
Getting Started of PAC-7186EG(D)/PEG(D) & I-7188EG(D)/XG(D)

This manual is intended for integrators, programmers, and maintenance personnel who will be installing and maintaining a PAC-7186EG/PEG & an I-7188EG/XG controller system.

ISaGRAF PAC Series of ICP DAS includes :

PAC: PAC-7186EG, PAC-7186PEG, I-7188EG, I-7188XG,
PAC-5007, PAC-5107, PAC-5207, PAC-5307
iPAC: iP-8417, iP-8817, iP-8447, iP-8847, I-8417, I-8817, I-8437-80, I-8837-80
WinPAC: WP-8147, WP-8447, WP-8847, WP-8137, WP-8437, WP-8837
ViewPAC: VP-25W7, VP-23W7, VP-2117
XPAC: XP-8047-CE6, XP-8347-CE6, XP-8747-CE6

Legal Liability

ICP DAS CO., LTD. assumes no liability for any and all damages that may be incurred by the user as a consequence of this product. ICP DAS CO., LTD. reserves the right to change this manual at any time without notice.

ICP DAS CO., LTD. constantly strives to provide our customers with the most reliable and accurate information possible regarding our products. However, ICP DAS CO., LTD. assumes no responsibility for its use, or for any infringements of patents or other rights of third parties resulting from its use.

Trademark & Copyright Notice

The names of products are used for identification purposes only, and are the registered trademarks of their respective owners or companies.

Technical Service:

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

Please visit www.icpdas.com > [FAQ](#) > [Software](#) > [ISaGRAF](#) for Frequently Asked Questions.

Written by Chun Tsai, Spike Huang & Eva Li, R&D dept., ICP DAS

Copyright Apr. 2002, by ICP DAS CO., LTD. All Rights Reserved.

Table of Contents

GETTING STARTED OF D 5 7186EG(D)/PEG(D) & I-7188EG(D)/XG(D)	1
TABLE OF CONTENTS	2
REFERENCE GUIDE	4
PERFORMANCE COMPARISON TABLE OF ISAGRAF PACS	5
SPECIFICATIONS: aPAC-7186EG(D)/PEG(D)	6
SPECIFICATIONS: I-7188EG/EGD	9
SPECIFICATIONS: I-7188XG/XGD	12
CHAPTER 1 : TYPICAL APPLICATION	1-1
1.1 PAC-7186EG/PEG is better than I-7188EG	1-1
1.2 Remote I/O Modules and Expansion Module/board	1-1
1.3 SMS: Short Message Service	1-2
1.4 Data Recorder and Data Logger	1-2
1.5 VIP Communication Security	1-3
1.6 Modbus RTU/TCP Slave - Multi-HMI Application	1-3
1.7 Modbus RTU/ASCII Master . Connect to other Modbus devices	1-4
1.8 As a Modbus Gateway for the Remote I/O Modules	1-5
1.9 Data Exchange: Fbus or Ebus	1-5
1.10 Data Acquisition Auto-Report System	1-6
1.11 aPAC-7186EG can send email with one attached file	1-6
1.12 An Easy Way to Program the FRnet I/O Modules	1-7
1.13 Integrate with CAN/CANopen Devices and Sensors	1-7
1.14 GPS applications: ISaGRAF PAC plus I-87211W or GPS-721	1-8
1.15 ZigBee Wireless Solution	1-8
1.16 Connect to the Intelligent Power Meter PM-2133/2134	1-9
CHAPTER 2 : SOFTWARE INSTALLING & PROGRAMMING	2-1
2.1 Step 1 . Installing the ISaGRAF Software	2-1
2.1.1: The hardware protection device (dongle & USB Key-Pro)	2-2
2.1.2: Important Notice for Window 2000 Users.....	2-3
2.1.3: Important Notice for Window NT Users	2-3
2.1.4: Important Notice for Windows Vista or Windows 7 (32-bit) Users	2-4
2.1.5: Important Notice for Windows 7 (64-bit) Users.....	2-5
2.1.6: Important Setting for Using Variable Arrays	2-6
2.2 Step 2 . Installing ICP DAS Utilities For ISaGRAF	2-6
2.3 Step 3 . Writing A Simple ISaGRAF Program	2-7
2.3.1: Start ISaGRAF . Project Management	2-8
2.3.2: Creating an ISaGRAF Project Group	2-8
2.3.3: Creating a New ISaGRAF Project.....	2-9

2.3.4:	Declaring the ISaGRAF Project Variables.....	2-10
2.3.5:	Creating the Example LD Program	2-13
2.3.6:	Editing the Example "LD1" Program	2-14
2.3.7:	Connecting the I/O	2-17
2.4	Step 4 . Compiling & Simulating The Example Project.....	2-21
2.5	Step 5 . Download & Debug The Example Project.....	2-25
2.6	ISaGRAF Demo Programs List	2-30
2.6.1:	Demo Programs List I-7188EG/XG & aPAC-7186EG	2-30

CHAPTER 3 : HARDWARE SYSTEM & SETTING 3-1

3.1	Connect Your PC To COM1 Port	3-1
3.2	Connect Your PC To Ethernet Port	3-2
3.3	How to Update Hardware Driver.....	3-4
3.4	Set NET-ID For Controller System	3-7
3.5	Set Baud Rate For COM1	3-8
3.6	Set COM1 to Non-Modbus-Slave For I-7188EG/aPAC-7186EG.....	3-9
3.7	Set COM2 or COM3 as a Modbus RTU Slave Port.....	3-11
3.8	Set IP & MASK & Gateway For I-7188EG & aPAC-7186EG.....	3-13
3.9	Delete An ISaGRAF Project From The PAC	3-14
3.10	Set I-7000 and I-87K Remote I/O by DCON Utility	3-16
3.11	Link I-7000 and I-87K Modules For Remote I/O.....	3-19
3.12	Create Two Modbus Master/Slave Links	3-19
3.13	Link To HMI Interface Device	3-21
3.14	Use I/O Expansion Boards : X-Board Series.....	3-21
3.15	Backup & Restore An ISaGRAF Project.....	3-25
3.16	Dimension & Mounting for 7188/7186 PAC.....	3-27

CHAPTER 4 : FREQUENTLY ASKED QUESTIONS 4-1

4.1	ISaGRAF FAQ Table.....	4-1
-----	------------------------	-----

APPENDIX I

A	10-channel Thermocouple Input Module	i
A.1	I-7018Z	i
A.2	I-87018Z.....	i
A.3	Advantages:.....	i
B	Understanding I/O of I-7188EG with PoE.....	ii
B.1	What is PoE ?	ii
B.2	The Difference Between PAC-7186PEG and PAC-7186EG	ii

Reference Guide

9 b [`] g \ ` Í I g Yof ISaGRAFUPACÎ U`

CD-ROM: \napdos\isagraf\8000\english_manu\ "user_manual_i_8xx7.pdf" & "user_manual_i_8xx7_appendix.pdf" or
http://www.icpdas.com/products/PAC/i-8000/getting_started_manual.htm

ISaGRAF (Chinese Manual):

\napdos\isagraf\8000\chinese_manu\ "chinese_user_manual_i_8xx7.pdf" or & "chinese_user_manual_i_8xx7_appendix.pdf"
http://www.icpdas.com/products/PAC/i-8000/getting_started_manual.htm

Hardware Manual:

aPAC-7186EG/EGD: CD\NAPDOS\7186e\document\ or at
<http://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/7186e/document/>

I-7188EG/EGD: CD\NAPDOS\7188E\document\7188ehh.pdf or at
<http://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/7188e/document/>

I-7188XG/XGD: CD\NAPDOS\7188Xabc\7188xb\document\7188xb.pdf or at
<http://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/7188xabc/7188xb/document/>

ISaGRAF 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>

Industrial Ethernet Switch: NS-205 / NS-208 / NS-205PSE

Best choice for Industrial Ethernet Communication.
http://www.icpdas.com/products/Switch/switch_list.htm



Model: NS-205



Model: NS-208



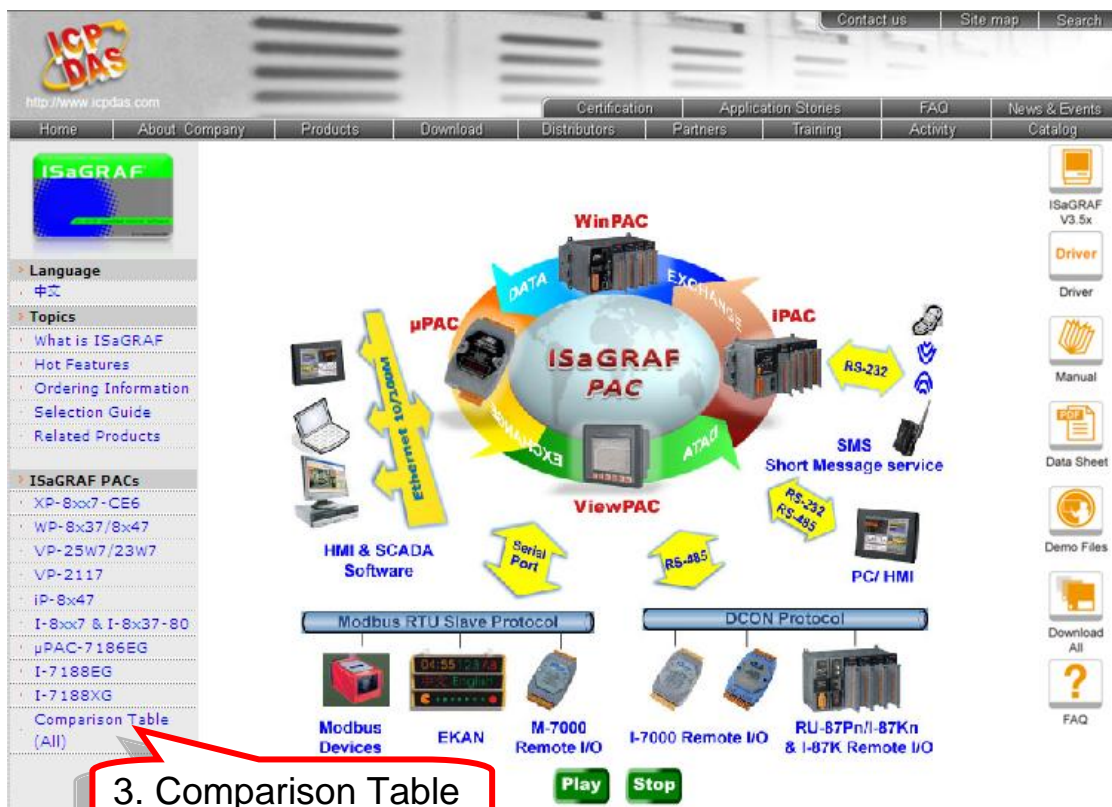
Model: NS-205PSE

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 refer to the [ISaGRAF Comparison Table Web Site](http://www.icpdas.com/Products/ISaGRAF/ComparisonTable) or follow the steps.



