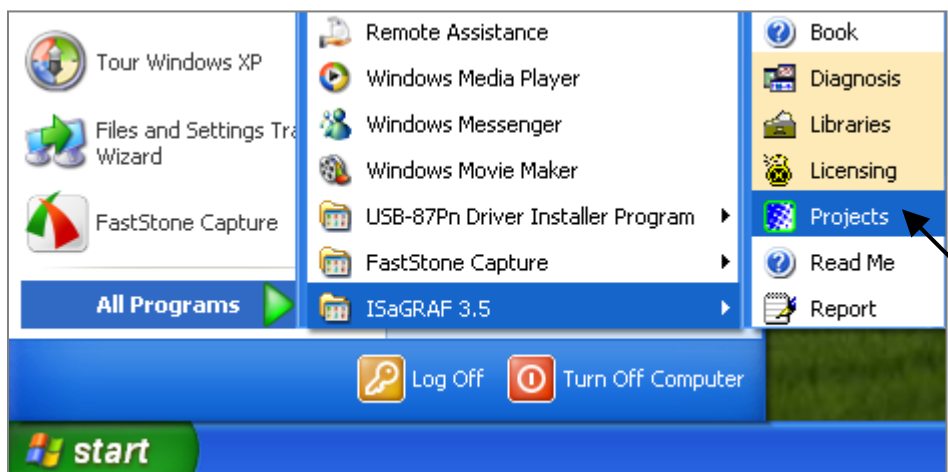


## “LD1” Program:



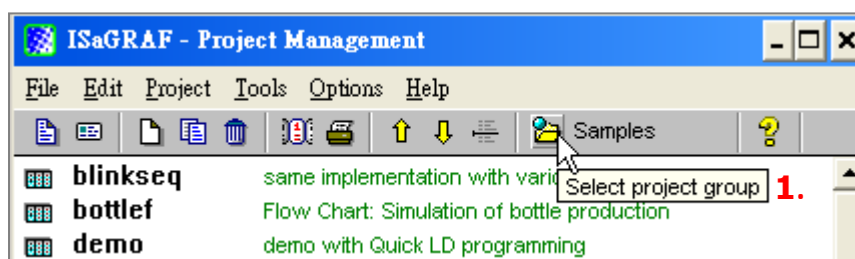
### 2.3.1 Open ISaGRAF-Project Management

Click the Windows "Start" > "All Programs" > "ISaGRAF 3.5" > "Projects" as shown below.

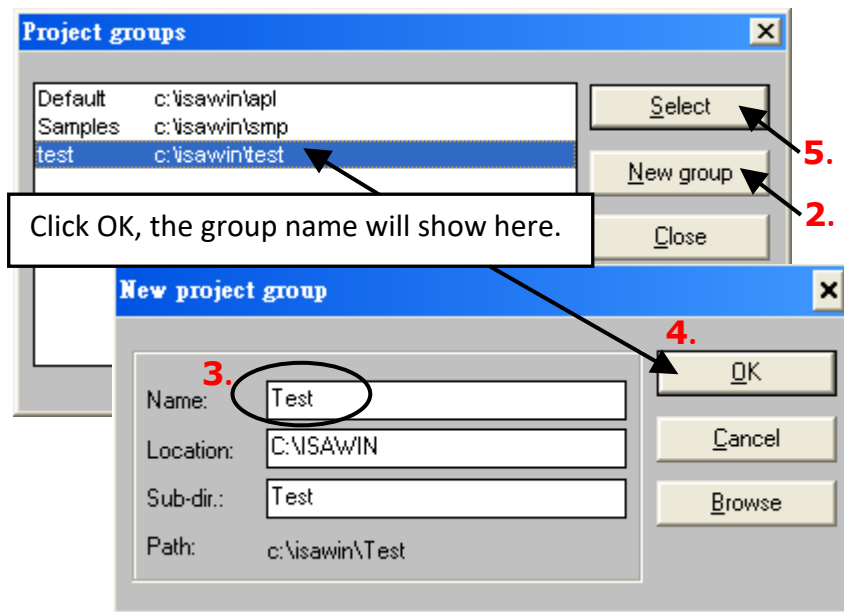


### 2.3.2 Creating an ISaGRAF User's Group

Click the "Select Project Group", and then click on "New Group" (as diagram below), then type in the name for the new user's group you wish to create, and last click on "OK".

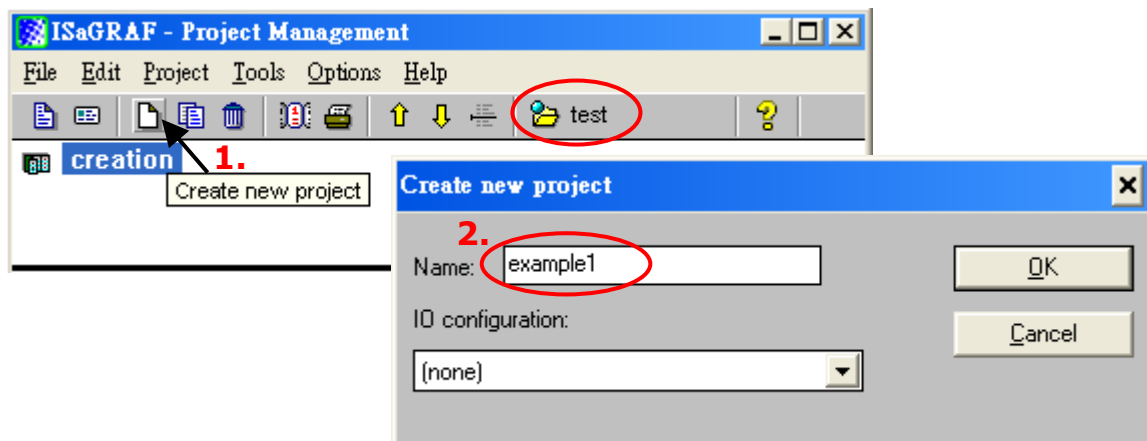


After click "OK", the group name will show up, please click "Select" to enter this group.

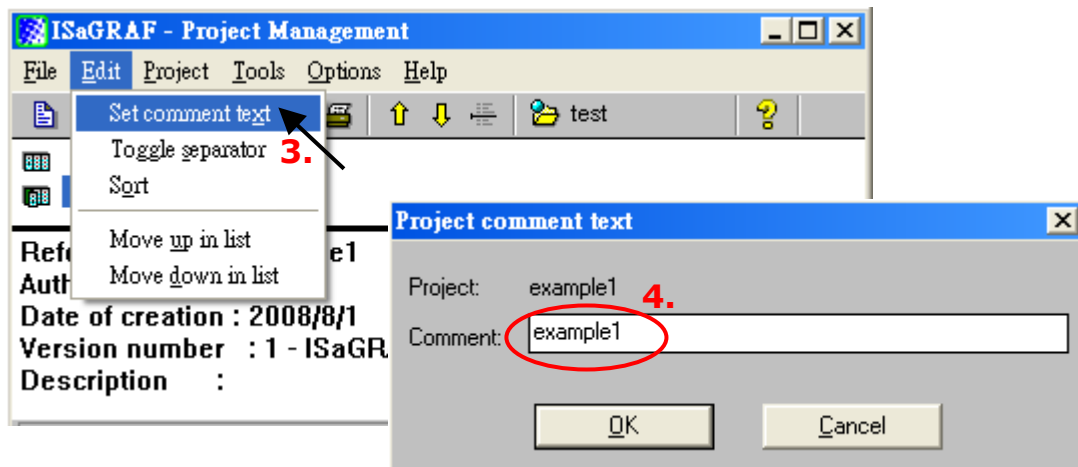


### 2.3.3 Creating a New ISaGRAF Project

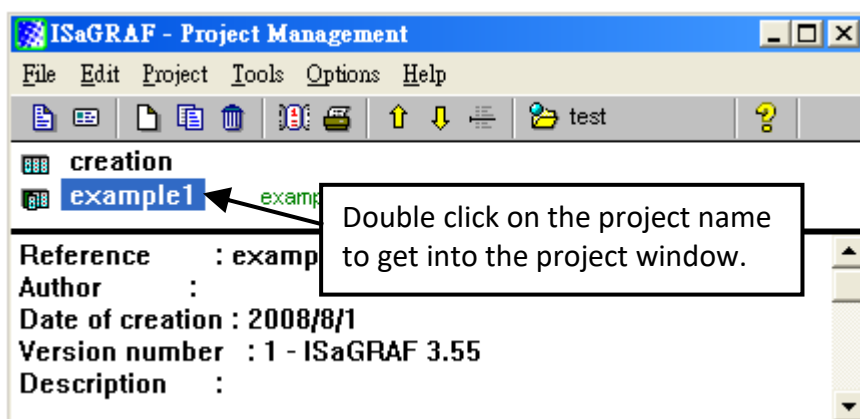
To start a new ISaGRAF project, click the "Create New Project" button and then enter in the name for the new project.



you can then enter additional information for your project by clicking on the "Edit" and then "Set Comment Text" menu 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 it.

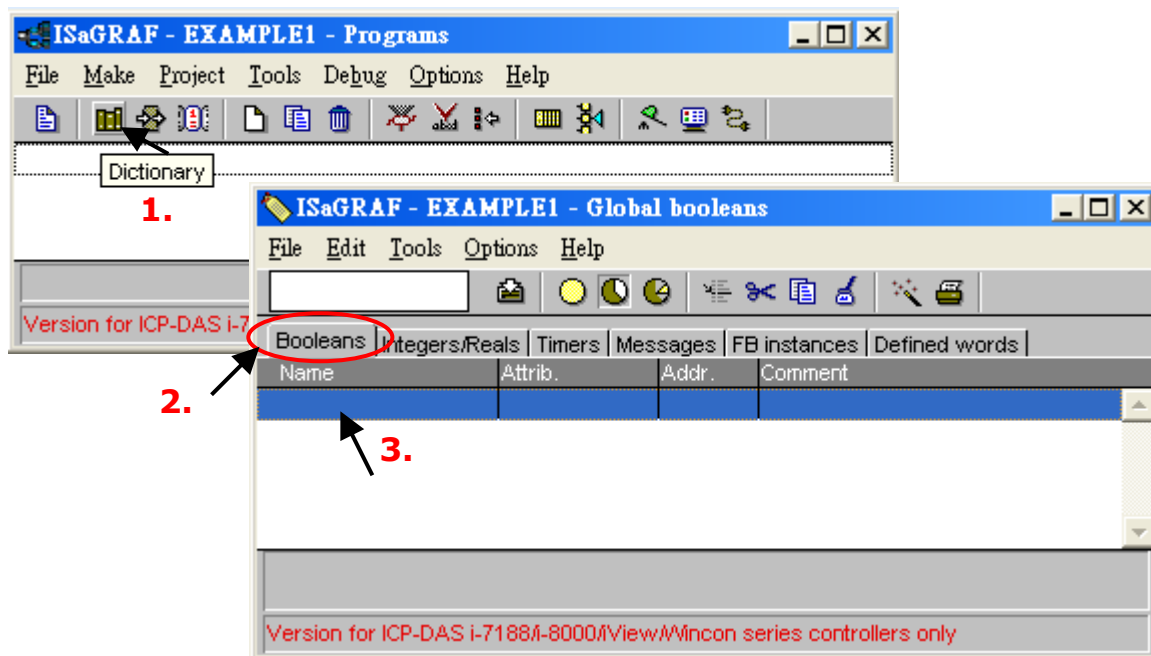


### 2.3.4 Declaring the ISaGRAF Project Variables

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, click the "Dictionary" button.
2. Click 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.

The 'Boolean Variable' dialog box shows the following fields and settings:

- Name:** INIT (circled with a red line and labeled 4.)
- Comment:** Flag to indicate first scan cycle or not (circled with a red line and labeled 5.)
- Attributes:** Internal (selected with a radio button, circled with a red line and labeled 6.)
- Values:** False: (empty), True: (empty)
- set to true at init:** Checked (circled with a red line and labeled 7.)
- Retain:** Unchecked
- Buttons:** Store (labeled 8. with an arrow), Cancel, Next, Previous, Extended

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

The 'ISaGRAF - EXAMPLE1 - Global booleans' window shows the following table:

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

Below the table, the variable declaration is shown in a red box:

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

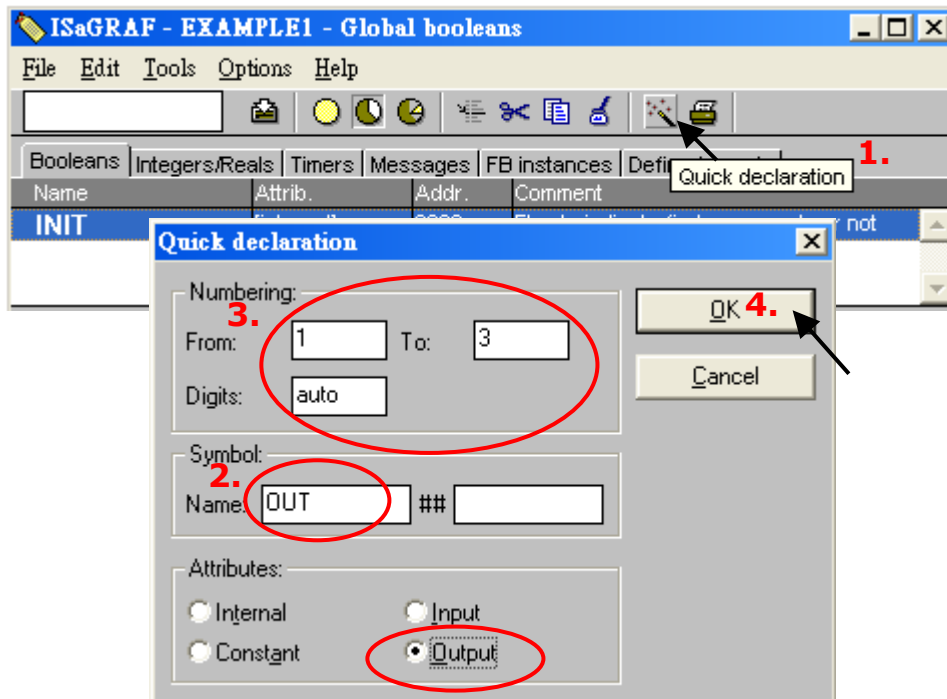
#### Note:

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

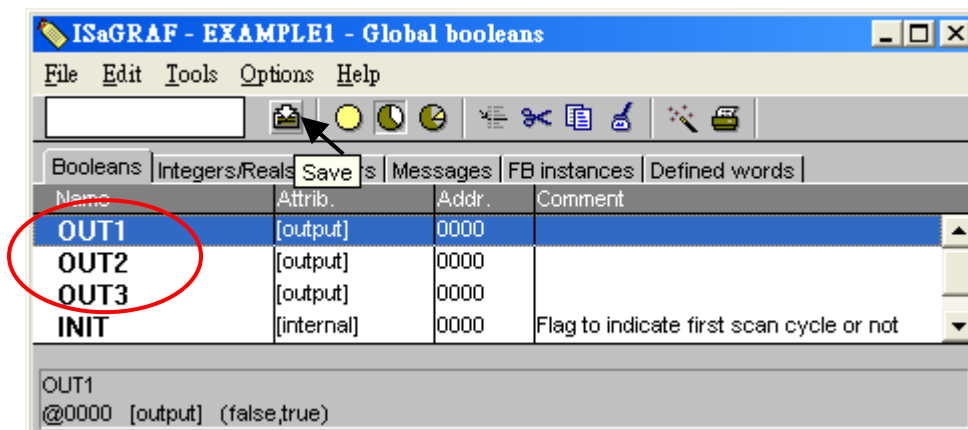
#### Quick Declaration:

There are three outputs used in this example program named "OUT1, OUT2, and OUT3". ISaGRAF provides a quick and easy way to declare like variables that are sequentially ordered. To begin this process,

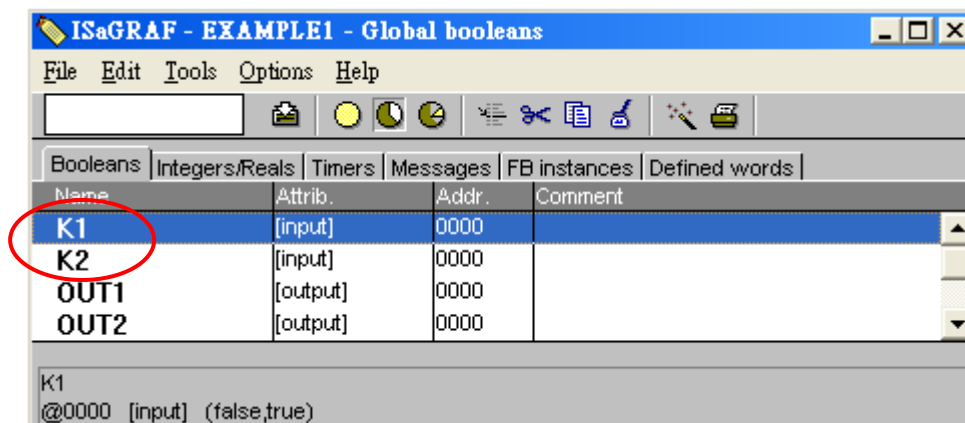
1. Click the "Quick Declaration" button.
2. Enter the name for the output variables being declared
3. Enter in the output number that you will start within the "Numbering" - "From" and "To" field (this example uses from 1 to 3).
4. Set the attribute to "Output" and then click "OK"



All three outputs will be added to the "Global Booleans" window. Please click "Save" button to save all the variables.



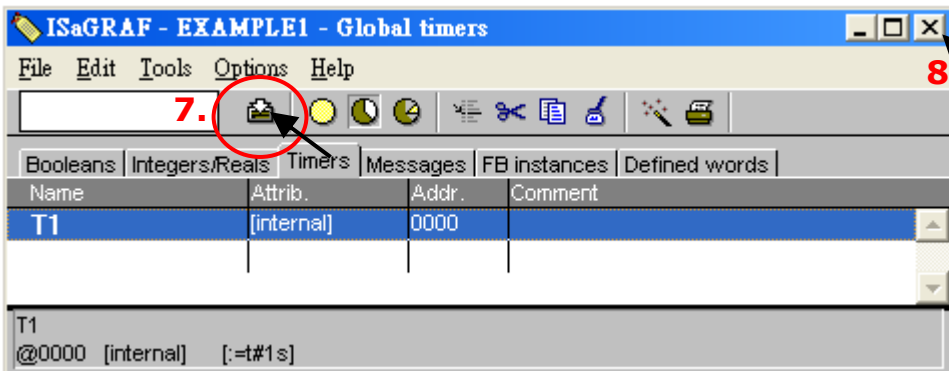
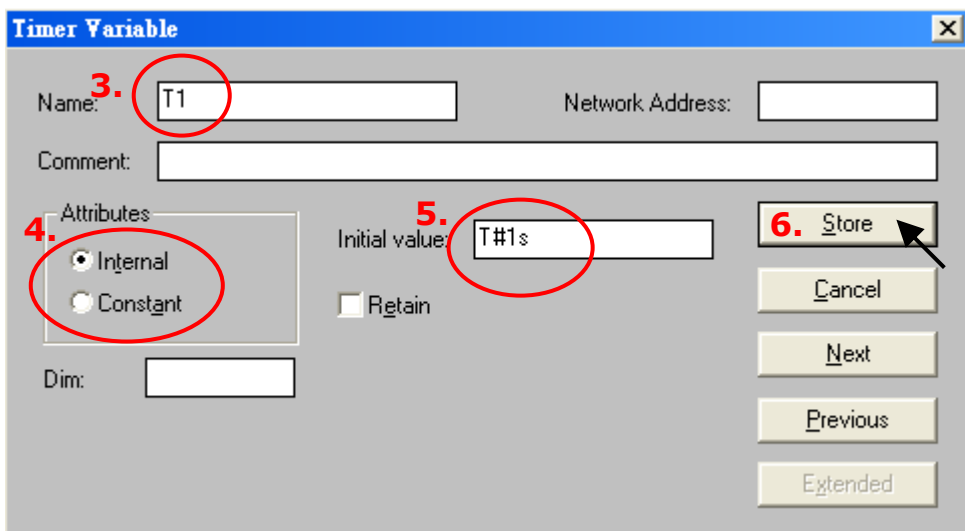
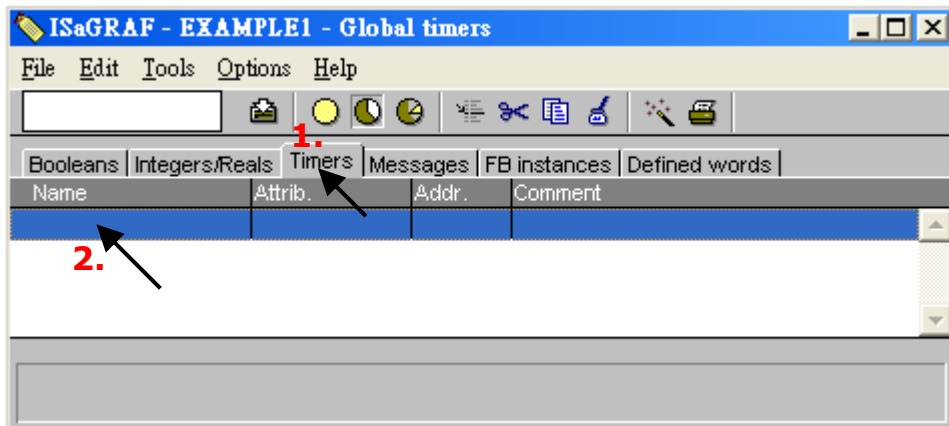
Use the same method as former to create another two variables – "K1" & "K2" however with "input" attribution.



## Declaring Timer

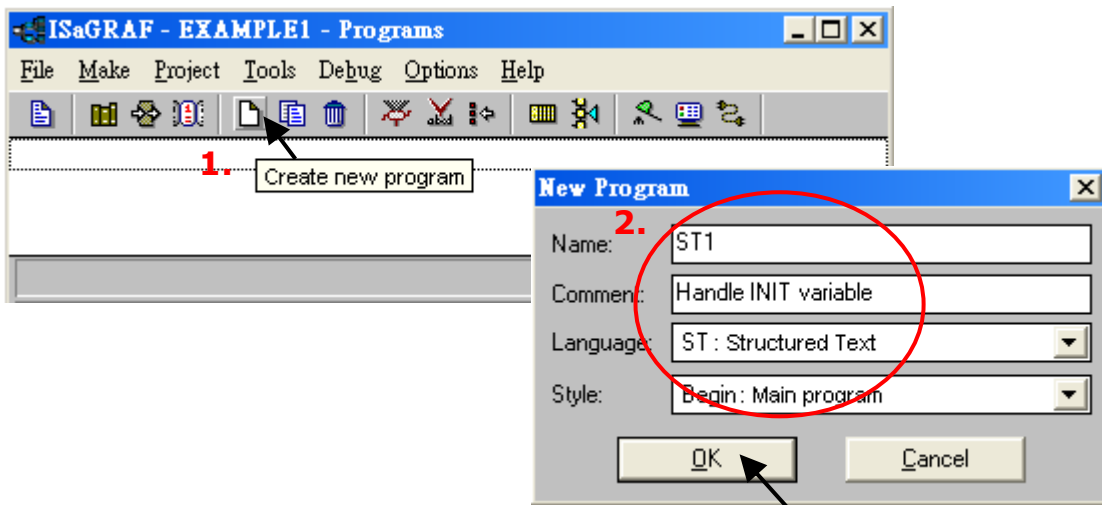
To declare the timer (T1) variable used in this example program:

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#1s", then click on the "Store" button.
4. Click the "Save" button and click on "X" to close the window.

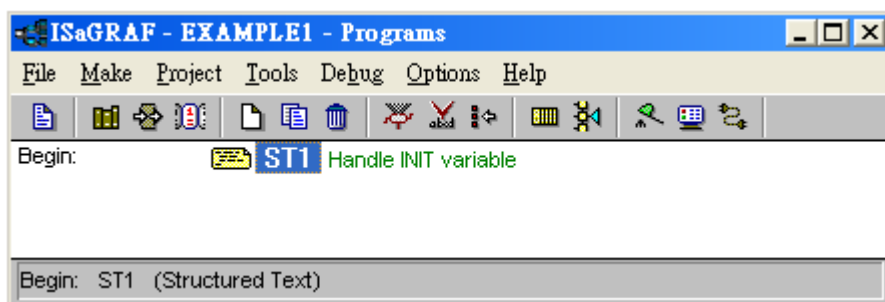


### 2.3.5 Create and Edit the ST - "ST1" Program

In this project, we need an ST program to handle the "INIT" variable. As follows diagram, click on "Create new program" to add a ST program. Given the Name as "ST1", Comment as "Handle INIT variable", Language as "ST: Structured Text" and Style as "Begin: Main program". Then click on "OK".

