

# 2.2 ISaGRAF+XPAC Motion Control Solutions



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PAC Solutions

## Introduction

As a pioneer of PAC, ICP DAS provides a new PAC motion control solution - ISaGRAF + XPAC Motion Control Solution. Integrating with the ISaGRAF development software and the Soft-GRAF HMI, the XPAC series plus the I-8094F/8094/8092F motion control solution allows users to easily design and implement a professional and user-friendly system with effective integration of motion controls, logic controls and I/O device controls.

## Features

- ISaGRAF provides IEC 61131-3 standard PLC open Syntax: Motion control design is easy and professional.
- Using XPAC-CE6 is more effective than using PLC: Using XPAC-CE6 for motion control is more effective when integrating motion controls, logic controls and I/O controls.
- Support free Soft-GRAF HMI Software: The control logic via ISaGRAF & the HMI Screen via Soft-GRAF.

## Motion Functions

- Independent 4-axis motion control
- Support manual pulse generator and jog functions
- 2/3-axis linear interpolation function
- 2-axis circular interpolation function
- Programmable T/S-curve acceleration and deceleration
- A maximum pulse output rate of 4M pps for each axis
- Pulse Output Types: CW/CCW or PULSE/DIR
- 32-bit encoder counter for each axis
- Encoder pulse input types: A/B phase or Up/Down
- Programmable automatic homing for each axis
- Position comparison management and software limits
- Expandable remote I/O: 128 DI and 128 DO via a two-wire FRnet interface
- Require low CPU loading for motion function processing
- Multiple motion modules can be used with a single XPAC-CE6 and the status of other I/O devices can be monitored at the same time

## Development Software - Control Logic



### The SoftLogic Solution: ISaGRAF

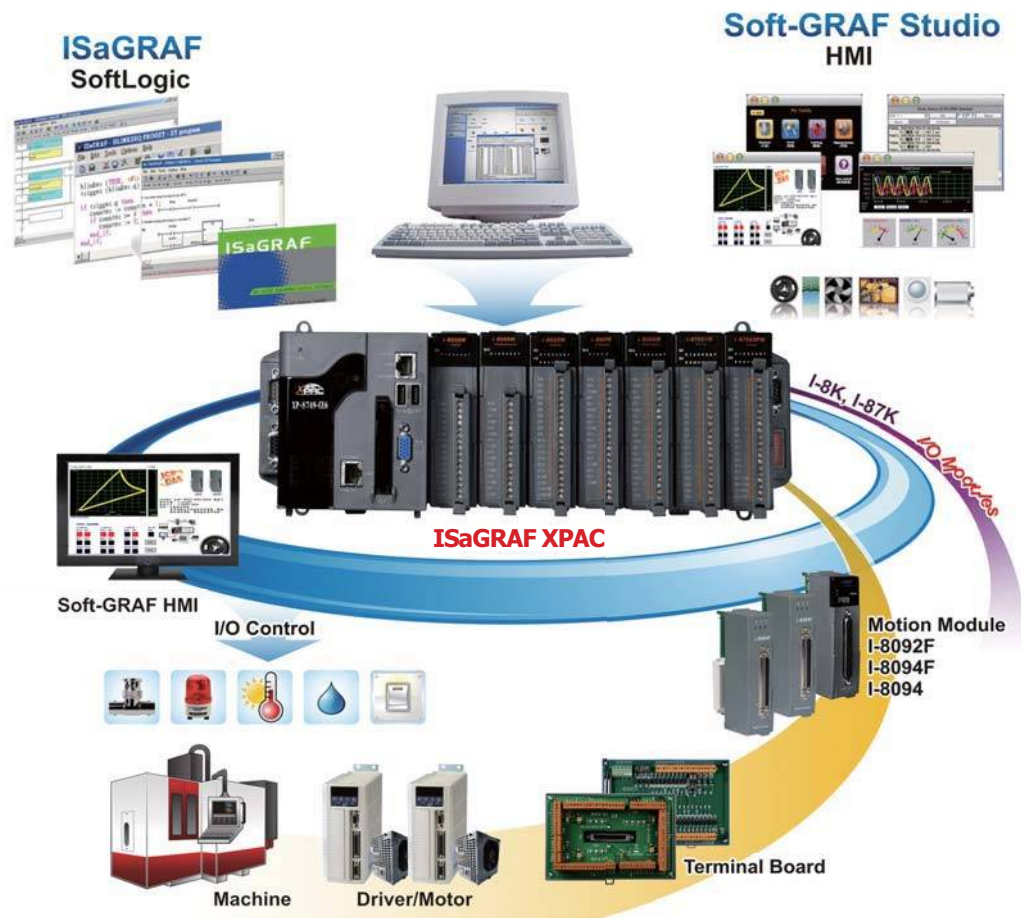
ISaGRAF is a powerful SoftLogic package on the industrial market. ISaGRAF Workbench is a PLC-like development software running on Windows 95, 98, NT, 2000, XP, Vista and Windows 7. Its ISaGRAF Runtime application programs can run on any ISaGRAF PACs such as ISaGRAF WinCE series (WP-8xx7/5xx7, VP-2xW7/4xx7, XP-8xx7-CE6/XP-8xx7-Atom-CE6) and ISaGRAF MiniOS7 series (VP-2117, iP-8xx7/I-8xx7, μPAC-7186EG, I-7188EG/XG, μPAC-5xx7) etc. Using ISaGRAF PACs, the control/monitor systems can easily implement industrial level of real-time data acquisition and data/devices control via wiring or wireless network in various industries.

