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

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

ISaGRAF PAC Series of ICP DAS includes :

μPAC:	μPAC-7186EG, μPAC-7186PEG,I-7188EG, I-7188XG,
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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Please visit www.icpdas.com ➔ FAQ ➔ Software ➔ ISaGRAF for Frequently Asked Questions.

Written by Chun Tsai, Spike Huang & Janice Hong, R&D dept. , ICP DAS.

Table of Contents

Reference Guide

ISaGRAF User's Manual:

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

ISaGRAF (Chinese) User's Manual:

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

Hardware Manual:

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

Resource on the Internet:

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

ISaGRAF Web Information:

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

Related Products:

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

FAQ:

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

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

Performance Comparison Table 1 of ISaGRAF PACs

PACs	CPU	Compared with I-8417		Ethernet	ISaGRAF code size limitation (bytes)	Memory for running program (bytes)
		Normal running Speed (Normal PLC scan-time)	Normal Speed for floating point calculation (scan-time)			
XP-8xx7 -CE6	LX 800 **500** MHz	About **10~50** (times) (3~15 ms)	About **10~50** (times) (3~15 ms)	**2** ports **10/100** Mbps	**2 MB**	About **200~400 MB**
WP-8xx7	PXA270, **520** MHz or compatible	About **10~30** (times) (3~15 ms)	About **10~30** (times) (3~15 ms)	**2** ports **10/100** Mbps	**1 MB**	About **20~40 MB**
W-8347 W-8747	Strong-ARM 206 MHz or compatible	About 10~20 (times) (3~15 ms)	About 10~20 (times) (3~15 ms)			
W-8337 W-8737				1 port 10 Mbps		
VP-25W7 VP-23W7	PXA270, **520** MHz or compatible	About **10~30** (times) (3~15 ms)	About **10~30** (times) (3~15 ms)	1 port **10/100** Mbps	**1 MB**	About **20~40 MB**
VP-2117	80186,**80** MHz or compatible	About **4** (times) (2~25 ms)	About **0.8** (times) (10~125 ms)	1 port **10/100** Mbps	64 KB	About **768 KB**
iP-8447 iP-8847	80186,**80** MHz or compatible	About **4** (times) (2~25 ms)	About **0.8** (times) (10~125 ms)	**2** ports **10/100** Mbps	64 KB	About **768 KB**
I-8437-80 I-8837-80				1 port 10 Mbps		About 512 KB
I-8437 I-8837	80188 40 MHz or compatible	About 1 (times) (5~100 ms)	About **0.2** (times) (25~500 ms)			
I-8417 I-8817				-		
µPAC-7186EG	80186,**80** MHz or compatible	About **4** (times) (2~5 ms)	About **0.8** (times) (10~125 ms)	1 port **10/100** Mbps	64 KB	About **640 KB**
µPAC-7186PEG						About **768 KB**
I-7188EG	80188,40 MHz or compatible	About 1 (times) (5~100 ms)	About **0.2** (times) (25~500 ms)	1 port 10 Mbps		About 512 KB
I-7188XG				-		

Note: W-8xx7/I-8x37 has phased out. Please select compatible WP-8x47/iP-8x47.

Performance Comparison Table 2 of ISaGRAF PACs

WinCE PAC & iP-8x47:

OS	WinCE			MiniOS7
Model	XP-8xx7 -CE6 *2	WP-8x37/ WP-8x47 *2	VP-25W7/ VP-23W7	iP-8447 iP-8847 *2
Modbus TCP Master (Max. Connecting)	Max. 100 devices			-
Modbus RTU/ASCII Master Function Block (Max.)	(Per port)			(Total)
	256			128
Modbus RTU/ASCII *3 Master COM Port (Max.)	33 ports	10 ports		2 ports
	COM1~33	1~14	2,3,5~14	1~5
Modbus RTU Slave *3 COM Port (Max.)	9 ports	5 ports		2 ports
	COM1 ~ 33	1 ~ 8	2,3,5~8	1 or 2,3
Modbus TCP/IP Slave Connections *4	64	32		6
Modbus Address Range	1~8191			1~4095
LCD Monitor	-		TFT 5.7”/3.5”	-
Touch Panel	-		Yes/ -	-
VGA Resolution (Max.)	1024x768	1024x768 /800x600	640x480 /320x240	-
USB Port *5	2	2/1	1	-
Battery Backup SRAM*6	512K			
PAC to PAC Data Exchange	Ebus			Fbus, Ebus
Send E-mail (file attached) *7	Yes			
Redundant Ethernet Port *8	Yes			
Mbus24r & mbus24r1 Function Block	Yes			
Mbus_xr & Mbus_xr1 Function Block *9	Yes			-
Software Features (Require Optional Accessories)				
Support FRnet I/O *10	Yes			
Support CAN/CANopen*11	Yes			
Support VW Sensor	Yes			
Support New Redundant System *12	Yes			-

OS	WinCE			MiniOS7
Model	XP-8xx7 -CE6 *2	WP-8x37/ WP-8x47 *2	VP-25W7/ VP-23W7	iP-8447 iP-8847 *2
Remote I/O Modules (Optional Accessories)				
Support Ethernet I/O (with I-8KE4/E8-MTCP)	Yes			-
Support I-7K/87K I/O	Max. Connecting: 255			64
(*Only support 1 COM Port)	COM 3 or 4	2 or 3		2 or 3 or 4

MiniOS7 PAC & WP-8xx7:

OS	MiniOS7							WinCE
Model	I-7188 XG	I-7188 EG	µPAC-7186 PEG /EG *1	I-8417 I-8817	I-8x37 -80 *2	iP-8447 iP-8847 *2	VP-2117	WP-8x37 / WP-8x47 *2
Modbus TCP Master (Max. Connecting Device)	-							100
Modbus RTU/ASCII Master Function Block (Max.)	(Total)							(Per port)
	64		128	64		128		256
Modbus RTU/ASCII *3 Master COM Port (Max.)	2 ports							10 ports
	COM 2, 3	1, 2, 3		1, 3, 4, 5		1~ 5	1~3, 5	1~14
Modbus RTU Slave *3 COM Port (Max.)	2 ports							5 ports
	COM1 or 2/3			1, 2	1, 3	1 or2/3		1 ~ 8
Modbus TCP/IP Slave Connections *4	0	4	6	0	4	6		32
Modbus Address Range	1~4095							1~8191
LCD Monitor	-						STN	-
Touch Panel	-						-	-
VGA Resolution (Max.)	-						128x64	1024x768 /800x600
USB Port *5	-						-	2/1
Battery Backup SRAM *6	Optional			Optional		512K		
PAC to PAC Data Exchange	Fbus	Fbus,Ebus		Fbus	Fbus, Ebus			Ebus
Send E-mail (file attached) *7	-		Yes	-		Yes		
Redundant Ethernet Port *8	-					Yes	-	Yes
Mbus24r & mbus24r1 Function Block	-		Yes	-			Yes	

OS	MiniOS7							WinCE
Model	I-7188 XG	I-7188 EG	µPAC-7186 PEG /EG *1	I-8417 I-8817	I-8x37 -80 *2	iP-8447 iP-8847 *2	VP-2117	WP-8x37 / WP-8x47 *2
Mbus_xr & Mbus_xr1 Function Block *9				-				Yes
Software Features (Require Optional Accessories)								
Support FRnet I/O *10	-		Yes	-		Yes		
Support AN/CANopen*11	-		Yes	-		Yes		
Support VW Sensor	-			Yes				
Support New Redundant System *12				-				Yes
Remote I/O Modules (Optional Accessories)								
Support Ethernet I/O (with I-8KE4/E8-MTCP)				-				Yes
Support I-7K/87K I/O	Max. Connecting: 64							255
(*Only support 1 COM Port)	COM 2 or 3			3 or 4		2 or3 or4	2 or 3	2 or 3

Annotations:

*1. µPAC-7186PEG is µPAC-7186EG with PoE(Power-over-Ethernet).

*2. I-8x37/I-8x37-80 represents the products of I-8437/8837/8437-80/8837-80.
iP-8x47 represents the products of iP-8447/8847.
WP-8x37 represents the products of WP-8137/8437/8837.
WP-8x47 represents the products of WP-8147/8447/8847.
XP-8xx7-CE6 represents the products of XP-8047-CE6/8347-CE6/8747-CE6

*3. I-8000's COM5~20 & W-8x47/ 8x37's COM5~14 resides at the I-8112/8114 /8142/8144/ 8142i expansion modules ;

iP-8x47's COM5~20 & VP-2117's COM5~16 resides at the I-8112iW/ 8114W/ 8114iW/ 8142iW/ 8144iW expansion modules;

WP-8x47, WP-8x37 and VP-25W7/23W7's COM5~14 resides at the I-8112iW/ 8114W/ 8114iW/ 8142iW/ 8144iW expansion modules;

XP-8x47-CE6's COM6 ~ 33, resides at the I-8112iW/ 8114W/ 8114iW/ 8142iW/ 8144iW expansion modules;

I-7188/ µPAC-7186's COM3 ~ 8 resides at the X5xx X-board expansion boards.

*4. The Ethernet communication of the XP-8xx7-CE6 is more efficient than WP-8xx7 and VP-2xW7. It supports up to 64 Modbus TCP/IP connections.

The W-8x47 with driver version 4.02 or older version only supports 8 Modbus TCP/IP connections, while supports up to 32 Modbus TCP/IP connections since the version 4.03.

If the controller is W-8347/8747 (two Ethernet ports), its OS image must update to the version released on July, 1, 2008 to ensure the network communications is correct.
Please refer to www.icpdas.com > FAQ > Software > ISaGRAF > 095 for more information.

*5. The USB port for the mouse device of the XP-8xx7-CE6 is more efficient than the WP-8xx7 and VP-2xW7.
WP-8x37 support 2 USB Port, WP-8x47 support 1 USB Port.

*6. I-8x17/8x37-80 equip with S256/S512, μPAC-7186EG, I-7188EG/XG equip with X607(256K)/608(512K) can support up to 1024 retained variables. The data, date & time can also be stored in it.

*7. μPAC-7186EG has to use an extra X607/608 battery backup SRAM expansion card for sending E-mail with an attached file, or it can only send E-mail without attached file.

*8. If the cable of one Ethernet port is broken or damaged, the PC/HMI can communicate with the other Ethernet port by Modbus TCP/IP protocol.
(Please plug one I-8135W in VP-25W7/23W7 to enable the 2nd Ethernet port)

*9. The Mbus_xr and Mbus_xr1 can read max. 120 words or 60 long integers or 60 real values. Please refer to www.icpdas.com > FAQ > Software > ISaGRAF > FAQ-101 for more information.

*10. To support FRnet I/O in μPAC-7186EG, please insert one FX-016 in it.
VP-2xW7 & VP-2117 support Max. **3** pcs. of I-8172W (Max. ch.768 DI & 768 DO).
iP-8x47 support Max. **4** pcs. of I-8172W (Max. ch. 1024 DI & 1024 DO).
WP-8x47 & WP-8x37 support Max. **8** pcs. of I-8172W (Max. ch.2048 DI & 2048 DO)
XP-8xx7-CE6, W-8x47/8x37 support Max. **7** pcs. of I-8172W (Max. ch.1792 DI & 1792 DO).

*11. XP-8xx7-CE6, μPAC-7186EG, iP-8x47, WP-8x47, WP-8x37, VP-25W7/23W7 and W-8xx7 supports the I-7530 (RS-232 to CAN converter) to connect to other CAN/CANopen devices.

*12. Only the XP-8xx7-CE6, WP-8x47, WP-8x37, VP-25W7/23W7 and W-8x47 support new redundant system, the W-8x37 doesn't support it.

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

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

■ Power Supply	
Power Requirements	+10 ~ +30 V_{DC} (unregulated), 20 W (when I/O slots are empty)
Protection	Power reverse polarity protection
■ General Environment	
Temperature	Operating: -25 ~ +75 °C Storage : -30 ~ +80 °C
Humidity	10 ~ 90 % RH (non-condensing)
■ System	
CPU	I-8437/8837: 80188 or compatible, 40 MHz I-8437-80/8837-80: 80186 or compatible, 80 MHz
Watchdog Timer	Yes, Default = 0.8s
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year
SRAM	512 KB
FLASH Memory	512 KB, Erase unit is 64 KB, 100,000 erase/write cycles
NVRAM	31 bytes, battery backup, data valid up to 10 years
EEPROM	2048 bytes, retention > 100 years. 1,000,000 erase/write cycles
SMMI	Five Digits. 7-Seg. LED, four push buttons & three LED on the front panel. It can display message, value, input value, simulate input & output.
I/O Slots	Accept parallel & serial I/O boards 4 empty slots for I-8437-80, 8 empty slots for I-8837-80.
NET ID	8 DIP switch to set NET ID as 1 ~ 255
■ Serial Ports	
Ethernet	10 Mbps, NE2000 compatible, 10 Base-T, Program download port.
COM1	RS-232: TxD, RxD, GND, Speed: 115200 bps max. Program downloads port.
COM3	RS-232/RS-485, RS-232:TxD,RxD,RTS,CTS,GND, RS-485:DATA+,DATA-, Speed: 115200 bps max. Program downloads port.
COM4	RS-232:,TxD,RxD,RTS,CTS,DSR,DTR,CD,RI,GND. Speed: 115200 bps max. Full modem signals

■ **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)
■ **Motion Control**	
	I-8x37/8x37-80 can integrate with one I-8091(2-axis) or two I-8091(4-axis) to do motion control. When doing motion control, the Ethernet communication is not available. (Please update to motion driver to support it.)
■ **PWM Output**	
Pulse Width Modulation Output	8-ch max. for one controller. 500 Hz max. for Off=1 & On=1 ms Output square wave: Off: 1 ~ 32767 ms, On: 1 ~ 32767 ms Optional D/O boards: I-8037, 8041, 8042, 8054, 8055, 8056, 8057, 8060, 8063, 8064, 8065, 8066,8068, 8069 (Relay Output boards can not generate fast square wave)
■ **Counters**	
Parallel D/I Counter	8-ch. max. for 1 controller. Counter Val: 32 bit. 500Hz max. Min. ON & OFF width must >1ms Optional D/I boards: I-8040, 8042, 8051, 8052, 8053, 8054, 8055, 8058, 8063, 8077
Serial D/I Counter	Counter input: 100 Hz max. Counter value: 0 ~ 65535 (16-bit) Optional serial I-87K D/I boards: I-87040, 87051, 87052, 87053, 87054, 87055, 87058, 87063
Remote D/I Counter	All remote I-7000 & I-87K D/I modules support counters. 100 Hz max. value: 0 ~ 65535
High Speed Counter	I-87082: 100 kHz max. 32-bit, I-8080: 450 kHz max. 32-bit
■ **Protocols**	
Modbus Slave Protocol	Up to **2** COM Ports (COM1 and COM3) can support Modbus RTU Slave protocol for connecting ISaGRAF, PC/HMI/OPC Server & MMI panels.
Modbus TCP/IP Protocol	Ethernet Port support Modbus TCP/IP Slave protocol for connecting ISaGRAF & PC/HMI. (Max. 4 connections)
Remote I/O	One of COM3 or COM4 supports I-7000 I/O modules & (I-87K base + I-87K serial I/O boards or RU-87P1/2/4/8 + I-87K High Profile I/O cards) as Remote I/O.

	Max. 64 Remote I/O module for one controller
Modbus Master Protocol	Up to **2** COM Ports (COM1,COM3,COM4 and COM5 in multi serial port board) can support Modbus RTU Master or ASCII Master protocol to connect to other Modbus Slave devices, 2 ports support up to 64 Modbus_xxx function blocks (same type).
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 COM4 or COM5 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)
User Defined Protocol	User can write his own protocol applied at COM1, COM3, COM4 (& COM5 ~ COM20 if multi-serial port boards are plugged) by serial communication function blocks.
Modem_Link	Supports PC remotely download & monitor the controller through a normal modem.
MMICON/LCD	One of COM3 or COM4 supports ICP DAS's MMICON. The MMICON is featured with a 240 x 64 dot LCD and a 4 x 4 Keyboard. User can use it to display picture, string, integer, float, and input a character, string, integer and float.
Redundant Bus7000	**Two** ISaGRAF PACs can link to remote I-7000 & I-87K I/O modules at the same time. Only **one** controller is active to control these Remote I/Os. If one is dead, the other one will take over the control of Remote I/Os.

■ Battery backup SRAM

I-8x37/8x37-80 can support up to 1024 retain variables with a S256/S512 plug in the socket of the back-plane. Data can also be stored in the S256/S512, and then PC can load these data via COM1 or Ethernet. PC can also download pre-defined data to the S256/S512. Optional: S256: 256 KB, S512: 512 KB

Specifications: I-8417/8817

■ Power Supply	
Power Requirements	+10 ~ +30 V_{DC} (unregulated) , 20 W (when I/O slots are empty)
Protection	Power reverse polarity protection
■ General Environment	
Temperature	Operating: -25 °C ~ +75 °C , Storage : -30 °C ~ +80 °C
Humidity	10 ~ 90 % RH (non-condensed)
■ System	
CPU	80188 or compatible, 40 MHz
Watchdog Timer	Yes, Default=0.8s
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year
SRAM	512 KB
FLASH Memory	512 KB, Erase unit is 64 KB, 100,000 erase/write cycles
NVRAM	31 bytes, battery backup ,data valid up to 10 years
EEPROM	2048 bytes, Retention > 100 years. 1,000,000 erase/write cycles
SMMI	Five Digits. 7-Seg. LED, four push buttons & three LED on the front panel. It can display message, value, input value, simulate input & output.
I/O Slots	Accept parallel & serial I/O boards. 4 empty slots for I-8417, 8 empty slots for I-8817.
NET ID	8 DIP switch to set NET ID as 1 ~ 255
■ Serial Ports	
COM1	RS-232: TxD, RxD, GND, Speed: 115200 bps max. Program downloads port.
COM2	RS-485: DATA+, DATA-, Speed: 115200 bps max. Self-tuner ASIC inside, Program downloads port.
COM3	RS-232/RS-485, RS-232: TxD, RxD, RTS, CTS, GND, RS-485: DATA+, DATA- Speed: 115200 bps max.
COM4	RS-232: Full modem signals, 115200 bps max. TxD,RxD,RTS,CTS,DSR,DTR,CD,RI,GND.
■ 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)
■ **Motion Control**	
	I-8417/8817 can integrate with one I-8091 (2-axis) or two I-8091 to do motion control. When doing motion control, the Ethernet communication is not available. (Please update to motion driver to support it.)
■ **PWM Output**	
Pulse Width Modulation Output	8-ch max. For one controller. 500 Hz max. for Off=1 & On=1 ms Output square wave: Off: 1 ~ 32767 ms, On: 1 ~ 32767 ms Optional D/O boards: I-8037, 8041, 8042, 8054, 8055, 8056, 8057, 8060, 8063, 8064, 8065, 8066,8068, 8069 (Relay Output boards can not generate fast square wave)
■ **Counters**	
Parallel D/I Counter	8-ch. max. For 1 controller. Counter Val: 32-bit. 500 Hz max. Min ON & OFF width must >1ms Optional D/I boards: I-8040, 8042, 8051, 8052, 8053, 8054, 8055, 8058, 8063, 8077
Serial D/I Counter	Counter input: 100 Hz max. Counter value: 0 ~ 65535 (16-bit) Optional serial I-87K D/I boards: I-87040, 87051, 87052, 87053, 87054, 87055, 87058, 87063
Remote D/I Counter	All remote I-7000 & I-87K D/I modules support counters. 100 Hz max. value: 0 ~ 65535
High Speed Counter	I-87082: 100 kHz max. 32-bit, I-8080: 450 kHz max. 32-bit
■ **Protocols**	
Modbus Slave Protocol	COM1 & COM2 default supports Modbus RTU Slave protocol for connecting ISaGRAF, PC/HMI/OPC Server & MMI panels.
Remote I/O	One of COM3 or COM4 supports I-7000 I/O modules & (I-87K base + I-87K serial I/O boards or RU-87P1/2/4/8 + I-87K High Profile I/O cards) as Remote I/O. Max. 64 Remote I/O module for one controller
Modbus Master Protocol	Up to 2 COM Ports (COM1,COM3,COM4 and COM5 in multi serial port board) can support Modbus RTU Master or ASCII Master protocol to connect to other Modbus Slave devices, 2 ports support up to 64 Modbus_xxx function blocks (same type).
Fbus	Built-in COM3 Port to exchange data between ICP DAS's

	ISaGRAF PACs.
SMS: Short Message Service	One of COM4 or COM5 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)
User Defined Protocol	User can write his own protocol applied at COM1, COM3, COM4 (& COM5 ~ COM20 if multi-serial port boards are plugged) by serial communication function blocks.
Modem_Link	Supports PC remotely download & monitor the controller through a normal modem.
MMICON/LCD	One of COM3 or COM4 supports ICP DAS's MMICON. The MMICON is featured with a 240 x 64 dot LCD and a 4 x 4 Keyboard. User can use it to display picture, string, integer, float, and input a character, string, integer and float.
■ **Battery Backup SRAM**	
	I-8417/8817 can support up to 1024 retain variables with a S256/S512 plug in the socket of the back-plane. Data can also be stored in the S256/S512, and then PC can load these data via COM1 or COM2. PC can also download pre-defined data to the S256/S512. Optional: S256: 256 KB, S512: 512 KB

Chapter 1 Typical Application

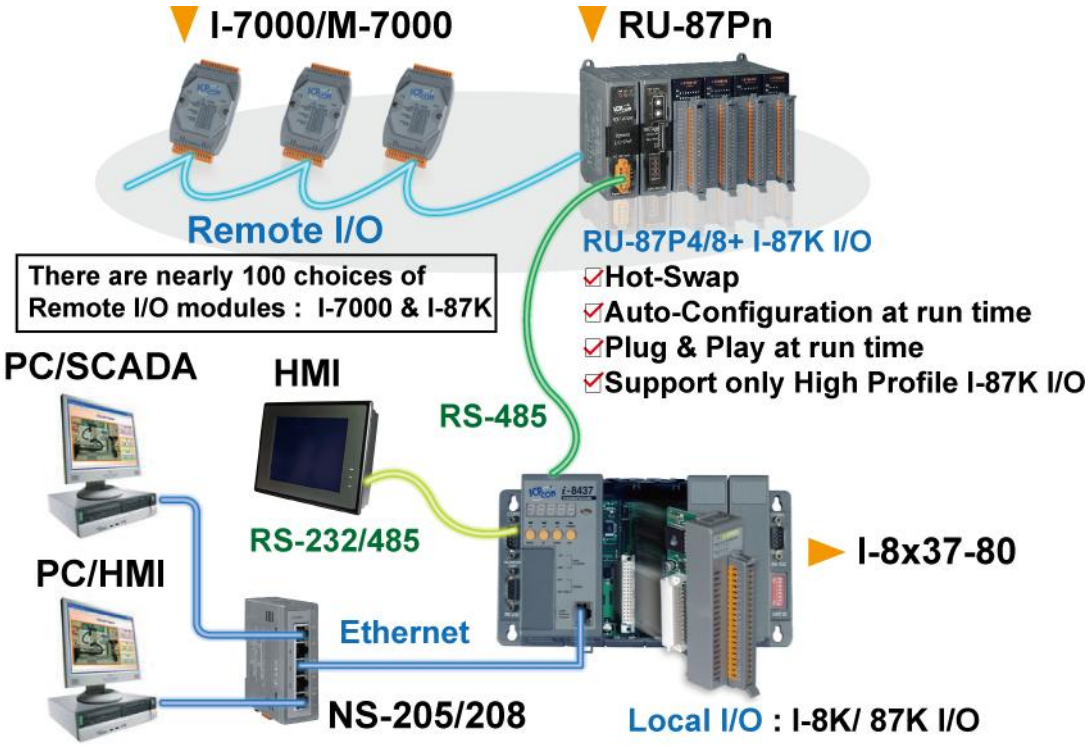
1.1 iPAC-8x47 is better than I-8x37-80

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

Features:

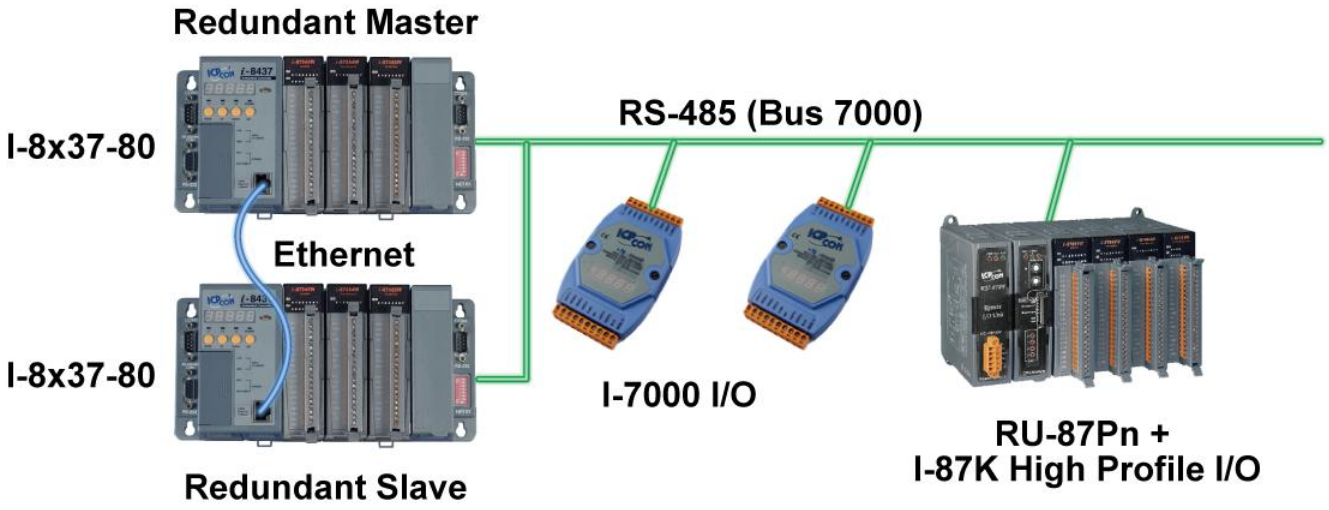
- Support Dual Ethernet 10/100 Mbps
- 768K memory for running program, 256K more than I-8437-80/8837-80
- Built-in 512K Battery backup SRAM
- Support sending E-mail with an attached file (Max. 488 KB)
- Support FRnet I/O
- Support CAN/CANopen
- Support VW Sensor
- Support Ethernet Port redundant system

1.2 Multi-HMI & Local/Remote I/O



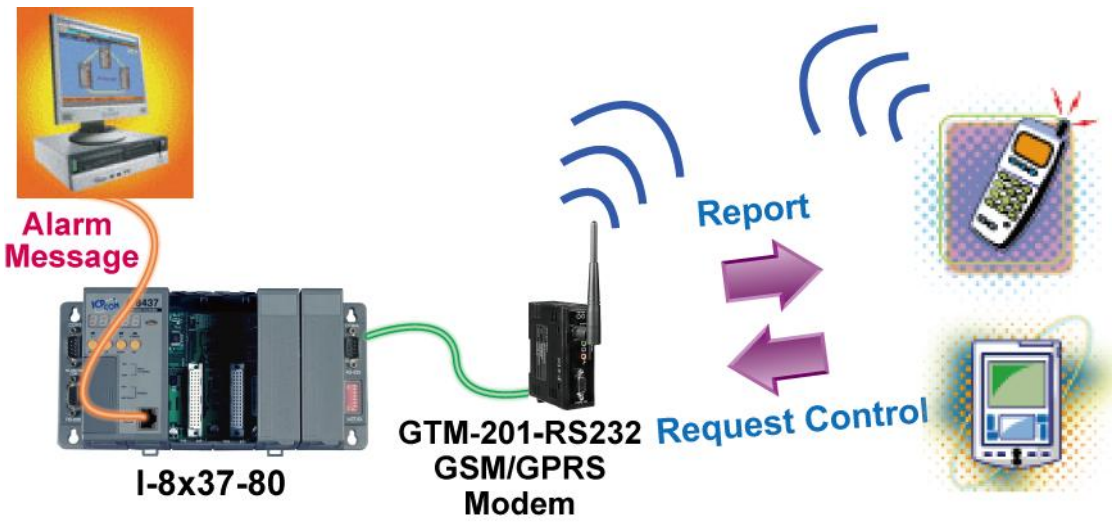
1.3 Redundant Bus7000

I-8437-80/8837-80:



