Getting Started: VP-2117

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ICP DAS CO., LTD. would like to congratulate you own your purchase of our ISaGRAF PACs - VP-2117. The ease to integration of the controller system and the power of the IEC 61131-3 ISaGRAF software program combine to make a powerful, yet inexpensive industrial process control system.

ISaGRAF PAC Series of ICP DAS includes :

μPAC:	μPAC-7186EG, μPAC-7186PEG , I-7188EG, I-7188XG,
iPAC:	iP-8447, iP-8847, I-8437-80, I-8837-80, I-8417, I-8817,
WinPAC:	WP-8147, WP-8447, WP-8847 (WinCon: W-8347, W-8747)
ViewPAC:	VP-2117, VP-2xW7

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

ISaGRAF Web Information:

http://www.icpdas.com/products/PAC/i-8000/isagraf.htm or
www.icpdas.com > Products > Software > ISaGRAF

ISaGRAF User's Manual:

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

ISaGRAF (Chinese) User's Manual:

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

Hardware Manual:

Please refer to CD-ROM:
\NAPDOS\vp-2000\document\vp_2111_user_manual_v1.01.pdf
http://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/vp-2000/document/vp_2111_user_manual_v1.01.pdf

Resource on the Internet:

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

Related Products:

- Industrial Ethernet Switch: NS-205/NS-208
  http://www.icpdas.com > Products > Industrial Ethernet Switch > Unmanaged Industrial Ethernet Switch

- RS-232 to RS-422/485 Converter : I-7520R
  http://www.icpdas.com > Products > Industrial Communcation > Converter & Repeater

- Power Supply : DP-665/660, KA-52F
  http://www.icpdas.com > Products > Accessories > Power_Supply

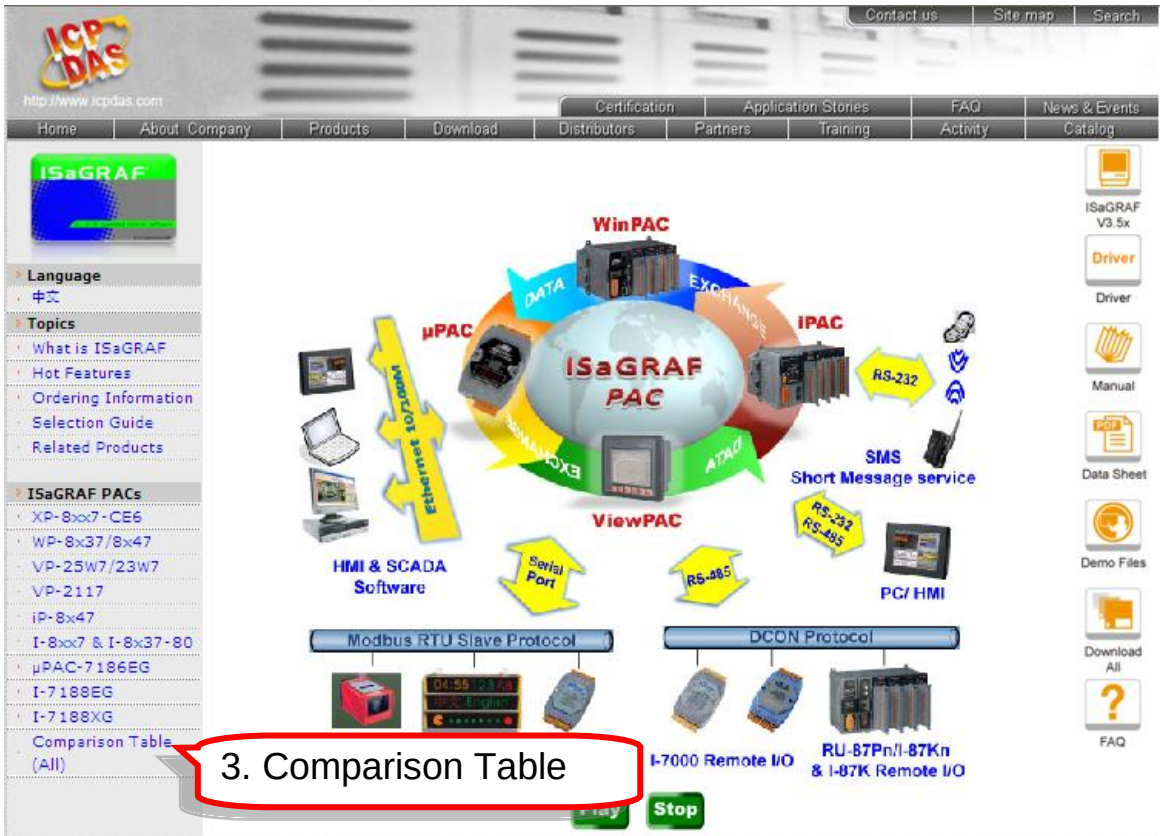
- High profile I-8K/87K Series I/O Modules
  http://www.icpdas.com/products/PAC/i-8000/io_support_list.htm

FAQ:

Please visit www.icpdas.com ➔ FAQ ➔ Software ➔ ISaGRAF for Frequently Asked Question, or visit http://www.icpdas.com/faq/isagraf.htm

Performance Comparison Table of ISaGRAF PACs

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



Specifications: VP-2117

■ System Software	
OS	MiniOS7 (DOS-like embedded operating system)
■ Development Software	
ISaGRAF Version 3	IEC 61131-3 standard. Languages: LD, ST, FBD, SFC, IL & FC
Max. Code Size	Accepts max. 64 KB ISaGRAF code size (Appli.x8m must < 64 KB)
■ Power Supply	
Power Input	+10 ~ +30 V_{DC}
Isolated	1 kV
Redundant Power Inputs	Yes, with one power relay (1 A @ 24 V_{DC}) for alarm
Capacity	3A, 5V supply to I/O expansion slots
Consumption	6 W (0.25 A @ 24 V)
■ General Environment	
Temperature	Operating: -15 ~ +55 °C Storage : -30 ~ +80 °C
Humidity	10 ~ 90 % RH (non-condensing)
■ System	
CPU	80186 (80 MHz and 16-bit) or compatible
SRAM	**768** KB
Dual Battery Backup SRAM	512 KB (for 5 years data retention), support up to 1024 retain variables
Flash	512 KB (100,000 erase/write cycles)
Flash Disk	64 MB NAND Flash (100,000 erase/write cycles)
NVRAM	31 bytes (battery backup, data valid up to 5 year)
EEPROM	16 KB (data retention > 40 years ; 1,000,000 erase/write cycles)
Watchdog Timer	Yes, Default=0.8s
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year
Serial Number	64-bit hardware serial (The user can add a check mechanism to protect program);
■ Communication Interface	
Ethernet	RJ-45*1, 10/100 Base-TX, (Auto-negotiating, LED indicators), program download port.
COM0	Internal communication with the I-87K High Profile modules in slot 0 ~ 2.
COM1	RS-232: TxD, RxD, GND, Speed: 115200 bps max. Program downloads port.
COM2	RS-485: D+, D- ; Speed: 115200 bps max. 2500 V_{DC} isolated.
COM3	RS-232/RS-485, RS-232:TxD,RxD,GND,CTS,RTS ; RS-485:DATA+,DATA-,

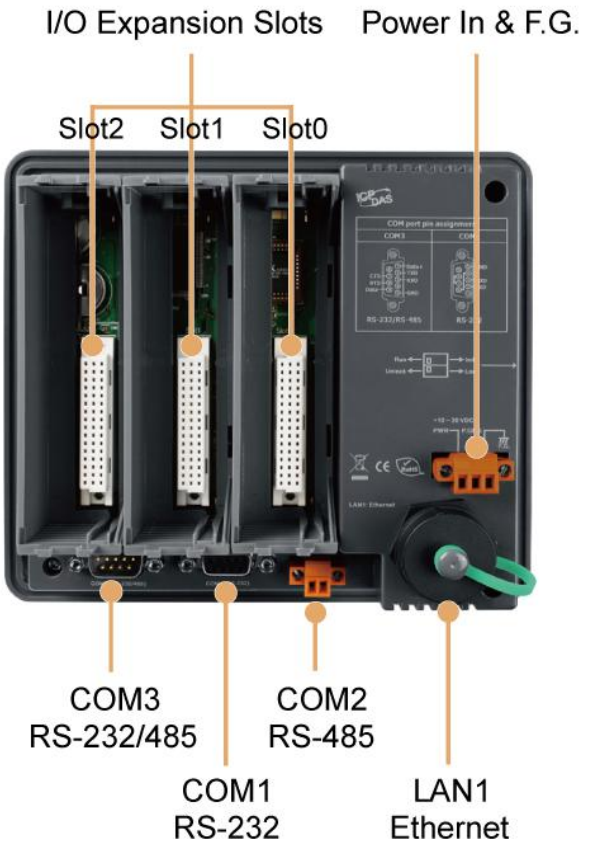
	Speed: 115200 bps max. Program downloads port.
■ I/O Expansion Slots	
Slots Number	3 (For High Profile I-8K and I-87K Modules only)
Hot Swap	Yes (For High Profile I-87K Modules Only)
Data Bus	8/16 Bits
Address Bus Range	2 K for each slot
■ MMI (Man Machine Interface)	
LCD Type and Size	STN, 128x64 Dot Matrix LCD
Text Font	English + Simplified Chinese (VP-2117) or English + Traditional Chinese (VP-2117-TC)
Display Mode	Text + Graphics
Rubber Keypad	24 keys
Buzzer	Yes
LED Indicators	3 Dual-Color LEDs (PWR, RUN, LAN1, L1, L2, L3; L1~L3 for User Programmable)
■ Mechanical	
Dimensions (W x L x H)	182 mm x 158 mm x 125 mm
Ingress Protection	Front panel: IP65
■ Motion Control	
one I-8091W (2-axis) or two I-8091W (4-axis) to do motion control. Ethernet communication is also available when doing motion control.	
■ PWM Output	
High Speed PWM Module	I-8088W: 8-ch PWM outputs, software support 1 Hz ~ 100 KHz (non-continuous), duty: 0.1 ~ 99.9%
DO Module as PWM	8-ch max. for one controller. 500 Hz max. for Off=1 & On=1 ms Output square wave: Off: 1 ~ 32767 ms, On: 1 ~ 32767 ms. Optional DO boards: I-8037W, 8041W, 8041AW, 8042W, 8050W, 8054W, 8055W, 8056W, 8057W, 8060W, 8063W, 8064W, 8068W, 8069W (Relay Output boards can not generate fast square pulse)
■ Counters , Encoder, Frequency	
Parallel DI Counter	8-ch max. for 1 controller. Counter Val: 32-bit. 500 Hz max. Min. ON & OFF width must >1ms. Optional DI boards: I-8040W, 8040PW, 8042W, 8050W, 8051W, 8052W, 8053W, 8053PW, 8054W, 8055W, 8058W, 8063W.
Serial DI Counter	Counter input: 100 Hz max. Counter value: 0 ~ 65535 (16-bit) Optional serial I-87K DI boards: I-87040W, 87046W, 87051W, 87052W, 87053W, 87053W-A5, 87054W, 87055W, 87058W, 87059W, 87063W
Remote DI Counter	All I-7000 & I-87K DI modules support counters. 100 Hz max. value: 0 ~ 65535
High Speed Counter	I-87082W: 100 kHz max. 32-bit, I-8084W: 250 kHz max. 32-bit
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-8084W: 8-ch, 1 Hz ~ 250 kHz;
■ Protocols	
Modbus Master Protocol	Up to **2** COM Ports ; COM1 ~ 3 & (COM5 in multi serial port board) can support Modbus RTU Master or ASCII Master protocol to connect to other Modbus Slave devices, 2 ports support up to 128 Modbus_xxx function blocks (same type).
Modbus Slave Protocol	Up to 2 COM Ports, COM1 and one of (COM2, COM3) can support Modbus RTU Slave protocol for connecting ISaGRAF, PC/HMI/OPC Server & MMI panels.
Modbus TCP/IP Protocol	Support Modbus TCP/IP Slave protocol for connecting ISaGRAF & PC/HMI. (Max. 6 connections)
Remote I/O	One of COM2, 3 supports I-7000 I/O modules & (I-87K base or RU-87P1/2/4/8) + I-87K High Profile I/O cards as Remote I/O. Max. 64 Remote I/O module for one controller
Fbus	Built-in COM3 Port to exchange data between ICP DAS's ISaGRAF PACs.
Ebus	To exchange data between ICP DAS's ISaGRAF Ethernet PACs via Ethernet Port.
SMS: Short Message Service	One of COM3 or (COM5 in multi serial port board) can link to a GSM Modem to support SMS. User can request data/ control the controller by cellular phone. The controller can also send data & alarms to user's cellular phone. Optional GSM Modem: GTM-201-RS232 (850/900/1800/1900 GSM/GPRS External Modem) or visit to http://www.icpdas.com/products/GSM_GPRS/wireless/GSM_GPRS_modem.htm for recommended GSM/GPRS Modem
User Defined Protocol	User can write his own protocol applied at COM1 ~ COM3 (& COM5 ~ COM16 if multi-serial port boards are plugged) by serial communication function blocks.
CAN/CANopen	Up to 3 COM Port. User can use its COM1, 3, or (COM5 ~ COM12, resides at the I-8112iW/8114W/8114iW RS-232 expansion board) to connect one I-7530 (RS-232 to CAN converter) to support CAN/CANopen devices and sensors. One VP-2117 supports max. 3 RS-232 Ports to connect max. 3 I-7530. Please refer to www.icpdas.com > FAQ > Software > ISaGRAF Ver.3 (English) > FAQ-086.
FRnet I/O	Support max. 3 I-8172W FRnet Master cards to connect FRnet I/O modules. (max. 768-ch D/I + 768-ch D/O)
Sending E-Mail	Actively or passively sending E-mail via Ethernet Port through internet. Max. 10 receivers for each sending and can send E-mail with an attached file (Max. file size is about 488 KB).

Chapter 1 Typical Application

1.1 Appearance

VP-2117 is the ISaGRAF PAC with graphic display and keypad.



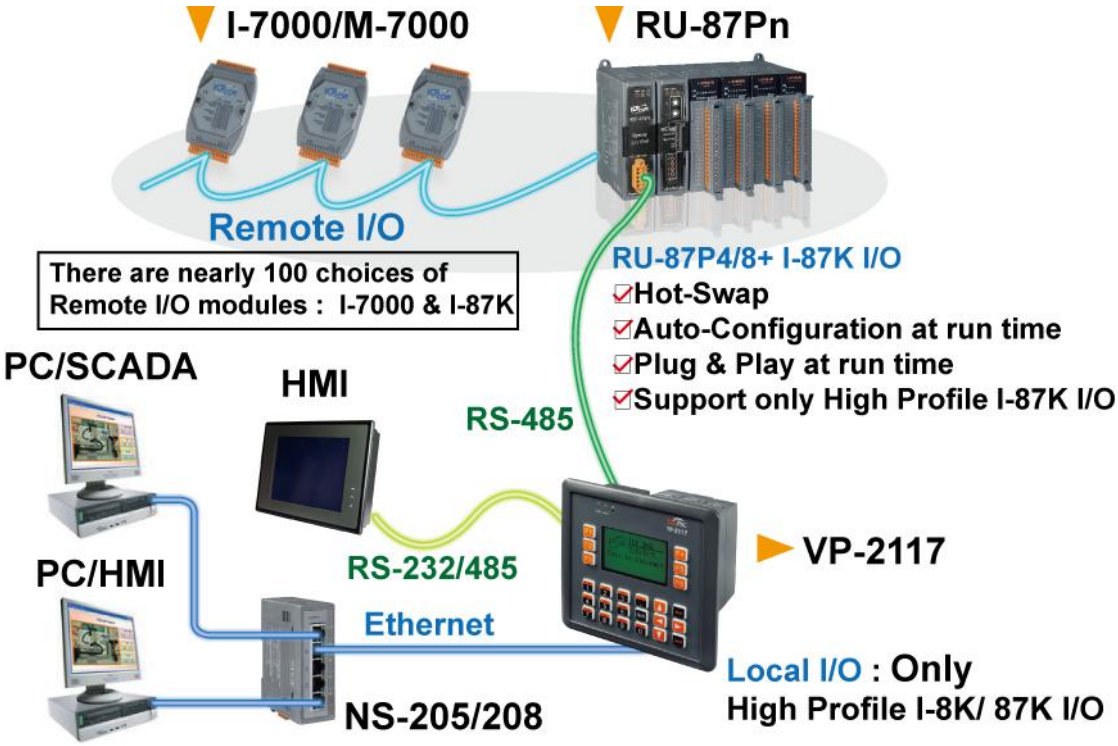
Features:

- 80186, 80 MHz CPU (16 bits)
- Large SRAM: 768 KB
- 512 KB FLASH Memory
- 64 MB NAND Flash for Data Storage
- Dual Battery Backup SRAM (512 KB)
- Hot-Swap High Profile I-87K I/O Ability
- 64-bit Hardware Serial Number for Software Protection
- IP65 Compliant Front Panel
- MMI (Man Machine Interface)
  - STN, 128 x 64 Dot Matrix LCD
  - English + Simplified Chinese or English + Traditional Chinese Fonts
  - Text and Graphics Display Mode
  - Rubber Keypad with 24 Keys
  - Buzzer : Yes
  - 3 Dual-Color LED Indicators (PWR, RUN, LAN1, L1, L2, L3; L1 ~ L3 for User Programmable)

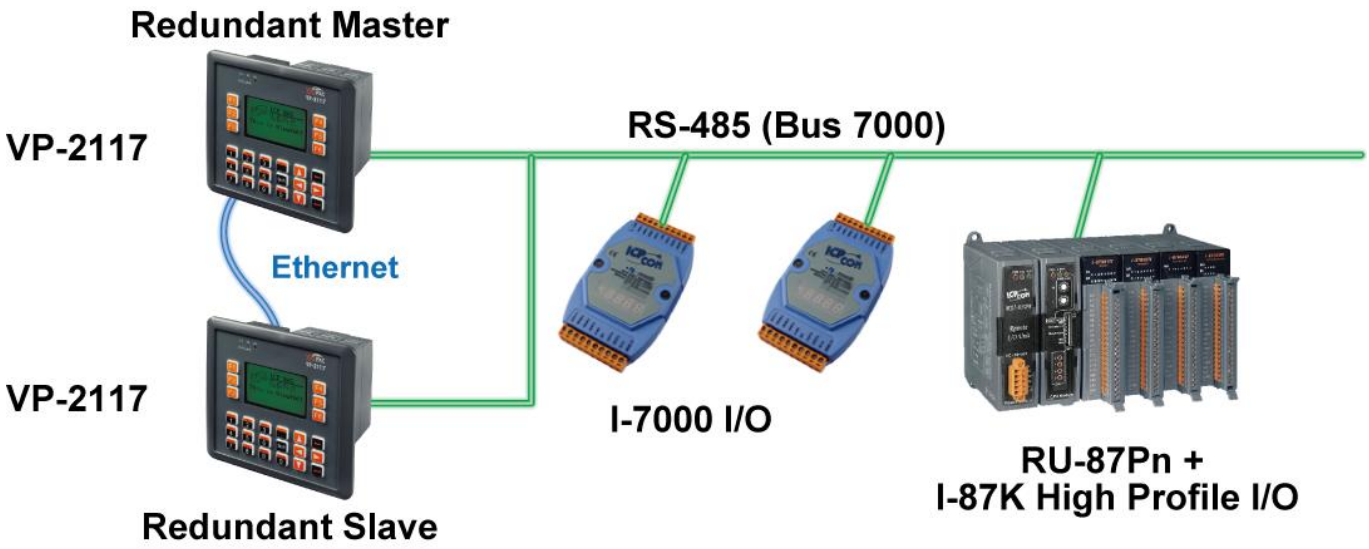
Note: VP-2117 only support I-8K, I-87K High Profile I/O modules plugged on slot 0 ~ 2.

1.2 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 VP-2117.

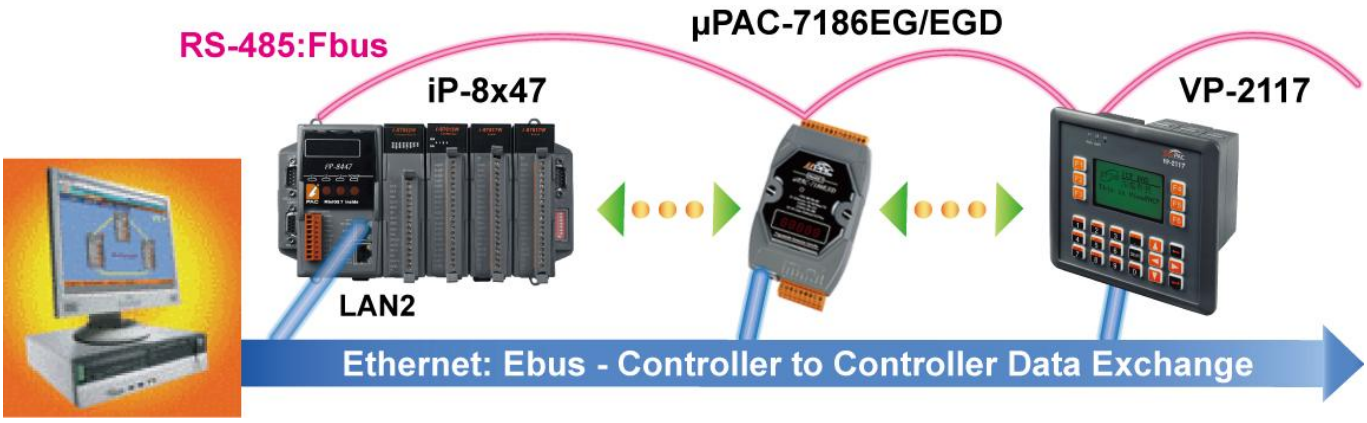


1.3 Redundant Bus7000



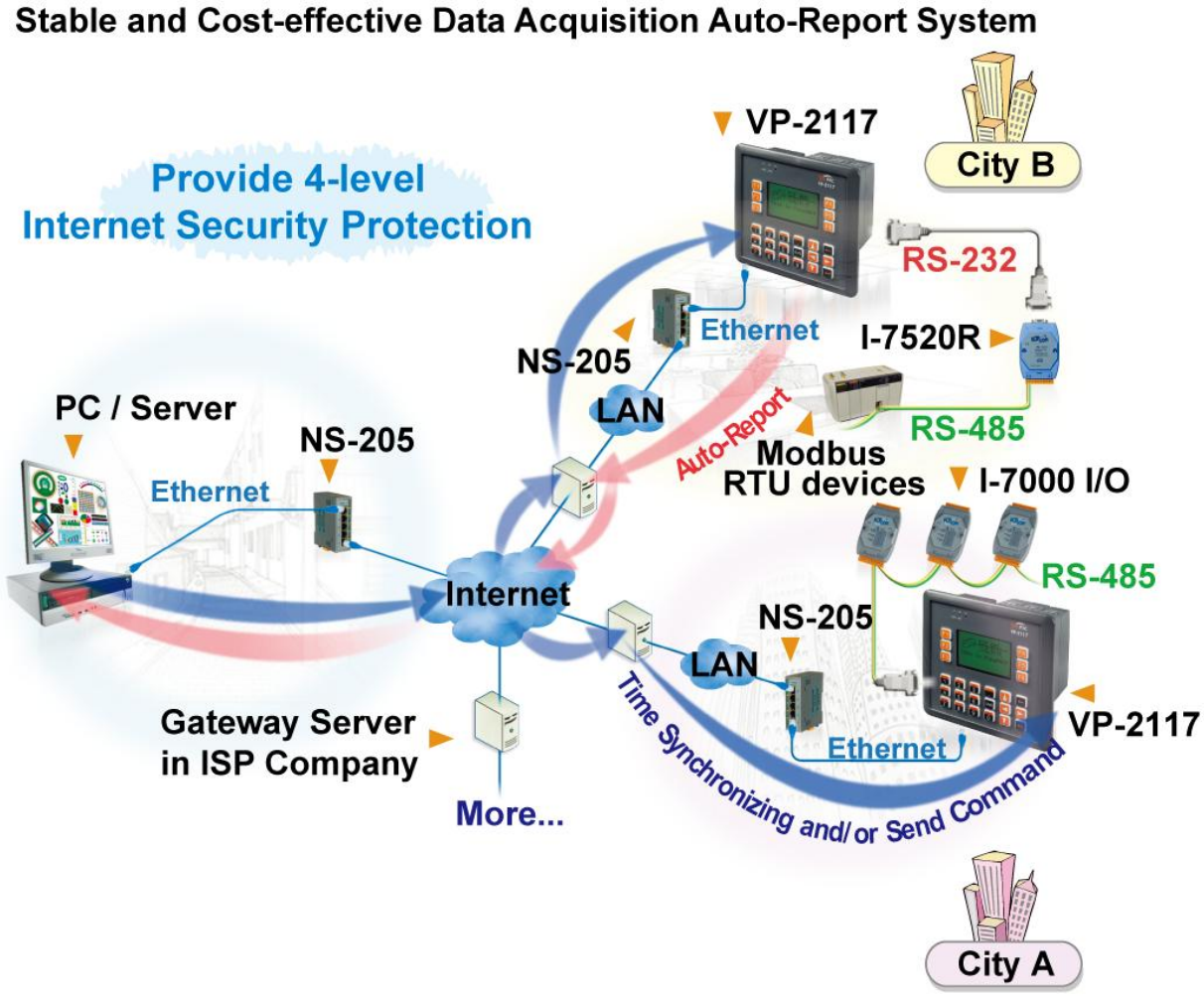
1.4 Data Exchange through Ethernet & RS-485

VP-2117 can support Ebus (Ethernet) and Fbus (RS-485)



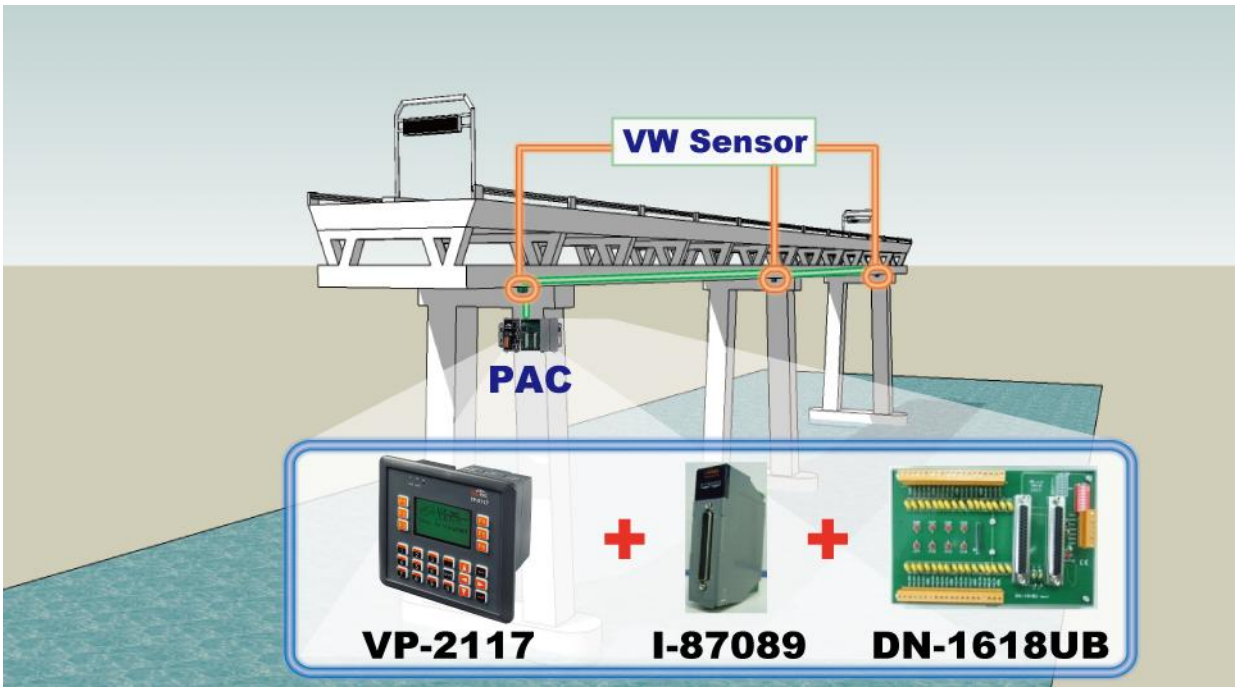
1.5 Active Control Data and I/O Acquisition Data Reporting System

For more information, please refer to [www.icpdas.com > FAQ > Software > ISaGRAF Ver.3 (English)](www.icpdas.com) > FAQ-065



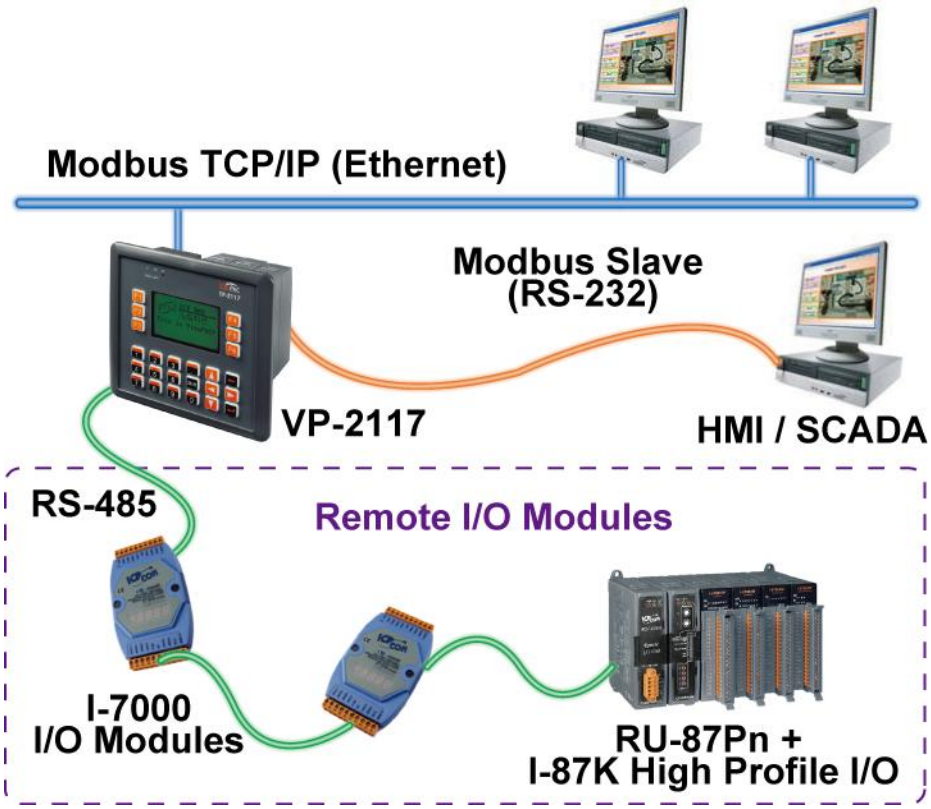
1.6 Constructions Monitoring Application (VW Sensor)

For more information, please refer to [www.icpdas.com > FAQ > Software > ISaGRAF Ver.3 (English)](www.icpdas.com) > FAQ-091



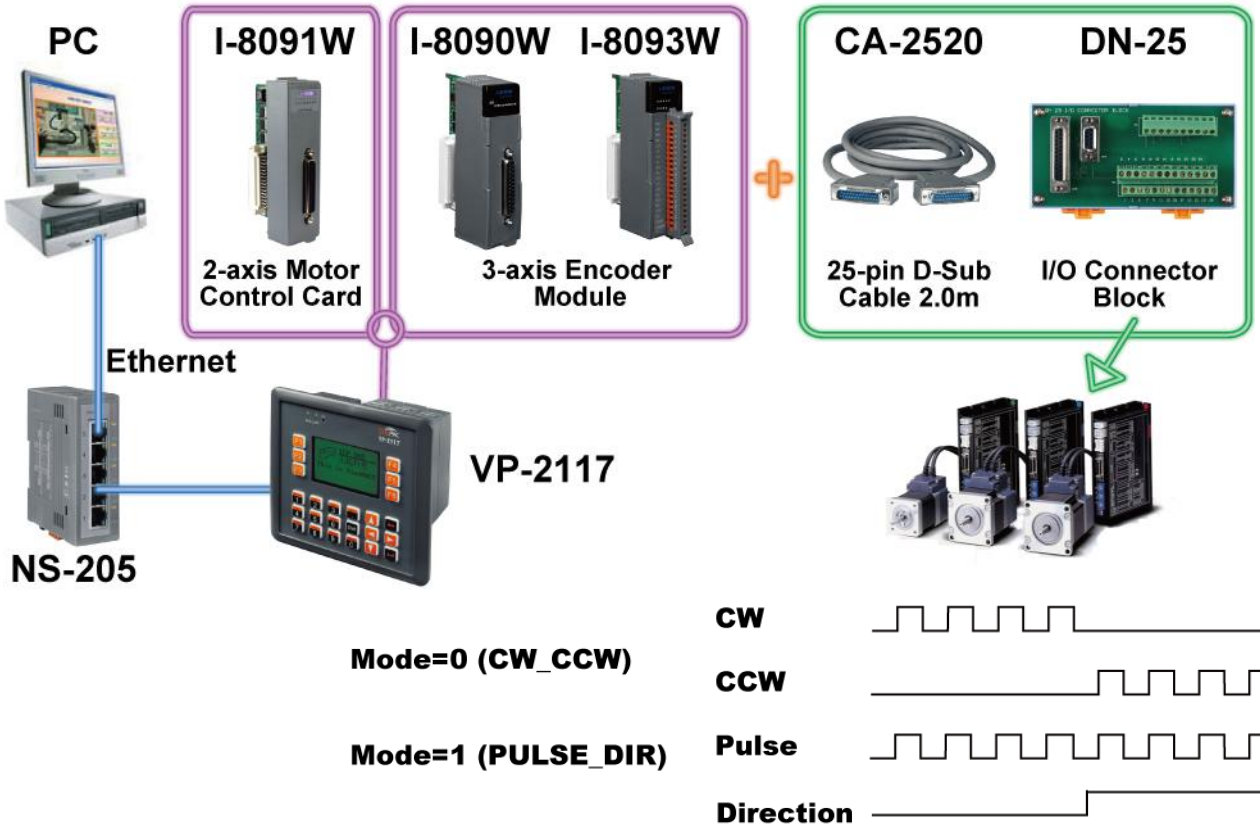
1.7 Modbus Converter of I-7000 & I-87K I/O

VP-2117 can be a Modbus RTU serial & TCP/IP converter of I-7000 & I-87K Remote I/O modules.