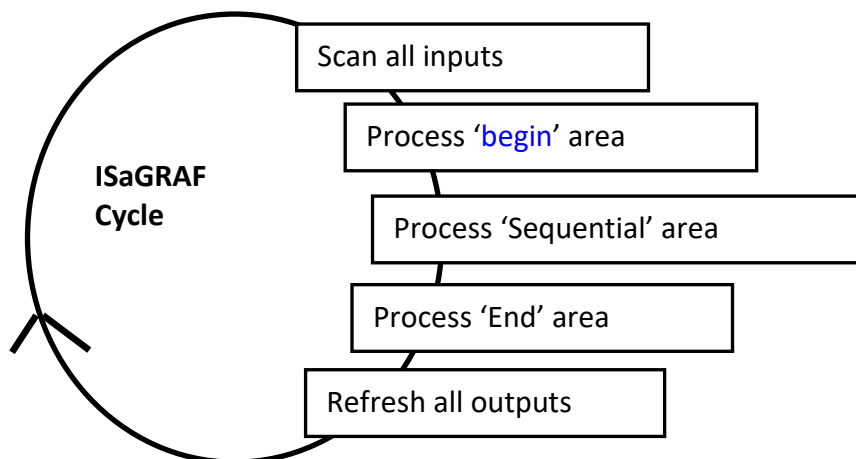


Now we have one program inside this project.

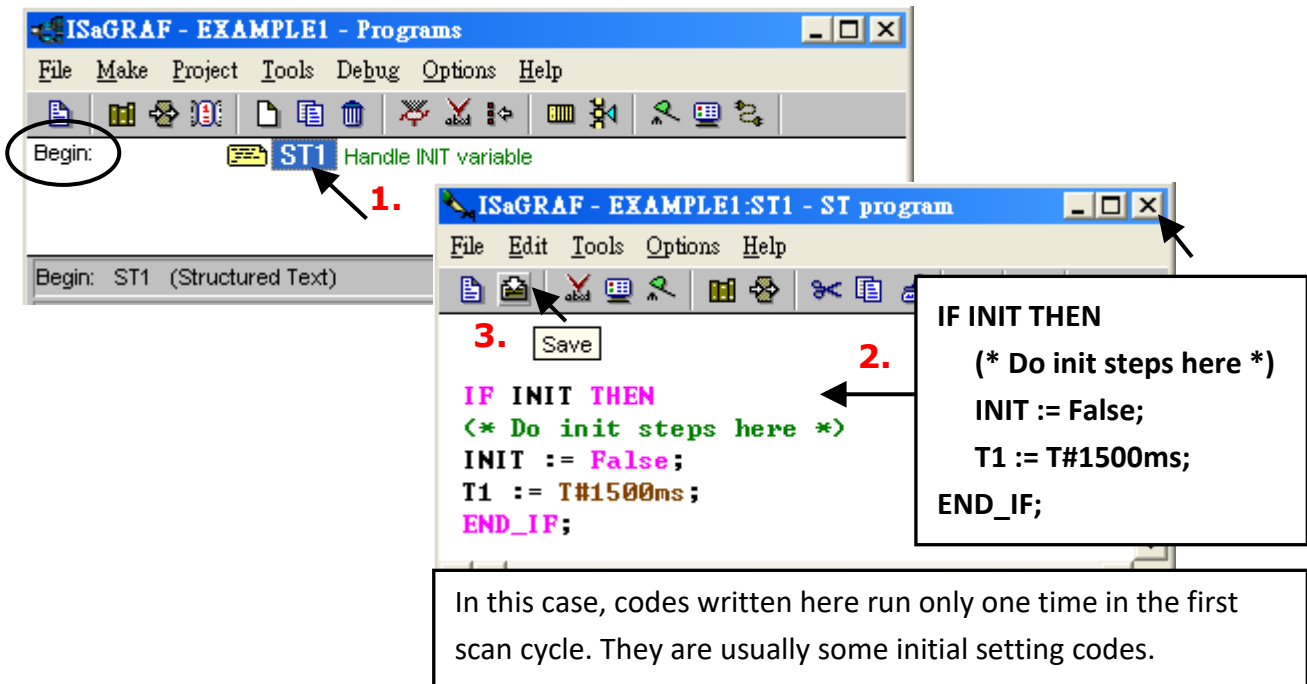


#### Note:

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.

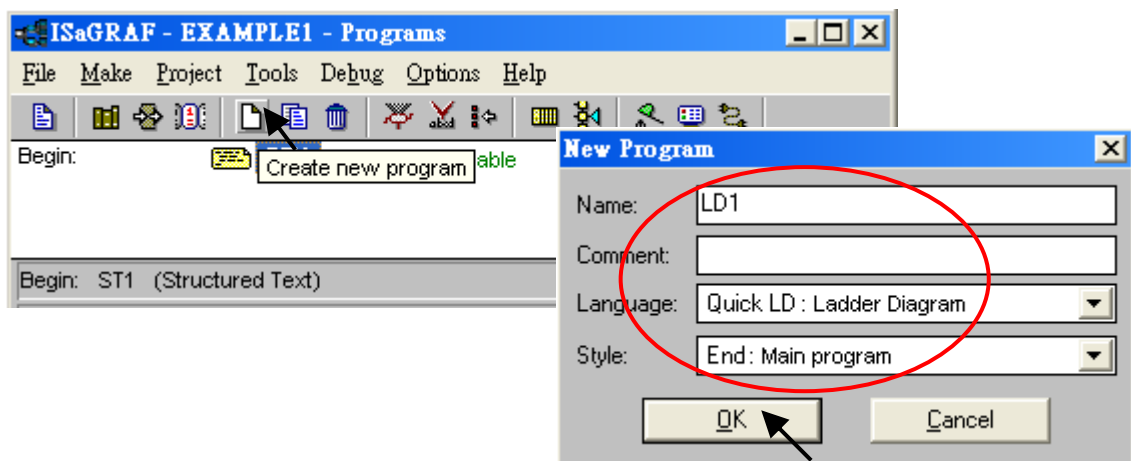


Double-click on "ST1" program to edit it. Click on "save" and then exit when you finish it.  
Note: Any character inside between (\* and \*) is the comment.

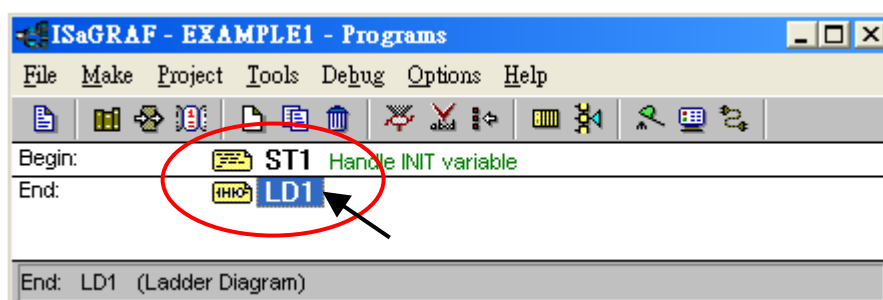


### 2.3.6 Create the LD - "LD1" Program

Click the "Create New Program" button and the "New Program" window will appear. Enter the "Name" as "LD1", next, click 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" column for the LD program, but it is not essential.



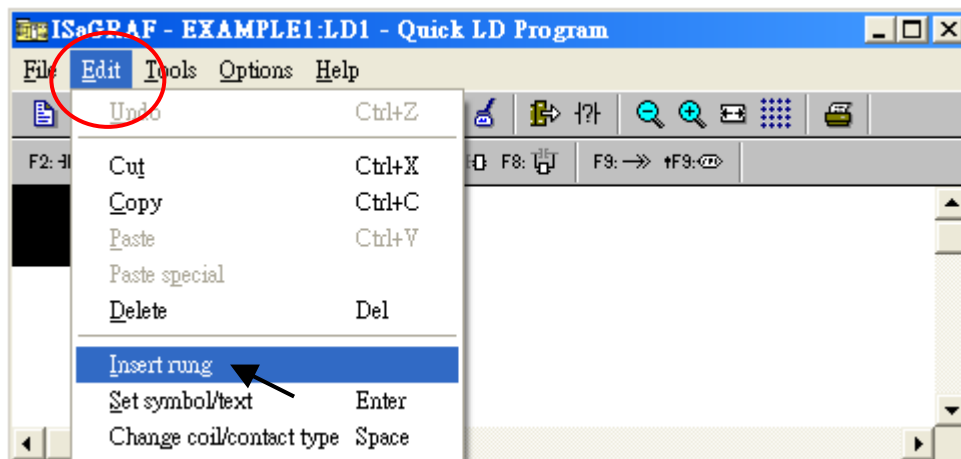
Now we have two programs inside this project. Please Double-click the "LD1" to get into it.



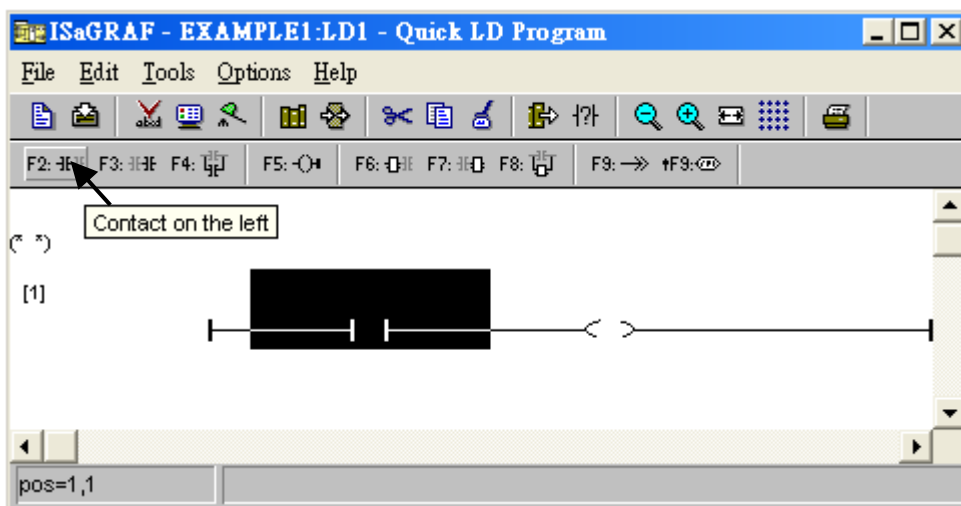


### 2.3.7 Edit the "LD1" Program

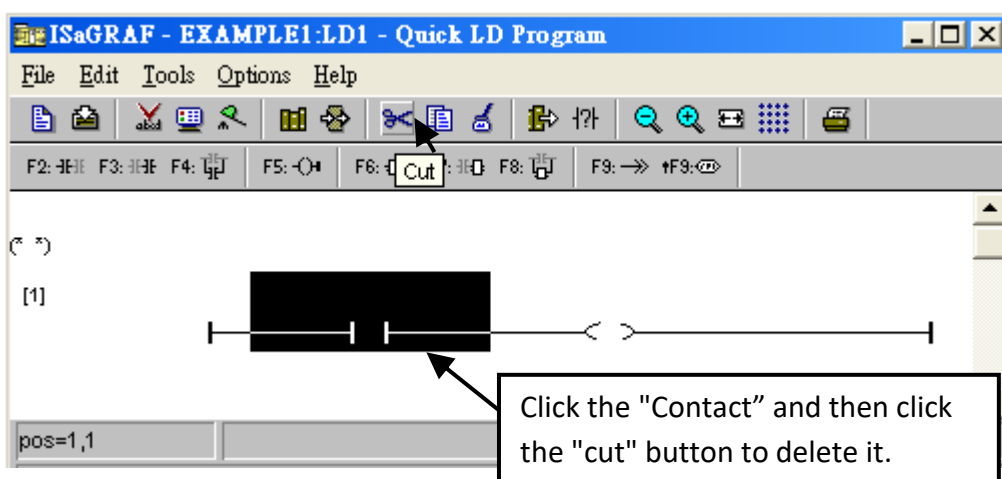
In the "LD1" program window, Click "Insert Rung" from the Edit menu.



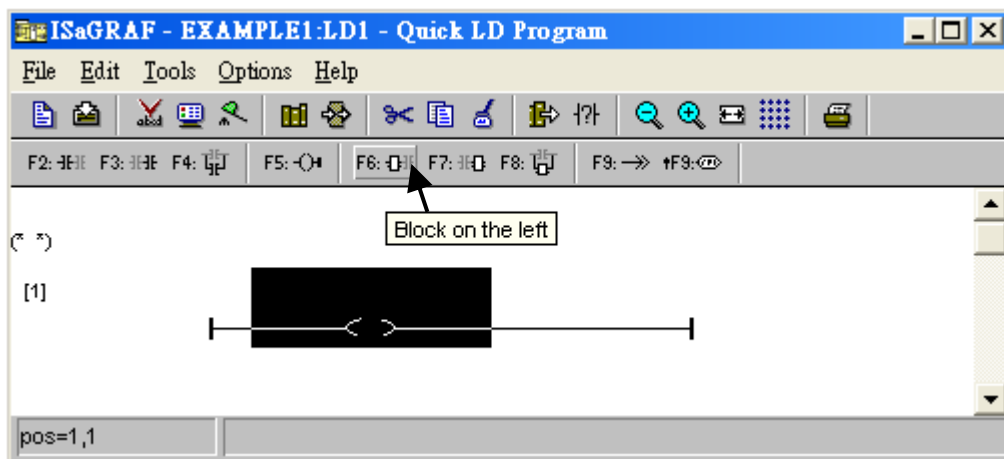
Or, just click the "F2 (Contact on the Left)" button and the screen will be shown as below.



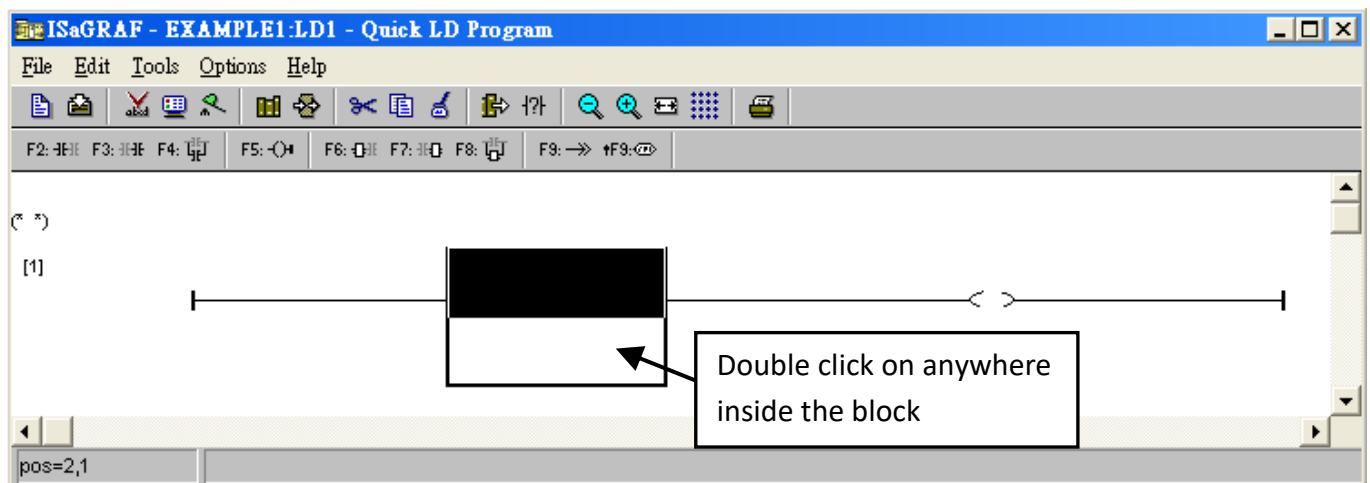
We are going to write the first line of the LD1 program. Click the first "contact" and then click the "cut" button to delete it.



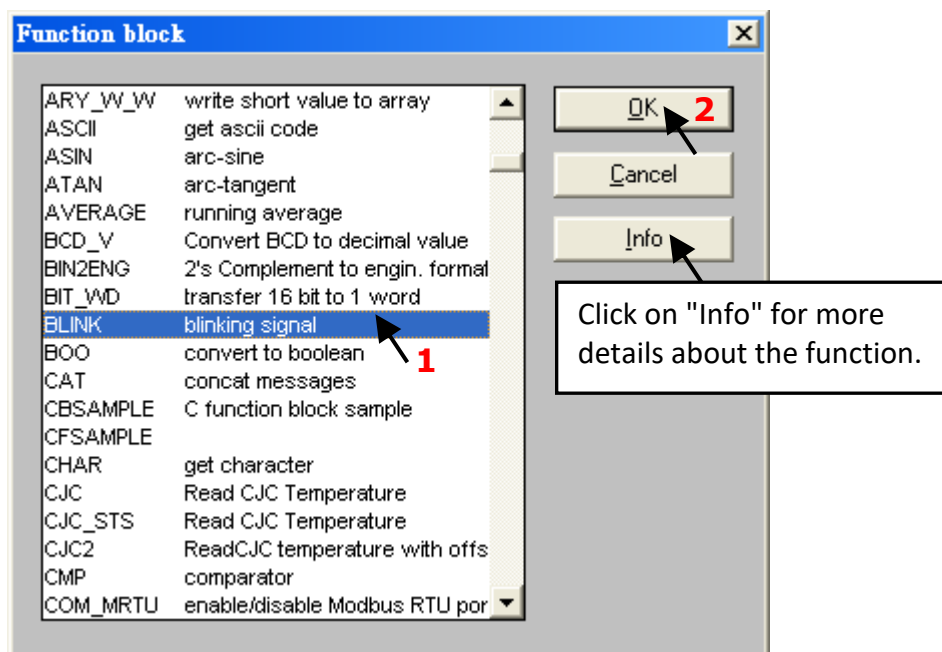
Click the "F6 (Block on the left)" button to create a block on the left of the "coil".



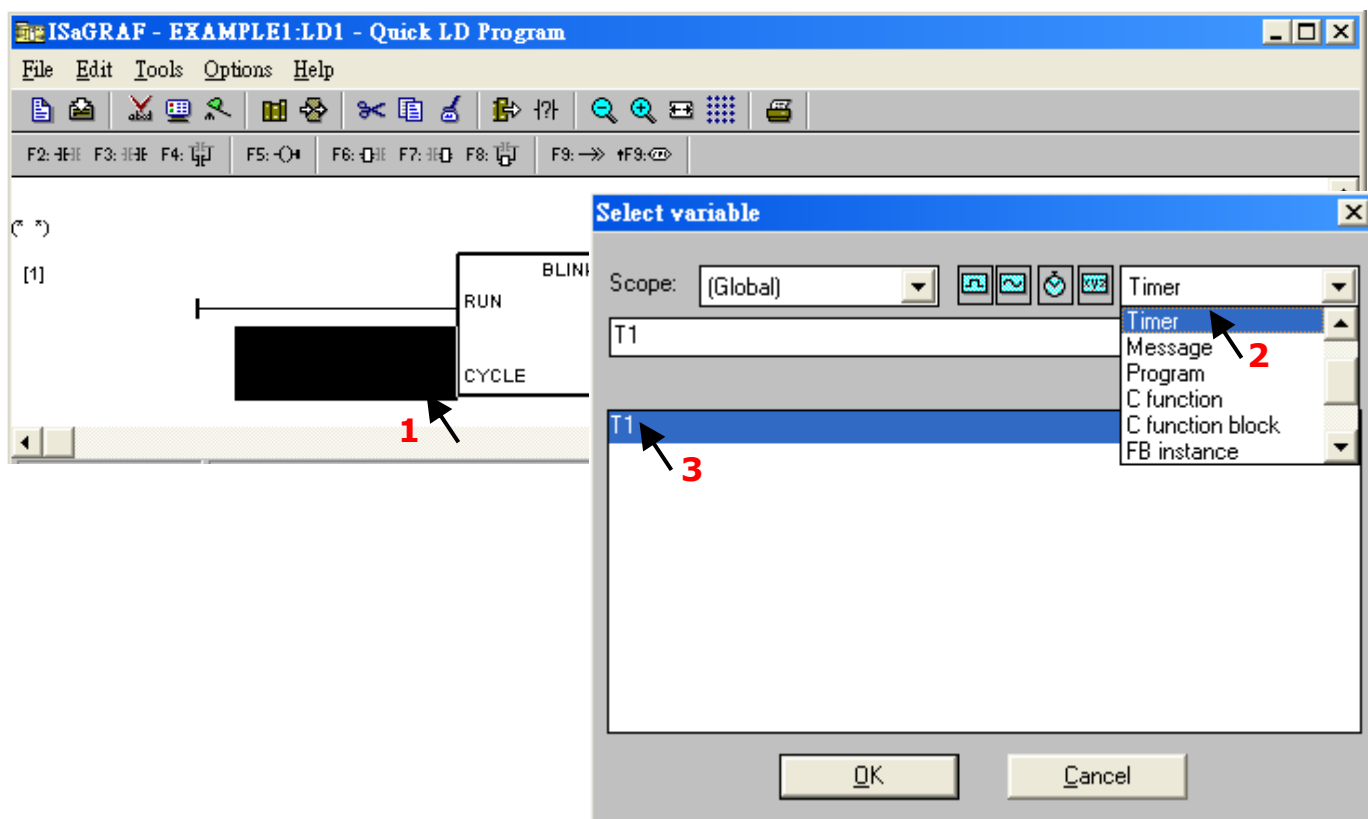
Now we are going to choose a function block. Double-click anywhere inside the block and the "Function Block" window appears.



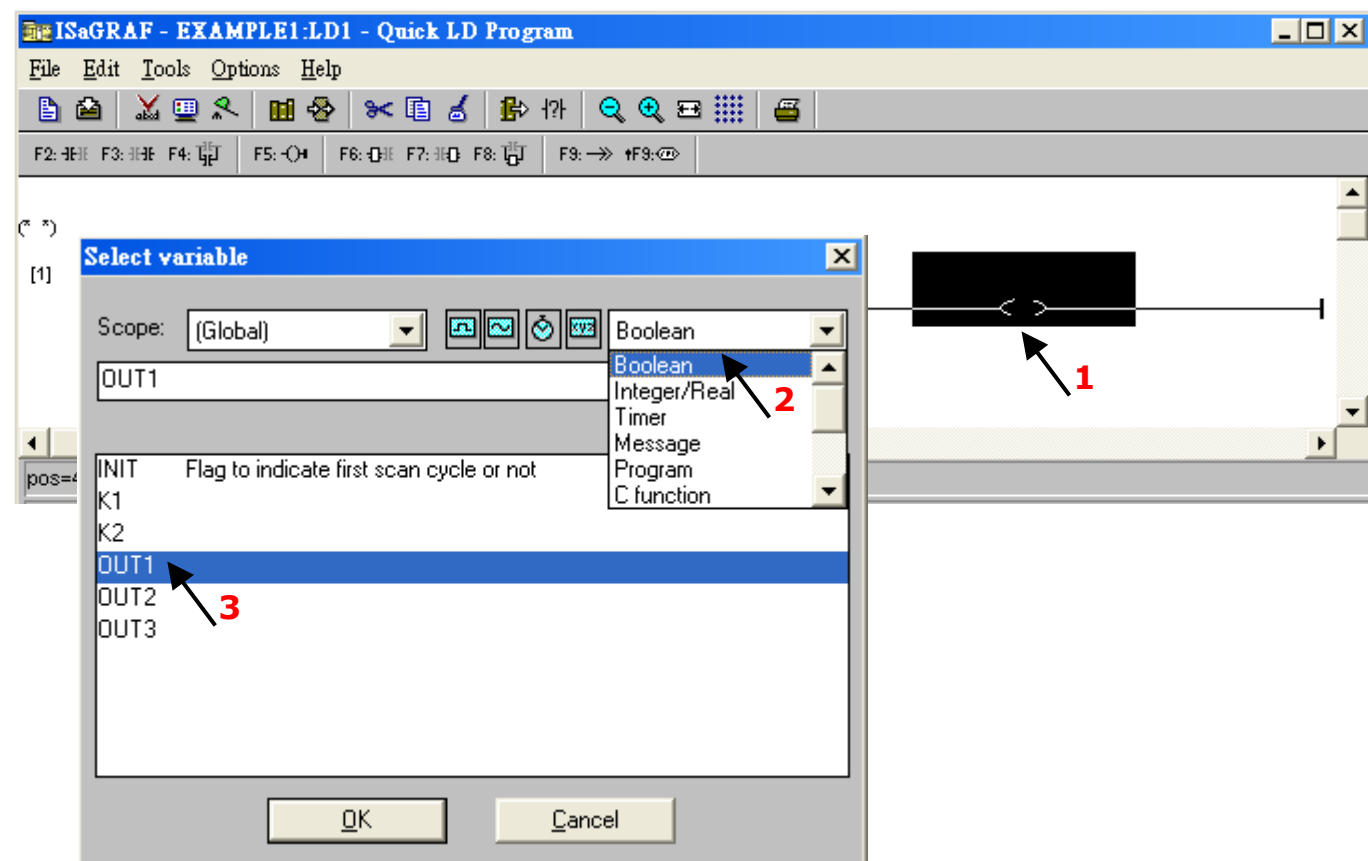
Select the "BLINK" function block and click OK. Also, click the Info button for more information about the function.