Specifications: aPAC-7186EG(D)/PEG(D)

Models		D 5 7186EG(D)	D 5 7186 PEG(D)
System Software			
OS		MiniOS7	
Development Software			
ISaGRAF Software	ISaGRAF Ver. 3	IEC 61131 -3 standard	
	Languages	LD, ST, FBD, SFC, IL & FC	
	Max. Code Size	64 KB	
	Scan Time	2 ~ 25 ms for normal program 10 ~ 125 ms (or more) for complex or large program	
CPU Module			
CPU		80186 or compatible (16-bit and 80 MHz)	
SRAM		640 KB	768 KB
FLASH Memory		512 KB	
		100,000 erase/write cycles.	
EEPROM		16 KB	
		1,000,000 erase/write cycles; Data retention > 10 years.	
NVRAM		31 bytes	
		Battery backup, data valid up to 10 years.	
RTC (Real Time Clock)		Provide second, minute, hour, date, day of week, month, year	
64-bit Hardware Serial Number		Yes, for Software Copy Protection	
Watchdog Timer		Yes (0.8 second)	
Communication Ports			
Ethernet		10/100 Mbps, NE2000 compatible, 10/100 Base -TX, Programs download port.	
COM1		RS -232: TxD, RxD, RTS, CTS, GND ; non -isolated.	
		Speed: 115200 bps max. ; Program downloads port.	
COM2		RS -485: D2+, D2 - ; non -isolated.	
		Self-tuner ASIC inside ; Speed: 115200 bps max.	
LED Indicator			
5-Digit LED Display		Yes, 5 -Digit 7 -G Y [" ' @ 9 8 ' fl-7186EGD/PEGD). It can display message & value.	
System LED Indicator		Yes (Red)	Yes (Red/Orange)
PoE LED Indicator		-	Yes (Green)
Hardware Expansion			

I/O Expansion Bus	Yes, 1 (14 Pins)	
Mechanical		
Dimensions (W x L x H)	72 mm x 123 mm x 35 mm	
Environmental		
Operating Temperature	-25 ~ +75 °C	
Storage Temperature	-40 ~ +80 °C	
Ambient Relative Humidity	5 ~ 90 % RH (non -condensing)	
Power		
Input Range	+10 ~ +30 V DC	+12 ~ +48 V DC
Protection	Power reverse polarity protection	
PoE	-	IEEE 802.3af, Class 1
Power Consumption	% ") ' K ' Z c -f186EG(D)/PEG & ") ' K ' Z c -f186EG(D) /PEG D (when I/O slots are empty)	
Protocols (some protocols need optional devices)		
NET ID	User -assigned by software, 1 ~ 255	
Modbus RTU/ASCII Master Protocol	Up to 2 COM Ports: COM1 ~ COM3 (*). (To connect to other Modbus Slave I/O devices) Max. Mbus_xxx Function Block amount: 128.	
Modbus RTU Slave Protocol	Up to 2 COM Ports: COM1, one of COM2 or COM3 (*). (For connecting ISaGRAF, PC/HMI/OPC Server & MMI panels)	
Modbus TCP/IP Protocol	Ethernet port supports Modbus TCP/IP Slave protocol for connecting ISaGRAF & PC/HMI. Max. 6 connections.	
User -defined Protocol	COM1, COM2 & COM3 ~ COM8 (*) by serial communication function blocks.	
Remote I/O	One of COM2 or COM3: RS -485 (*) supports I -7000 I/O modules & (I -87Kn or RU -87Pn + I -87K High Profile I/O boards) as Remote I/O. Max. 64 I/O module for one PAC.	
Fbus	Built -in COM2 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 COM1 or COM3 or COM4 (*) 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 modems: GTM -201 -RS232 (850/900/1800/1900 GSM/GPRS External Modem)	

Send Email	Send email to maximum 10 receivers each time via internet. If applying with an X607/608 X -board, it could send email with one attached file and the maximum file size is about 488 KB for using X608 or about 112 KB for using X607.
Modem Link	Supports PC to remotely download & monitor the controller through COM4 of X504.
MMICON/LCD	The COM3: RS -232 (*) supports ICP DAS's MMICON. The MMICON is featured with a 240 x 64 dot LCD and a 4 x 4 Keyboard. User can use it to display picture, string, integer, float, and input a character, string, integer and float.
Redundancy Solution	One is Master, one is Slave. Master handles all inputs & outputs at run time. If Master is damaged (or Power off), Slave takes the control of Bus7000b. If Master is alive from damaged (or power up again), it takes the control of Bus7000b again. The change over time is about 5 seconds. Control data is exchanging via Ebus (if using a cross cable, no need any Ethernet switch) . All I/O should be RS -485 I/O except the status I/O in the slot 0: X -107.
CAN/CANopen	D 5-7186EG can use its COM1 or COM3 ~ COM8 (*) to connect one I -7530: the RS -232 to CAN converter to support 7 5 B ` U b X ` 7 5 B c d Y b ` X Y j] WY g ` U b-7186EG b supports max.3 RS -232 port to connect max. 3 I-7530. Please refer to www.icpdas.com > FAQ > Software > ISaGRAF Ver.3 (English) > 086
Battery Backup SRAM	
SRAM Expansion Card	With an X607/X608 (plug in the only expansion I/O slot), data can be stored in X607/X608. PC can load these data via COM1 or Ethernet. PC can also download pre -defined data to the X607/X608. Optional: X607: 128 KB , X608: 512 KB
Optional I/O Functions	
PWM Output	
Pulse Width Modulation Output	All X-series DO boards support PWM output. 8 -ch max. for one controller. 500 Hz max. for Off = 1 & On = 1 ms Output square wave: Off: 1 ~ 32767 ms, On: 1 ~ 32767 ms
Counters	
Parallel DI Counter	All X-series DI boards support DI counter. 8-ch. max. for one controller. Counter value: 32 -bit 500 Hz max. Min. pulse width > 1 ms
Remote DI Counter	All remote I -7000 & I -87K DI modules support counters. 100 Hz max. value: 0 ~ 65535
Remote High Speed Counter	Optional I -87082: 100 kHz max. ,32 -bit
*Note: COM3 ~ COM8 are resided at the optional X-series board if it is plugged inside h \ Y ` -D186EG/PEG.	

Specifications: I-7188EG/EGD

Models	I - 7188EG	I - 7188EG D
System Software		
OS	MiniOS7	
Development Software		
ISaGRAF Software	ISaGRAF Ver. 3	IEC 61131 -3 standard
	Languages	LD, ST, F BD, SFC, IL & FC
	Max. Code Size	64 KB
	Scan Time	5 ~ 100 ms for normal program 25 ~ 500 ms (or more) for complex or large program
CPU Module		
CPU	80188 or compatible (16 -bit and 40 MHz)	
SRAM	512 KB	
FLASH Memory	512 KB	
	100,000 erase/write cycles.	
EEPROM	2 KB	
	1,000,000 erase/write cycles; Data retention > 10 years.	
NVRAM	31 bytes	
	Battery backup, data valid up to 10 years.	
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year	
64-bit Hardware Serial Number	Yes, for Software Copy Protection	
Watchdog Timer	Yes (0.8 second)	
Communication Ports		
Ethernet	10/100 Mbps, NE2000 compatible, 10/100 Base -TX, Programs download port.	
COM1	RS -232: TxD, RxD, RTS, CTS, GND ; non -isolated.	
	Speed: 115200 bps max.; Program download port.	
COM2	RS -485: D2+, D2 - ; non -isolated.	
	Self -tuner ASIC inside ; Speed: 115200 bps max.	
LED Indicator		
5-Digit LED Display	-	5-Digit 7 -Seg. LED. It can display message & value.
System LED Indicator	Yes	
Hardware Expansion		

I/O Expansion Bus	Yes, 1 (14 Pins)	
Mechanical		
Dimensions (W x L x H)	72 mm x 123 mm x 33 mm	
Environmental		
Operating Temperature	-25 ~ +75 °C	
Storage Temperature	-40 ~ +80 °C	
Ambient Relative Humidity	5 ~ 90 % RH (non -condensing)	
Power		
Input Range	+10 ~ +30 V DC	
Protection	Power reverse polarity protection	
Power Consumption	2 W (when I/O slots are empty)	3 W (when I/O slots are empty)
Protocols (some protocols need optional devices)		
NET ID	User -assigned by software, 1 ~ 255	
Modbus RTU/ASCII Master Protocol	Up to 2 COM Ports: COM1 ~ COM3 (*). (To connect to other Modbus Slave devices) Max. Mbus_xxx Function Block amount: 64.	
Modbus RTU Slave Protocol	Up to 2 COM Ports: COM1, one of COM2 or COM3 (*). (For connecting ISaGRAF, PC/HMI/OPC Server & MMI panels)	
Modbus TCP/IP Protocol	Ethernet port supports Modbus TCP/IP Slave protocol for connecting ISaGRAF & PC/HMI. Max. 4 connections.	
User -defined Protocol	User can write his own protocol applied at COM1, COM2 & COM3 ~ COM8 (*) by serial communication function blocks.	
Remote I/O	One of COM2 or COM3: RS -485 (*) supports I -7000 I/O modules & (I -87Kn or RU -87Pn + I -87K High Profile I/O boards) as Remote I/O. Max. 64 I/O module for one PAC.	
Fbus	Built -in COM2 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 COM1 or COM3 or COM4 (*) 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 modems: GTM -201 -RS232 (850/900/1800/1900 GSM/GPRS External Modem)	
Modem Link	Supports PC to remotely download & monitor the controller through COM4 of X504.	

MMICON/LCD	The COM3: RS -232 (*) supports ICP DAS's MMICON. The MMICON is featured with a 240 x 64 dot LCD and a 4 x 4 Keyboard. User can use it to display picture, string, integer, float, and input a character, string, integer and float.
Battery Backup SRAM	
SRAM Expansion Card	With a n X607/X608 (plug in the only expansion I/O slot), data can be stored in X607/X608. PC can load these data via COM1 or Ethernet. PC can also download pre -defined data to the X607/X608. Optional: X607: 128 KB , X608: 512 KB
Optional I/O Functions	
PWM Output	
Pulse Width Modulation Output	All X-series DO boards support PWM output. 8 -ch max. for one controller. 500 Hz max. for Off = 1 & On = 1 ms Output square wave: Off: 1 ~ 32767 ms, On: 1 ~ 32767 ms
Counters	
Parallel DI Counter	All X-series DI boards support DI counter. 8-ch. max. for one controller. Counter value: 32 -bit 500 Hz max. Min. pulse width > 1 ms
Remote DI Counter	All remote I -7000 & I -87K DI modules support counters. 100 Hz max. value: 0 ~ 65535
Remote High Speed Counter	Optional I -87082: 100 kHz max. ,32 -bit
*Note: COM3 ~ COM8 are resided at the optional X-series board if it is plugged inside the I -7188EG(D).	

Specifications: I-7188XG/XGD


Models		I - 7188XG	I - 7188XG D
System Software			
OS		MiniOS7	
Development Software			
ISaGRAF Software	ISaGRAF Ver. 3	IEC 61131 -3 standard	
	Languages	LD, ST, FBD, SFC, IL & FC	
	Max. Code Size	64 KB	
	Scan Time	5 ~ 100 ms for normal program 25 ~ 500 ms (or more) for complex or large program	
CPU Module			
CPU		80188 or compatible (16 -bit and 40 MHz)	
SRAM		512 KB	
FLASH Memory		512 KB	
		100,000 erase/write cycles.	
EEPROM		2 KB	
		1,000,000 erase/write cycles; Data retention > 10 years.	
NVRAM		31 bytes	
		Battery backup, data valid up to 10 years.	
RTC (Real Time Clock)		Provide second, minute, hour, date, day of week, month, year	
64-bit Hardware Serial Number		Yes, for Software Copy Protection	
Watchdog Timer		Yes (0.8 second)	
Communication Ports			
COM1		RS -232/RS -485: RS -232: TxD, RxD, RTS, CTS, GND RS -485: D1+, D1 - (Self -tuner ASIC inside)	
		Non -isolated ; Speed: 115200 bps max. ; Program downloads port.	
COM2		RS -485: D2+, D2 - (Self -tuner ASIC inside)	
		Non -isolated ; Speed: 115200 bps max.	
Digital Input			
Channels		1	
Contact		Dry	
On Voltage Level		Connect to GND	

Off Voltage Level	Open	
Digital Output		
Channels	1	
Output Type	Open Collector	
Load Current	100 mA	
Load Voltage	30 VDC Max.	
LED Indicator		
5-Digit LED Display	-	5-Digit 7 -Seg. LED. It can display message & value.
System LED Indicator	Yes	
Hardware Expansion		
I/O Expansion Bus	Yes, 1 (14 Pins)	
Mechanical		
Dimensions (W x L x H)	72 mm x 123 mm x 33 mm	
Environmental		
Operating Temperature	-25 ~ +75 °C	
Storage Temperature	-40 ~ +80 °C	
Ambient Relative Humidity	5 ~ 90 % RH (non -condensing)	
Power		
Input Range	+10 ~ +30 V DC	
Protection	Power reverse polarity protection	
Power Consumption	2 W (when I/O slots are empty)	3 W (when I/O slots are empty)
Protocols (some protocols need optional devices)		
NET ID	User -assigned by software, 1 ~ 255	
Modbus RTU/ASCII Master Protocol	Up to 2 COM Ports: COM2 and COM 3 (*). (To connect to other Modbus Slave I/O devices) Max. Mbus_xxx Function Block amount: 64.	
Modbus RTU Slave Protocol	Up to 2 COM Ports: COM1, one of COM2 or COM3 (*). (For connecting ISaGRAF, PC/HMI/OPC Server & MMI panels)	
User -defined Protocol	User can write his own protocol applied at COM1, COM2 & COM3 ~ COM8 (*) by serial communication function blocks.	
Remote I/O	One of COM2 or COM3: RS -485 (*) supports I -7000 I/O modules & (I -87Kn or RU -87Pn + I -87K High Profile I/O boards) as Remote I/O. Max. 64 I/O module for one PAC.	
Fbus	Built -in COM2 Port to exchange data between ICP DAS's ISaGRAF PACs.	