1.8 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

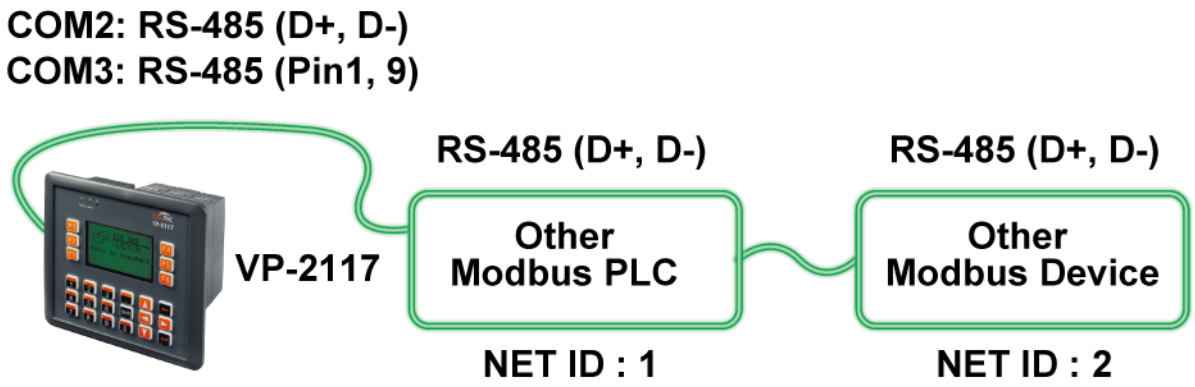


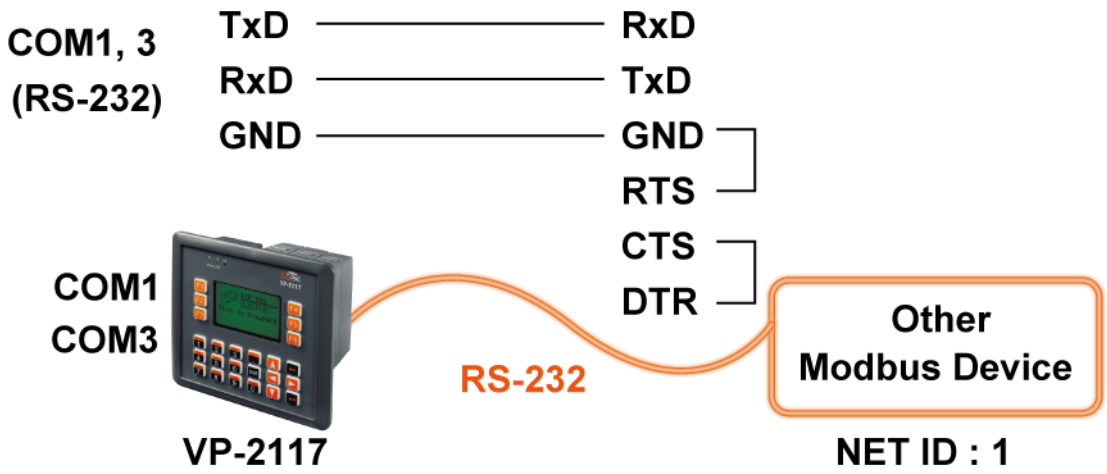
1.9 SMS: Short Message Service

VP-2117 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.

1.10 Modbus Master

Up to **2** COM Ports (COM1: RS-232, COM2: RS-485, COM3: RS-232/485 and COM5 in multi serial port board) can support Modbus RTU Master or ASCII Master Protocol to connect to other Modbus Slave devices.



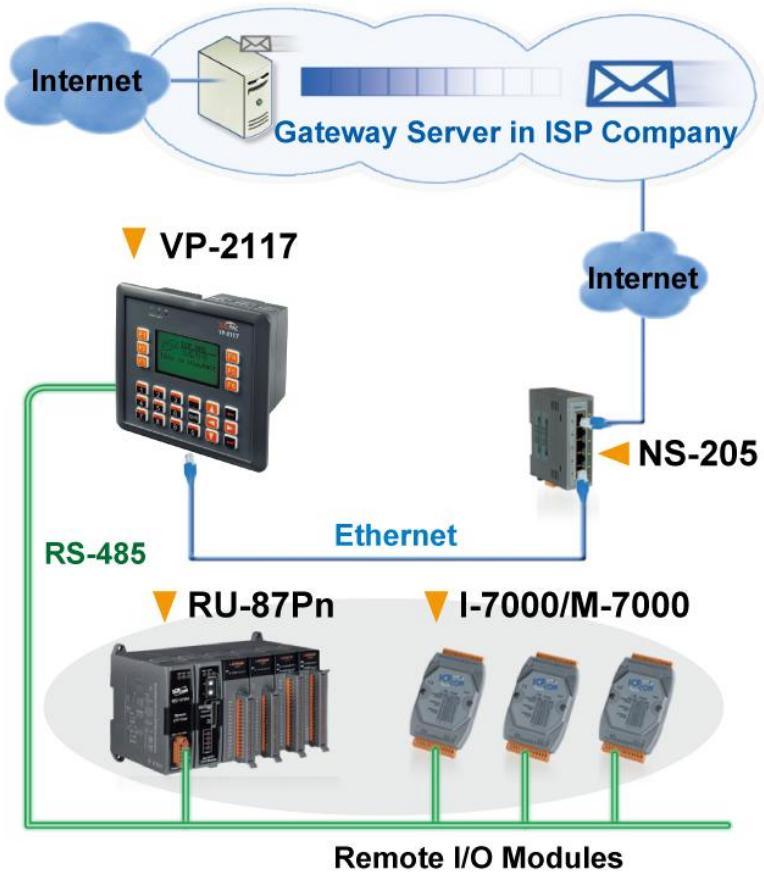


NOTE:

When the I-8112iW/8114W/8114iW/8142iW/8144iW expansion board plugged, COM5 ~ COM16 will be added.
http://www.icpdas.com/products/PAC/i-8000/8000_IO_modules.htm

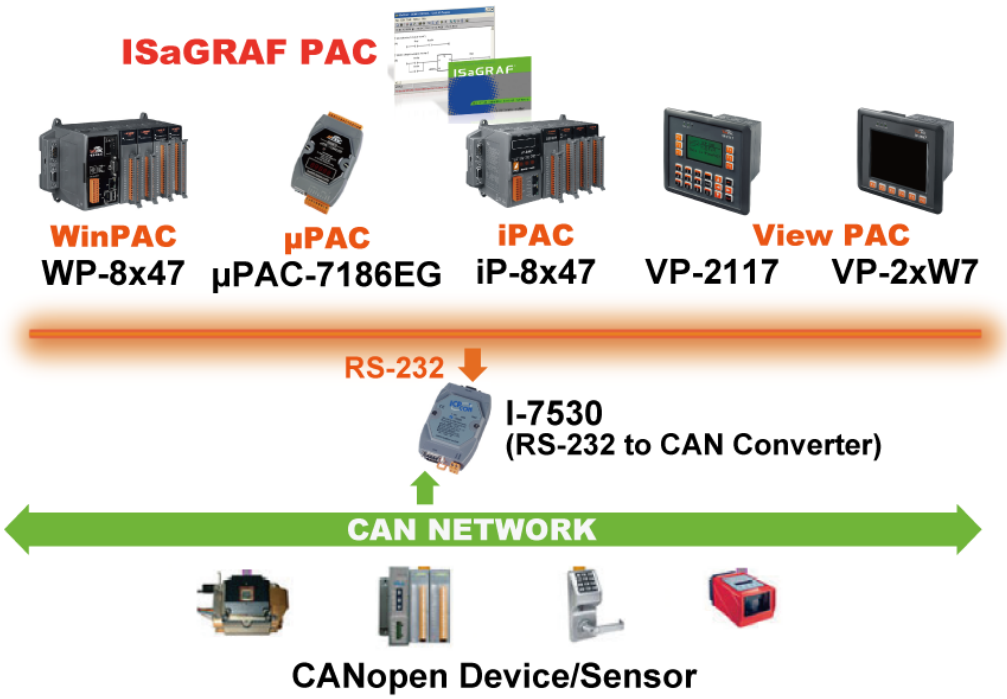
1.11 Send Email with One Attached File

For more information, please refer to [www.icpdas.com > FAQ > Software > ISaGRAF Ver.3 (English)](www.icpdas.com) > FAQ-067



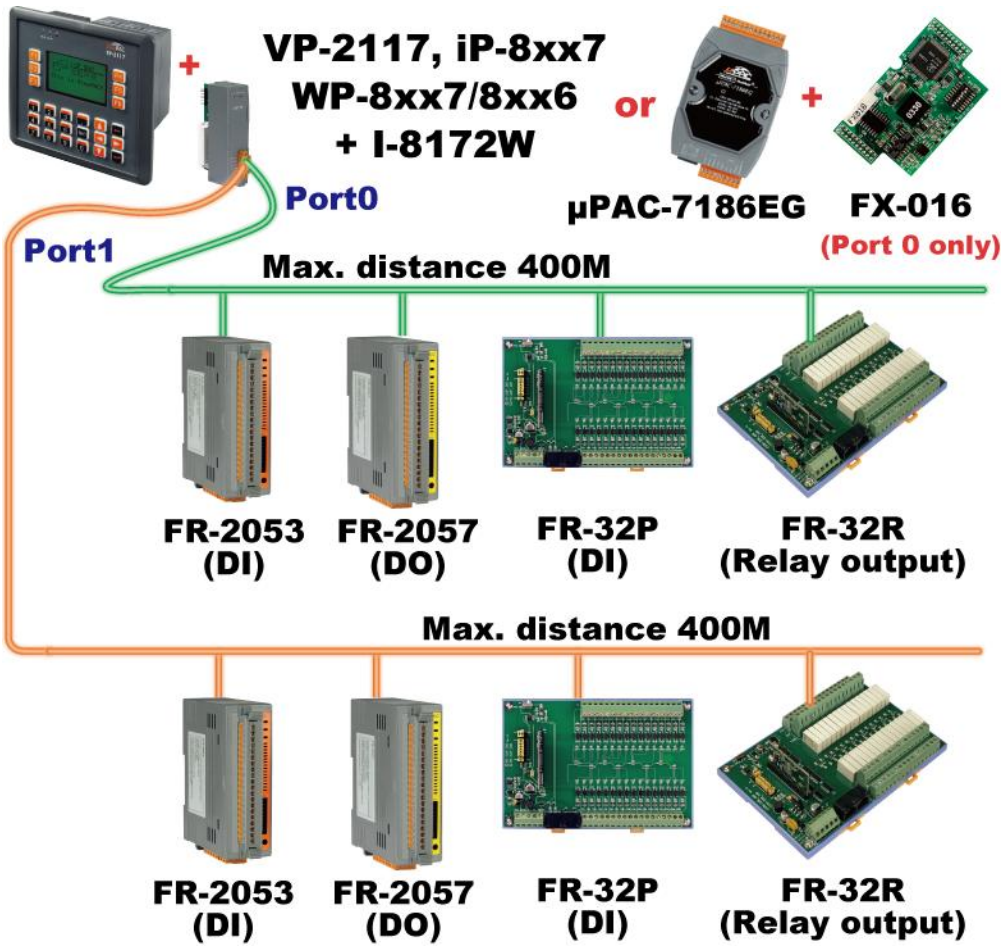
1.12 Integrate with CAN/CANopen Devices and Sensors

For more information, please refer to [www.icpdas.com > FAQ > Software > ISaGRAF Ver.3 (English)](www.icpdas.com) > FAQ-086



1.13 Fast FRnet Remote I/O

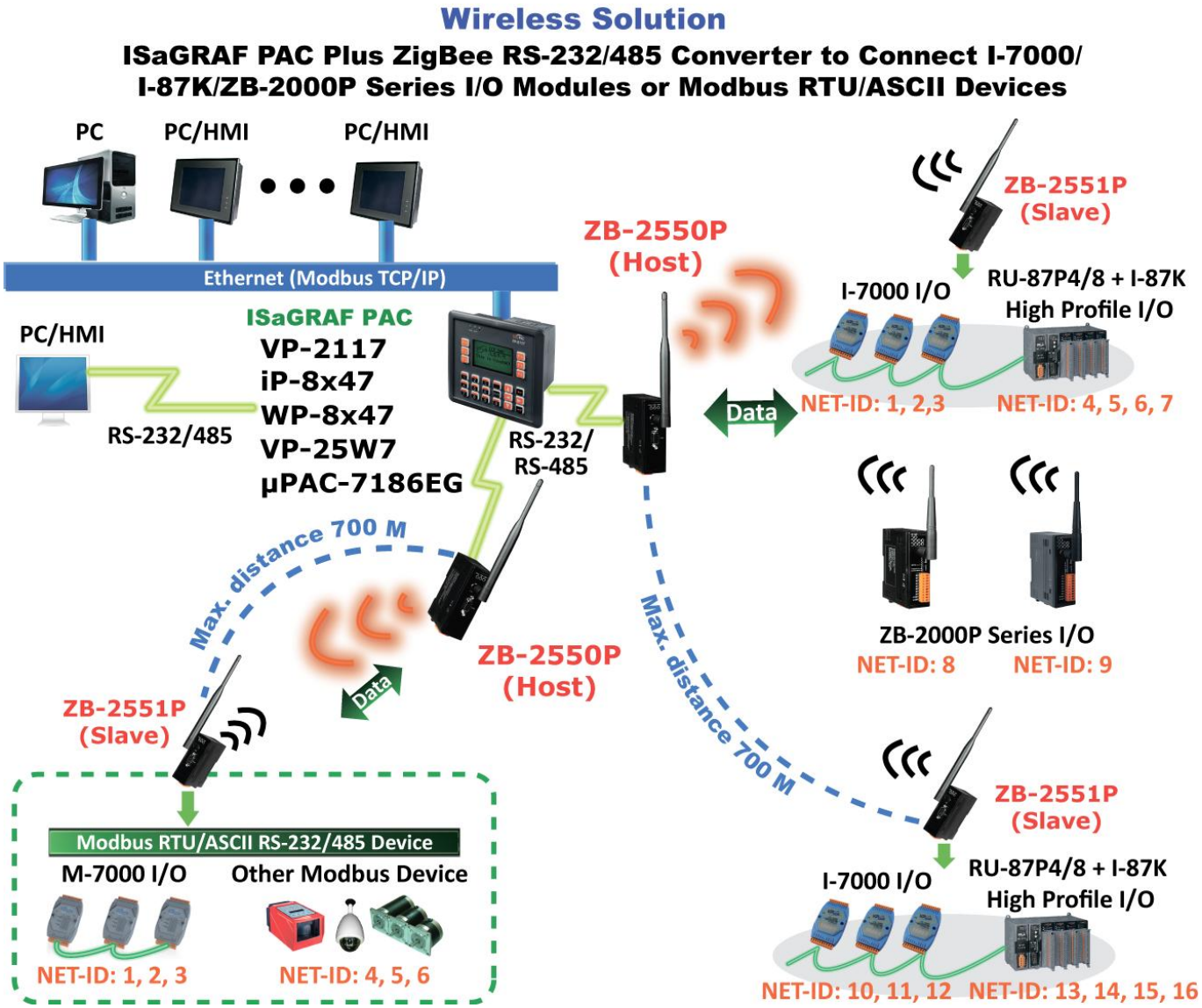
For more information, please refer to [www.icpdas.com > FAQ > Software > ISaGRAF Ver.3 (English)](www.icpdas.com) > FAQ-082



1.14 ZigBee Wireless Solution

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

For more information, please refer to [www.icpdas.com > FAQ > Software > ISaGRAF Ver.3 (English)](www.icpdas.com) > FAQ-110



Chapter 2 Installing Software

2.1 Step 1 - Installing the ISaGRAF Software

The user needs to install the following two kinds of software before he can program the VP-2117 controller system. They are

A. ISaGRAF Workbench
B. ICP DAS Utilities for ISaGRAF

User has to purchase at least one pcs. of ISaGRAF Workbench (Ver. 3.4x or Ver. 3.5x ISaGRAF-256-E or ISaGRAF-256-C or ISaGRAF-32-E or ISaGRAF-32-C) to install on his PC to edit, download, monitor & debug the controller system. Item (B) is free and it is burned inside the CD-ROM which is delivered with the VP-2117.

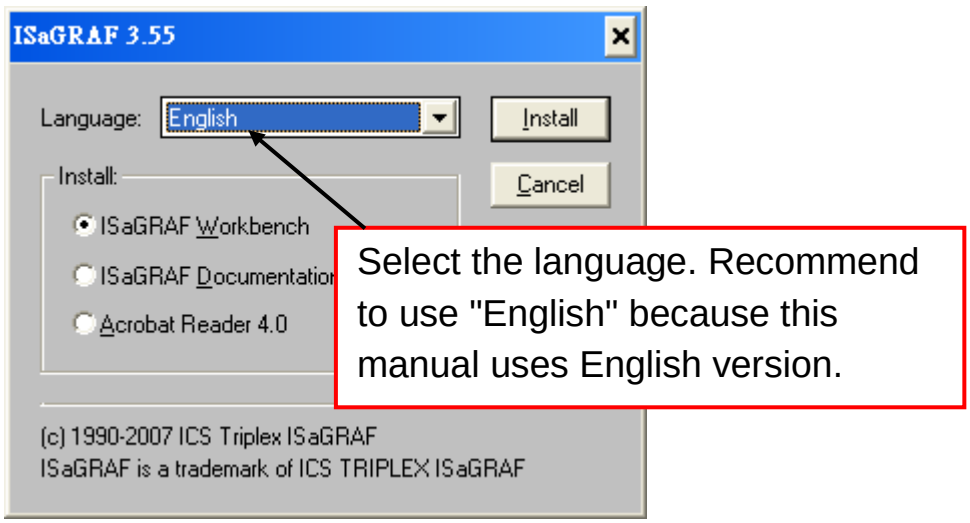
Operating system Requirements:

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

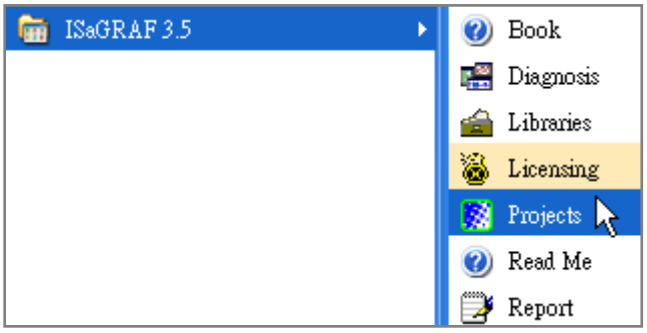
- Windows 95 / Windows 98 / Windows 2000
- Windows NT Version 3.51 or Windows NT Version 4.0
- Windows XP or Vista or Windows 7 (Please refer to www.icpdas.com > FAQ > Software >ISaGRAF Ver.3 > FAQ117)

Steps to Installing the ISaGRAF Workbench:

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

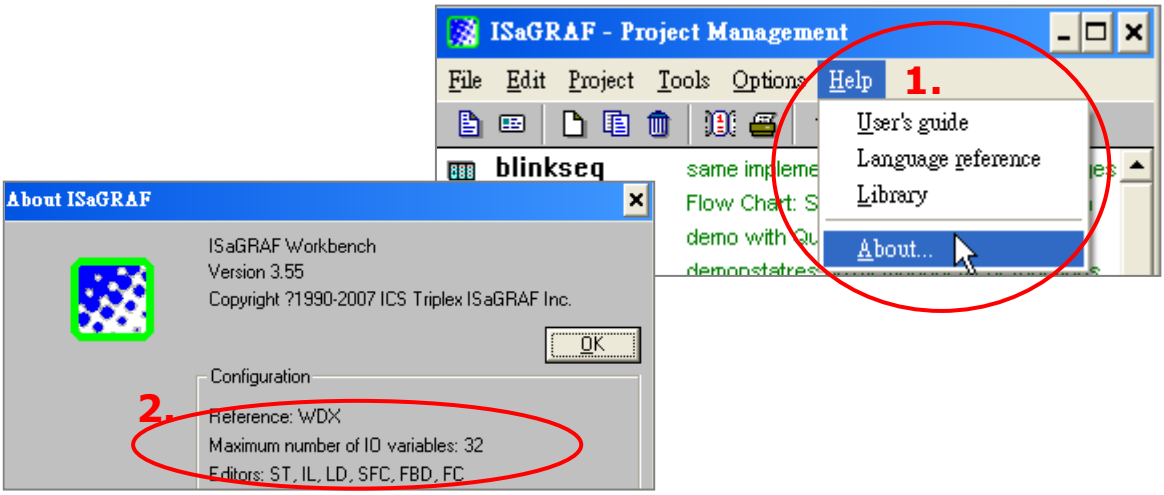


To begin the ISaGRAF 3.x software program, click on the Windows “Start” button, then on “Programs”, and you should see the ISaGRAF program group as illustrated below. You could click “Projects” to start the program.



2.1.1 The hardware protection device (dongle & USB Key-Pro)

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



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

Dongle Protection:

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

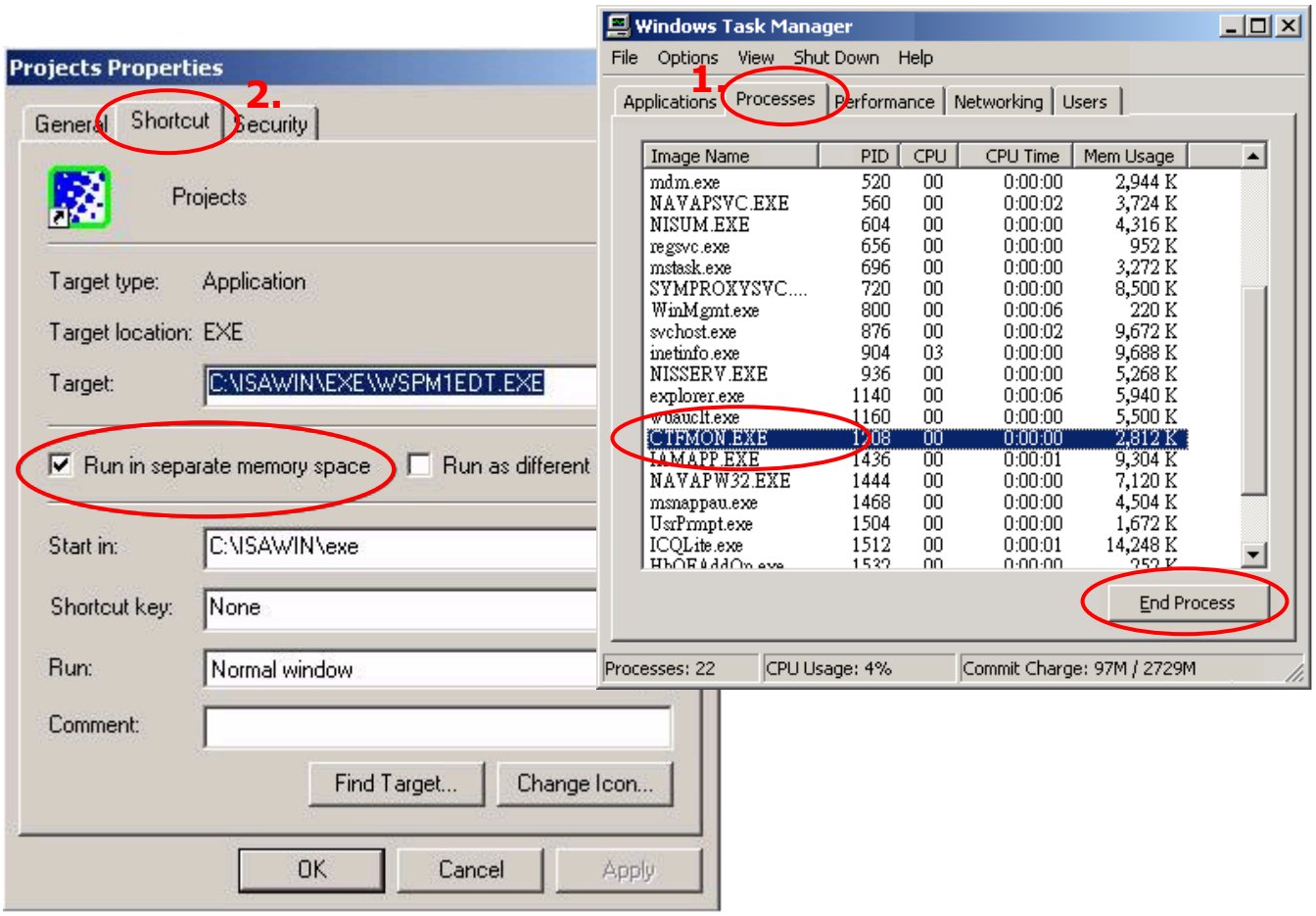
USB Key-Pro Protection:

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

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

2.1.2 Important Notice for Window 2000 Users:

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



2.1.3 Important Notice for Window NT Users

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

C:\ISAWIN\EXE\isa.ini

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

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

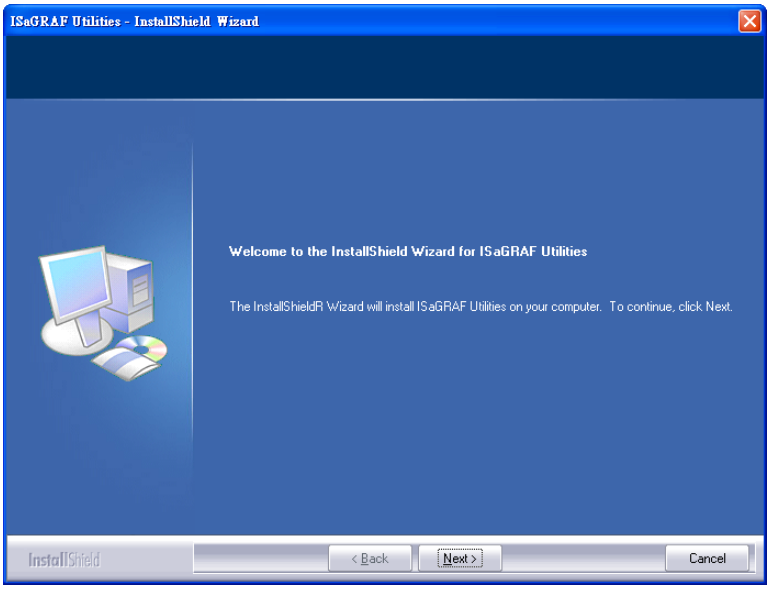
2.2 Step 2 - Installing the ICP DAS Utilities for ISaGRAF

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

- I/O libraries
  For VP-2117, iP-8x47, I-8xx7, I-7188EG/XG, µPAC-7186, W-8xx7
- Modem_Link utility
- Auto-scan I/O utility

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

There is a CD-ROM supplied with each of the VP-2117 PACs with the “ICP DAS Utilities for ISaGRAF”. Please insert the CD-ROM into your CD-ROM drive. Then run CD-ROM: \napdos\isagraf\setup.exe. Follow the steps to install it.



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

Chapter 3 Hardware System & Setting

3.1 Setting the NET-ID for the VP-2117

For the normal operation, the VP-2117 must have a unique NET-ID.

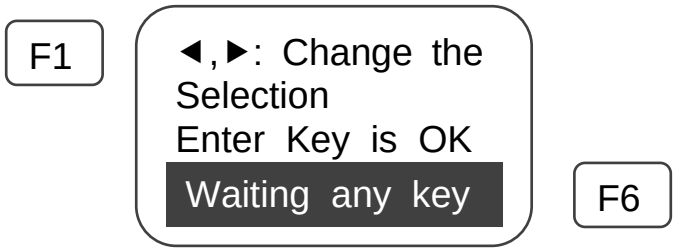
Default setting → NET-ID=01

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

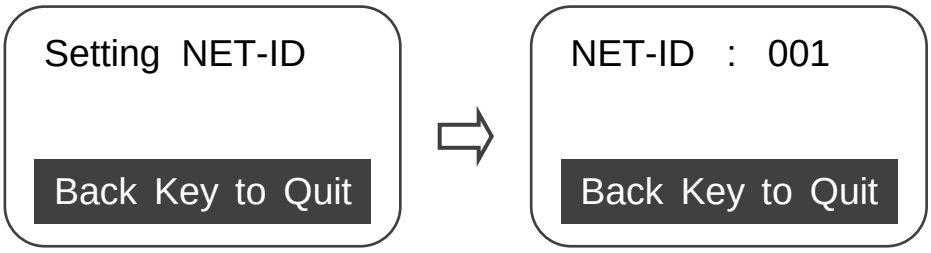
★ The NET-ID of every Main Control Unit in the same network must be unique (different from each other).

◄ ► : Change the selection ↵ : Confirm ← : Cancel

① First, power off the VP-2117 PAC, then press and hold on the F1 and F6 button and then power it up. In the setup mode, you will see "◄,►: Change the Selection" and "Enter Key is OK".



② Press the ◄ or ► button to switch to the "Setting NET-ID" screen and then press ↵ to enter the setup screen.

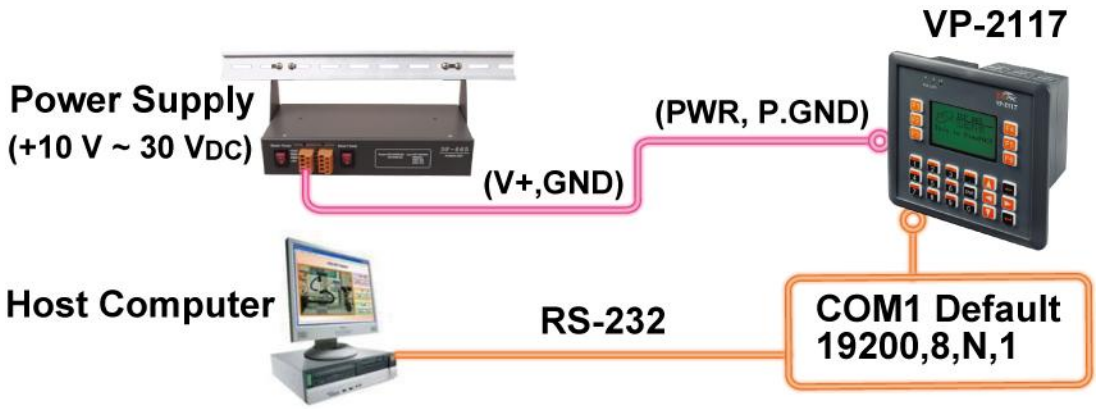


③ At first, the screen shows NET-ID = 001, you can press ◄ to change to the maximum 255. In general, you can press ► to increase or press ◄ to decrease the ID number then press ↵ to save the setting.

④ After complete the setting, please press ← to quit the setup mode.

3.2 Connecting PC to the VP-2117's COM1

When you receive your VP-2117 PAC, there is one RS-232 communication cable (CA-0915) provided with the system. The cable is used to connect your PC to the VP-2117 or to an I-7520R (RS-232/485 converter) that can be purchased from ICP DAS.