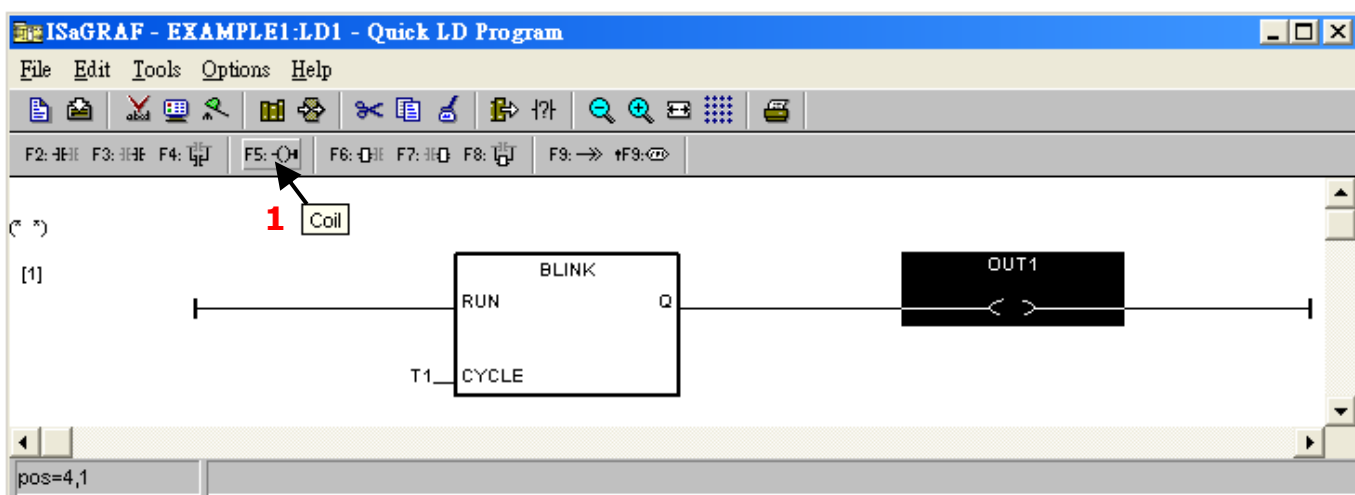
Double-click on the left of the "CYCLE" parameter, select "Timer" from the drop-down menu, and then double-click "T1" to specify this variable.



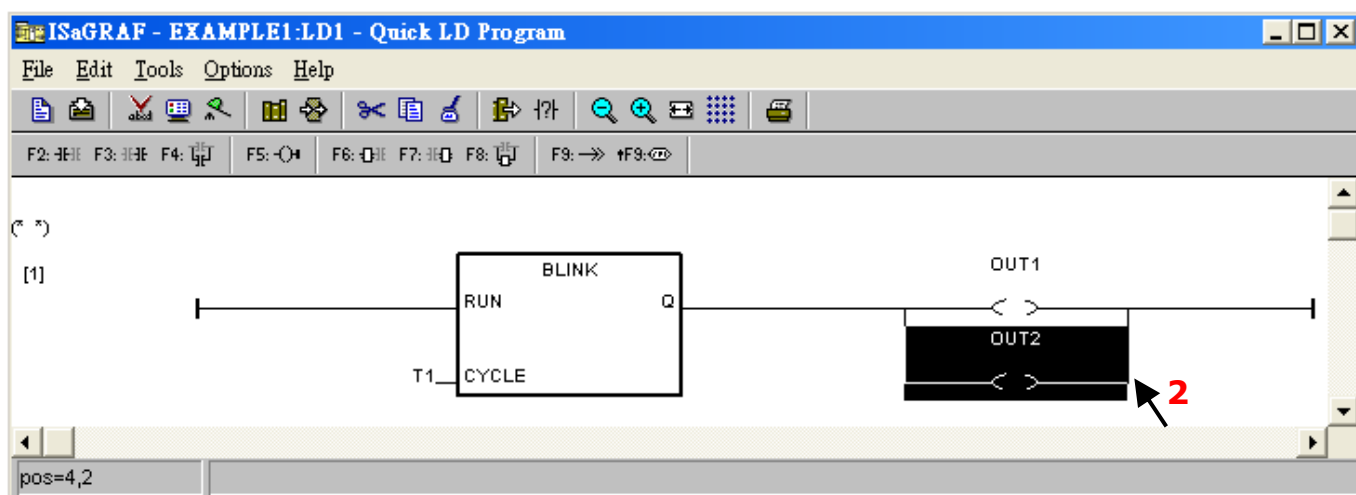
Double-click the "coil", select "Boolean" from the drop-down menu, and then double-click the "OUT1" variable.



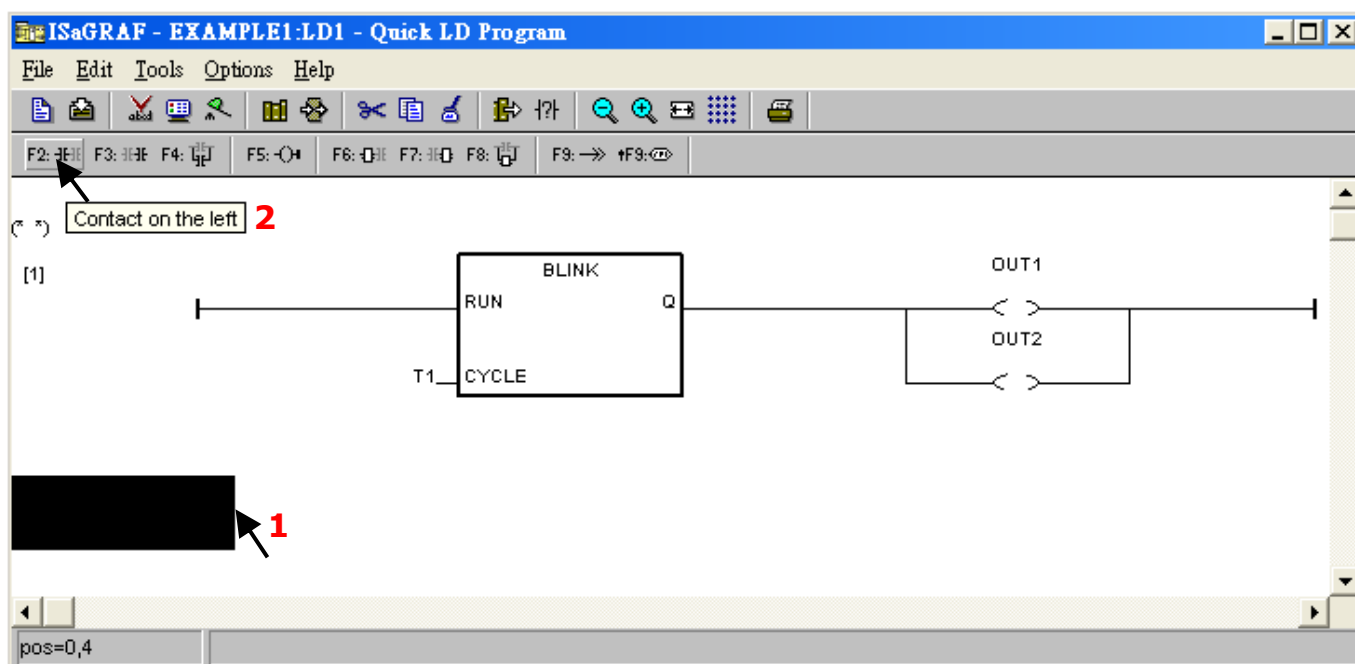
Click the "F5" (coil) button to create one another coil below the "OUT1".



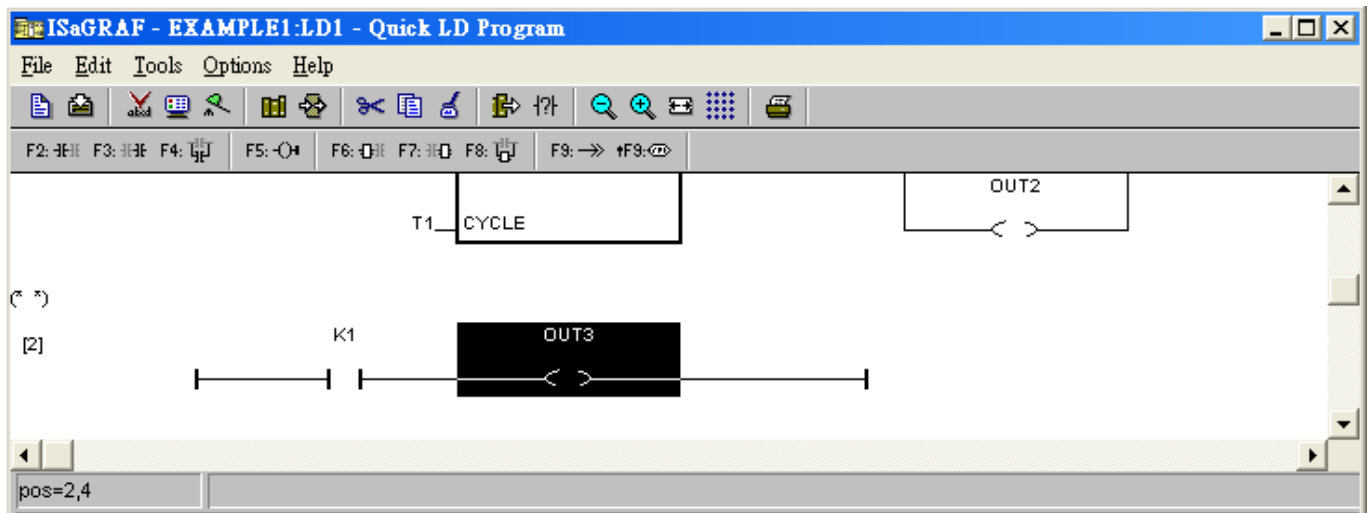
Using the same methods as noted before to specify the "OUT1" variable.



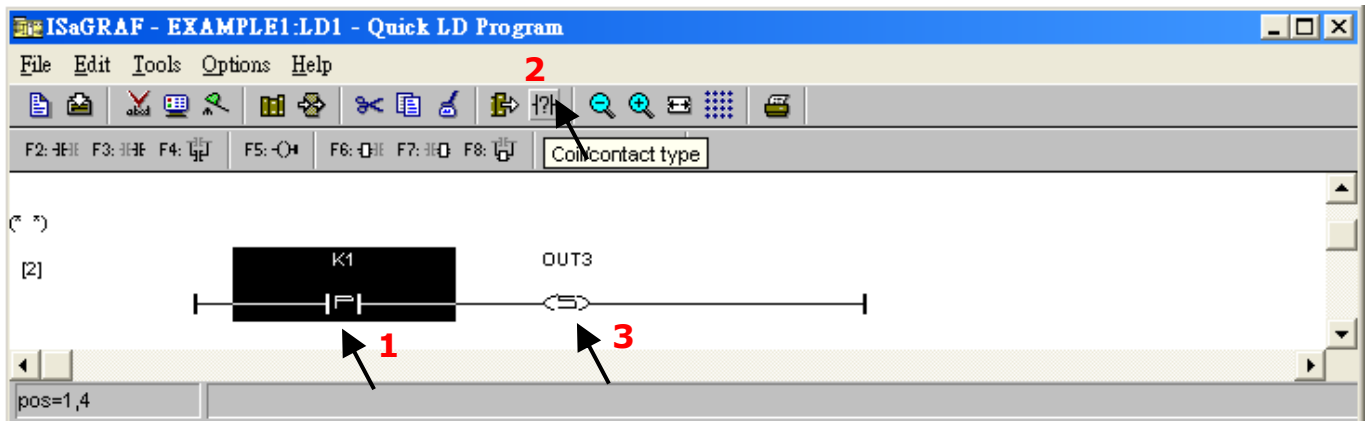
Click on the left side below the first line and click the "F2 (Contact on the left)" button to add the second line of the program.



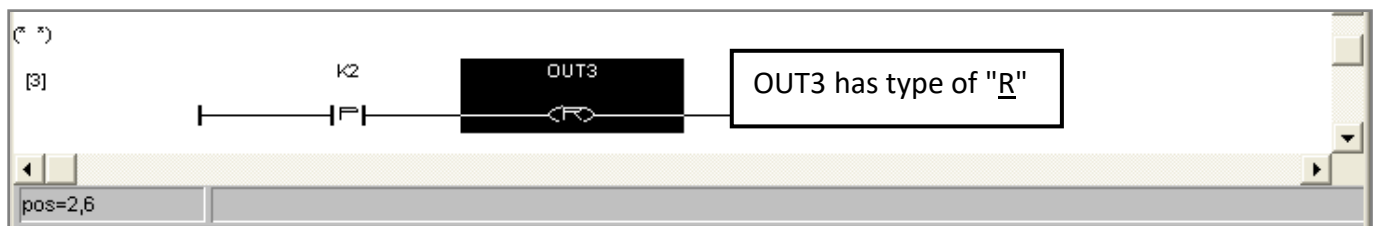
Using the same methods as noted before to specify "K1" and "OUT3" variables.



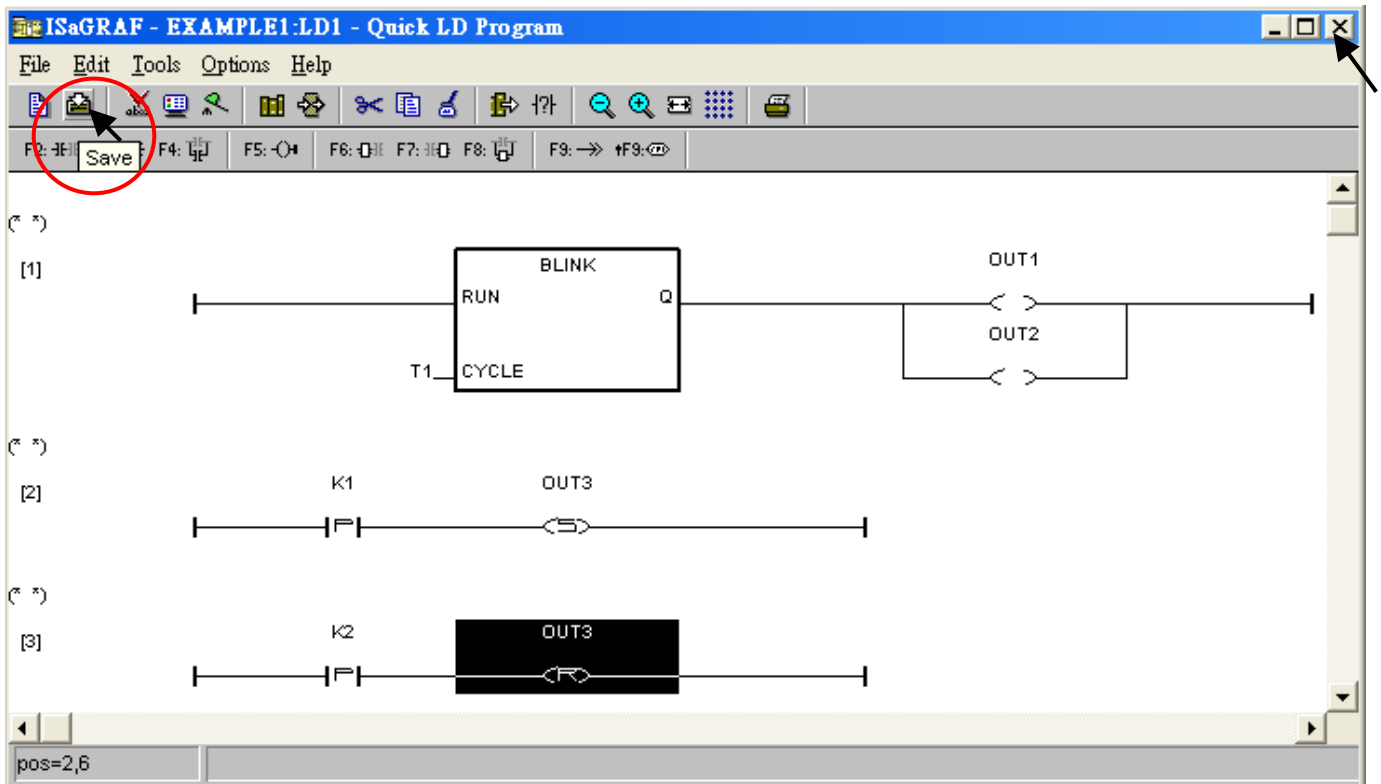
Click on "K1" and click the "Coil/contact type" button several times to get the type of "P", and then use the same methods to set "OUT3" as the type of "S".



Using the same ways as former to add the third rung as below. Note that the type of K2 is "P"; the type of OUT3 is "R".



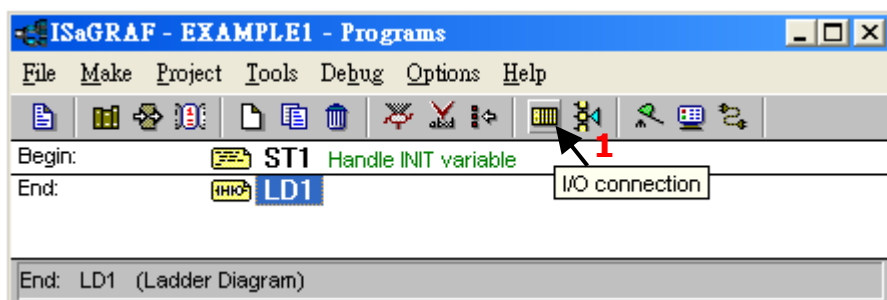
The LD1 program is finished now, click the "Save" button and then exit.



### 2.3.8 Connecting the I/O

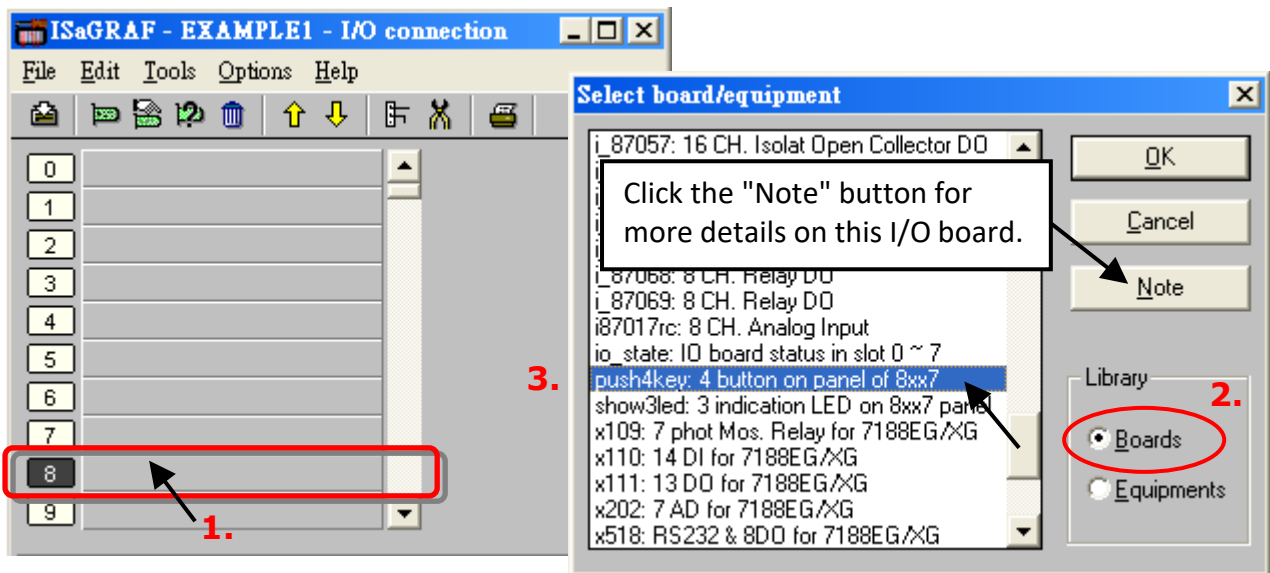
We have defined variables name of "OUT1", "OUT2" & "OUT3" as "Output" attribution, while "K1" & "K2" as "Input" attribution in [step 2.3.4](#). These "Input" & "Output" variables should be mapped to I/O channels or function keys on the PAC before they can work.

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

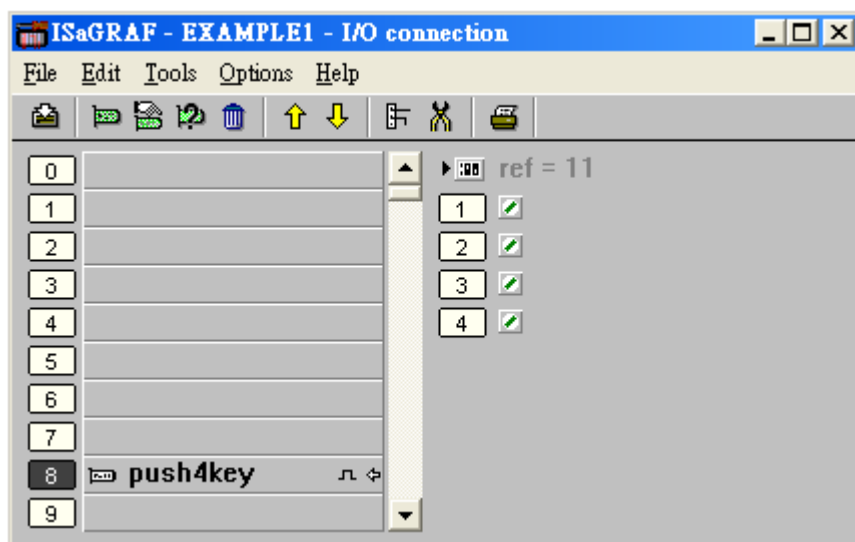


As the figure, double-click the Slot8 and select 'Boards' and then double-click the "push4key: 4 button on panel of 8xx7" to choose the function.