SMS: Short Message Service	One of COM3 or COM4 (RS -232) (*) 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 modems: GTM -201 -RS232 (850/900/1800/1900 GSM/GPRS External Modem)
Modem Link	Supports PC to remotely download & monitor the controller through COM4 of X504.
MMICON/LCD	The COM3: RS -232 (*) supports ICP DAS's MMICON. The MMICON is featured with a 240 x 64 dot LCD and a 4 x 4 Keyboard. User can use it to display picture, string, integer, float, and input a character, string, integer and float.
Battery Backup SRA M	
SRAM Expansion Card	With an X607/X608 (plug in the only expansion I/O slot), data can be stored in X607/X608. PC can load these data via COM1 or Ethernet. PC can also download pre-defined data to the X607/X608. Optional: X607: 128 KB , X608: 512 KB
Optional I/O Functions	
PWM Output	
Pulse Width Modulation Output	All X-series DO boards support PWM output. 8 -ch max. for one controller. 500 Hz max. for Off = 1 & On = 1 ms Output square wave: Off: 1 ~ 32767 ms, On: 1 ~ 32767 ms
Counters	
Parallel DI Counter	All X-series DI boards support DI counter. 8-ch. max. for one controller. Counter value: 32 -bit 500 Hz max. Min. pulse width > 1 ms
Remote DI Counter	All remote I -7000 & I -87K DI modules support counters. 100 Hz max. value: 0 ~ 65535
Remote High Speed Counter	Optional I -87082: 100 kHz max. , 32 -bit
*Note: COM3 ~ COM8 are resided at the optional X-series board if it is plugged inside the I -7188XG(D).	

Chapter 1 : Typical Application

1.1 PAC-7186EG/PEG is better than I-7188EG



PAC-7186EG
D 5-7186PEG
The advanced I-7188EG ISaGRAF based PAC

PAC-7186PEG is the PAC-7186EG with PoE (Power-over-Ethernet).

- “ Faster than I-7188EG (about 2~4 times)
- “ Faster Ethernet: 10/100M bps
- “ 640/768 KB memories for running program, 128K more than I-7188EG
- “ Support sending email with an attached file if applying X607/608.

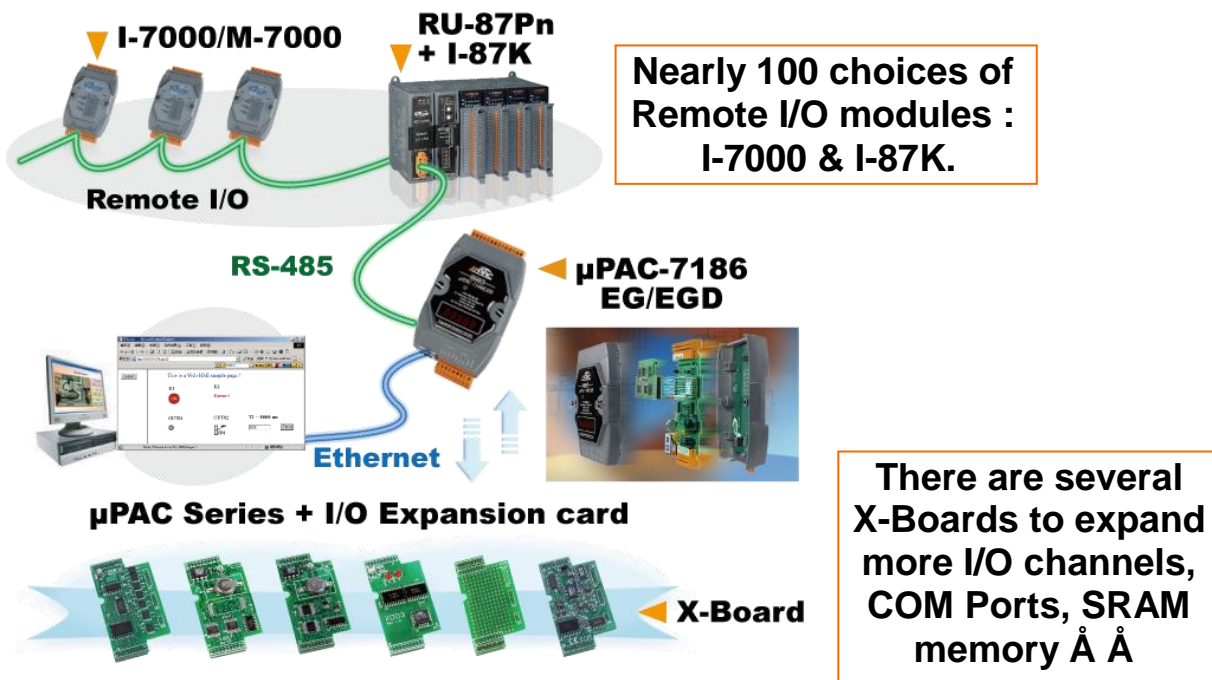
æ All the applications for PAC-7186EG can be applied to PAC-7186PEG

1.2 Remote I/O Modules and Expansion Module/board

Advantage of using RU-87P4/P8 + I-87K I/O modules :

- ' Hot-Swap
- ' Auto-Configuration at run time
- ' Plug & Play at run time

NOTE : RU-87Pn support only High profile I-87K I/O module.



I-7000/M-7000
Remote I/O

RU-87Pn + I-87K

Nearly 100 choices of Remote I/O modules : I-7000 & I-87K.

RS-485

µPAC-7186 EG/EGD

Ethernet

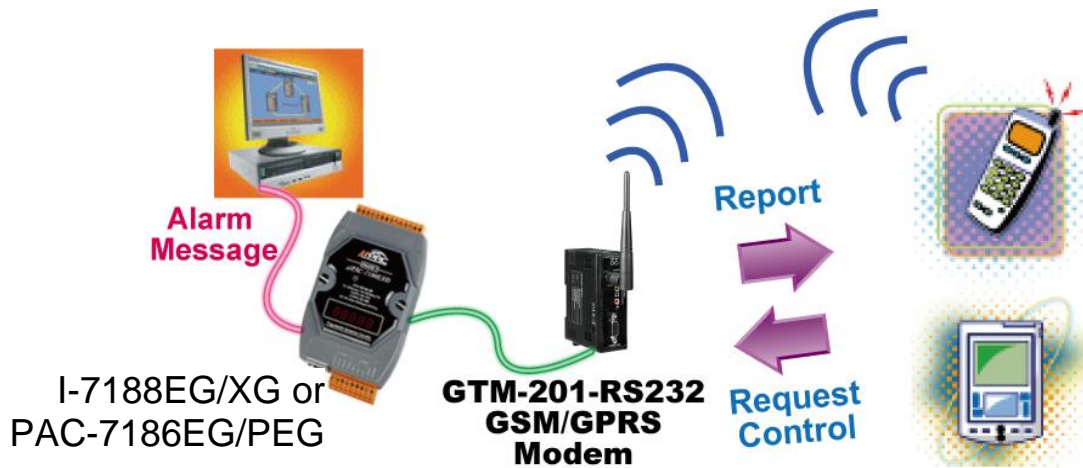
µPAC Series + I/O Expansion card

X-Board

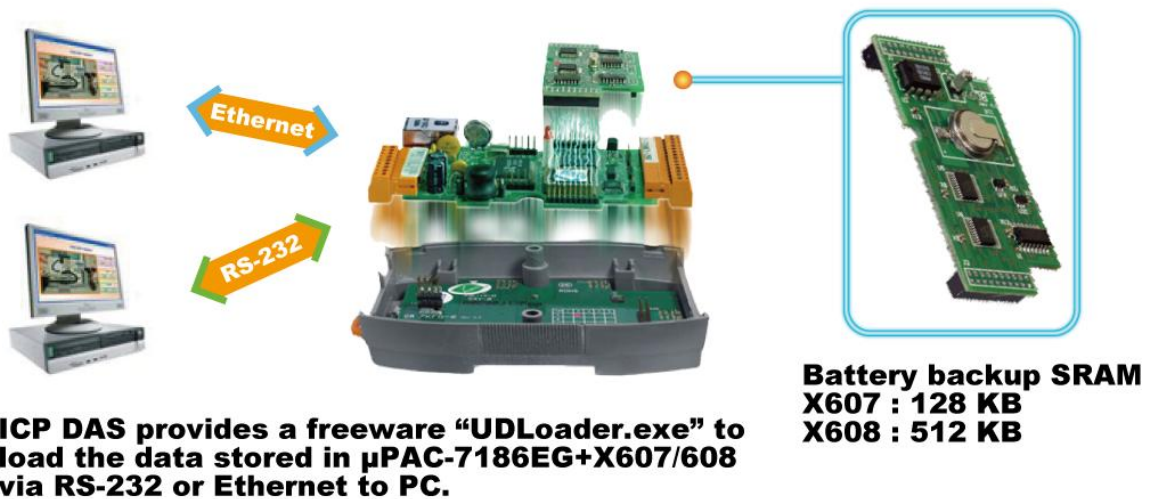
There are several X-Boards to expand more I/O channels, COM Ports, SRAM memory & Å

1.3 SMS: Short Message Service

- ' Short message can be sent in multiple language format (like Chinese, English... others)
- ' More at www.icpdas.com > FAQ > Software > ISaGRAF Ver.3 (English) - 111

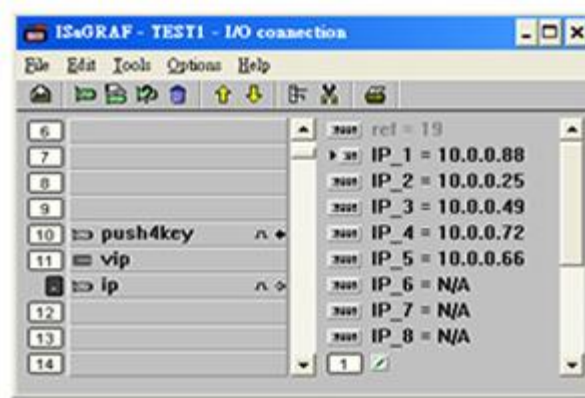


1.4 Data Recorder and Data Logger



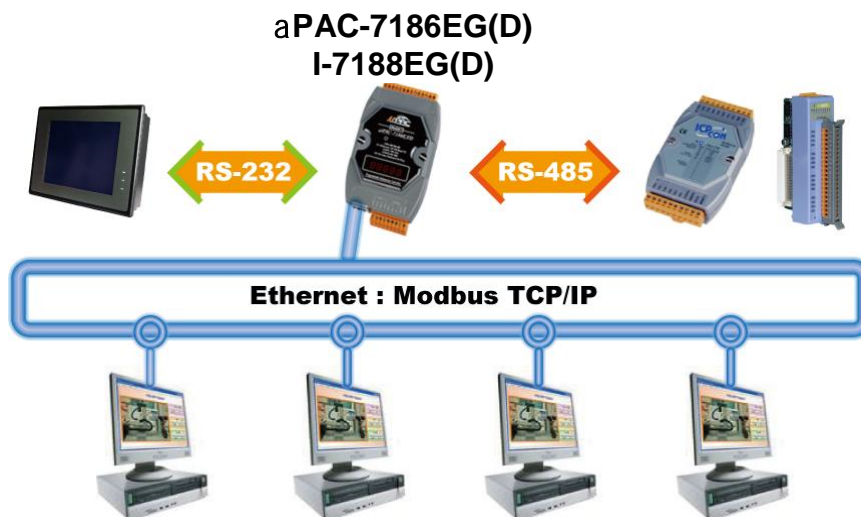
1.5 VIP Communication Security

- ' Set VIP (Very Important IP No.) for Modbus TCP/IP security.
- ' I-7188XG does not support this feature.