### ISaGRAF Workbench Features:

- Support IEC 61131-3 Standard Open PLC Languages (1~5)
  - + Flow Chart (FC):
  - 1. Quick Ladder (LD)
  - 2. Function Block Diagram (FBD)
  - 3. Sequential Function Chart (SFC)
  - 4. Structured Text (ST)
  - 5. Instruction List (IL)
  - 6. Flow Chart (FC)
- Online debug/control/monitor
- Offline simulation
- Online change (For ISaGRAF WinCE series only)
- Spotlight: Simple graphic HMI
- Auto-scan I/O
- Lock & unlock I/O
- Uploading the program in the PAC

### ISaGRAF Solution Features:

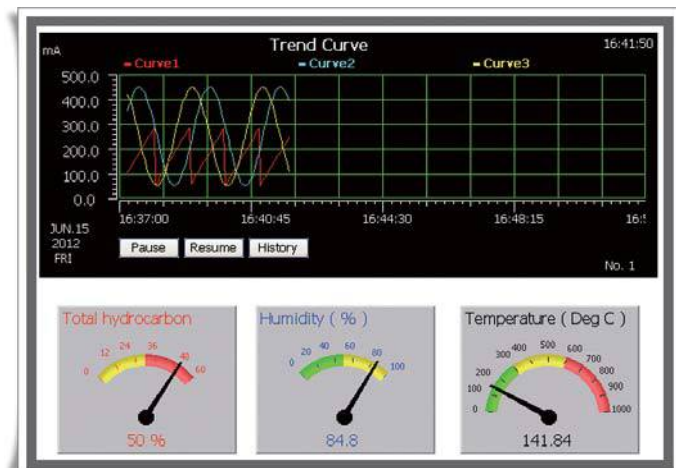
- Support Soft-GRAF HMI
  - A free HMI software on the WinPAC, XPAC and ViewPAC
  - Soft-GRAF Studio: simple HMI screen editing (Mouse drag & drop)
- Modbus Master Protocol - RTU, ASCII, RS-232/485/422, TCP Master
- Modbus Slave Protocol - RTU (RS-232/485/422), TCP/IP Slave
- Data-Recorder & Data-Logger
- Data Exchange - Ebus (via Ethernet), Fbus (via RS-485), PAC to PAC
- CAN/CANopen - Via I-7530 to connect CAN/CANopen devices, ex. meters...
- FRnet I/O
- Motion Control: For controlling server motors (P-command)
- PAC can send email to the internet
- SMS: GSM modem, For reporting data and alarms to the operators
- Wireless Communication: GPS, ZigBee & Radio
- Auto-report Acquisition/Control Data
- Redundant Solution: Hot-swap/Ethernet
- Schedule-Control