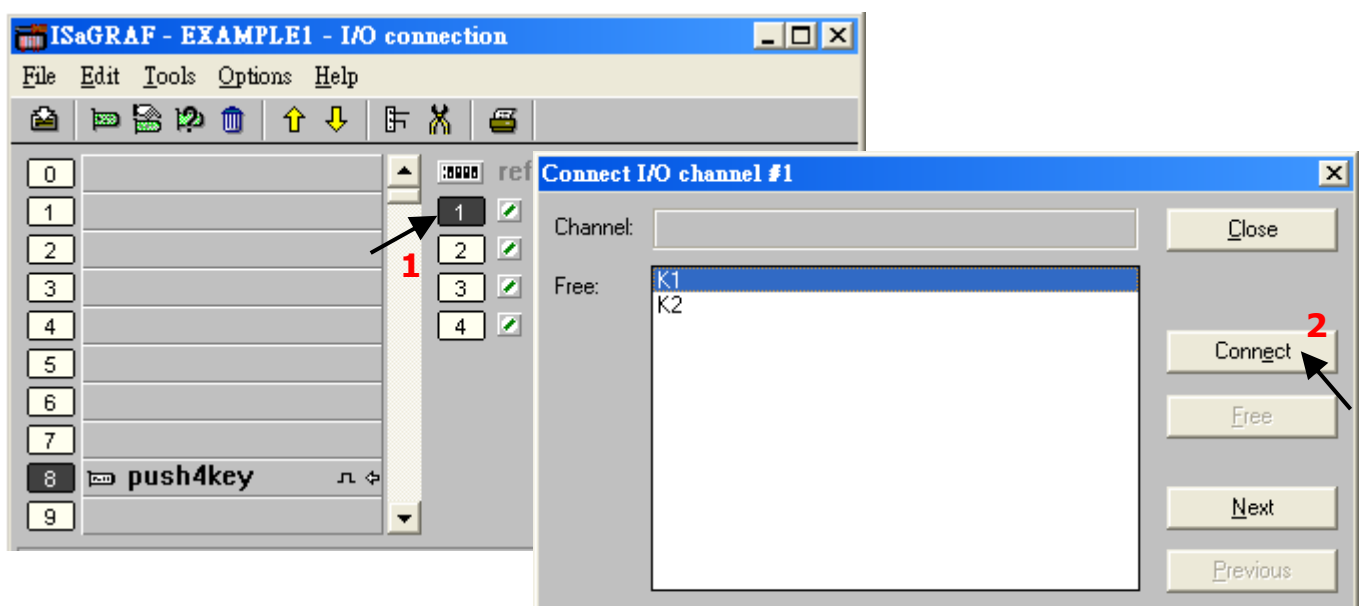
**Note:** Slot 0 to 7 is used for mapping to the I/O modules in used on the PAC. In this case, we add the DI function on slot8.



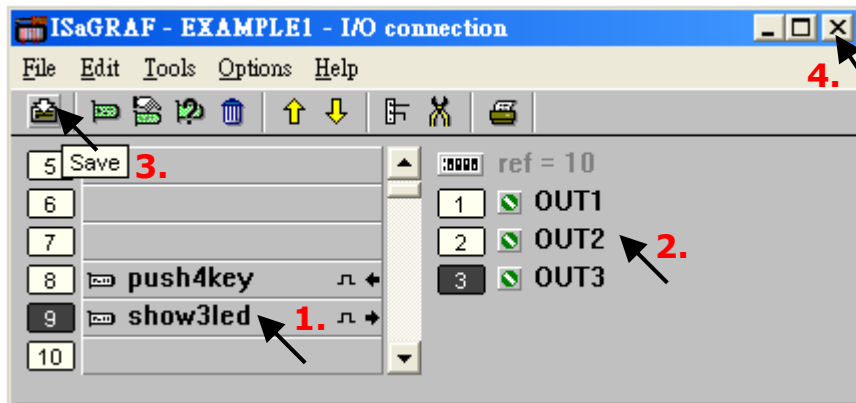
Then we have below window.



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" twice to connect K1, K2 to channel 1 and channel 2.



By the same way, add the "show3led" DO function on slot 9 and specify OUT1, OUT2, and OUT3 variables to channel 1, 2, and 3. Then, click on "Save" and then exit.



### **IMPORTANT NOTICE:**

1. Slot0 to 7 are used for mapping to I/O modules in used on the PAC. Slot8 or above are used for the additional I/O function such as the DI/DO function in this example.
2. All of the variables with "Input" or "Output" attribute MUST be connected through the I/O connection as described above for any program to be successfully compiled.

Only the I/O variables will display in the "I/O Connection" window. E.g., Boolean output variables - OUT1, OUT2 & OUT3 and Boolean input variables – K1 & K2 in the example.

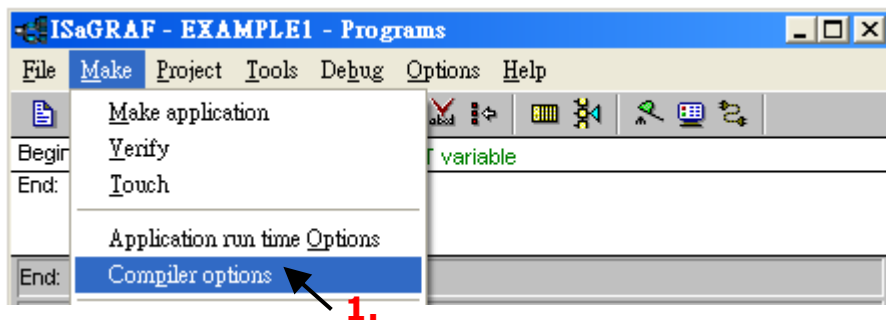
3. Also, You can click the  button to set it as the virtual I/O.



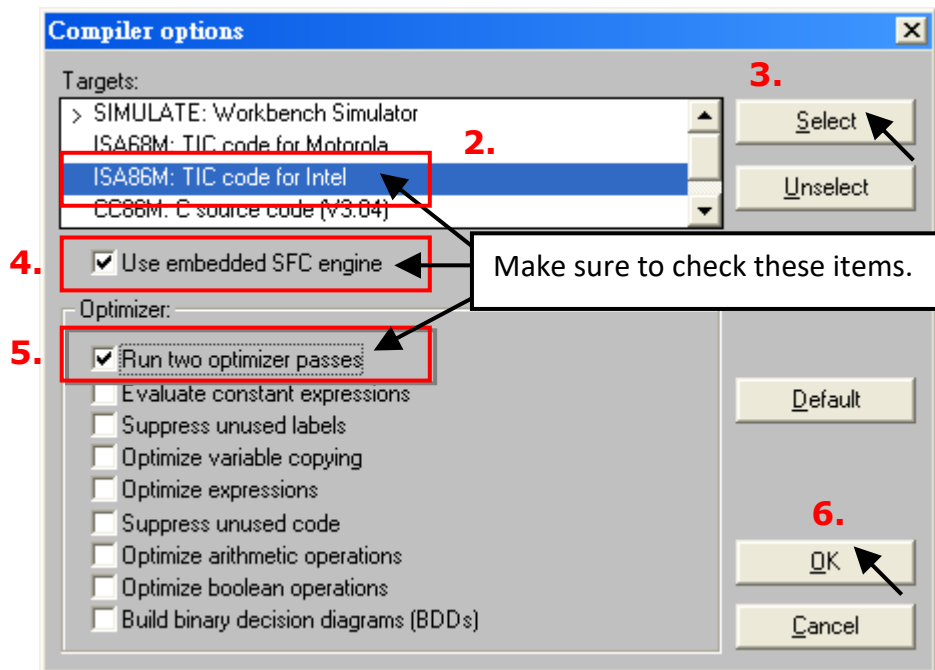
## 2.4 Step 4 - Compiling & Simulating the Example Project

- ★ 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.



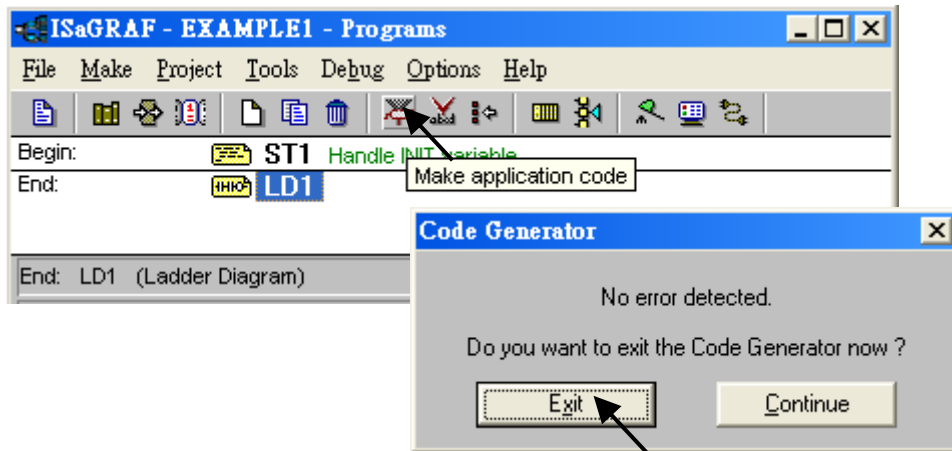
### **Note:**

When using "Variable Array" in the program, **DO NOT** check the 2nd , 7th , 8th and 9th Optimizer options, or the value of the variable array will be incorrect.

Recommend to check only the first option– "Run two optimizer passes".

### 2.4.1 Compiling the LD Project

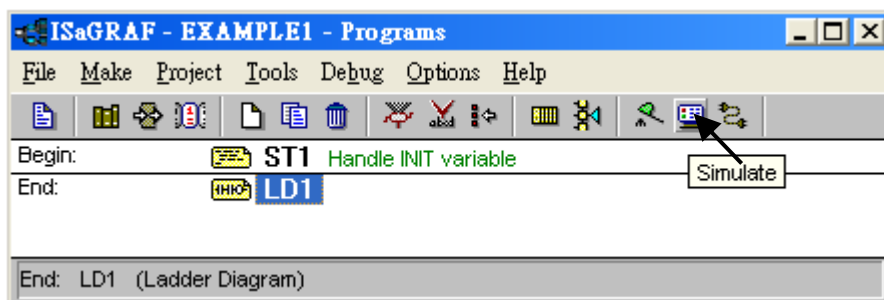
After selecting the proper compiler options, click the "Make Application Code" button to compile the project. If there are no compiler errors detected during the compilation process, CONGRATULATIONS, you have successfully created an ISaGRAF program.



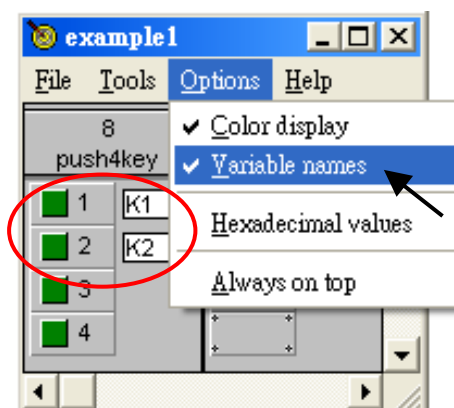
If the error message in red is detected during the compilation process, just double-click the error message to correct it in a pop-up window. After modifying, please compile the program again.

### 2.4.2 Simulating the LD Project

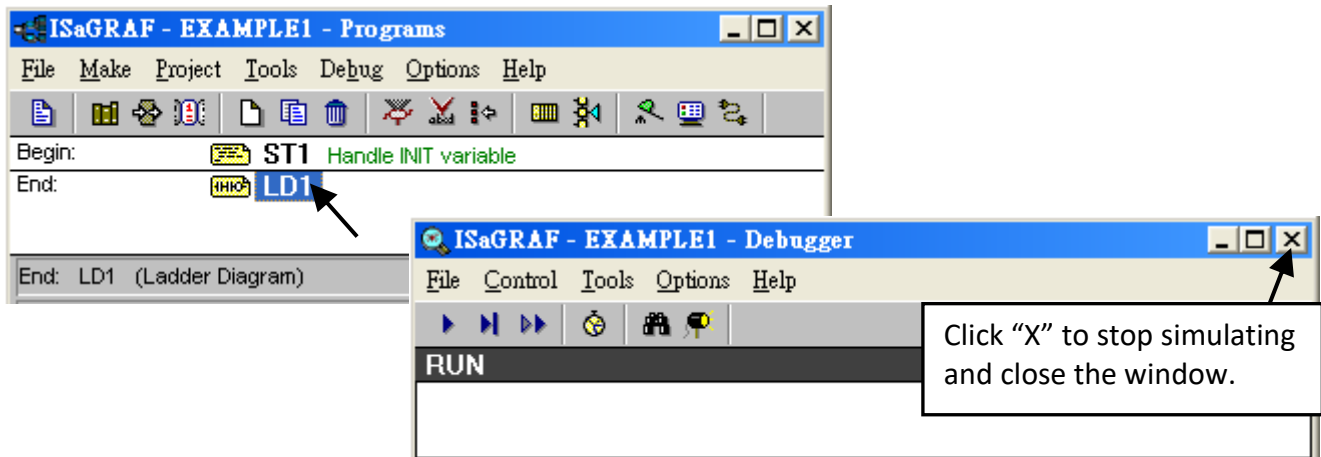
If the compilation is Ok, you may simulate the project on the PC to see how the program works. To do that, click the "Simulate" button.



Then, you can see the "I/O Simulator", "ISaGRAF Debug Programs", and "ISaGRAF Debugger" window. If I/O variables are not displayed in the simulating window, check the "Variables names" item from the Options menu to show the variable name.

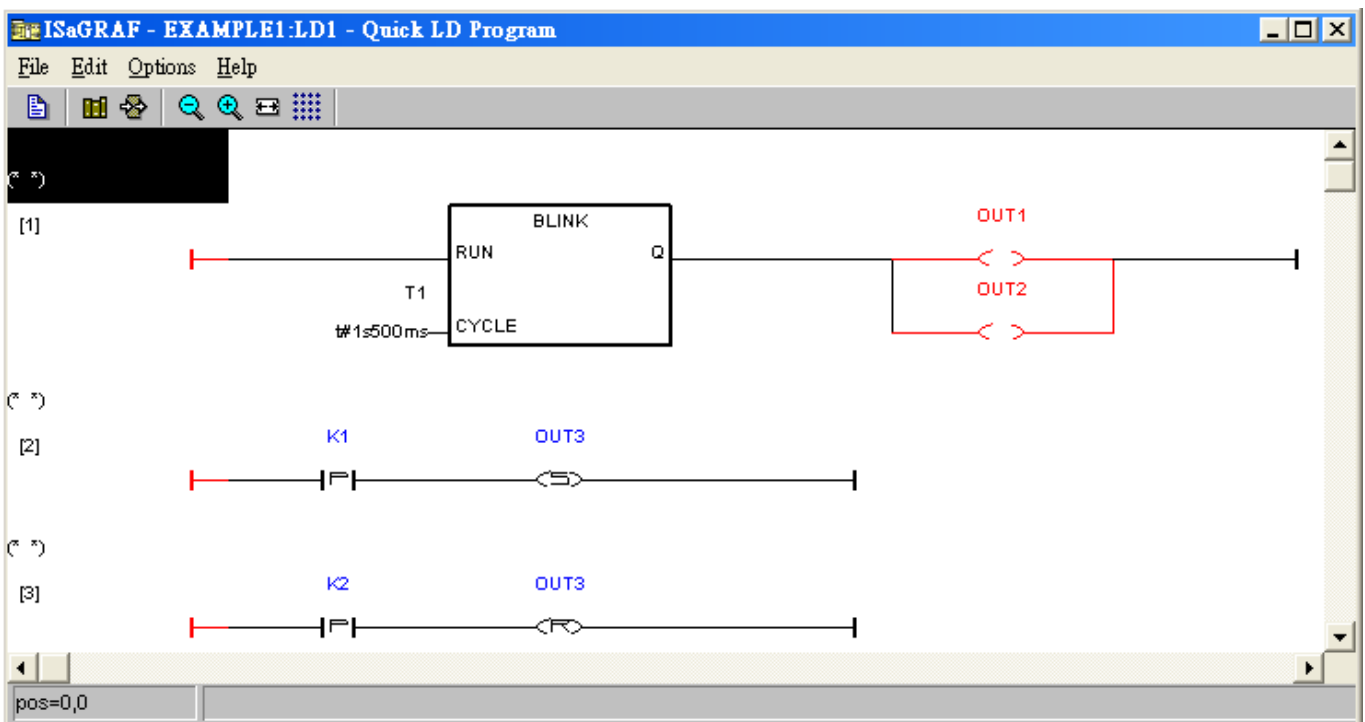


Double-click the "LD1" program in the "ISaGRAF Debug Program" window to see the status of the simulation.

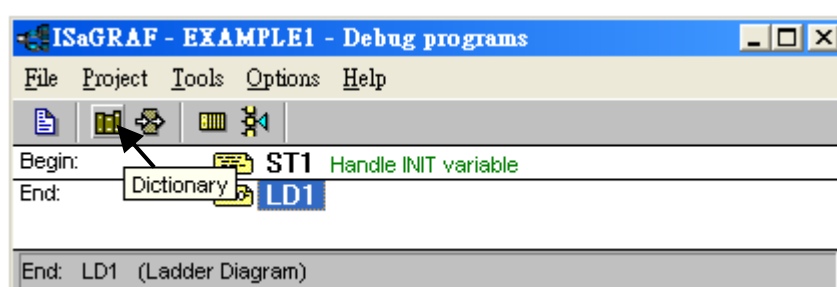


### 2.4.3 Running the Simulation Program

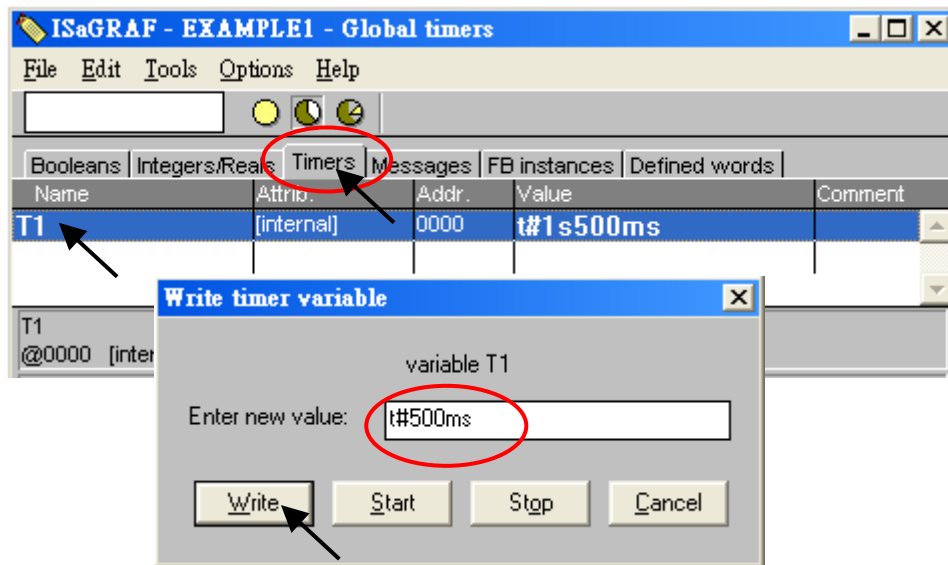
After double-clicking on "LD1" in the "ISaGRAF Debug Programs" window, you can see "OUT1" and "OUT2" is blinking every 1.5 seconds.



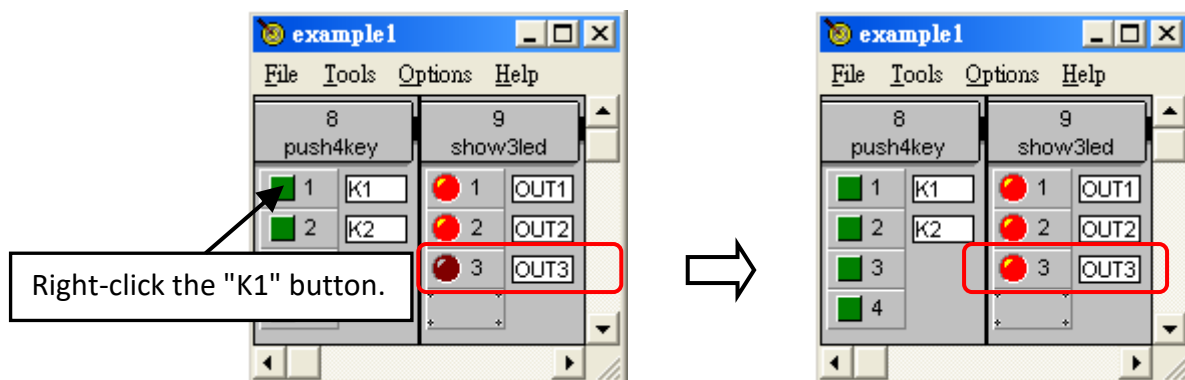
Users can adjust the value of the "T1" variable during the simulation. In this case, change the setting to blink every 0.5 second. To accomplish this, click the "Dictionary" button.



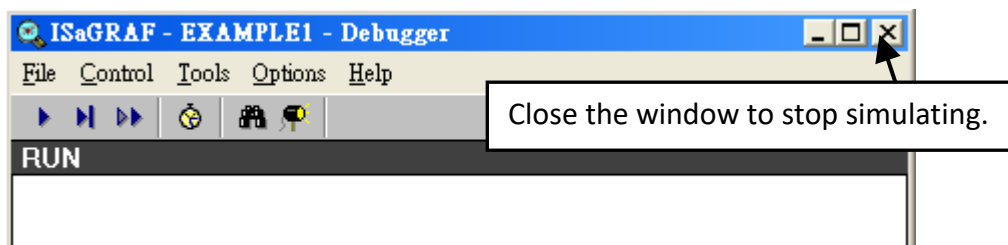
Double-click "T1" below the Timers tab in the "ISaGRAF Global Timers" window. Then, set the "T1" as "t#500ms" in the "Write Timer Variable" dialog box and click "Write" to set the value.



As you can see, "OUT1" and "OUT2" is blinking every 0.5 seconds. To simulate "K1" and "K2" variables, right-click the "K1" button and the "OUT3" is light up.

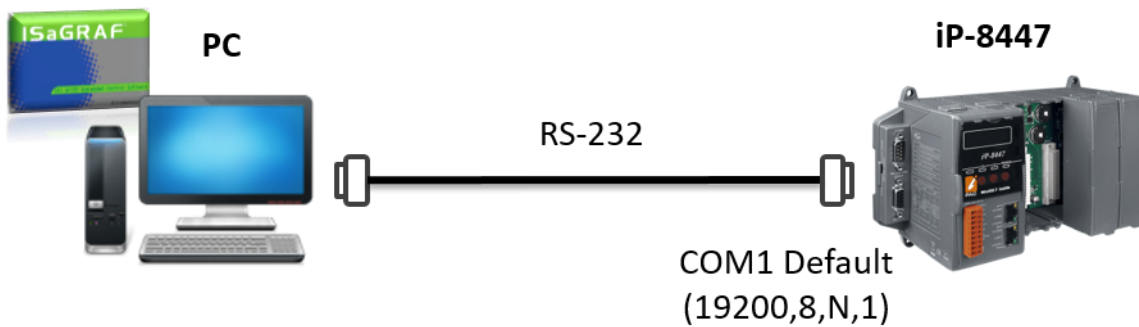


To exit the simulation, please close the debugger window.



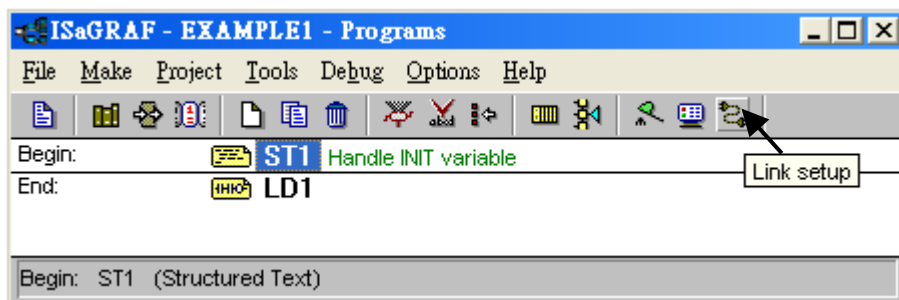
## 2.5 Step 5 - Download & Debugging the Example Project

To begin this process, set up the hardware below.