1.4 SMS: Short Message Service

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

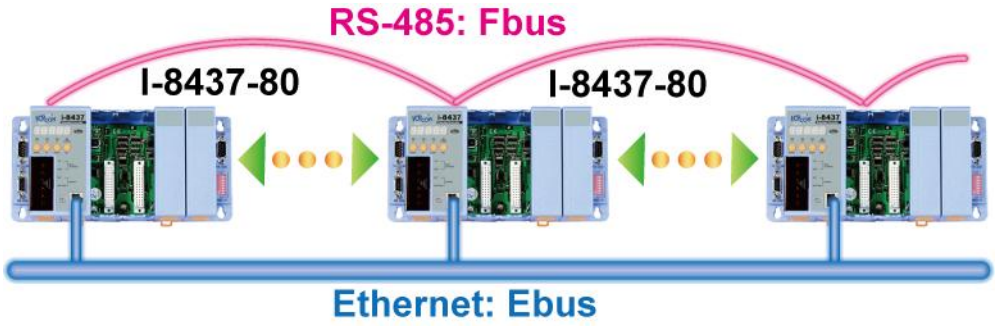


1.5 Data Exchange through Ethernet & RS-485

Controller to Controller Data Exchange

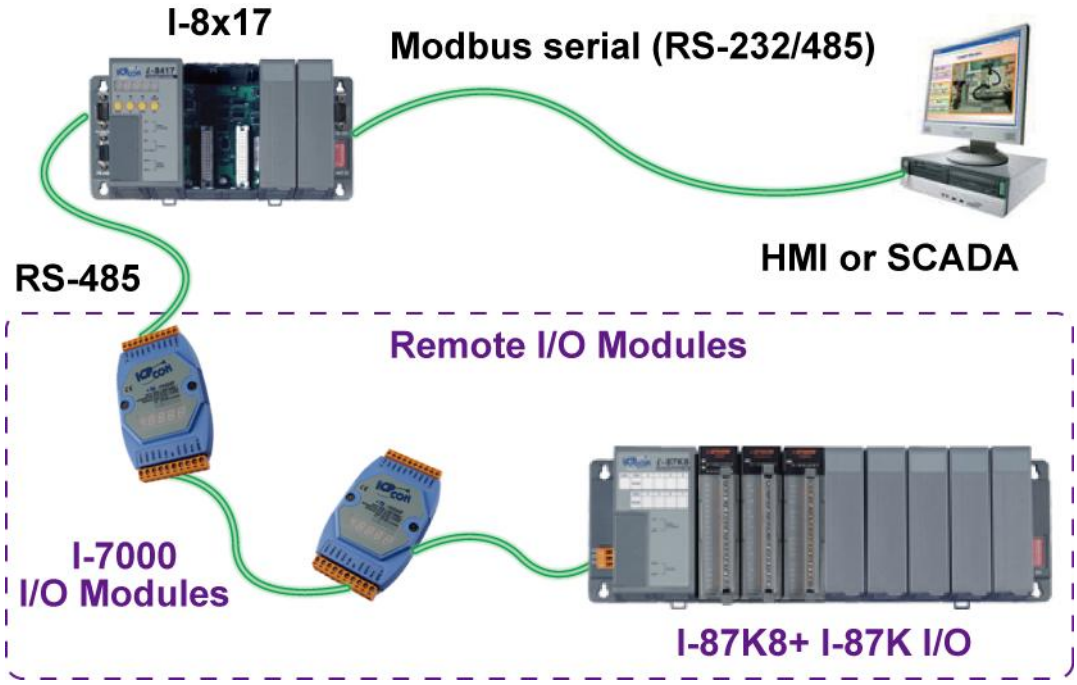
Ethernet : I-8437-80/8837-80

RS485 : I-8xx7/8x37-80

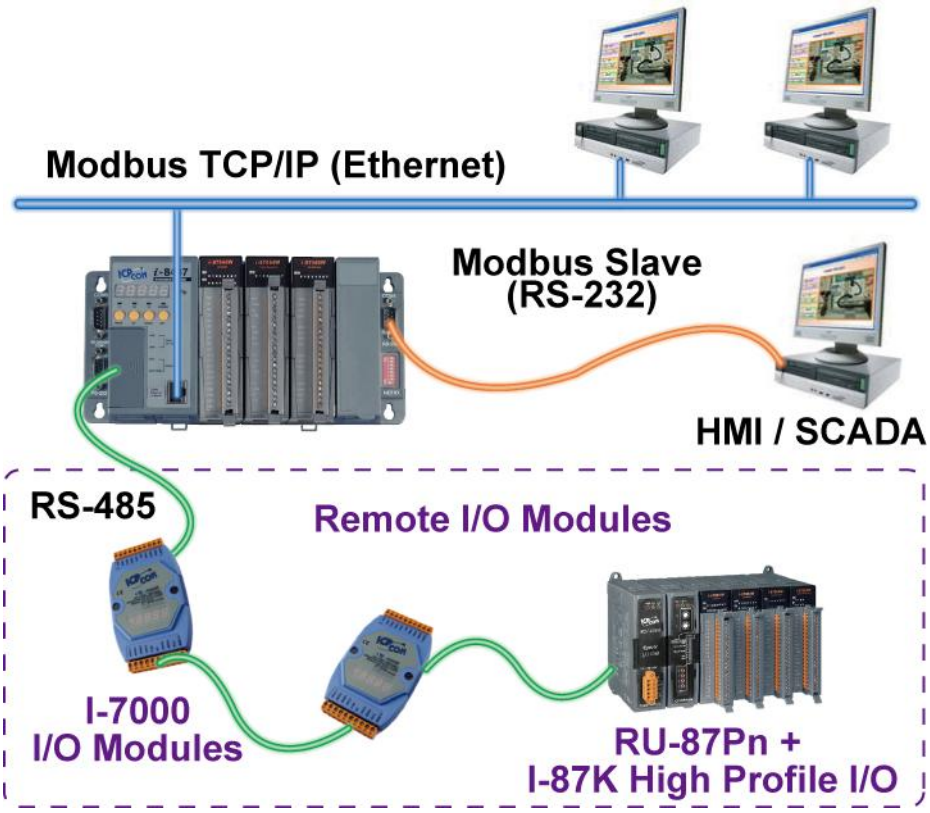


1.6 Modbus Converter of I-7000 & I-87K I/O

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



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



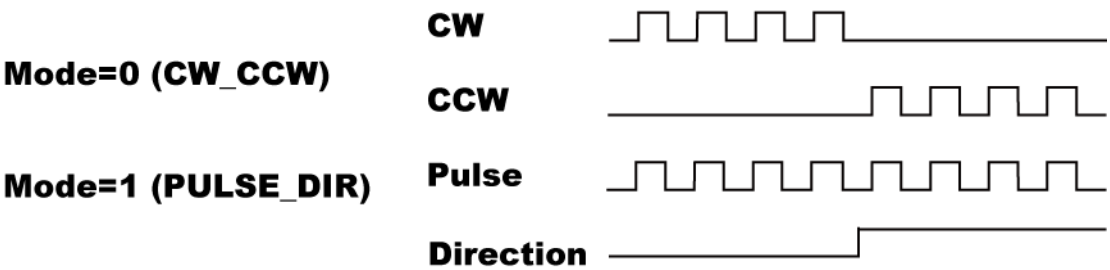
1.7 Motion Control

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

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

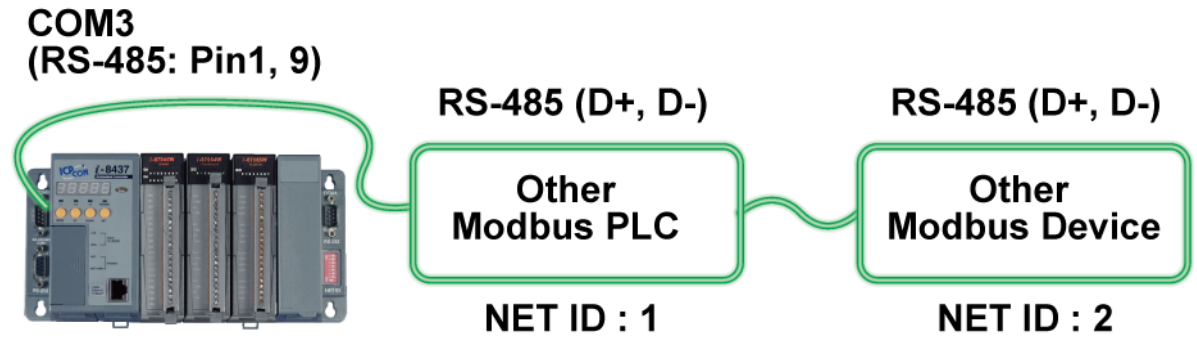
I-8091: 2 axes

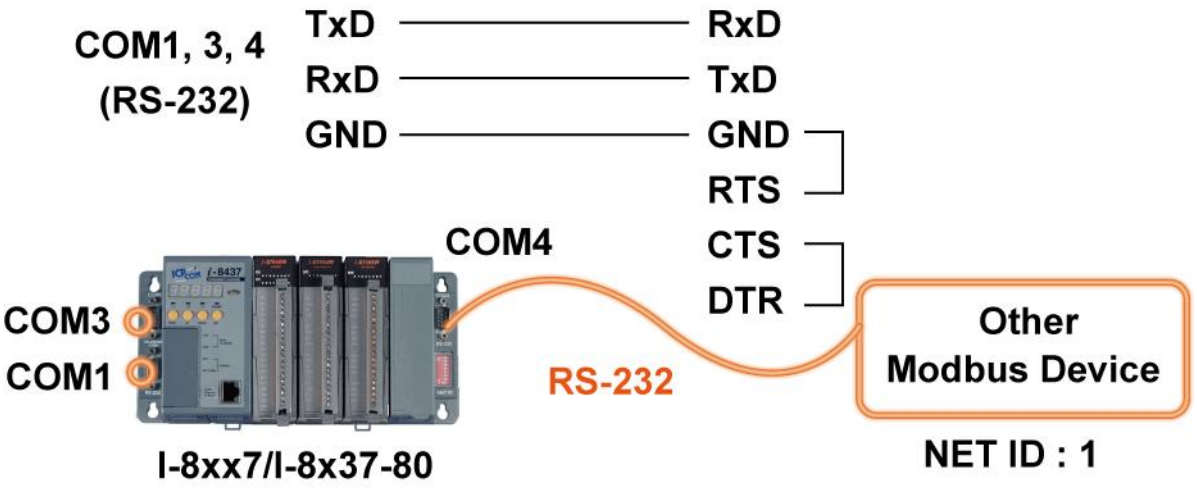
I-8090: 3 axes Encoder



1.8 Modbus Master

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



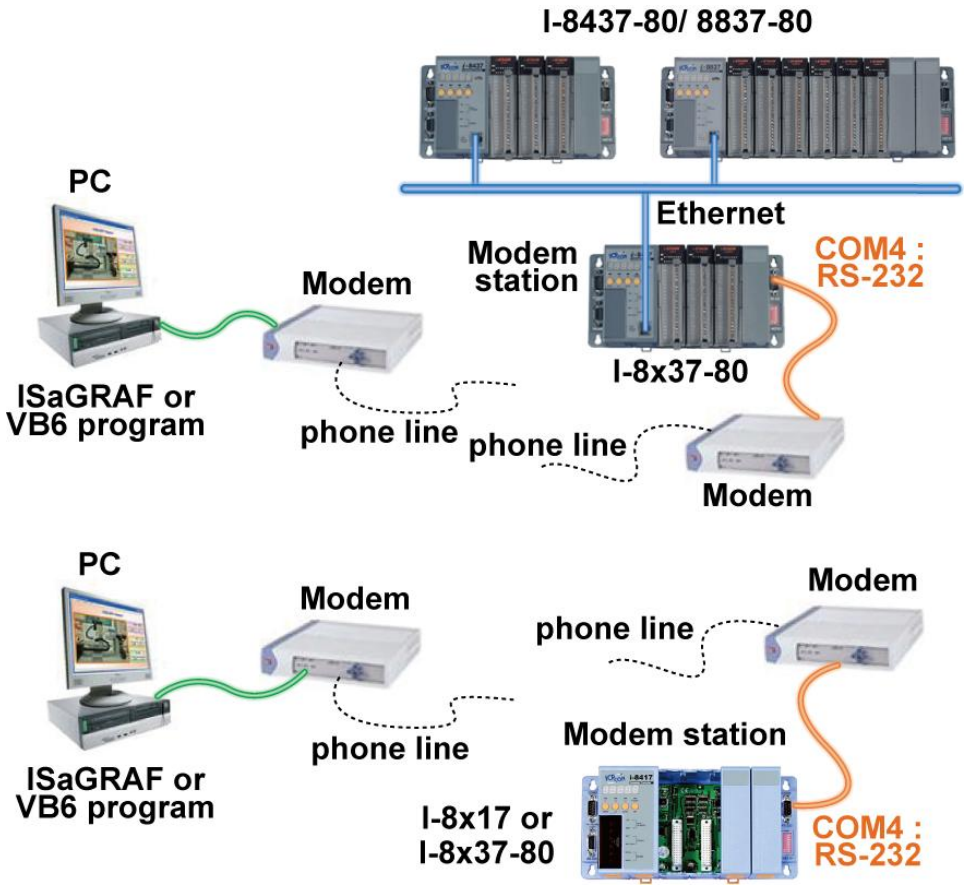


NOTE:

When the **I-8112/8114/8142/8144/8142i** expansion board plugged, COM5 ~COM20 will be added

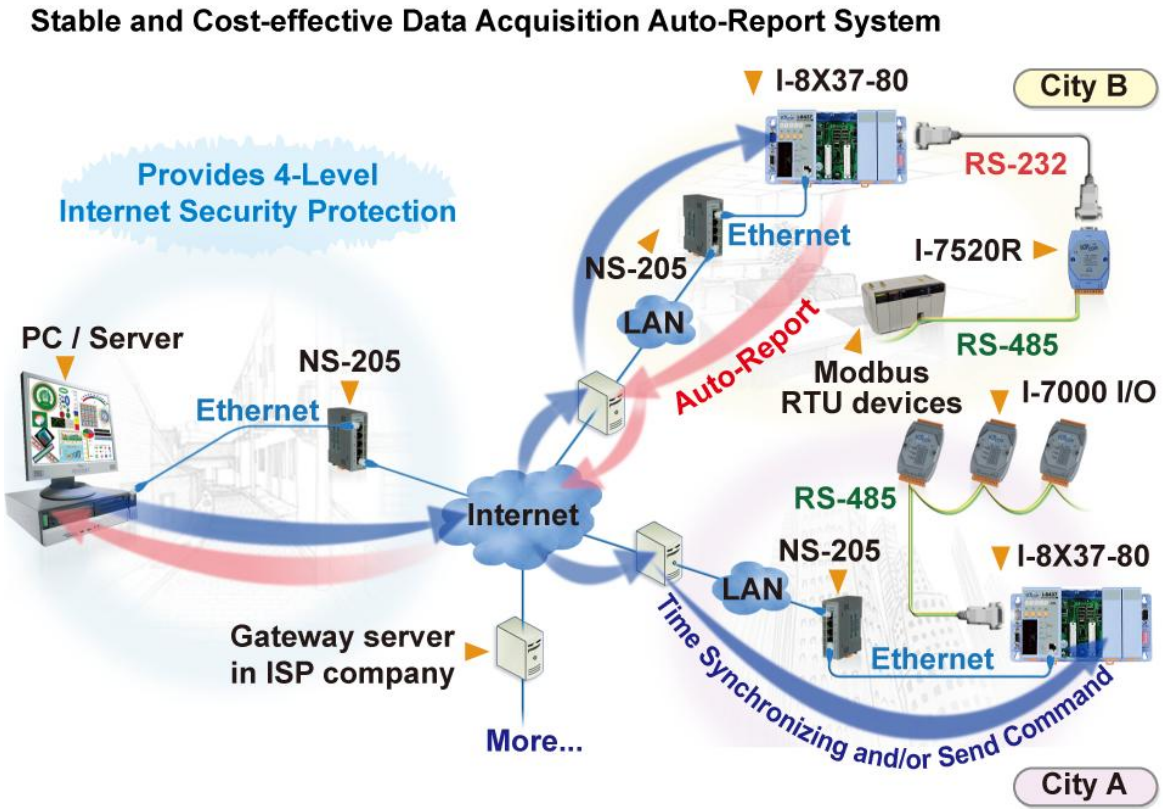
http://www.icpdas.com/products/Remote_IO/i-8ke/selection_rs232_i8k.htm

1.9 Download & Monitoring Via Modem_Link



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

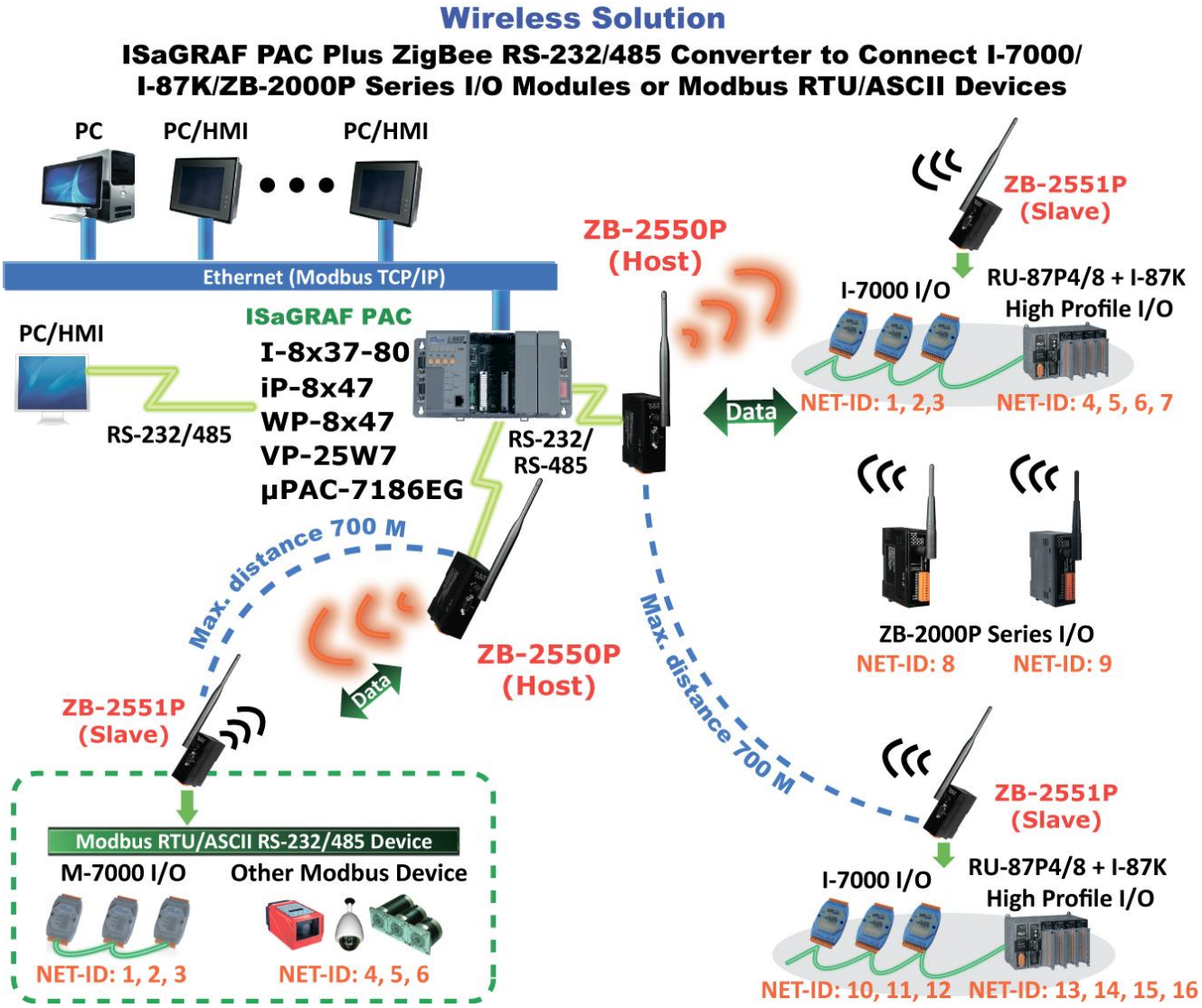
Please refer to [www.icpdas.com > FAQ > Software > ISaGRAF Ver.3 (English) - 065](www.icpdas.com) for more information.



1.11 ZigBee Wireless Solution

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

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



Chapter 2 Software Programming

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

2.1 Step 1 - Installing the ISaGRAF Software

The user has to install two kinds of software before he can program on the I-8xx7/8x37-80 controller system. They are

A. ISaGRAF Workbench
B. ICP DAS Utilities for ISaGRAF

User has to purchase at least one pcs. of ISaGRAF workbench Version 3 (ISaGRAF-256) to install on his PC to edit, download, monitor & debug the controller system.

Item (B) is free and it is burned inside the CD-ROM which is delivered with the I-8xx7/8x37-80.

Operating system Requirements:

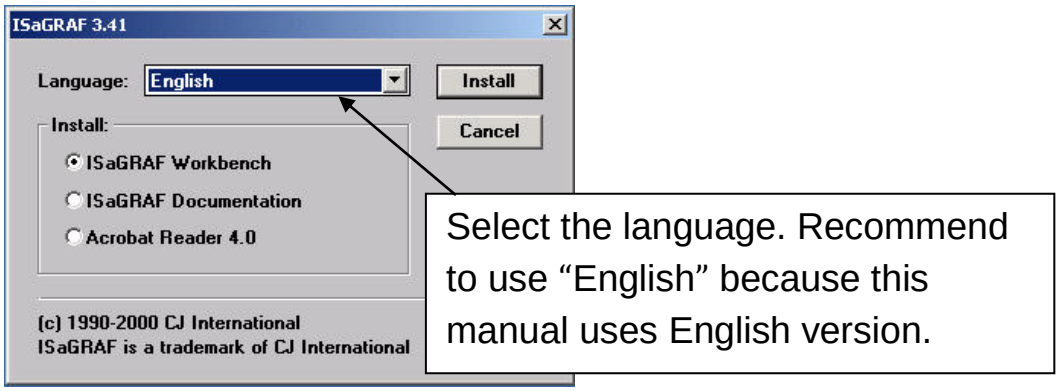
One of the following computer operating systems must be installed on the target computer system before you can install the ISaGRAF Workbench software program.

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

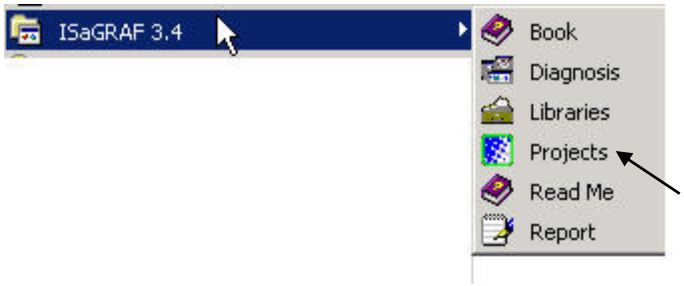
Steps to Installing the ISaGRAF Workbench:

- 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.)

- Double-click on the “install.bat” file listed on the ISaGRAF CD.
  (If the “install.bat” file is not found on your ISaGRAF CD, and then double-click on the “ISaGRAF.exe” file to start the installation process.)

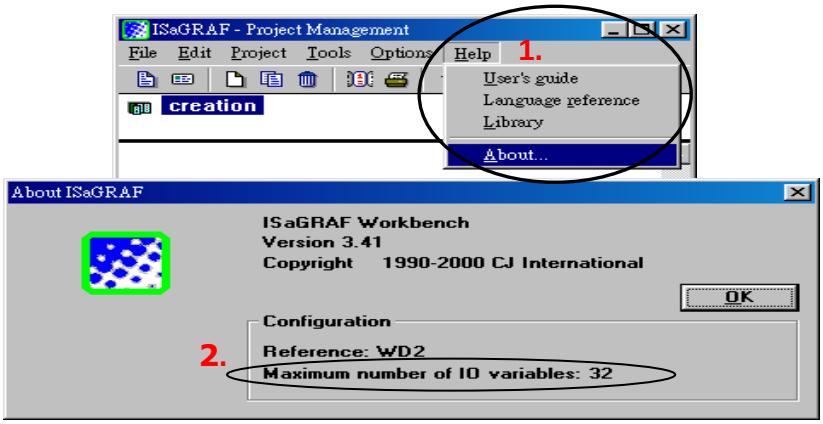


To begin the ISaGRAF 3.x software program, click on the Windows "Start" button, then on "Programs", and you should see the ISaGRAF program group as illustrated below. You could click " Projects " to start the program.



Note:
You must install the hardware protection device (dongle) provided with the ISaGRAF software on your computers parallel port to for the ISaGRAF program to achieve fully authorized functionality. While using ISaGRAF and the dongle is plugged well,

- **If the "Help"➔"About"** says "Maximum number of IO variables: 32", it means ISaGRAF workbench cannot find the dongle well.
  ➔Please reset your PC and then check the "Help"➔"About" again.

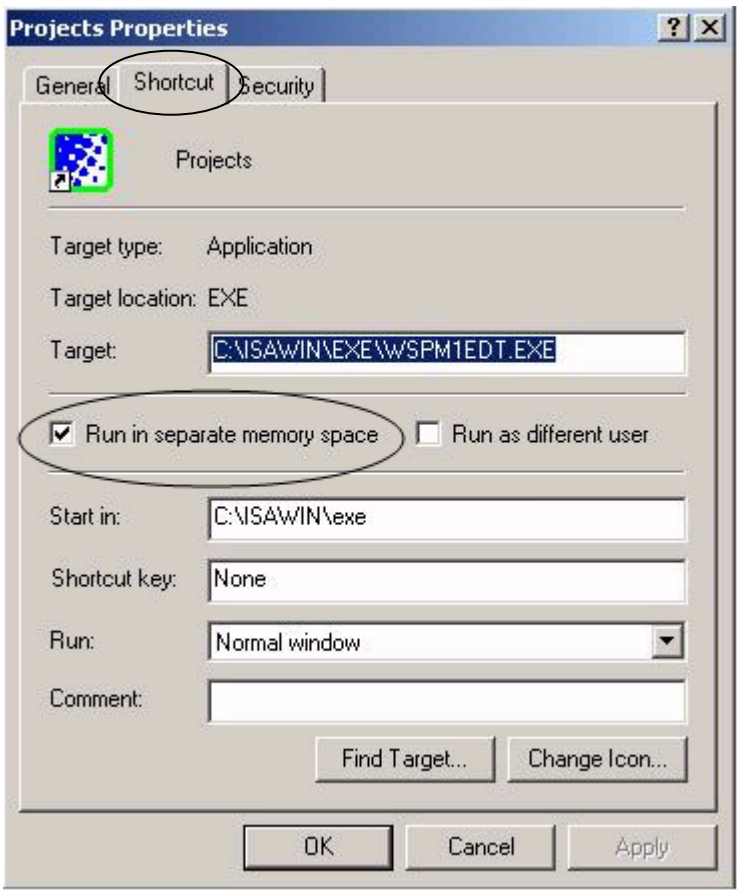


- If it still displays "Maximum number of IO variables: 32", the dongle driver may not be installed well.
  ➔Please execute the ISaGRAF CD_ROM \Sentinel5382\setup.exe for ISaGRAF-80 or \Sentinel\setup.exe for other ISaGRAF version and then reset the PC again.

Note:
Since ISaGRAF 3.51, it is using USB protection-key, after you have installed the ISaGRAF, please un-plug the USB key from your USB Port first, then run "\Sentinel\SSD5411-32bit.exe" in the ISaGRAF 3.51 ~ 3.55 CD-ROM. Then please reset your PC. Afterwards, must plug the USB protection-key when you execute the ISaGRAF.

Important Notice for Window 2000 Users:

If you close some ISaGRAF windows, it holds about 20 to 40 seconds (No response). This may caused by the procedure "CTFMON.EXE" of Windows 2000. To avoid this problem, 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.



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
```

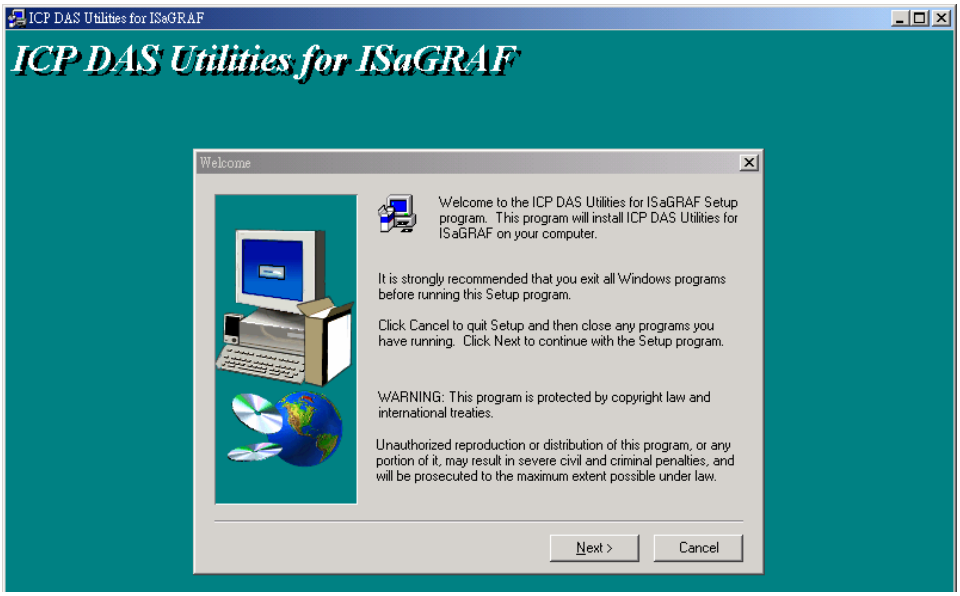
2.2 Step 2 - Installing the ICP DAS Utilities for ISaGRAF

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

- I/O libraries of I-8xx7/8x37-80 & W-8347/8747
- Modem_Link utility
- Auto-scan I/O utility

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

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



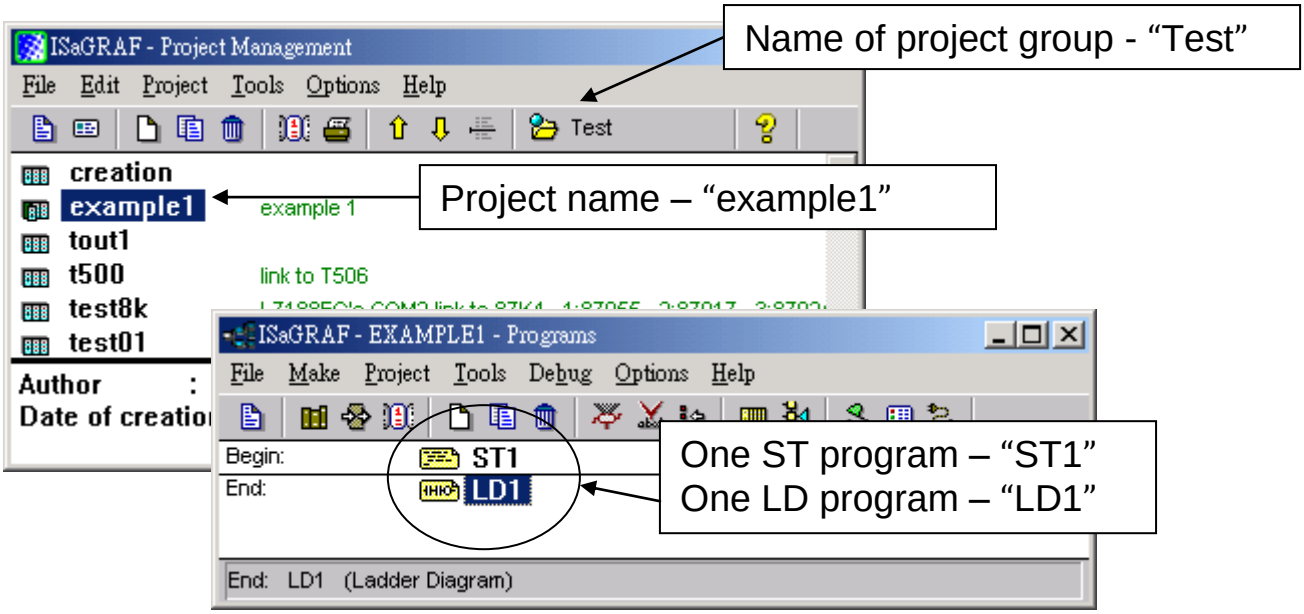
Note:
If “ICP DAS Utilities for ISaGRAF” is not in your CD-ROM, please refer to website of http://www.icpdas.com/products/PAC/i-8000/isagraf.htm , then click “**Driver”** icon to download “**io_lib.zip**”.

2.3 Step 3 - Writing a Simple ISaGRAF Program

We are going to use ISaGRAF to write a simple ISaGRAF example program and then download it to the I-8xx7/8x37-80 controller to make it work.

If you haven't installed "ISaGRAF" & "ICP DAS Utilities for ISaGRAF", please go back to 2.1:Step 1 & 2.2:Step 2.

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



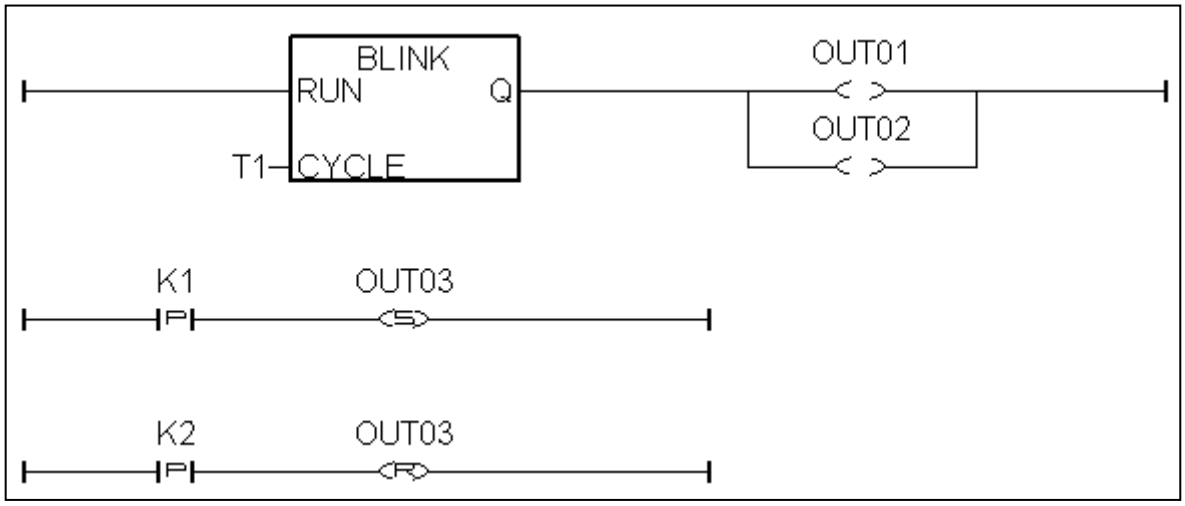
Variables declaration:

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

ST program – "ST1" outline:

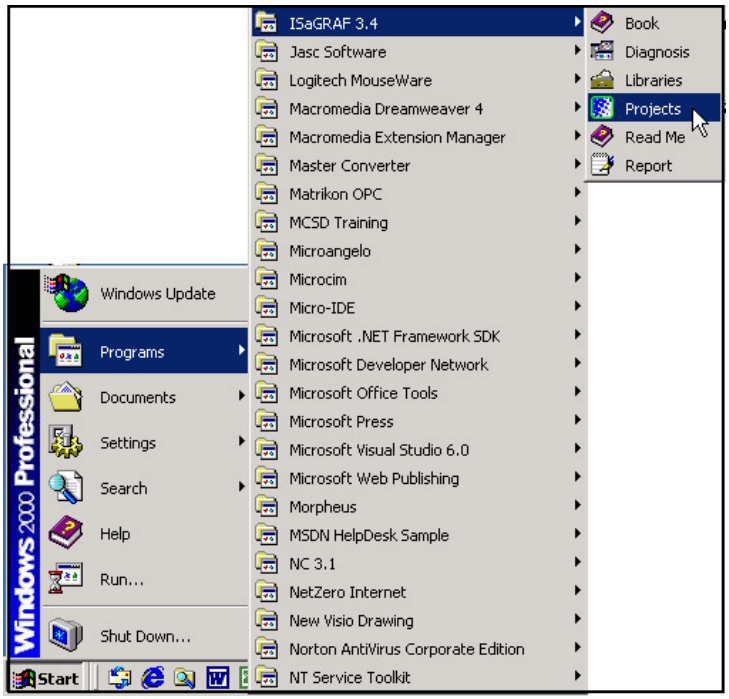
```
IF INIT THEN