The default value of VP-2117's communication parameters are 19200 baud rate, 8 data bits, no stop bits, and one parity bit ("19200, 8, N, 1"). The RS-232 pin assignment is defined as follows:

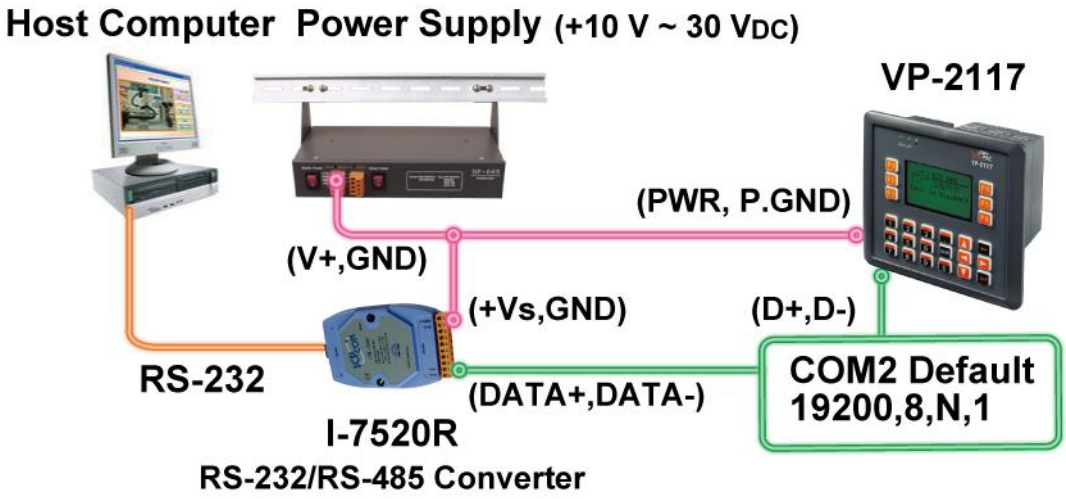
PC 9-Pin D-Sub		VP-2117 COM1
RxD	———	TxD
TxD	———	RxD
GND	———	GND

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

PC 9-Pin D-Sub		VP-2117 COM1
RxD 2	———	TxD
TxD 3	———	RxD
GND 5	———	GND
DTR 4 ⌐		
DSR 6 ⌐		
RTS 7 ⌐		
CTS 8 ⌐		

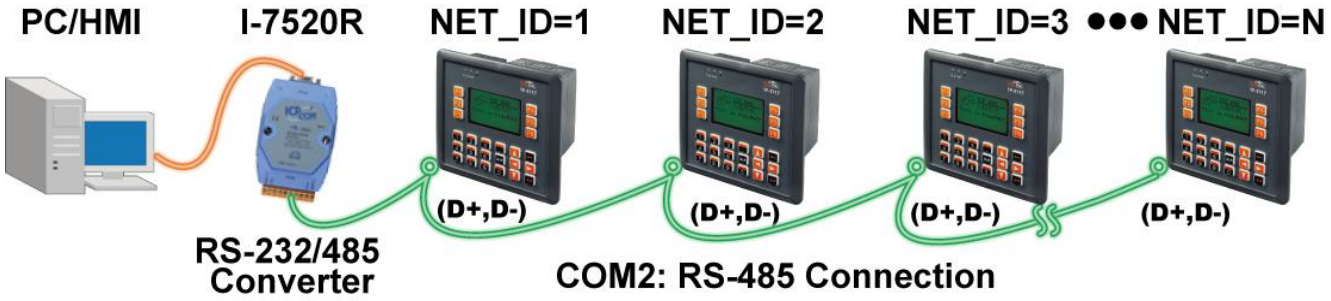
3.3 Connecting PC to VP-2117's COM2

If your PC is connecting to a VP-2117 COM2 Port (RS-485), the maximum distance between the I-7520R (the RS-232/RS-485 converter) and the VP-2117 PAC is up to 1,200 meters (4,000 feet). The distance between these two is dependent on the baud rate; the rule to follow is the lower you set the baud rate, the longer the distance can be.



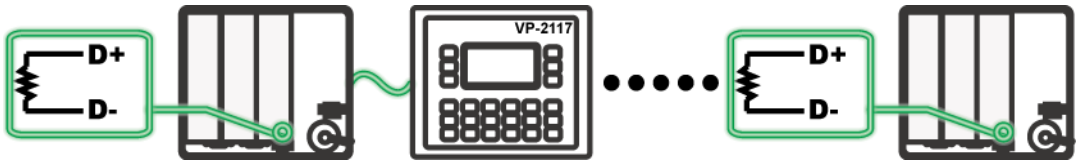
3.4 Connecting PC to Several VP-2117's COM2

An additional feature of using the COM2 Port of the VP-2117 is that you can configure an RS-485 network from one PC to link to numerous VP-2117 PACs. The PC can download ISaGRAF applications to each PAC on the RS-485 network. The maximum number of PACs that can be networked via the RS-485 network is 255 (Not recommended to use so many).



To create an RS-485 network you must first insure that each VP-2117 PAC has a unique NET-ID address, and each of the COM2 on PACs link the "D+" to the "D+" signal and the "D-" to the "D-" signal.

It is recommended to add two terminal resistors (try 220Ω, then 110Ω, and then 330Ω if the RS-485 communication is not stable) on the nearest VP-2117 and farthest VP-2117 for long distance RS-485 connection.



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

In this section, you can setup the baud rate of COM1/2/3. When you choose one of the baud rates that is mean this COM Port is a Slave Port. You can also setup the COM1/2/3 as non-Modbus Slave Port from control panel.

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

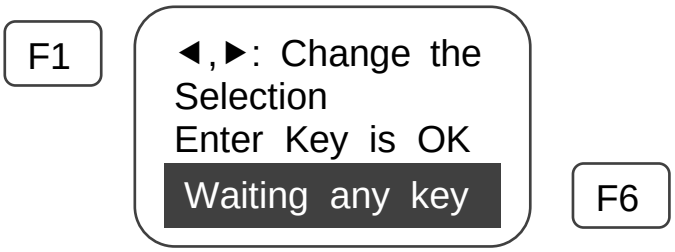
COM1 (RS-232) and **One of the COM2 (RS-485),**
COM3 (RS-485/RS-232, Default: Non- Modbus Slave Port)

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

◀ ▶ : Change the selection ↵ : Confirm ← : Cancel

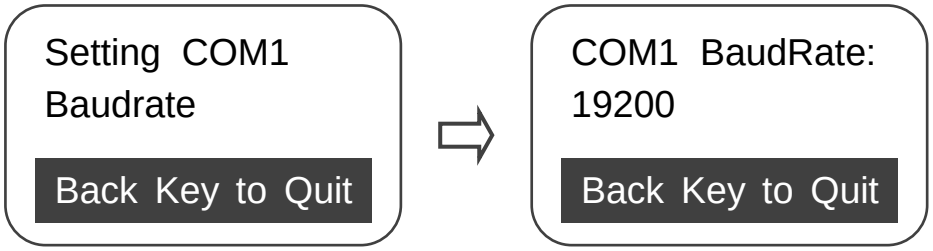
Setup COM1/COM2/COM3's baud rate & Non-Modbus Slave Port :

① First, power off the VP-2117 PAC, then press and hold on the F1 and F6 button, and then power it up. In the setup mode, you will see "◀,▶: Change the Selection" and "Enter Key is OK".



② Press the ◀ or ▶ button to switch to the "Setting COM1 Baudrate" / "Setting COM2 or COM3 Baudrate" screen and then press ↵ to enter the setup screen. The following description is divided into two parts COM1 and COM2/COM3.

Setup COM1: (Switch to "Setting COM1 Baudrate")

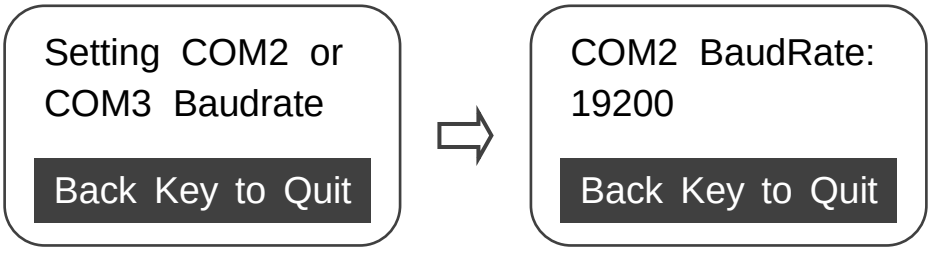


In the default screen (COM1 BaudRate: 19200), please press the ▶ button to change the selection, the sequence as below:

19200 → 38400 →57600 → 115200 → 300 → 600 → COM1 is not Modbus Slave → 1200 → 2400 → 4800 → 9600.

You can press ◀ or ▶ to change the selection, If you change the selection to “COM1 is not Modbus Slave” mean that you want to set COM1 as “Non- Modbus Slave”.

Setup COM2/3: (Switch to “Setting COM2 or COM3 Baudrate”)



COM2 and COM3 share the same setup screen. In the default screen (COM2 BaudRate: 19200), please press ▶ to change the selection, the sequence as below:

COM2:19200 →38400 →57600 →115200 →300 →600 →**COM3:**1200 → 2400 →4800 →9600 →9200 →38400 →57600 →115200 →300 →600 → COM2, COM3 are not Modbus Slave →COM2:1200 →2400 → 4800 → 9600

You can press ◀ or ▶ to change the selection, If you change the selection to “COM2, COM3 are not Modbus Slave” mean that you want to set COM2, COM3 as “Non- Modbus Slave”.

③ please press ↵ to confirm the selected settings.

④ After complete the setting, please press ← to quit the setup mode.

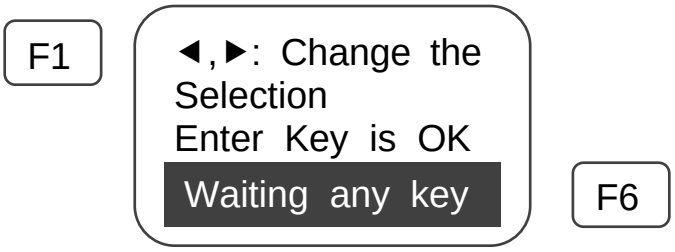
The ISaGRAF workbench’s default setting for PC’s COM1 ~ 9 is 19200, 8, N, 1. If you have changed the VP-2117 COM1/2/3’s baud rate to other value. You should change your ISaGRAF Workbench’s COMM. to the same setting before they can link to each other. (Please refer to Section 2.5)

3.6 Deleting an ISaGRAF Project from the Controller

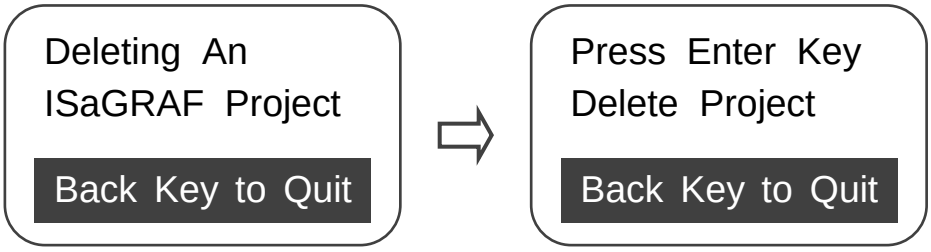
There may be some reason you need to delete the ISaGRAF program from the controller. TO begin this, as the way you change the baud rate before.

◄ ► : Change the selection ↵ : Confirm ← : Cancel

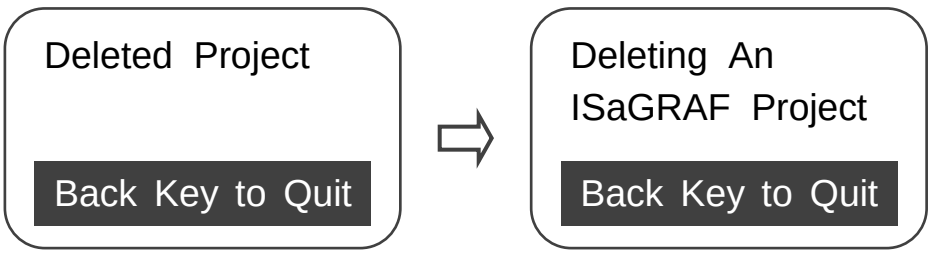
① First, power off the VP-2117 PAC, then press and hold on the F1 and F6 button and then power it up. In the setup mode, you will see "◄,►: Change the Selection" and "Enter Key is OK".



② Press the ◄ or ► button to switch to the "Deleting An ISaGRAF Project" screen, and then press ↵ to enter the setup screen.



③ Press ↵ to confirm the deletion, at this point, you will receive the "Deleted Project" screen. After deleting the ISaGRAF project, it will return to the selection screen.



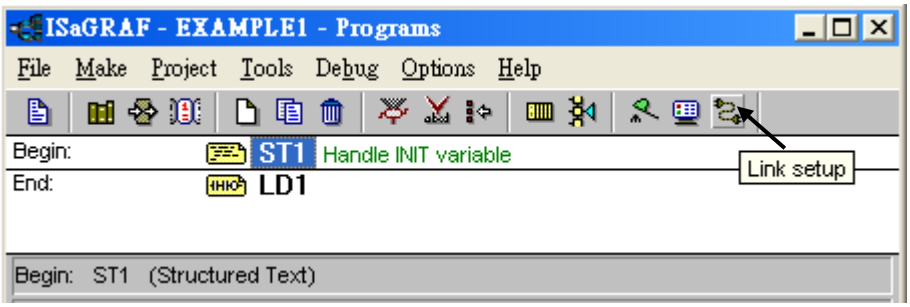
④ After complete the setting, please press ← to quit the setup mode.

3.7 Connecting PC to the VP-2117 Ethernet Port

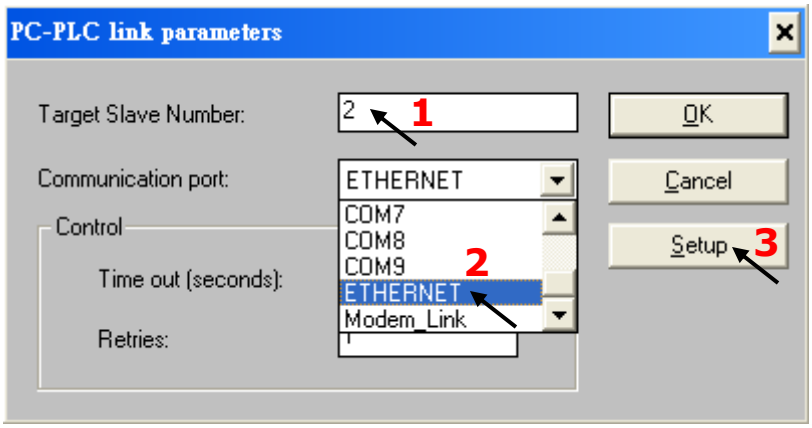
The VP-2117 controller systems feature a built-in Ethernet Port. You can use Ethernet to connect with the PC. Before you can download an ISaGRAF application to the VP-2117 controller via Ethernet, you must correctly setup the communication parameters of Ethernet. (Please refer to Section 3.9 to setup IP, Mask and Gateway address)

On your PC:

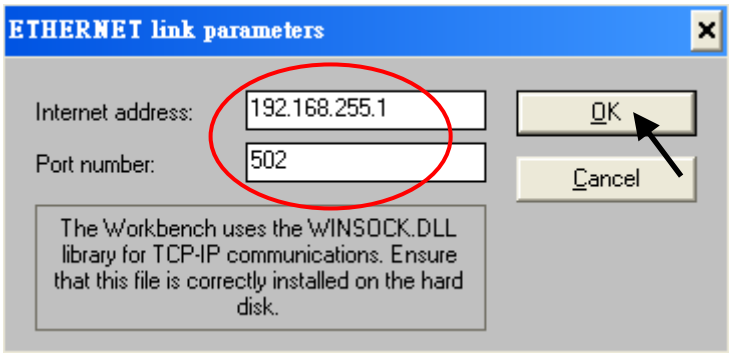
Please open an ISaGRAF project and select the program you want to download to the VP-2117 controller, and then press the "Link Setup" button on the project screen as shown below.



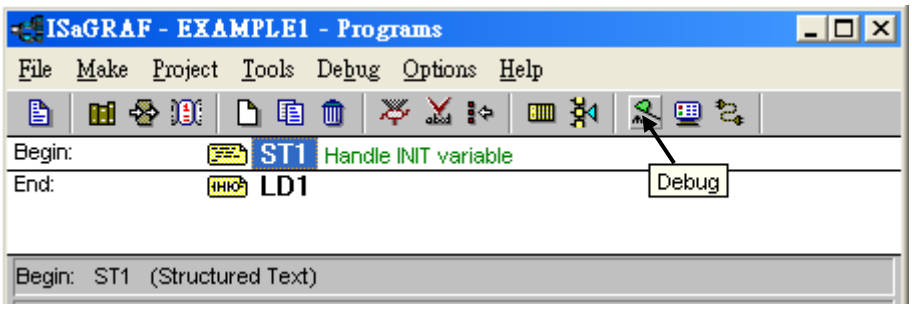
A "PC-PLC Link Parameters" dialog box will appear as shown below. From here, please enter the NET-ID and select the "Ethernet" communication options then click on the "Setup" button.



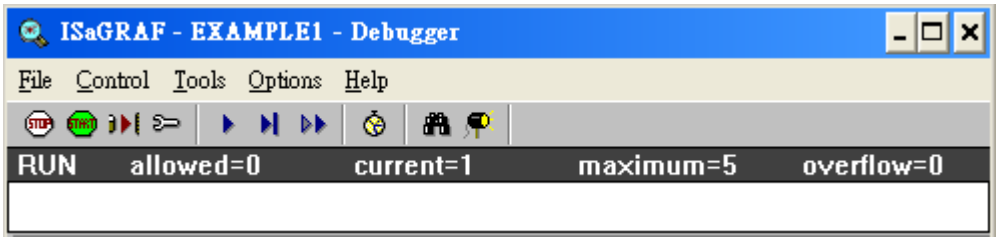
Once you have clicked on the "Setup" button, an "Ethernet Link Parameters" dialog box will appear. Set the "Port Number" to "502" and enter the IP address of the VP-2117 controller, please refer to Section 3.9.



When you enter the appropriate information and press the “OK” button, you have completed the configuration and can communicate with the VP-2117 PAC via Ethernet successfully. Please click on “Debug” to connect the controller.

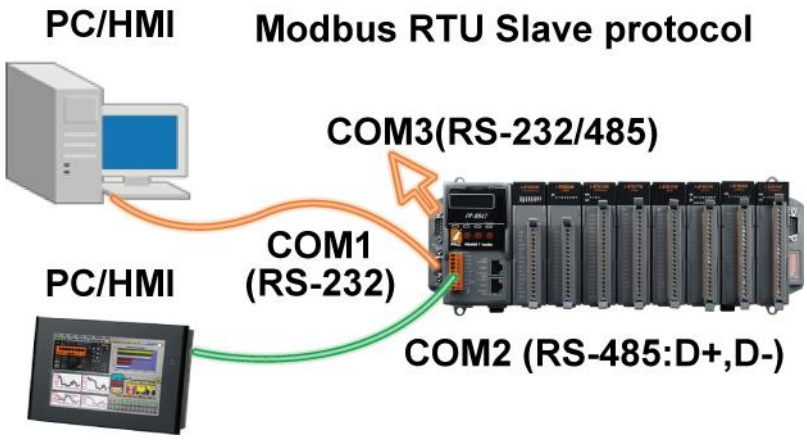


As follows diagram, the program is running now. (if you receive a “No application running” means that your PAC does not download any program, please refer to Section 2.5.1 to download the required procedure)

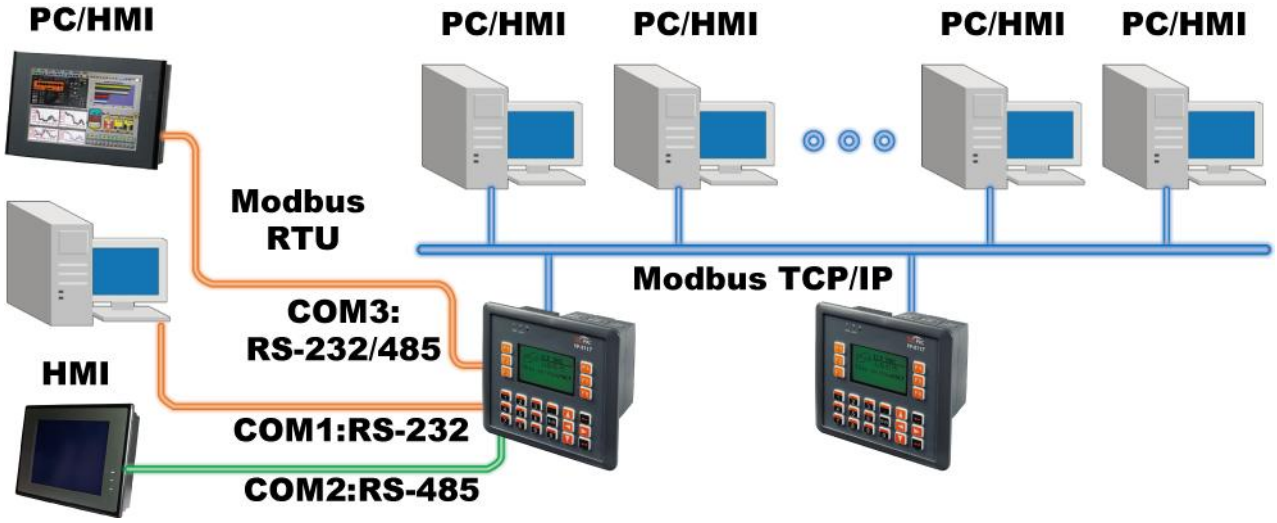


3.8 Modbus Slave Connection to the VP-2117

VP-2117 can use COM1 (RS-232) and one of COM2 (RS-485), COM3 (RS-232/485) to connect. The COM1/2 of the VP-2117 PAC supports Modbus RTU Slave protocol by default. They can be linked by ISaGRAF Workbench or by HMI devices or by SCADA software as diagram below:



The Ethernet Port of the VP-2117 PAC supports Modbus TCP/IP Slave protocol. They can be linked by ISaGRAF Workbench or by HMI devices or by SCADA software. As diagram below:



The Modbus TCP/IP protocol's Ethernet Port No. is fixed as **502.** Up to **6** PCs can link to one VP-2117 throughout Ethernet Port. Another PC or HMI can link to COM1: RS-232 Port or one of COM2: RS-485, COM3: RS-232/485 (Modbus RTU Slave protocol) of the PAC. Therefore the maximum number of clients can be linked is 8.

3.9 Setting VP-2117's IP & MASK & Gateway

Create a file folder named "vp2k" in your hard drive. For example, "c:\ vp2k".

1. Copy CD-ROM: \napdos\isagraf\vp2k\driver\1.xx\7188xw.exe, 7188xw.ini from the CD_ROM into your "vp2k" folder.
2. Run "\vp2k\7188xw.exe" in your hard drive. A "7188xw" screen will appear.
3. Link from COM1 or COM2 of PC to COM1 of the VP-2117 PAC by a RS-232 cable (CA-0915). If you use other COM Port (ex.COM5), please refer to ch3.10 step4.
4. Power off the VP-2117 PAC, change the DIP switch on the left side of control panel to the "Init", and then power it up.
5. If the connection is OK, the "VP-2111>" messages will appear on the 7188xw screen. (If you run "7188xw" after the PAC power on, please press "Enter" on keyboard to start the setup)

```
ICP_DAS MiniOS7 for ViewPAC-2111 Ver. 2.04 build 011,Apr 22 2009 15:13:46
OS id=45
SRAM:768K, FLASH MEMORY:512K
[CPU=ICPDAS R2240I]
CPU internal WDT is ENABLED(WDT timeout=0.8 sec)
Serial number= 01 D9 EF 7F 12 00 00 ED

VP-2111>
```

6. Using your PC's "Command Prompt" to search out the IP segment, and then according it to setup the IP/MASK/Gateway of the PAC.

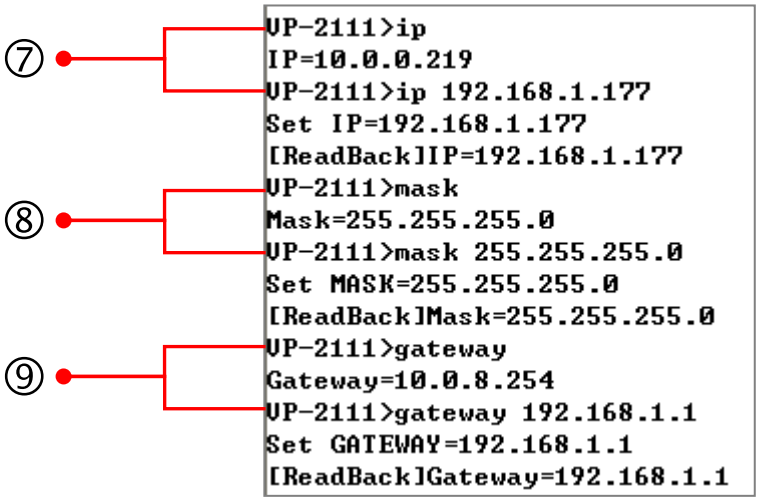
   On PC, you can press "Start" > "All Programs" > "Accessories" > Run "Command Prompt" > enter in "ipconfig" to know the network settings.

```
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 ICPDAS:

        Connection-specific DNS Suffix  . :
        IP Address. . . . . . . . . . . . : 192.168.1.202
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
        Default Gateway . . . . . . . . . : 192.168.1.1
```

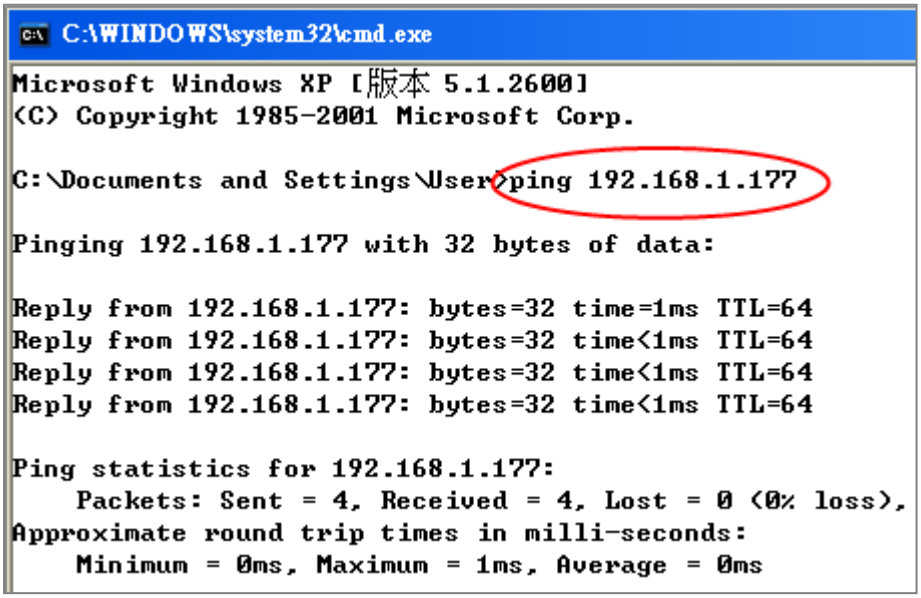
7. Type "ip" to see the current IP address of the VP-2117.
   Type "ip 192.168.1.xxx" to setup a new IP address.

8. Type “mask” to see the current address mask.
   Type “mask 255.255.255.0” to setup a new address mask.

9. Type “gateway” to see the current gateway address.
   Type “gateway 192.168.1.1” to setup a new gateway address.



10. Please press **ALT_X** to quit the “7188xw” window, to avoid COM1/COM2 has been occupied.
11. Change the DIP switch on the left side of control panel to “Run”, and then reboot the VP-2117 PAC.
12. On PC, you can press “Start” > “Run…” > Input “cmd” to open the “Command Prompt” window, and then Input “ping …” (IP) to confirm the connection between PC and PAC is well.

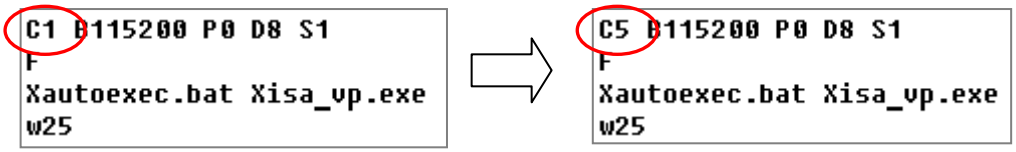


3.10 Update VP-2117's Hardware Driver

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

To Know the Current Driver Version

1. Create a file folder named "vp2k" in your hard drive. (Ex."c:\vp2k")
2. Copy napdos\isagraf\vp2k\driver\1.xx\
   ① **7188xw.exe,** ② **7188xw.f4,** ③**7188xw.ini,** ④ vp_20090612.img**,**
   ⑤ **AUTOEXEC.BAT,** ⑥ **ISA_VP.EXE**, ⑦ **isa_data.exe** from the CD_ROM into your "vp2k" folder.
3. Run "\vp2k\7188xw.exe" in your hard drive. A "7188xw" screen will appear (Press F1 for help).
4. Link COM1 or COM2 of your PC to COM1 of the PAC through a RS-232 cable (CA-0915). If you use other COM Port (ex.COM5), please modify the first line of "7188xw.ini".



5. Power off the VP-2117, change the DIP switch on the left side of control panel to "Init", and then power it up.
6. If the connection is OK, the "VP-2111>" message will appear on the 7188xw screen. (If you run "7188xw" after the PAC power on, please press "Enter" on keyboard to start the setup).

```
ICP_DAS MiniOS7 for ViewPAC-2111 Ver. 2.04 build 011,Apr 22 2009 15:13:46
OS id=45
SRAM:768K, FLASH MEMORY:512K
[CPU=ICPDAS R2240I]
CPU internal WDT is ENABLED(WDT timeout=0.8 sec)
Serial number= 01 D9 EF 7F 12 00 00 ED

VP-2111>
```

7. Type "ver" to see the current OS version & date.

```
VP-2111>ver

ICP_DAS MiniOS7 for ViewPAC-2111 Ver. 2.04 build 011,Apr 22 2009 15:13:46
OS id=45
SRAM:768K, FLASH MEMORY:512K
[CPU=ICPDAS R2240I]
CPU internal WDT is ENABLED(WDT timeout=0.8 sec)
Serial number= 01 D9 EF 7F 12 00 00 ED
```

8. Type "isa_ip *p=" to see the current driver version No. & setting of the PAC.

```
VP-2111>isa_vp *p=

 Driver  : VP-2117:isa_vp.exe- 1.01,Jan.25,2010
 MiniOS7 : Must use vp_20090603.img
 isa_data.exe -1.01,Jan.25,2010
 NET-ID  : 2
 Licence is OK
 COM1 is Modbus RTU slave port,19200,8,N,1
 COM2 & COM3 are free
 Flash Menory is unprotected; refer to www.icpdas.com > FAQ > Software > I
 > 089 for more detail info.
(C)Copyright:ICP DAS  CO. , LTD.      Taiwan Id:84517297
```

To Upgrade an ISaGRAF Embedded Driver

(We use driver 1.01 as an example)

1. Power off the PAC, change the DIP switch on the left side of control panel to "Init", and then power it up.
2. Press "**F4**" to auto download the following files and reboot system. (isa_data.exe, AUTOEXEC.BAT, ISA_VP.EXE, vp_20090612.img)

```
VP-2111>del /y
Total File number is 2, do you really want to delete(y/n)?

VP-2111>LOAD
File will save to 8000:0000
StartAddr-->7000:FFFF
Press ALT_E to download file!
Load file:isa_data.exe[crc=DDA9,0000]
Send file info. total 298 blocks
Block 298
Transfer time is: 14.828000 seconds

VP-2111>isa_data
isa_data.exe - 1.01,Jan.25,2010
```

Wait about 70 sec. to update ISaGRAF system and **DO NOT** Remove the Power!

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

```
VP-2111>bios1
MiniOs7 for VP-2111 Ver 2.04.013, date=06/12/2009
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 ViewPAC-2111 Ver. 2.04 build 013,Jun 12 2009 10:55:32
OS id=45
SRAM:768K, FLASH MEMORY:512K
[CPU=ICPDAS R2240I]
CPU internal WDT is ENABLED(WDT timeout=0.8 sec)
Serial number= 01 D9 EF 7F 12 00 00 ED
```

4. Press ALT+X to quit "7188xw" to avoid COM1/COM2 of the PC always been occupied.
5. Please change the DIP switch on the left side of control panel to "Run", then reboot the VP-2117 PAC.