1.6 Modbus RTU/TCP Slave - Multi-HMI Application

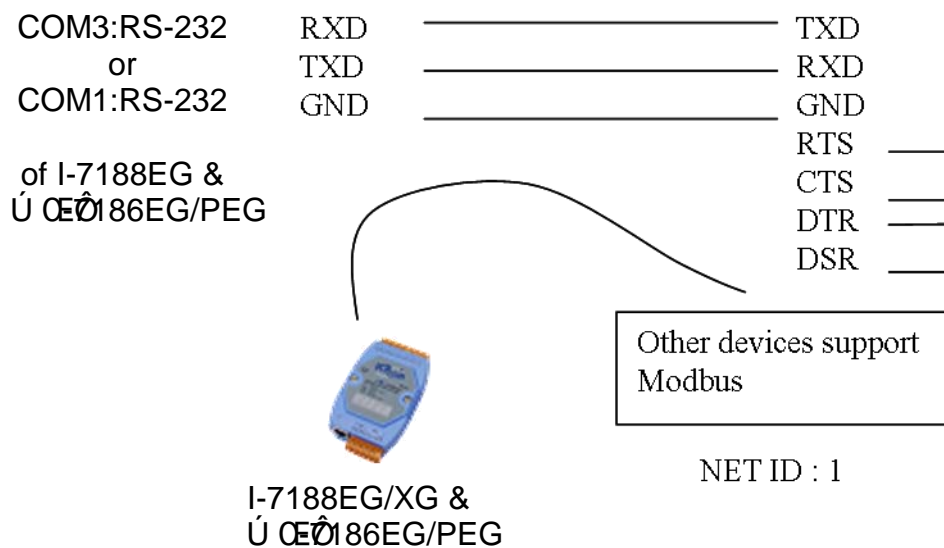
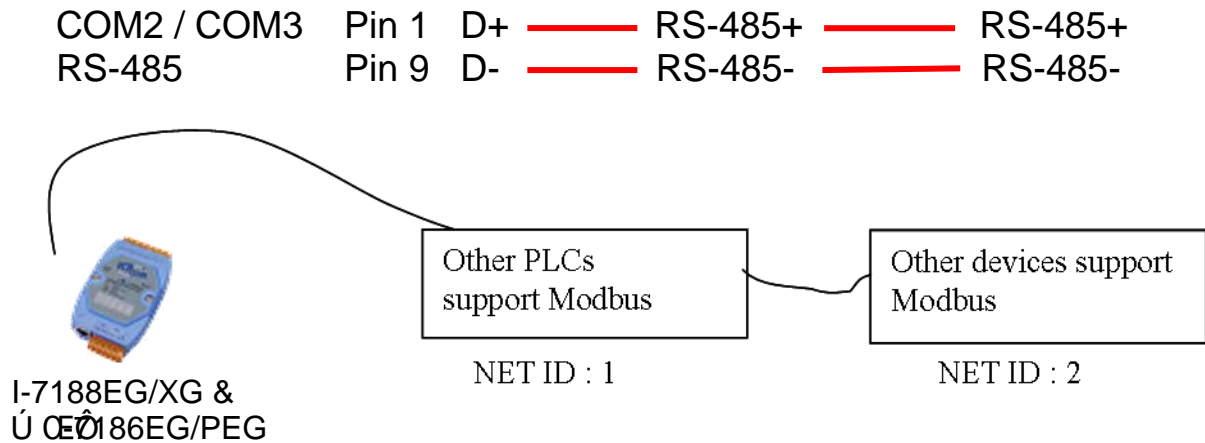
- ' **Modbus RTU (RS-232/485/422) Slave**
 - Ú CE0186EG, I-7188EG/XG: Max. 2 Modbus RTU Slave ports
- ' **Modbus TCP/IP Slave**
 - Ú CE0186EG: Max. 6 Modbus TCP Slave connections
 - I-7188EG: Max. 4 Modbus TCP Slave connections
 - I-7188XG: no Ethernet port, so does not support Modbus TCP Slave



1.7 Modbus RTU/ASCII Master Ę Connect to other Modbus devices

- I-7188EG/XG & aPAC-7186EG/PEG support up to **2** COM ports of Modbus RTU/ASCII Master protocol to integrate with other Modbus devices.

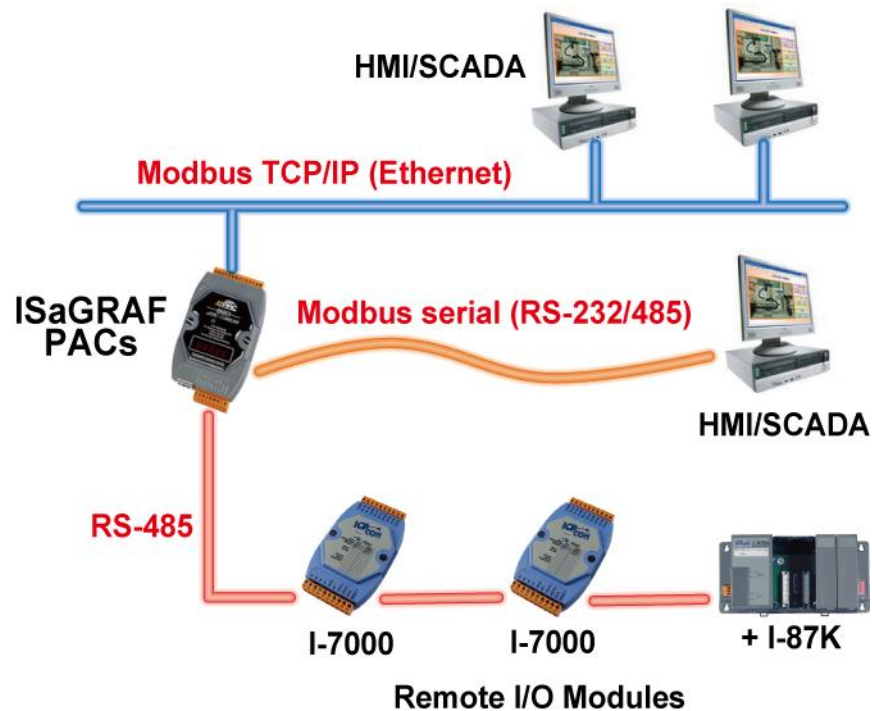
I-7188EG, aPAC-7186EG/PEG : COM1, 2, 3
 I-7188XG : COM2, 3



Note: COM3 ~ COM8 is optional from X-Board X5xx I/O expansion board. Please refer to [section 3.14: Using I/O Expansion Boards - X Series Boards](#).

1.8 As a Modbus Gateway for the Remote I/O Modules

- ' **I-7188EG & aPAC-7186EG/PEG** can be a Modbus RTU Serial & TCP/IP gateway of I-7000 & I-87K Series I/O modules.
- ' **I-7188XG** can be a Modbus RTU Serial gateway of I-7000 & I-87K Series I/O modules.
- ' All ISaGRAF PACs support this feature:
The PACs with Ethernet port support both communications;
The PACs without Ethernet port support Modbus Serial communication only.

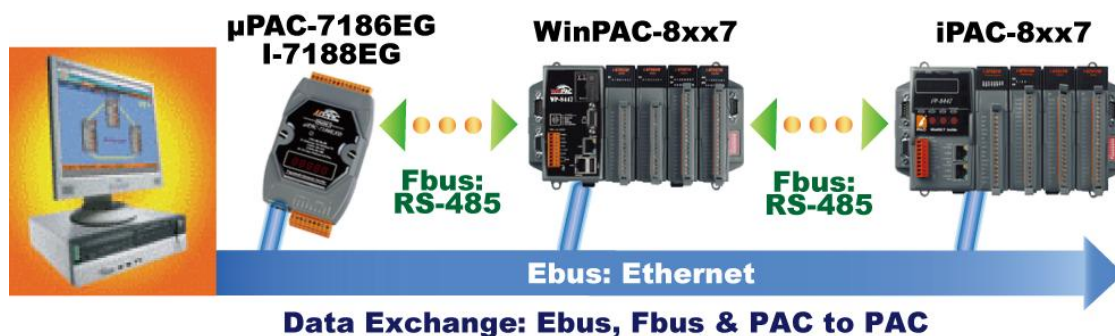


1.9 Data Exchange: Fbus or Ebus

PAC to PAC data exchange

Ebus (Ethernet) : aPAC-7186EG(D)/PEG(D), I-7188EG(D)

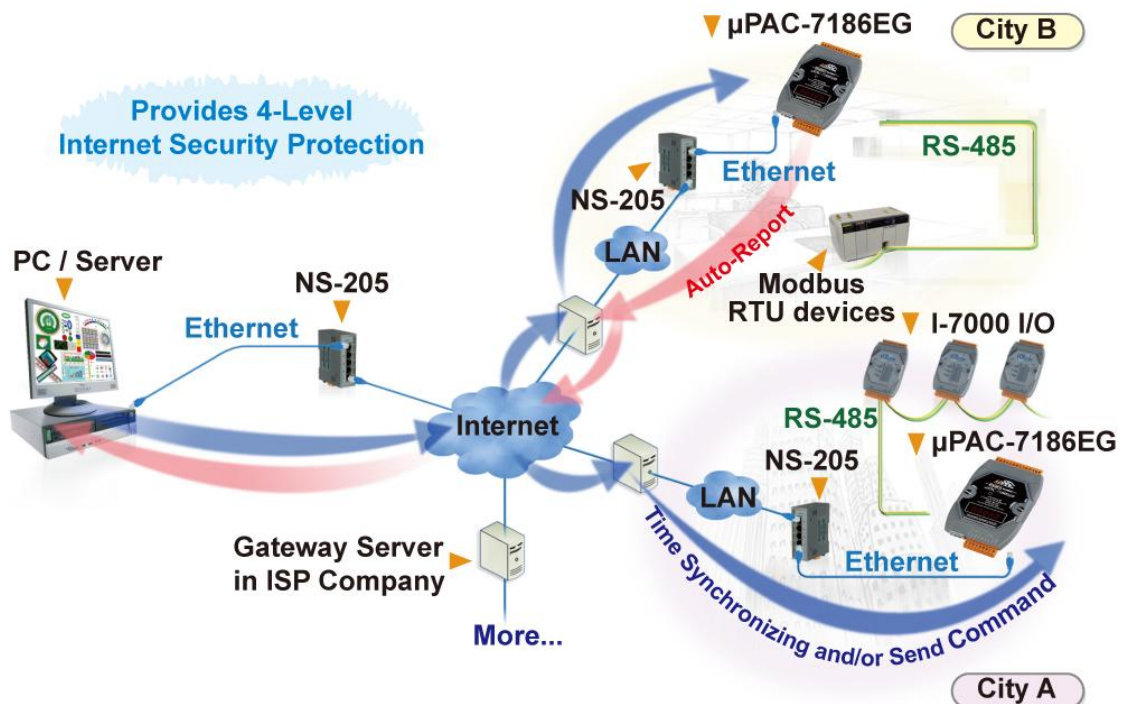
Fbus (RS-485) : aPAC-7186EG(D)/PEG(D), I-7188EG(D)/XG(D)



1.10 Data Acquisition Auto-Report System

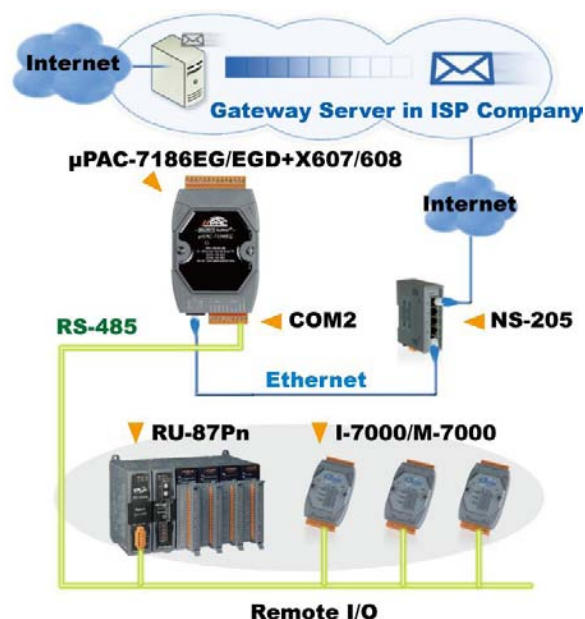
- ' ISaGRAF PAC can use UDP/IP to auto-report acquisition data & control data to local or remote internet PC/Server. (Not for I-7188XG)
- ' **Advantage: Every aPAC-7186EG/PEG in the different location doesn't need a fixed Internet IP.**
- ' [FAQ-065](#)