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

END_IF;
```

Ladder Logic Program Outline:



2.3.1 Open ISaGRAF-Project Management

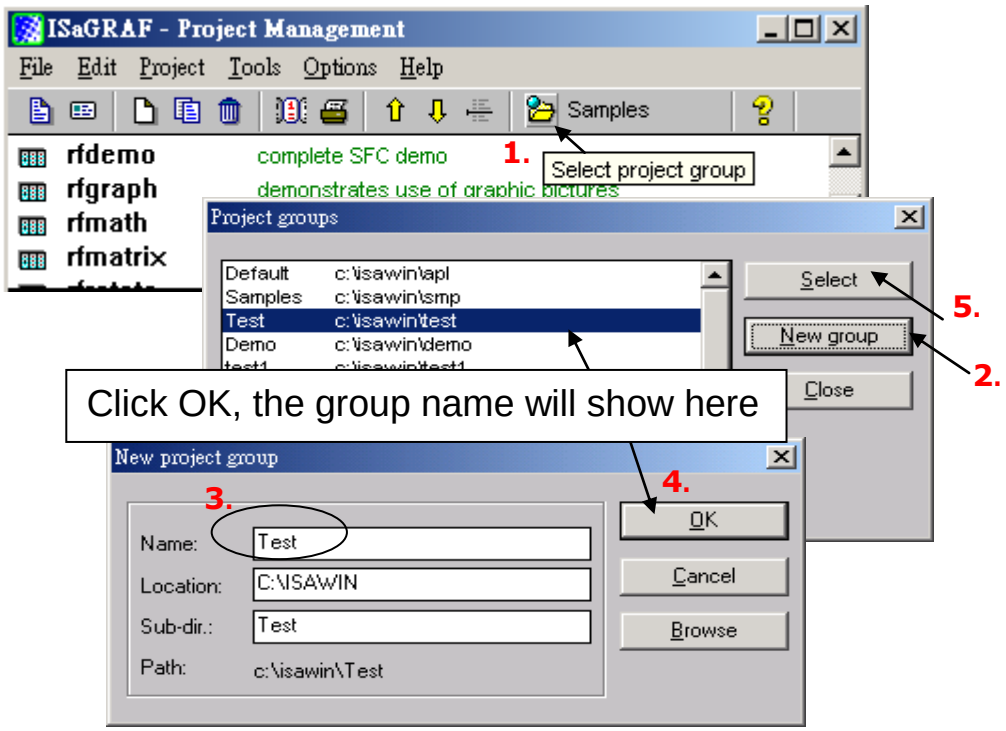
Click on the Windows "Start" button, then click on "Programs", then click on "ISaGRAF 3.4" then click on "Projects" as shown below.



2.3.2 Creating An ISaGRAF User's Group

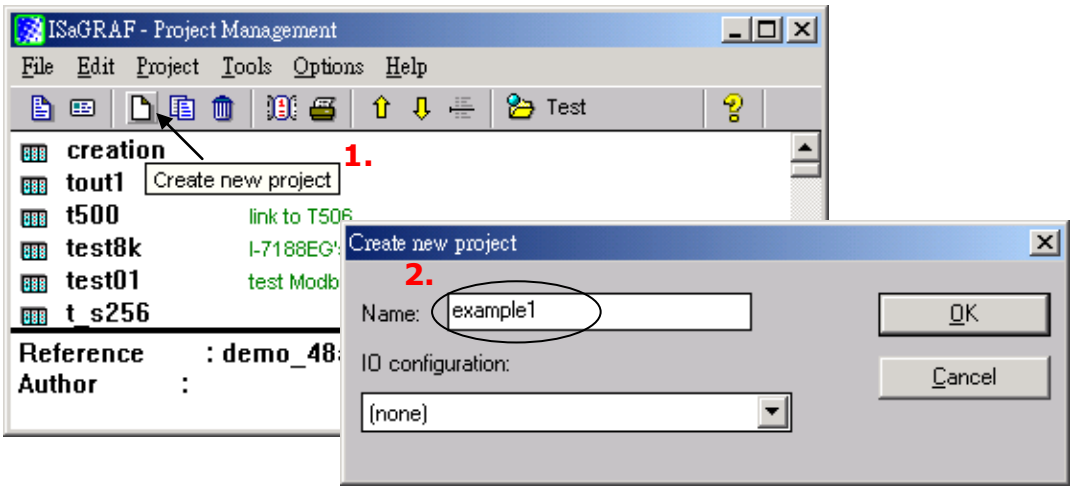
Click on the "Select Project Group", and then click on "New Group", then type in the name for the new user's group you wish to create, and last click on "OK".

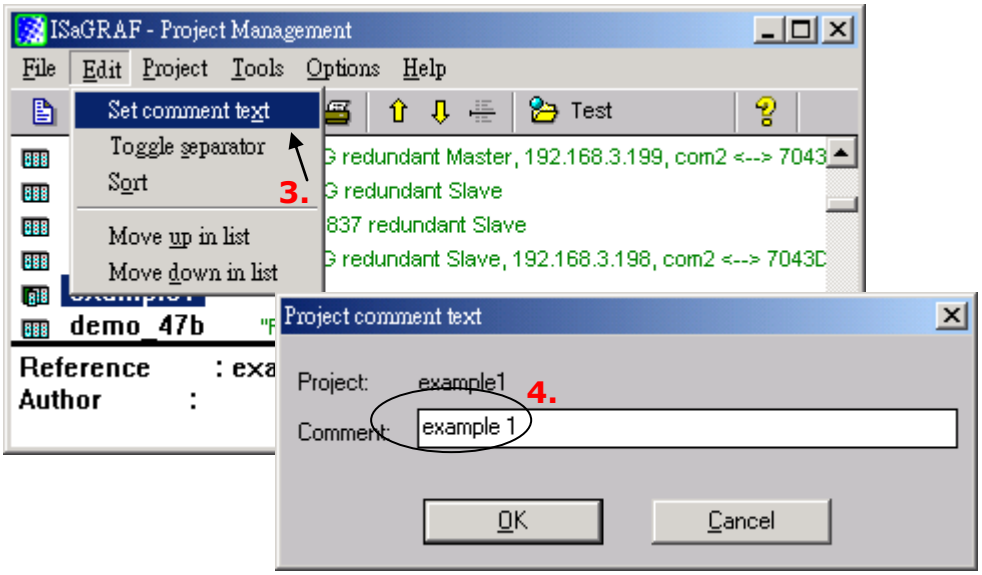
After click "OK", the group name will show as below, please click "Select" to enter this group.



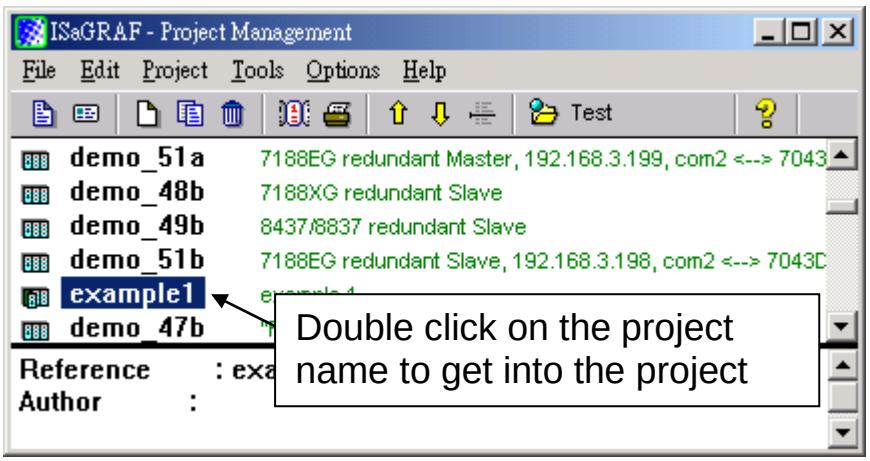
2.3.3 Creating a New ISaGRAF Project

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





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

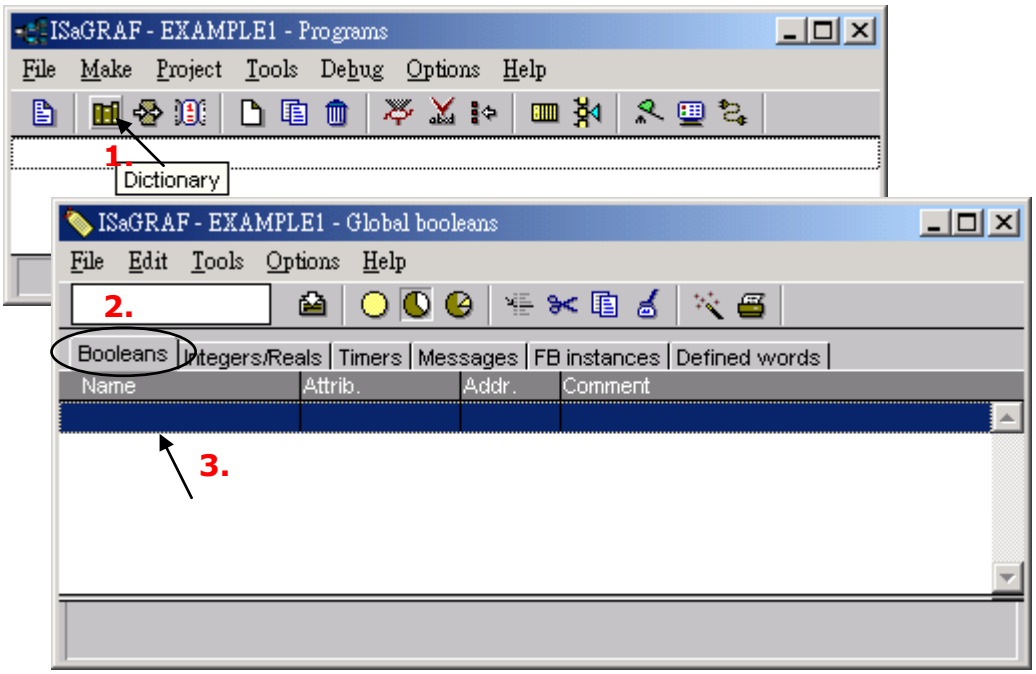


2.3.4 Declaring the ISaGRAF Project Variables

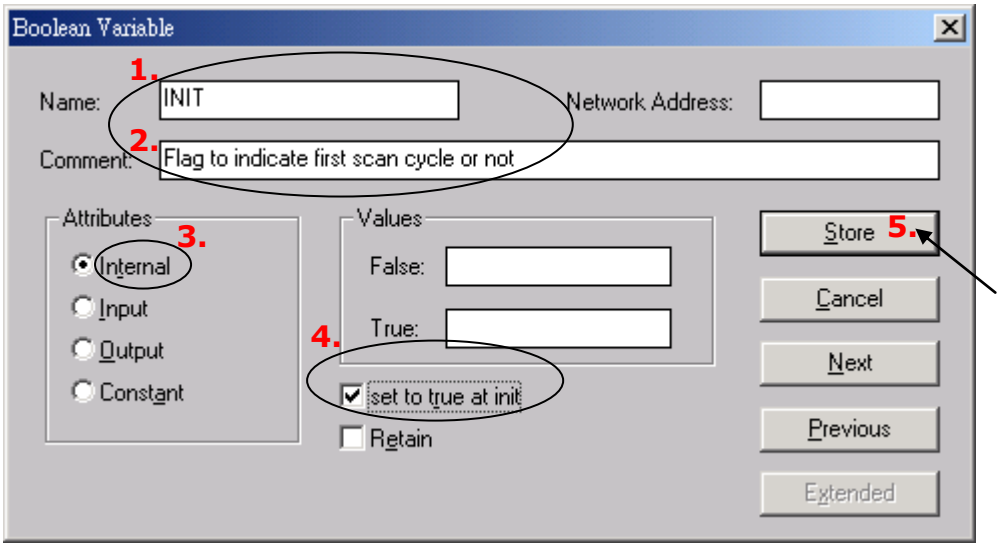
Before you can start creating an ISaGRAF program, you must first declare the variables that will be used in the ISaGRAF program.

Declaring Boolean:

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



For the purpose of this example program



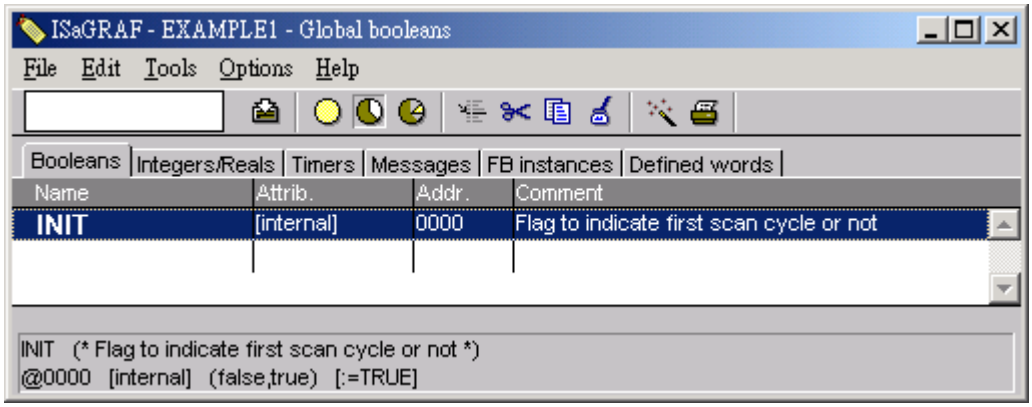
(Please refer to ch2.3 Variables declaration)

1. The variable “Boolean Variable Name” is “INIT”
2. “Flag to indicate first scan cycle or not” is added to the “Comment Section”.
3. The type of “Attribute” In this example program –”INIT” will be an “Internal”.
4. Lastly, check on the “set to true at init” since we need INIT has its initial value as TRUE when the project is just power up to run.
5. Then press the “Store” button to save it.

   The new Boolean variable has now been declared.

Note:

The other information areas that are provided for the programmer to fully explain how the variable will be handled.



Note:

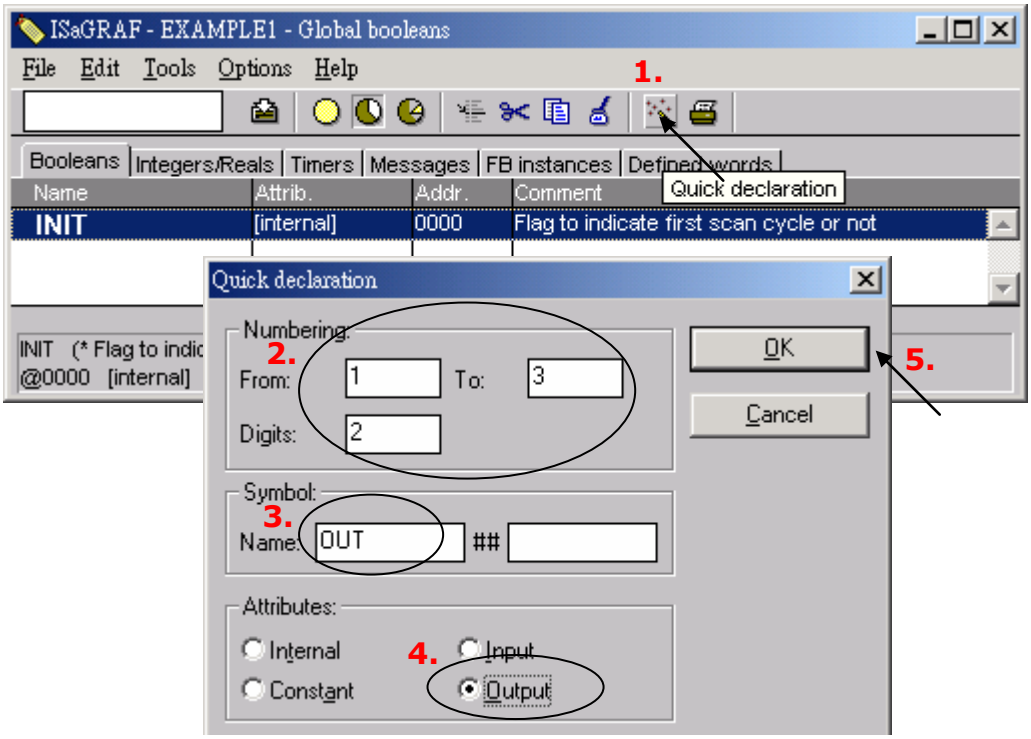
You MUST make sure that the variable you have declared has the desired Attribute assigned.

If you decide that you want to change a project variable's attribute, just double click on the variable name and you can reassign the attribute for the variable

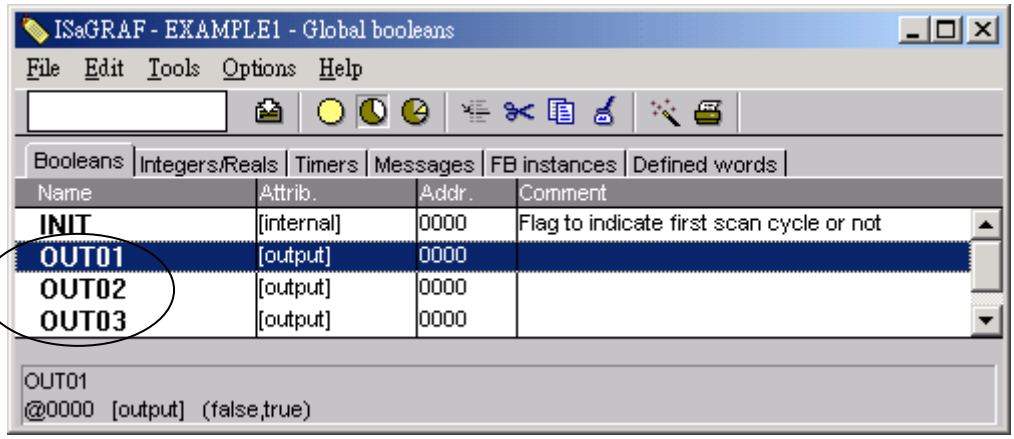
Quick Declaration:

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

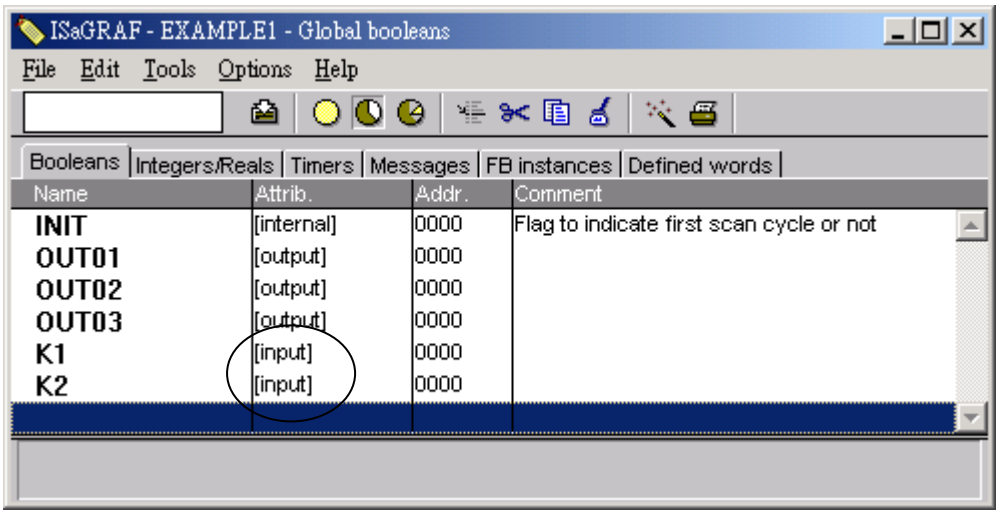
1. Click on the "Quick Declaration" icon
2. Enter in the output number that you will start within the "Numbering" from and "To" field (this example uses from 1 to 3).
3. Enter the "Symbol" name for the output variables being declared
4. Lastly, set the attribute to "Output



When you click on the “OK” button, all three outputs will be immediately added to the “Global Boolean” window.

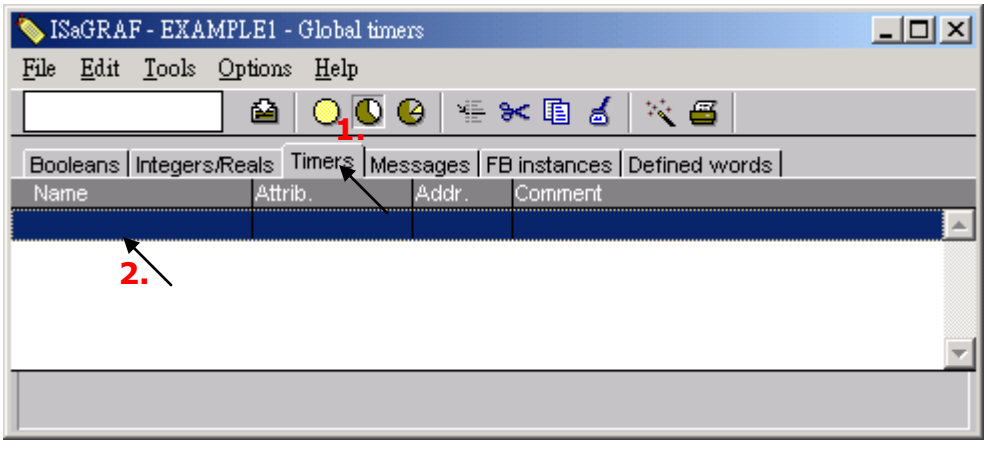


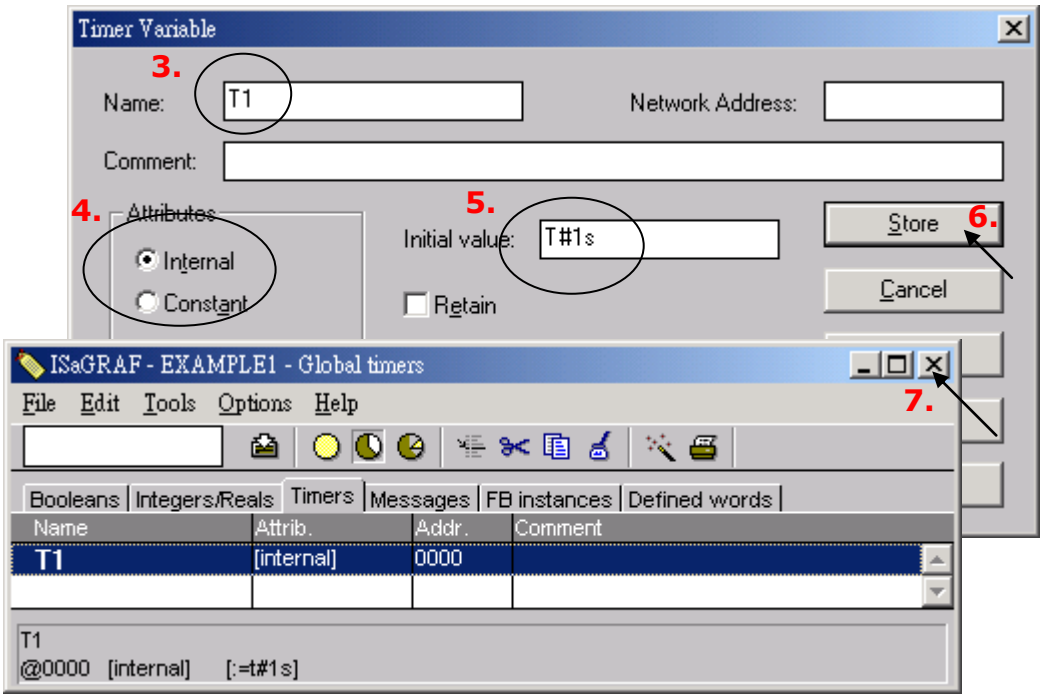
Use the same method as former to create another 2 variables – “K1” & “K2” however with “input” attribution.



Declaring Timer

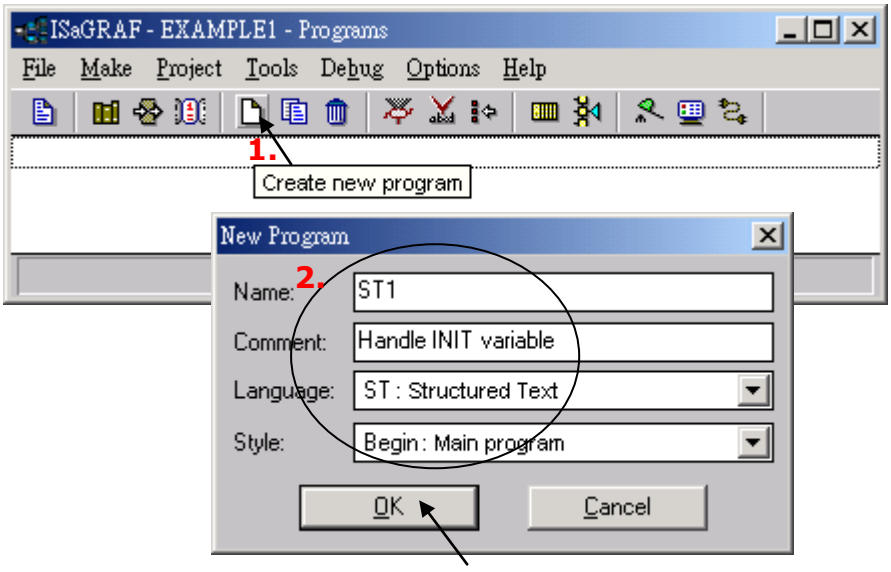
To declare the timer (T1) variable used in this example program, ① click on the “Timers” tab in the setup screen.② Double click on the colored area and ③ enter the Name as “T1”, ④ set the “Attributes” to “Internal”,⑤the “Initial Value” to “T#1s”,⑥ then click on the “Store” button. ⑦ Then please click on “X” to close the “dictionary” window.





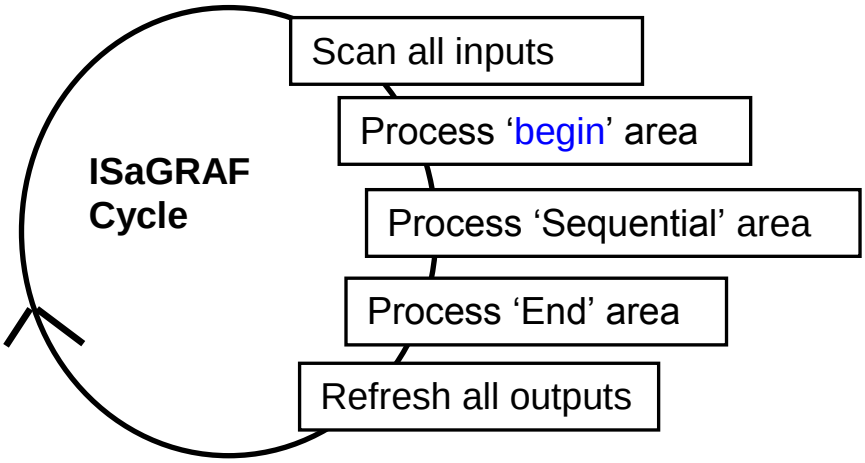
2.3.5 Create and Edit the ST - "ST1" Program

In this project we need an ST program to handle the "INIT" variable. ① Click on "Create new program" in the "xxx - Programs" window to add a ST program. ② Given the Name as "ST1", Comment as "Handle INIT variable", Language as "ST: Structured Text", & Style as "Begin: Main program". Then click on "OK".

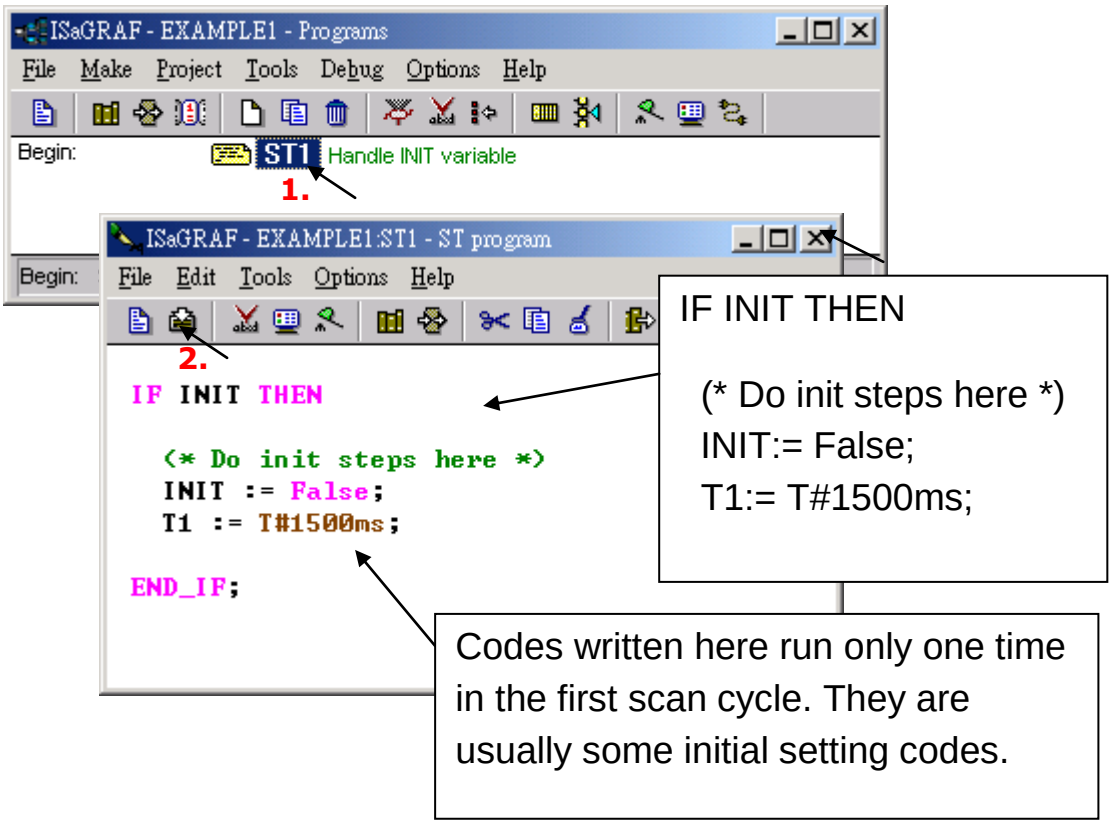


Now we have one program inside this project.

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

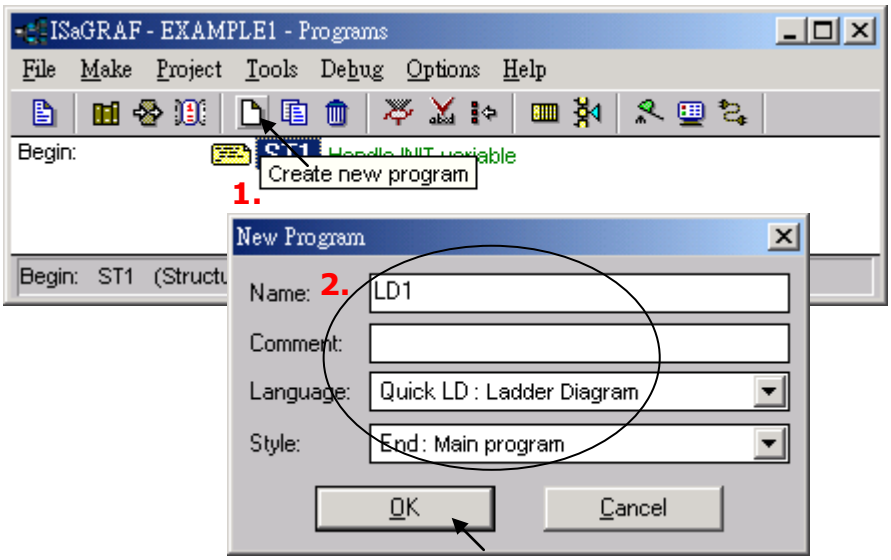


① Double click on "ST1" program to edit it. ② Click on "save" and then exit when you finish it. (Any character inside between **(*** and ***)** is the comment.)

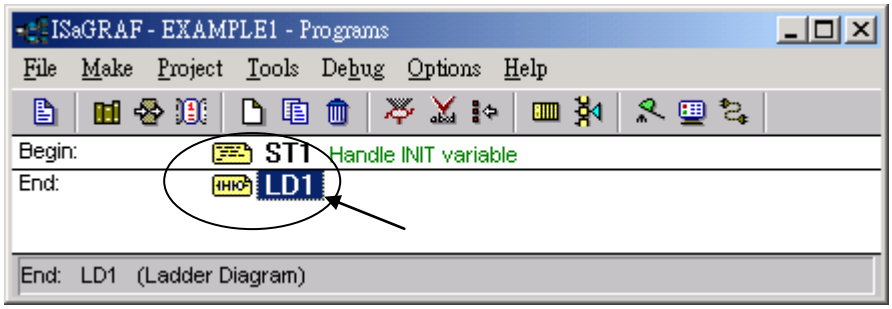


2.3.6 Create the LD - "LD1" Program

① Click on the "Create New Program" icon and the "New Program" window will appear. ② Enter the "Name" as "LD1", next, click on the "Language" scroll button and select "Quick LD: Ladder Diagram", and make sure the "Style" is set to "End: Main Program". You can add any desired text to the "Comment" section for the LD program, but it isn't required.

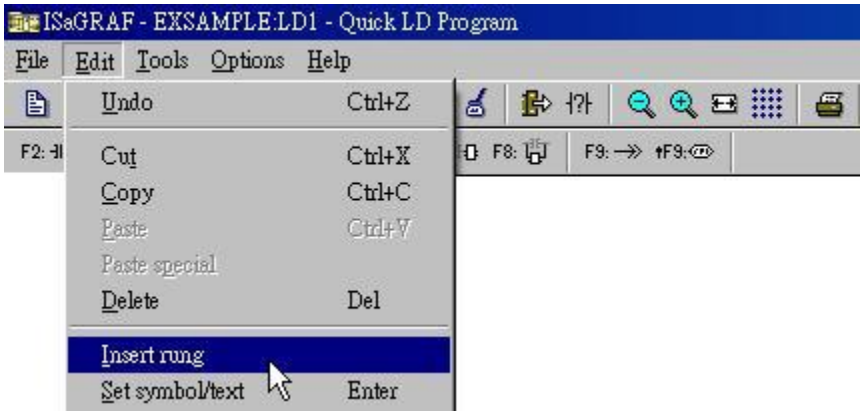


Now we have two programs inside this project. Please double click on the "LD1" to get into it.

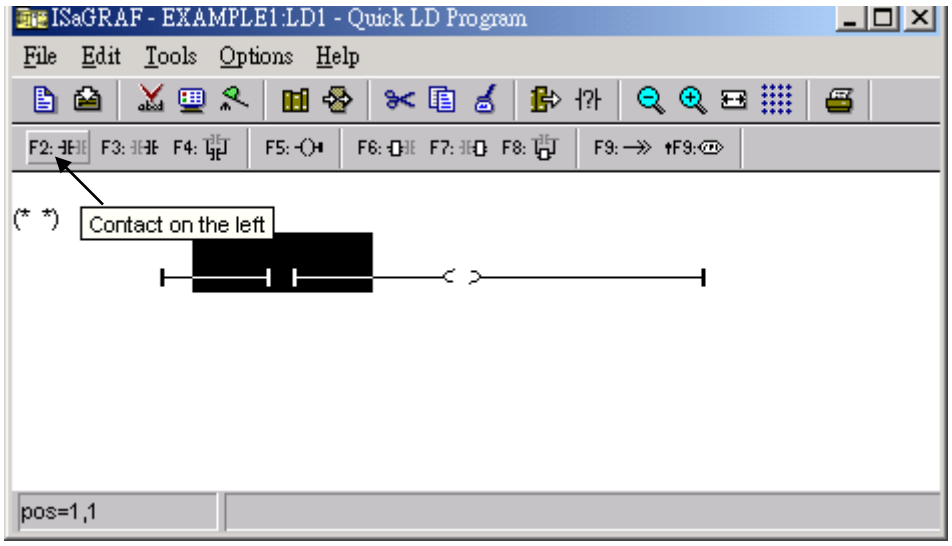


2.3.7 Edit the "LD1" Program

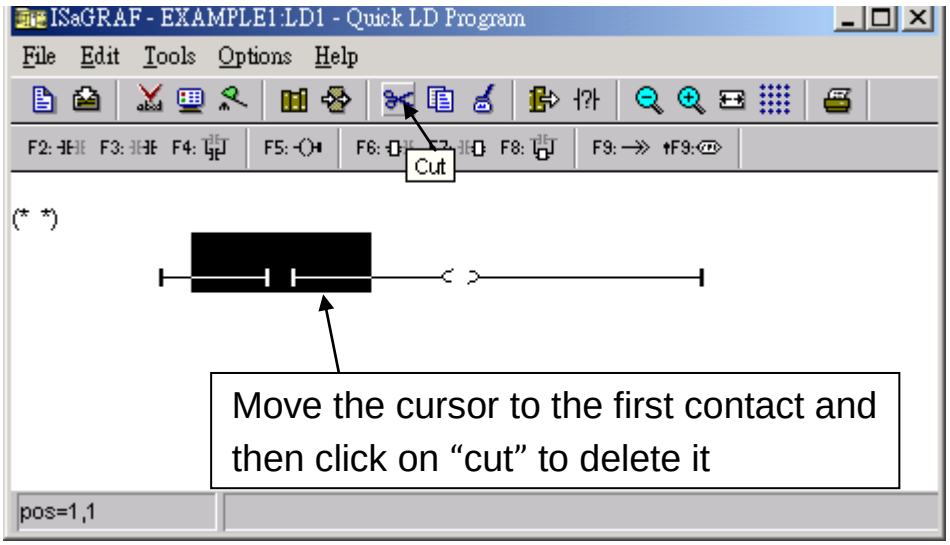
When you double click on the "LD1" name the "Quick LD Program" window will appear. To start programming our LD program, click on "Edit" from the main menu bar, and then click on "Insert Rung". "Insert Rung" means to insert a basic LD rung just above the current position.



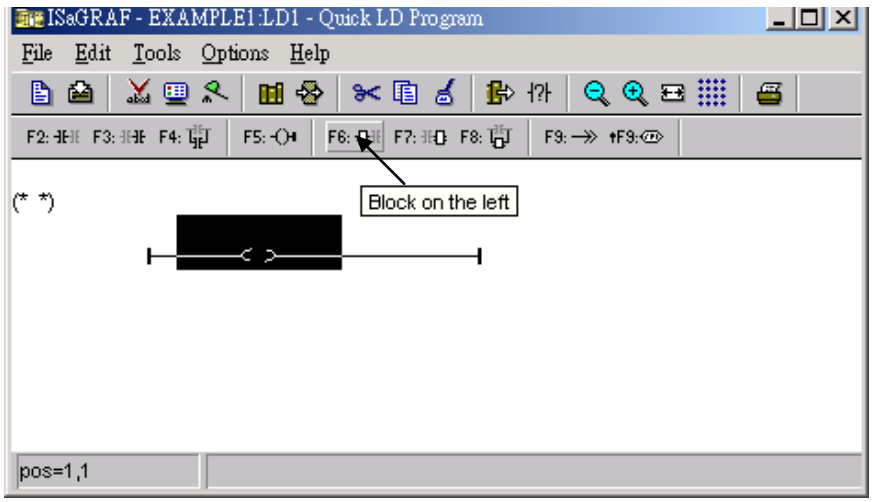
Or, you may just simply click on the "F2 (Contact on the Left)" icon, and the following will appear within the Quick LD Program window.



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

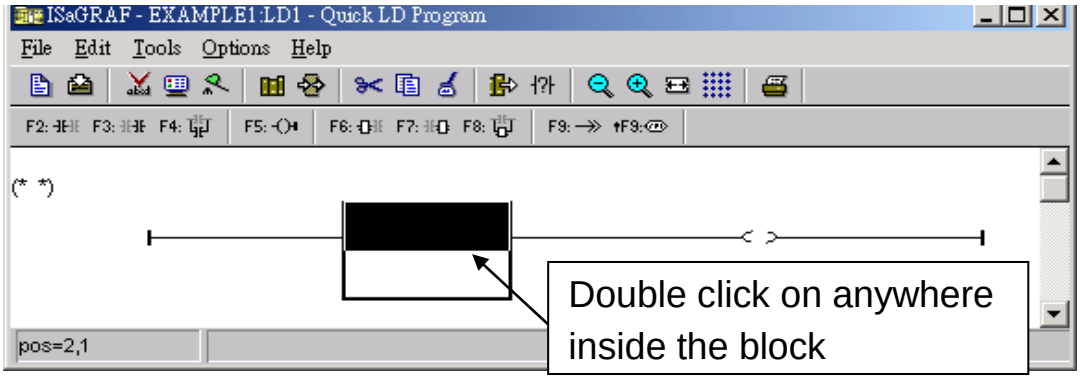


Click on the "F6 (Block on the left)" icon and you will create a block on the left of the "coil".

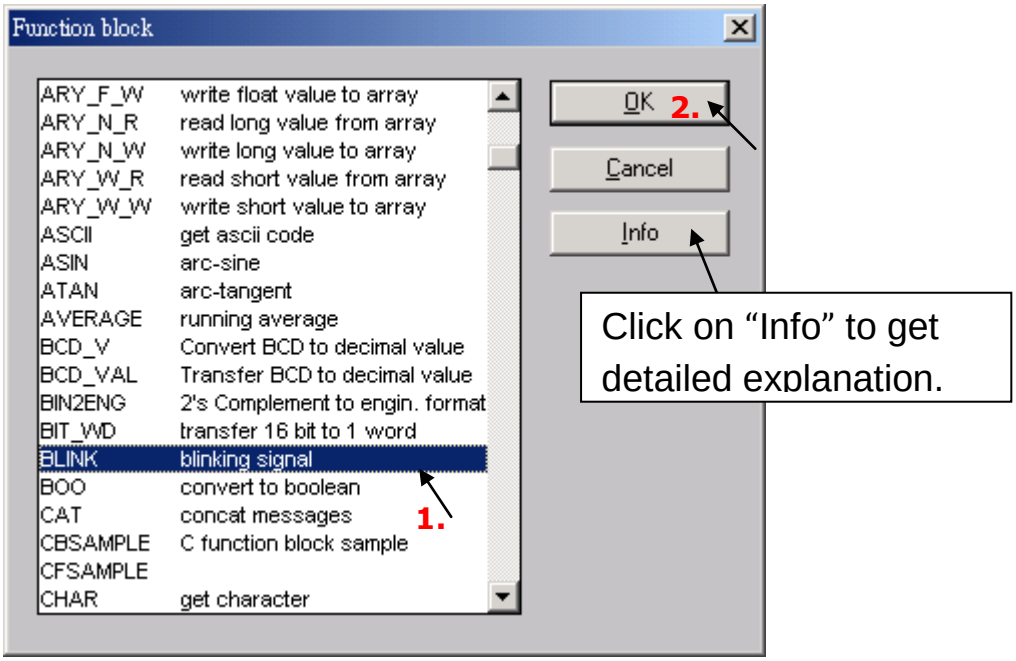


Now we are going to assign the associated variable & constant to each item.

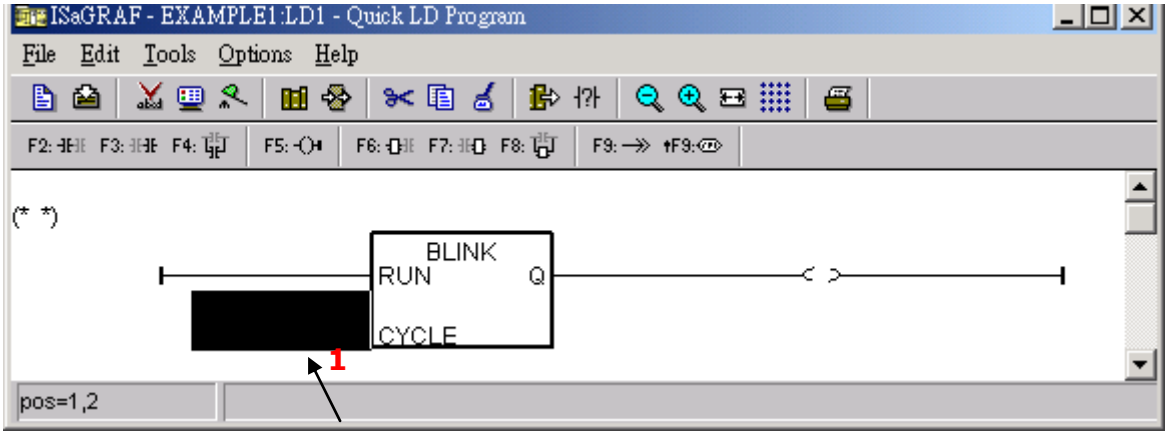
Double click anywhere inside the block and the “Function Block” assignment window appears.

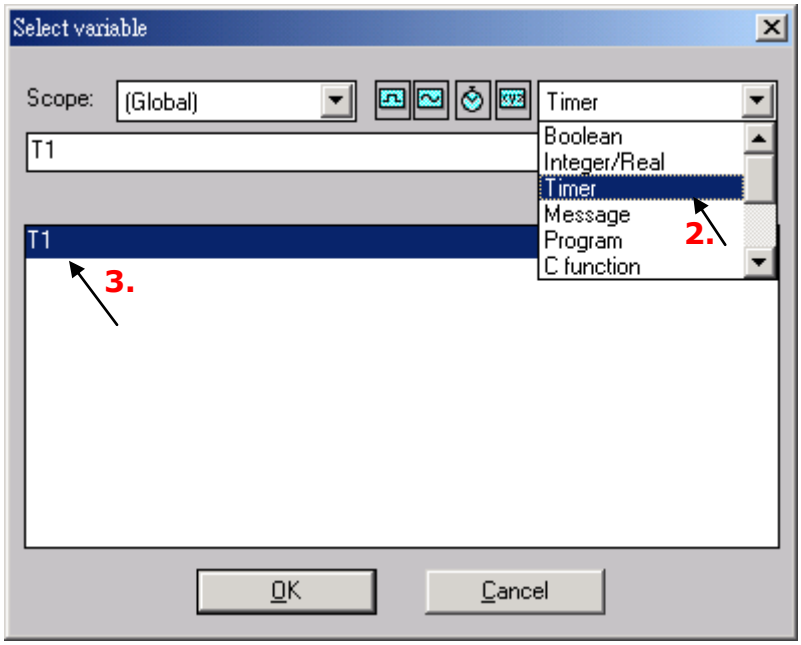


① Select the “BLINK” type function block. To learn how the “BLINK” function operates you can click on the “Info” button for a detailed explanation of its functionality

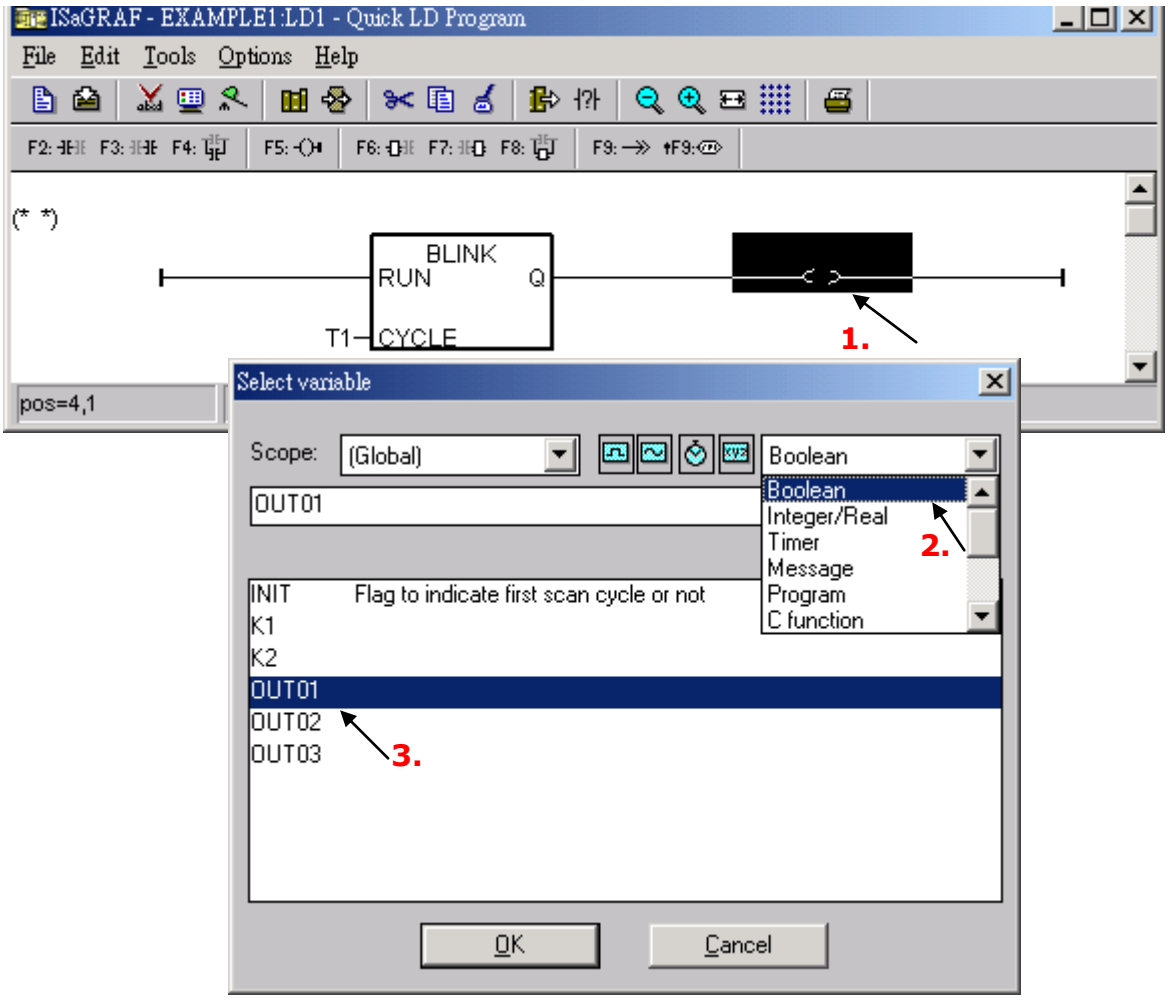


① Now move your cursor to the left of the parameter “CYCLE” of the “BLINK” block. Double click on it, ② select “Timer” and then ③ double click on variable name - “T1”

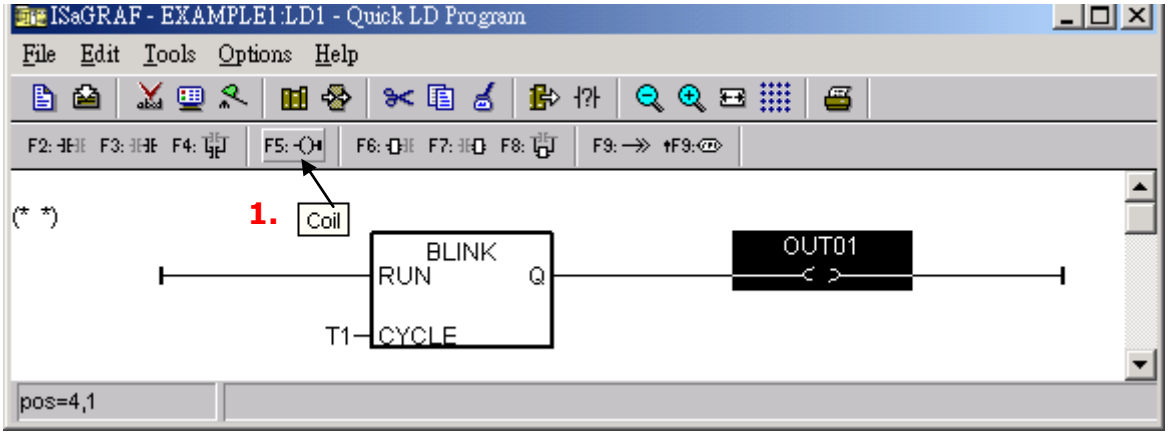




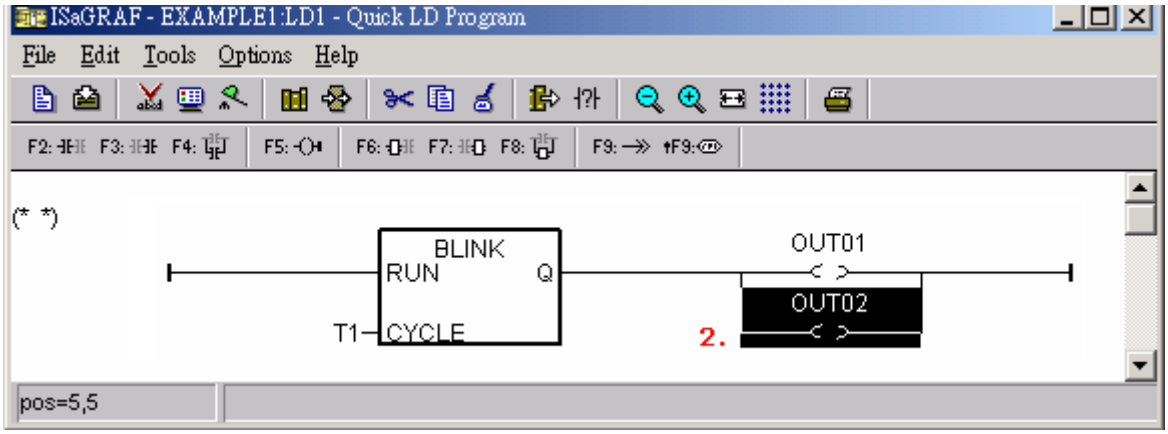
① Move your cursor to the “coil”. Double click on it, ② select “Boolean” and then ③ double click on variable name – “OUT01”.



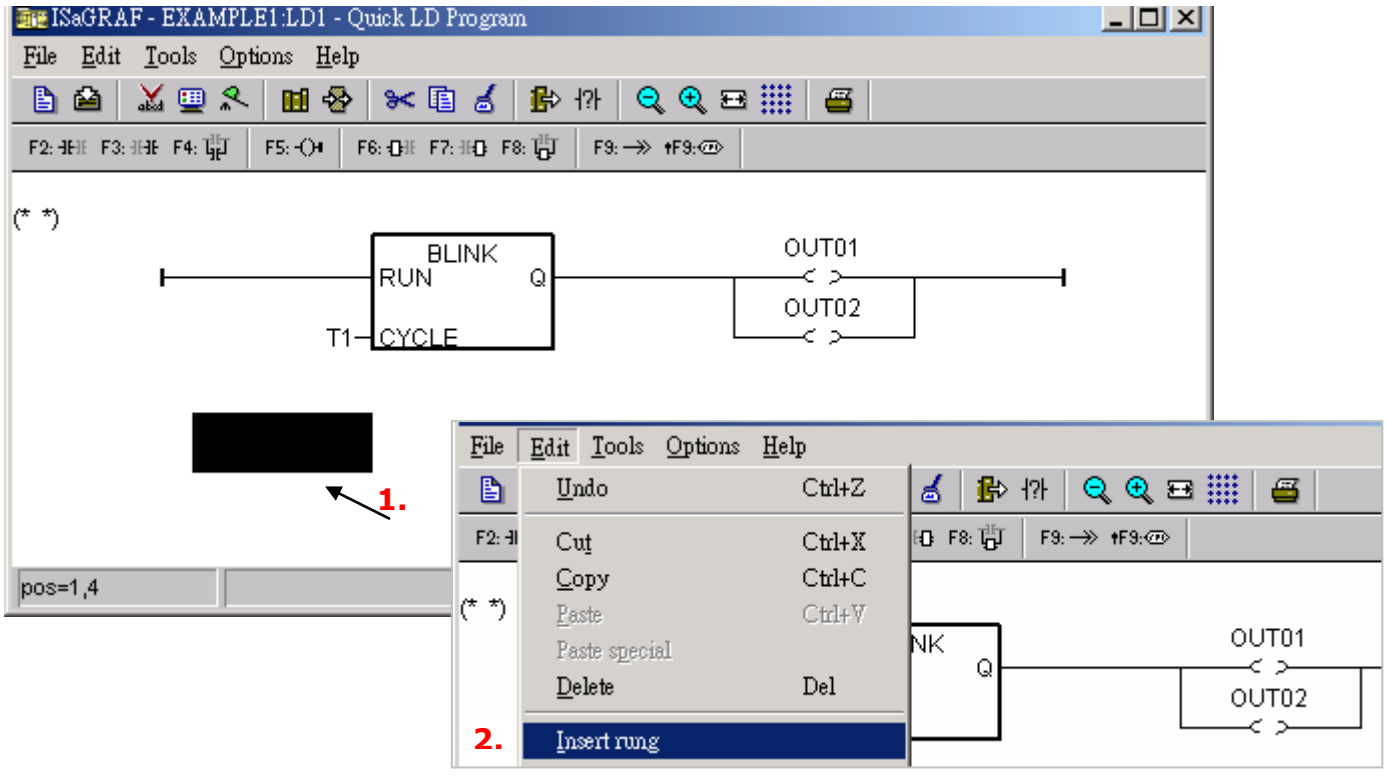
① Click on “coil” icon to create one another coil below the “OUT01”, and then assign a Boolean name – “OUT02” to it.



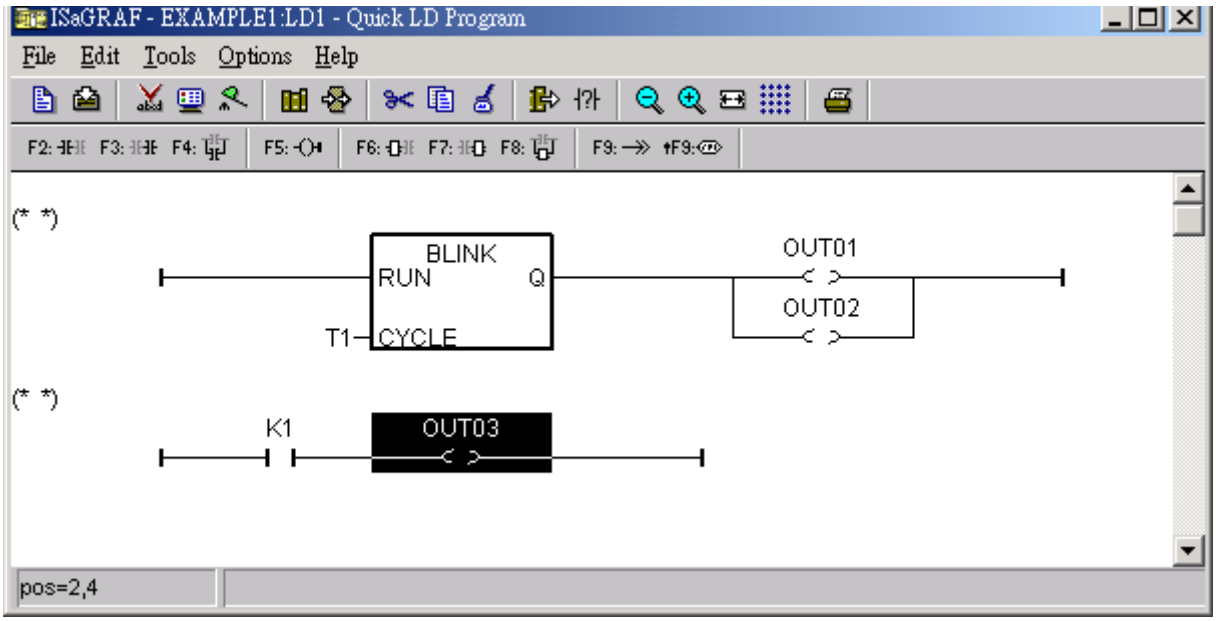
②Then we have the below window.



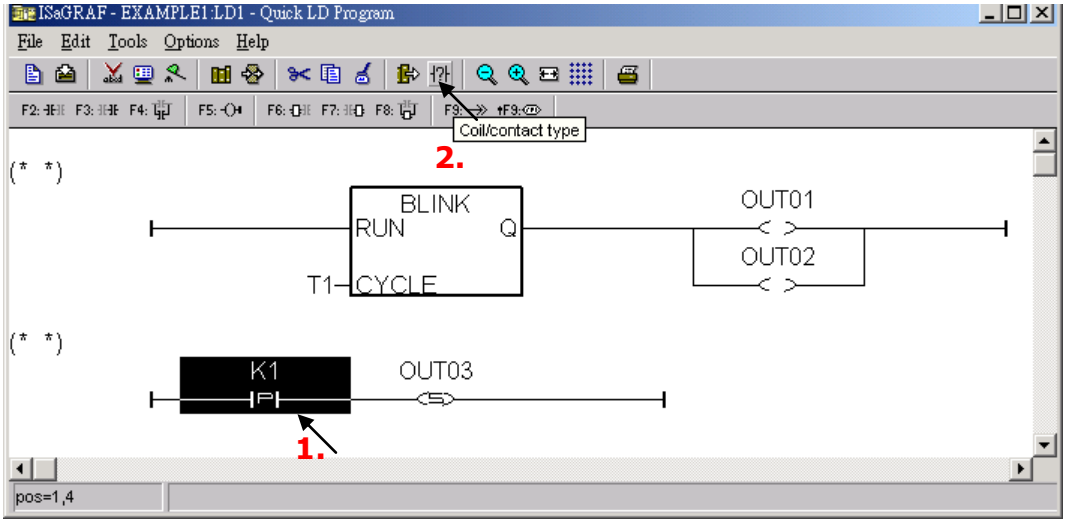
To insert the second LD rung, ① move the cursor to be under the first rung, ② then click on "Edit" – "Insert rung".



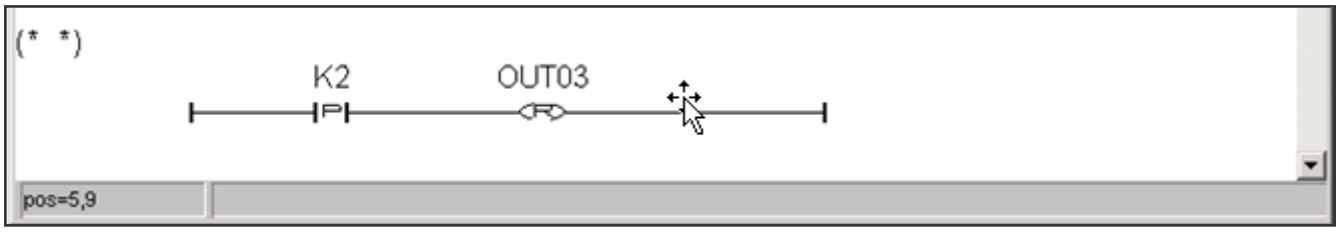
Using the same way as former to assign name “K1” and “OUT03” to the correct position.



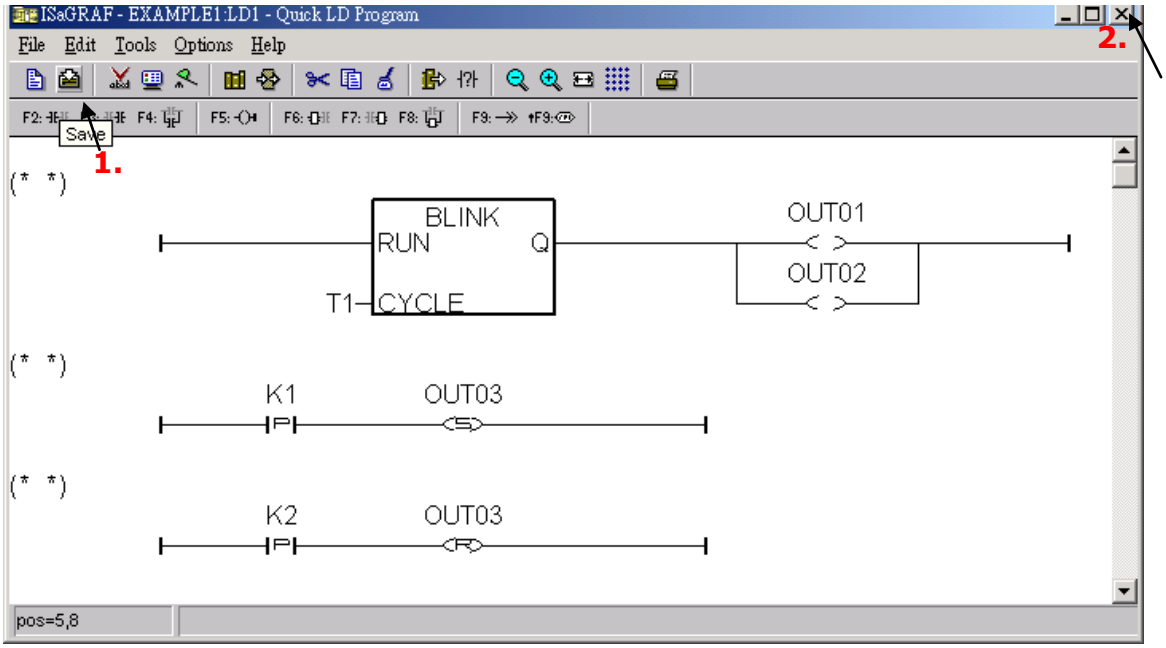
To assign proper type to the “contact” & “coil”, ① move the cursor to “K1” and then ②slowly click on “Coil/contact type” icon several times to get the correct type. In this example, K1 has type of “P” while OUT03 has type of “S”.



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



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

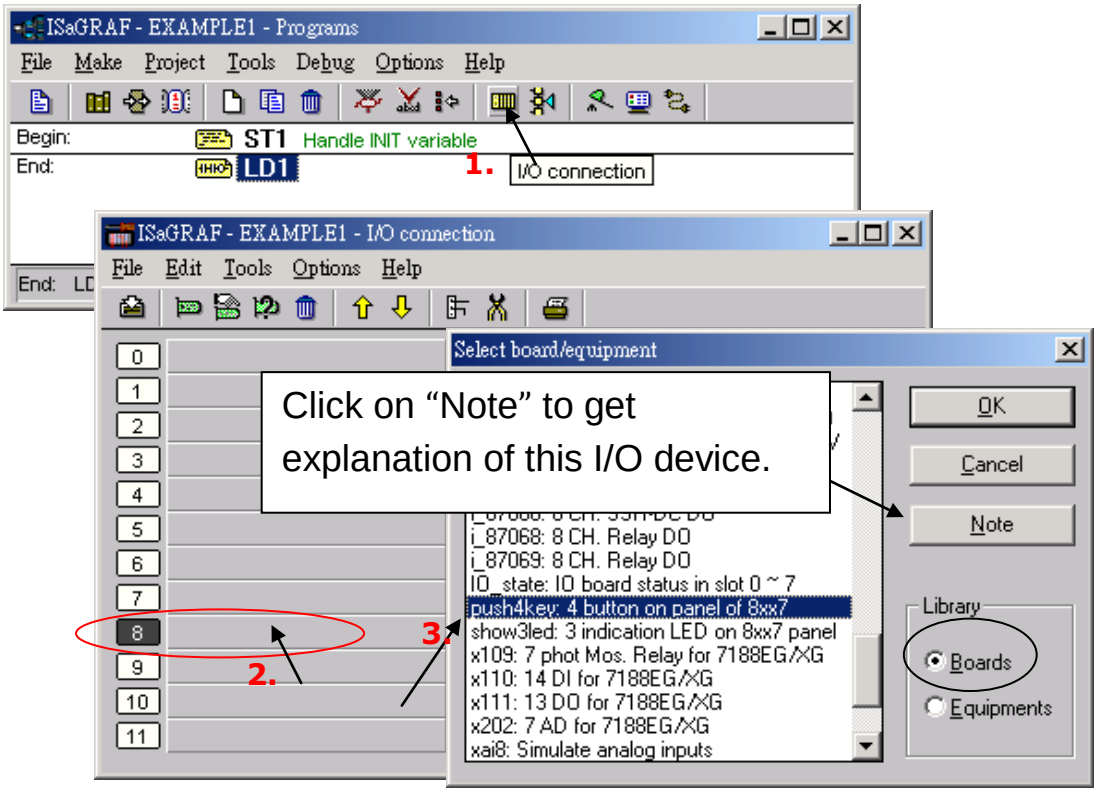


2.3.8 Connecting the I/O

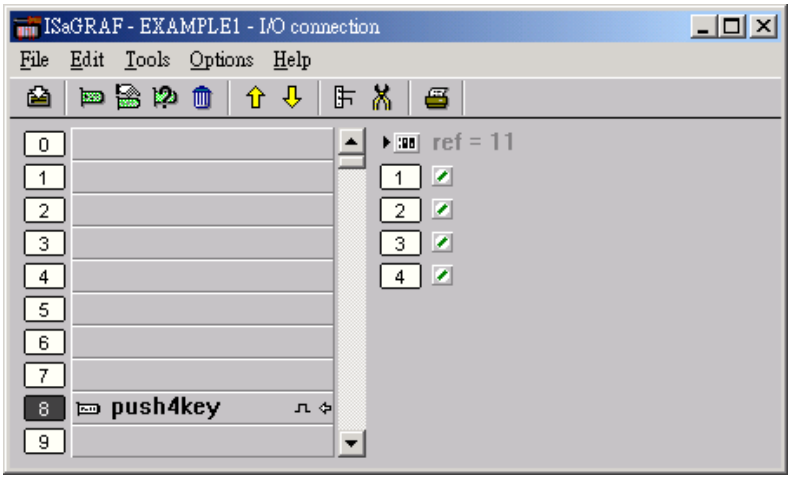
We have defined variables name of “OUT01”, “OUT02” & “OUT03” as “output” attribution, while “K1” & “K2” as “input” attribution in step 2.3.4.

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

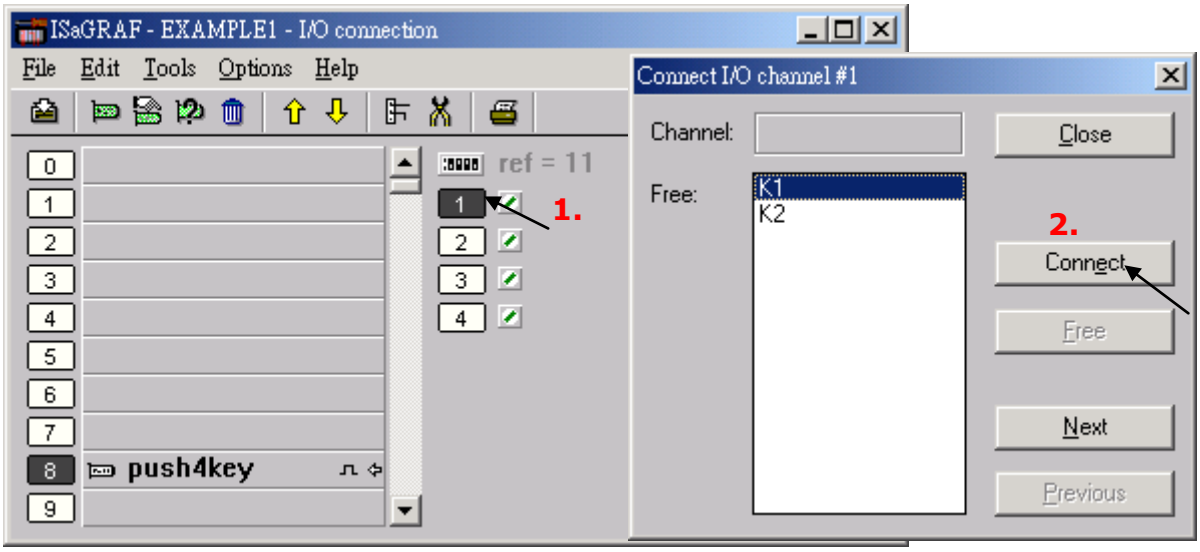
To do that, ① click on “I/O connection” to get into the I/O connection window. ② Double click on the No. 8 slot & then ③ check on the “Boards” & double click on the “push4key: 4 button on panel of 8xx7”.



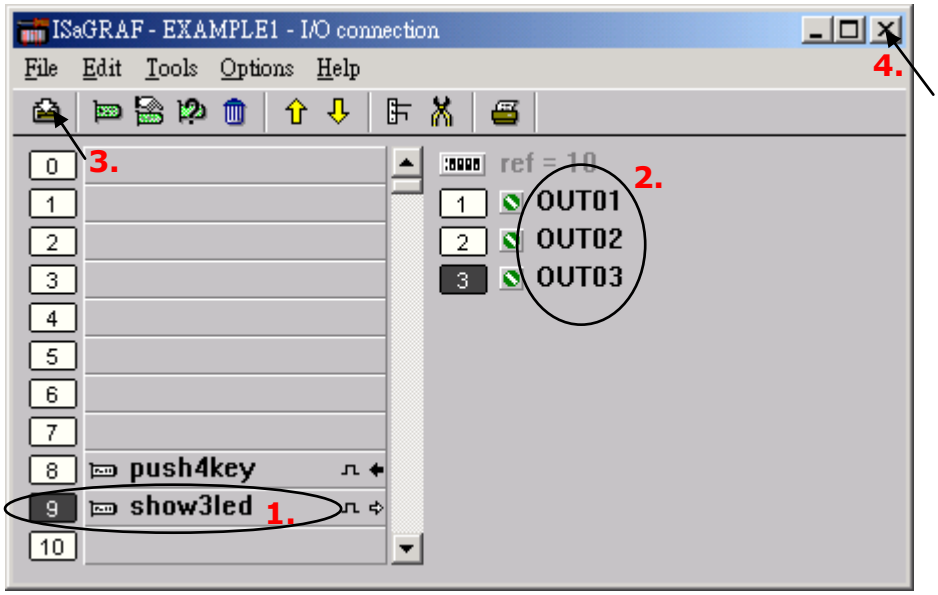
Then we have.



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



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



IMPORTANT NOTICE:

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

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

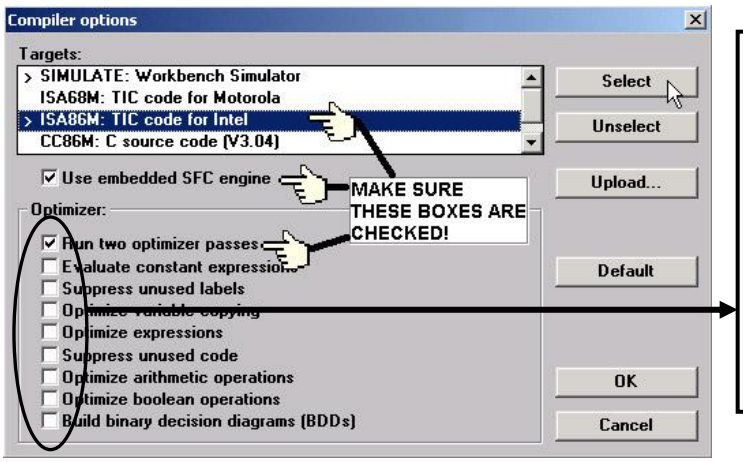
   Only the Input and Output attributed variables will appear in the "I/O Connections" window. In this example we have only 3 Boolean output variables - OUT01, OUT02 & OUT03 and 2 Boolean input variables – K1 & K2.