3.11 Backup & Restore an ISaGRAF Project

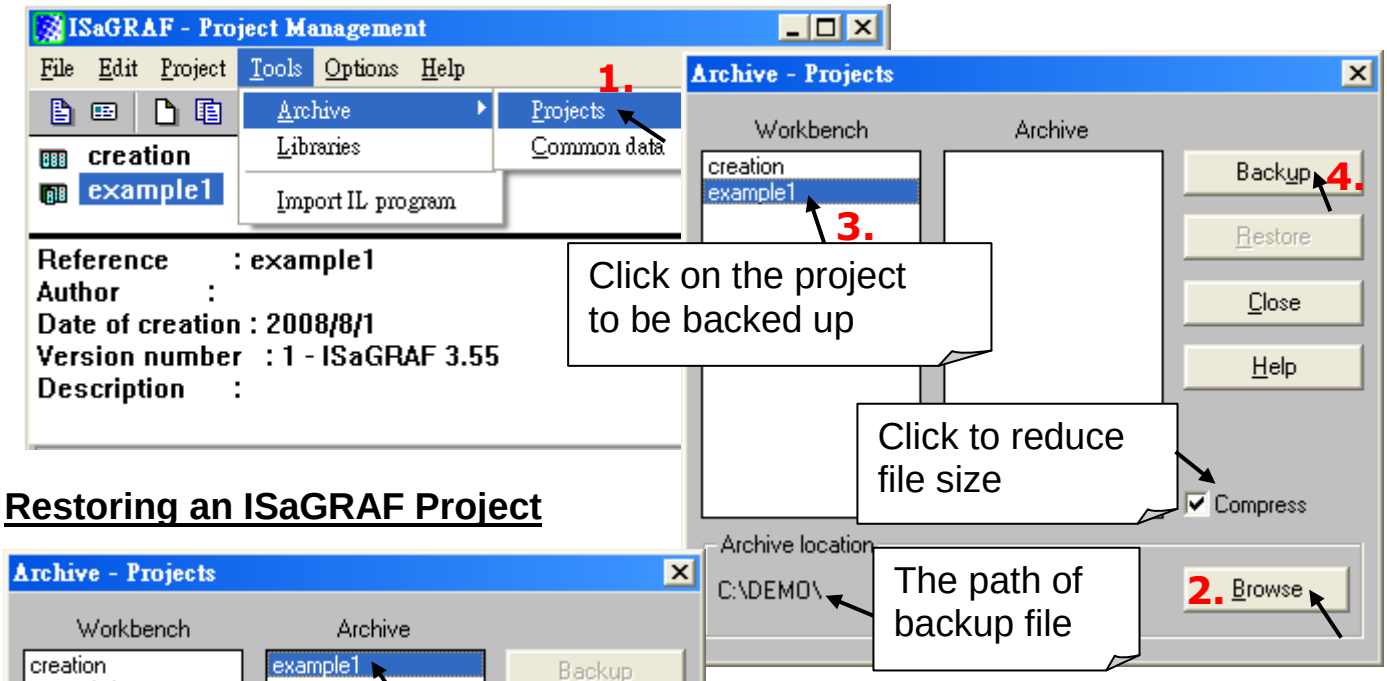
For archiving purposes you can “Backup” and “Restore” an ISaGRAF project. For example, you may want someone to test your program or email to service@icpdas.com for ICP DAS’s ISaGRAF service.

Backing Up an ISaGRAF Project

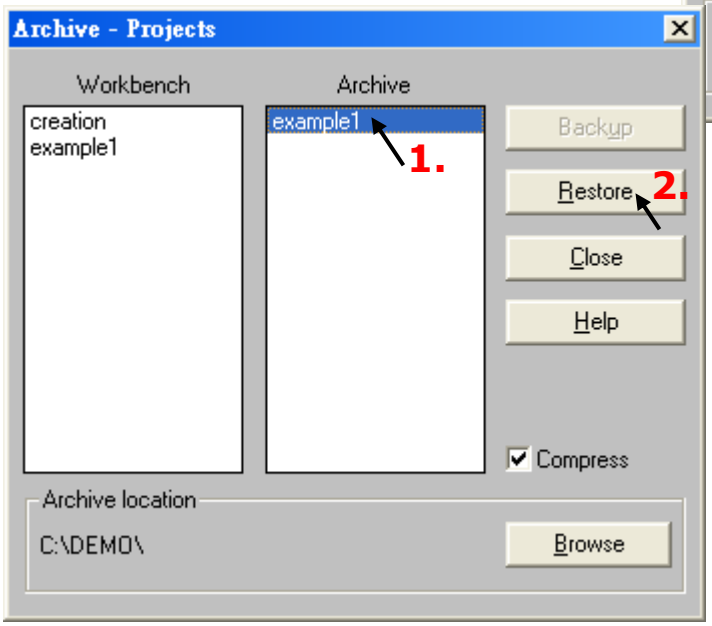
Open the “ISaGRAF Project Management” window,

1. Select “Tools” from the menu bar, click on “Archive”, and then click on “Projects”. An “Archive Projects” window will open.
2. You can click on “Browse” to designate where you want to save the ISaGRAF project. (Ex. C:\Demo)
3. Click on the name of the ISaGRAF project you want to backup,
4. and then click on the “Backup” button. The ISaGRAF project file will be backed up to the path (Ex. C:\Demo\example1.pia) you designated.

Note: You can compress the size of the file you have backed up by clicking on the “Compress” checkbox BEFORE you click on the “Backup” button.



Restoring an ISaGRAF Project

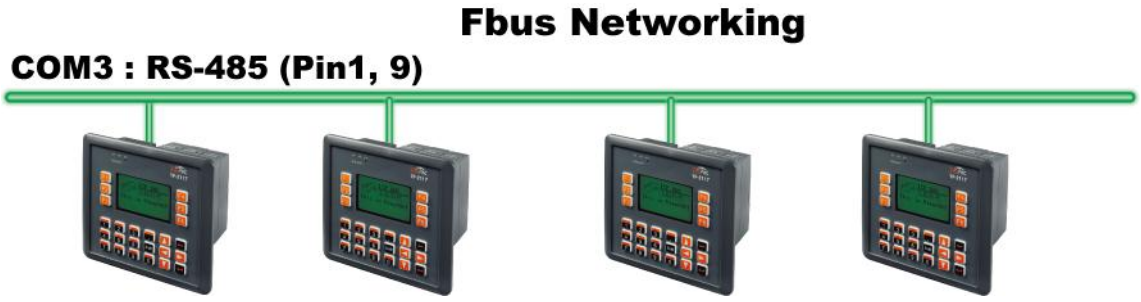


To restore an ISaGRAF project from a backed up file, use the same method as above to access the “Archive Projects” window, ① click on the name of the backed up file from the “Archive” window, then ② click on the “Restore” button. The ISaGRAF project will now be restored to the sub-directory you designated.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

3.12 The connection mode of Fbus

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

For detailed ISaGRAF User’s Manual. The Fbus is listed in Chapter 7.



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

VP-2117 PAC system can link up to 64 pcs ICP DAS's Remote I/O modules - “I-7000” and “I-87K” series Remote I/O modules.

TO DO:
Before linking I-7000 and I-87K modules for Remote I/O, you must use DCON Utility to pre-set each I-7000 and I-87K remote module to have a unique address (NET-ID), and set them to the same baud rate as the VP-2117 PAC system.

The DCON Utility is a toolkit that helps user to search the RS-485 I/O network, easily to configure and test the I/O modules. For DCON Utility program and manual please reach to http://www.icpdas.com/products/dcon/introduction.htm. or www.icpdas.com > Products > Software > DCON Utility

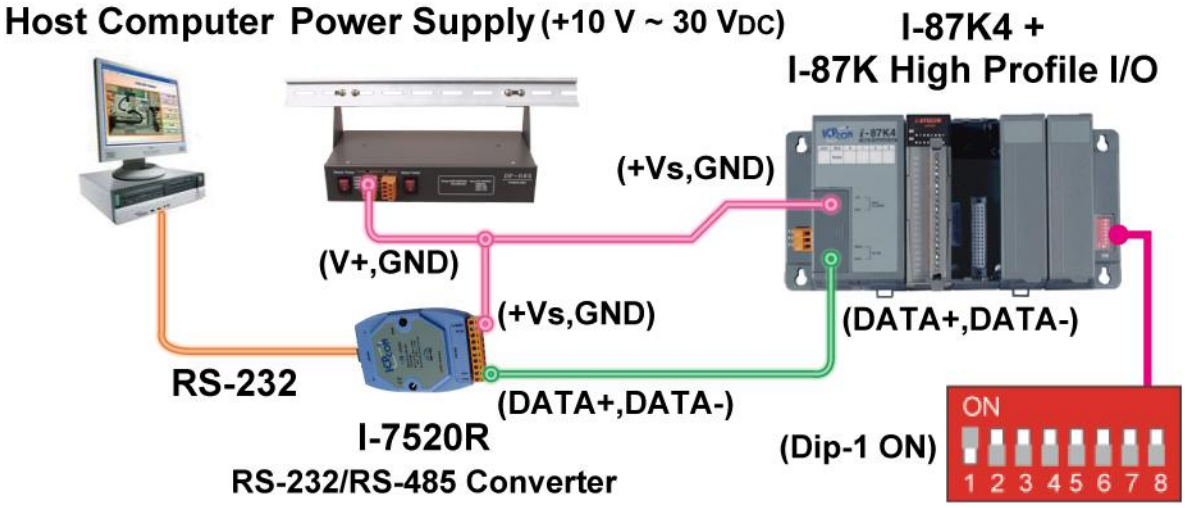
NOTE:

1. Make sure the hardware connection is correct.
2. Configure I/O modules with I-87Kn (or RU-87Pn).
3. Using I-87Kn, please search and configure the modules one by one.
4. I-7000: Connect the INIT* to GND and Power on the module.
   I-87K (High Profile): Change the DIP switches of I-87Kn expansion unit or setup the INIT jumper on I-87K module. Lastly, power on the module.

Step 1: Hardware connection

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

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



Step 2: Initialize I/O module

If the module is a new one, factory have set a default settings (as table 1) for user's convenient. If you don't know the configuration of the module, please initialize the I/O module (as table 2).

The default state from factory (table 1):

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

The initial state after initialization (table 2):

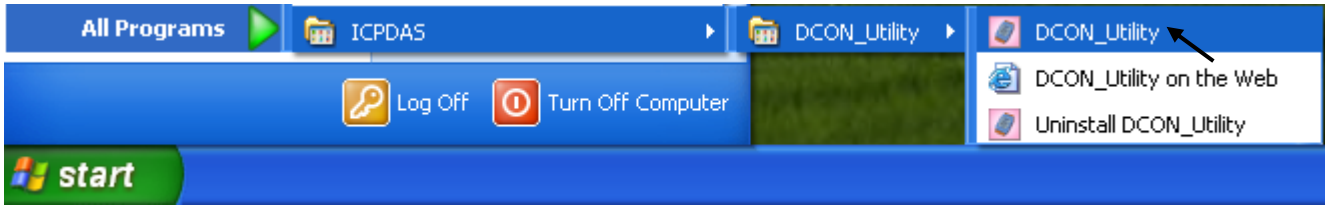
I/O Module	7000 series (I-7000 and M-7000)	87K series
Address	0	0
Baud rate	9600	115200
Checksum	Disabled	Disabled
Protocol	DCON Protocol	DCON Protocol

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

★To initialize I-87K (high profile) module, please switch the DIP switch of I-87K4/5/8 /9. For example, switch Dip-1 to "ON" and restart I-87Kn, the Slot1 will setup to initial. **When use I-87K5/9 you must start from the second slot (slot1), CAN NOT use the first slot (slot0).**

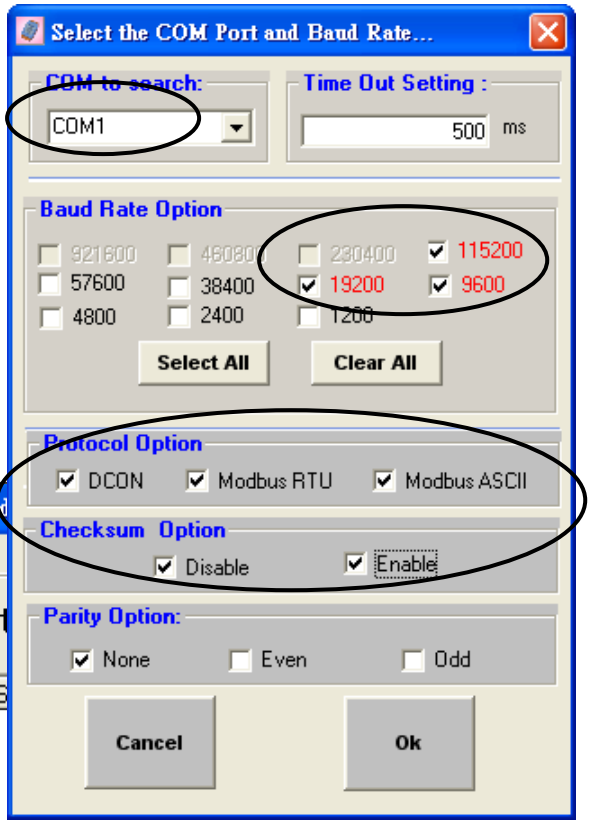
Step 3: Select COM Port and Baud Rate to search

On PC, Click on “Start > All Programs > ICPDAS > DCON_Utility > Run DCON_Utility”.



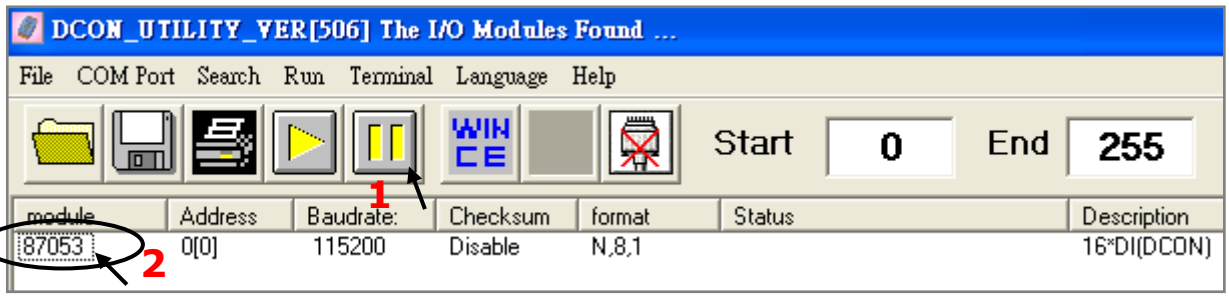
1. Click “COM Port” menu to select the COM Port and Baud Rate to search. You can select multi-Baud Rate, Protocol or Checksum conditions if you do not know the module’s setting, but it will spend more time to scan the network. After selection, click “OK”.

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

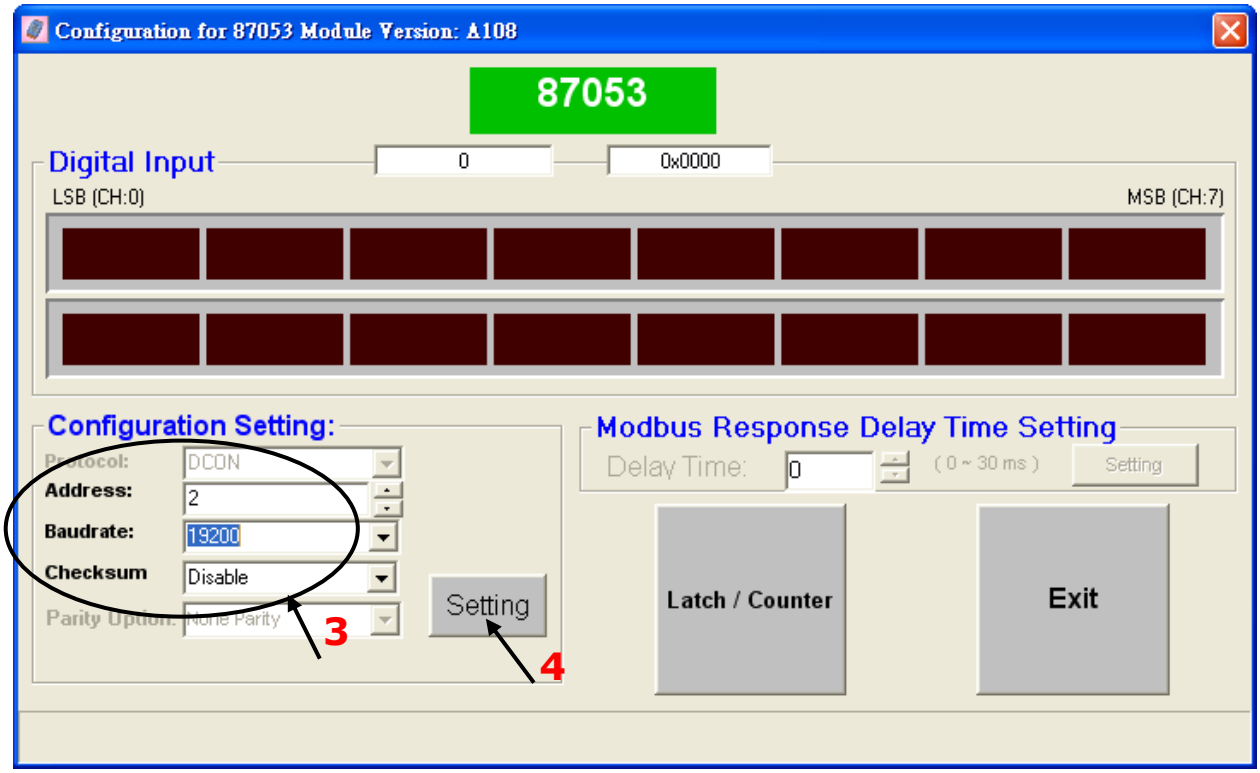


Step 4: Click Searched module ID and give the new configuration

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



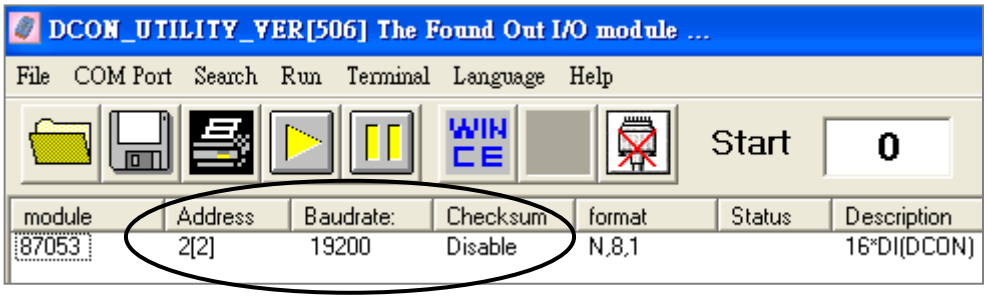
As screen below, you can setup the Address, Baud rate, Checksum, and then click “Setting” to save.



If you didn't connect the INIT, It will show the message window, please connect INIT to GND (Ex. I-7000) or change the DIP switch to "ON" (Ex. I-87Kn), and then click "Setting" button again.

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

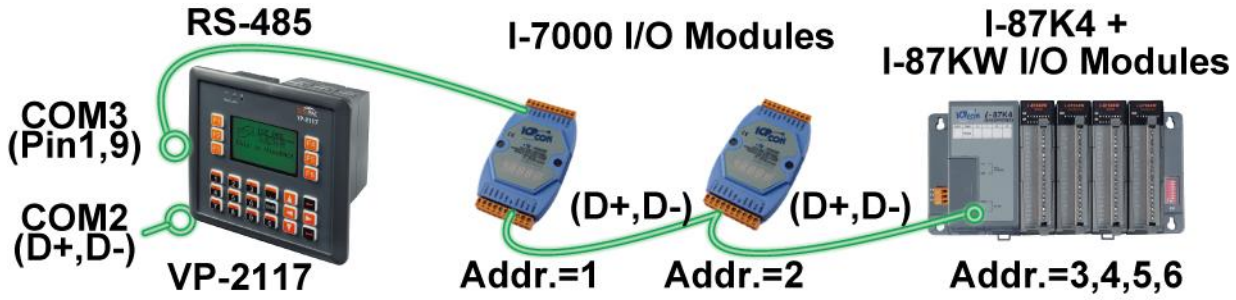
Finally, you can search the module again and check the settings.



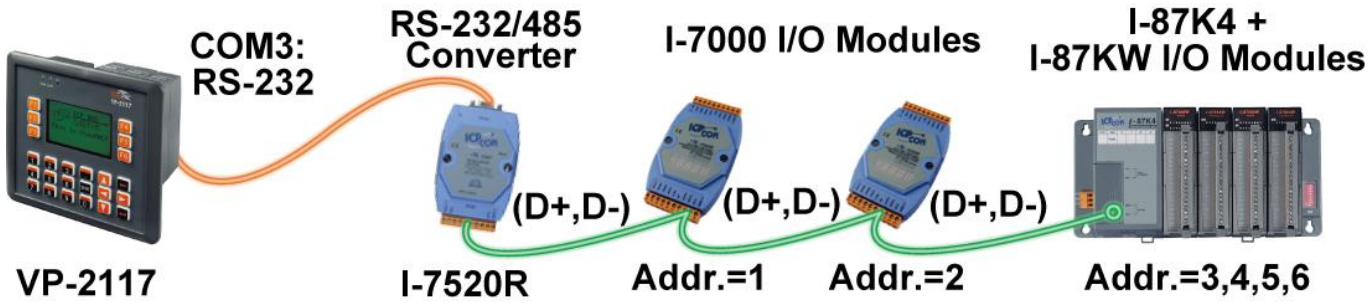
3.14 Linking I-7000 and I-87K Modules for Remote I/O

Please refer to CD-ROM: \napdos\isagraf\8000\english_manu\
“user_manual_i_8xx7.pdf”
For detailed ISaGRAF User’s Manual. It is listed in Chapter 6.

You can choose ONE of COM2 (RS-485), COM3 (RS-232/485) to connected.



If you choose to utilize the RS-232 of COM3, connect the COM3 Port to the I-7520R's RS-232 Port, and for each I/O modules also connect its “DATA+” to the “DATA+” signal, and the “DATA-” to the “DATA-” signal. As below diagram:



You can link up to 64 I-7000 or I-87K series remote modules to one VP-2117 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 VP-2117 PAC.

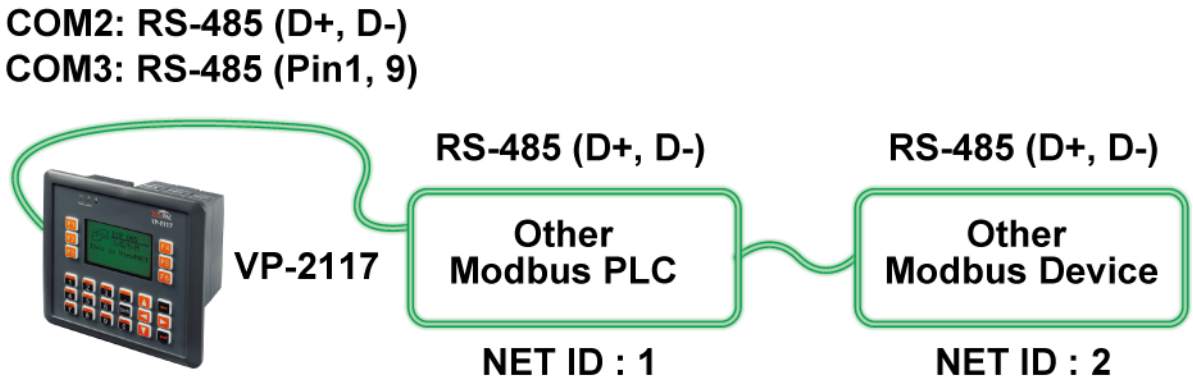
For more information regarding setting up and programming an I-7000/I-87K remote module, please refer to ISaGRAF User’s Manual Chapter 6 - “Linking To I-7000 and I-87K Modules”.

3.15 Creating a Modbus Link with the PAC

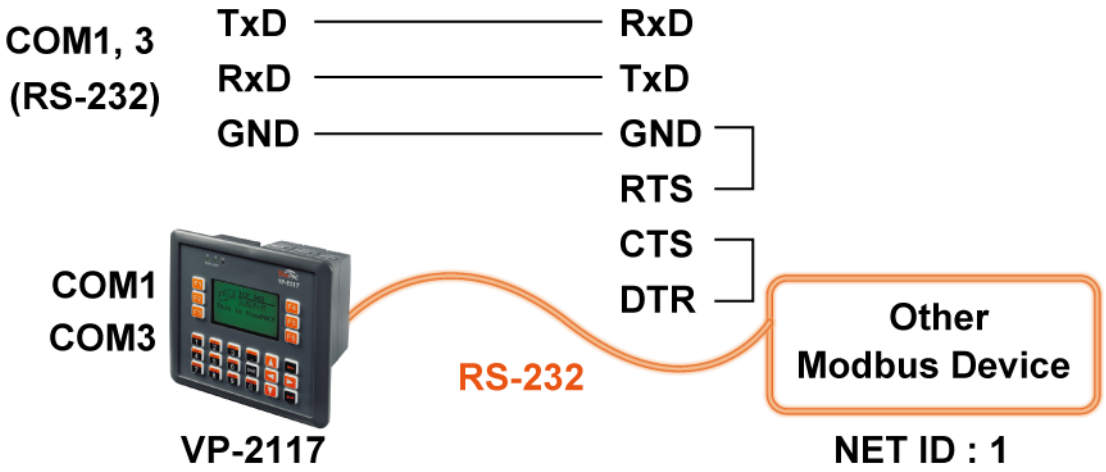
Please refer to CD-ROM: \napdos\isagraf\8000\english_manu\
“user_manual_i_8xx7.pdf”

For detailed ISaGRAF User’s Manual. It is listed in Chapter 8.

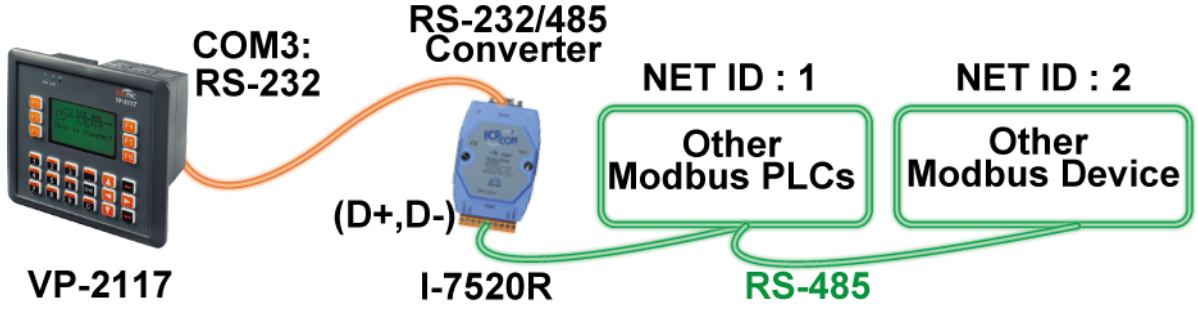
If the COM2/3: RS-485 Port is used for Modbus Master, one VP-2117 can connect to many other devices. Each device on the link must have a unique NET ID (1 ~ 255) address, and communicate at same baud rate settings.



If COM1 : RS-232 is used, you can only link one VP-2117 to ONE other Modbus device. To use the COM1 as Modbus Master Port, please disable the default Modbus RTU Slave setting in it. Please refer to Section 3.5.



If the COM3 : RS-232 Port of the PAC is used to connect to one I-7520R (RS-232/ RS-485 converter), then the PAC can network to numerous Modbus devices.



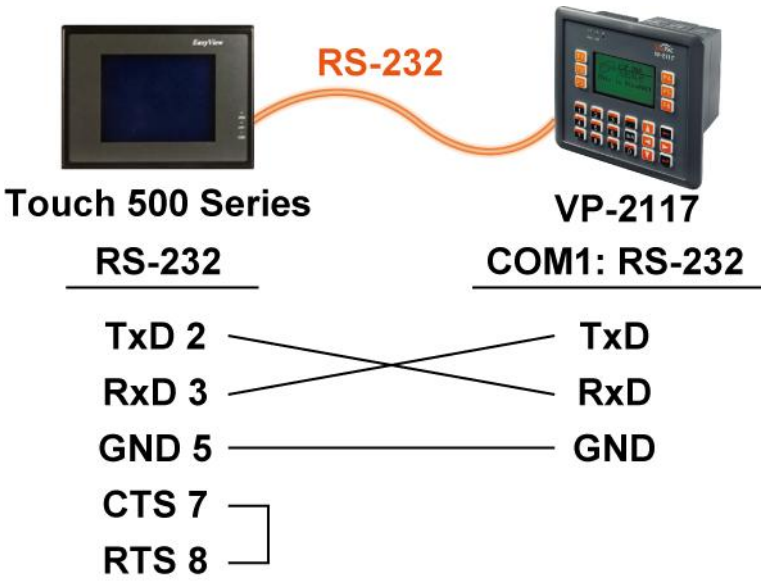
3.16 Linking To an MMI Interface Device

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

For more information, please refer to:

1. ISaGRAF User's Manual. It is listed in Section 4.4
2. CD-ROM: \napdos\others\touch\manual\
   "touch200_link_to_i8xx7_7188eg_7188xg.pdf" and
   "touch500_link_to_i8xx7_7188eg_7188xg.pdf"

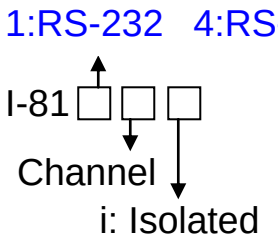
If you are using any of the "Touch" series of MMI devices (Ex: Touch506L/506S/ 510T…etc.) to connect to a PAC, you can only interface the devices to the COM1 Port on the VP-2117 PAC.



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

3.17 Using N-Port COM

There are some N-Port COM boards that can be used to extend communication ability of the VP-2117 PAC. The model No. available is as below.



I-8112iW: 2-ch Isolated RS-232 Expansion Module
I-8114W: 4-ch Non-isolated RS-232 Expansion Module
I-8114iW: 4-ch Isolated RS-232 Expansion Module
I-8142iW: 2-ch Isolated RS-485 Expansion Module
I-8144iW: 4-ch Isolated RS-485 Expansion Module

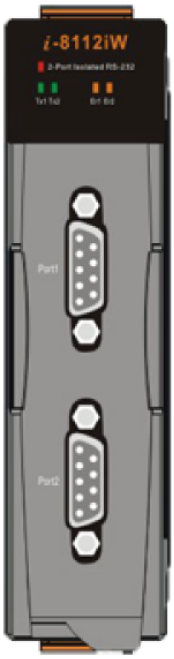
Please refer to:
http://www.icpdas.com/products/PAC/i-8000/8000_IO_modules.htm

Note:
These N-Port COM boards can be plugged into slot 0 ~ 2. That means user can use only COM5 to COM16 of N-Port COM boards.

Some functions can be used to read/write these COM Ports. Please refer to CD-ROM: \napdos\isagraf\8000\english_manu\"user_manual_i_8xx7.pdf" for detailed ISaGRAF User's Manual. They are listed in **Appendix A.4** for "COMOPEN", "COMCLOSE", COMREADY", "COMARY_R" , "COMARY_W", "COMREAD", "COMSTR_W", "COMWRITE" and "COMCLEAR".