## Development Software - HMI Screens

### Free HMI Designer: Soft-GRAF Studio

Soft-GRAF Studio is an HMI (Human Machine Interface) software developed by ICP DAS which allows user to create his colorful HMI application running with the control logic in the same XP-8147-Atom-CE6/8347-Atom-CE6/8747-Atom-CE6, XP-8047-CE6/8347-CE6/8747-CE6, WP-8137/8437/8837, WP-8147/8447/8847, WP-5147/5147-OD and VP-25W7/23W7/4137 ISaGRAF PAC. User can edit the HMI screen by Soft-GRAF Studio using the graphical drag and drop operation. And use ISaGRAF to design the control logic by PLC Languages (Ladder, ST, FBD, .....).



### Soft-GRAF Features:

- Support Various and Colorful HMI Objects:
  - Pages (Max. 200, Support Password Security)
  - Label (Normal, Reverse Type, Under-line)
  - Boolean Value (Normal, Reverse Type, Blinking)
  - Numeric Value (Normal, Scaling, Limit - Blink/Color/Text)
  - Message Value (Dynamic Message, Multi-language)
  - Button (Value, Title, Picture, Security, Confir m, Password)
  - Picture (Static, Dynamic, Boolean Picture)
  - Login/Logout
  - Bar Meter (Vertical, Horizontal, Scale, Unipolar, Bipolar)
  - Trace (1-axis, 2-axis)
  - Trend (Real-time, Historical)
  - Schedule-Control
  - Gauge Meter
  - Alarm Lists
  - Data Logger (Log data; support USB export or FTP upload)
  - Built-in Various Objects (Button, Gif, LED... will be More)
- Multi-language:
  - English, Traditional Chinese, Simplify Chinese, Russian...
- Support user designed graphics, e.g. JPG, PNG ...



# ISaGRAF XPAC Series

## XP-8047-CE6 / XP-8347-CE6 / XP-8747-CE6



**XP-8047-CE6**



**XP-8147-Atom-CE6**



**XP-8347-CE6**



**XP-8347-Atom-CE6**



**XP-8747-CE6**



**XP-8747-Atom-CE6**

### Features:

- XP-8x47-CE6: LX800, 500 MHz CPU  
XP-8x47-Atom-CE6: Atom Z510, 1.1 GHz CPU
- Windows CE 6.0 R3 Core
- Embedded ISaGRAF Ver.3 SoftLogic (IEC 61131-3)
- Hard Real-time Capability
- VGA Port Output
- Modbus RTU/TCP (Master, Slave)
- Support Soft-GRAF HMI
- Redundant Power Inputs
- Support Motion Control Using I-8094F/8094/8092F
- Operating Temperature: -25 ~ +75°C



### Introduction:

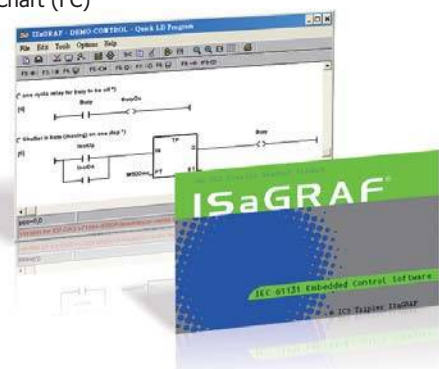
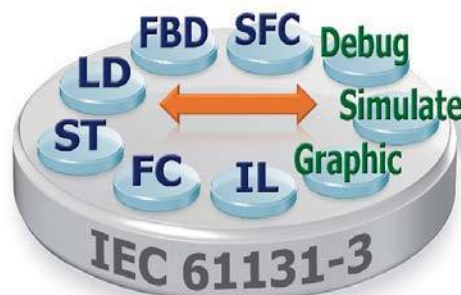
The **XP-8x47-CE6 Series** and **XP-8x47-Atom-CE6 Series** are the new generation of ISaGRAF based PACs from ICP DAS. Each is equipped with an AMD LX800 500 MHz CPU (for XP-8x47-CE6) or an Atom Z510 1.1 GHz CPU (for XP-8x47-Atom-CE6), a variety of input/output ports (VGA, USB, Ethernet, RS-232/485), and a range of I/O slots (0/3/7) that can be used to integrate high performance parallel I/O modules (high profile I-8K Series) or serial I/O modules (high profile I-87K series).