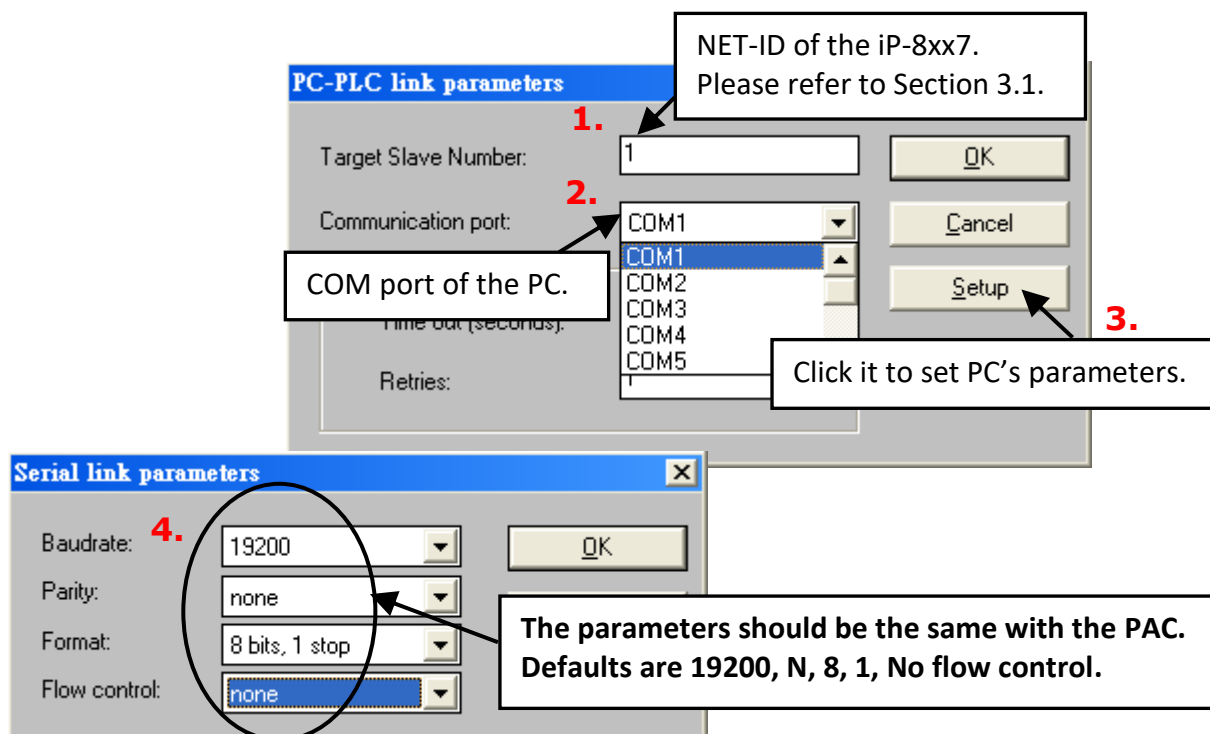


**Note:** The shipping box of the PAC includes a RS-232 cable (CA-0915) that can be used to connect the COM1 (or COM2) of the PC to the COM1 of the PAC.

Click the "Link Setup" button in the "ISaGRAF Programs" window.

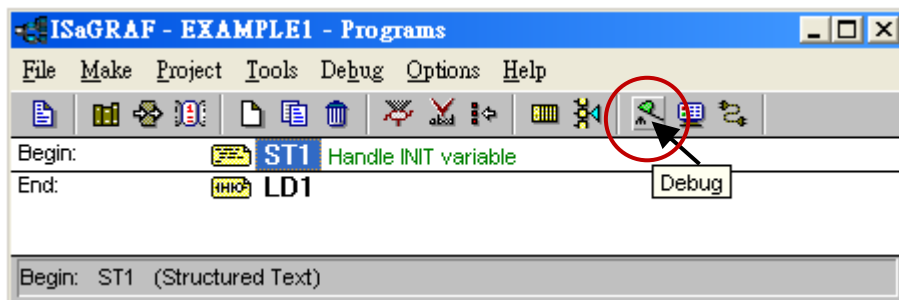


In the "PC-PLC Link parameters" window, set the communication parameters properly.

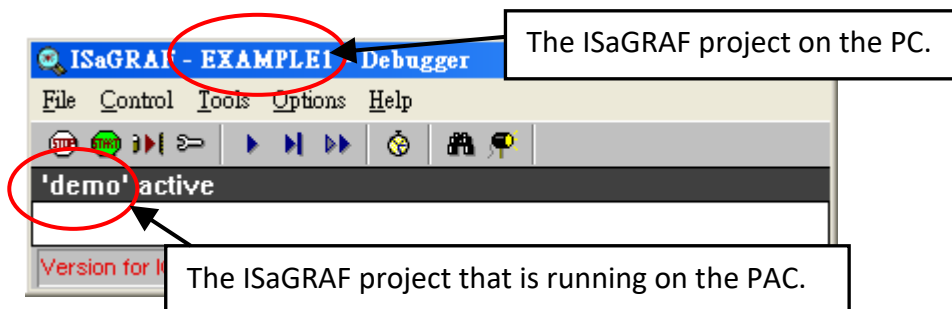


## 2.5.1 Downloading the Project

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.



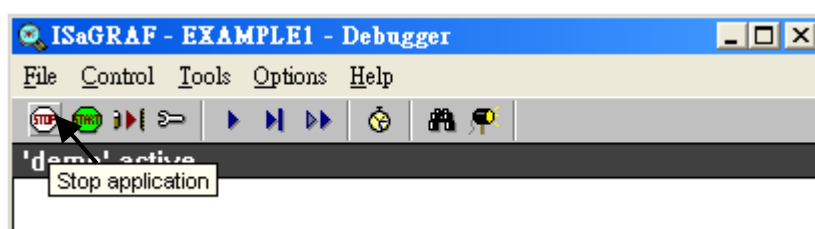
If the connection between a PC and a PAC is working, the project name which is running on the PAC will be displayed in the Debugger window.



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.

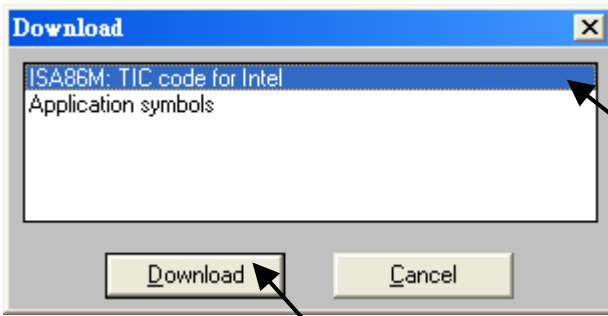
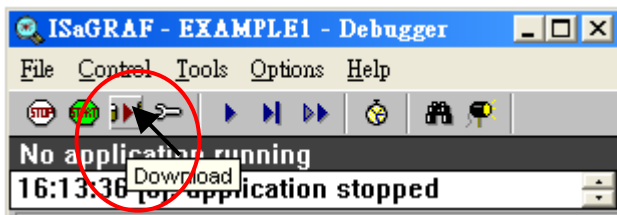
If there is a project running on the PAC, you need to stop that project before downloading a new one. The way is to click the "Stop application" button in the "ISaGRAF Debugger" window.



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

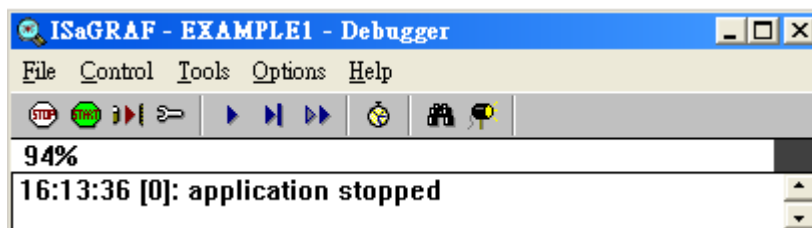
## Starting the Downloading Process

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

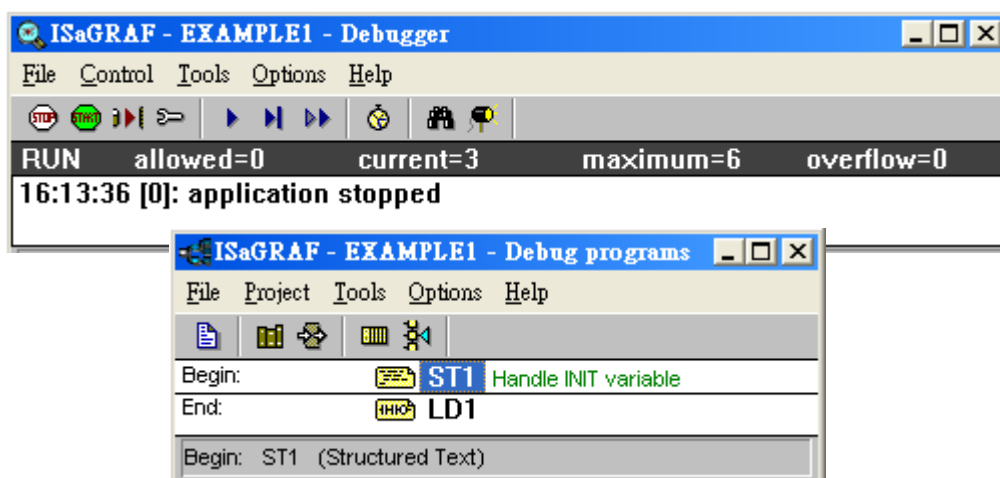


If there is no "ISA86M: TIC code for Intel", refer to Section 2.4 to set the "Compiler Options" and compile the program again.

Click the Download button to download the Example1 project to the PAC. A progress bar will display to show the project downloading progress.



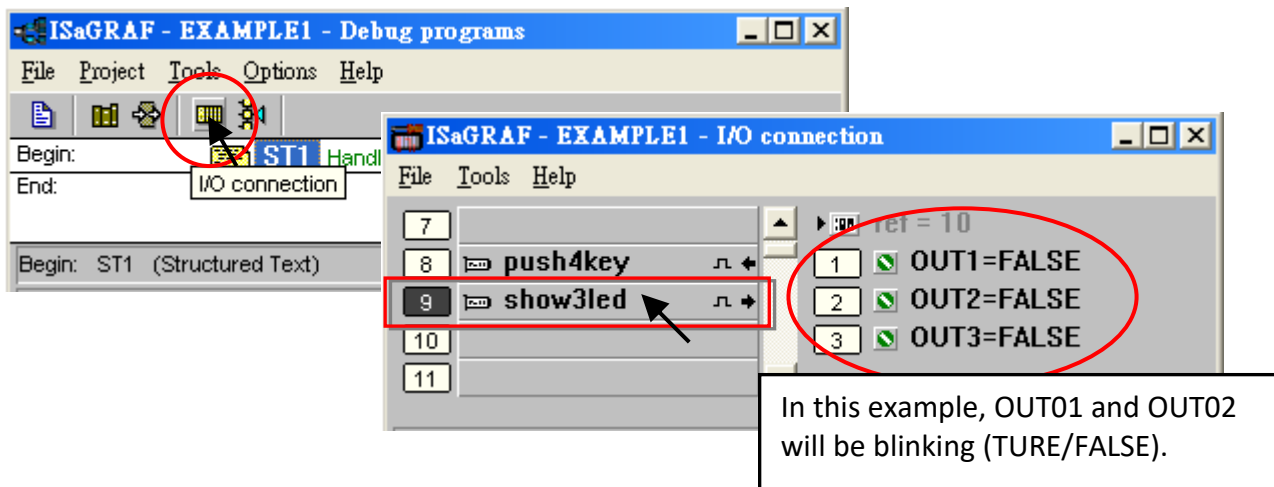
If the download is completed, you can see the window below.



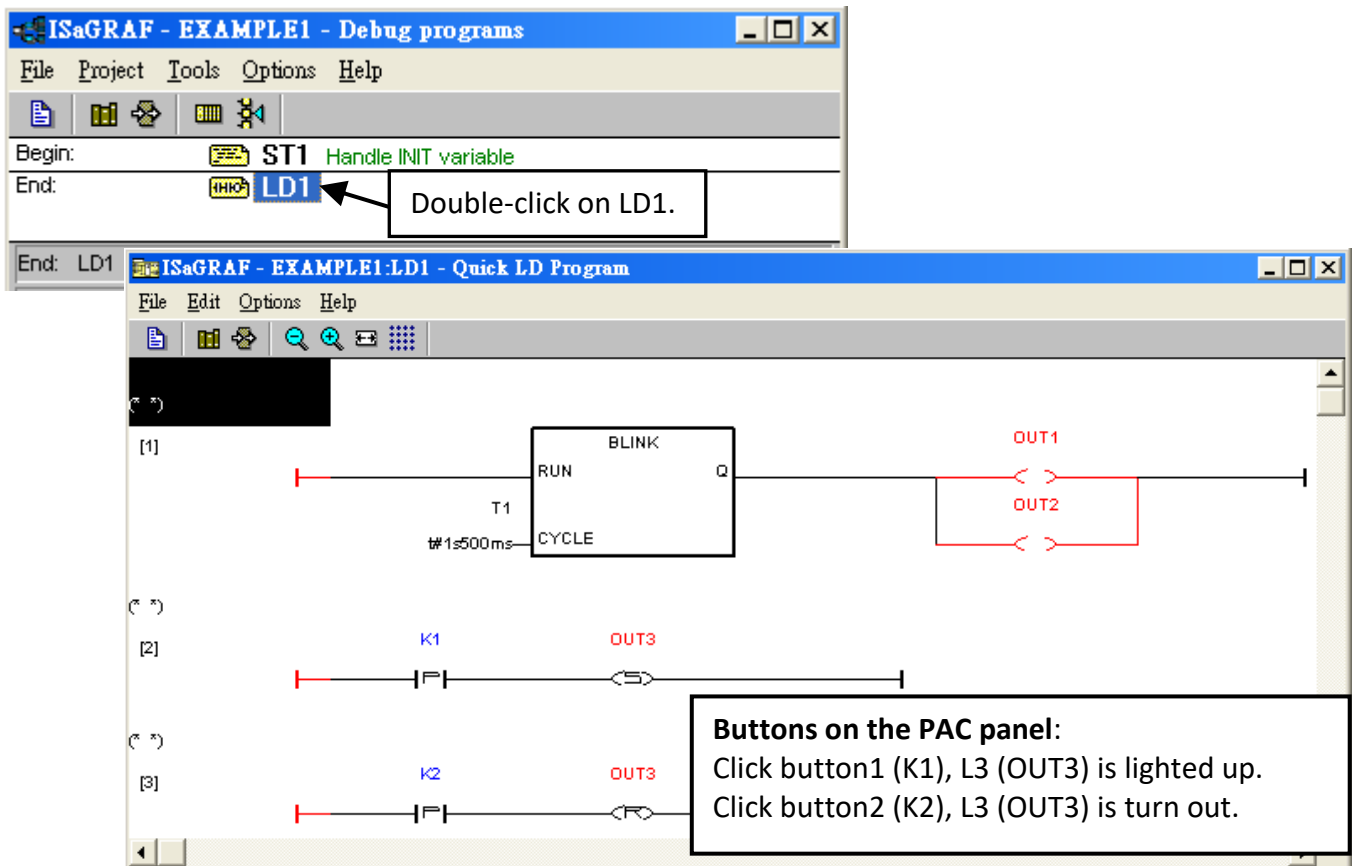


## 2.5.2 Running the Example Program

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".

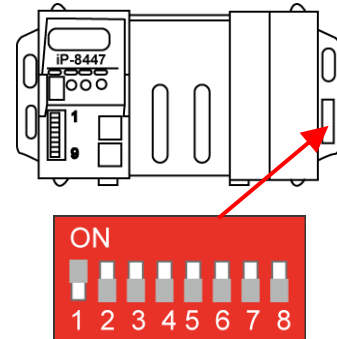


Though there are numerous steps involved in creating and downloading an ISaGRAF program, each step is quick and easy to accomplish. ISaGRAF provides a powerful and flexible software environment to develop the PAC control system.

## 3.1 Setting the NET-ID for the iP-8xx7

For the iP-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 (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	2	3	4	5	6	7	8
$2^0=1$	$2^1=2$	$2^2=4$	$2^3=8$	$2^4=16$	$2^5=32$	$2^6=64$	$2^7=128$

If Net-ID=01 ( $2^0=1$ ), setup the **DIP 1** to ON.

If Net-ID=02 ( $2^1=2$ ), setup the **DIP 2** to ON.

If Net-ID=03 ( $2^0+2^1=3$ ), setup the **DIP 1 and 2** to ON.

If Net-ID=04 ( $2^2=4$ ), setup the **DIP 3** to ON.

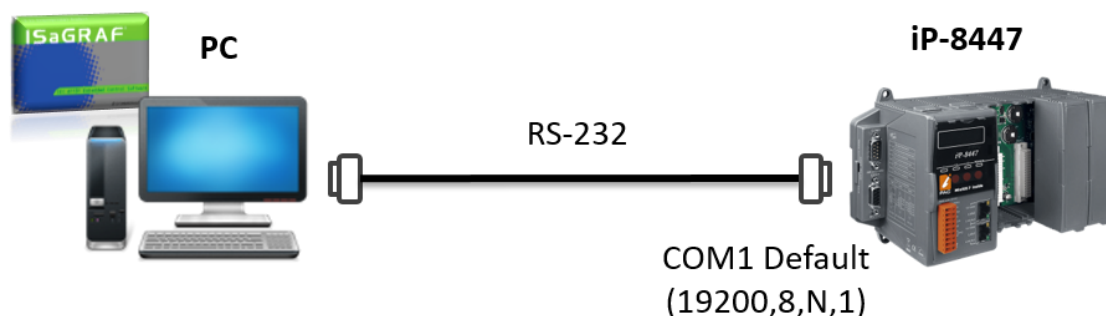
If Net-ID=05 ( $2^0+2^2=5$ ), setup the **DIP 1 and 3** to ON.

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

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

## 3.2 Connecting PC to the iP-8xx7's COM1

There is one RS-232 communications cable (CA-0915) included in the iP-8x47 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 iP-8x47 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.

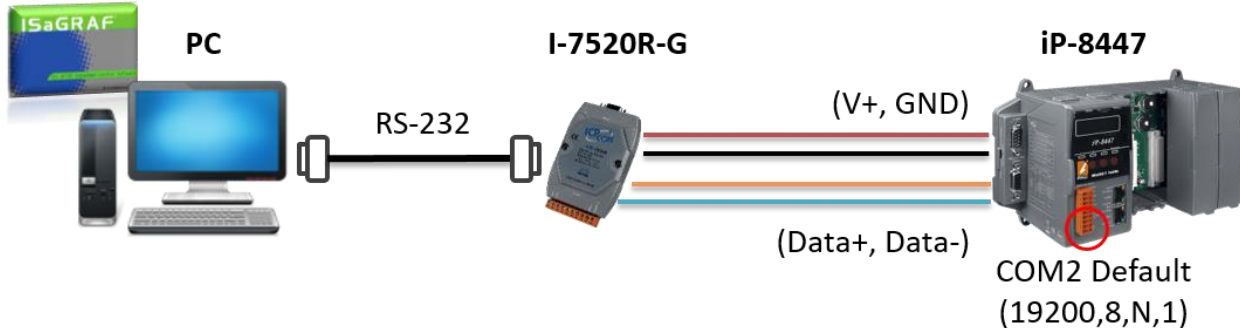
PC 9-Pin D-Sub		iP-8x47 COM1
RxD 2	_____	TxD 2
TxD 3	_____	RxD 3
GND 5	_____	GND 5

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		iP-8x47 COM1
RxD 2	_____	TxD 2
TxD 3	_____	RxD 3
GND 5	_____	GND 5
DTR 4	_____	
DSR 6	_____	
RTS 7	_____	
CTS 8	_____	

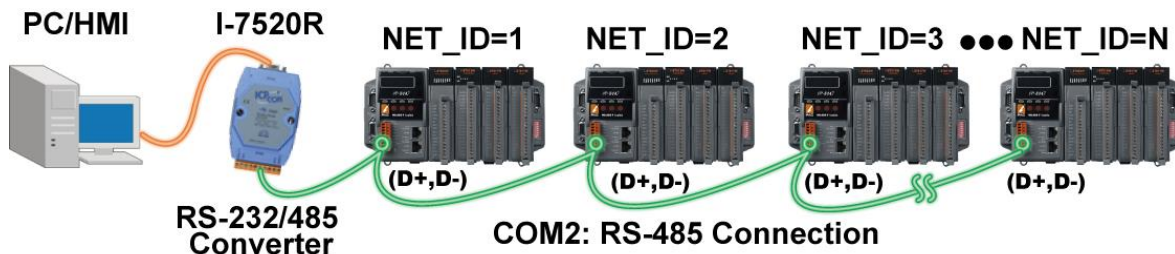
### 3.3 Connecting PC to iP-8xx7's COM2

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.



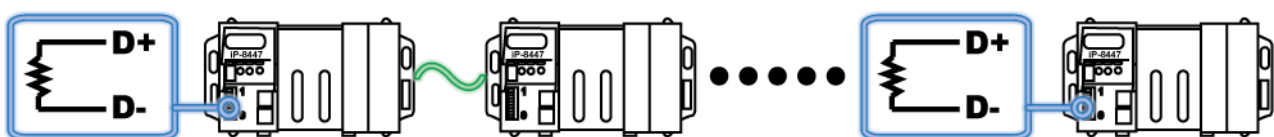
### 3.4 Connecting PC to Several iP-8xx7's COM2

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 iP-8xx7 can be connected each other. We do not recommend connecting so many PACs if not necessary.



To create an RS-485 network, make sure that each PAC has a unique NET-ID address, and the COM2 on each PAC links the "D+" to the "D+" signal and the "D-" to the "D-" signal.

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



### 3.5 Setup COM Port's Baud rate & Non-Modbus Slave Port from PAC

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.

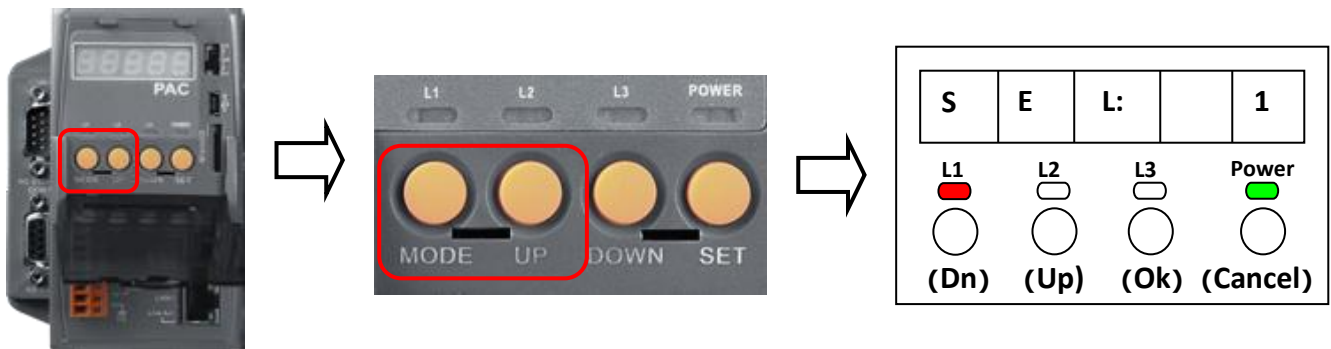
The following COM ports support Modbus Slave (Default baud rate setting: 19200)

**COM1 (RS-232) and**

**One of the COM2 (RS-485) and COM3 (RS-485/RS-232, Default: **Non- Modbus Slave Port**)**

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 1" (Select 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.



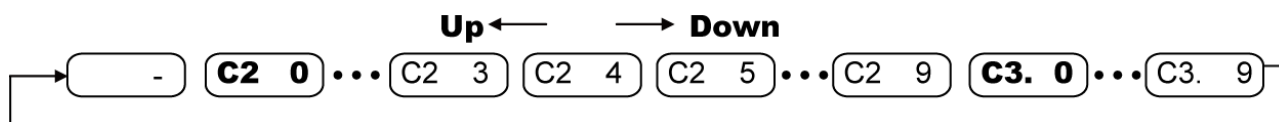
**Note:** For iP-8xx7 PAC, "SEL 0" is used to set the baud rate of first Slave port (i.e., COM1), while "SEL 1" is used to set the baud rate of the second Slave port (i.e., COM2 or COM3)

#### Setup COM1's baud rate:

1. Press the "Up" button to change the selection to "SEL 0", and then press the "OK" button.
2. The "BAU 4" setting 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
3. Press "OK" to save the settings. It will show the COM1's communication mode (RS-232) and return to the "SEL 0" screen, please reboot the PAC to load the settings.

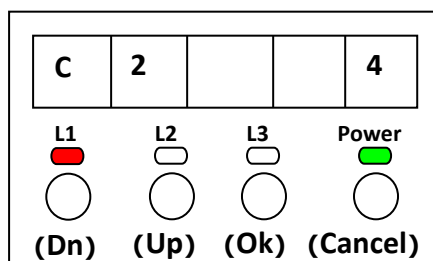
#### Setup COM2/COM3's baud rate:

1. As mentioned above, you can see the "SEL 1" screen after power on the PAC. Press the "OK" button.
2. One of COM2 and COM3 can be used; you can set the baud rate on a common screen. The settings can be:



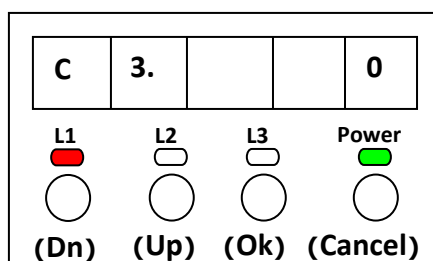
#### (a) Set COM2

The first setting on LED display is "C2 4" which stands for "COM2: 19200", you can press "Up" or "Dn" to change the baud rate settings. The settings can be: (-) non-Modbus Slave Port (0) 1200, (1) 2400, (2) 4800, (3) 9600, (4) 19200, (5) 38400, (6) 57600, (7) 115200, (8) 300 (9) 600.