2.4 Step 4 - Compiling & Simulating the Example Project

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

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

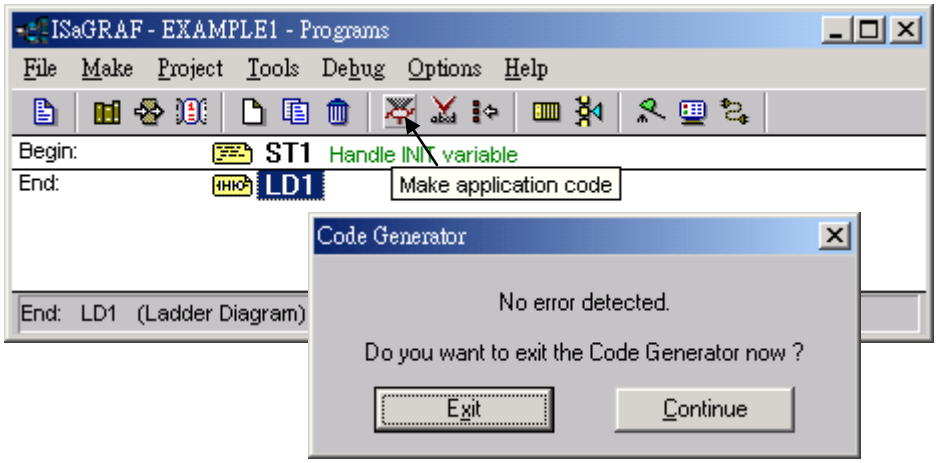
The "Compiler Options" window will now appear. Make sure to select the options as shown below then press the "OK" button to complete the compiler option selections.



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

2.4.1 Compiling the LD Project

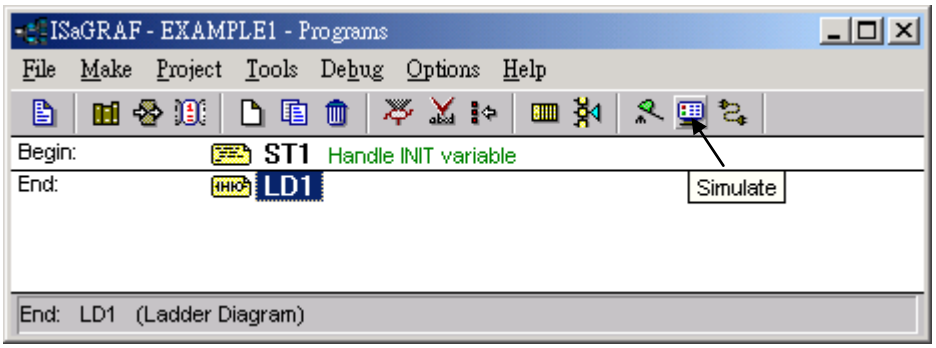
Now that you have selected the proper compiler options, click on the "Make Application Code" icon to compile the example project. If there is no compiler errors detected during the compilation process, CONGRATULATIONS, you have successfully created our example program.



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

2.4.2 Simulating the LD Project

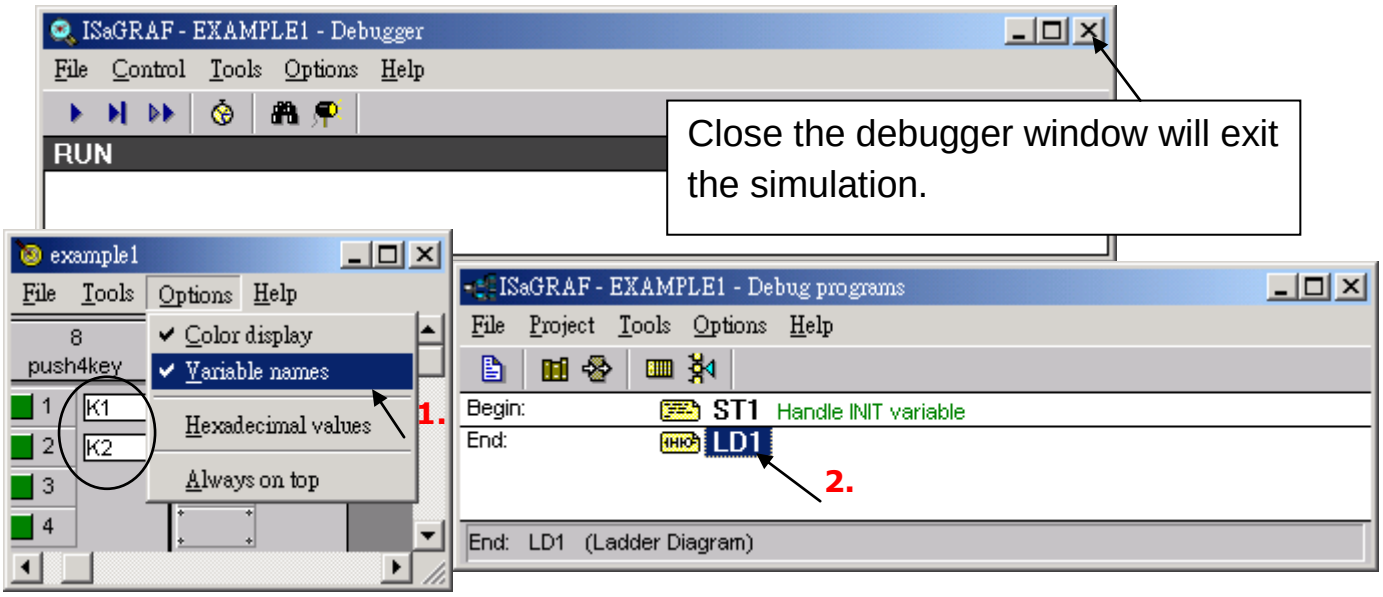
If the compilation is Ok, you may simulate the project on the PC to see how the program works without the controller. To do that, click on the "Simulate" icon.



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

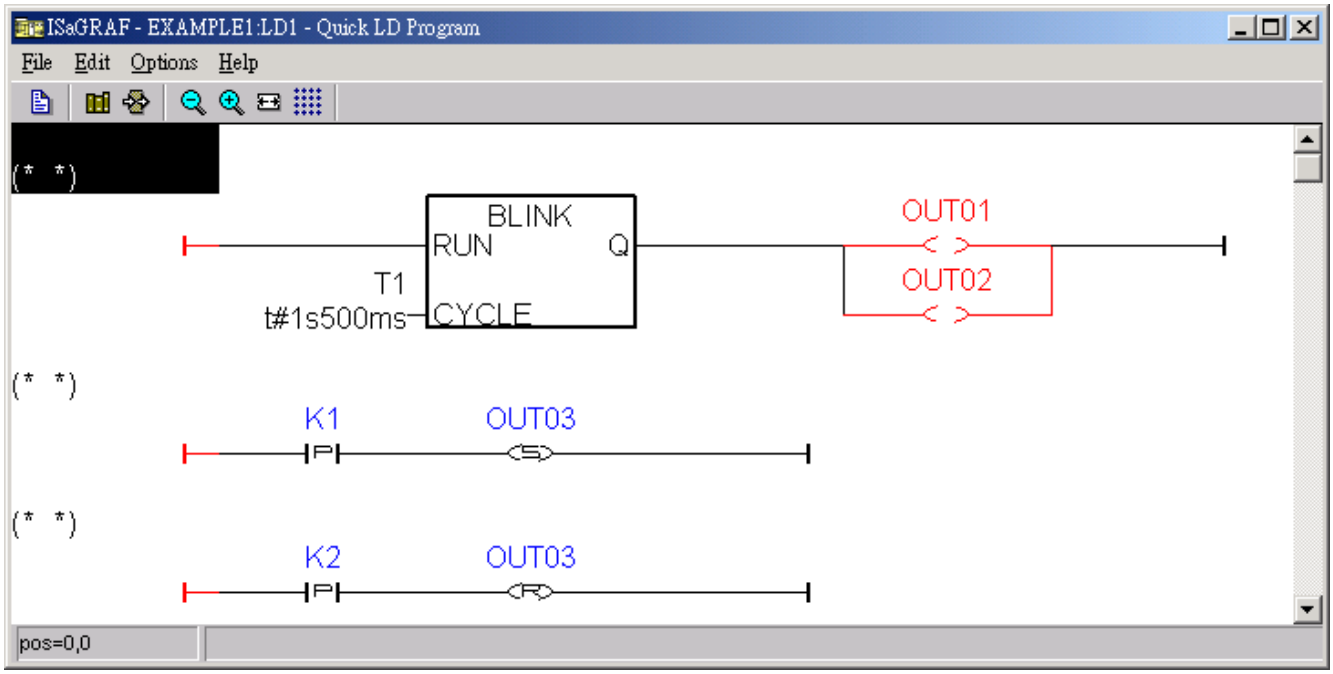
If the I/O variable names you have created DO NOT appears in the I/O simulator window, just ① click on the "Options" ➔ "Variable Names" selection and the variable names you have created will now appear next to each of the I/O's in the simulator window.

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

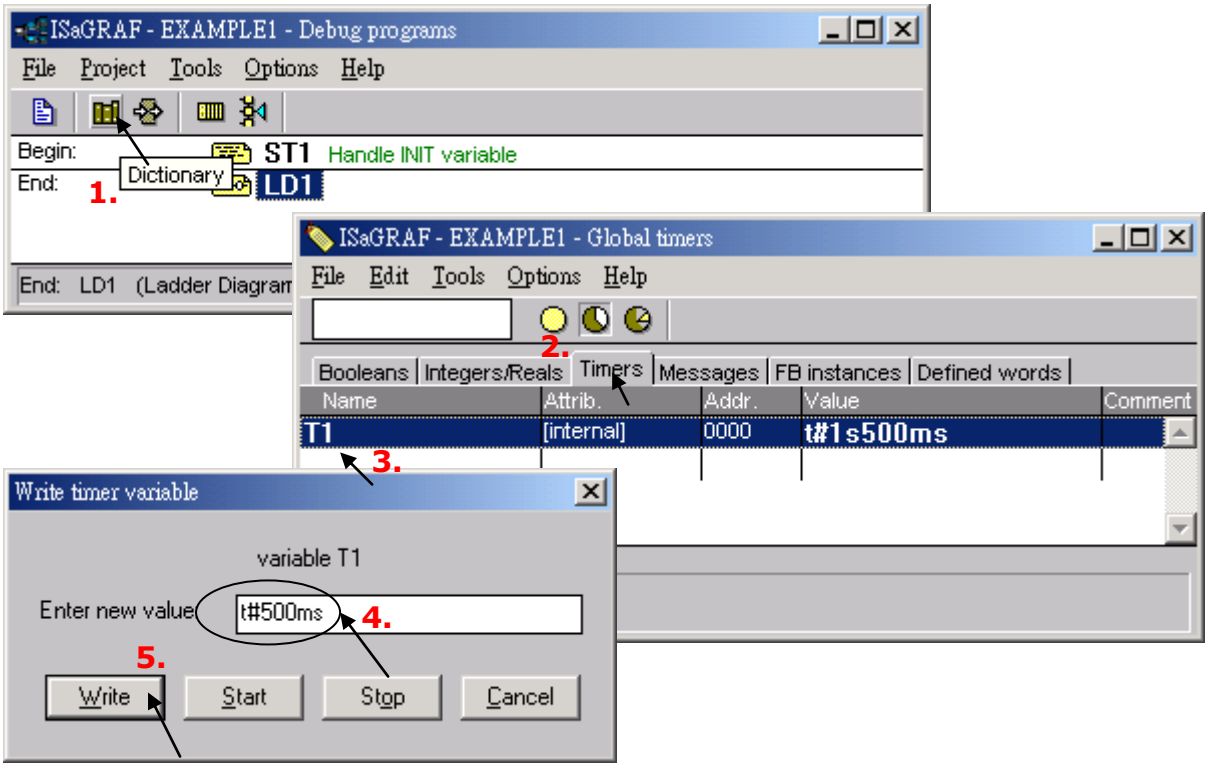


2.4.3 Running the Simulation Program

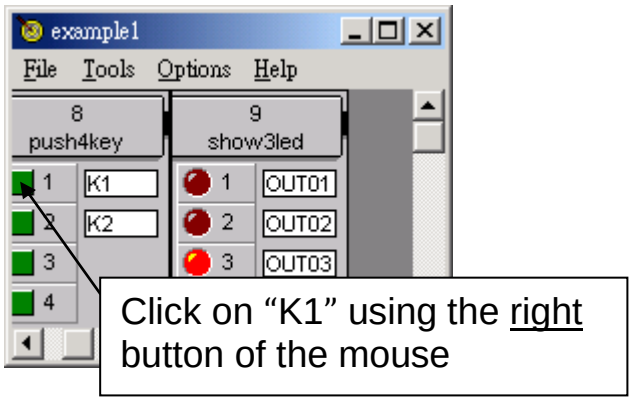
When you double click on “LD1” in the “ISaGRAF Debug Programs” window, the follow window should appear. You can see outputs “OUT01” thru. “OUT03” will blink in the period of 1500ms.



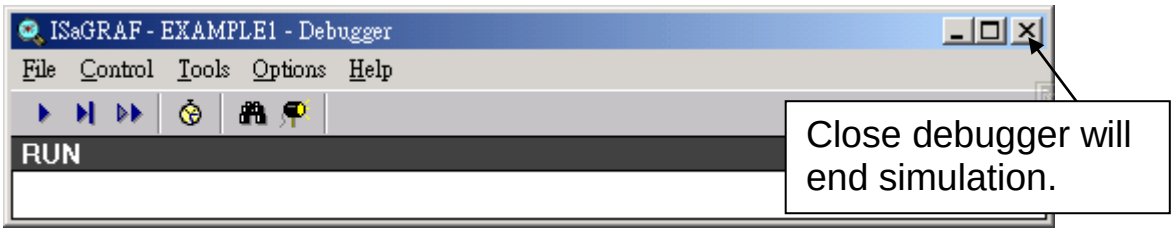
You can adjust the “T1” variable while the program is running. To accomplish this, ① click on the “Dictionary” icon which will open the “ISaGRAF Global Variables” window as shown in the first two pictures below. ② Click on “Timer” tab and then ③ double click on “T1” to ④ change the timer value to “T#500ms” (this means 0.5 second). ⑤Then click on “Write”.



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

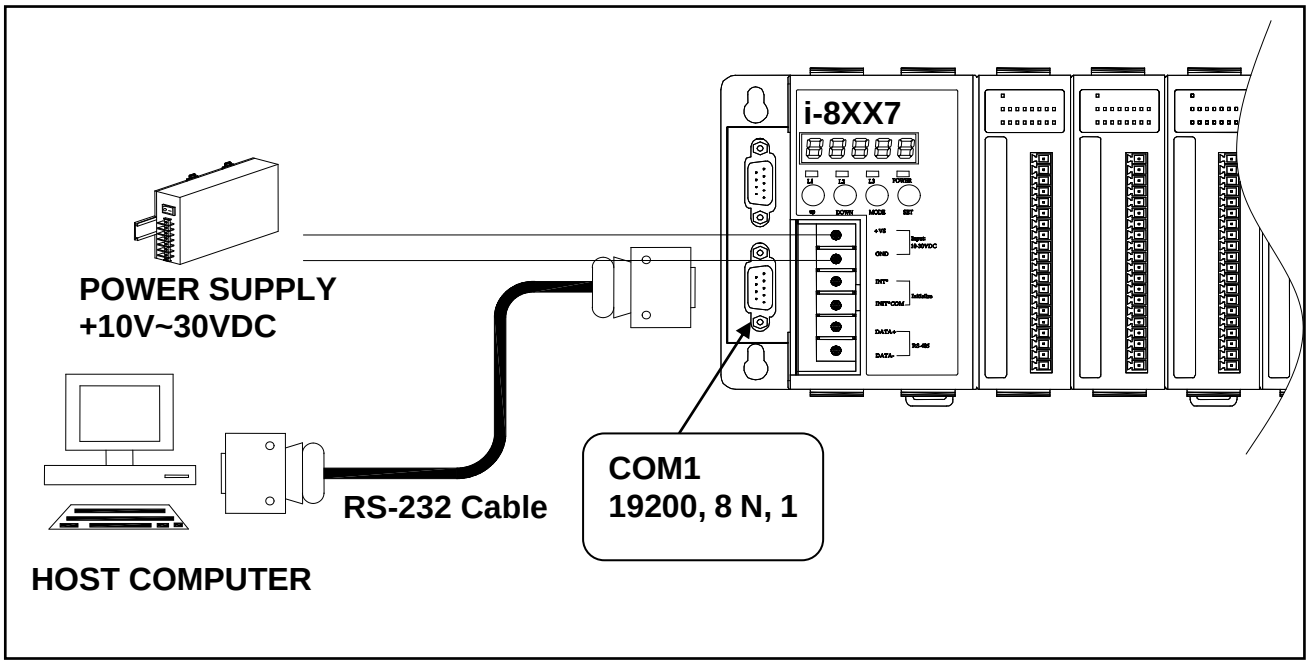


To exit simulation, please close the debugger window.



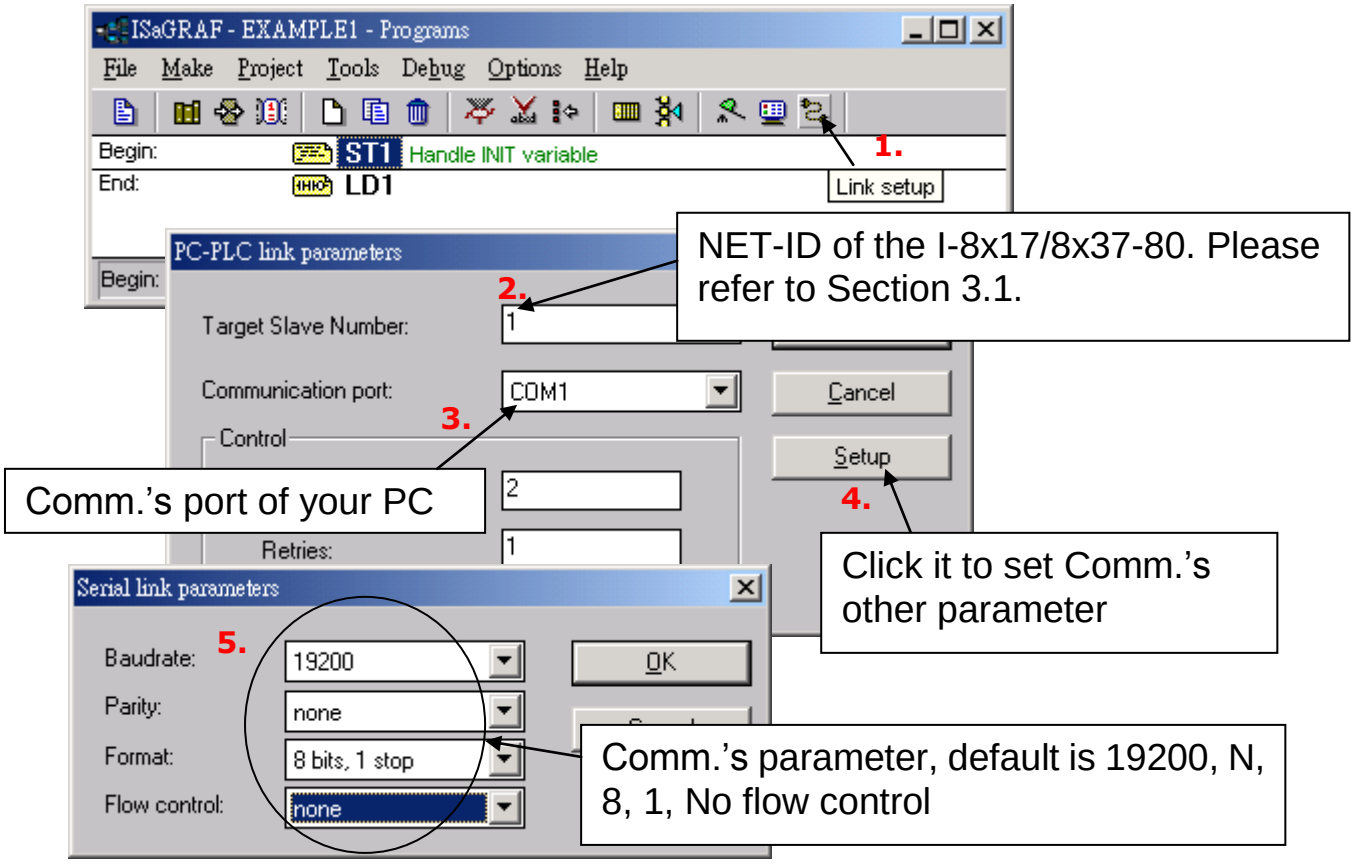
2.5 Step 5 - Download & Debugging the Example Project

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



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

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

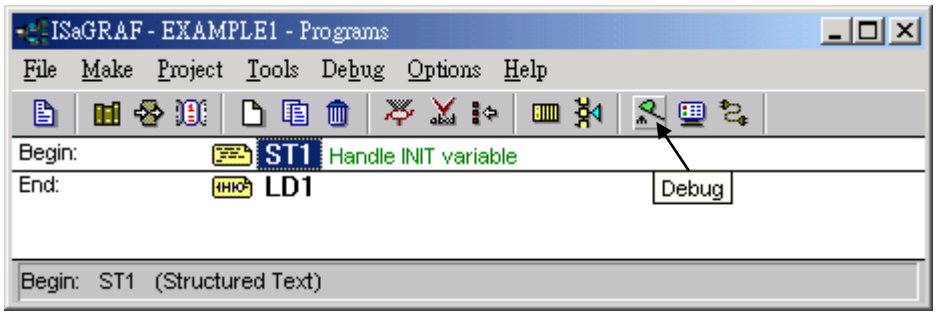


The communication parameters for the target I-8xx7/8x37-80 controller MUST be set to the same serial communication parameters for the development PC. For I-8x17/8x37 controllers (serial port communications), the default parameters for COM1 (RS-232) and COM2 (RS-485) Ports are:

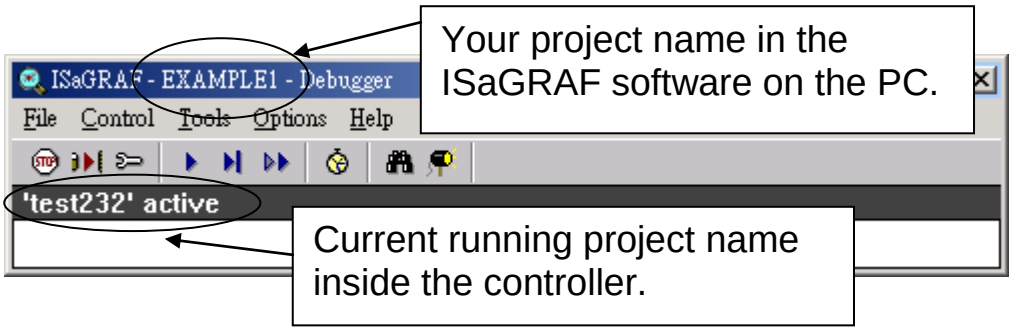
Baud rate:	19200
Parity:	none
Format:	8 bits, 1 stop
Flow control:	none

2.5.1 Downloading the Project

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



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

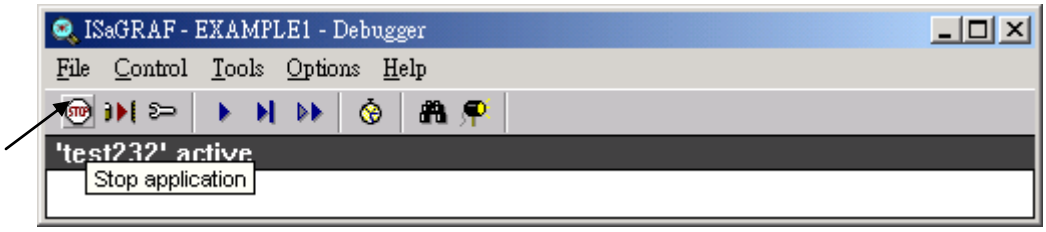


If the message in the "ISaGRAF Debugger" says "Disconnected", it means that the development PC and the controller system have not established communications with each other.

The most common causes for this problem is either the serial port cable not being properly configured, or the development PC's serial port communications DO NOT match that of the I-8xx7/8x37-80 controller system.

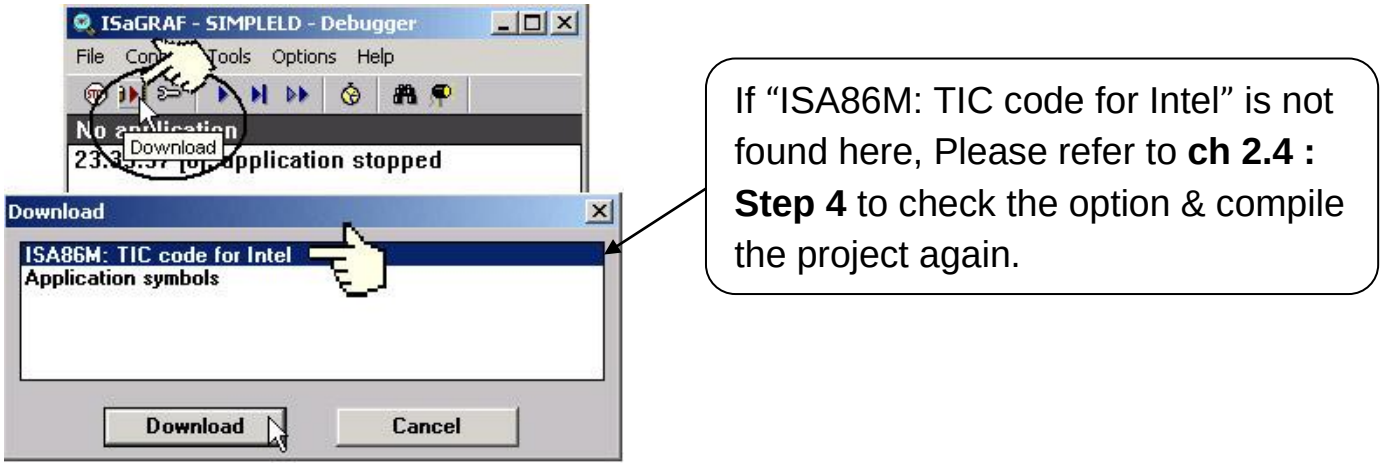
You may have to either change the serial port communication settings for the development PC (which may require changing a BIOS setting) or change the "Serial Link Parameters" in the ISaGRAF program.

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

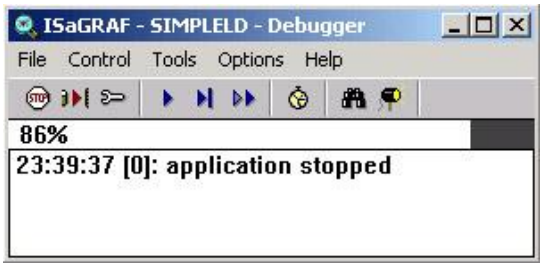


Starting the Downloading Process

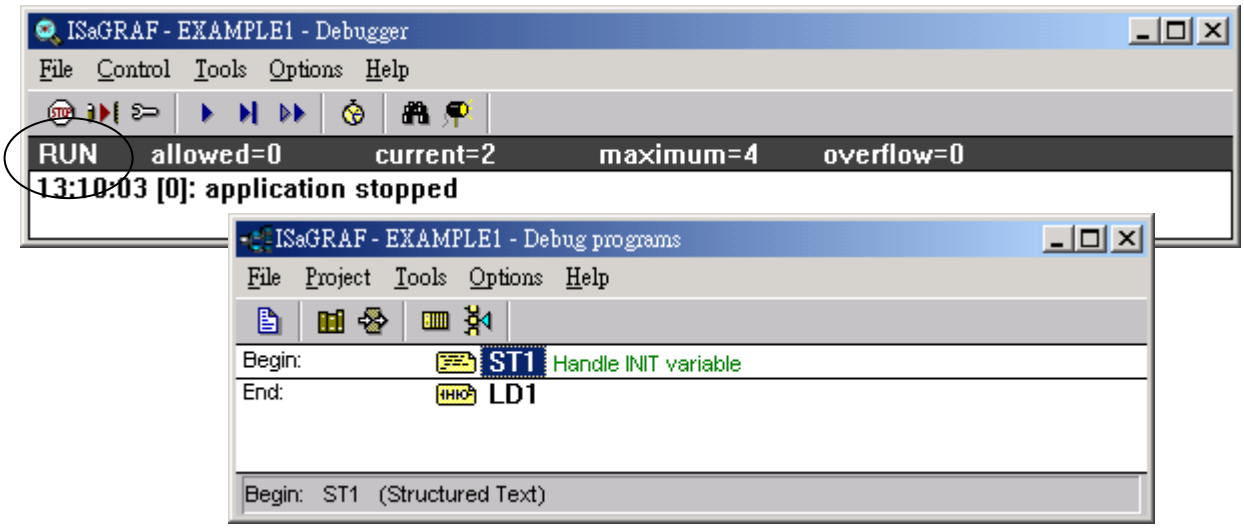
From the "ISaGRAF Debugger" window click on the "Download" icon, then click on "ISA86M: TIC Code for Intel" from the "Download" window as shown below.



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



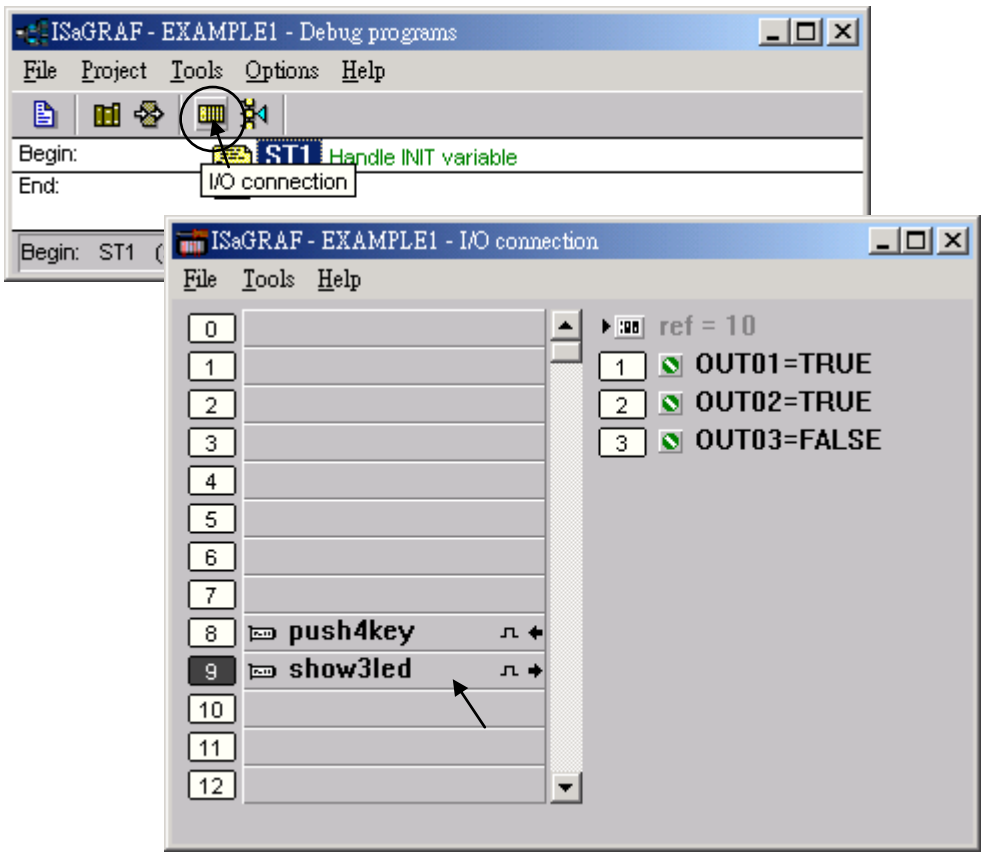
When the example project has successfully completed the downloading process to the I-8xx7/8x37-80 controller system the following two windows will appear.



2.5.2 Running the Example Program

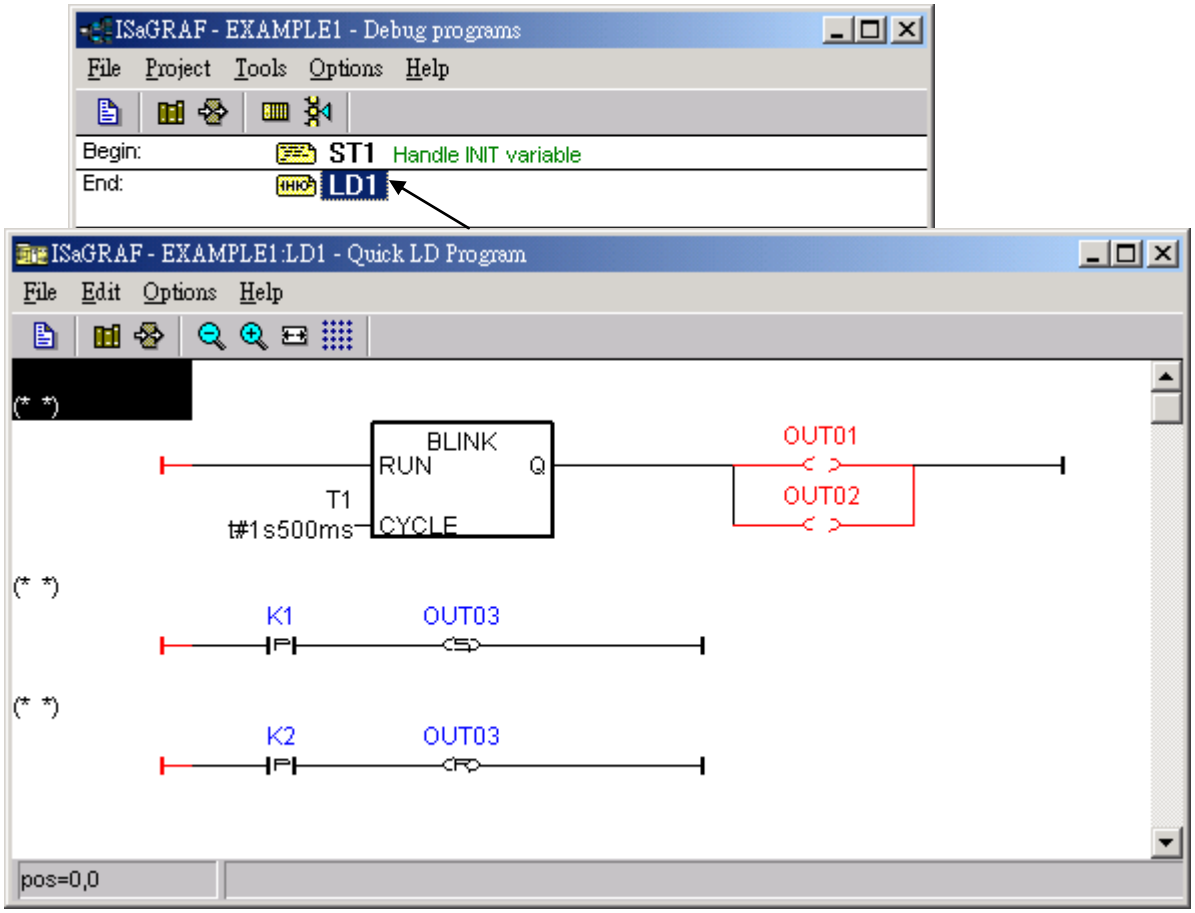
You can observe the real time I/O status from several ISaGRAF windows while you are running the example project. One of the windows is the "I/O Connections" window, which shows each of the inputs and outputs as assigned.

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



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

may push the first button and second button on the front panel of the I-8xx7/8x37-80 controller to test it.



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

PRACTICE, PRACTICE, PRACTICE!

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

2.6 Demo Programs List

2.6.1 I-8xx7/8x37-80 Demo Program List:

www.icpdas.com > Products > Software > ISaGRAF > Demo files

Project Name	Description	I/O Boards Or Complex Equipment Used
Demo_01	Timer Control	Push4Key Show3Led
Demo_01a	To do something at some sec later when an event happens	Push4Key Show3Led
Demo_02	Start, Stop, & Reset Timer	Push4Key Show3Led
Demo_03	R/W System Date & Time. To output at a scheduled time interval, For ex. Monday, 09:00 ~ 18:00, Sunday, 10:00 ~ …	
Demo_04	Calculate Empty Cycle Time	
Demo_05	Blinking Output	Push4Key Show3Led
Demo_06	Change Output Mode	Push4Key Show3Led
Demo_07	Show A Value To S-MMI	Push4Key Show3Led
Demo_08	Input A Value To S-MMI	Push4Key Show3Led
Demo_09	Integer Calculation	
Demo_10	Display Analog Input Value To S-MMI	I-87017 I-87024 Push4Key
Demo_11a	Fbus Master, NET_ID = 1	Fbus_m Push4Key Show3Led
Demo_11b	Fbus Slave, NET_ID = 2	Fbus_s Push4Key
Demo_12	Use COM3 To Receive User-Defined Command From PC	Show3Led
Demo_13	Send User-Defined Data To PC Via COM3 Every 3	I-87017

Project Name	Description	I/O Boards Or Complex Equipment Used
	Seconds	
Demo_14	Convert I-7000 & I-87xx Protocol To Modbus Protocol	Bus7000
Demo_15a	Link To Other Modbus Devices	Mbus
Demo_15b	Simulate I-8417 As A Modbus Device For Demo_15a To Link To This Project	None
Demo_16	Periodic Pulse Generation, And Send Modbus Commands To Another Controller	Push4Key Mbus
Demo_17	Read/Write EEPROM	
Demo_18	PID control	
Demo_21	Write one string to COM5 & COM6	Push4Key Show3Led
Demo_22	Receive message and echo back to COM5 or COM6	Show3Led
Demo_23	Receive a user defined protocol from PC	Show3Led
Demo_27	Motion x, slot 0: I-8091, Slot 1 : I-8090, Napdos\ISaGRAF\8000\Driver\motion.pdf	I-8091 I-8090 Show3Led
Demo_27a	Motion x, slot 0 : I-8091, Napdos\ISaGRAF\8000\Driver\motion.pdf	I-8091a Show3Led
Demo_28	Motion x-y, slot0 : I-8091, slot1 : I-8090, Napdos\ISaGRAF\8000\Driver\motion.pdf	I-8091 I-8090 Show3Led
Demo_29	Store 1200 short-int values every 75 sec. and then send to PC via COM3	I-87017
Demo_30	Store 2880 short-int values every 18 sec. and then send to PC via COM3	I-8017h
Demo_31	Press push button 1 to send an email from COM4 of I-8xx7 controller	Push4Key
Demo_32	Press Push button 1 or 2 or 3 to send emails to two users with multi-buffers	Push4Key
Demo_33	R/W user defined protocol via COM3	Show3Led
Demo_34	ISaGRAF Spotlight Demo	Push4Key Show3Led

Project Name	Description	I/O Boards Or Complex Equipment Used
Demo_35a	Time Synchronization : SA Update Date & Time at this controller will synchronize date & time at SB	Fbus_m
Demo_35b	Time Synchronization : SB	Fbus_s
Demo_36	Get driver version of I-8xx7	
Demo_37	Spotlight demo	Push4Key Show3Led
Demo_38	I-8xx7 talks to the MMICON : Demo 1	MMICON
Demo_39	8xx7 talks to the MMICON : Demo 2	MMICON
Demo_40	store 8 A/I (binary) to S256 per min, then PC can load it by “ICPDAS UDloader”	I-8017h S256_512 Show3Led
Demo_41	Record Alarm (text) to S256/512 & PC can load it by “ICPDAS UDloader”	S256_512 Show3Led
Demo_42	store 8 A/I (text) to S256 per min, then PC can load it by “ICPDAS UDloader”	I-8017h S256_512 Show3Led
Demo_43	SMS demo, Please declare your own phone No. in the dictionary, message type	SMS Show3Led Push4key