The benefits of running Windows CE 6.0 on an XPAC device include hard real-time capabilities, small core size, fast boot speed, interrupt handling at a deeper level, and achievable deterministic control. XPAC devices are also capable of running ISaGRAF and PC-based control software, such as Visual Basic .NET, Visual C#, etc., providing all of the best features of both traditional PLCs and Windows capable PCs.

### ISaGRAF Features:

ISaGRAF is the most powerful SoftLogic package on the market, and is a PLC-like software suite application that supports IEC 61131-3 standard PLC programming languages (LD, FBD, SFC, ST, IL, FC). ISaGRAF can be used to execute applications generated by the ISaGRAF workbench on any ISaGRAF PAC. The features of the ISaGRAF workbench Ver. 3.x include:

- IEC 61131-3 Standard Open PLC Programming Languages (LD, FBD, SFC, ST, IL) + Flow Chart (FC)
- Auto-scan I/O
- Online Debug/Control/Monitor, Offline Simulation
- Simple Graphic HMI
- Support Soft-GRAF HMI





## Applications:

### Soft-GRAF Studio Colorful HMI



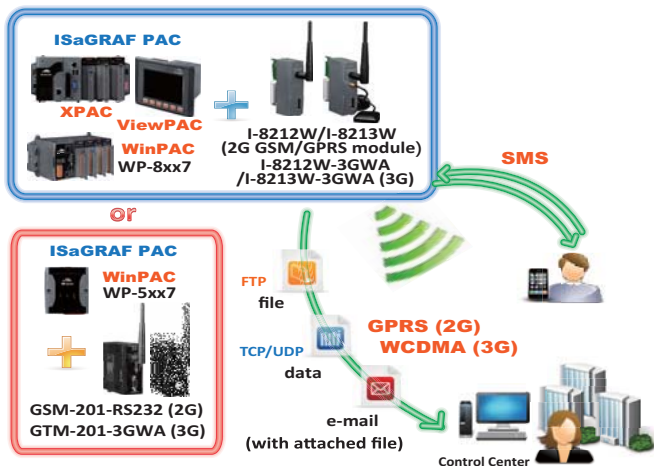
### Schedule Control



### Motion Control: Using I-8094F/8092F/8094

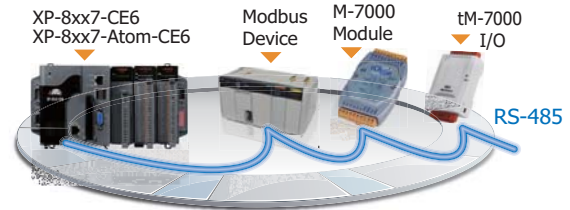


### 2G/3G Wireless Application

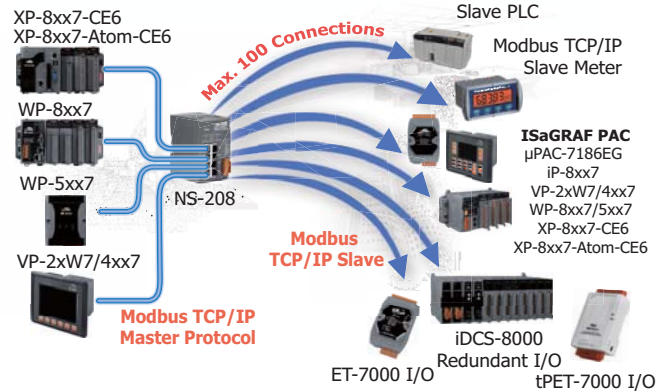


### Modbus Master Ports

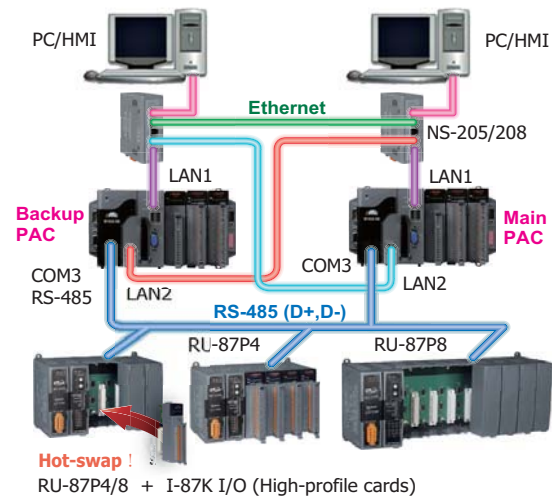
#### Modbus RTU/ASCII Master



#### Modbus TCP/IP Master

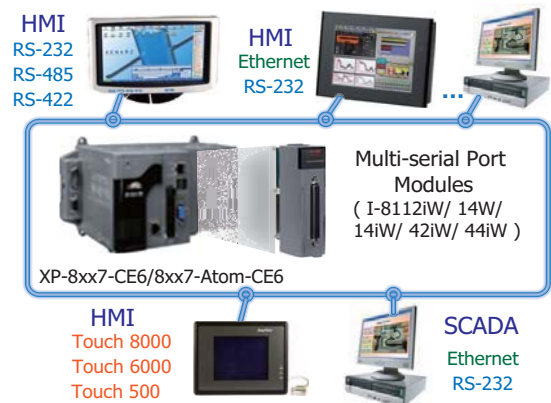


### Hot-Swap Redundant System



### Modbus Slave : RTU / TCP

- Modbus RTU (RS-232/485/422) Slave: max. 9 ports
- Modbus TCP/IP Slave: max. 64 connections