Stable and Cost-effective Data Acquisition Auto-Report System



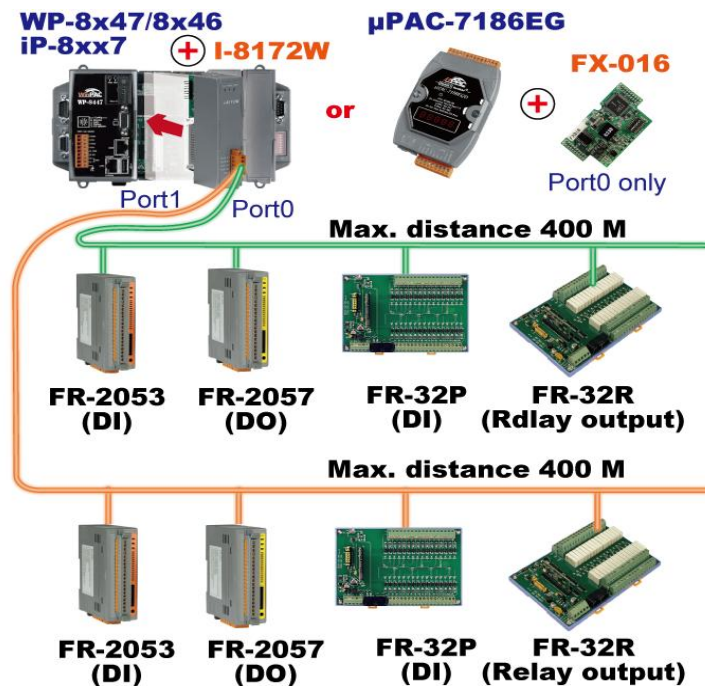
1.11 aPAC-7186EG can send email with one attached file

- ' ISaGRAF PAC can send Email with one attached file via Ethernet Port. The maximum file size is about 488K bytes. (X607: 112K bytes; X608: 488K bytes)
- ' One Email can send to 10 receivers at one sending. ([FAQ-067](#) & [FAQ-077](#))



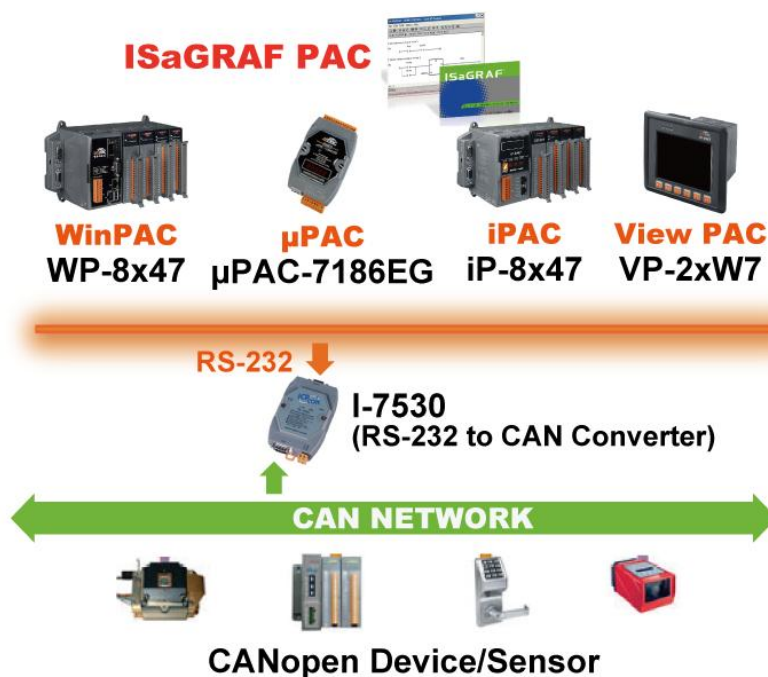
1.12 An Easy Way to Program the FRnet I/O Modules

- ' **Advantage of FRnet I/O:** Fast I/O scan time is about 3 ms/scan.
 scan time is about 9 ms, then the scan time for all will be 9 ms, not 3 ms)
- ' **Note:** FRnet I/O do not support AI & AO yet.
- ' Refer to [FAQ-082](#)



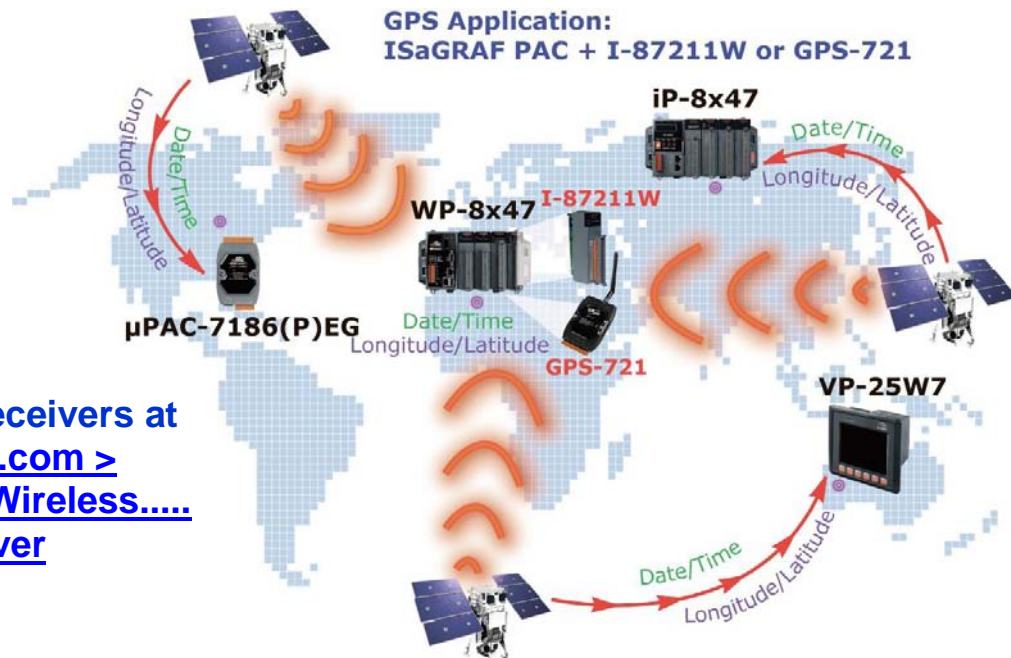
1.13 Integrate with CAN/CANopen Devices and Sensors

- ' PAC-7186EG Supports max. **3** I-7530 (RS-232 to CAN) Converters.
 Refer to www.icpdas.com > [FAQ](#) > [Software](#) > [ISaGRAF Ver.3 \(English\) - 086](#)



1.14 GPS applications: ISaGRAF PAC plus I-87211W or GPS-721

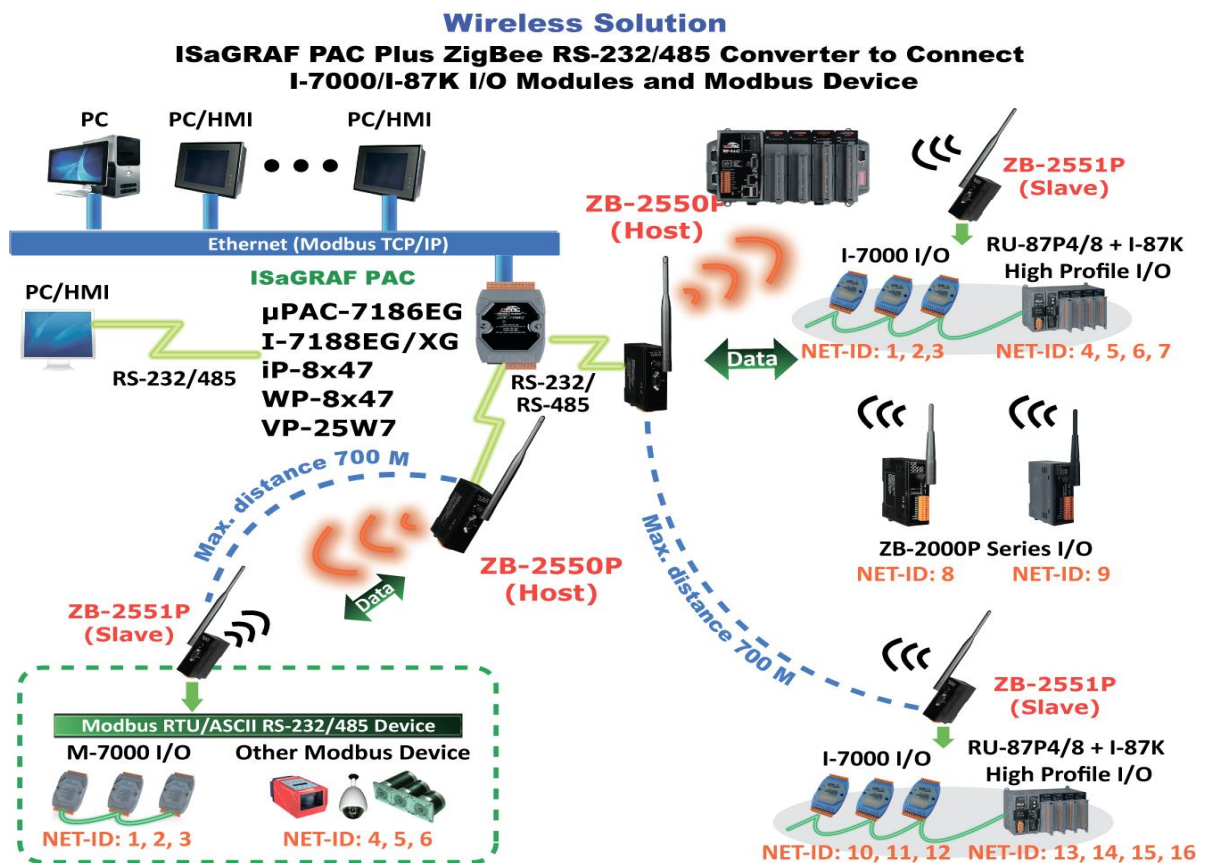
- µPAC-7186(P)EG, WP-8xx7, VP-2xW7, iP-8xx7 can support one I-87211W (slot 0~7) or I-87211W / GPS-721 as RS-485 remote GPS I/O.
- For doing auto-time-synchronization and getting local Longitude and Latitude
- Please refer to [FAQ-107](#)



More GPS receivers at
www.icpdas.com >
[Products > Wireless.....](#)
[> GPS receiver](#)

1.15 ZigBee Wireless Solution

- ISaGRAF PAC plus ZB-2550P and ZB-2551P converters (ZigBee to RS-232/485)
- Please refer to [FAQ-110](#)



1.16 Connect to the Intelligent Power Meter PM-2133/2134

- Support standard Modbus protocol, support multiple RS-485 ports to connect to multiple PM-213x Smart meters.
- For the power measurement control systems in small/medium sized stores, buildings and factories with electric equipments.
- PM-213x smart meter with "Wh" pulse output is useful in the systems needing to connect the meter tester.
- PM-213x smart meter with wired clip-on CT is easily wiring for on-line installation, suitable for the uninterruptible power systems.
- PM-213x is a series of 3 Phase/4 Loops 1 Phase Compact Smart Meter with true RMS energy and power parameters measurement in compact size. The ISaGRAF PACs combining with PM-213x can apply to various control/monitor systems about intelligent electric power measurement.
- Please refer to [FAQ-129](#)



Chapter 2 : Software Installing & Programming

Note: For a ^ c æã | ^ å Á Ò } * | ã • | @Áw•^^Á::ISaGRAFÁc ↑ á|Á]Á T æ }
or CD of \napdos\isagraf\8000\english_manu\Ä ~ • ^ | ' { æ } ~ æ | & ã ' i
"user_manual_i_8xx7_appendixÉ] å ø +
http://www.icpdas.com/products/PAC/i-8000/getting_started_manual.htm

2.1 Step 1 Installing the ISaGRAF Software

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

- A. ISaGRAF Workbench
- B. ICP DAS Utilities for ISaGRAF

User has to purchase at least one pcs. of ISaGRAF Workbench (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 PAC.