Demo_44	Demo of PC to download data to the S256/512	Show3Led
Demo_46	Motion control : Pulse move at a specified speed	I-8091 I-8090 Push4Key
Demo_49a	Redundant : 8437/8837 redundant Master	Bus7000 Ebus_m
Demo_49b	Redundant : 8437/8837 redundant Slave	Bus7000 Ebus_s
Demo_50	PWM I/O demo. (Pulse Width Modulation)	I-8055
Demo_52	Parallel D/I counter demo 1 at slot 0 (Counter Value is retained in this demo)	I-8051 Push4Key
Demo_53	Parallel D/I counter demo 2 at slot 0 (high speed near 1K) (Not retained)	I-8051 I-8056

Project Name	Description	I/O Boards Or Complex Equipment Used
		Push4key
Demo_54a	Modbus Master	Mbus
		Push4key
Demo_54b	Modbus Slave	
Demo_55	PWM I/O demo 2. (Pulse Width Modulation)	I-8055
Demo_58	Stepping motor controller	Push4key
		I-8041
Demo_59	Stepping motor controller	Push4key
		I-8041
Demo_61	DI counters using DI_CNT, I-8xx7 + 8051 Do something when DI signal happens	I-8051
Demo_63	PWM & DI_CNT demo, ON & OFF time can be dynamically changed	I-8055
Demo_70	Send string to COM3 when alarm 1 to 8 happens (Access to variables as array)	Slot 1 : I-8077

NOTE:
Demo_18 uses PID_AL which is provided by CJ Company for evaluation. Please refer to
ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/isagraf/8000/english_manu/pid_al.complex_pid_algorithm_implementation.pdf

2.6.2 VB.Net 2005 and VB 6.0 Modbus TCP/IP Protocol Demo Program

1. PC with MS .net frame work 2005 installed can run this VB.net 2005 (MBTCP_demo) program to use Modbus TCP/IP protocol to link to ICP DAS controllers. Please refer to

   http://www.icpdas.com/faq/isagraf.htm
   http://www.icpdas.com/faq/isagraf/051.htm

2. PC can run this VB 6.0 (demo_3) program to use Modbus TCP/IP protocol to link to ICP DAS controllers. Please refer to

   http://www.icpdas.com/faq/isagraf.htm
   http://www.icpdas.com/faq/isagraf/052.htm

2.6.3 ISaGRAF Demo Example Files

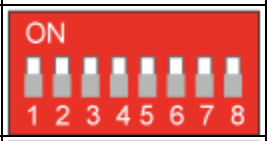
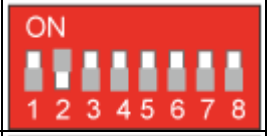
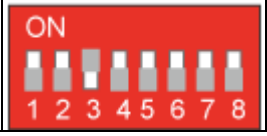
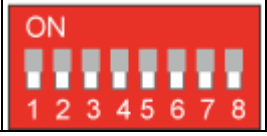
http://www.icpdas.com/products/PAC/i-8000/isagraf_demo_list.htm

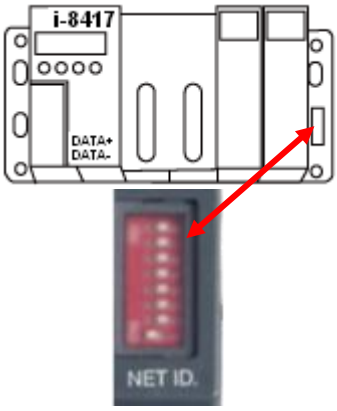
Chapter 3 Hardware System & Setting

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

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

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

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



Default setting → NET-ID=01

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

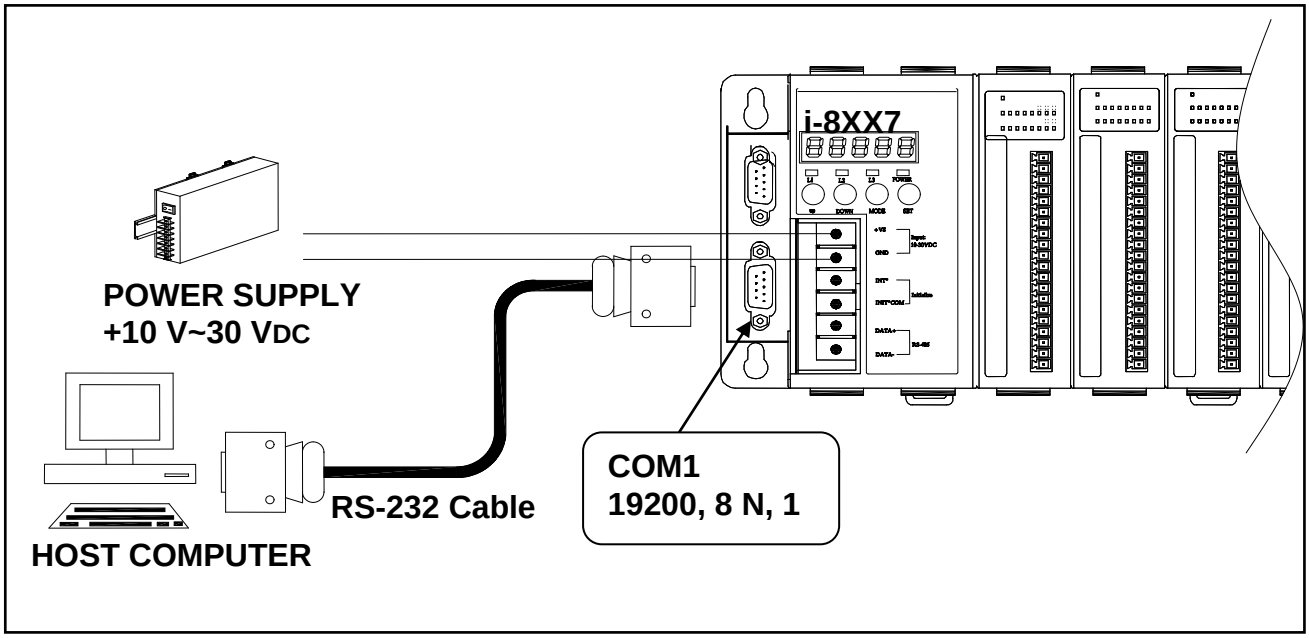
★ The NET-ID of every Main Control Unit in the same network must be unique (different from each other).

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

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

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

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



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

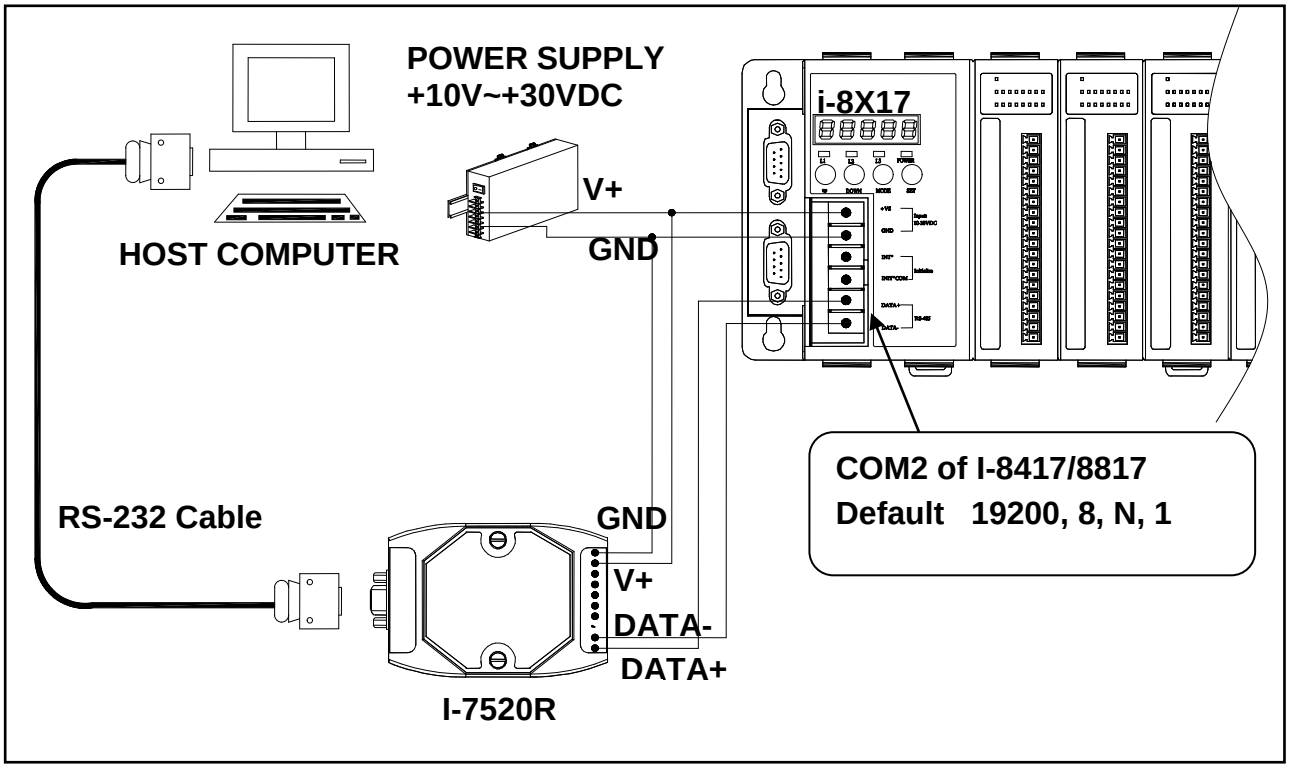
PC 9-Pin D-Sub		I-8xx7 COM1
RxD 2	———	TxD 2
TxD 3	———	RxD 3
GND 5	———	GND 5

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

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

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

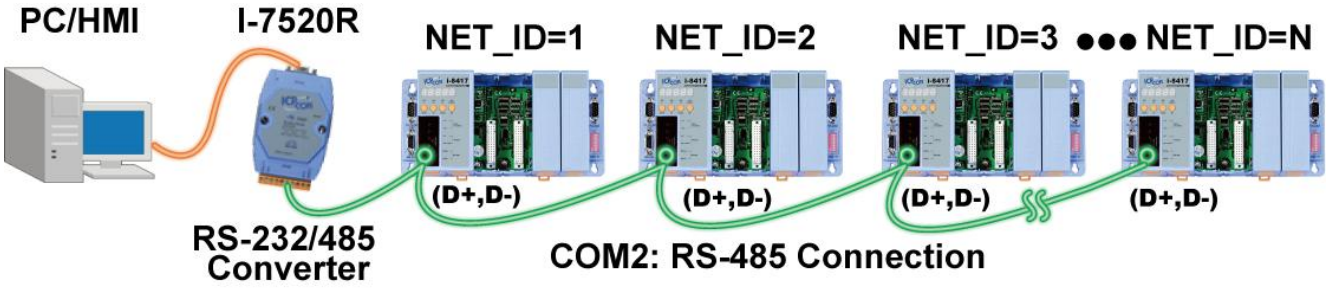
If your PC is connecting to an I-8417/8817's COM2 Port (RS-485), the maximum distance between the I-7520R (the RS-232/RS-485 converter) and the I-8417/8817 controller is up to 1,200 meters (4,000 feet). The distance between these two is dependent on the baud rate; the rule to follow is the lower you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



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

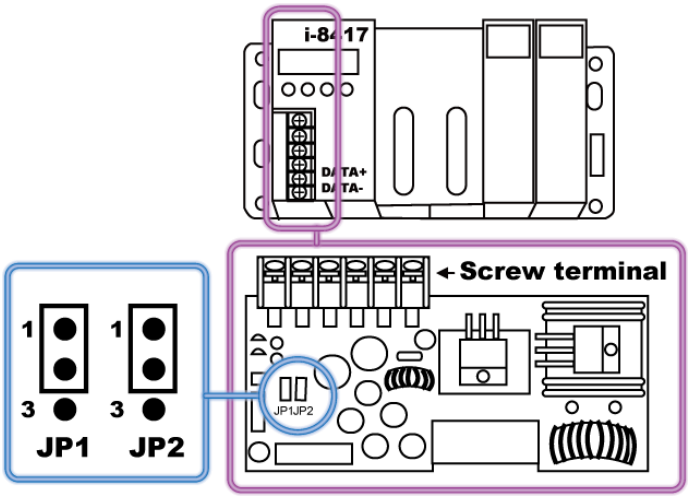
An additional feature of using the COM2 Port of the I-8417/8817 is that you can configure an RS-485 network from one PC to link to numerous I-8417/8817 controllers.

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

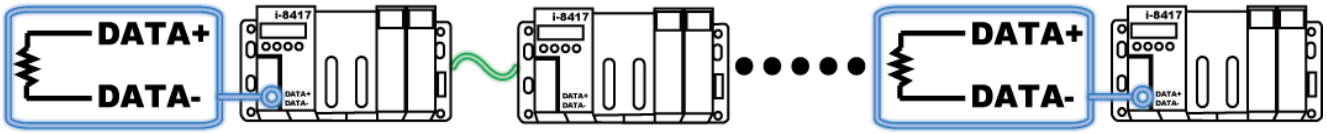


To create an RS-485 network you must first insure that each I-8417/8817 controller has a unique NET-ID address, and each of the controllers link the "DATA+" to the "DATA+" signal and the "DATA-" to the "DATA-" signal.

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



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

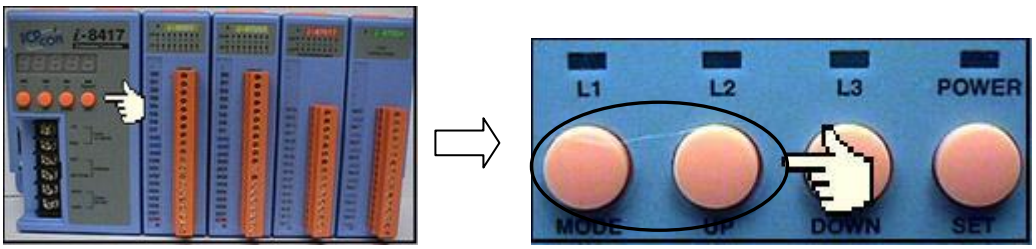


3.5 How to change Modbus RTU Baud Rate & Setup COM3 as Modbus Slave Port

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

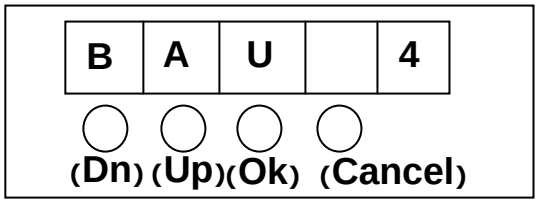
The baud rate can be set between 300、600、1200、2400、4800、9600、19200、38400、57600、115200 bps (bit per second).

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



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

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



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

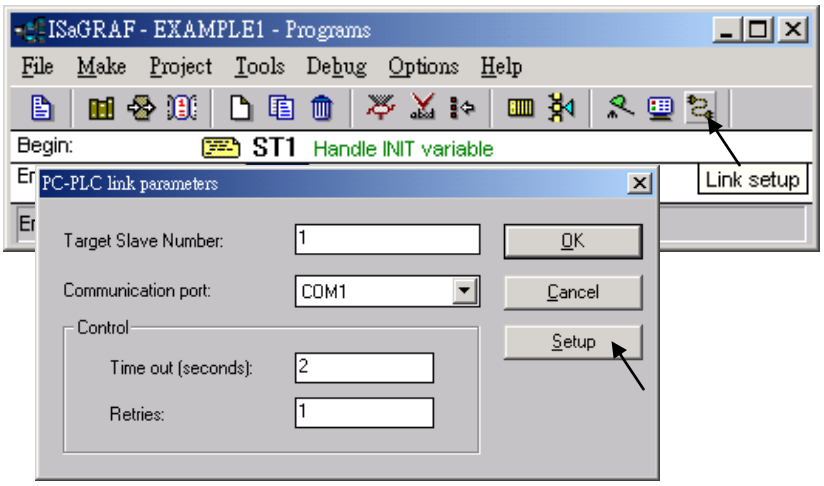
The settings for the **COM1/COM2 /COM3** baud rate are as follows:
(0) 1200, (1) 2400, (2) 4800, (3) 9600, (4) 19200, (5) 38400, (6) 57600, (7) 115200, (8) 300 (9) 600 (-) None-Modbus Slave Port. The setting “(-)” is only for the **COM3**!
(You can select one of the baud rates to setup COM3 as Slave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

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

IMPORTANT NOTICE:

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

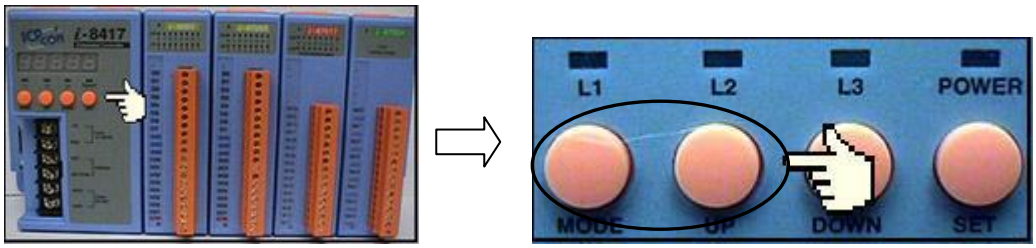
You should change your ISaGRAF Workbench’s COMM to the same setting before they can link to each other. (Please refer to Section 2.5)



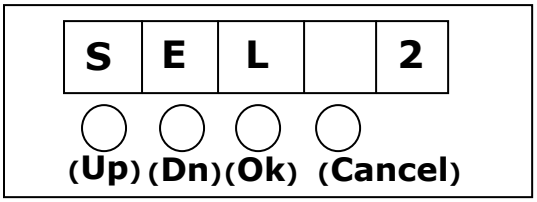
3.6 Deleting an ISaGRAF Project from the Controller

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

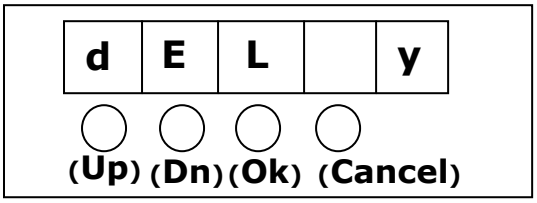
① press and hold the **first two buttons** on the front panel of the controller and then
② power back up the I-8xx7/8x37-80 controller to gain the ability to change the parameters.



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



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



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

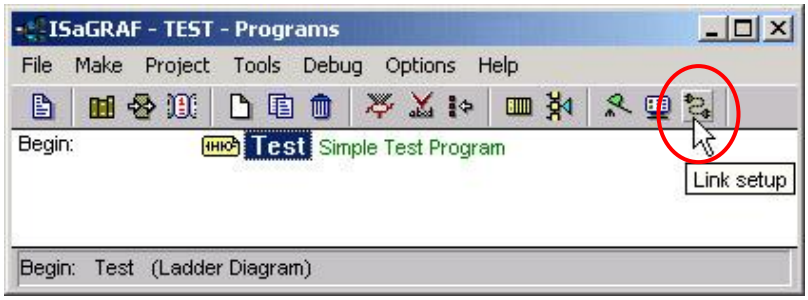
3.7 Connecting PC to the I-8437-80/8837-80 Ethernet Port

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

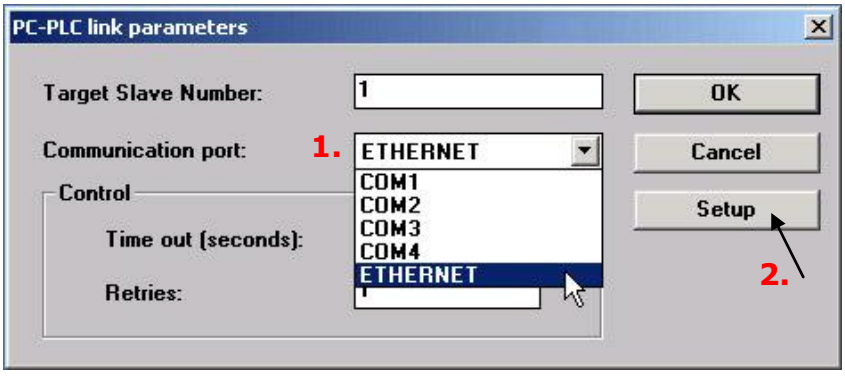
Before you can download an ISaGRAF application to the I-8437-80/8837-80 controller using the Ethernet Port, you must first setup the Ethernet Port to properly communicate with the host PC.

On the I-8437-80/8837-80, Set IP, Mask and Gateway address:
Please refer to section 3.9 to do this setting.

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

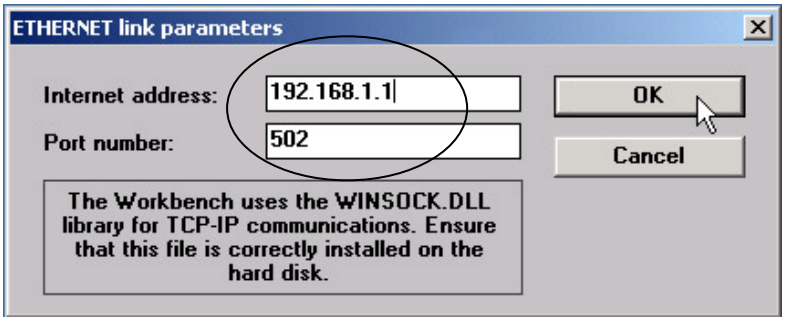


A "PC-PLC Link Parameters" dialog box will appear as shown below. From here select the "Ethernet" communications option and click on the "Setup" button.



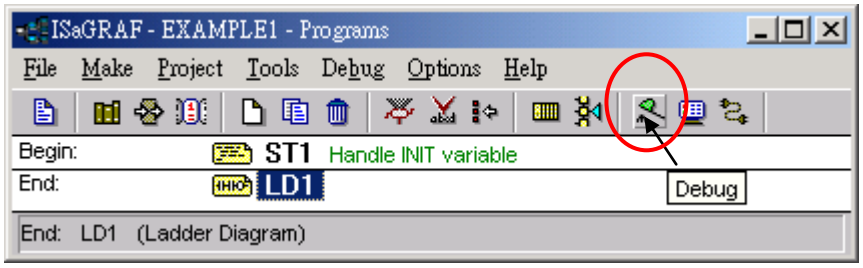
Once you have clicked on the "Setup" button, an "Ethernet Link Parameters" dialog box will appear.

Set the “Port Number” to “502” and enter in the Internet address (IP) of the I-8437-80/8837-80 controller, Please refer to section 3.9



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

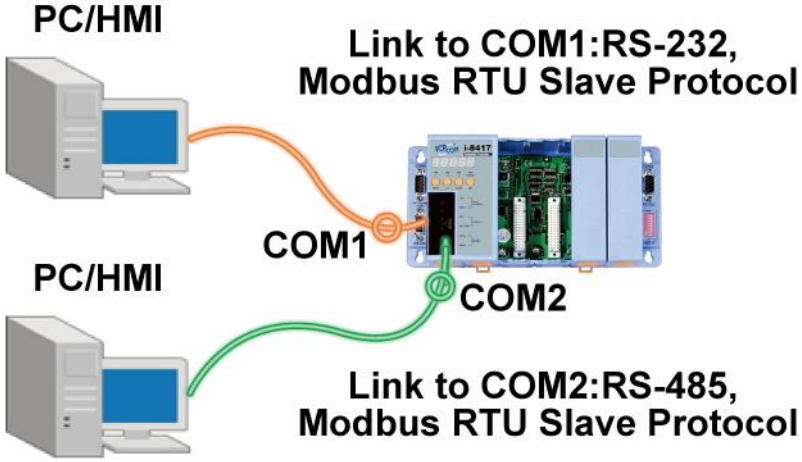
Click on “Debug” to link to the controller.



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

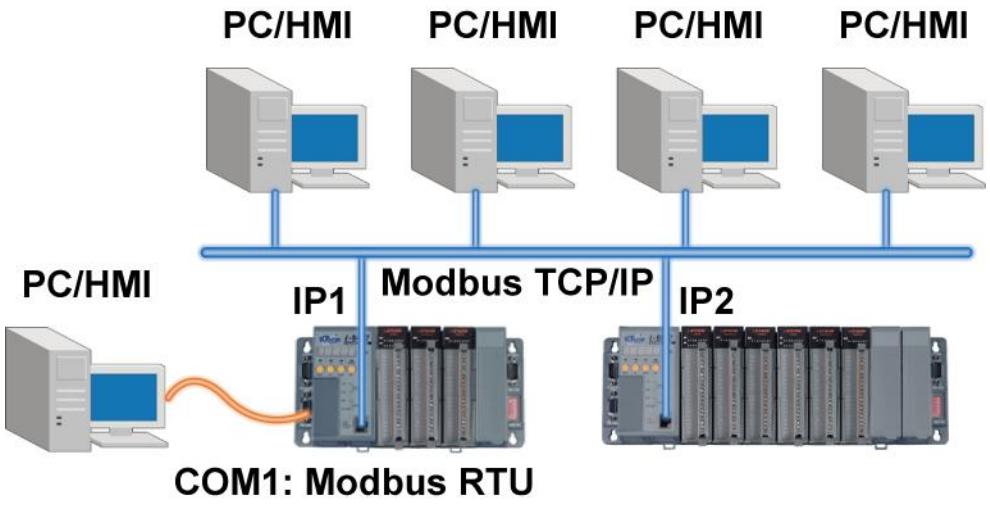
The COM1: RS-232 & COM2: RS-485 of the I-8417/8817 controller supports Modbus RTU Slave protocol by default. They can be linked by

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



The COM1: RS-232 & COM3: RS-232/RS-485 of the I-8437-80/8837-80 controller supports Modbus RTU Slave protocol by default.

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



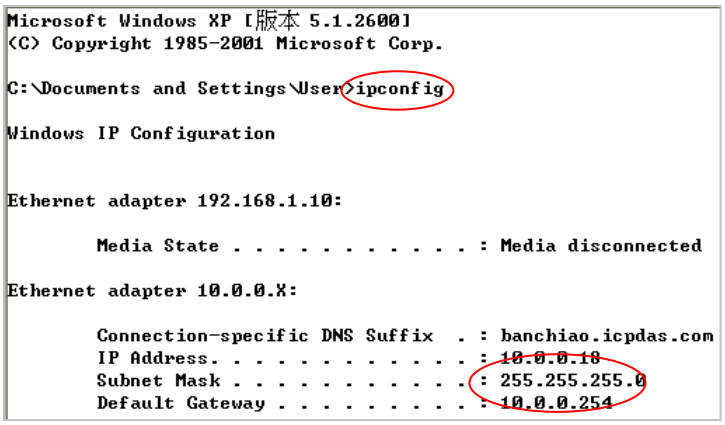
The Modbus TCP/IP protocol's Ethernet Port No. is fixed as **502.**
Up to 4 PCs can link to one I-8437-80/8837-80 throughout Ethernet Port. Another PC or HMI can link to COM1: RS-232 Port (Modbus RTU Slave protocol) of the controller. Therefore the maximum number of clients can be linked is 5.

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

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

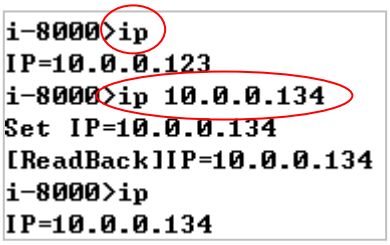
```
ICP_DAS MiniOS7 for I-8000 Ver. 2.00 build 002,Apr 08 2005 17:06:02
SRAM:512K, FLASH MEMORY:512K
[CPU=Am188ES]
Serial number= 09 63 4A 60 03 00 00 76