## Specifications:

Models		XP-8047-CE6	XP-8347-CE6	XP-8747-CE6	XP-8147-Atom-CE6	XP-8347-Atom-CE6	XP-8747-Atom-CE6
System Software							
OS		Windows CE 6.0 R3 Core					
.Net Compact Framework		3.5					
Embedded Services		FTP Server, ASP (Java Script, VB Script), SQL Compact Edition 3.5					
SDK Provided		DII for Visual Studio .Net 2005/2008					
Multilanguage Support		English, German, French, Spanish, Russian, Italian, Czech, Japanese, Korean, Simplified Chinese, Traditional Chinese					
Development Software							
ISaGRAF Software	ISaGRAF Ver.3	IEC 61131-3 standard					
	Language	LD, ST, FBD, SFC, IL & FC Support Soft-GRAF HMI: XP-8xx7-CE6, XP-8xx7-Atom-CE6, WP-8xx7/5xx7 and VP-2xW7/4xx7 PAC					
	Max. Code Size	2 MB					
	Scan Time	3 ~ 15 ms for normal programs 15 ~ 50 ms (or more) for complex or large programs					
Non-ISaGRAF		Options: VS.NET 2005/2008 (VB.NET, C#.NET)					
Web Service							
Web HMI		PC running Internet Explorer can monitor/control PAC via the Internet/modem					
Security		Web HMI supports three levels of username and password protection. (high/medium/low)					
CPU Module							
CPU		LX800, 500 MHz			Atom Z510, 1.1 GHz		
System Memory		512 MB DDR SDRAM					
Dual Battery Backup SRAM		512 KB; data valid for up to 5 years (for retaining variables)					
Flash		4 GB			8 GB		
EEPROM		16 KB					
CF Card		Yes, support up to 32 GB					
RTC (Real Time Clock)		Display seconds, minutes, hours, date, day of the week, month, year					
Programmable LED Indicator		-			2		
64-bit Hardware Serial Number		Yes, for Software Copy Protection					
Dual Watchdog Timers		Yes					
Rotary Switch		Yes (0 ~ 9)					
DIP Switch		-	Yes (8 bits)				
Audio		-			Microphone-In and Earphone-Out		
VGA & Communication Ports							
VGA		Yes (resolution: 1024 x 768, 800 x 600, 640 x 480)			Yes (resolution: 1400 x 1050, 1024 x 768, 800 x 600, 640 x 480)		
Ethernet		RJ-45 x 2, 10/100 Base-TX (Auto-negotiating, Auto MDI/MDI-X, LED indicators).					
USB 2.0		2			4		
COM 1		RS-232 (RxD, TxD and GND); Non-isolated	Internal communication with high-profile I-87K series modules in the slots				
COM 2		RS-232 (RxD, TxD and GND); non-isolated					
COM 3		RS-485 (Data+, Data-) with internal self-tuner ASIC; 3000 VDC isolated					
COM 4		RS-232/RS-485 (RxD, TxD, CTS, RTS and GND for RS-232, Data+ and Data- for RS-485); non-isolated					
COM 5		RS-232 (RxD, TxD, CTS, RTS, DSR, DTR, CD, RI and GND); non-isolated					
I/O Expansion Slots							
Number of Slots		0	3	7	1	3	7
		Note: For High Profile I-8K and I-87K Modules Only					
Mechanical							
Dimensions (W x L x H)		137 x 132 x 125 (mm)	231 x 132 x 125 (mm)	355 x 132 x 125 (mm)	169 x 132 x 125 (mm)	231 x 132 x 125 (mm)	355 x 132 x 125 (mm)
Installation		DIN-Rail or Wall Mounting					
Environmental							
Operating Temperature		-25 ~ +75°C					
Storage Temperature		-30 ~ +80°C					
Ambient Relative Humidity		10 ~ 90% RH (non-condensing)					
Power							
Input Range		+10 ~ +30 VDC					
Isolation		1 kV					
Redundant Power Inputs		Yes, with one power relay (1 A @ 24 VDC) for alarm					
Capacity		15 W	35 W	35 W	25 W	35 W	35 W
Consumption		14.4 W	14.4 W	16.8 W	16.6 W	16.8 W	18 W