#### (b) Set COM3

As noted before, press "Dn" several times to change the selection to "C3. 0" (i.e., COM3: 1200). Then, press "Dn" to select a baud rate setting. The settings can be: (0) 1200, (1) 2400, (2) 4800, (3) 9600, (4) 19200, (5) 38400, (6) 57600, (7) 115200, (8) 300 (9) 600 (-) non-Modbus Slave Port



- Press "OK" to save the settings. It will show the COM Port's communication mode (COM2: RS-485, COM3: RS-232/485) and return to the COM Port selection mode, please reboot the PAC to load the settings.

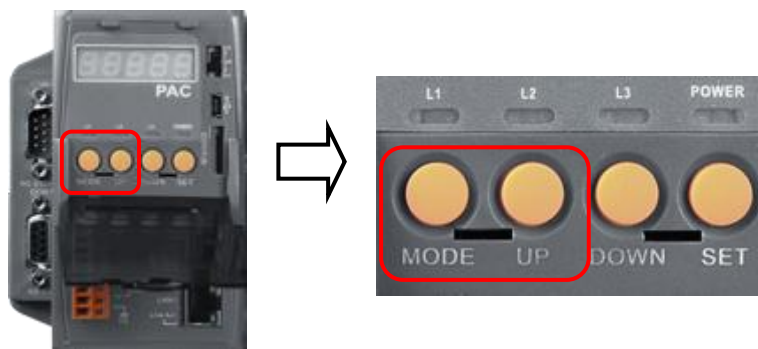
#### **Setup COM2/COM3 as non-Modbus Slave Port:**

After the baud rate is set, the COM2 or COM3 is a Modbus Slave port. In addition, when choosing the "(-) non-Modbus Slave Port" which means both COM2 and COM3 are set as a non-Modbus Slave port. Then, reboot the PAC to apply the settings.

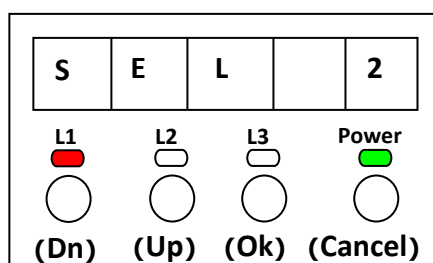
**Note:** The default setting of PC's COM 1 to 9 in the ISaGRAF "Link Setup" function is '19200, 8, N, 1'. For the communication between PAC and PC works properly, if the baud rate setting of COM1 and COM2/3 on the PAC is changed, the settings of PC MUST be set to be the same.  
([Please refer to Section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

### 3.6 Deleting an ISaGRAF Project from the PAC

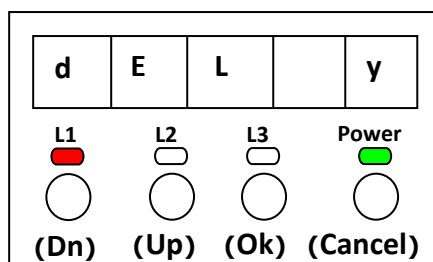
The user can remove the ISaGRAF project from the PAC panel, similar to changing the baud rate, first turn off the PAC. Then, press and hold on the first two buttons and power on the PAC until the "SEL 1" (Select 1) appears on the LED display.



At first, press the "Dn" button until "SEL 2" (Select 2) appears, and then press "OK" button.



Now, the "dEL n" will show on LED display. Please press the "Up" or "Dn" buttons until "dEL y" appears, and then press "OK" button.

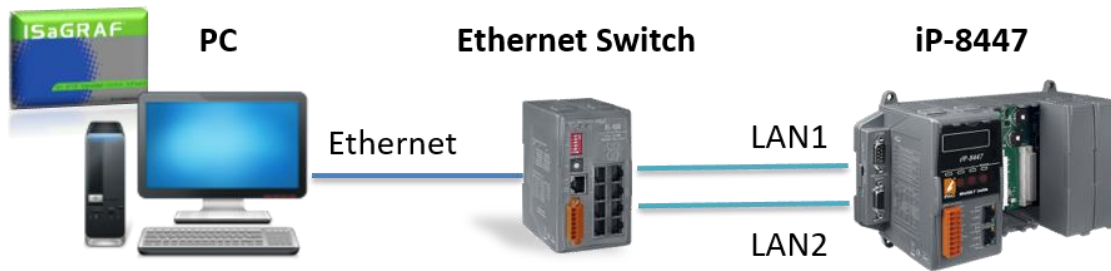


When the "CLEAr" appears, the ISaGRAF project in the PAC has been removed. Please reboot the PAC.



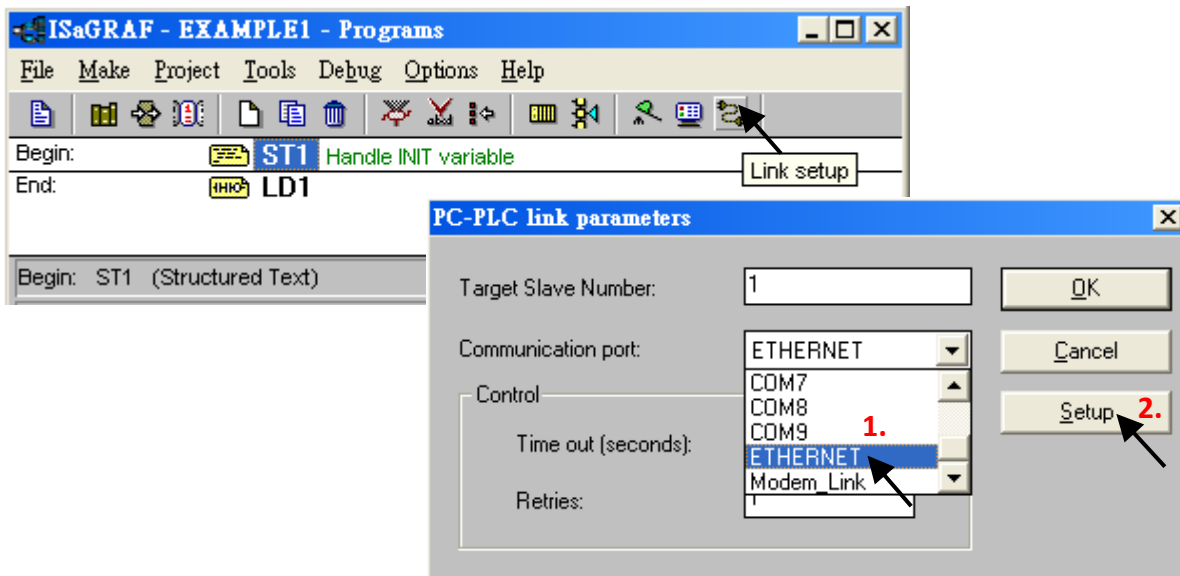
### 3.7 Connecting PC to the iP-8x47 Ethernet Port

iP-8x47 provides two Ethernet ports, you can use the LAN1 or LAN2 to connect with the PC.

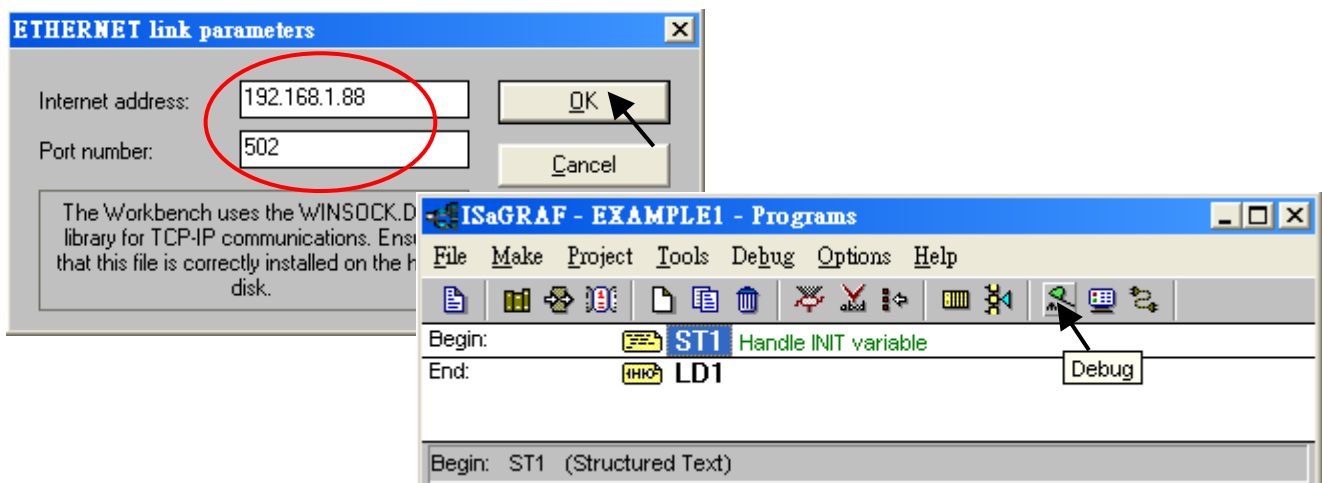


The user must set the Ethernet communication parameters correctly for successfully downloading the ISaGRAF project to the PAC over the network. Refer to [section 3.9](#) to set IP, Mask and Gateway address.

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.



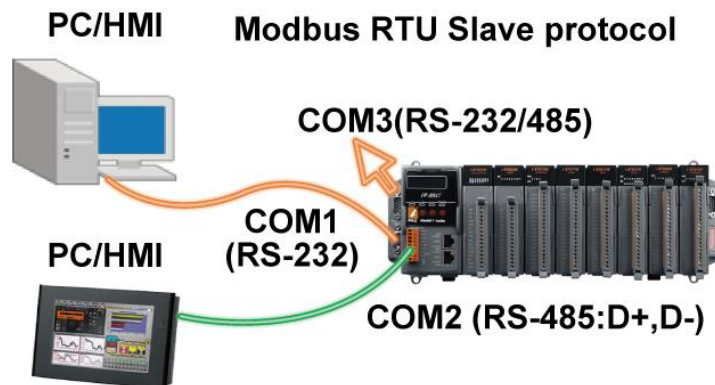
In the "Ethernet Link Parameters" window, enter the IP address of the PAC and make sure the "Port Number" is 502 and then click OK. Click on "Debug" in the "Programs" window to connect to the PAC.



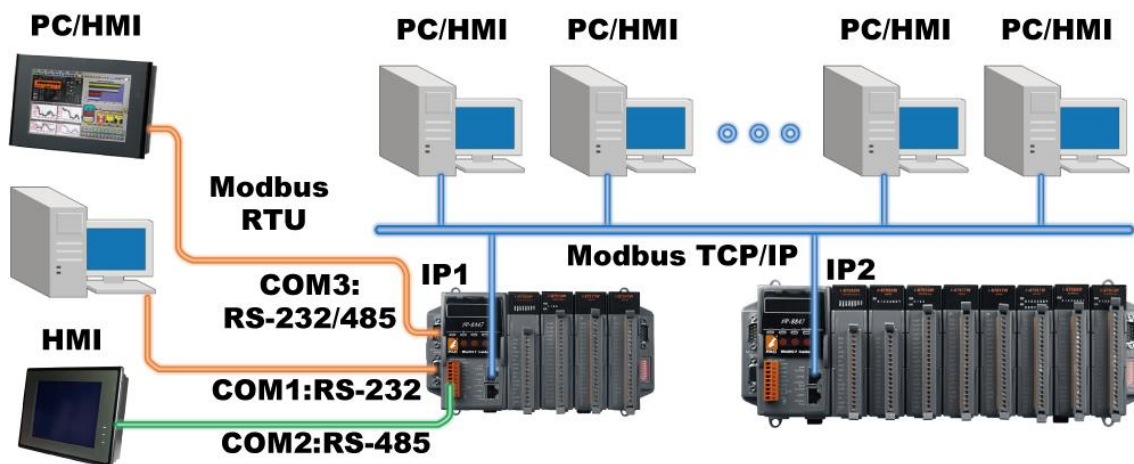
### 3.8 Modbus Slave Connection to the iP-8xx7

The iP-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 iP-8xx7 supports up to two Modbus RTU Slave ports, COM1 (RS-232) and one of COM2 (RS-485) 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.



iP-8447/8847 provides two Ethernet port that support Modbus TCP Slave protocol. The user can set the IP address and TCP port number (fixed 502) for each PAC. One PAC can connect up to 6 PCs through the Ethernet port.



The others PC or HMI can connect to the COM1 and one of the COM2 and COM3 on the PAC. Therefore, one iP-8xx7 can connect to up to 8 devices.

### 3.9 Setting iP-8x47's IP & MASK & Gateway

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

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

1. Create a folder named "iP8000" in the hard drive (e.g., "c:\iP8000").
2. Copy "7188xw.exe", "7188xw.ini", "7188xw.f4", "isa\_ip.exe", "autoexec.bat", and "8k050408.img" from the driver folder to the "iP8000" folder.
3. Make sure the serial communication between the PC and the PAC via RS-232 (e.g., COM1) is OK. If using another COM port (e.g., 'COM5'), see [Section 3. 11, step4](#) to modify the "7188xw.ini" file.
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, set the DIP switch on PAC panel to the "Init", and restart the PAC.
6. Run "7188xw.exe" on PC and a "7188xw" screen will be displayed. If the connection is Ok, "C837\_V2.2\_UDP>" will be shown on the screen. (Also, press Enter to check the connection.)

```
ICP_DAS MinIOS7 for iPAC-8000E(80MHz) Ver. 2.04 build 007, May 23 2008 14:23:49
OS id=25
SRAM:768K, FLASH MEMORY:512K
[CPU=ICPDAS R2240I]
CPU internal WDT is ENABLED(WDT timeout=0.8 sec)
Serial number= 01 08 99 31 11 00 00 FE

C837_V2.2_UDP>
```

**Note:** Set the following IP/Mask/Gateway addresses based on PC's network settings.

"IP2" means the upper Ethernet Port on control panel (LAN2)

"IP" means the lower Ethernet Port on control panel (LAN1)



7. Type the "ip" or "ip2" command to see the LAN1 or LAN2 IP address of the PAC.  
Type "ip 192.168.1.xxx" or "ip2 192.168.1.xxx" to set a new IP address

```
C837_U2.2_UDP>ip
IP=192.168.1.104
C837_U2.2_UDP>ip2
IP=10.0.0.104
```

```
C837_U2.2_UDP>ip 192.168.1.88
Set IP=192.168.1.88
[ReadBack]IP=192.168.1.88
C837_U2.2_UDP>ip2 192.168.1.89
Set IP=192.168.1.89
[ReadBack]IP=192.168.1.89
```

8. Type the "mask" or "mask2" command to see the mask address of the PAC.  
Type "mask 255.255.255.0" or "mask2 255.255.255.0" to set a new mask address.

```
C837_U2.2_UDP>mask
Mask=255.255.255.0
C837_U2.2_UDP>mask2
Mask=255.255.255.0
```

9. Type the "gateway" or "gateway2" command to see the gateway address.  
Type "gateway 192.168.1.1" or "gateway2 192.168.1.1" to set a new gateway address.

```
C837_U2.2_UDP>gateway
Gateway=10.0.0.254
C837_U2.2_UDP>gateway2
Gateway=10.0.0.254
```

```
C837_U2.2_UDP>gateway 192.168.1.1
Set GATEWAY=192.168.1.1
[ReadBack]Gateway=192.168.1.1
C837_U2.2_UDP>gateway2 192.168.1.1
Set GATEWAY=192.168.1.1
[ReadBack]Gateway=192.168.1.1
```

10. Press **ALT\_X** to exit "7188xw", or COM1/COM2 of the PC will be occupied.  
11. Set the DIP switch on PAC panel to "Run", and restart the PAC.

**Note:** Launch the Command Prompt window on the PC and type the "ping ..." command to check the connection of the PAC.

```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [版本 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\User>ping 192.168.1.89

Pinging 192.168.1.89 with 32 bytes of data:

Reply from 192.168.1.89: bytes=32 time=1ms TTL=64
Reply from 192.168.1.89: bytes=32 time<1ms TTL=64
Reply from 192.168.1.89: bytes=32 time<1ms TTL=64
Reply from 192.168.1.89: bytes=32 time<1ms TTL=64

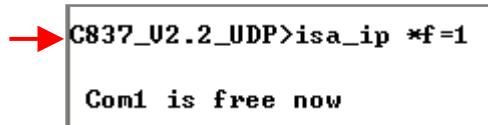
Ping statistics for 192.168.1.89:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

### 3.10 Setting COM1 as None-Modbus-Slave Port

---

By default, the COM1 of the iP-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 "iP8000" in the hard drive (e.g., "c:\iP8000").
2. Copy "7188xw.exe", "7188xw.ini", "7188xw.f4", "isa\_ip.exe", "autoexec.bat", and "8k050408.img" from the driver folder to the "iP8000" 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, set the DIP switch on PAC panel to the "Init", and restart the PAC.**
5. Run "7188xw.exe" on PC and a "7188xw" screen will be displayed. If the connection is Ok, "C837\_V2.2\_UDP>" will be shown on the screen. (Also, press Enter to check the connection.)
6. Type "isa\_ip \*f=1" to release COM1 (i.e., set COM1 as non-Modbus-Slave Port).



A screenshot of a terminal window titled "7188xw". The prompt is "C837\_V2.2\_UDP>". The user has entered the command "isa\_ip \*f=1". The terminal response is "Com1 is free now". A red arrow points to the command input line.

7. Press ALT+X to exit "7188xw", or COM1/COM2 of the PC will be occupied.
8. Set the DIP switch on PAC panel to "Run", 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.

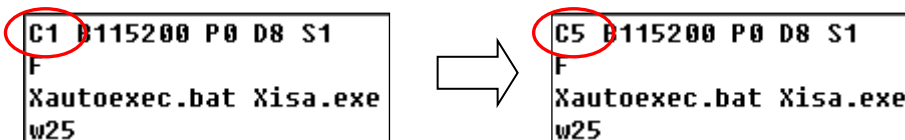
### 3.11 Update iP-8xx7's Hardware Driver

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 1.00 as an example)

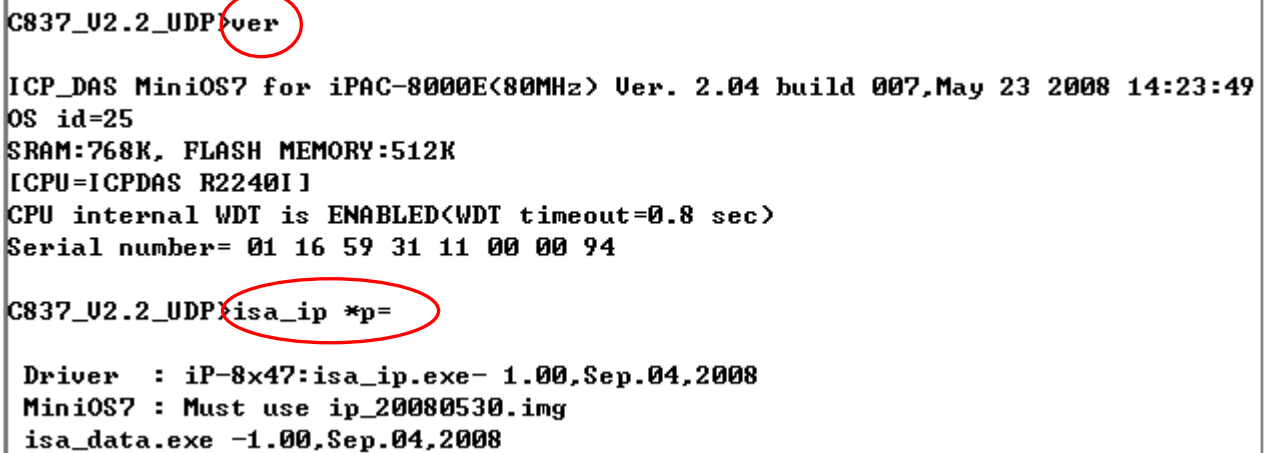
1. Create a folder named "iP8000" in the hard drive (e.g., "c:\iP8000").
2. Copy "7188xw.exe", "7188xw.ini", "7188xw.f4", "isa\_ip.exe", "isa\_data.exe", "autoexec.bat", and "8k050408.img" from the driver folder to the "iP8000" folder.
3. To check that the serial connection (e.g., 'COM1') between a PC 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.



```
C1 B115200 P0 D8 S1
F
Xautoexec.bat Xisa.exe
w25
```

```
C5 B115200 P0 D8 S1
F
Xautoexec.bat Xisa.exe
w25
```

4. Power off the PAC, set the DIP switch on PAC panel to the "Init", and restart the PAC.
5. Run "7188xw.exe" on PC and a "7188xw" screen will be displayed. If the connection is Ok, "C837\_V2.2\_UDP>" will be shown on the screen. (Also, press Enter to check the connection.)



```
C837_V2.2_UDP>ver
ICP_DAS MiniOS7 for iPAC-8000E(80MHz) Ver. 2.04 build 007,May 23 2008 14:23:49
OS id=25
SRAM:768K, FLASH MEMORY:512K
[CPU=ICPDAS R2240I]
CPU internal WDT is ENABLED(WDT timeout=0.8 sec)
Serial number= 01 16 59 31 11 00 00 94

C837_V2.2_UDP>isa_ip *p=
Driver : iP-8x47:isa_ip.exe- 1.00,Sep.04,2008
MiniOS7 : Must use ip_20080530.img
isa_data.exe -1.00,Sep.04,2008
```

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

## To Upgrade an ISaGRAF Driver

8. Press "**F4**" to auto load the following files and reboot system.

- (1) isa\_data.exe
- (2) autoexec.bat
- (3) isa\_ip.exe
- (4) ip\_080530.img

```
C837_U2.2_UDP>del /y
Total File number is 2, do you really want to delete(y/n)?

C837_U2.2_UDP>LOAD
File will save to 8000:0000
StartAddr-->7000:FFFF
Press ALT E to download file!
Load file:isa_data.exe[crc=A0A5,0000]
Send file info. total 298 blocks
Block 298
Transfer time is: 14.500000 seconds

C837_U2.2_UDP>del /y
Total File number is 1,
C837_U2.2_UDP>LOAD
File will save to 8000:0000
StartAddr-->7000:FFFF
Press ALT E to download file!
Load file:autoexec.bat[crc=590C,0000]
Send file info. total 1 blocks
Block 1
Transfer time is: 0.109000 seconds
```

1

2

Wait about 90 sec. to update ISaGRAF system and **DO NOT** Remove the Power!

```
C837_U2.2_UDP>LOAD
File will save to 8000:0009
StartAddr-->8000:0000
Press ALT E to download file!
Load file:isa_ip.exe[crc=B7E1,0000]
Send file info. total 765 blocks
Block 765
Transfer time is: 36.797000 seconds
```

3

```
C837_U2.2_UDP>UPLOAD
Press ALT E to download file!
Load file:ip_080530.img[crc=191E,0000]
Send file info. total 256 blocks
Block 256
Transfer time is: 12.297000 seconds
CRC16=522F
7000:FFFE=7188
```

4

By now, the PAC already reboots and you have updated successfully.