i-8000>
```

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



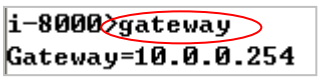
Please according as your computer to following setup (IP/MASK/GATEWAY)

8. Type “ip” to see the current IP address of the I-8437-80/8837-80.
   Type “ip 10.0.0.xxx” to setup a new IP address



9. Type “mask” to see the current address mask of the I-8437-80/8837-80.
   Type “mask 255.255.255.0” to setup a new address mask.

10. Type “gateway” to see the current gateway address.
    Type “gateway 10.0.0.254” to setup a new gateway address.



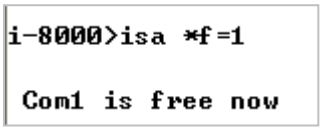
11. Press **ALT_X** to exit “7188xw”, or COM1/COM2 of the PC will be occupied.

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

3.10 Setting COM1 as None-Modbus-Slave Port

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

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



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

IMPORTANT NOTICE:

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

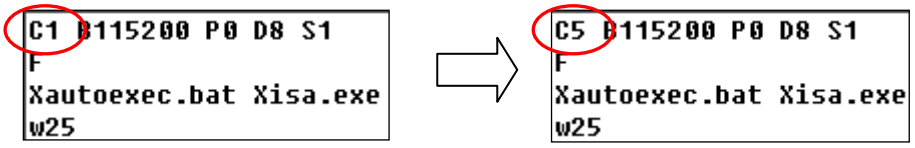
If the command doesn’t support, please refer to the next section to update the hardware driver.

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

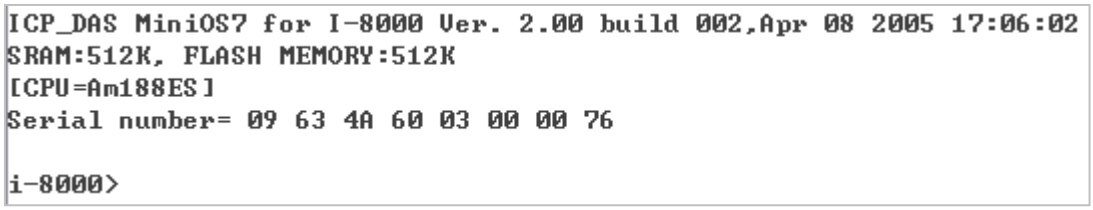
Our newly released driver can also be obtained from the below website:
http://www.icpdas.com/products/PAC/i-8000/isagraf.htm or
http://www.icpdas.com/products/PAC/i-8000/isagraf-link.htm
(Please extract the zip file)

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

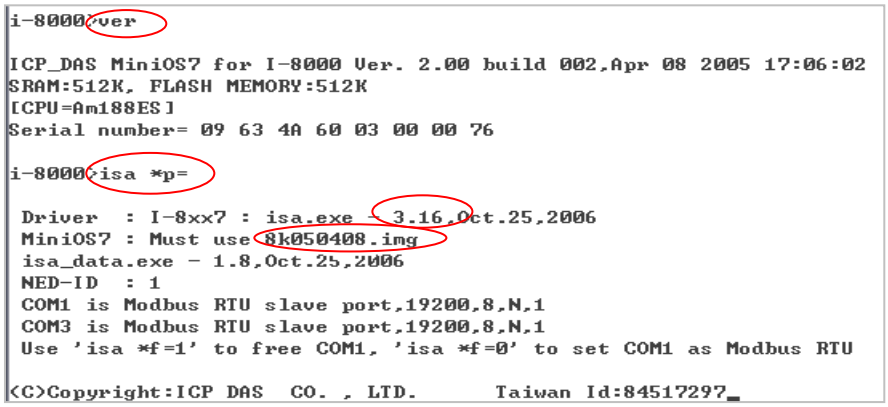
1. Create a file folder named "8000" in your hard drive .For example, "**c:\8000**".
2. Copy Napdos\ISaGRAF\8000\Driver\40m\3.16\Napdos\ISaGRAF\8000\Driver\40m\3.16\
   ① **7188xw.exe,** ② **7188xw.f4,** ③ **7188xw.ini,** ④ **8k050408.img,** ⑤ **autoexec.bat,** ⑥**isa.exe**, ⑦ **isa_data.exe** from the CD_ROM into your "**8000**" folder.
3. Run "\8000\7188xw.exe" in your hard drive. A "7188xw" screen will appear (Press F1 for help).
4. Link COM1 or COM2 of your PC to COM1 of the controller through a RS-232 cable. If you use other COM Port (ex.COM5), please modify the first line of "7188xw.ini".



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



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



To Upgrade an ISaGRAF Embedded Driver

1. Power off the controller, connect pin "INIT" to "INIT COM" and then power it up.

2. Press “**F4**” to auto download the following files and reboot system. **(isa_data.exe, autoexec.bat, isa.exe, 8k050408.img)**

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

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

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

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

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