Pin assignment:

I-8112iW



Pin Assignment Name	Terminal No.		Pin Assignment Name
DCD1	01		
RxD1	02	06	DSR1
TxD1	03	07	RTS1
DTR1	04	08	CTS1
GND1	05	09	RI1

DB-9 Male Connector (Port1)

Pin Assignment Name	Terminal No.		Pin Assignment Name
DCD2	01		
RxD2	02	06	DSR2
TxD2	03	07	RTS2
DTR2	04	08	CTS2
GND2	05	09	RI2

DB-9 Male Connector (Port2)

I-8114W

Pin Assignment Name	Terminal No.		Pin Assignment Name
N.C.	01		
DCD3	02	20	RI3
GND	03	21	DTR3
CTS3	04	22	DSR3
RxD3	05	23	RTS3
RI4	06	24	TxD3
DTR4	07	25	DCD4
DSR4	08	26	GND
RTS4	09	27	CTS4
TxD4	10	28	RxD4
DCD2	11	29	RI2
GND	12	30	DTR2
CTS2	13	31	DSR2
RxD2	14	32	RTS2
RI1	15	33	TxD2
DTR1	16	34	DCD1
DSR1	17	35	GND
RTS1	18	36	CTS1
TxD1	19	37	RxD1

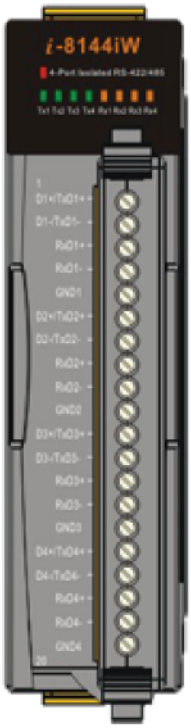
37-Pin Female D_Sub Connect (Port1~Port4)

I-8114iW

Pin Assignment Name	Terminal No.		Pin Assignment Name
N.C.	01	20	N.C.
N.C.	02	21	N.C.
GND3	03	22	N.C.
CTS3	04	23	RTS3
RxD3	05	24	TxD3
N.C.	06	25	N.C.
N.C.	07	26	GND4
N.C.	08	27	CTS4
RTS4	09	28	RxD4
TxD4	10	29	N.C.
N.C.	11	30	N.C.
GND2	12	31	N.C.
CTS2	13	32	RTS2
RxD2	14	33	TxD2
N.C.	15	34	N.C.
N.C.	16	35	GND1
N.C.	17	36	N.C.
RTS1	18	37	RxD1
TxD1	19		

37-Pin Female D_Sub Connect (Port1~Port4)

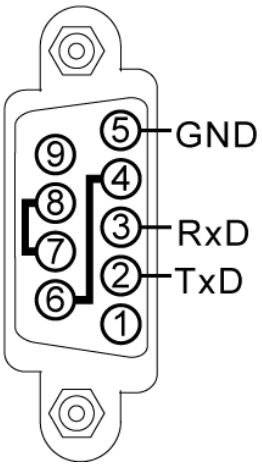
I-8144iW



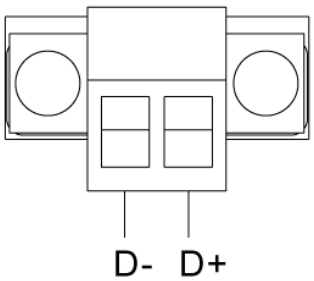
Terminal No.	Pin Assignment Name
01	D1+/TxD1+
02	D1-/TxD1-
03	RxD1+
04	RxD1-
05	GND1
06	D2+/TxD2+
07	D2-/TxD2-
08	RxD2+
09	RxD2-
10	GND2
11	D3+/TxD3+
12	D3-/TxD3-
13	RxD3+
14	RxD3-
15	GND3
16	D4+/TxD4+
17	D4-/TxD4-
18	RxD4+
19	RxD4-
20	GND4

3.18 Pin Assignment of Communication Ports

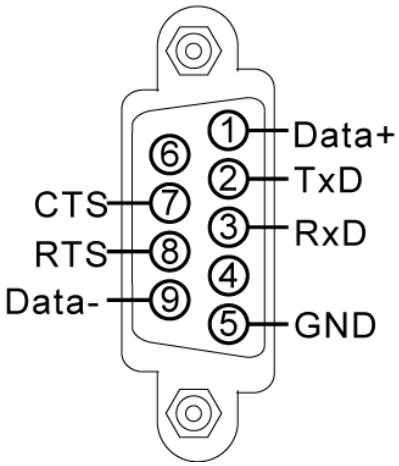
COM1: RS-232



COM2: RS-485

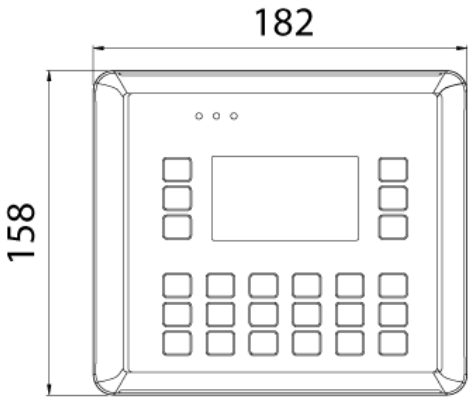


COM3: RS-232/RS-485

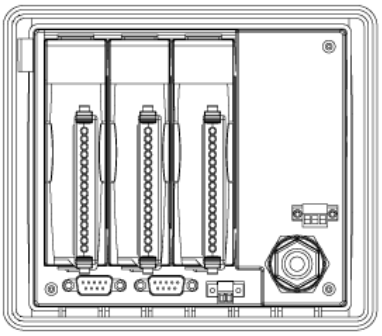


3.19 Dimension

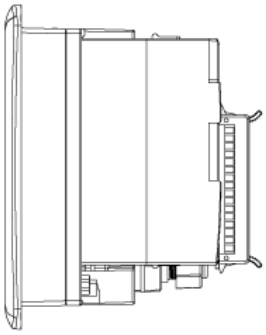
Unit: mm



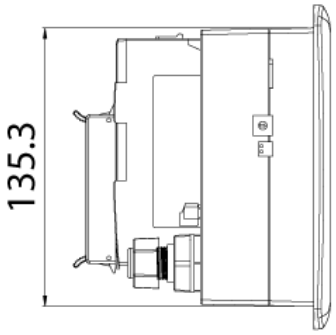
Front View



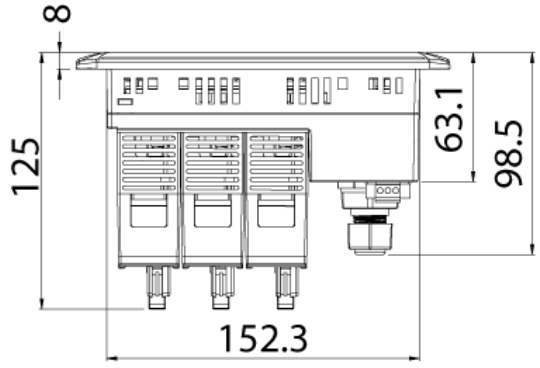
Back View



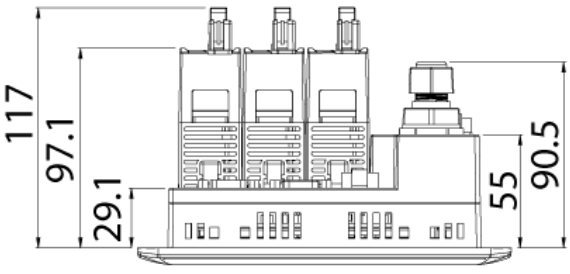
Left Side View



Right Side View



Top View



Bottom View

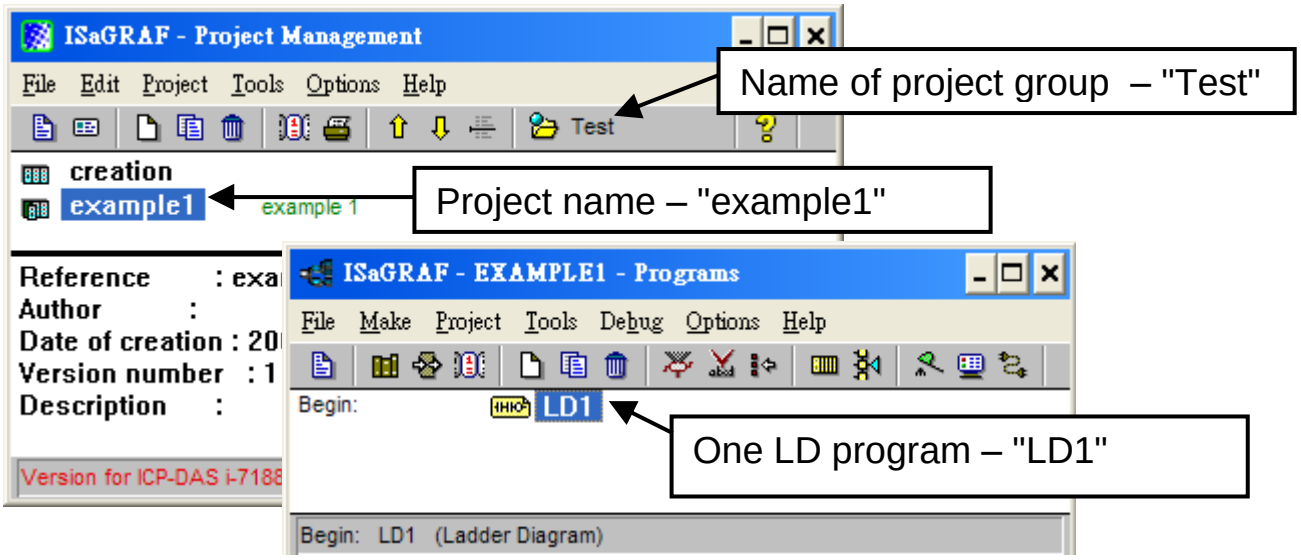
Chapter 4 Show String on the VP-2117's LCD

This chapter describes how to create an ISaGRAF project and show the blinking String on VP-2117's LCD screen.

4.1 Writing a Simple ISaGRAF Program

We are going to use ISaGRAF Workbench to write a simple ISaGRAF example program, then download it to the VP-2117 controller to make it work. If you haven't installed "SaGRAF" & "ICP DAS Utilities for ISaGRAF", please go back to read chapter 2.

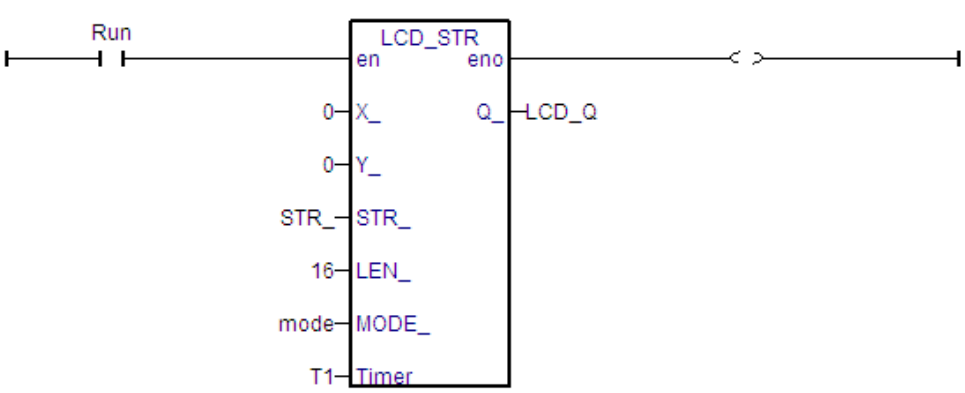
This example contains one LD program. (The demo is stored in CD-ROM: \napdos\isagraf\vp-2117\demo\ ).



Variables declaration:

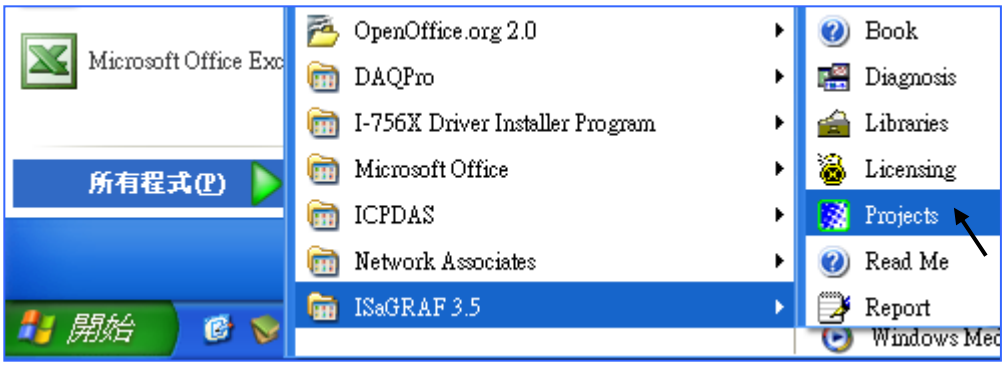
Name	Type	Attribute	Description
Run	Boolean	Internal	Initial value at "TRUE"
Mode	Integer	Internal	Display mode, Default : 1
LCD_Q	Integer	Internal	Return value of LCD_STR
STR_	Message	Internal	String, Default : "ICPDAS VP-2117"
T1	Timer	Internal	Blinking cycle, Default : T#1s

Ladder Logic Program Outline:



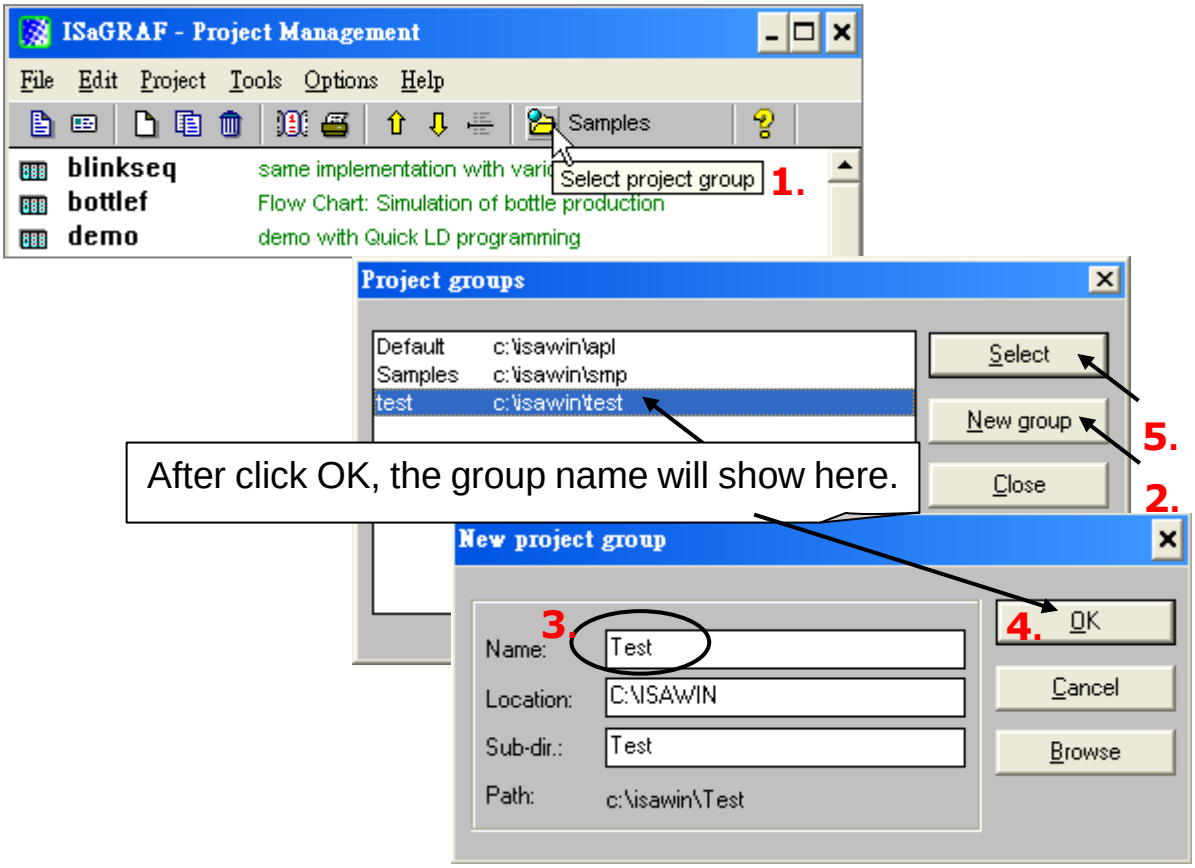
4.1.1 Open ISaGRAF-Project Management

Click on the Windows “Start” > “All Programs” > “ISaGRAF 3.5” (or ISaGRAF 3.4) > “Projects” as shown below.



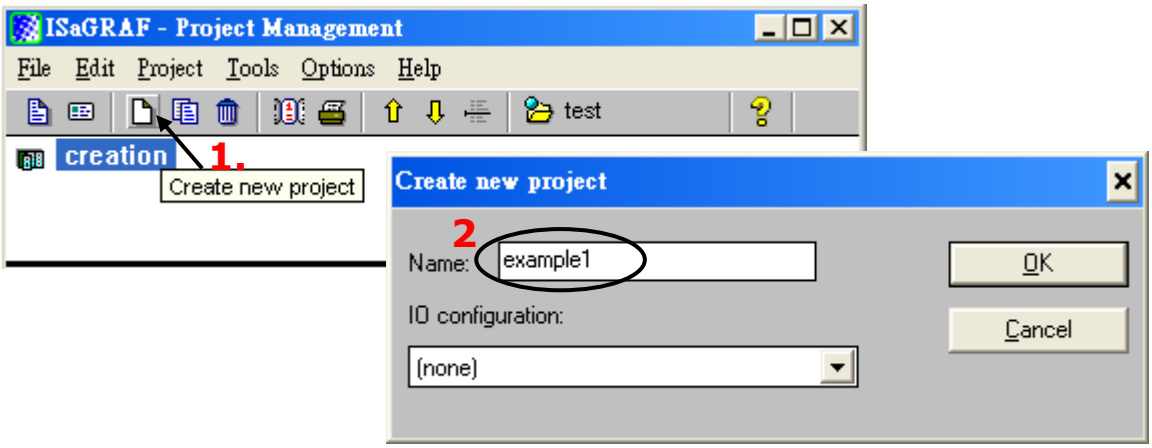
4.1.2 Creating An ISaGRAF User’s Group

Click on the “Select Project Group” > “New Group”, then enter the name for the new user's group you wish to create (ex. “Test”), and last click on “OK”. After click “OK”, the group name will show as below, please click “Select” to get into this group.

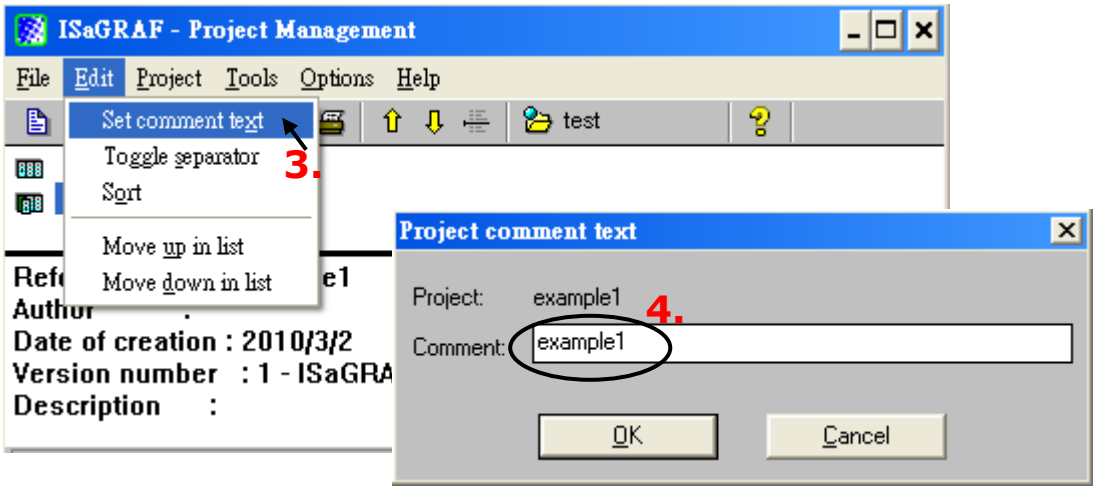


4.1.3 Creating a New ISaGRAF Project

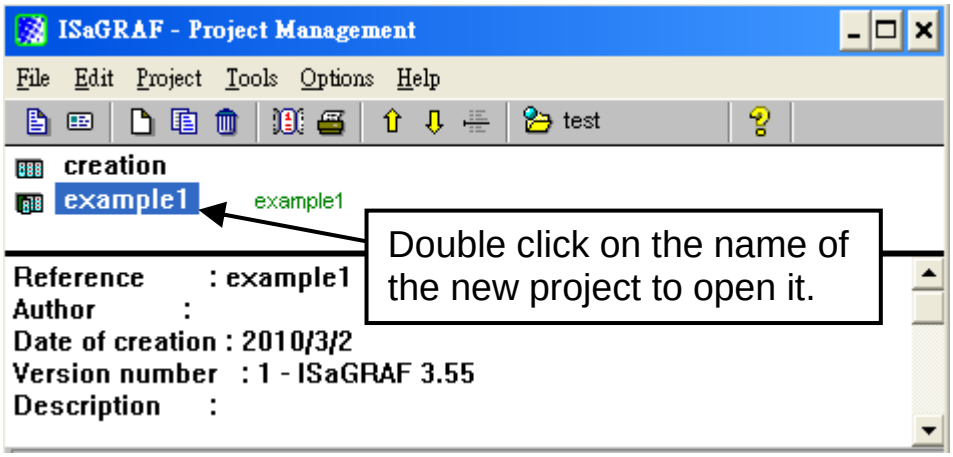
To start a new ISaGRAF project, click on the “Create New Project” tool button and then enter the name (ex. example1) for the new project.



If you want to write notes for your project, click on the menu bar “Edit” > “Set Comment Text” as below.



You will now see the new project name in the "Project Management" window. Double click on the new project name (ex. example1) to open the project.

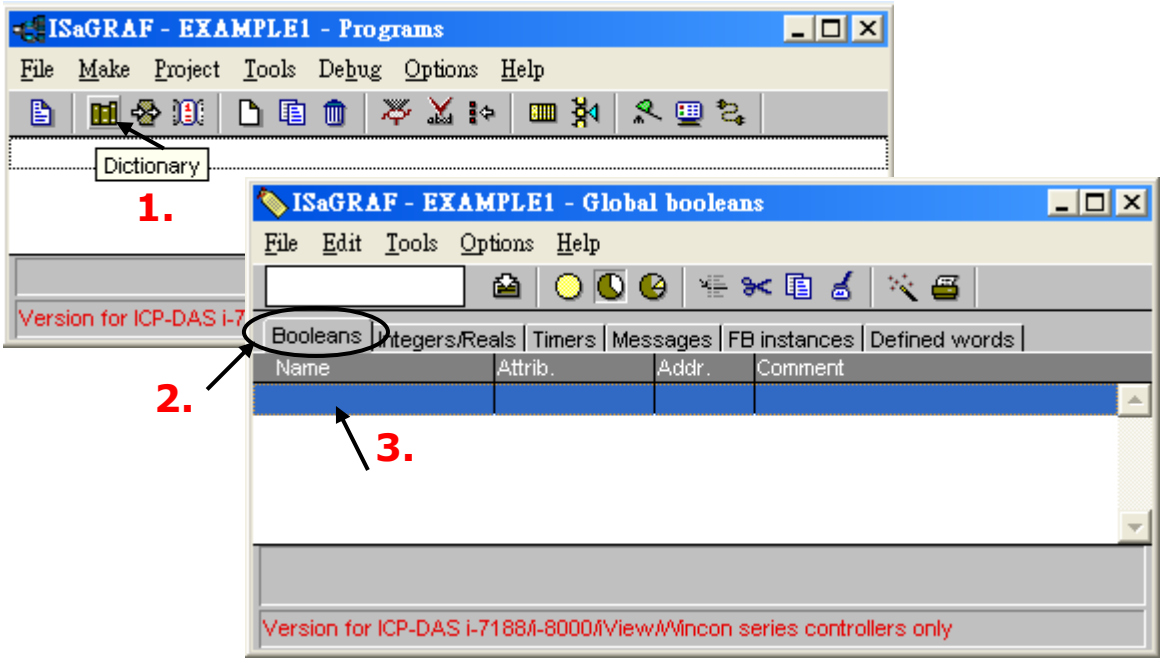


4.1.4 Declaring the ISaGRAF Project Variables

Before you can start creating an ISaGRAF program, you must first declare the related variables.

Declaring Boolean: (In this sample)

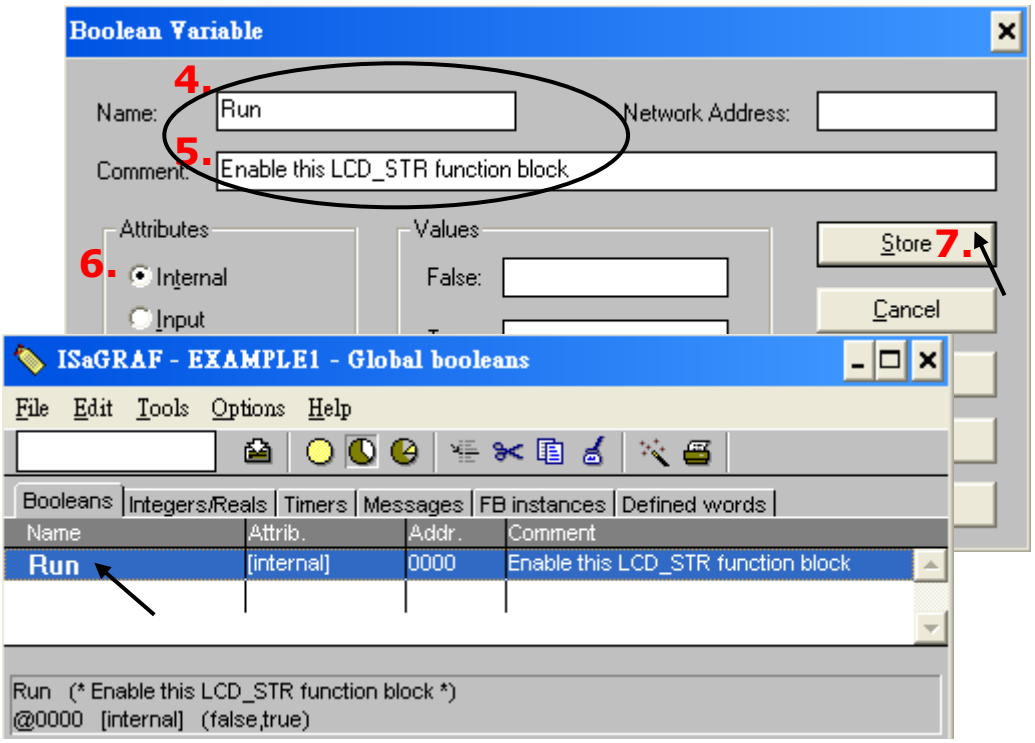
1. Click on the “Dictionary” tool button.
2. Click on the “Booleans” tab to declare the Boolean variables that will be used in this example program.
3. Double click on the colored area below the “Booleans” tab, and a “Boolean Variable” window will open.



4. Enter the variable name (ex. “Run”) in “Name” entry box.
5. Enter the notes for the variable (ex. “Enable this LCD_STR function block”) in “Comment.” entry box.
6. Select the “Internal” as the variable attribute in “Attributes” items.
7. Press the “Store” button to save it. The new Boolean variable has now been declared. Refer to “Global booleans” windows as below.

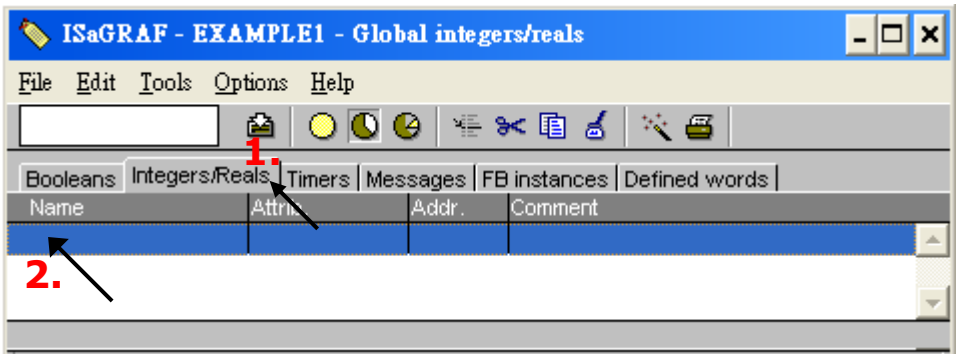
Note:

You MUST make sure that the variable you have declared has the desired attribute assigned. If you want to change the attribute, just double click on the variable name and you can reassign it.

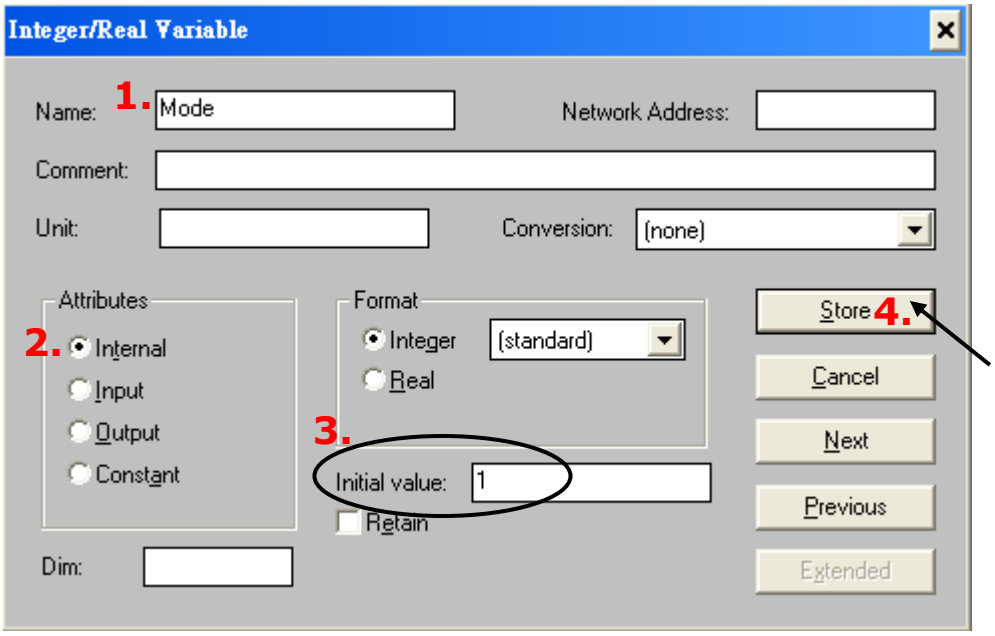


Declaring Integer

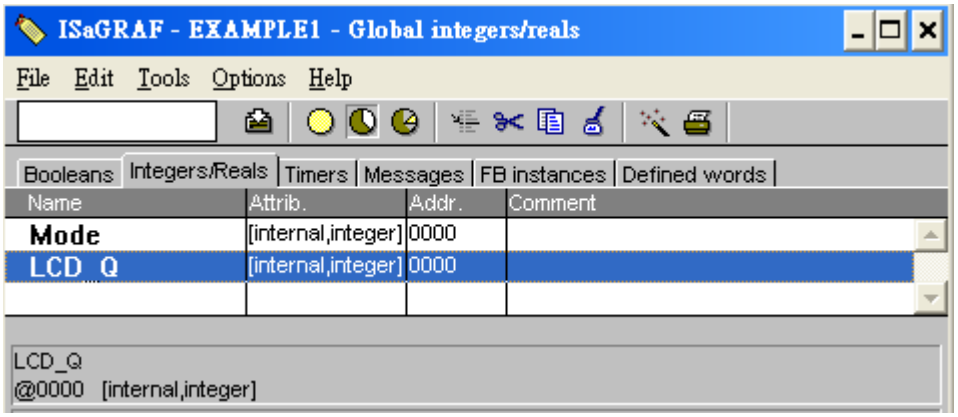
Similar to the above steps, click on the “Integers / Reals” tab in Global Setting window, and double-click the colored area to open “Integers / Reals Variable” window.



1. Enter the variable name (ex. “Mode”) in “Name” entry box.
2. Select the “Internal” as the variable attribute in “Attributes” items.
3. Enter the initial value as “1” in “Initial Value” entry box.
4. Press the “Store” button to save it. The variable has now been declared.

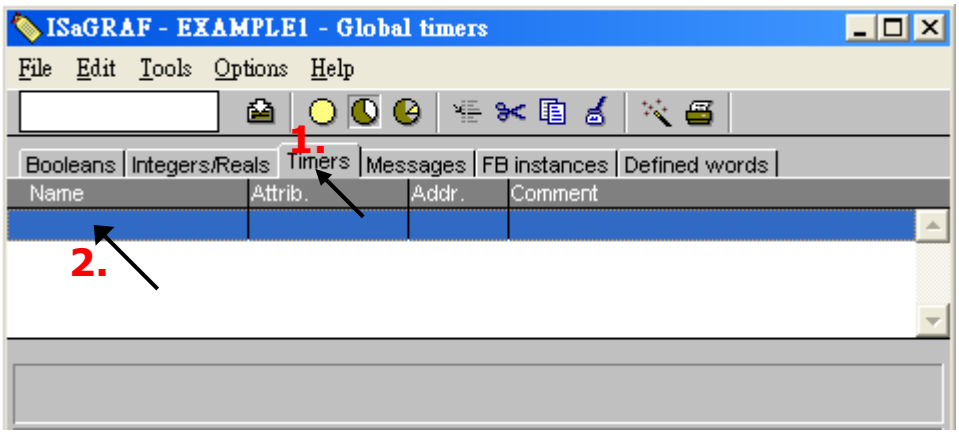


Please follow the above steps to declare the other variable – “LCD_Q” in this example. Refer to “Global integers/reals” window as below.