Operating System Requirements:

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

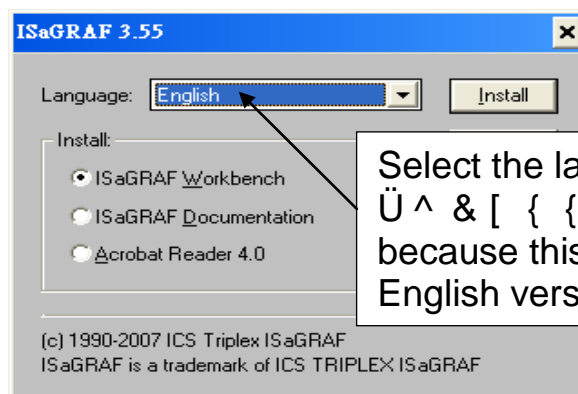
- " Windows 95 / Windows 98 / Windows 2000
- " Windows NT Version 3.51 or Windows NT Version 4.0
- " Windows XP or Vista or Windows 7 (Please refer to [FAQ-117](#))

Steps to Install the ISaGRAF Workbench:



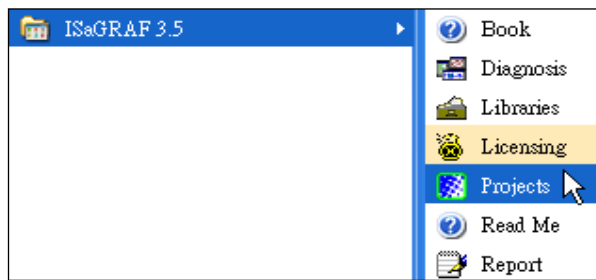
If your PC OS is Windows Vista or Windows 7 (32-bit), refer to [2.1.4](#).
If your PC OS is Windows 7 (64-bit), please refer to [2.1.5](#).

1. Insert the ISaGRAF Workbench CD into your CD-ROM drive.
If your computer does not auto-start the installation, use the Windows Explorer and go to the CD-ROM drive where the Workbench CD is installed.
2. 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.



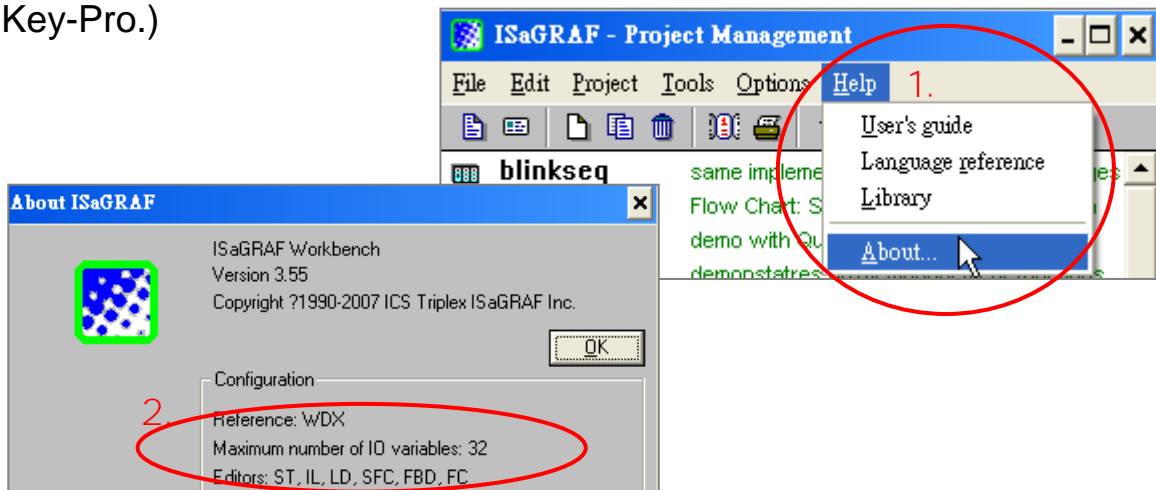
Select the language.
Ü ^ & [{ { ^ } å Á c [Á ~
because this manual uses English version.

- To begin the ISaGRAF 3.x software program, click the Windows [Start] button, then click [Programs], and you should see the ISaGRAF program group as illustrated below.



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 computer parallel port for 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:

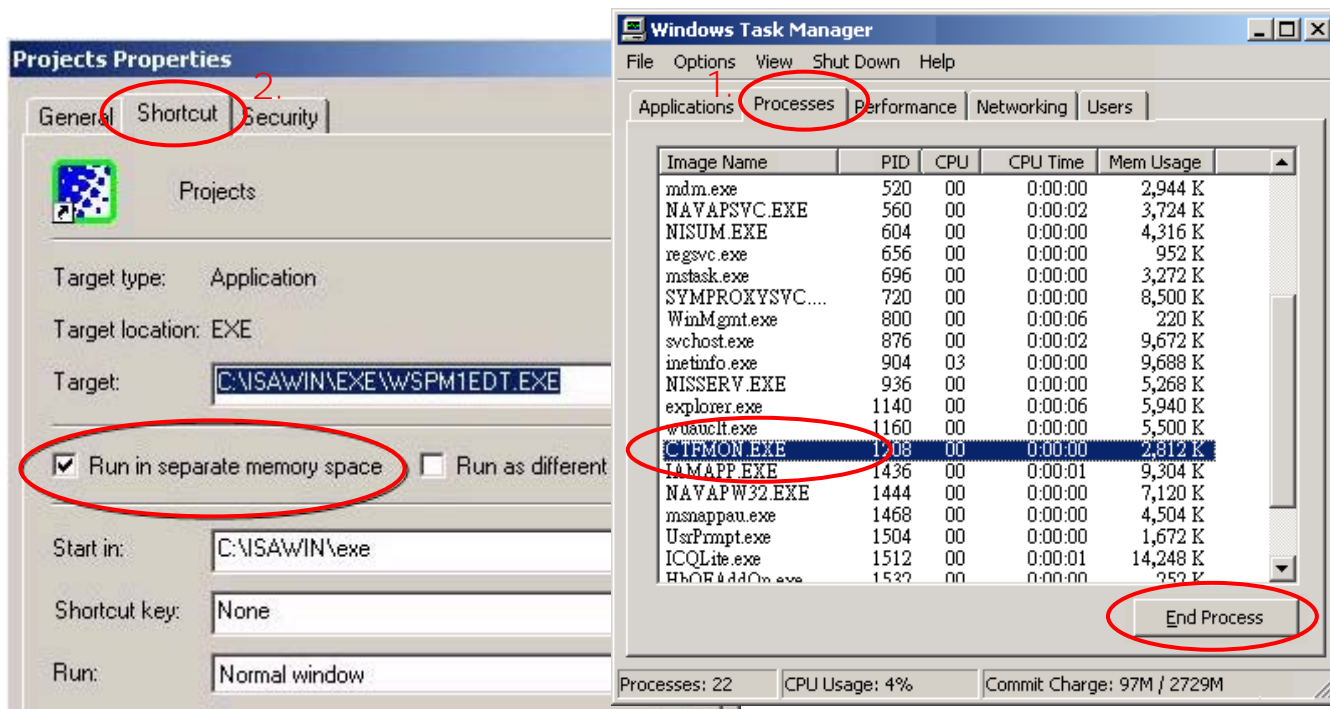
Please execute the ISaGRAF CD_ROM \Sentinel5382\setup.exe for ISaGRAF-80 or \Sentinel\setup.exe for other ISaGRAF version and then reset the PC again.

USB Key-Pro Protection:

- 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.
- To run ISaGRAF Ver. 3.5x, please always plug the USB protection-\ ^ ^ Á ã } Á c @ 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 be caused by the procedure CTFMON.EXE of Windows 2000. First click on Ctrl & Alt & Del at the same time to stop the CTFMON.EXE process, and then you may create a short cut for the ISaGRAF project manager. And then check on run in separate memory space option in the shortcut property.



2.1.3: Important Notice for Window NT Users

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

C:\ISAWIN\EXE\isa.ini

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

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

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

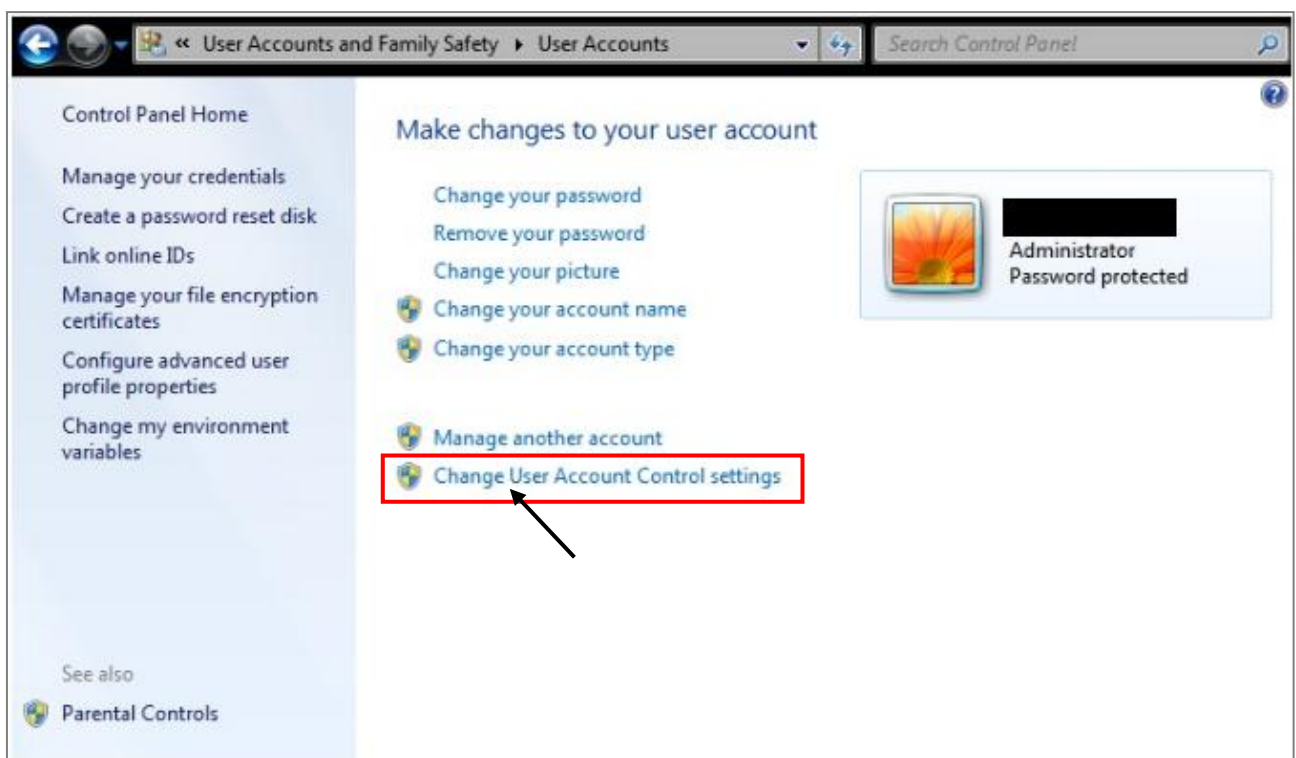
Before installing the ISaGRAF, if your operating system is Windows Vista or Windows 7 (32-bit), please change the User Account Control settings to avoid some of the setup restrictions.

How to disable User Account Control?



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

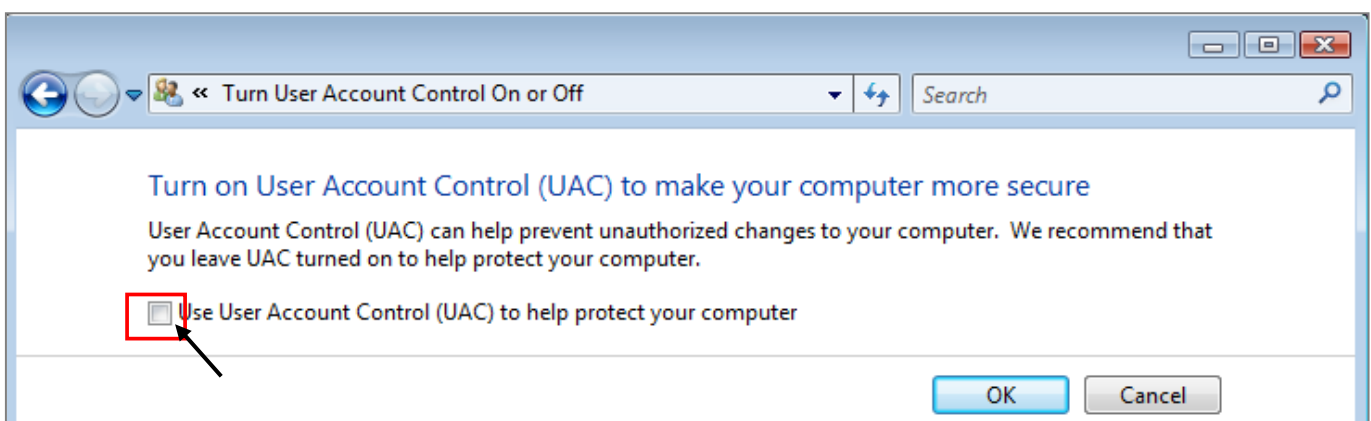
1. Open the Start menu, click on Control Panel, then click on User Accounts and Family Safety > User Accounts, then click on Change User Account Control settings or Turn User Account Control on or off.