```
i-8000>DIR

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

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

3.12 Backup & Restore an ISaGRAF Project

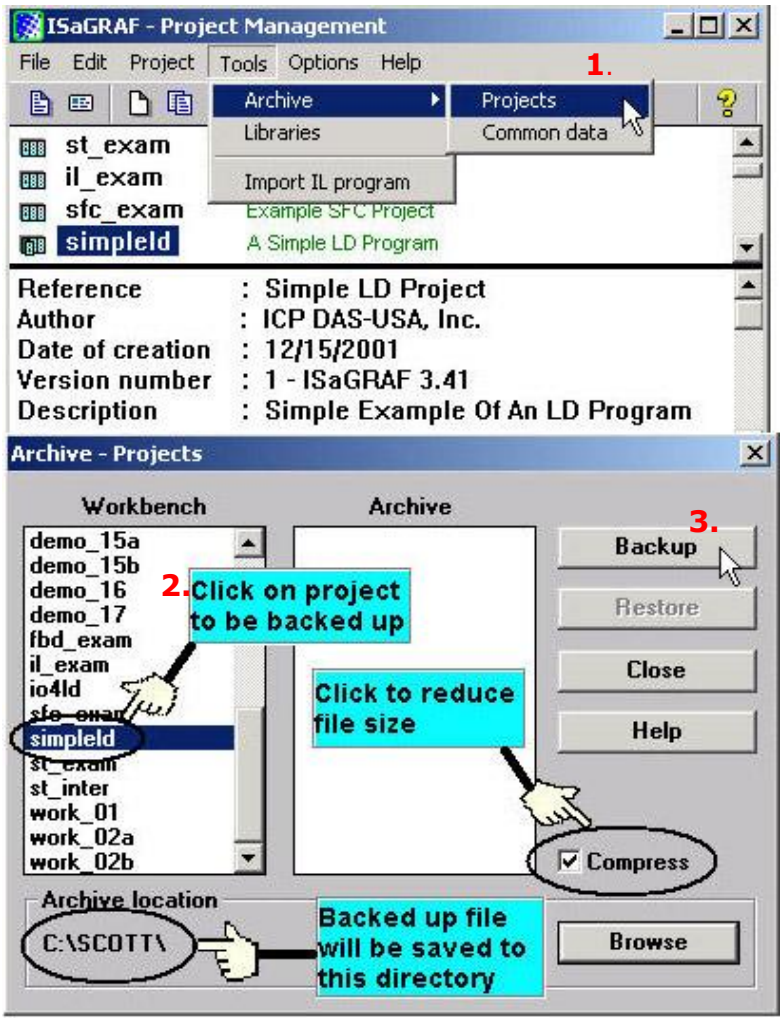
For archiving purposes you can "Back Up" and "Restore" an ISaGRAF project.

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

Backing Up an ISaGRAF Project

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

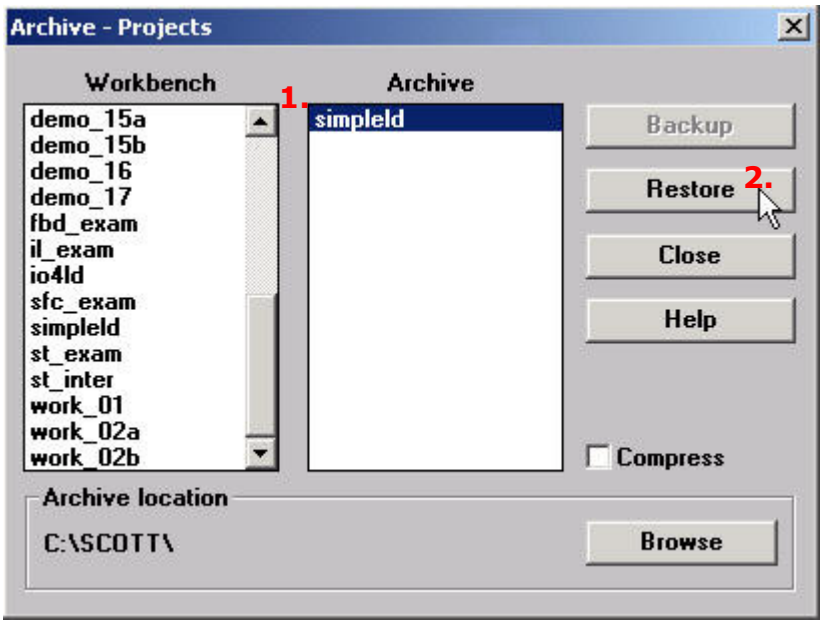
② Click on the name of the ISaGRAF project you want to backup, and then ③ click on the "Backup" button. You can compress the size of the file you have backed up by clicking on the "Compress" checkbox BEFORE you click on the "Backup" button.



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

Restoring an ISaGRAF Project

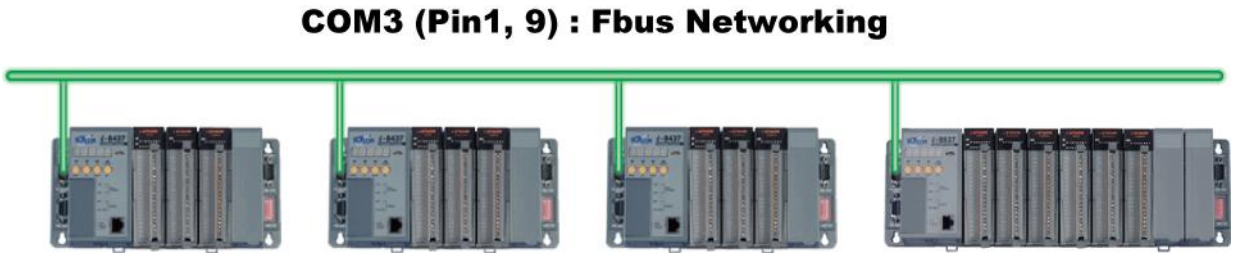
To restore an ISaGRAF project from a backed up file, use the same method as above to access the “Archive Projects” window, ① click on the name of the backed up file from the “Archive” window, then ② click on the “Restore” button. The ISaGRAF project will now be restored to the sub-directory you designated.



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

3.13 Pin assignment Of the Fbus

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



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

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

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

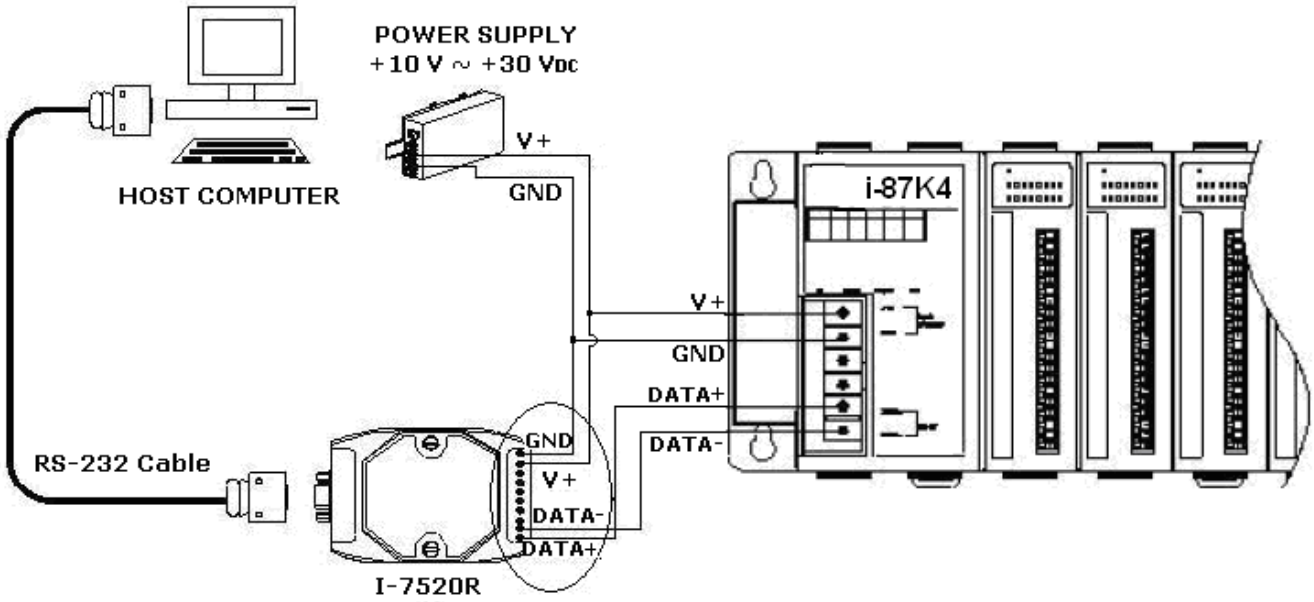
The DCON Utility is a toolkit that helps user to search the network, easily to configure and test the I/O modules. For DCON Utility program and manual please reach to http://www.icpdas.com/products/dcon/introduction.htm.

NOTE:

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

Step 1: Hardware connection

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



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

Step 2: Initialize I/O module

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

The default state from factory:

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

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

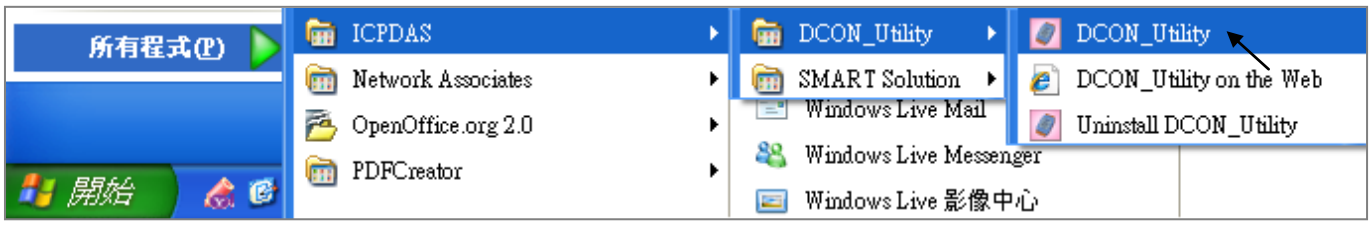
★To initialize I-87K module, please switch the DIP switch of I-87Kn. (Ex. Switch Dip-2 to "ON" and restart I-87Kn, the Slot2 will setup to initial.

The initial state after initialization:

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

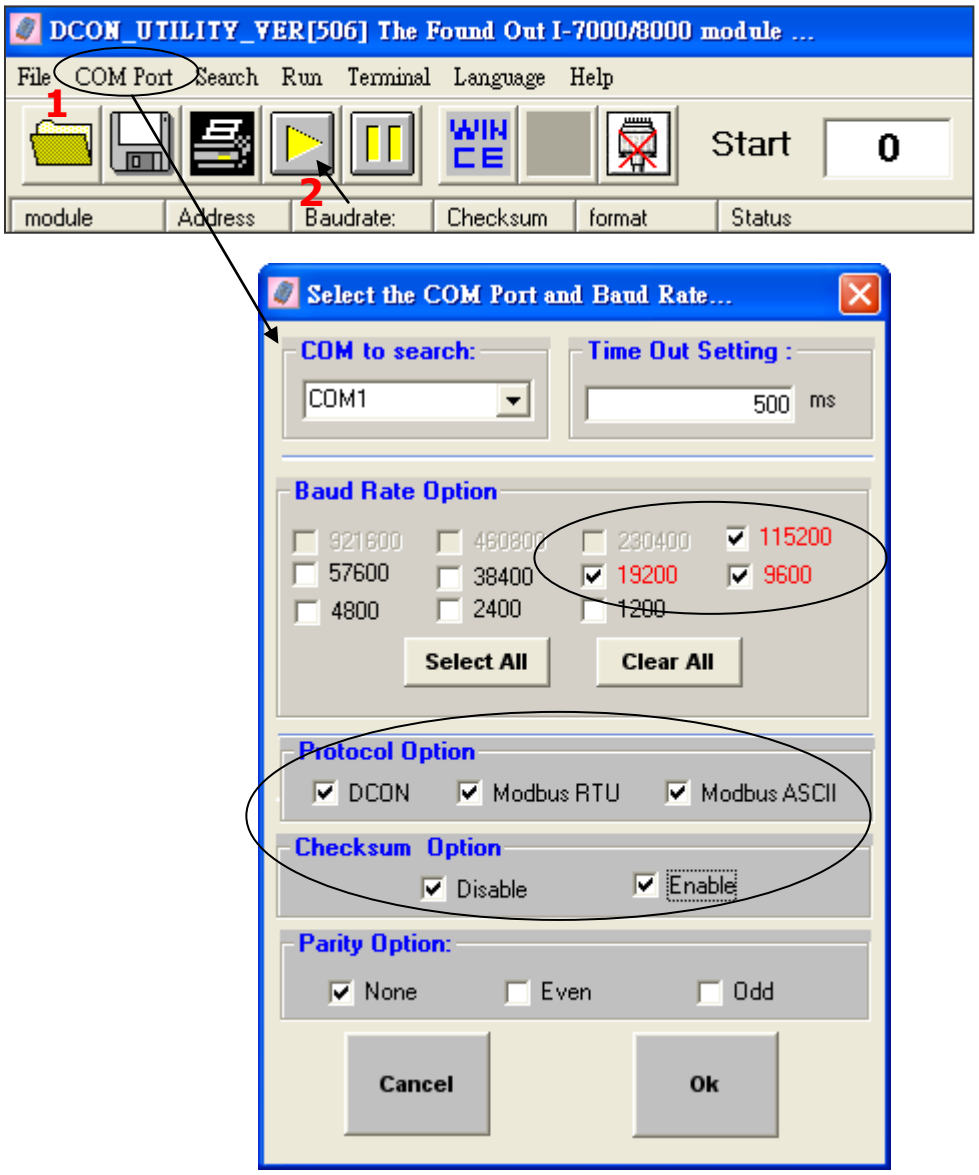
Step 3: Select COM Port and Baud Rate to search

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



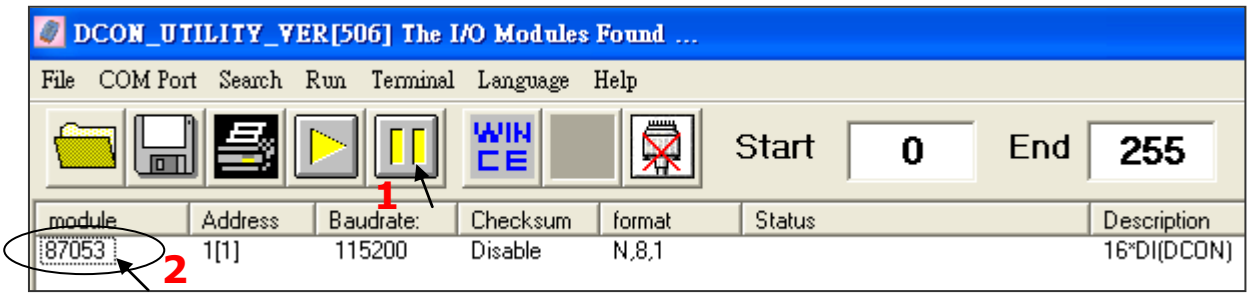
1. Click "COM Port" menu to select the COM Port and Baud Rate to search. You can select multi-Baud Rate, Protocol or Checksum conditions if you do not know the module's setting, but it will spend more time to scan the network. After selection, click "OK".

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

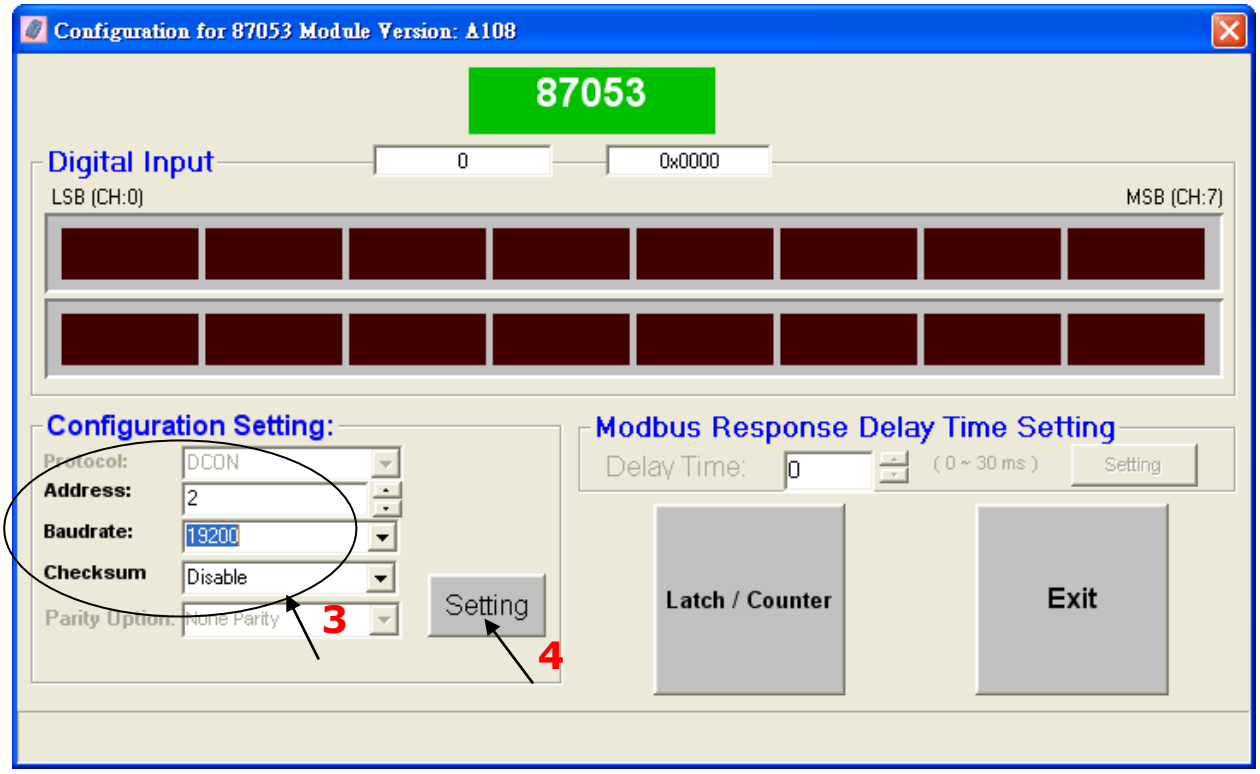


Step 4: Click Searched module ID and give the new configuration

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



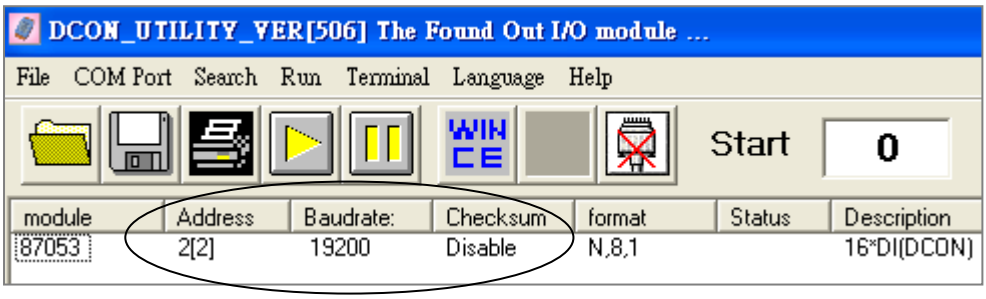
In the screen, you can setup the Address, Baud rate, Checksum, and then click "Setting" to save.