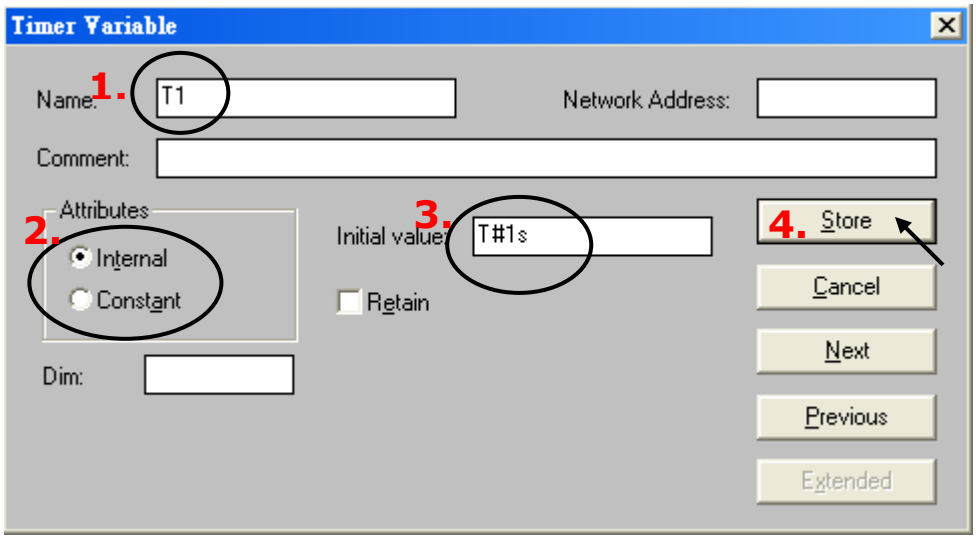


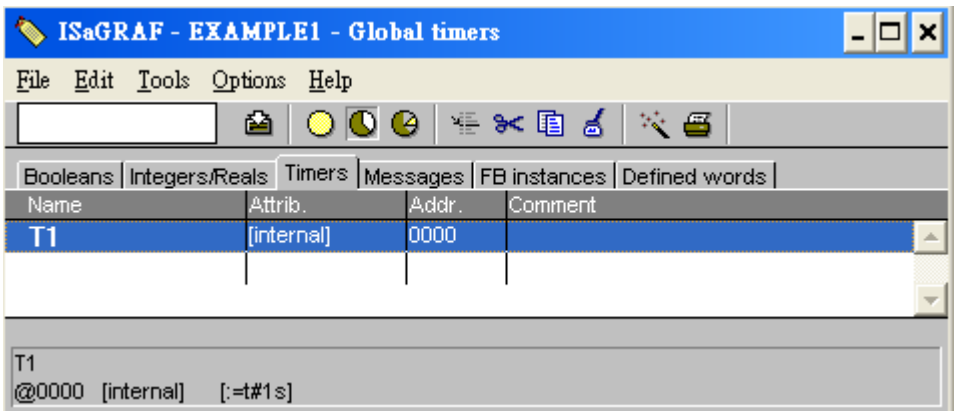
Declaring Timer

Similar to the above steps, click on the “Timers” tab in Global Setting window, and double-click the colored area to open “Timer Variable” window.



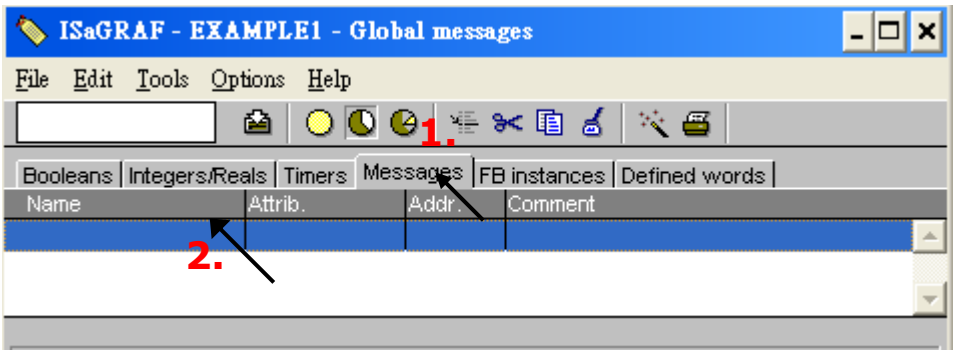
1. Enter the variable name (ex. “T1”) in “Name” entry box.
2. Select the “Internal” as the variable attribute in “Attributes” items.
3. Enter the initial value as “T#1s” in “Initial Value” entry box.
4. Press the “Store” button to save it, the variable has now been declared. Refer to “Global timers” window as below.



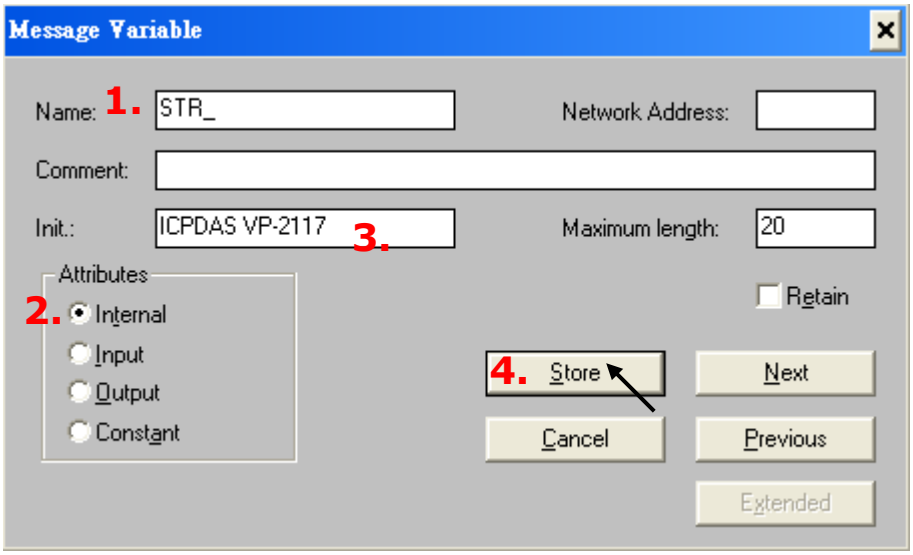


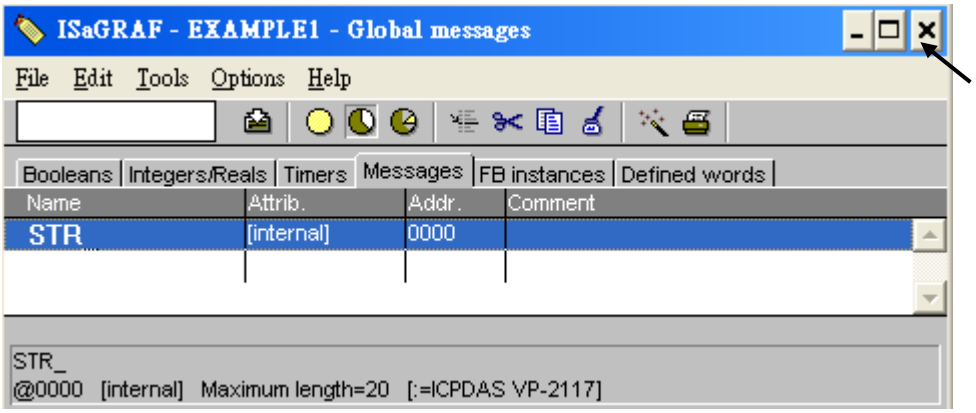
Declaring Message

Similar to the above steps, click on the “Messages” tab in Global Setting window, and double-click the colored area to open “Message Variable“ window.



1. Enter the variable name (ex. “STR_”) in “Name” entry box.
2. Select the “Internal” as the variable attribute in “Attributes” items.
3. Enter the string as “ ICPDAS VP-2117” in “Init.” entry box.
4. Press the “Store” button to save it, the variable has now been declared. Refer to “Global messages” window as below.

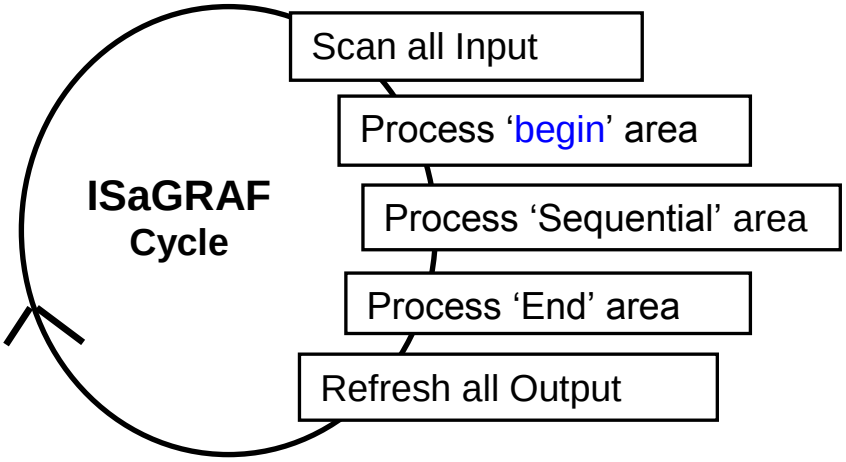




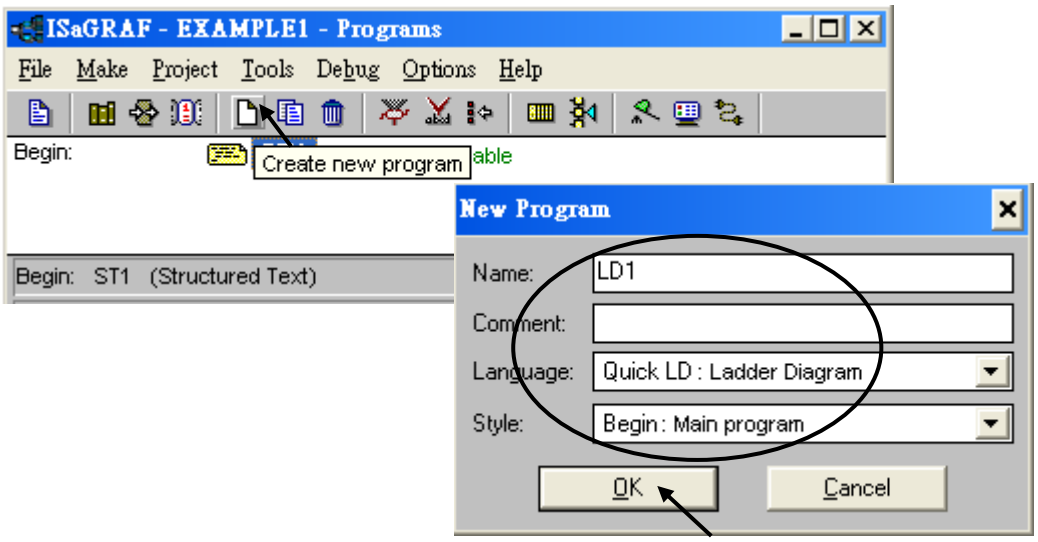
Please click the upper-right corner of the “X” to close the “Global messages” window.

4.1.5 Create the LD - “LD1” Program

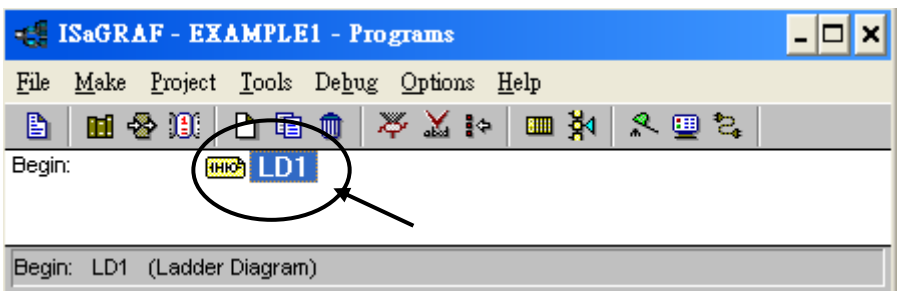
ISaGRAF will run every program one time in each PLC scan cycle. Programs in the “begin” area will run first, then the “Sequential” area, and last the “End” area. An ISaGRAF cycle run in the way as the below scheme.



1. Click the tool button - “Create New Program” and the “New Program” window will appear.
2. Enter the program name (ex.”LD1”) in “Name” entry box.
3. Select “Quick LD: Ladder Diagram” in “Language” drop-down menu.
4. Select “Begin: Main Program” in “Style” drop-down menu. You also can write notes in “Comment” entry box if necessary.

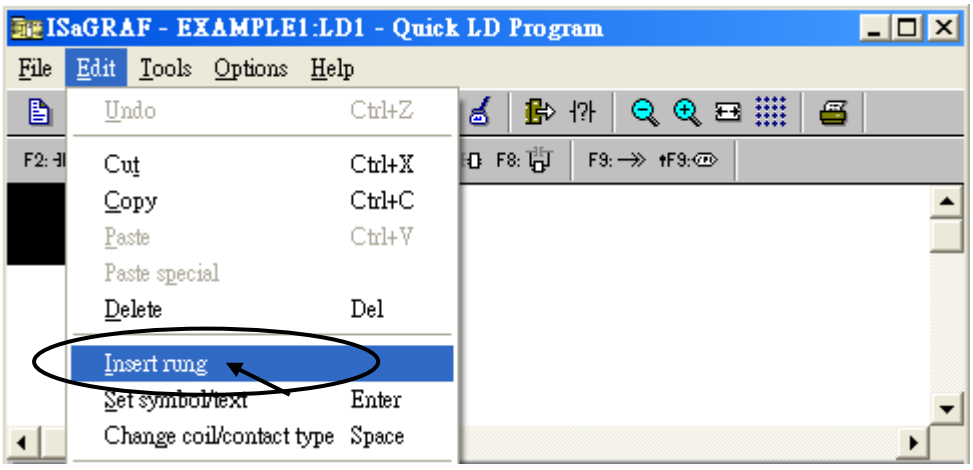


Now you have one program inside this project. Please double click on the “LD1” to get into it.

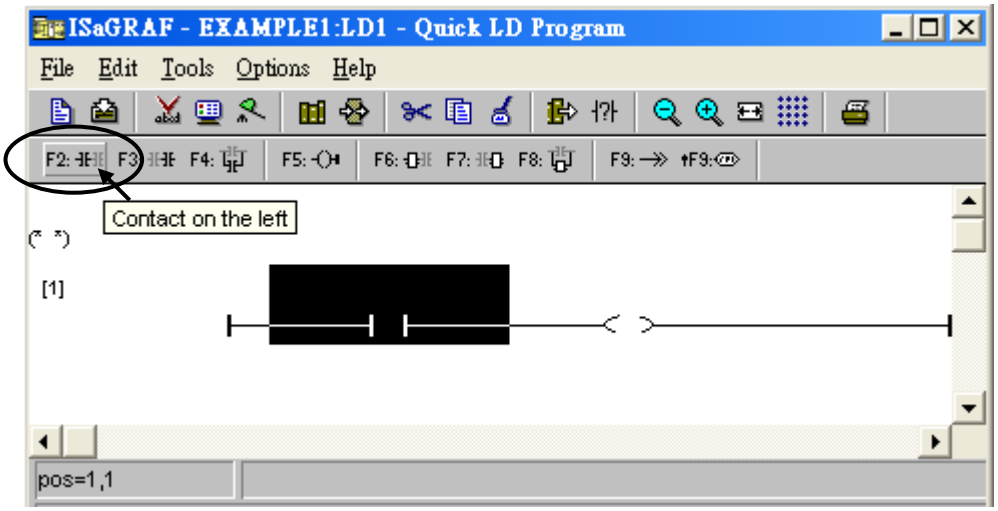


4.1.6 Edit the “LD1” Program

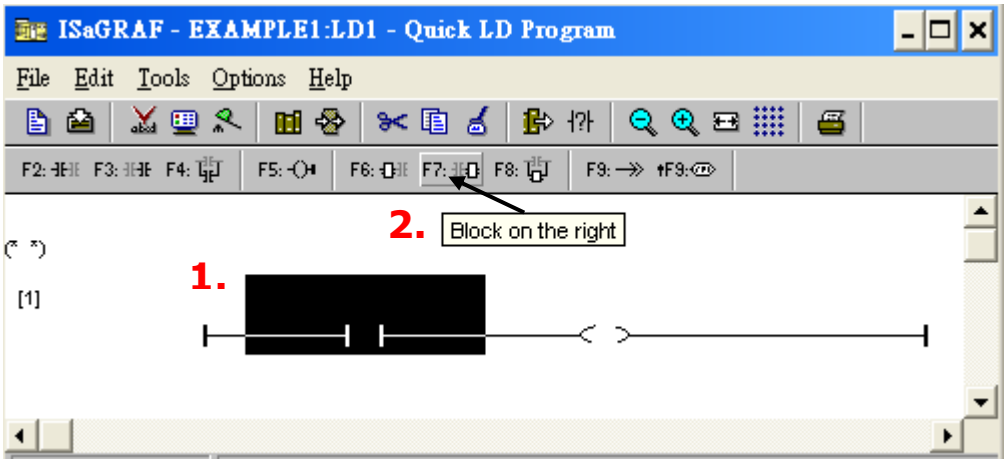
When you double click on the “LD1”, named the “Quick LD Program” window will appear. You can click on the menu bar “Edit” > “Insert Rung” , or,



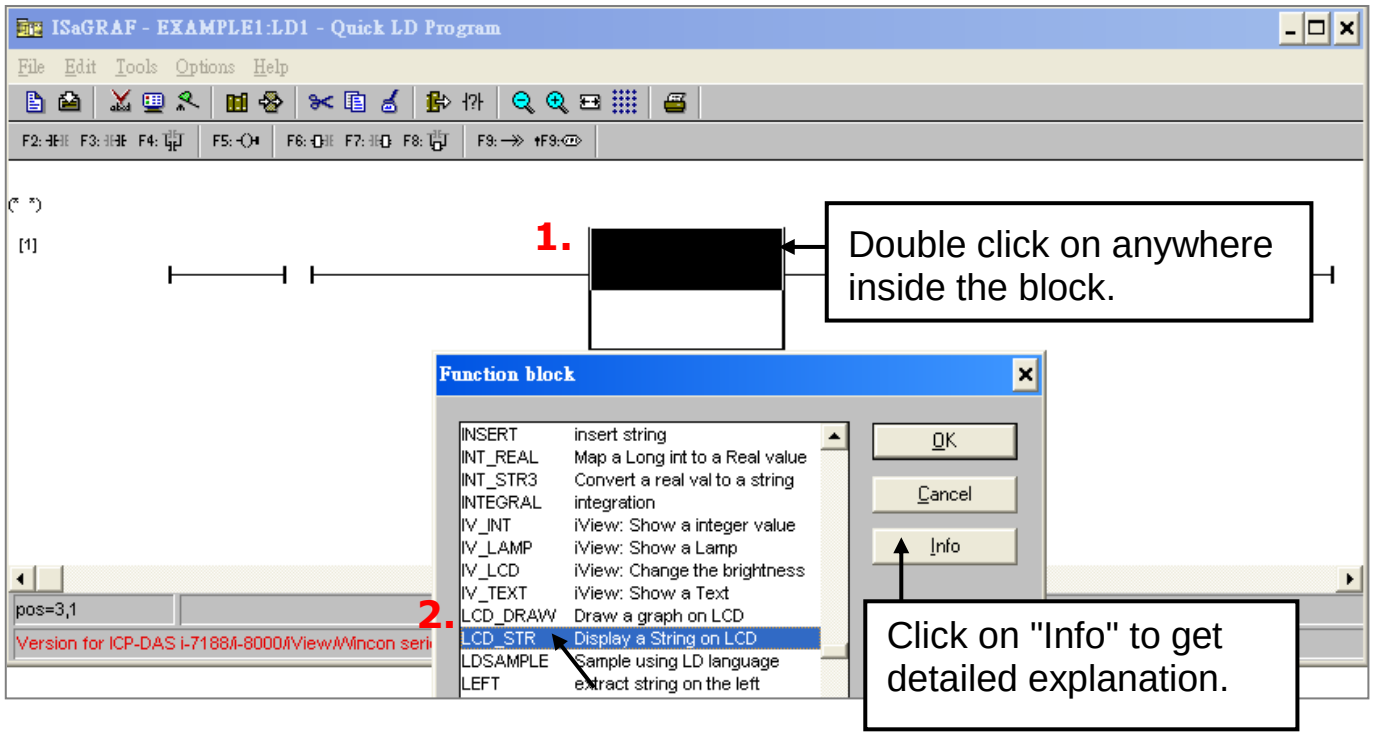
click on the tool button - “F2 (Contact On The Left) “ as below.



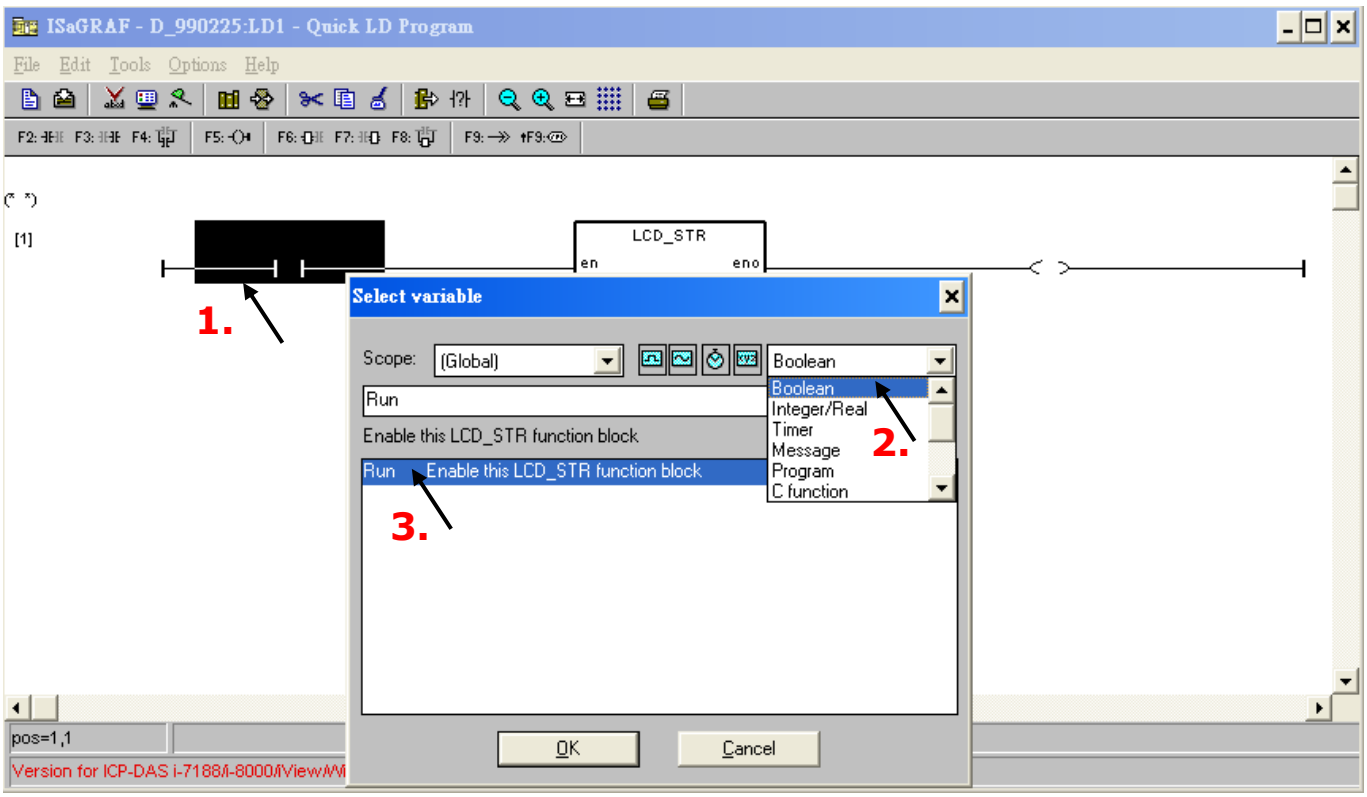
We are going to write the first line of the LD1 program. Move the cursor to the “contact” and then click on tool button - “ F7 (Block on the right)” to insert a Block to the right of “contact”.



Now we are going to assign the associated variable & constant to each item. Double click anywhere inside the block and the “Function Block” assignment window appears. Select the “LCD_STR” type function block, and then click “OK”. You can click on the “Info” button for a detailed explanation of its functionality.

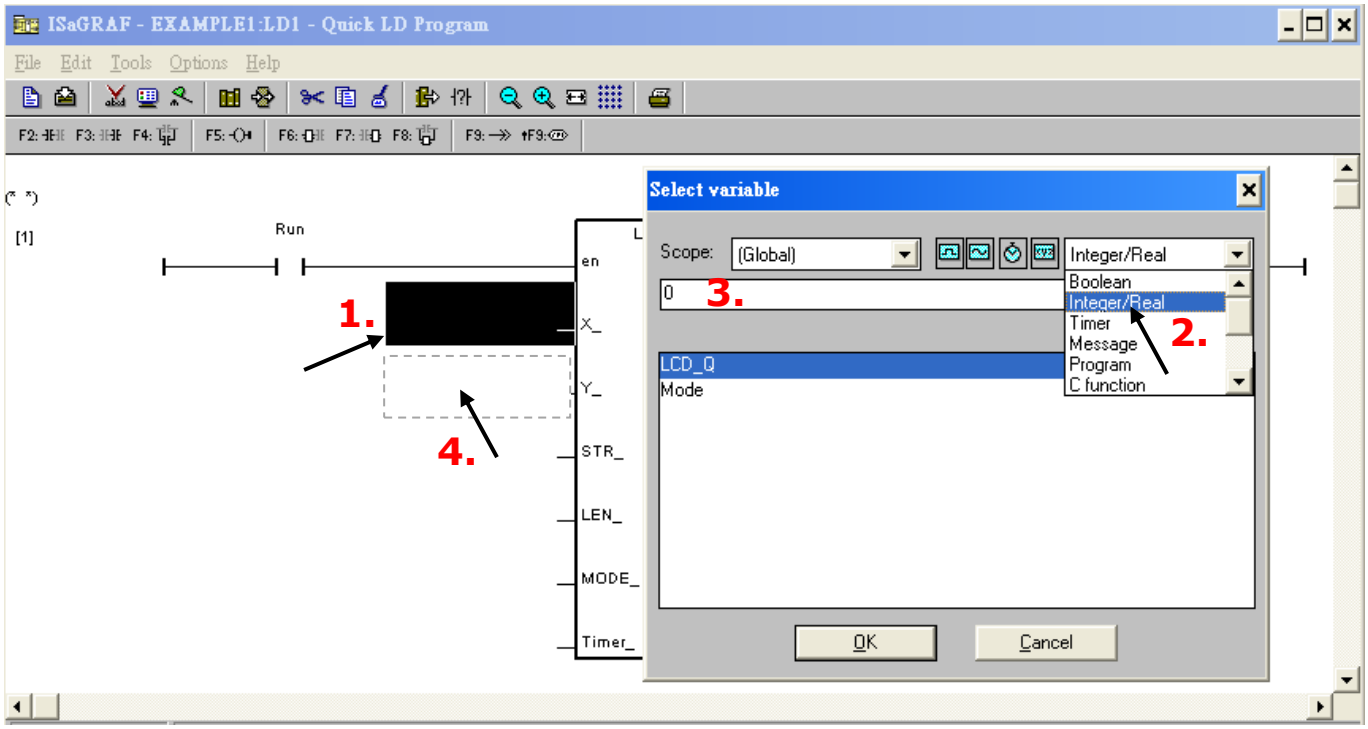


Double-click the “Contact” and select “Boolean” in upper right corner of the “Select variable” window, and then double-click on “Run” to assign it as the variable of “Contact”.

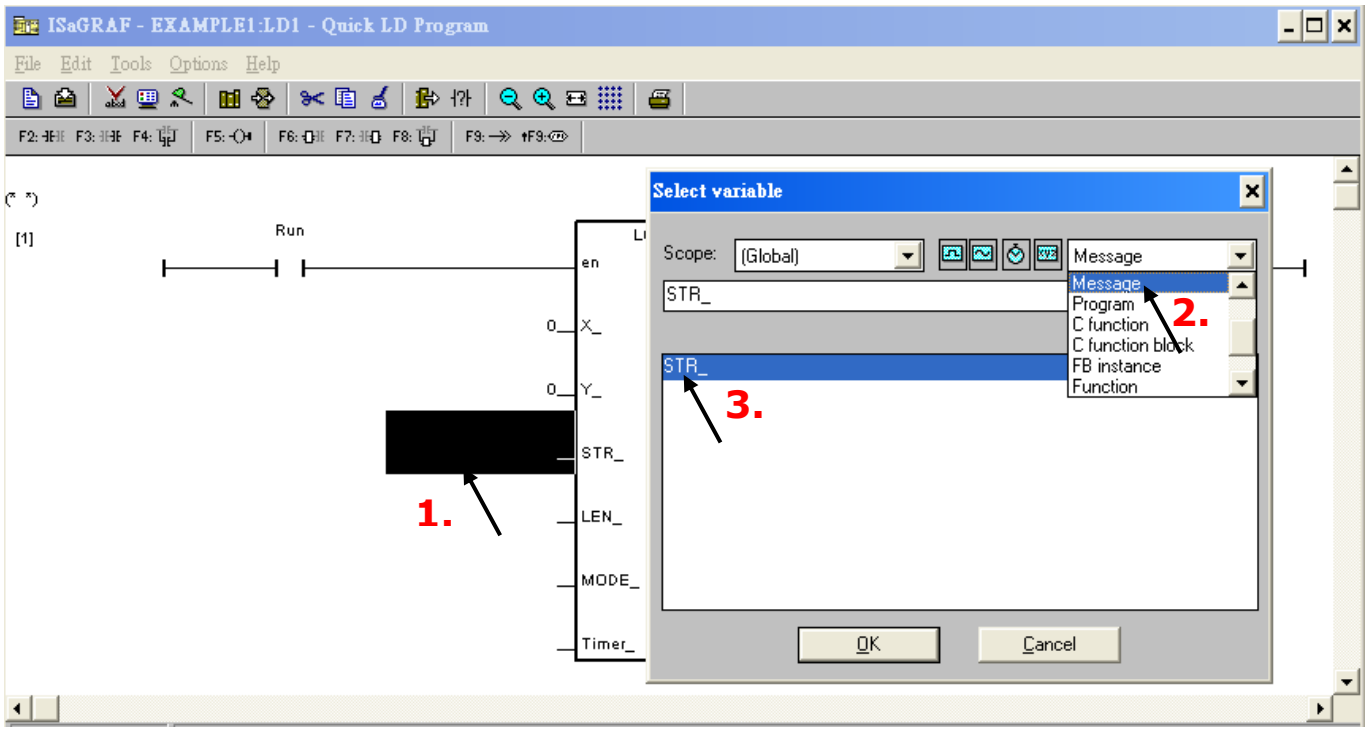


As below figure, double-click the left side of “X_” and “Y_” parameters to open “Select variable” window. The “X_” and “Y_” indicates the location of String in LCD. “X_” means the location of column (range:0 ~15), “Y_” means the location of row

(range:0 ~ 3). These two parameters must be constant pattern. When you select the “Integer/Real”, you can see the name of string variable. In this example, “X_” and “Y_” must be set as constant, please enter “0” as the value of location.

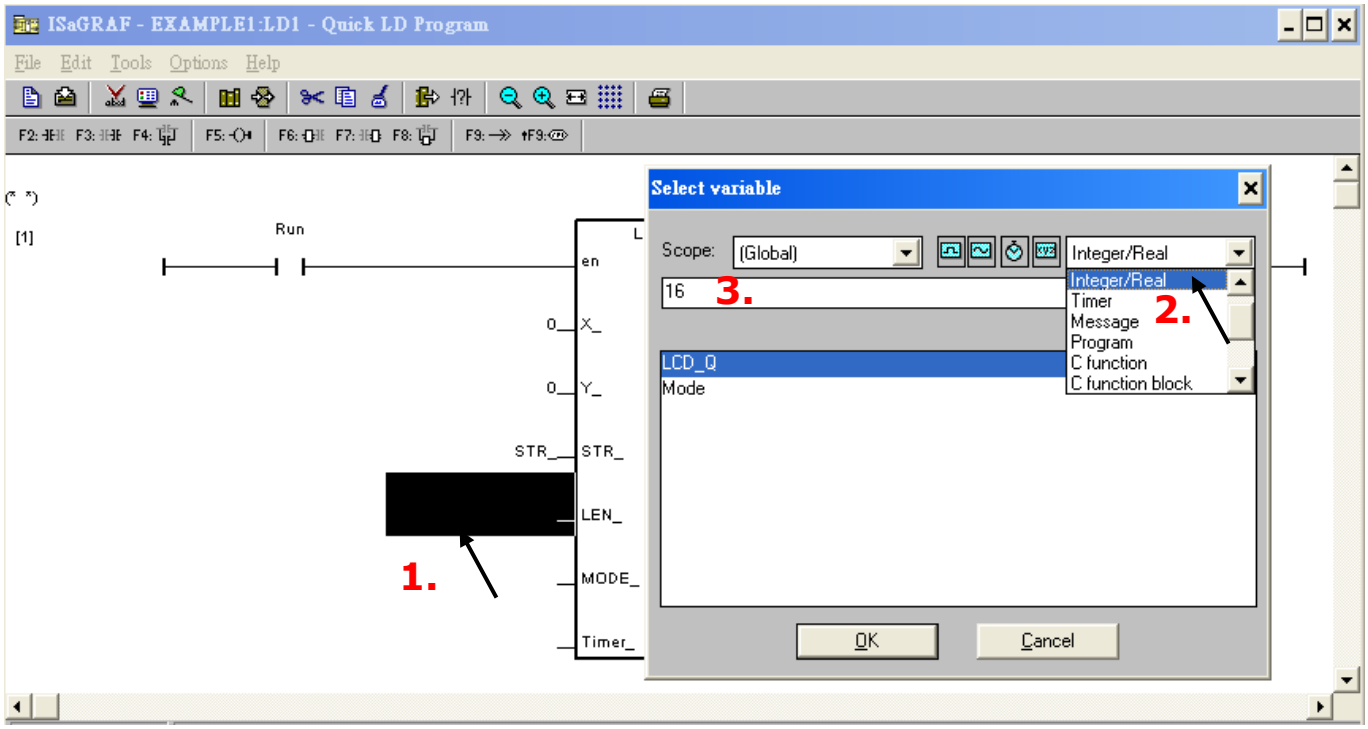


As below figure, double-click the left side of “STR_” to open the “Select variable” window. When you select the “Message”, you can see the name of string variable. Double-click the “STR_ “ to assign it.