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

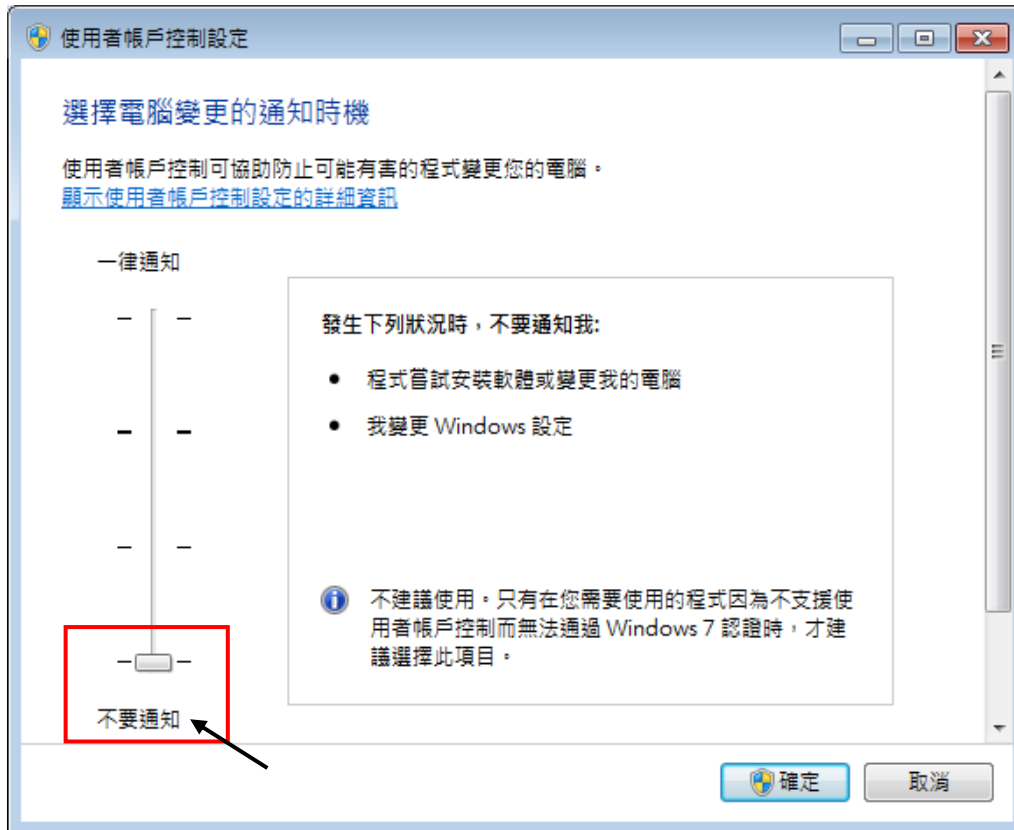
Windows Vista:

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



Windows 7:

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



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

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

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

Installing the Virtual PC and XP Mode:

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

2.1.6: Important Setting for Using Variable Arrays

Important setting for using variable arrays:

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

```
[DEBUG]
Arrays=1
```

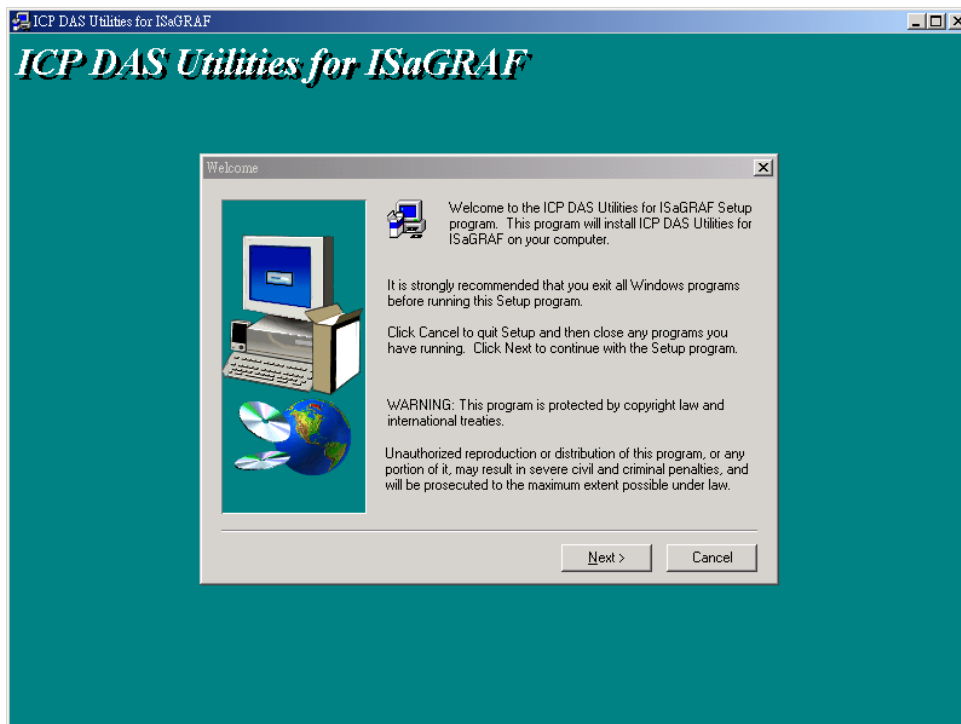
2.2 Step 2 – Installing ICP DAS Utilities For ISaGRAF

V @^ Á %Q Ô Ú Á Ö Æ Æ Ü Á Wc ã | ã c ã ^ • Á ~ [; Á Q Ò æ Õ Ü Æ Æ + Á & [} • ã

- ' I/O libraries: for I-7188EG/XG, aPAC-7186EG, I-8xx7 & W-8xx7
- ' Modem_Link utility
- ' Auto-scan I/O utility

Note: The ISaGRAF Workbench software program must be installed before attempting to install the %Q Ô Ú Á Ö Æ Æ Ü Á Wc ã | ã c ã ^ • Á ~ [; Á Q Ò æ Õ Ü Æ Æ installed the ISaGRAF Workbench program, please refer to Section 2.1 Step 1 before continuing.

There is a CD-ROM supplied with each of the aPAC-7186EG & I-7188EG/XG PAC , ã c @Á c @^ Á %Q Ô Ú Á Ö Æ Æ Ü Á Wc ã | ã c ã ^ • Á ~ [; Á Q Ò æ Õ Ü Æ Æ Please insert the CD-ROM into your CD-ROM drive. Then run **CD-ROM: \napdos\isagraf\setup.exe** . Follow the steps to install it.



Q ~ Á %Q Ô Ú Á Ö Æ Æ Ü Á Wc ã | ã c ã ^ • Á ~-ROM, please refer to website of <http://www.icpdas.com/products/PAC/i-8000/isagraf-link.htm>, then find %Q Ô Ú Á Ö Æ Æ Ü Á Wc ã | ã c ã ^ down load [%ã [Q Ò æ Õ Ü Æ Æ + Á ã

2.3 Step 3 Writing A Simple ISaGRAF Program

Note: The following is a step-by-step example on how to create a ladder logic (hence forth referred as "LD") program using the ISaGRAF Workbench software program provided with the I-7188EG/XG & aPAC-7186EG (plugged X-board: X107) controller system.

EXAMPLE OF LD PROGRAM:

The following is a step-by-step example on how to create a ladder logic (hence forth referred as "LD") program using the ISaGRAF Workbench software program provided with the I-7188EG/XG & aPAC-7186EG (plugged X-board: X107) controller system.

Variables Used In the Example LD Program:

Name	Type	Attribute	Description
SW1	Boolean	Input	Input Switch1
SW2	Boolean	Input	Input Switch2
SHUT	Boolean	Input	Input Shutdown button
OUT01	Boolean	Output	Output1
OUT02	Boolean	Output	Output2
OUT03	Boolean	Output	Output3
TMR1	Timer	Internal	Time Period of blinking, initial value is set at "T#1s"

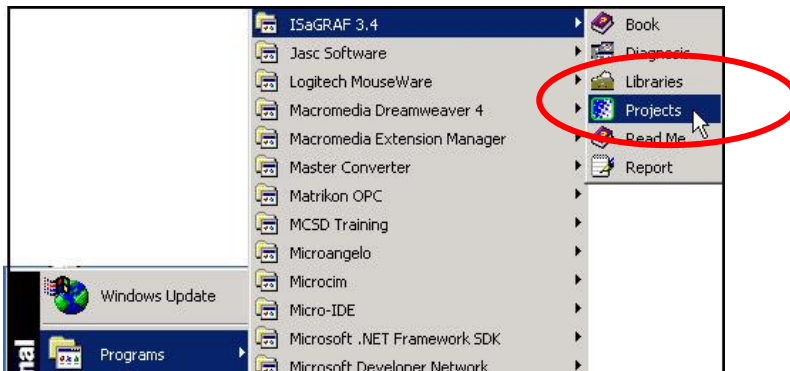
Ladder Logic Program Outline:

Process Operation Actions:

1. Monitor/Control SW1 (default: OFF) & SW2 (default: OFF) two Switches.
2. Monitor/Control SHUT button (default: OFF, normal close)
3. If either SW1 or SW2 is ON, and SHUT is OFF, active "Blink" Timer TMR1
4. OUT01~03 will ON and OFF at one second Interval Rate
5. Push SHUT to stop the blinking of OUT01~03.

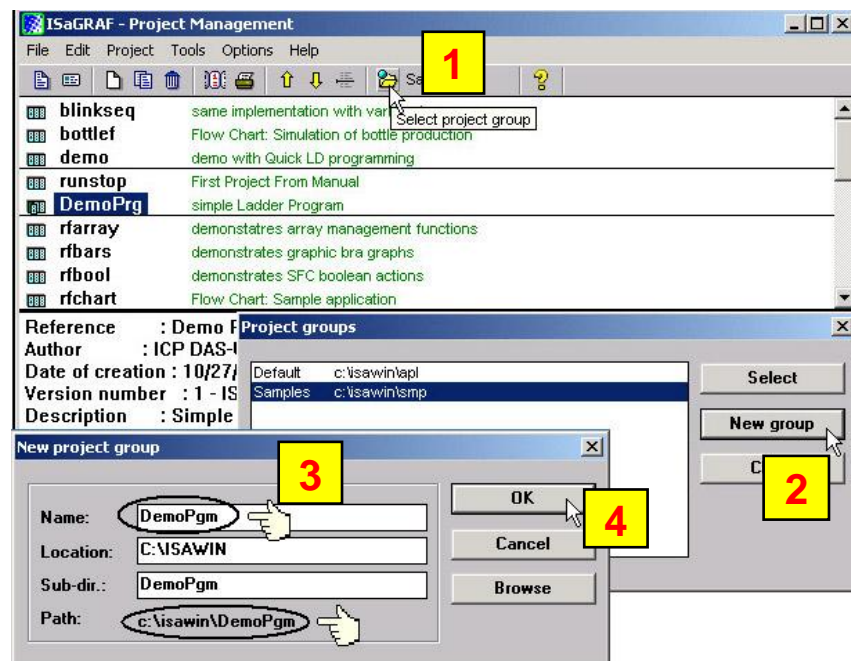
2.3.1: Start ISaGRAF Ę Project Management

Starting & Running the ISaGRAF Workbench Program please click on the Windows [Start] button, then click [Programs] > [ISaGRAF 3.x] > [Projects] as shown below.



2.3.2: Creating an ISaGRAF Project Group

Click the icon "Select Program Group" then click "New Group" button. Key in the name for the new group you wish to create then click on "OK".



Note that the name that you give the "New Project Group" also creates a new sub-directory corresponding to the project group name in the "c:\isawin\".