```
C837_U2.2_UDP>bios1
MiniOs7 for C837_2.2 Ver 2.04.007, date=05/30/2008
Checking CRC-16...Please wait...
Erase Flash [F000][F800][FA00][FC00]
Write Flash
[FF]
<<Write Finished>>OK
Wait WDT reset system...
ICP_DAS MiniOS7 for iPAC-8000E(80MHz) Ver. 2.04 build 007,May 23 2008 14:23:49
OS id=25
SRAM:768K, FLASH MEMORY:512K
[CPU=ICPDAS R2240I]
CPU internal WDT is ENABLED(WDT timeout=0.8 sec)
Serial number= 01 08 99 31 11 00 00 FE

C837_U2.2_UDP>
```

9. Press ALT+X to exit "7188xw", or COM1/COM2 of the PC will be occupied.

10. Set the DIP switch on PAC panel to "Run", and restart the PAC.

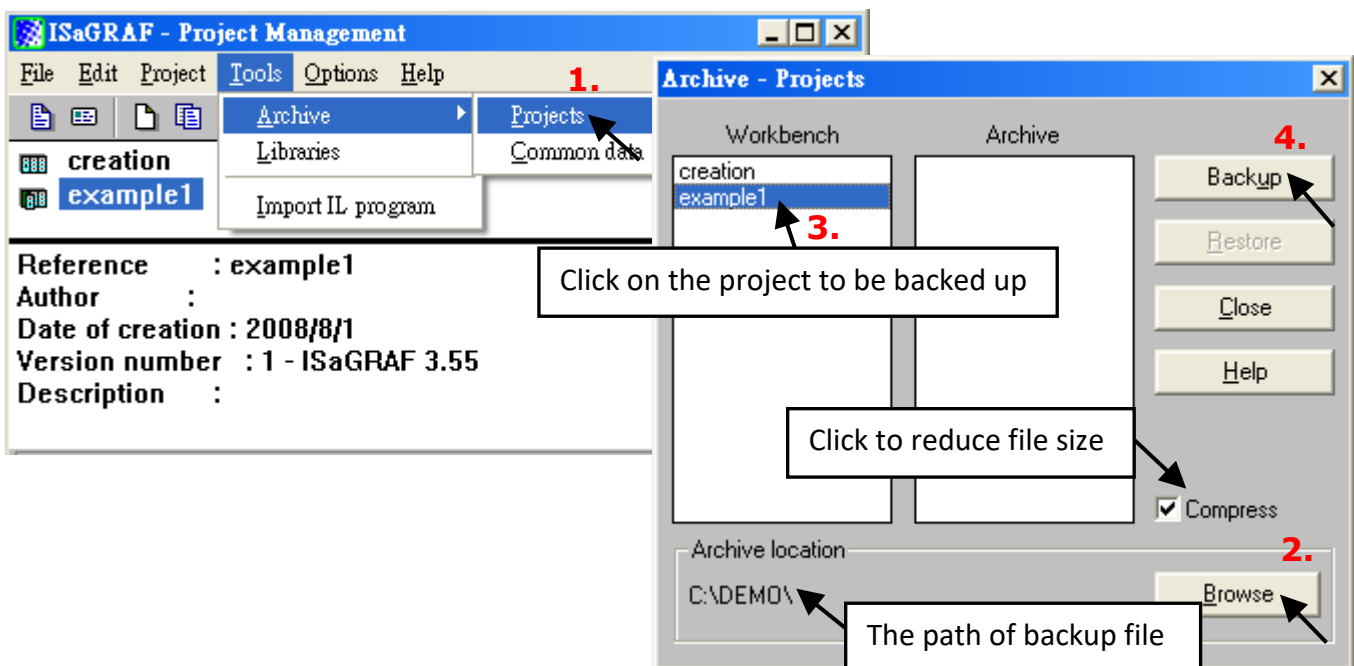


### 3.12 Backup & Restore an ISaGRAF Project

For archiving purposes, you can "Backup" and "Restore" an ISaGRAF project. For example, you may want someone to test your program or email to [service@icpdas.com](mailto:service@icpdas.com) for ICP DAS's ISaGRAF service.

#### Backing Up an ISaGRAF Project

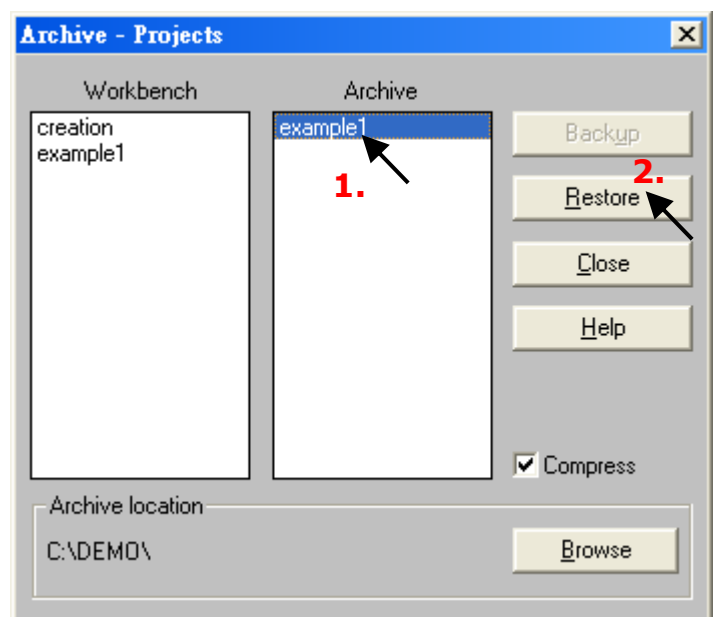
1. Open the "ISaGRAF Project Management" window. On the **Tools** menu, point to **Archive**, and then click **Projects**.
2. In the **Archive-Projects** window, click **Browse** to designate where you want to save the ISaGRAF project (e.g., 'C:\Demo'). Also, check the Compress box if you want to reduce 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 (e.g., 'C:\Demo\example1.pia').



#### 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

iP-8xx7 PAC system 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](https://www.icpdas.com/en/product/guide+Software+Utility_Driver+DCON__Utility__Pro)

#### **NOTE:**

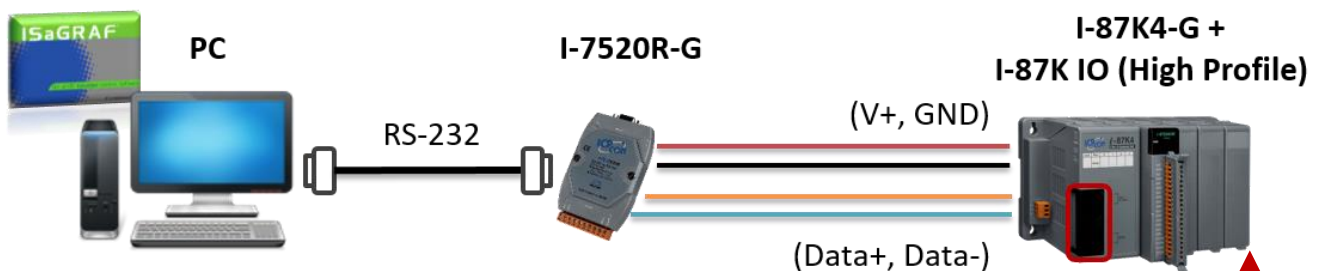
1. Make sure the hardware connection is correct.
2. Configure I-87K I/O modules with [I-87Kn or RU-87Pn](#).
3. Search and configure the modules one by one.
4. Set the module as the INIT mode and power it up.

#### **Step 1: Hardware connection**

1. The power supply must be DC power between +10V to +30V.
2. The figure below shows the way to connect the I-87K4 and the I-87K module (only one module is connected at a 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 hardware wiring.



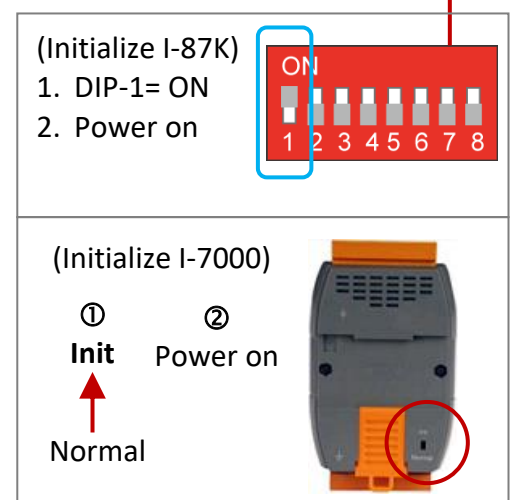
I-87Kn User Manual:

<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

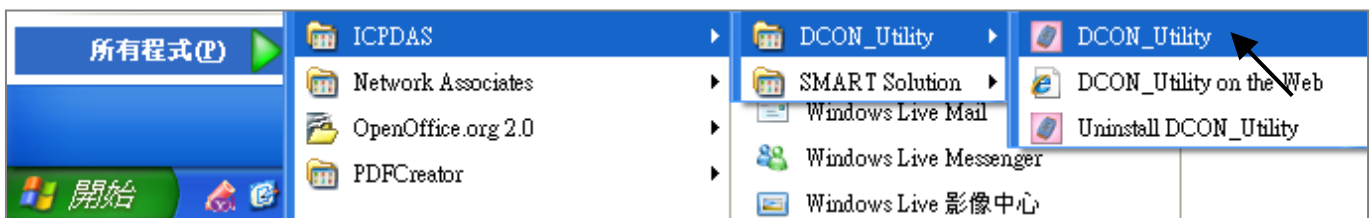
The initial settings:

- 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

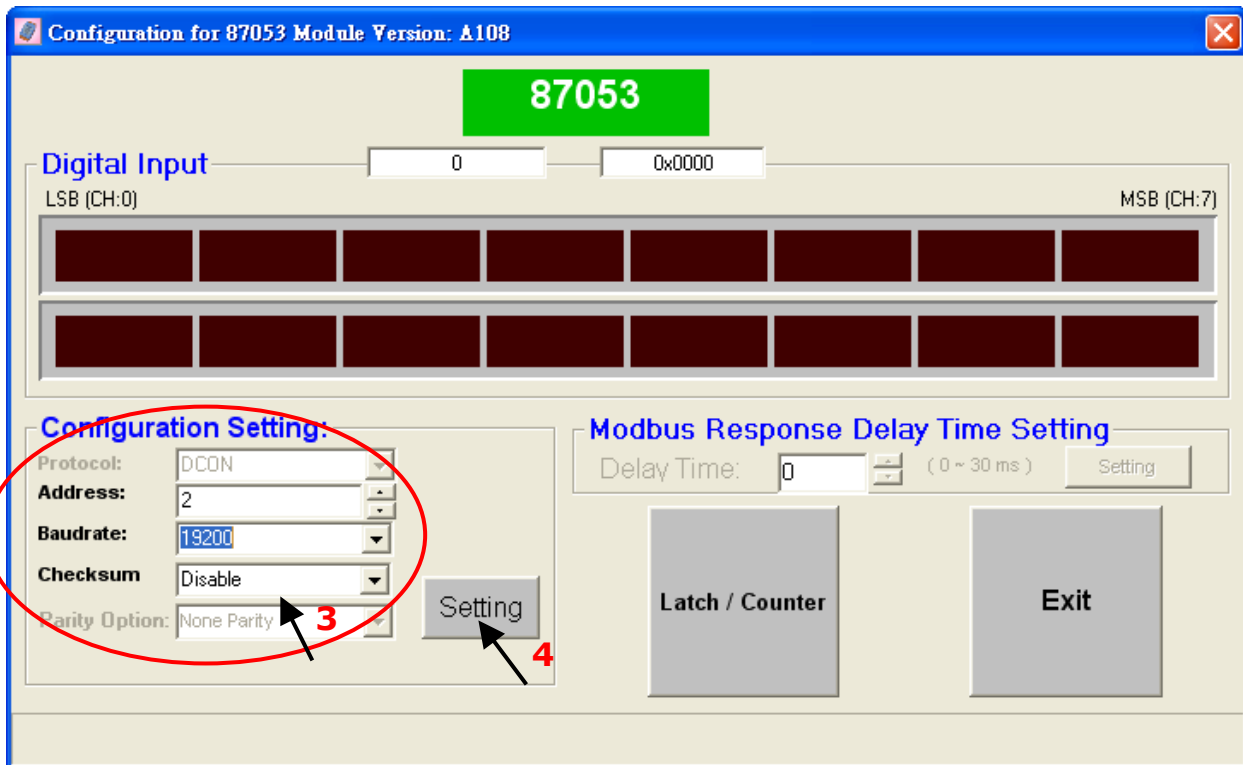
Click Windows “Start” and point to “programs”, “ICPDAS”, and “DCON\_Utility”. Then, click **DCON\_Utility** to execute the software.



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”.



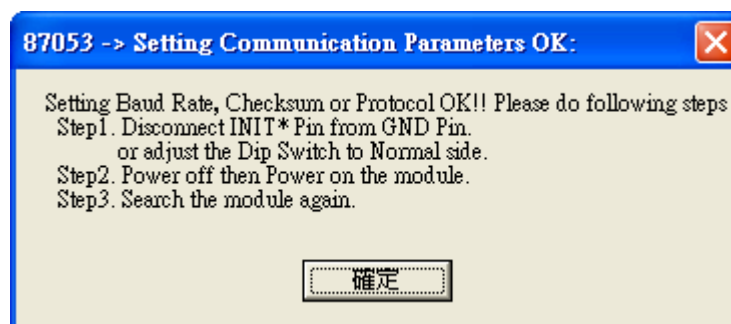
In the screen, you can setup the Address, Baud rate, Checksum, and then click “Setting” to save.



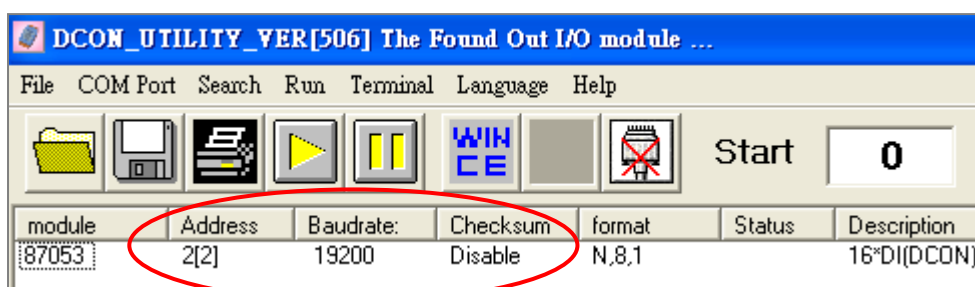
If the I-7000 module is not configured in INIT mode, the message window will be shown. Refer to [Step2](#) and set the module again.



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.

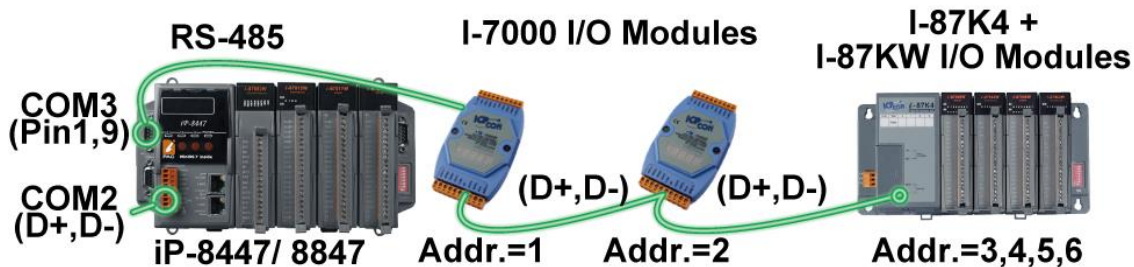


### 3.15 Linking I-7000 and I-87K Modules for Remote I/O

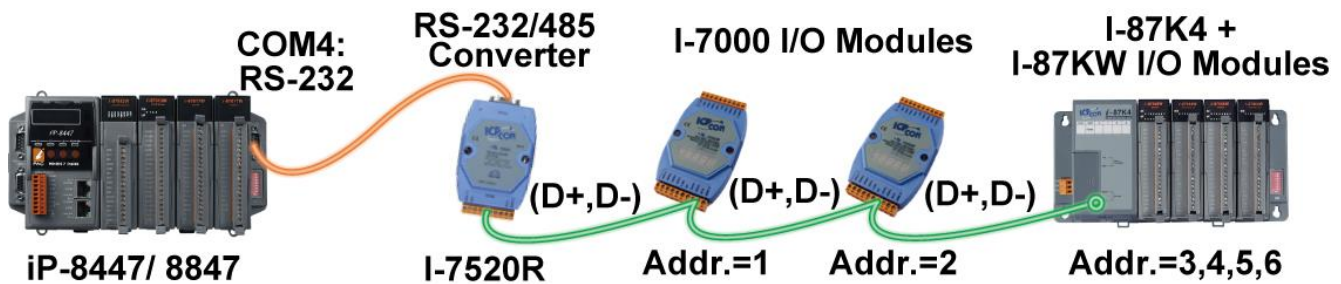
For more details, refer to Chapter 6 of the ISaGRAF user manual.

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

One of COM2 (RS-485), COM3 (RS-232/485), and COM4 (RS-232) can be used to connect remote I/O module. (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.



You can link up to 64 I-7000 or I-87K series remote modules to one iP-8xx7 PAC. 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 iP-8xx7 PAC.

For more information regarding setting up and programming an I-7000/I-87K remote module, please 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

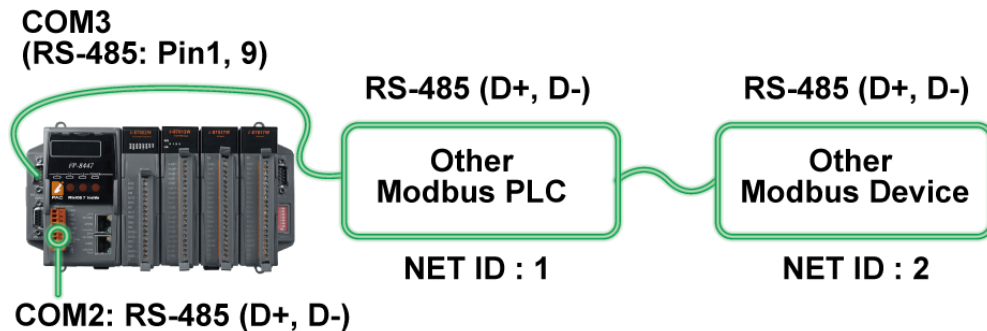
For more details, refer to Chapter 8 of the ISaGRAF user manual.

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

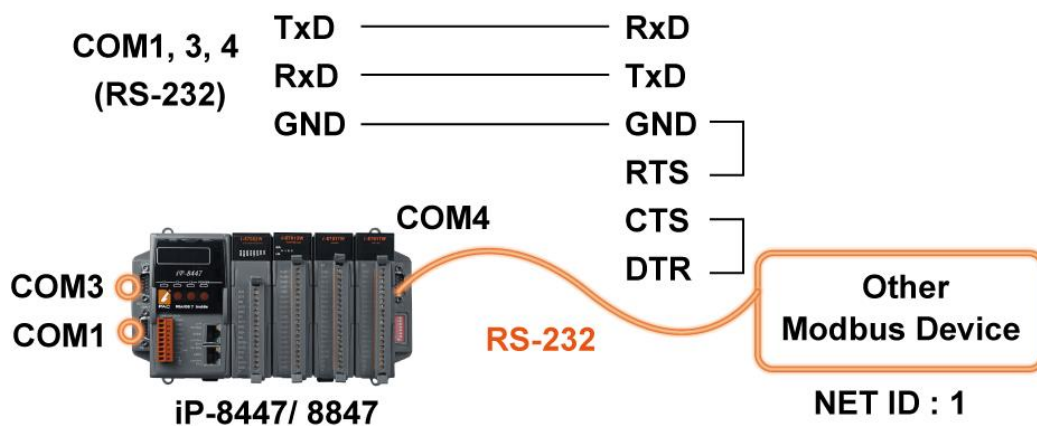
Two of COM1 (RS-232), COM2 (RS-485), COM3 (RS-232/485), COM4 (RS-232) or expended COM5 can be used as the Modbus Master port.

When using COM2/COM3 (RS-485), one iP-8x47 can connect to several devices.

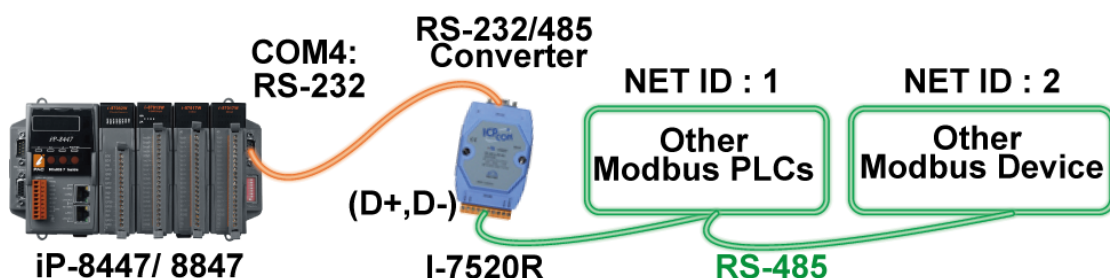
**Note:** Each device on the same RS-485 network must has a unique address (i.e., NET ID: 1 to 255) and the same baud rate settings.



When using COM1, COM3, or COM4 (RS-232) as the Modbus Master port, one iP-8x47 only 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

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For more information, please refer to:

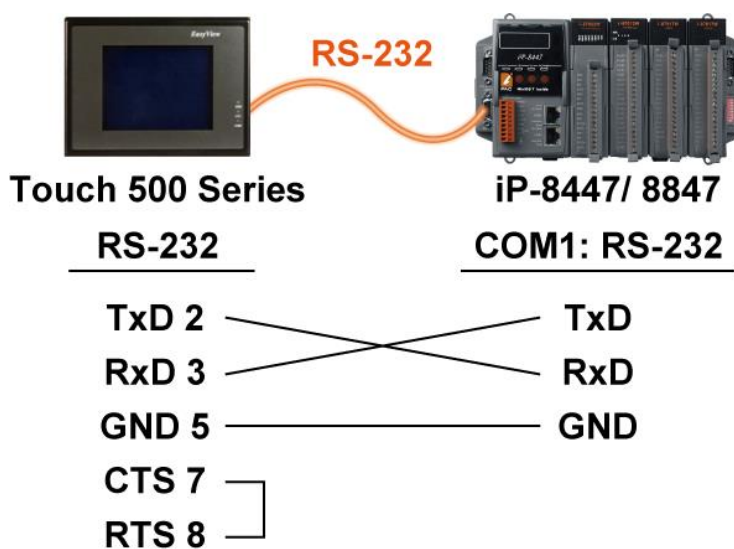
1. ISaGRAF User's Manual. It is listed in Section 4.4  
<http://www.icpdas.com/en/download/show.php?num=333>
2. Touch Panel Monitor User Manual  
<http://www.icpdas.com/en/download/show.php?num=432>

**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](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.

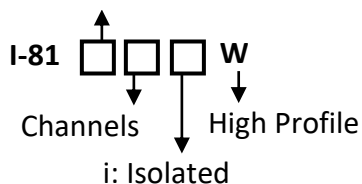


### 3.18 Using N-Port COM

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



1: RS-232 4: RS-485



I-8112iW: 2-port Isolated RS-232 Expansion Module

I-8114W: 4-port Non-isolated RS-232 Expansion Module

I-8114iW: 4-port Isolated RS-232 Expansion Module

I-8142iW: 2-port Isolated RS-485 Expansion Module

I-8144iW: 4-port Isolated RS-485 Expansion Module

#### Note:

I-81xx series modules can only be plugged in slot 0 to 3 (4 slots) on the iP-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 to the website for more information about [serial communication module](#) (High Profile) and refer to the data sheet on individual product page to see the pin assignment.

**Ordering Information**

PRODUCT SERIES	DESCRIPTION	QNT.	INQUIRY
I-8112iW-G CR	2-port Isolated RS-232 Module (RoHS)	1	\$

**Similar Products**

▶ Available soon ▶ Will be phased out ▶ Phased out

None

Specifications

Accessories

Related Products

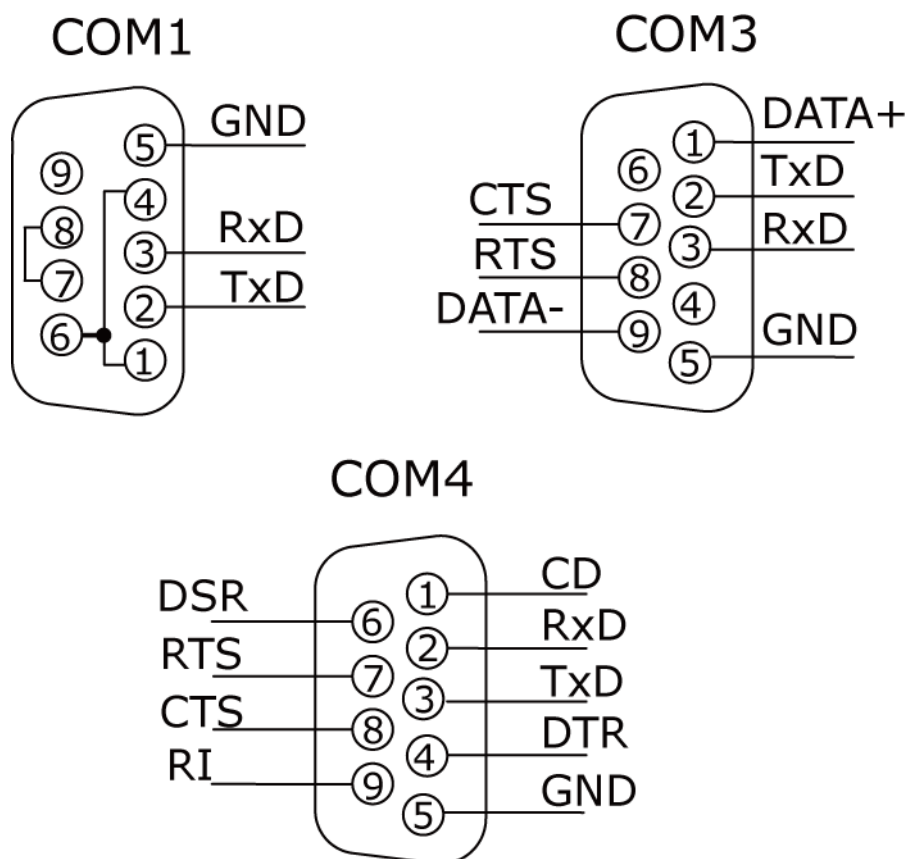
Applications

DATA SHEET

DOWNLOAD CENTER

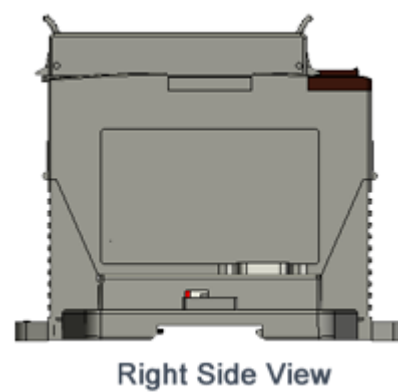
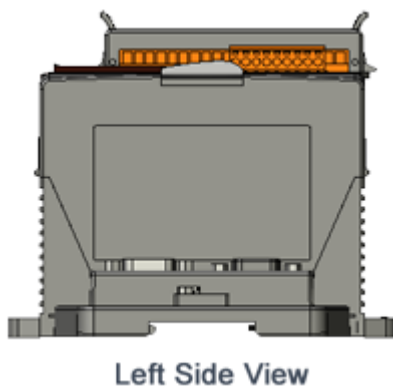
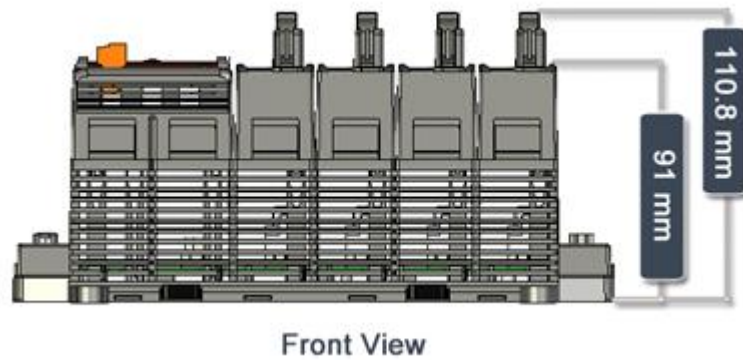
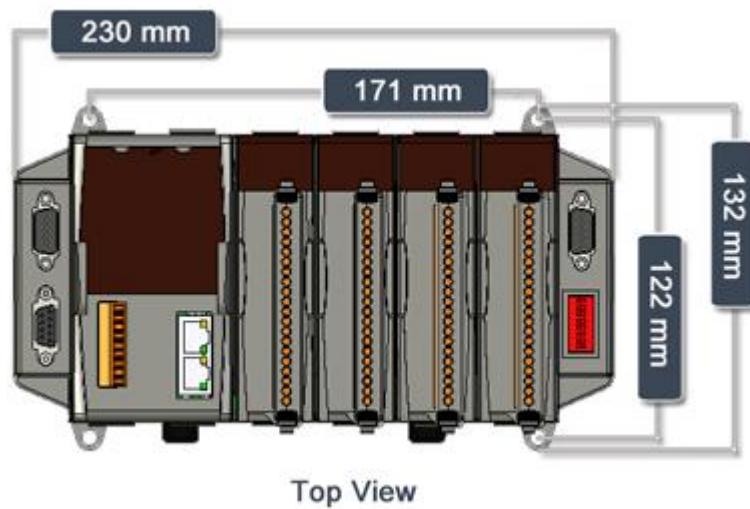