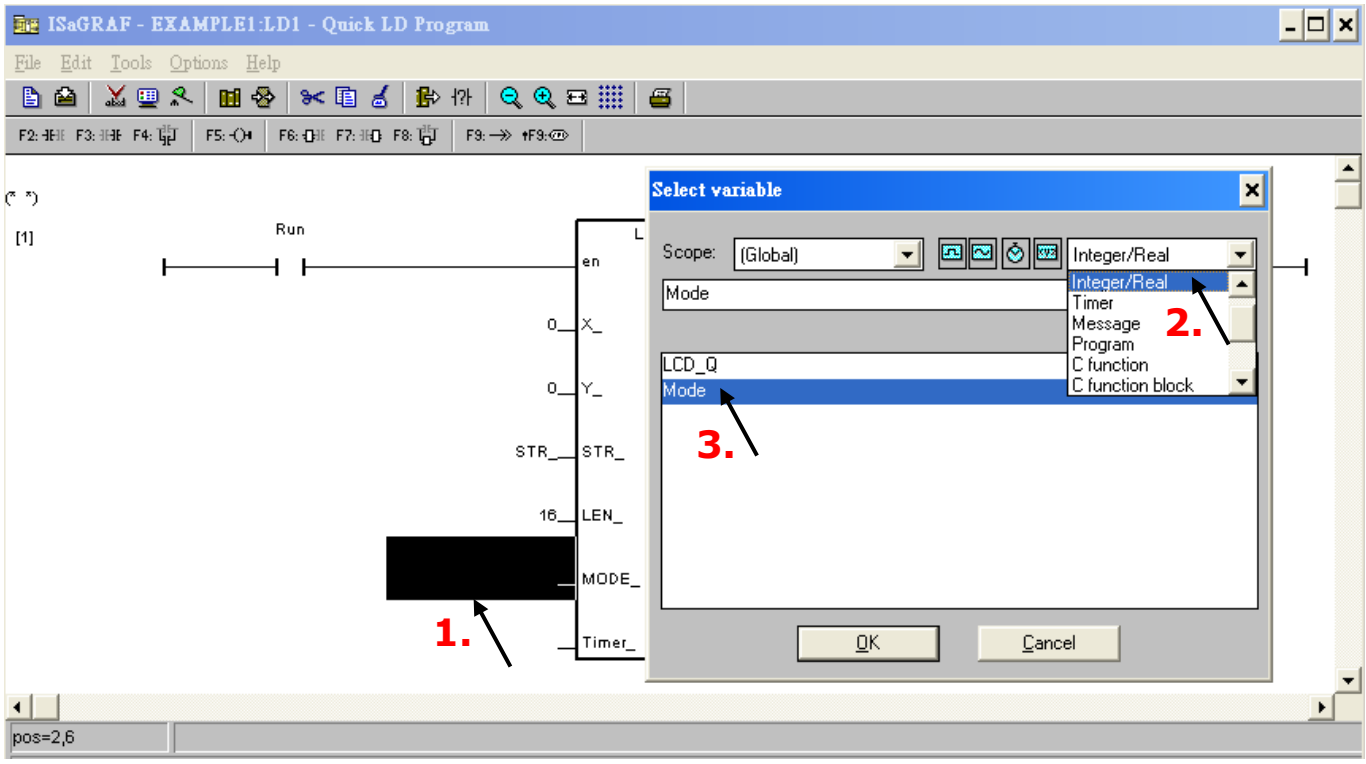
As below figure, double-click the left side of “LEN_” to open the “Select variable” window. “LEN_ “ indicates the length of String (range: 1 ~ 64) and it must be constant pattern.

When you select the “Integer/Real”, you can see the name of string variable. In this example, “LEN_” must be set as constant, please enter “16” to assign it.



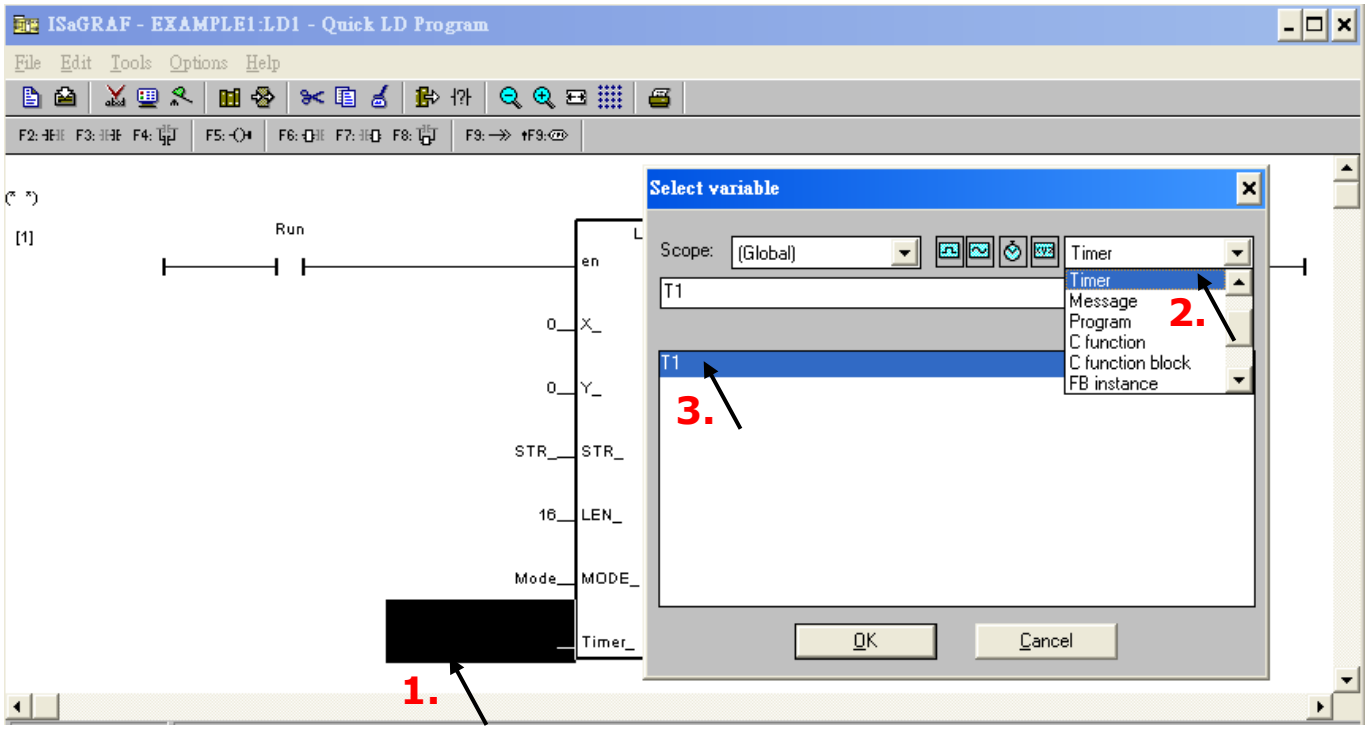
Double-click the left side of “MODE_” to open the “Select variable” window. “MODE_” indicates the display mode of String (range: 0 ~ 3). Mode 0: Do not display the string, Mode 1: Display the string, Mode 2: Highlight the string, Mode 3: Blinking the string.

When you select the “Integer/Real”, you can see the name of string variable. Double-click the “Mode” to assign it.

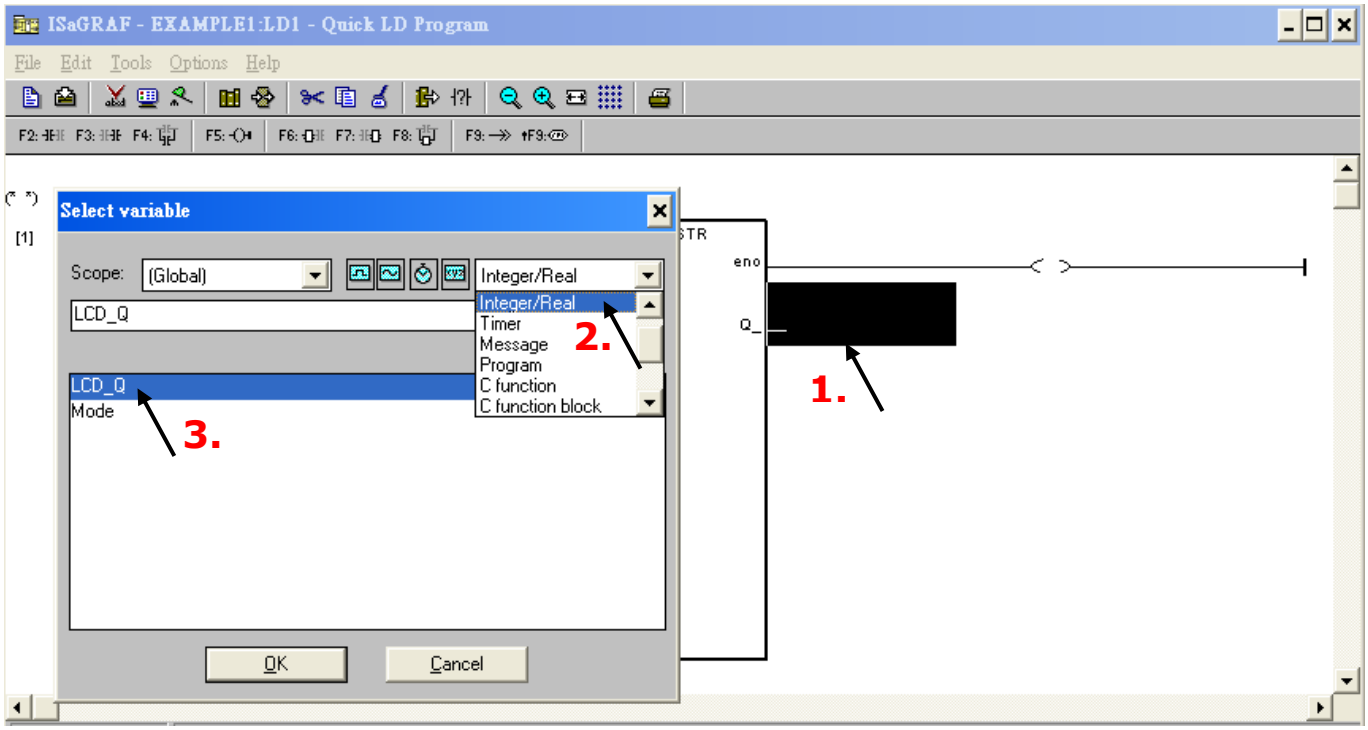


As below figure, double-click the left side of “Timer_” to open the “Select variable” window. “Timer_” indicates the cycle of blinking mode.

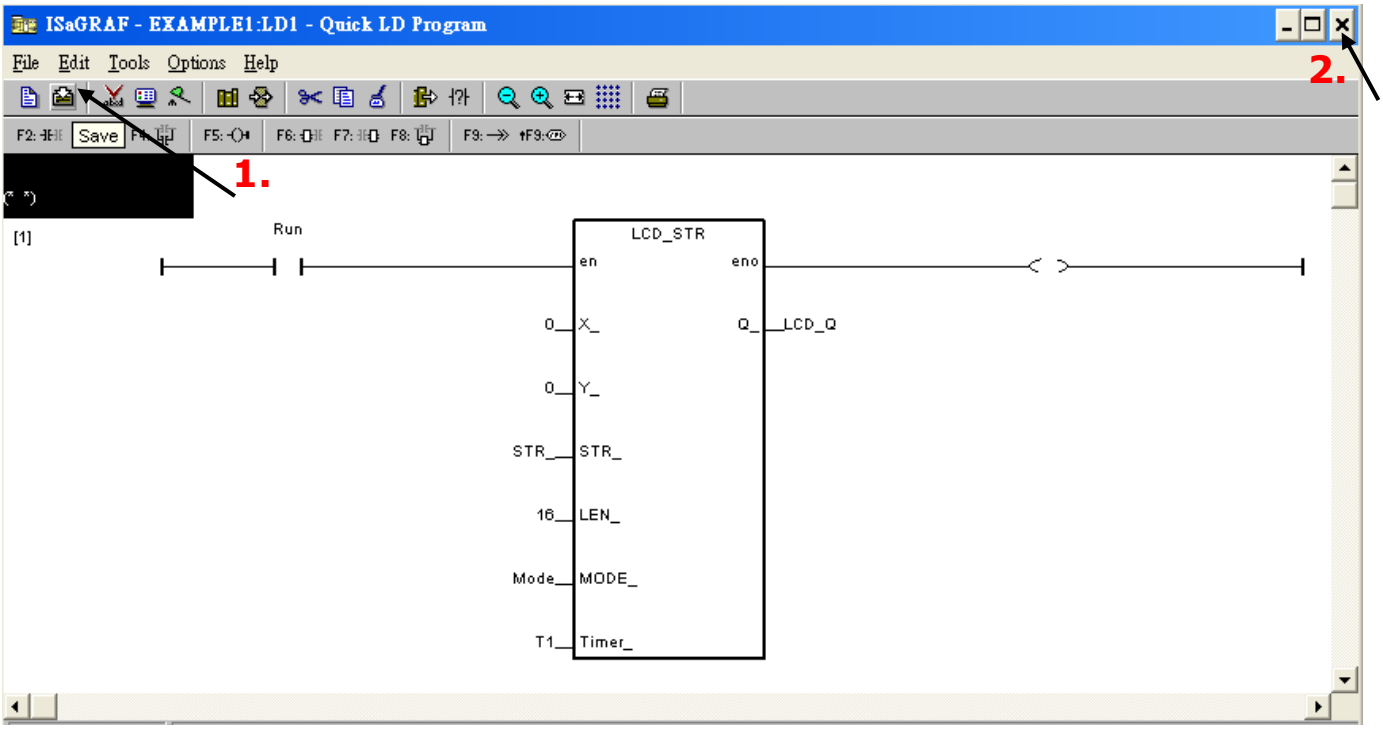
When you select the “Timer_”, you can see the name of string variable. Double-click the “T1” to assign it.



Double-click the right side of “Q_” to open the “Select variable” window. “Q_” indicates the status of “LCD_STR”.When you select the “Integer/Real”, you can see the name of string variable. Double-click the “LCD_Q” to assign it.

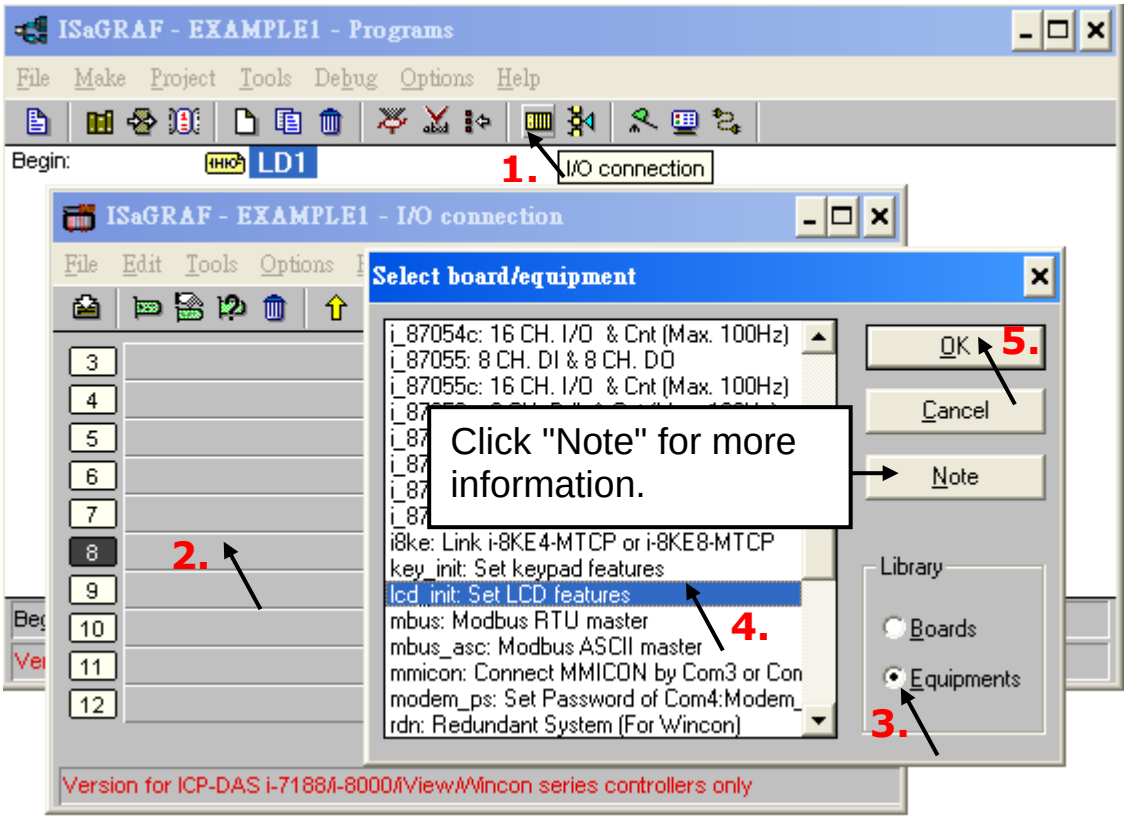


As below figure, the LD program has been completed. Click on tool button - “Save” to save the program and click “X” to exit.

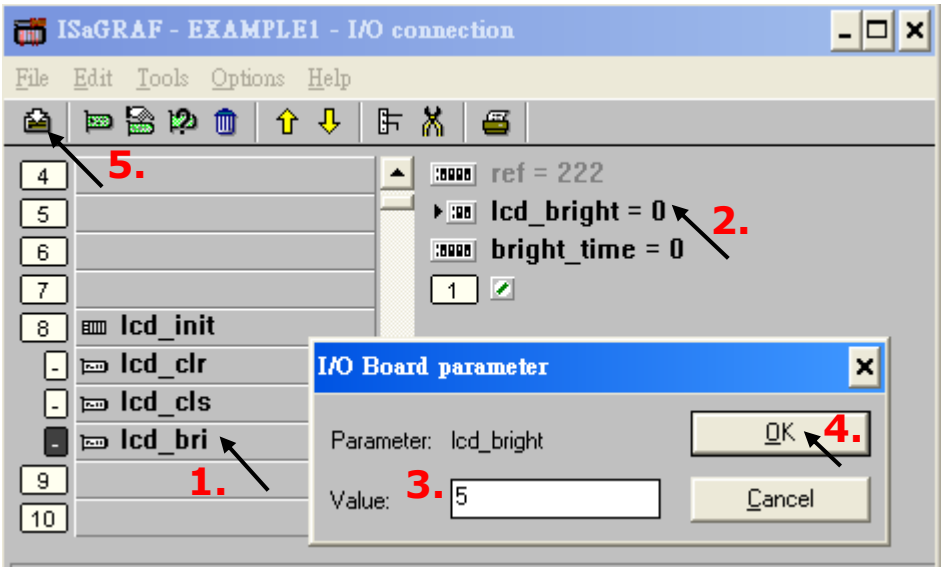


4.1.7 Connecting the I/O

Click on “I/O connection” tool button to get into “I/O connection” window. Double click on 8th slot and select “Equipments” on the lower-right corner, and then double click “lcd_init : Set LCD features”. Last, click “OK” to finish the setup.



As below figure, you can use the “lcd_init” to change the LCD backlight brightness. Click on “lcd_bri” and double-click on “lcd_bright” to setup the default brightness value (range: 0 ~ 10). Set to 0: backlight off ; Set to 10: Maximum brightness. After configuration, please click “OK” to confirm and then click “Save” to save it.



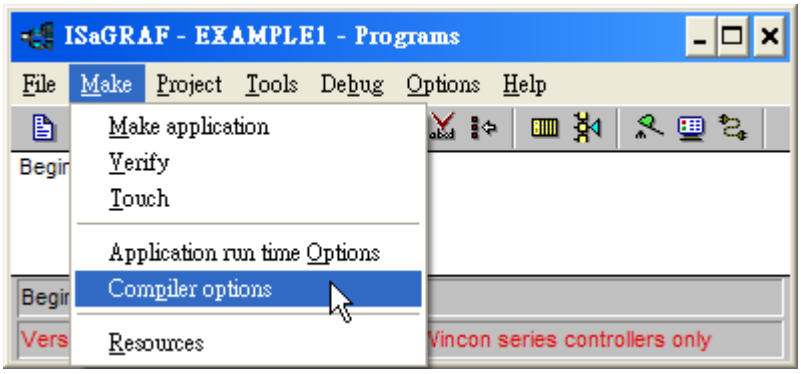
Important Notice:

1. I/O Slots 0 through 7 are reserved for REAL I/O boards that will be used in the ViewPAC. You can use slot No. 8 and above for additional functionality.

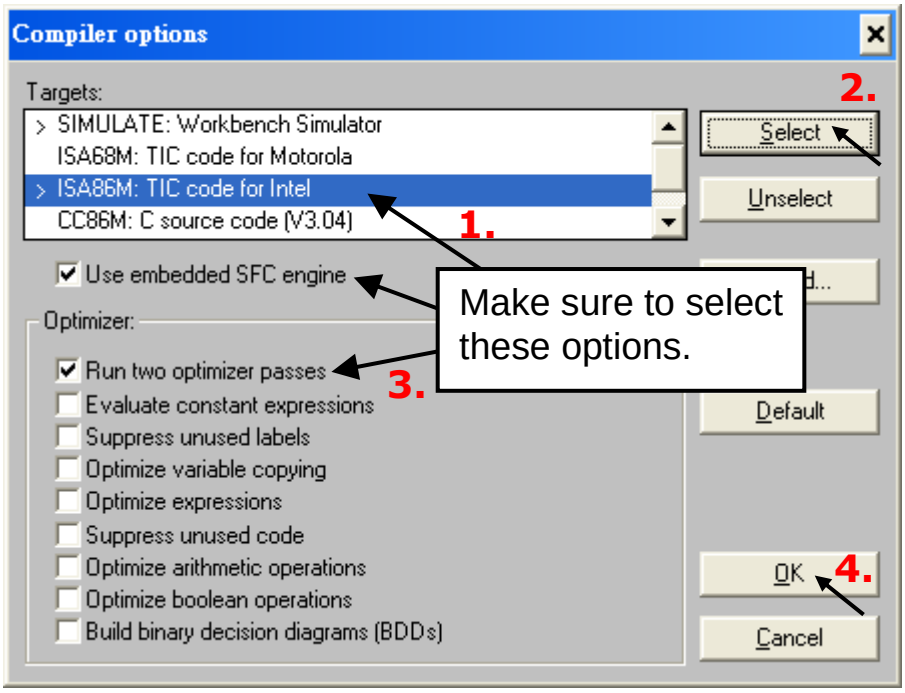
4.2 Compiling & Simulating the Example Project

For ANY AND EVERY ISaGRAF program to work properly with any of the ISaGRAF PACs (ISaGRAF µ PAC, iPAC, WinPAC, ViewPAC...) controller systems, it is the responsibility of the programmer to properly select the correct "Compiler Options". You MUST select the "ISA86M: TIC Code For Intel" option as described below.

First, click on the menu bar "Make" > "Compiler options" as shown below.

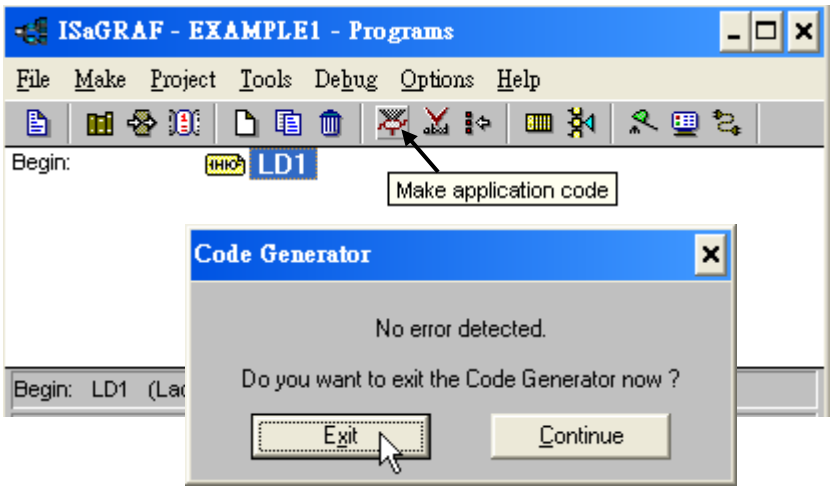


The "Compiler Options" window will now appear. Make sure to select the options as shown below then press the "OK" button to complete the compiler option selections.



Time to Compile the Project!

Now that you have selected the proper compiler options, click on the "Make Application Code" tool button to compile the example project.

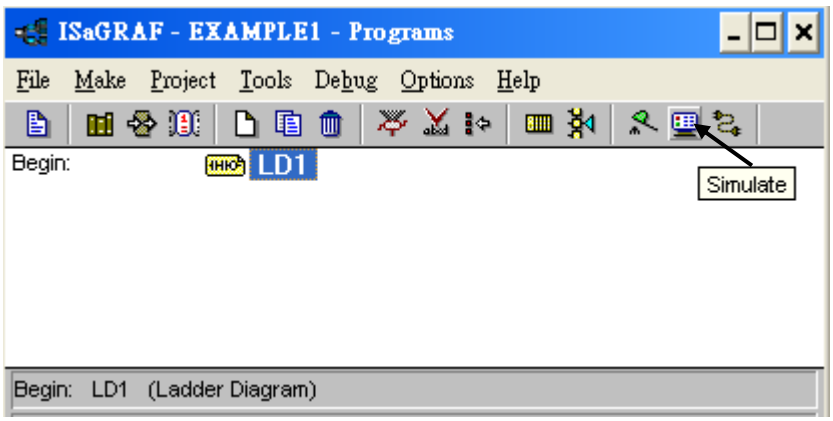


If there are no compiler errors detected during the compilation process, CONGRATULATIONS, you have successfully created the example program.

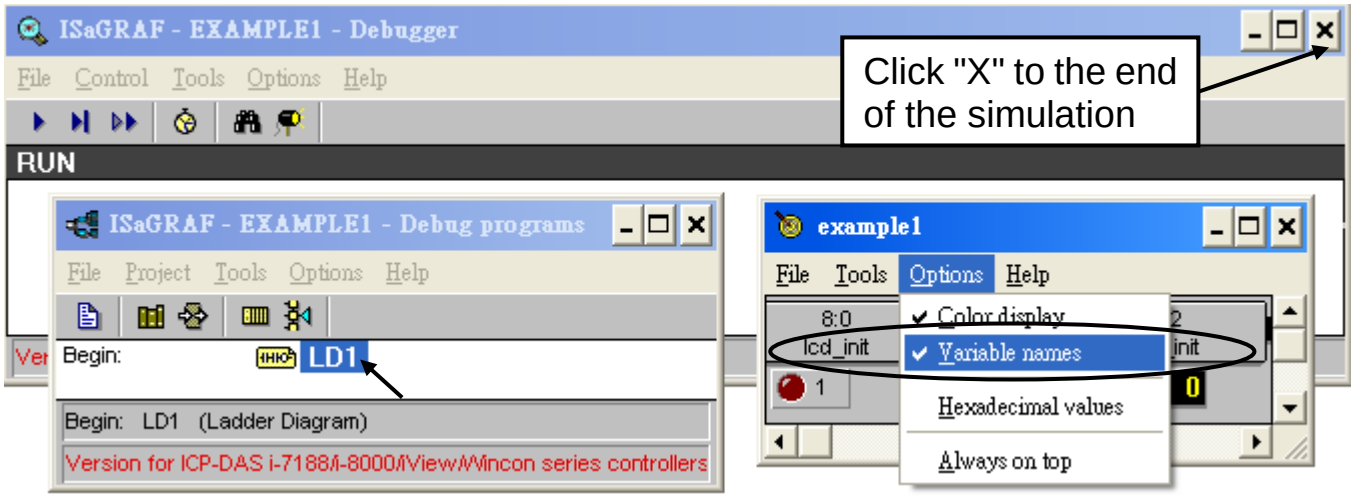
If errors are detected during the compilation process, just click on the "Continue" button to review the error messages. Return to the Project Editor and correct the errors as outlined in the error message window.

Time to Simulate the Project!

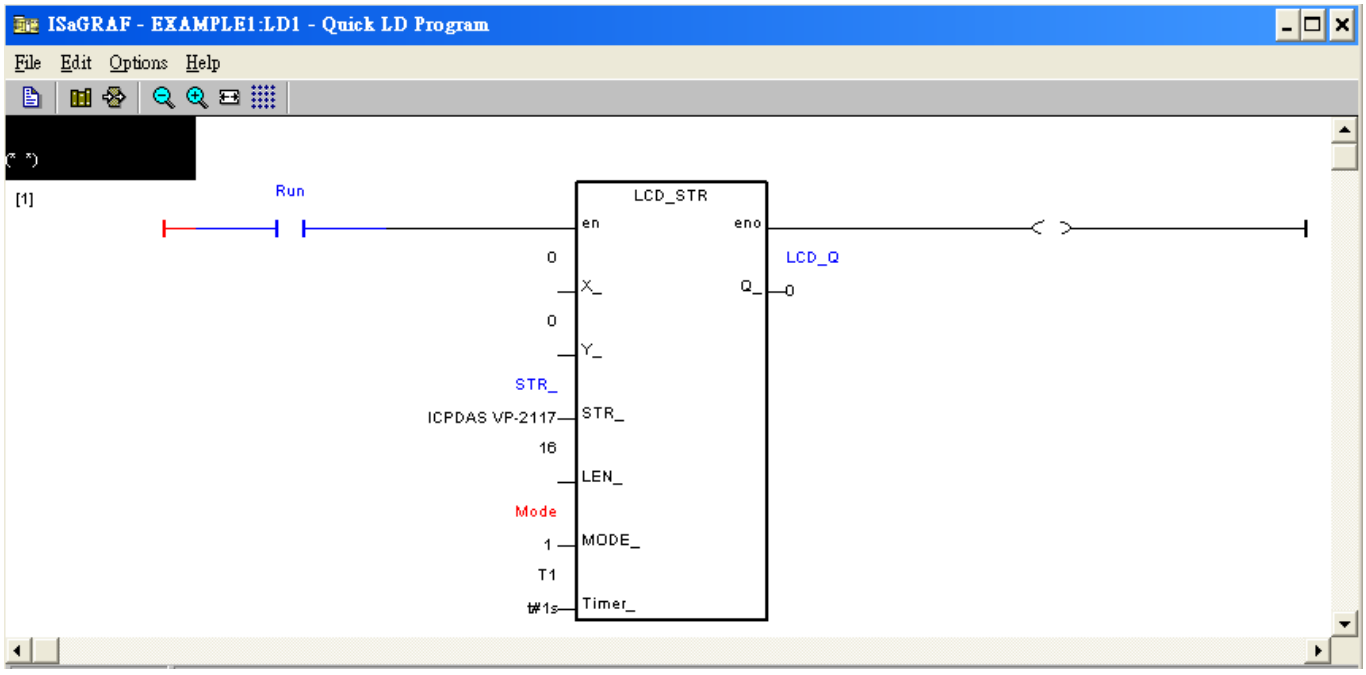
If the compilation is Ok, you may simulate the project on the PC to see how the program works without the controller. To do that, click on the "Simulate" tool button.



When you click on the “Simulate” tool button three windows will appear. The windows are the “ISaGRAF Debugger”, the “ISaGRAF Debug Programs”, and the “I/O Simulator” windows. If the I/O variable names DO NOT show on the simulator window, just click on menubar - “Options” > “Variable Names” to show the variable names



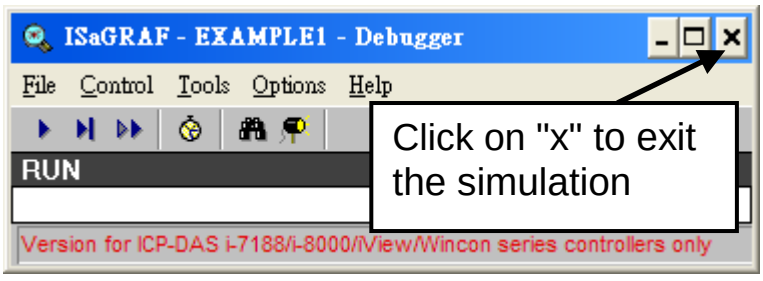
In the “ISaGRAF Debug Programs” window, double click on the “LD1” to open up the “ISaGRAF Quick LD Program” window as below and you can see the LD program you have created.