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

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

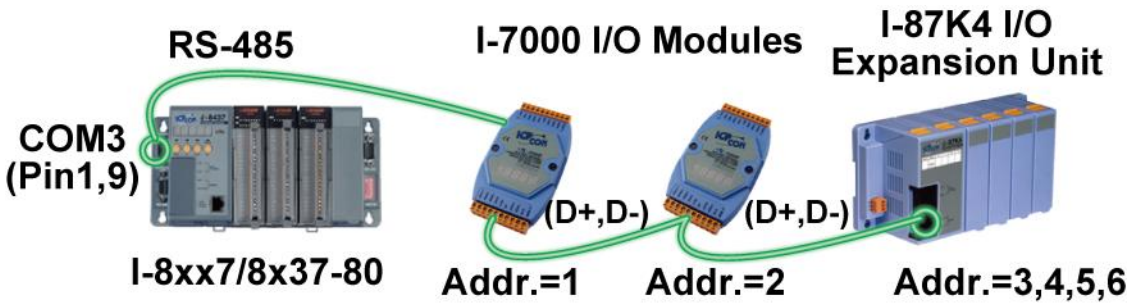
Finally, you can search the module again and check the settings.



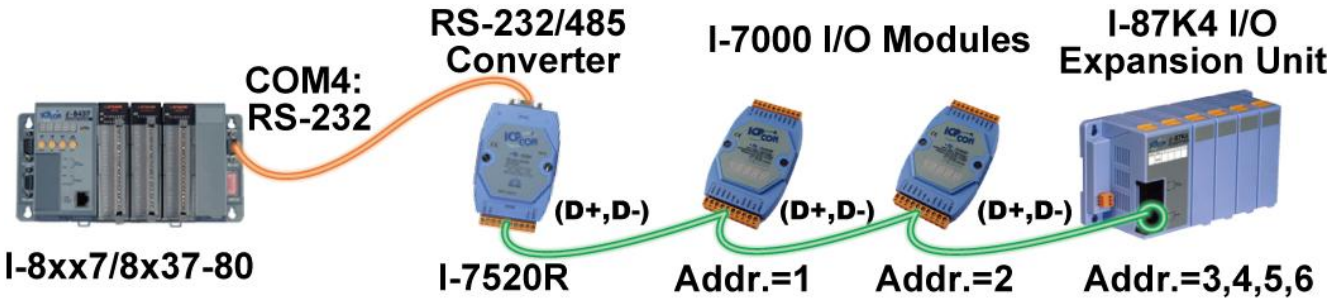
3.15 Linking I-7000 and I-87K Modules for Remote I/O

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

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



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



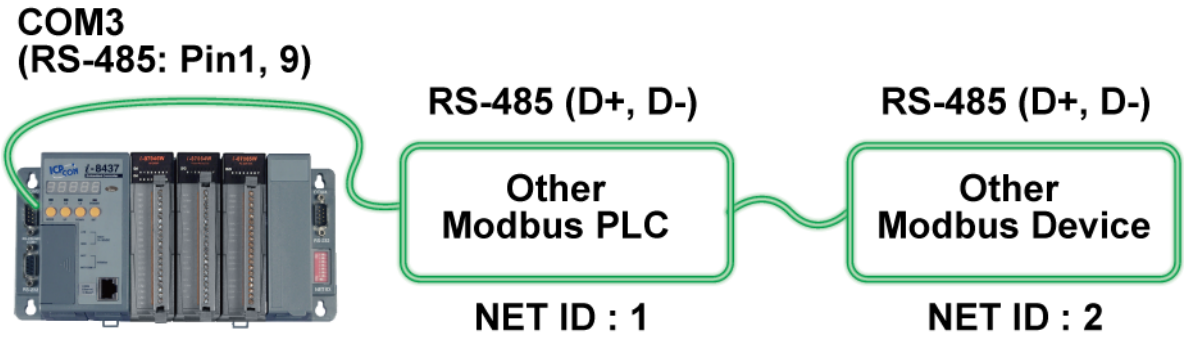
You can link up to 64 I-7000 or I-87K series remote modules to one I-8x17/ 8x37-80 controller. You must remember to set each I-7000 and I-87K remote module must have a unique address, and be set to the same baud rate as the I-8xx7/8x37-80 controller.

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

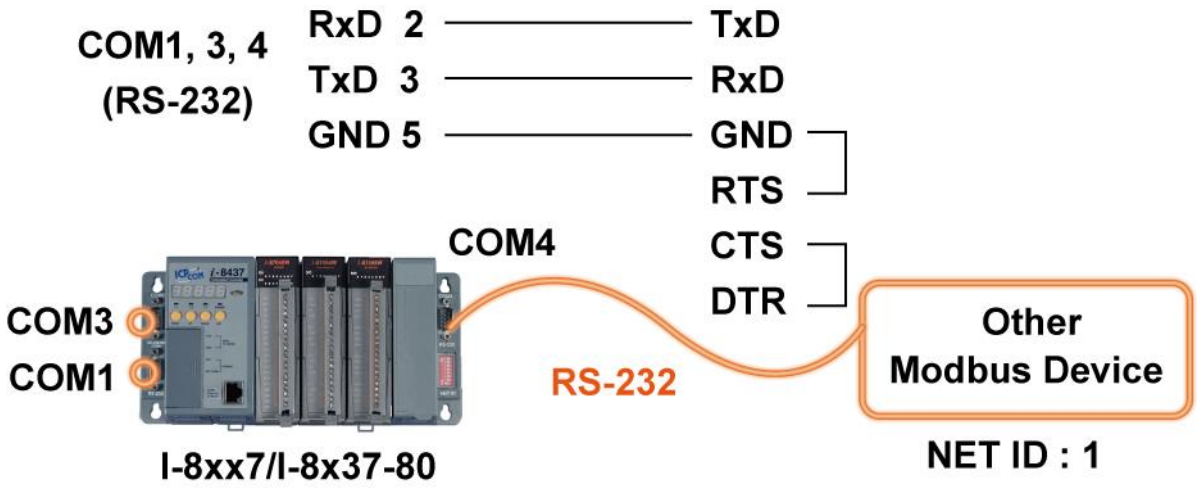
3.16 Creating a Modbus Link with the Controller

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

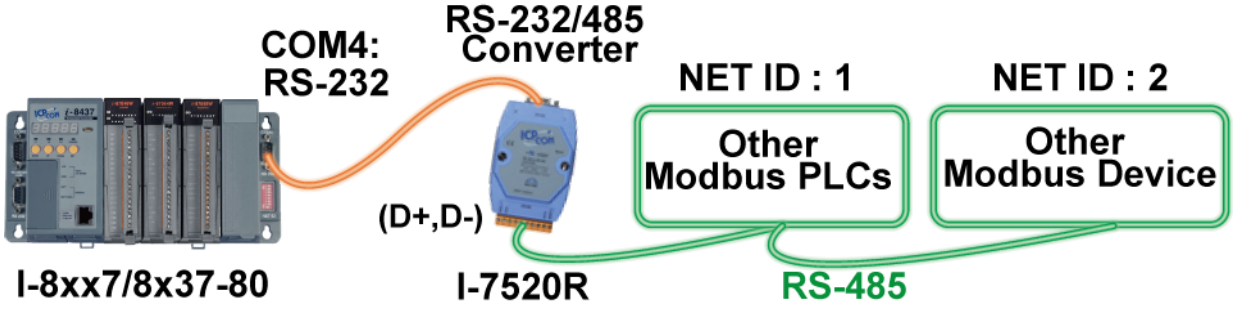
If the COM3:RS-485 Port is used for Modbus Master, one I-8x17/8x37-80 can connect to many other devices. Each device on the link must have a unique NET ID (1 ~ 255) address, and communicate at same baud rate settings.



If COM1/COM3/COM4 : RS-232 is used, you can only link one I-8x17/8437-80 to one other Modbus device. To use the COM1 as Modbus Master Port, please disable the default Modbus RTU Slave setting in it. Please refer to section 3.10.



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



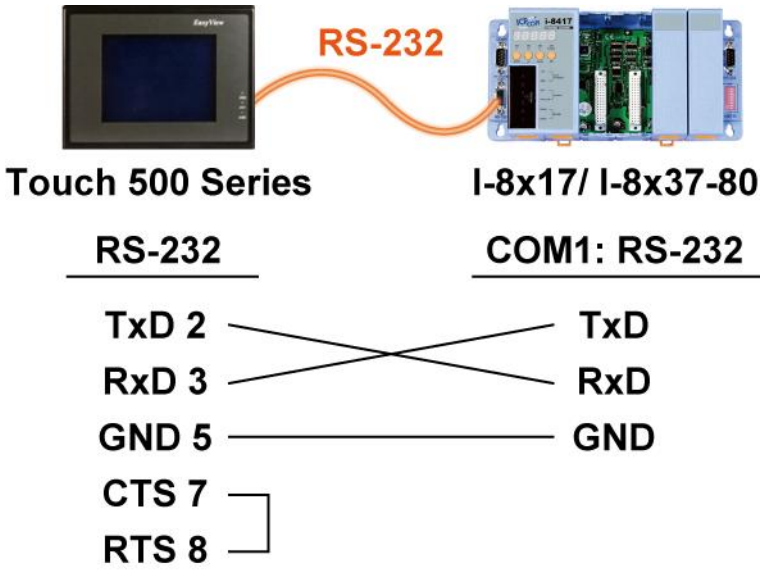
3.17 Linking To an MMI Interface Device

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

For detailed ISaGRAF User's Manual. It is listed in Section 4.4 &

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

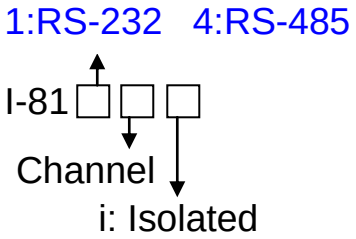
If you are using any of the "Touch" series of MMI devices to connect to a controller, you can only interface the devices to the COM1 Port on the I-8xx7/8x37-80 controller.



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

3.18 Using N-Port COM

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



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

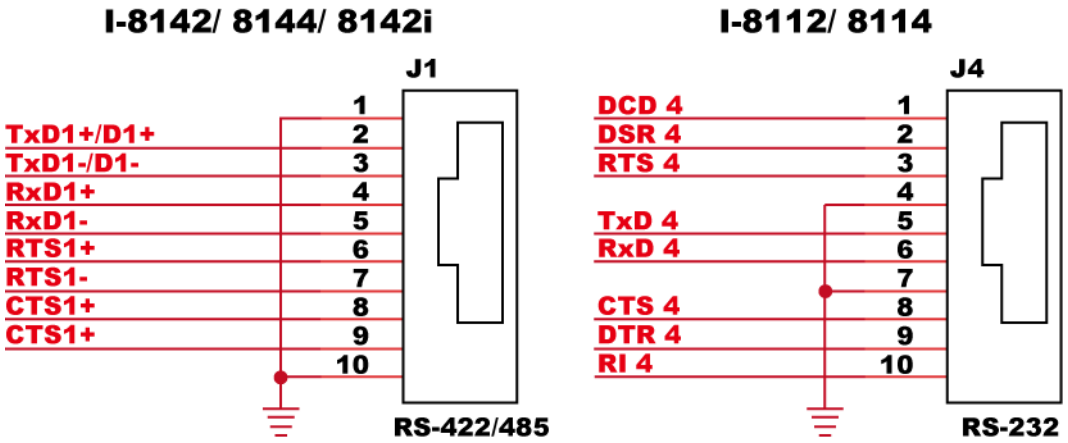
Please refer to:
http://www.icpdas.com/products/Remote_IO/i-8ke/selection_rs232_i8k.htm

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

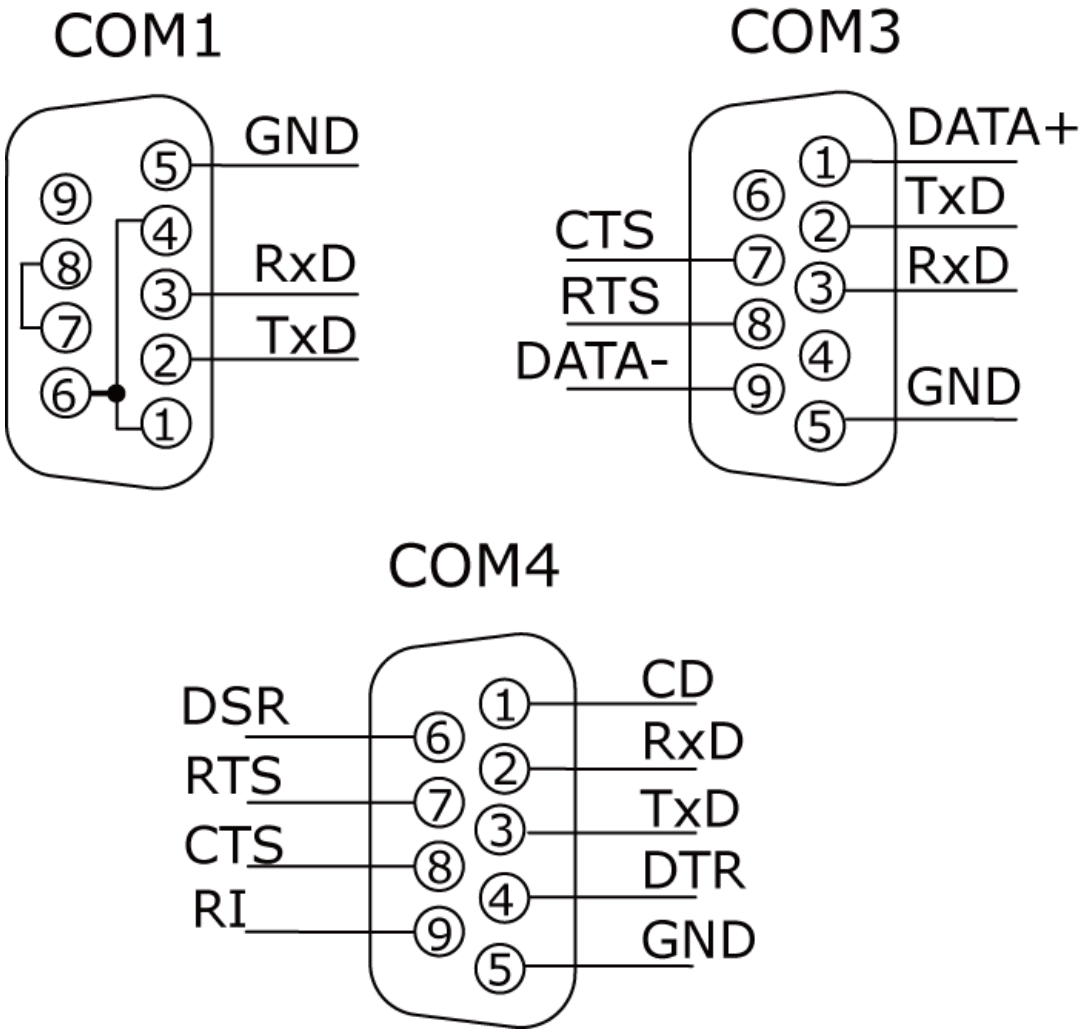
Some functions can be used to read/write these COM Ports. Please refer to CD-ROM: \napdos\isagraf\8000\english_manu\ "user_manual_i_8xx7.pdf" for detailed ISaGRAF User's Manual.

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

Pin assignment:

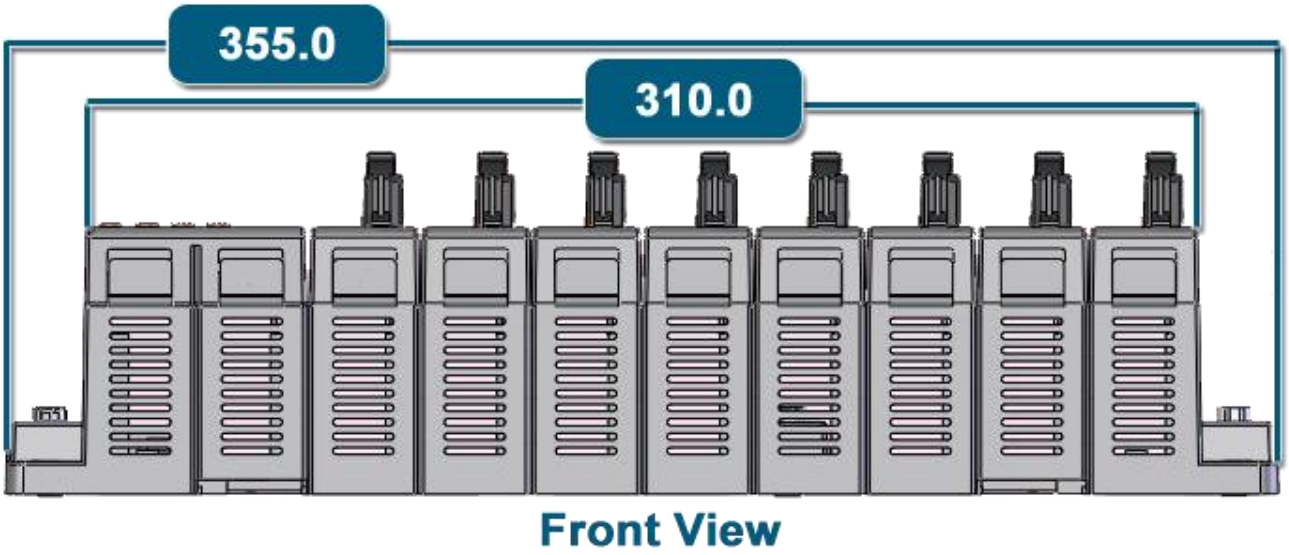


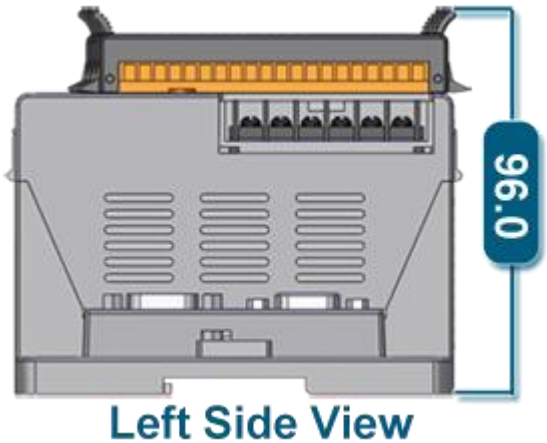
3.19 Pin Assignment of Communication Ports



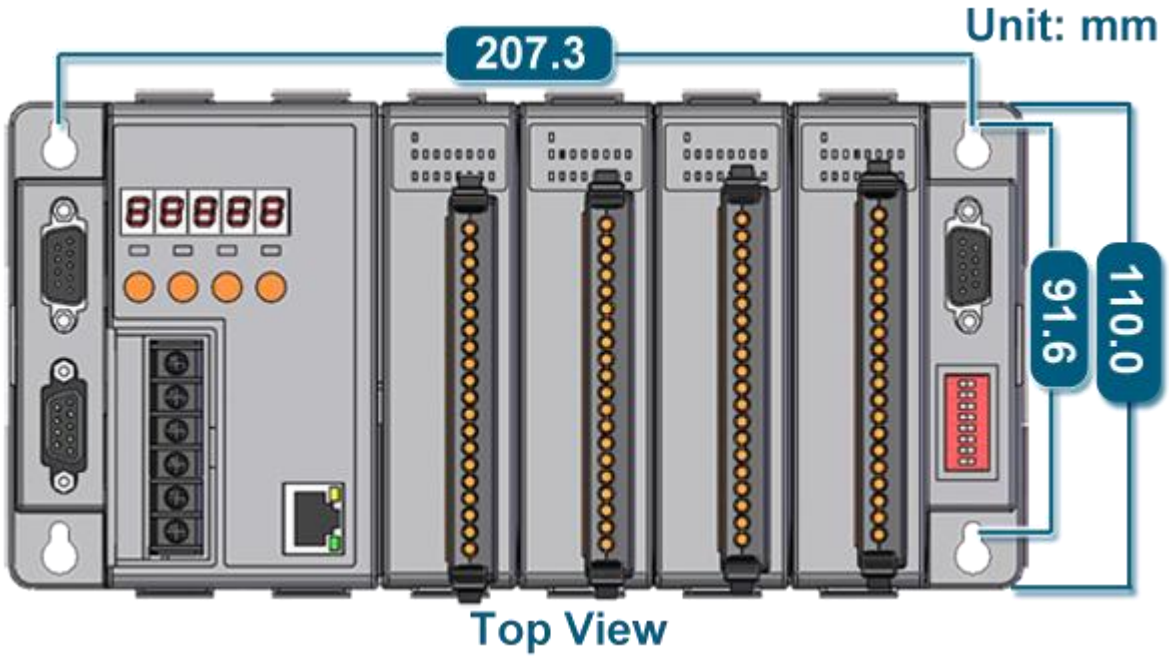
3.20 Dimension

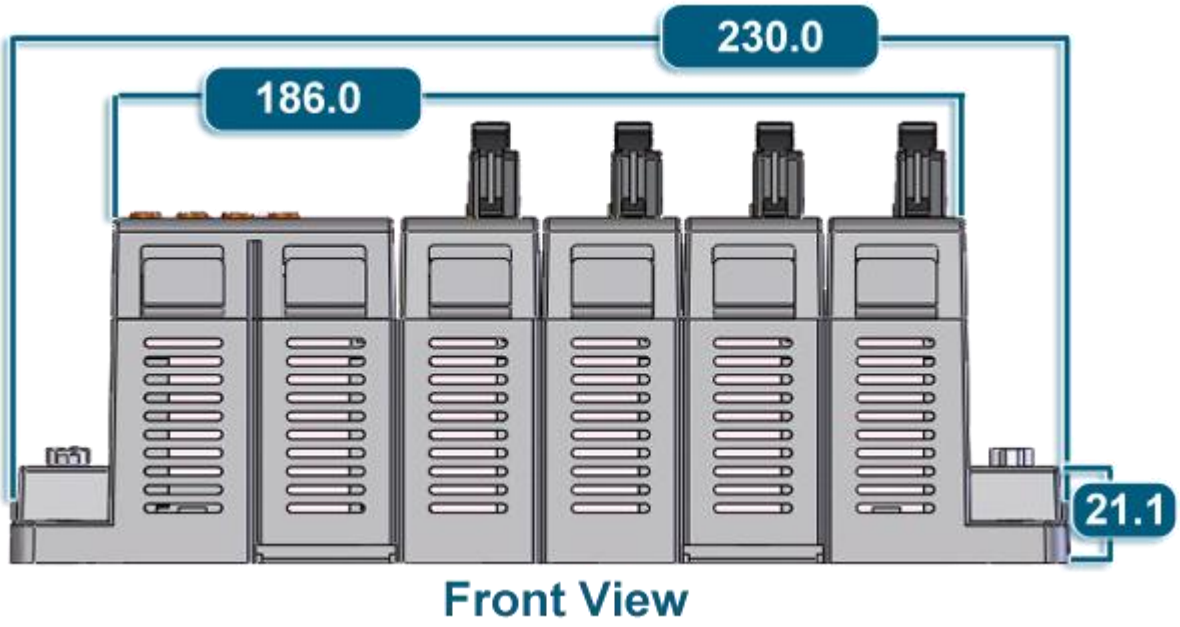
8 Slots:

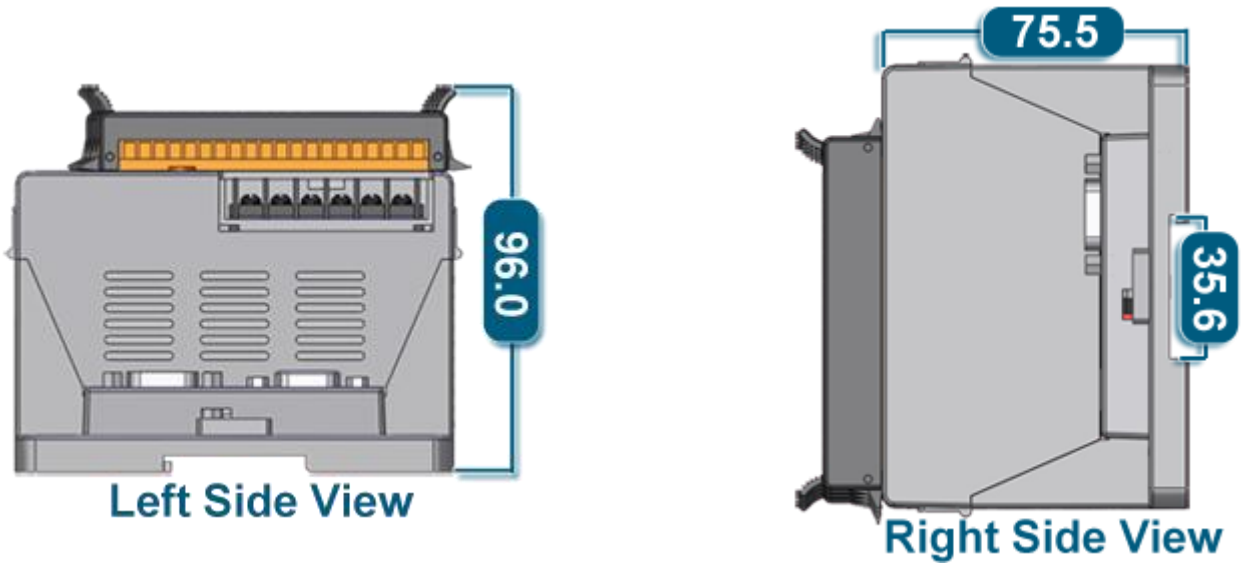




4 Slots:


Unit: mm
207.3
91.6
110.0
Top View


230.0
186.0
21.1
Front View


75.5
96.0
35.6
Left Side View
Right Side View

Chapter 4 Frequently Asked Questions

"User Manual of ISaGRAF Embedded Controller" 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 Embedded Controller - I-8xx7/8x37-80. For manual, please refer to
http://www.icpdas.com/products/PAC/i-8000/isagraf.htm or
http://www.icpdas.com ➔ Products/Software ➔ ISaGRAF

In this chapter we will list useful applications and their demo programs. Please download programs from CD or website http://www.icpdas.com/faq/isagraf.htm or
http://www.icpdas.com ➔ FAQ/ISaGRAF

4.1 English ISaGRAF Ver.3 FAQ

	language ?
112	Q: Program the I-8093W (3-axis high speed Encoder input module) by ISaGRAF.
113	Q: Linking ISaGRAF PAC to Modbus TCP/IP Slave Devices By Modbus TCP Master Protocol.
114	Q: How to avoid garbled content when printing ISaGRAF PDF documents?
115	Q: Working eLogger HMI with ISaGRAF SoftLogic in the WP-8xx7, VP-2xW7 and XP-8xx7-CE6 PAC. (the document version is 1.02 released on Dec.23,2009).
116	Q: How to enable the second to fifth Modbus RTU slave port of the WP-8xx7 and VP-2xW7 without modifying the ISaGRAF project ?
117	Q: How to install the ISaGRAF Ver.3 on Windows Vista?
118	Q: A M.S. VC++ 6.0 Demo Program To Connect One WP-8xx7 by Modbus TCP Protocol.
119	Q: How to implement the communication redundancy between the central control station and the local stations?
120	Q: How to calculate the moving average value of a variable by c-functions “Aver_N” or “Aver_F” ?
121	Q: How to install or remove the ISaGRAF development platform properly?
122	Q: How To Solve The USB-Freeze Problem Of The W-8x4x ? How To Update The W-8x4x 's OS Image ?

Appendix

A : 10-ch Thermocouple Input Module

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

A.1 : I-7018Z

A.2 : I-87018Z

A.3 : Advantages

1. It is special designed for thermocouple inputs. The innovative design makes the thermocouple measurement more accurate than the previous design.
2. It supports voltage and current inputs. The voltage input ranges can be ±15 mV ~ ± 2.5 V. The current input ranges can be 4 ~ 20 mA, 0 ~ 20 mA, and ± 20 mA.
3. Up to 10 analog inputs of different types can connected to one module.
4. Up to 240 V_{rms} over voltage protection is provided.
5. It features per-channel open wire detection for thermocouple and 4 ~ 20 mA inputs

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

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

Introduction

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

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

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

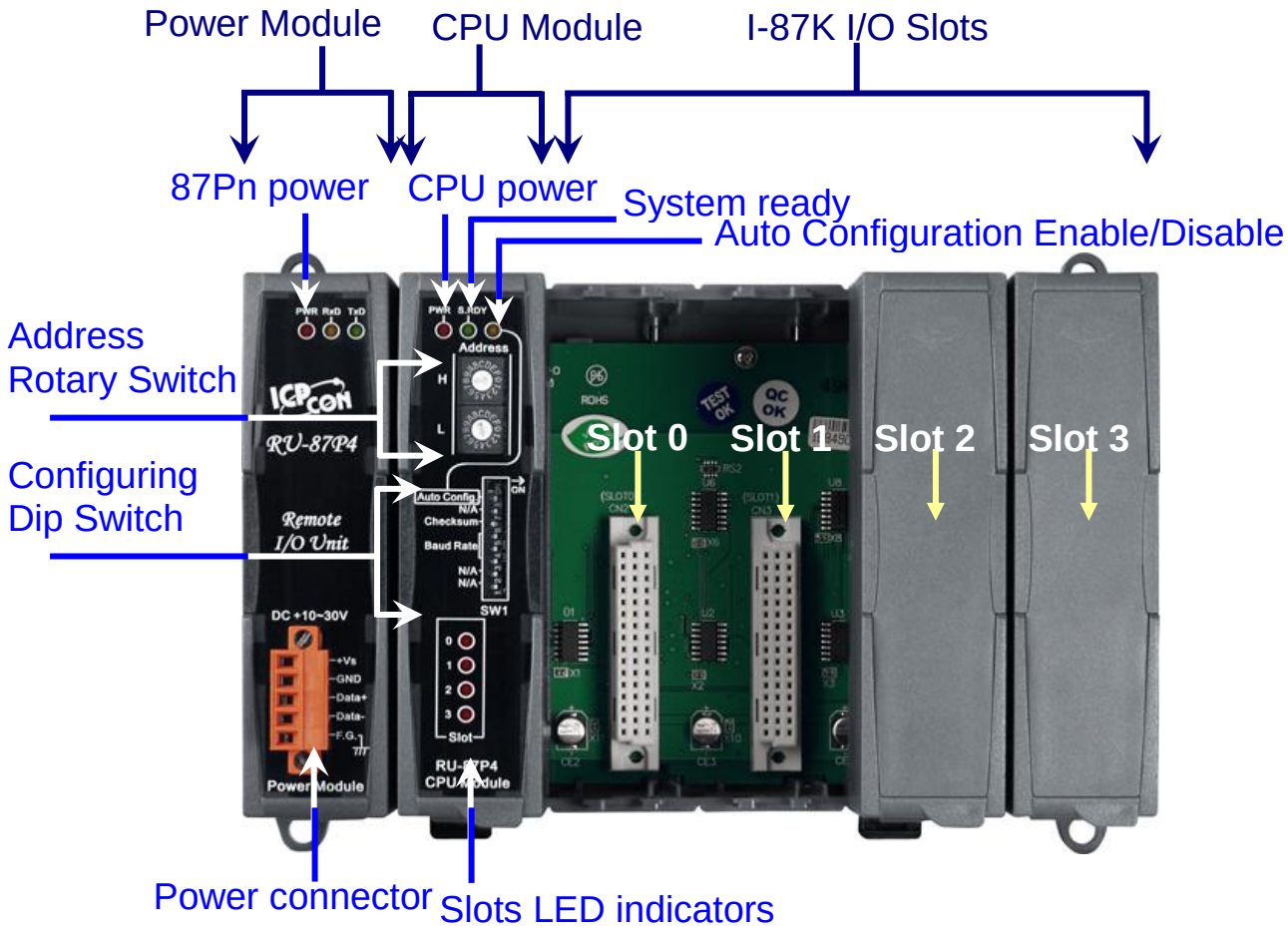


Fig. 1 RU-87P4

Features

Hot Swap

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

Auto-Configuration

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

Easy Duplicate System

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

Easy Maintenance and Diagnostic

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

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

Fully Software Support

The variant development kits and free charge software utility:

- **DCON Utility: for configuration**
- **OPC Servers**
- **EZ Data Logger**
- **Support Variant Software Develop Toolkits**
  Free DLL, ActiveX, Labview driver, Indusoft driver, DasyLab driver, Linux driver
- **ISaGRAF PACs can connect to the RU-87Pn directly**