### 3.19 Pin Assignment of Communication Ports

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## 3.20 Dimension

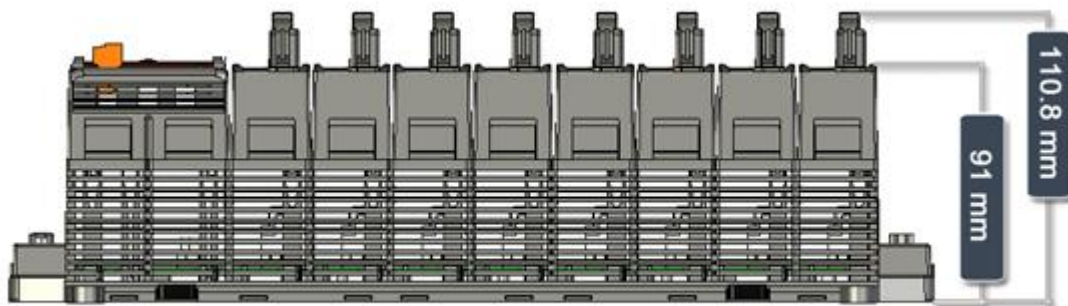
### 4 Slots:



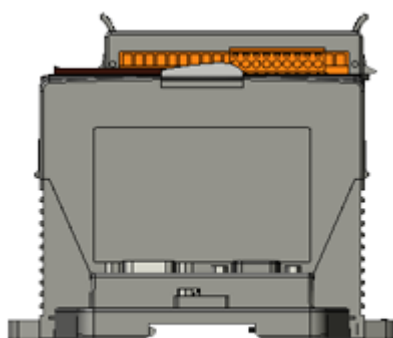
## 8 Slots:



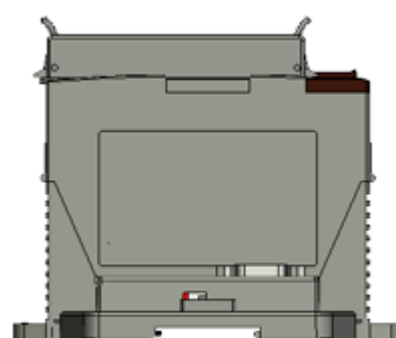
Top View



Front View



Left Side View



Right Side View

## Appendix

### A: ISaGRAF User Manual & Demo Program & FAQ

All ISaGRAF manuals and demo programs can be found on the ISaGRAF website. Follow these steps below to get the latest files and ISaGRAF FAQ.

#### 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](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	<a href="#">Q</a>

### Demo Sample

FILE NAME	DESCRIPTION	MODEL	LAST UPDATE	DETAIL
ISaGRAF Demo	For ISaGRAF PACs		2020-04-21	<a href="#">Q</a>

### Driver

FILE NAME	DESCRIPTION	MODEL	LAST UPDATE	DETAIL
ISaGRAF PAC Driver & Lib	For ISaGRAF PAC		2020-05-26	<a href="#">Q</a>

TOP



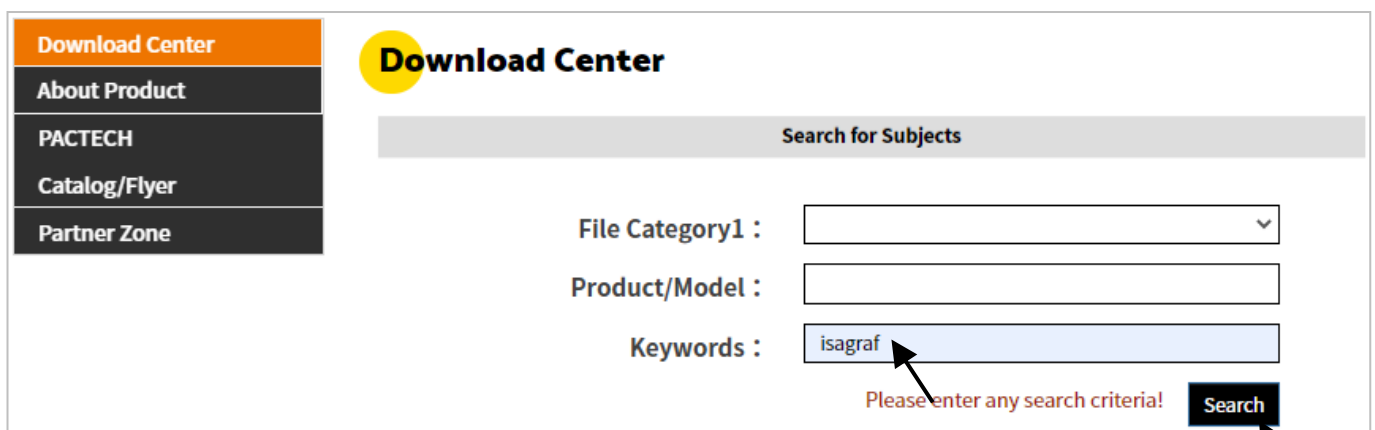
- Also, type the ICP DAS's web address <http://www.icpdas.com> in the browser.



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



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



HOME > SUPPORT > Download Center

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

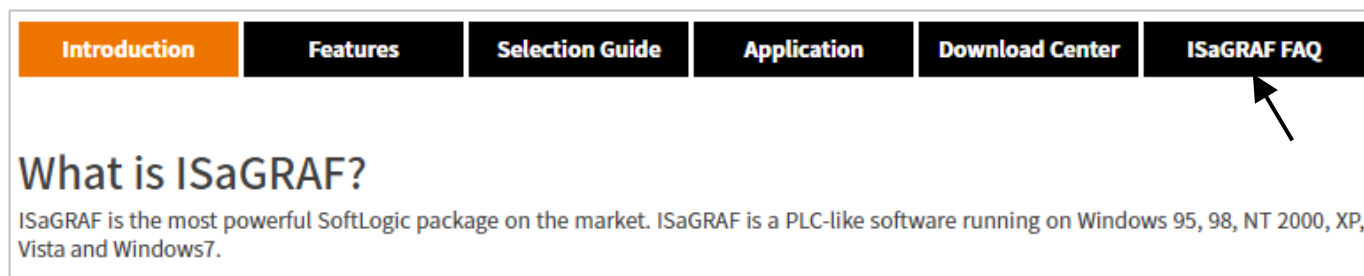
### Data Sheet

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](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	
<a href="#">FAQ-052: VB 6.0 Demo program using Modbus TCP/IP protocol to control ISaGRAF PACs</a>	
<a href="#">FAQ-051: VB.net 2005 Demo program using Modbus TCP/IP protocol to control ISaGRAF PACs</a>	

## B: 10-ch Thermocouple Input Module

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

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

**I-7018Z:** [http://www.icpdas.com/en/product/I-7018Z-G\\_S](http://www.icpdas.com/en/product/I-7018Z-G_S)

**I-87018Z:** [http://www.icpdas.com/en/product/I-87018ZW-G\\_S](http://www.icpdas.com/en/product/I-87018ZW-G_S)

### 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 40 I/O modules supported with RU-87Pn, including analog input/output, digital input/output, and counter/frequency I/O modules. RU-87Pn is the best choice for ISaGRAF PACs connecting to I-87K Remote I/O (only support High Profile) modules.

Visit to the website for new products about I-87K (High Profile) remote I/O modules.

[http://www.icpdas.com/en/product/guide+Remote\\_I\\_O\\_Module\\_and\\_Unit+Software\\_Support\\_+I-8K\\_I-87K\\_Software\\_Support#768](http://www.icpdas.com/en/product/guide+Remote_I_O_Module_and_Unit+Software_Support_+I-8K_I-87K_Software_Support#768)

RU-87Pn is designed to be used in harsh and noisy environment, so the hardware is manufactured with wide power input range (10 ~ 30 V<sub>DC</sub>) 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.

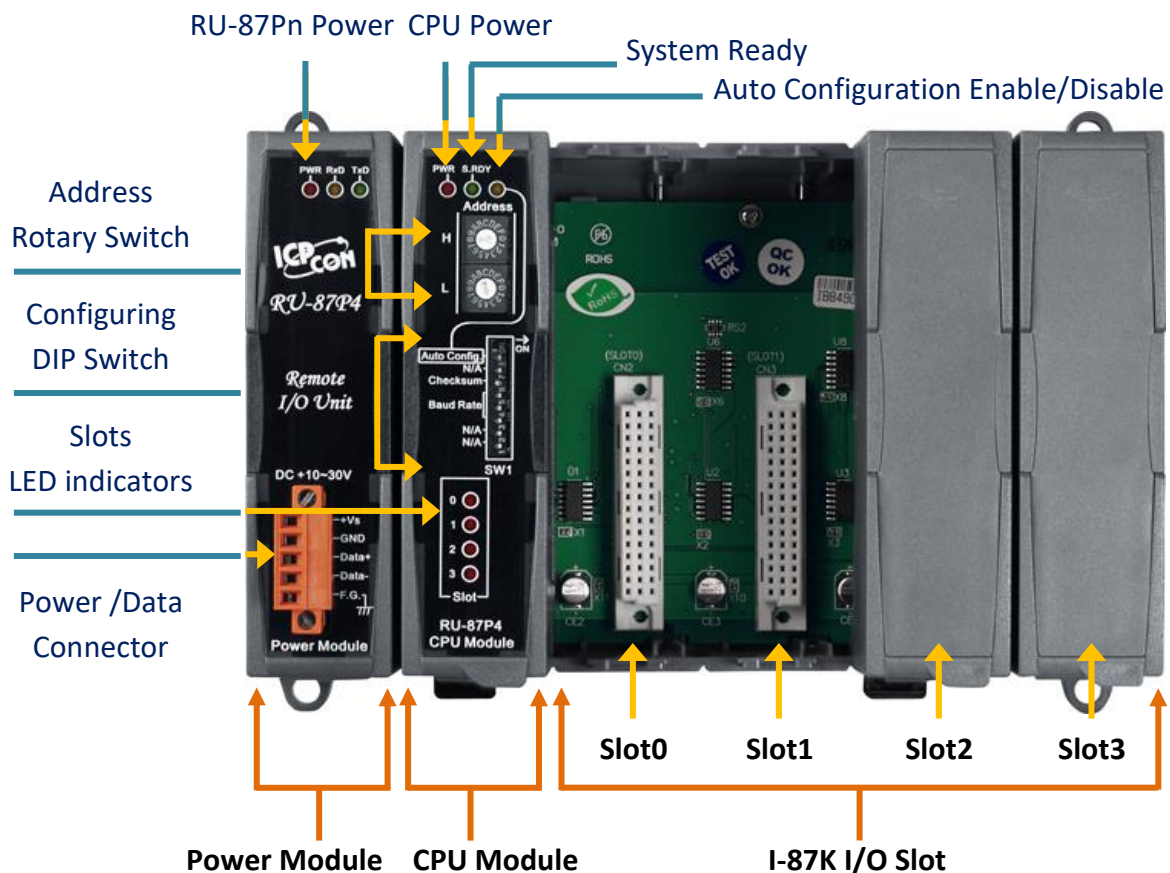


Fig. 1 : RU-87P4

## 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

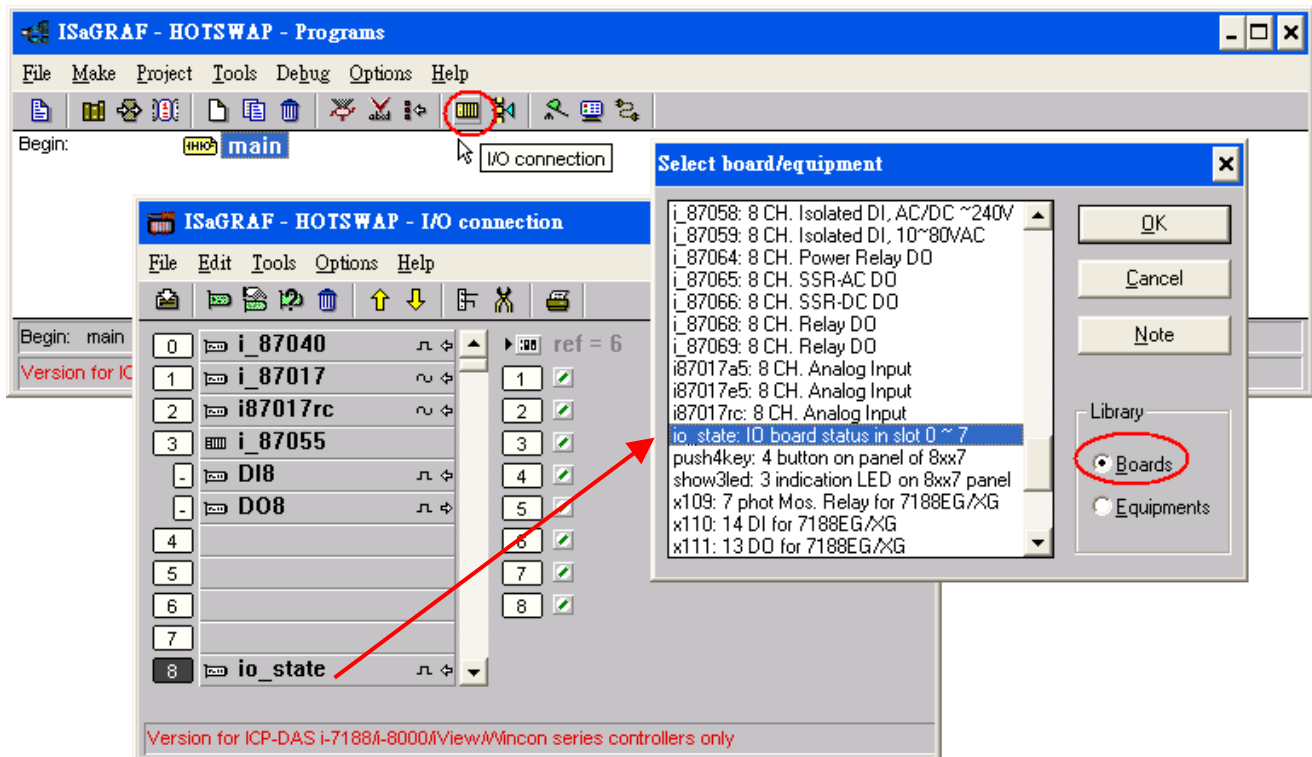
The variant development kits and free charge software utility:

- **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**

## D: How to Detect the Status of "Hot Swap" for I-87K

All I-87K (High Profiles) modules support "Hot Swap" function that means users can plug or unplug modules without shutting down the PAC. In addition, ISaGRAF provides the "io\_state" to view the running status of I/O modules.

First, click the "I/O connection" button to open the window and add the I/O link of used modules on slot 0 to 7. Next, double-click a blank slot (after #7 preferred), click "Boards", and double-click "io\_state" to add the function.



"io\_state" is used to display the operating status of I/O modules on slot 0 to 7. "True" means that the I/O module is functioning. "False" means that there is something wrong or the I/O module is unplugged. See the figure below:

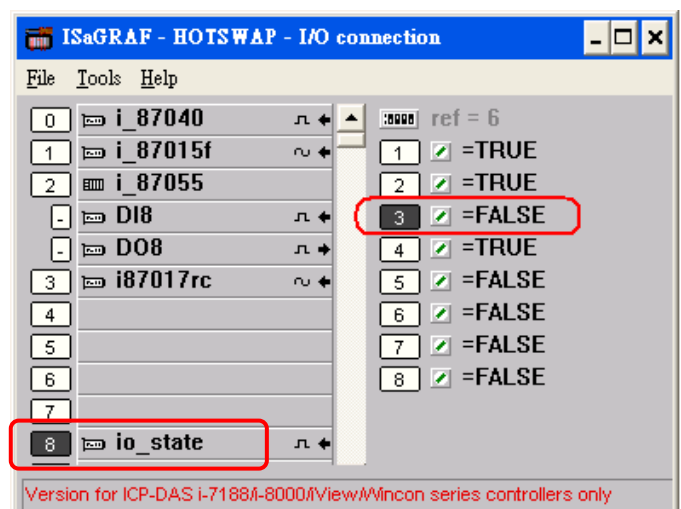
When you plug/unplug the I-87K (High Profile) I/O module, the operating status will be immediately displayed on the PAC panel (S-MMI).

-Sn-: indicates the I/O module is functioning.

n (0 to 7) stands for the slot number 0 to 7.

Sn-Er: indicates the I/O module is nonfunctioning.

n (0 ~ 7) stands for to the slot number 0 to 7.



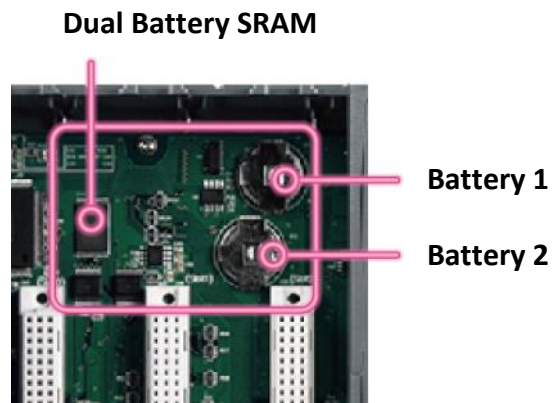
## E: How to Detect the Status of Dual Battery

**Attention: Please power off your iP-8xx7 before replacing the battery; it may cause permanent damage if the battery accidentally touches other metal electronic parts.**

iP-8xx7 equips a 512 KB SRAM with Dual battery design to ensure the persistence of data even in the case of total power loss. Additional S512/256 chip battery backup SRAM is no longer required.

The Dual battery provides 512 KB SRAM with continuous power supply to retain the data stored within up to 5 years; this dual battery design allows for the replacement of one of the batteries without losing power and thus not losing the data stored in the memory.

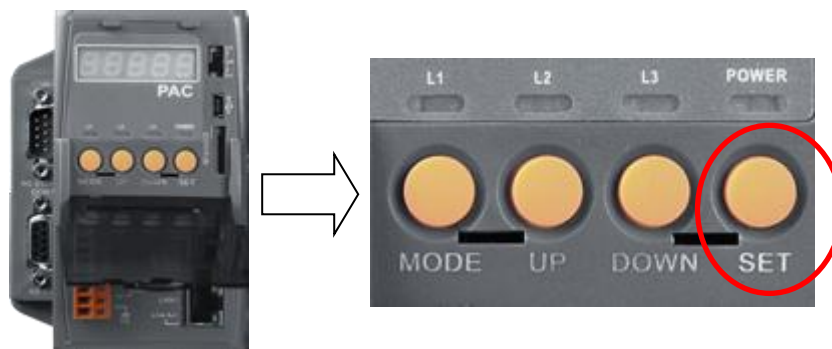
**(Warning: Please do not take out these two batteries at the same time or the data will be lost during this period of non-power.)**



There are two ways to retrieve Dual battery power status on iP-8xx7:

### A. Check the current power status when the system boots up

- 1) Power off the iP-8xx7.
- 2) Press and hold the 4th button (SET) on the PAC panel and then power on the iP-8xx7 (keep on pressing and holding the SET button when you power on your PAC)



S-MMI will display the power status of Battery 1(BA.1) and Battery 2 (BA.2).

"-BA1.-" or "-BA2.-": indicates Full power status;

"BA1.Er" or "BA2.Er": indicates Low power status; please replace the battery as soon as possible.

### B. Query the power status when the system is running

SCADA/HMI can read the Modbus address 9992 and 9993 of the iP-8xx7 to get the battery power status.

Modbus 9992: the power status of Battery 1;

Modbus 9993: the power status of Battery 2.

Status "99": indicates Full power status.

Status "0": indicates Low power status; please replace the battery as soon as possible.