Running the Simulation Program

You can click on the variable name to change its value and status. In this example, "LCD_STR" is to show the string on the VP-2117's LCD, so the return value (LCQ_Q) in the simulation process is 0.

You can close the “Debugger” window to exit the simulation.

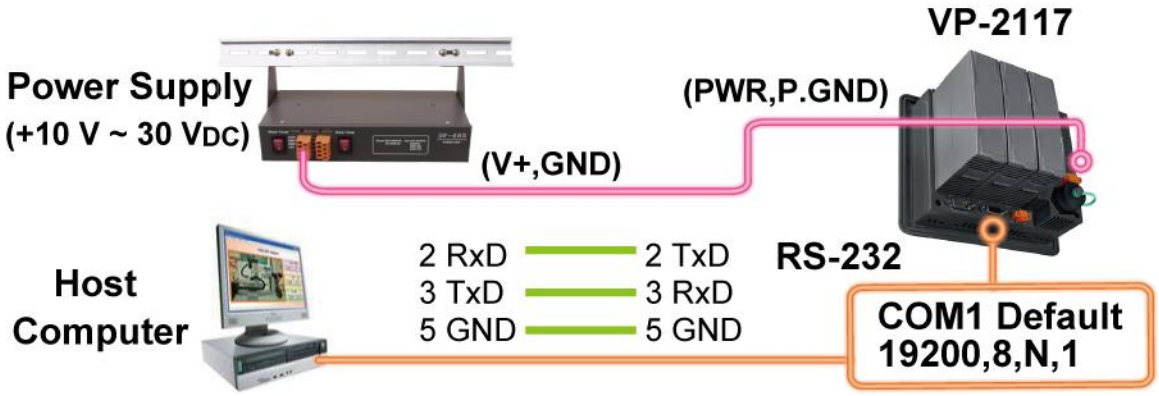


4.3 Download & Debug the Example Project

We have two ways to download the project to the VP-2117. One is using one is using RS-232 cable, the other one is using Ethernet cable (Refer to Section 3.7). Here will show you the RS-232 way.

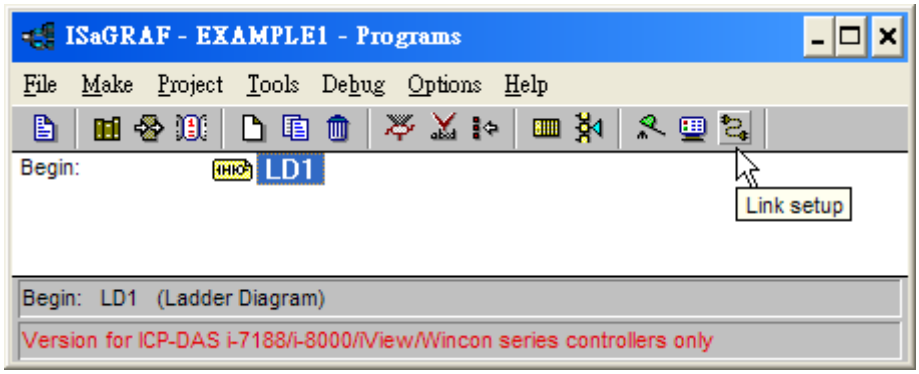
Wiring the Hardware

To begin this process, please install the hardware as below. The RS-232 cable wiring should be as below figure.

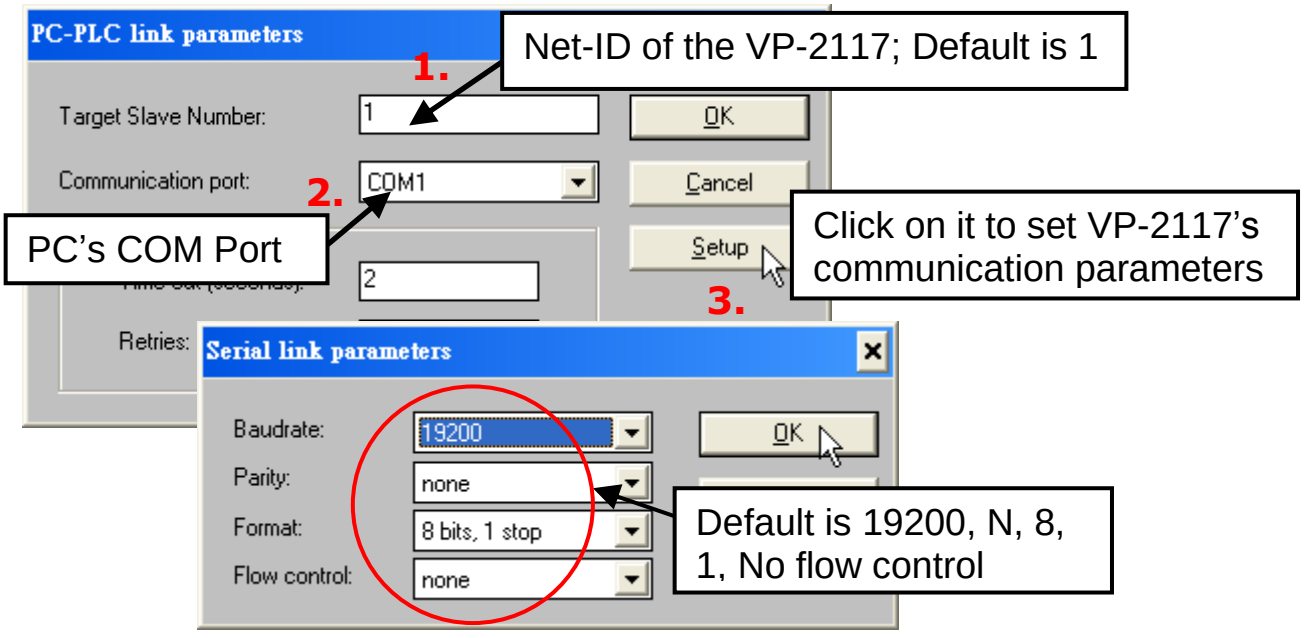


Setup Link Parameters

Click on “Link setup” tool button in the “ISaGRAF Programs” window.



Follow the figure below, set the proper values.

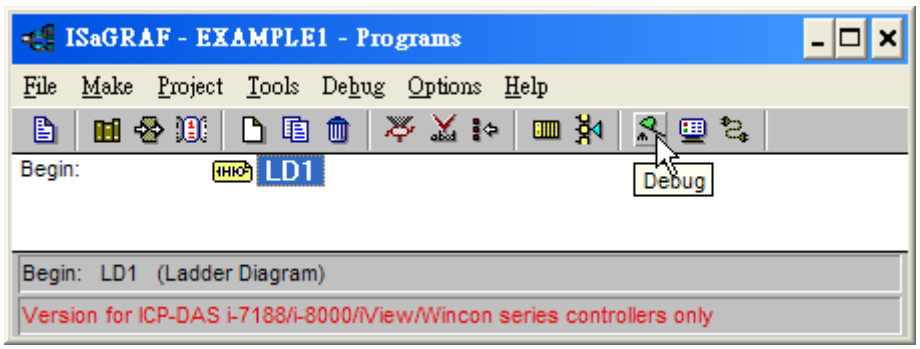


Both the VP-2117 PAC and the development PC **MUST** be set to the same serial communication parameters. The default parameters for COM1 (RS-232) port are:

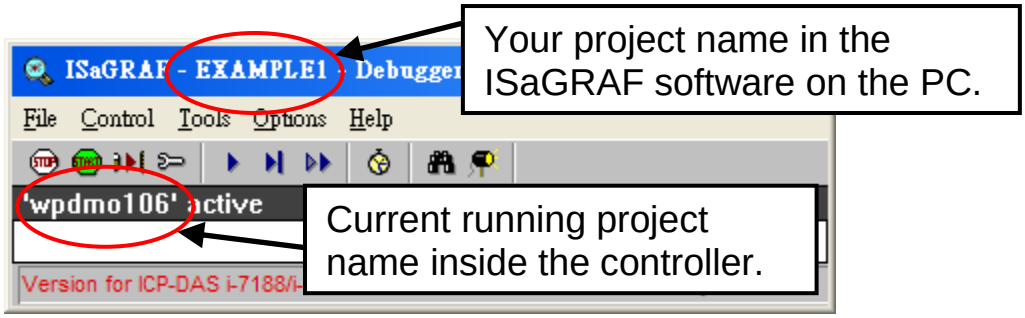
Baudrate:	19200
Parity:	none
Format:	8 bits, 1 stop
Flow control:	none

Downloading the Example Project

Before you can download the project to the controller system, you must first verify that your development PC and the controller system are communicating with each other. To verify proper communication, click on the “Debug” icon in the “ISaGRAF Programs” window as shown below.

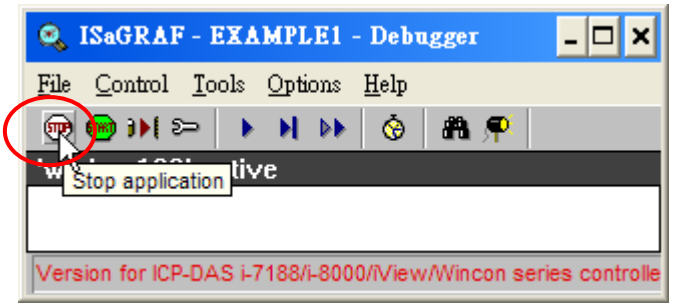


If the development PC and the VP-2117 controller system are communicating properly with each other, the following window displayed below will appear. If there is a previous program running in the VP-2117 PAC , the project name and the word "active" will show on the screen).



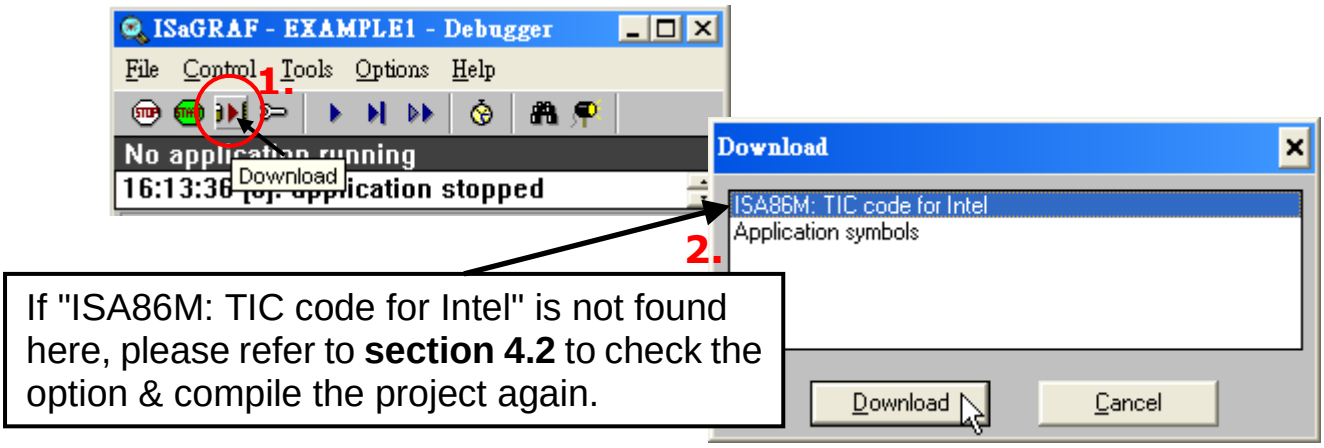
If the message in the “ISaGRAF Debugger” says “Disconnected”, it means that the development PC and the controller system have not established communications with each other. The most common causes for this problem is either the serial port cable not being properly configured, or the development PC’s serial port communications DO NOT match that of the VP-2117 controller system.

You may have to either change the serial port communication settings for the development PC (which may require changing a BIOS setting) or change the “Serial Link Parameters” in the ISaGRAF program. If there is a previous program running in the VP-2117 PAC, you will need to stop that project before you can download the example project. Click on the “Stop application” tool button as illustrated below to halt any applications that may be running.

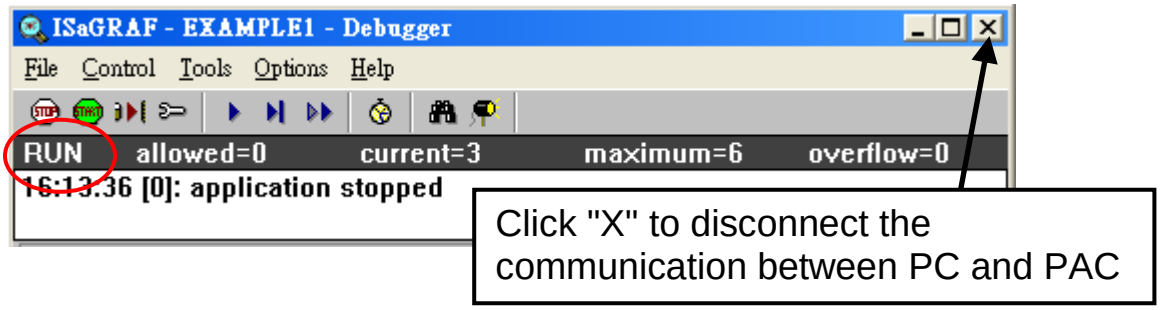


Starting the Downloading Process

Click on the “Download” tool button from the “ISaGRAF Debugger” window. Then click on “ISA86M: TIC Code For Intel” and click “Download” as shown below.



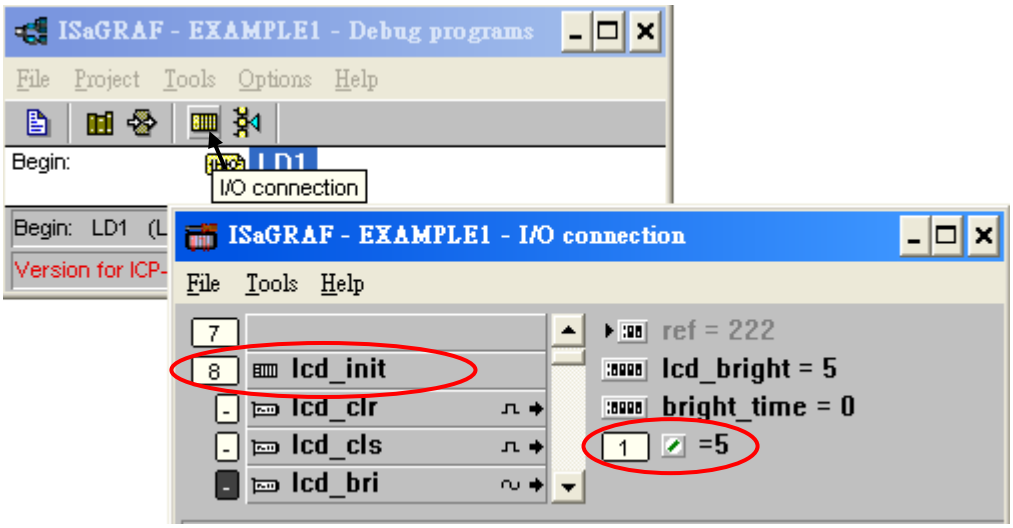
If the project downloading is successful, the following window will appear.



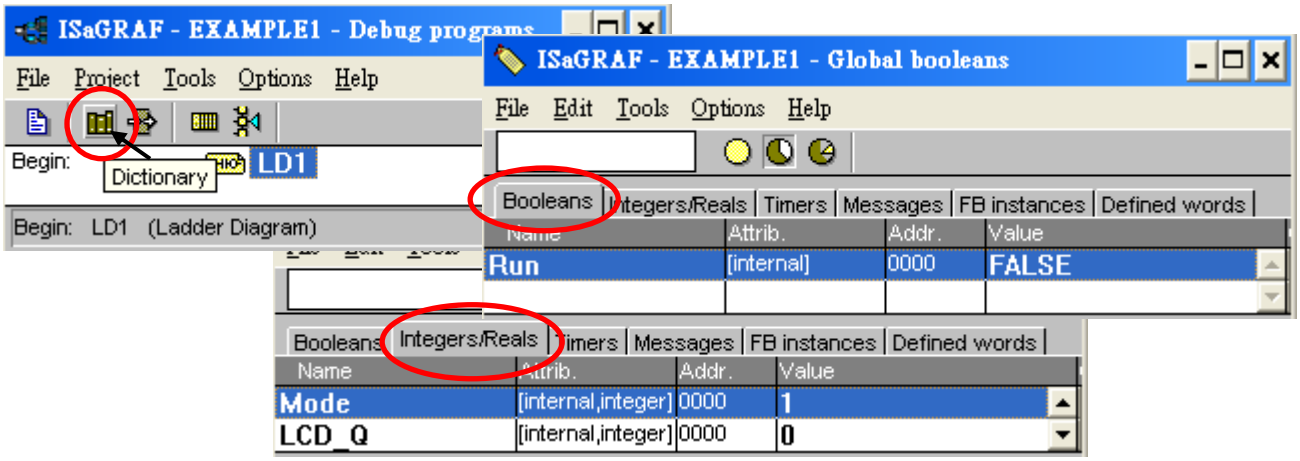
Running the Example LD Program

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

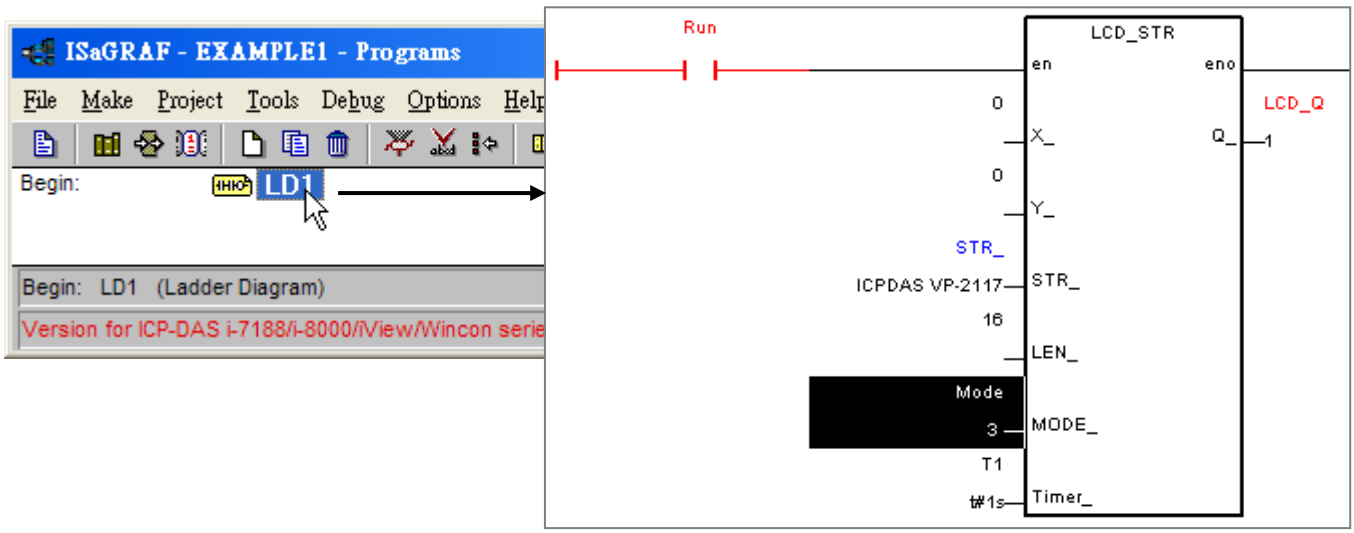
As below, click on the “I/O Connections” icon in the “ISaGRAF - Debug programs” window to open the “I/O Connections” screen. In the “lcd_init” I/O board, you may change the “lcd_bri” status (0 - 10) to control the LCD backlight brightness.



You may also click on “Dictionary” to see the real time variable state.



Another VERY helpful window you can open is the “Quick LD Program” window. From this window you can observe the LD program being executed in real time.



Appendix

A. ISaGRAF User Manual & Demo Program & FAQ

The related ISaGRAF manuals and demo programs are all in your VP-2117 CD. You can also follow the steps below to view the latest information and FAQ in ISaGRAF website.

A.1 The Download Page for ISaGRAF Resource

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

Manual:

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

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

Demo Files:

4. Click the "Demo Files" icon to download the ISaGRAF demo program. You can download all the files in CD or FTP:
   VP-2117 CD-ROM: \napdos\ISaGRAF\vp2k\demo or
   ftp://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/isagraf/vp2k/demo/

FAQ

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

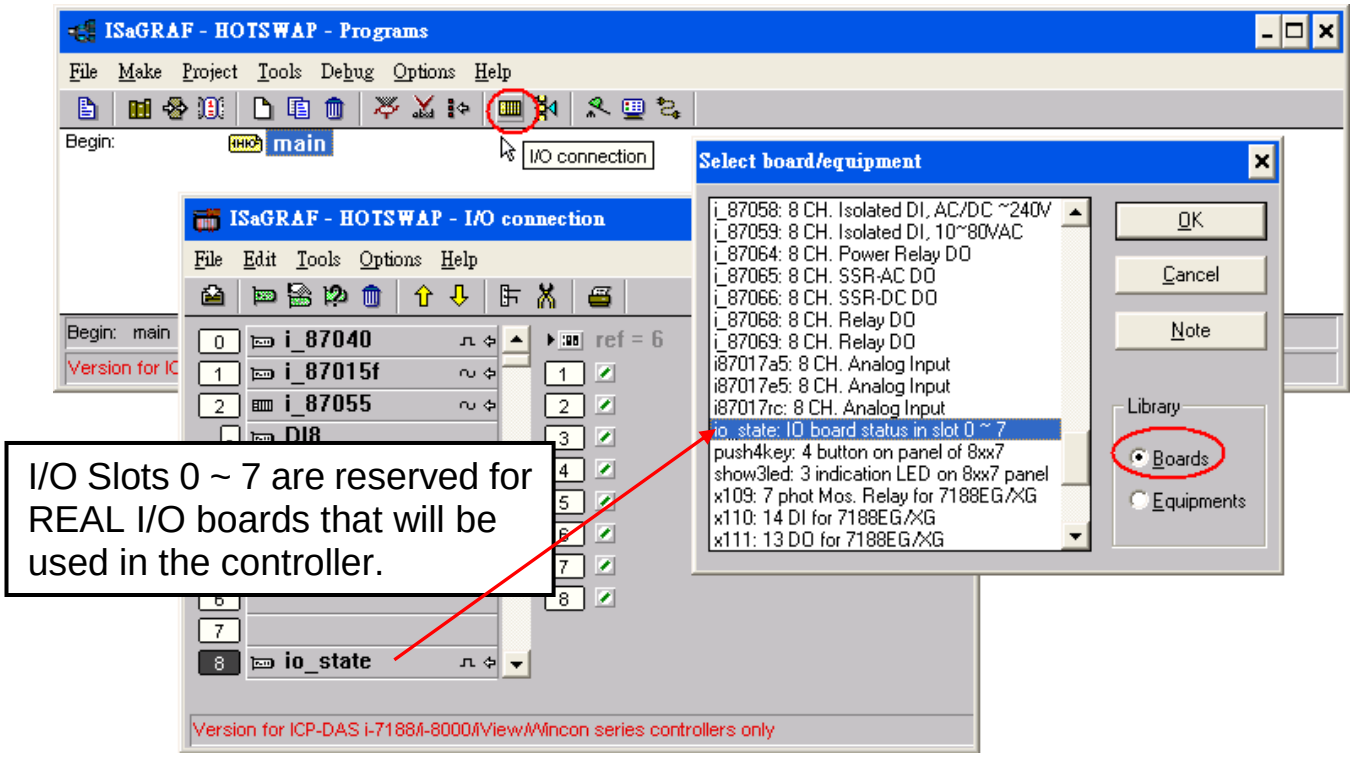
A.2 Using Modbus TCP/IP protocol to control ISaGRAF controllers with VB?

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

2. VB 6.0 Demo program using Modbus TCP/IP protocol to control ISaGRAF controllers. Please refer to below website:
   www.icpdas.com > FAQ > Software > ISaGRAF Ver.3 (English) - 052

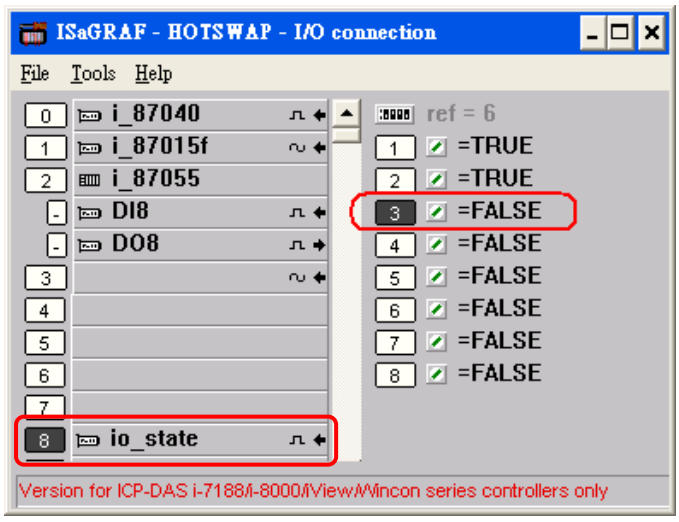
B. How to Detect the Status of “Hot Swap” for I-87K

By using I-87K (High Profiles) modules, VP-2117 can support “Hot Swap” function. This feature allows users to plug or unplug modules without shutting down the power. And you could check current I/O status by ISaGRAF Workbench. First click the “I/O connection” icon to bring up the window; you should connect the I/O boards on Slot 0 ~2 which you want to use and then double click any blank item (after #8 preferred), As diagram below, please select “io_state” in the “Select board/equipment” window to add it to the list and click OK.



Now, “io_state” will display the operating status of modules on slot 0 ~ 7.

If the I/O card is functioning normally, a message “True” will be displayed. If there is something wrong or no I/O card currently in use, a message “False” will be displayed. Show as below :



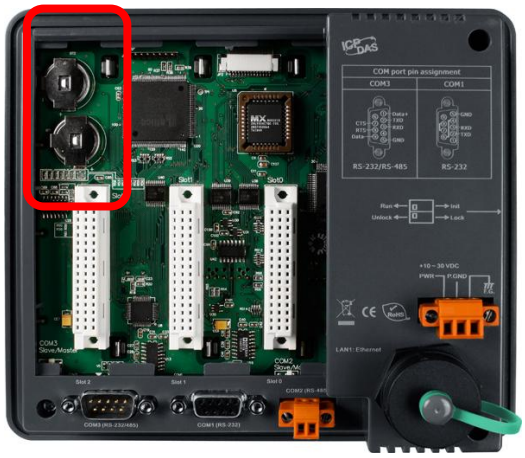
When you plug an I-87K (High Profile) I/O module, if it is not functioning normally, an error message will be immediately displayed on the front panel (S-MMI). Messages for I-87K operating status are shown as below:

-Sn-: indicates the I-87K (High Profile) module is functioning normally,
n (0 ~ 7) corresponds to the slot # 0 ~ 7

Sn-Er: indicates the I-87K (High Profile) module is not functioning normally,
n (0 ~ 7) corresponds to the slot # 0 ~ 7

C. How to Detect the Status of Dual Battery

Attention: Please power off your VP-2117 before replacing the battery; it may cause permanent damage if the battery accidently touches other metal electronic parts.



VP-2117 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.)**

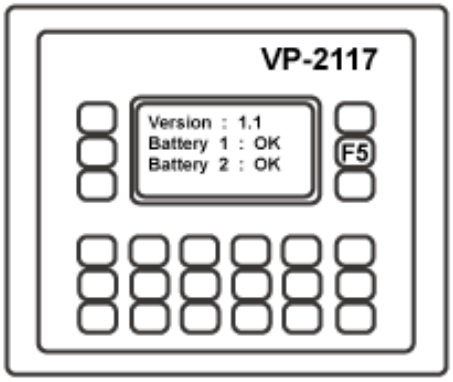
There are two ways to retrieve Dual battery power status on VP-2117:

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

① Power off your VP-2117

② Press and hold the “F5” button on the front panel and then power on your VP-2117 (keep on pressing and holding the F5 button when you power on your controller)

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



“-BA1.- “ , “-BA2.- “: indicates Full power status; it does not require immediate battery replacement.

“BA1.Er”, “BA2.Er”: indicates Low power status; please replace the battery as soon as possible.

B. Query the power status when the system is running

You can query the battery power status through SCADA/HMI by Modbus protocol at No. = 9992 & 9993. Modbus 9992: query the power status of Battery 1 ; Modbus 9993: query the power status of Battery 2.

Status “99”: indicates Full power status; it does not require immediate battery replacement ; Status “0”: indicates Low power status; please replace the battery as soon as possible.

D. 10-ch Thermocouple Input Module

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

D-1: I-7018Z

D-2: 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 ±15mV to ±2.5V. The current input ranges can be 4 to 20mA, 0 to 20mA, and ± 20mA.
3. Up to 10 analog inputs of different types can connected to one module.
4. Up to 240 V_{rms} over voltage protection is provided.
5. It features per-channel open wire detection for thermocouple and 4 to 20mA inputs

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

E. RU-87P1/2/4/8

Introduction

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

RU-87Pn is designed to be used in harsh and noisy environment, so the hardware is manufactured with wide power input range (10 ~ 30 VDC) and operating temperature (-25 ~ +75 ℃). 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.

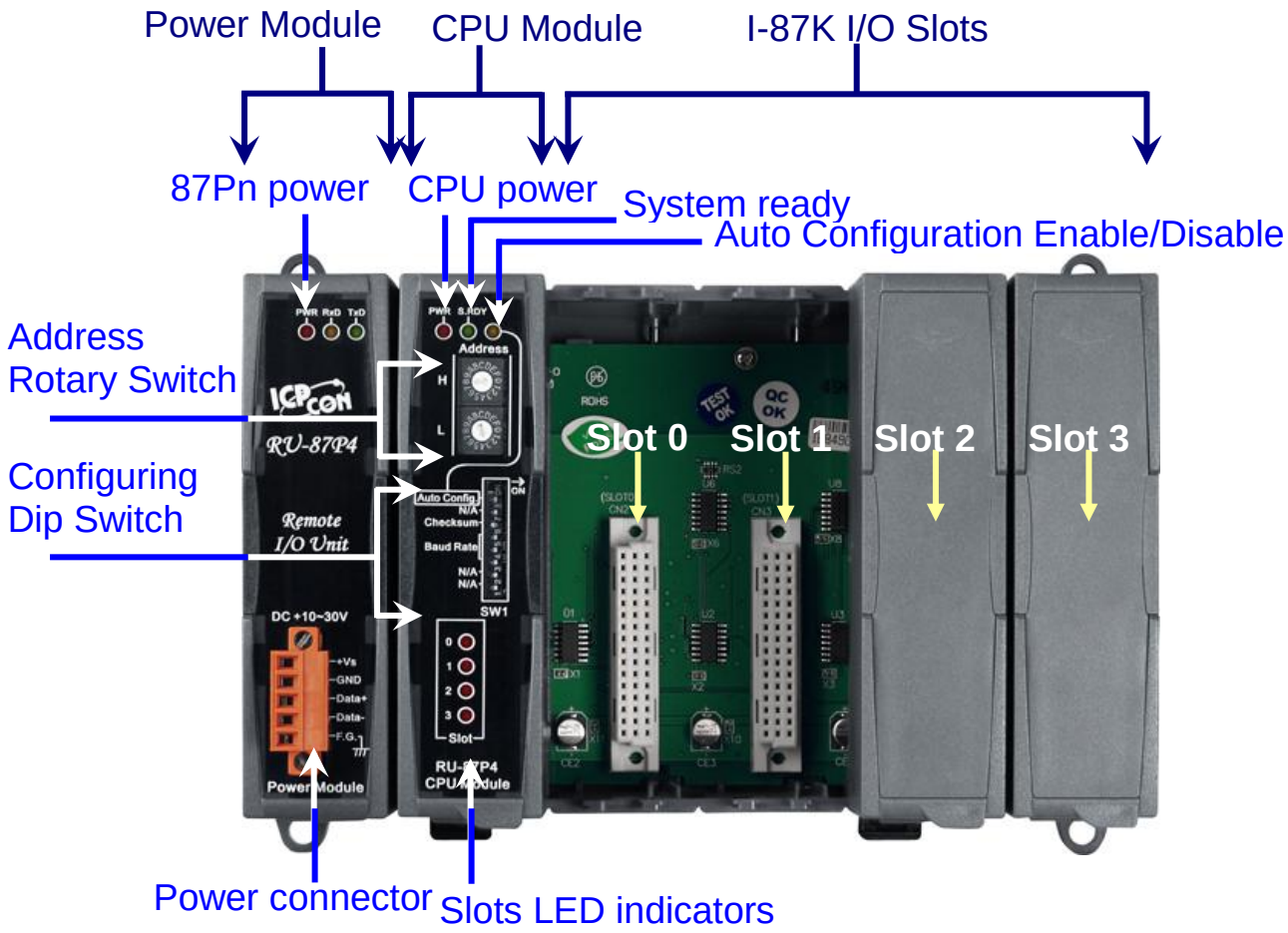


Fig. 1 RU-87P4

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**