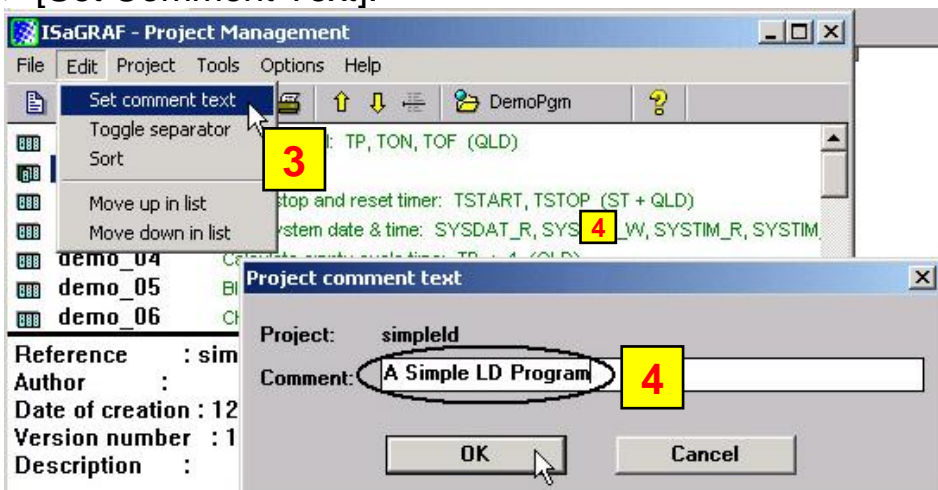
To open the new group, either double click the new group name or click the new group name to select the new group and then click on the "Select" button.

2.3.3: Creating a New ISaGRAF Project

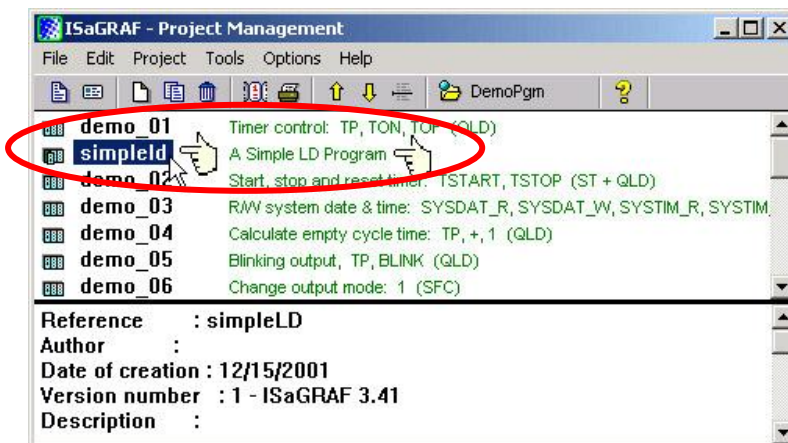
To create a new ISaGRAF project, click the icon "Create New Project" then enter the name for the new project.



You can enter additional information for your project by clicking on the [Edit] > [Set Comment Text].



You will now see the name of the new project in the "Project Management" window. Double click the name of the new project can open the new project.

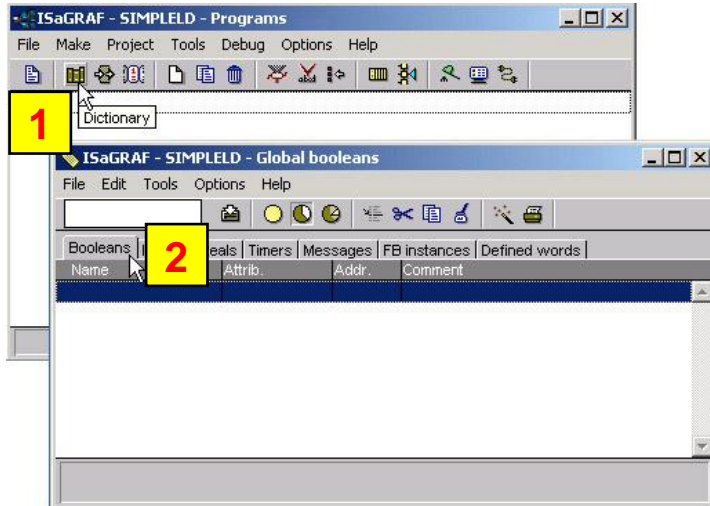


2.3.4: Declaring the ISaGRAF Project Variables

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

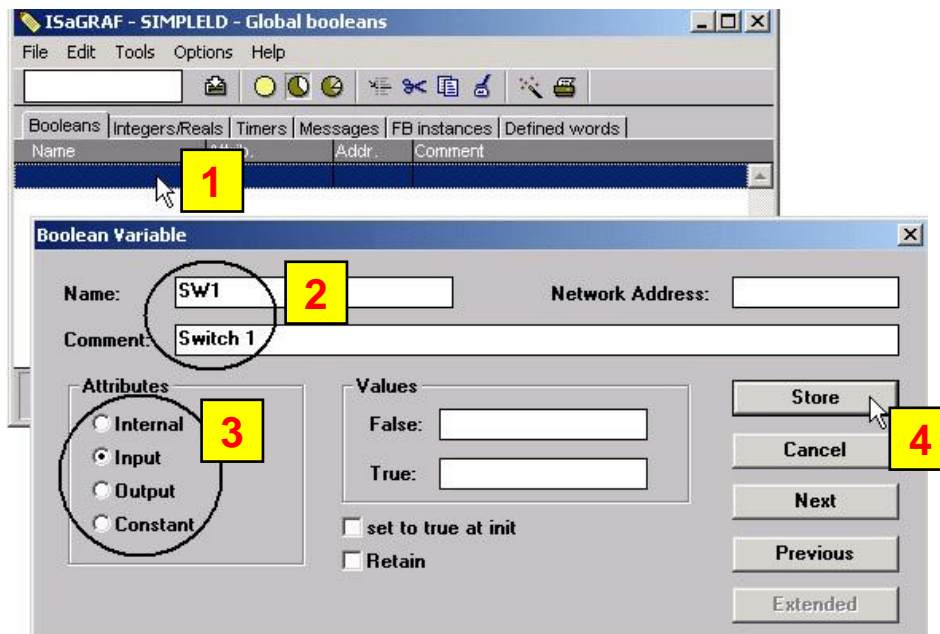
Declaring Boolean:

First click the "Dictionary" icon then click the "Booleans" tab to declare the Boolean variables that we want to use in our example program.



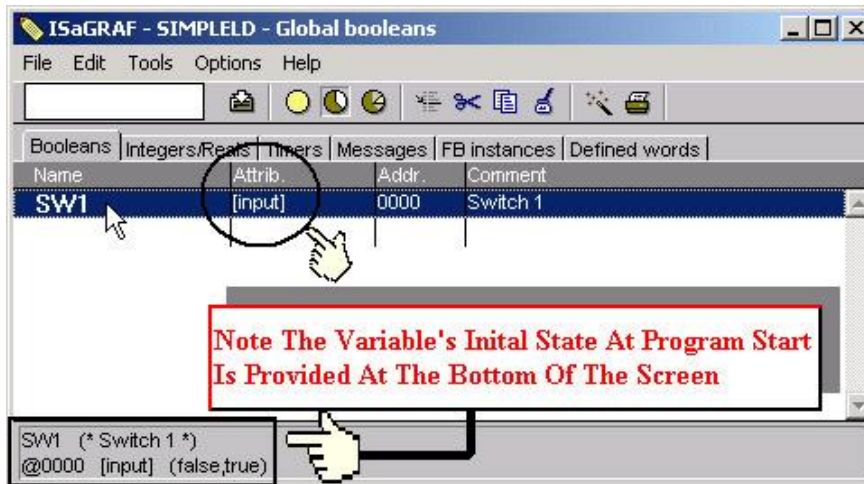
To declare the program variables for the ISaGRAF project, double click on the colored area below the "Booleans" tab, and a "Boolean Variable" window will be opened. Enter the variable name you want to use in this project.

For this example, the variable name is "SW1" and the comment is "Switch 1". The next item that must be declared is the "Attribute" section. The "Input" attribute is selected. The "Store" button is used to save the Boolean variable that has been created.



The new Boolean variable has now been declared.

Note: The information in the bottom area is provided for the programmer to fully explain how the variable will be handled.



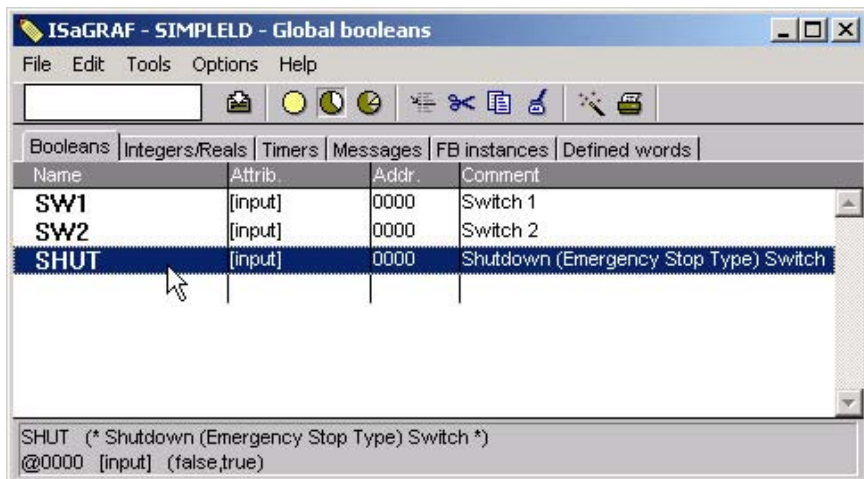
Note: You MUST make sure that the variable you have declared has the desired Attribute assigned.

Q~ Á ^ [ˇ Á á ^ & ã á ^ Á c @æc Á ^ [ˇ Á , æ} c Á c [Á & @æ} *

double click on the variable name and you can reassign the attribute for the variable.

Using the same method described above, declare the additional Boolean variables for this example program, "SW2" and "SHUT".

When you have completed the Boolean variable assignments, the Global Boolean window should be looked like below.

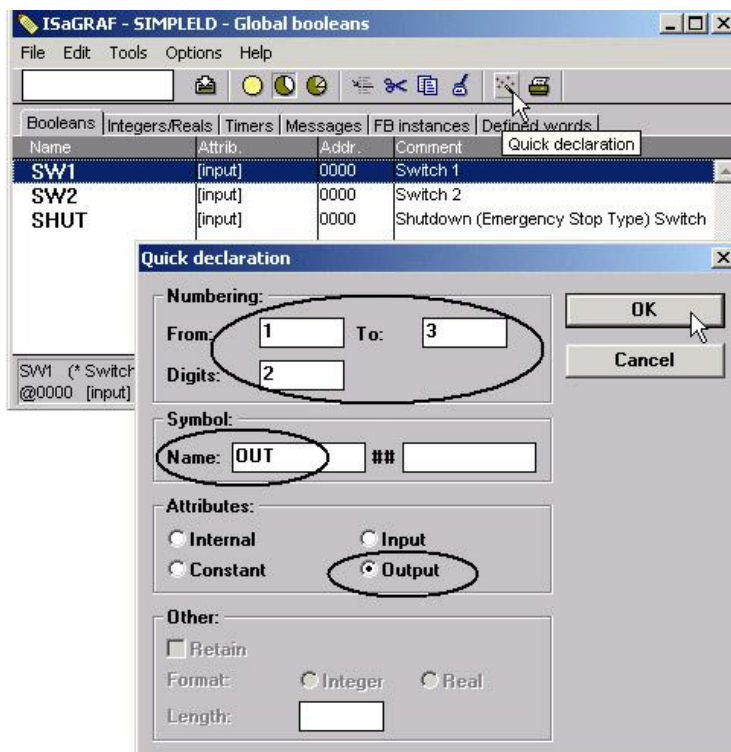


Quick Declaration:

There are three outputs used in this example named %OUT01+, %OUT02+, and %OUT03+. ISaGRAF provides a quick and easy way to declare like variables that are sequentially ordered.

Click on the "Quick Declaration" icon, and enter the number to the fields of %From+, "To" (e.g. from 1 to 3) and %oÖã * .ã c • +

Enter the "Symbol" name for the output variables, and set the attribute to "Output".



All three outputs will be immediately added to the "Global Booleans" window. Now we have all Boolean variables.

Declaring Timer:

To declare the timer (TMR1) variable used in this program, click on the "Timers" tab in the Global project setup screen. Double click on the colored area and enter the Name as "TMR1", set the "Attributes" to "Internal", the "Initial Value" to "T#1s", then click the "Store" button.