## ISaGRAF Specifications:

Protocols (Note that certain protocols require optional devices)		
Net ID	1 ~ 255, user-assigned via software.	
Modbus TCP/IP Master	Link to a max. of 100 devices that support the Standard Modbus TCP/IP Slave protocol (FAQ-113)	
Modbus RTU/ASCII Master	XP-8047-CE6: A max. of 33 ports (COM1 ~ 33) (*); Other ISaGRAF XPAC models: A max. of 32 ports (COM2 ~ 33) (*) (To connect to other Modbus Slave devices)	
Modbus RTU Slave	A max. of 9 ports (XP-8047-CE6: COM1 ~ 33; Other ISaGRAF XPAC models: COM2 ~ 33) (*) (For connecting ISaGRAF, PC/HMI/OPC Server and HMI panels)	
Modbus TCP/IP Slave	Two Ethernet ports each supporting the Modbus TCP/IP Slave protocol for connecting ISaGRAF and PC/HMI. The two ports support up to 64 connections. Note: If the PAC uses 1 connection to connect to the PC/HMI, it can connect to up to 64 PCs/HMIs; If the PAC uses 2 connections to connect to each PC/HMI, it can connect to up to 32 PCs/HMIs; If one of the Ethernet port malfunctions, the other one can still be used to connect to the PC/HMI.	
Web HMI Protocol	Ethernet ports for connecting a PC running Internet Explorer.	
User-defined Protocol	Custom protocols can be applied at COM2~33 (XP-8047-CE6 plus COM1) using Serial communication function blocks. (*)	
I-7000 & I-87K RS-485 Remote I/O	One of COM3~4 supports I-7000 I/O modules, I-87K base + I-87K Serial I/O boards, or RU-87Pn + I-87K High Profile I/O boards as remote I/O. A max. of 255 I-7000/87K remote I/O modules can connect to one PAC.	
M-7000 Series Modbus I/O	A max. of 32 RS-485 ports (XP-8047-CE6: max. 33) (*). Each port can connect to up to 32 M-7000 modules.	
Modbus TCP/IP I/O	LAN2 supports ICP DAS Ethernet I/O: I-8KE4-MTCP and I-8KE8-MTCP. If LAN2 malfunctions, it will automatically switch to LAN1 to continuously work. (The IP address for LAN1 and LAN2 should be set in the same IP domain) (FAQ-042)	
FRnet I/O	Enable a max. of 7 I-8172W boards in slot 1 ~ 7 to be used to connect to FRnet I/O modules, such as FR-2053, FR-2057, FR-32R, FR-32P. Each I-8172W board can link to a max. of 256 DI plus 256 DO channels. (FAQ-082, 154)	
Send Email	Provide functions to send email with a single attached file via the Ethernet port.	
Ebus	Used to exchange data between ICP DAS ISaGRAF Ethernet PACs via the Ethernet port. (LAN2 Port only)	
SMS: Short Message Service	Either COM4 or COM5 can link to a GSM Modem to support SMS. The user can request data/control the controller via a cellular phone. The controller can also send data and alarms to the user's cellular phone. Optional GSM Modem: GTM-201-RS232 (850/900/1800/1900 GSM/GPRS External Modem)	
MMICON/LCD	COM4 or COM5 supports the ICP DAS MMICON.	
UDP Server & UDP Client: Exchange Message & Auto-report	LAN1 or LAN2 supports the UDP Server and UDP Client protocols allowing messages to be sent/received to/from a PC/HMI or other device. For example, data can be automatically reported to the InduSoft's RXTX driver.	
TCP Client: Exchange Message & Auto-report	LAN1 or LAN2 supports the TCP Client protocol allowing messages to be sent/received to/from a PC/HMI or other device that supports the TCP server protocol.	
GPRS/SMS	Enable the I-8212W (2G/3G) card allowing short messages to be sent/received to/from or to access a dial up connection to link to the Internet and using a GPRS connection to send an email or communicate with remote stations using the "FTP Client" (FAQ-151) or the "TCP Client"/"UDP Server"/"UDP Client" (FAQ-143) protocols.	
SQL Client	Support for the SQL Client function that allows data to be written (or read from) a Microsoft SQL Server (2000 SP3, 2005, 2008).	
Hot-swap and Redundant System (Will be available for XP-8xx7-Atom-CE6)	This redundant system has setup two "Active IP" address point to the active LAN1 and LAN2 ports always. One or more PC/HMI/SCADA can communicate with this redundant system via one of the two given active IP. So the PC/HMI/SCADA can access to the system easily without any notice about which PAC is currently active. Moreover, the new redundant system can integrate with the RU-87P4/87P8 Expansion Unit plus the I-87K high-profile I/O cards to support the hot-swap application. If the I/O card is damaged, the maintenance person just takes one good-card with same model number to hot-swap the damaged one without stopping this redundant system. (FAQ-138, 125)	
CAN/CANopen	COM2 and COM4 ~ 33 (XP-8047-CE6 plus COM1) can connect to one I-7530 (converter: RS-232 to CAN) to support CAN/CANopen devices and sensors. One PAC supports a max. of 32 RS-232 ports to connect a max. of 32 I-7530. (*) (FAQ-086)	
CANopen Master	Enable the I-8123W CANopen Master card used to connect to other CANopen Slave devices. (FAQ-145)	
HART Solutions	Enable I-87H17W modules in slots 1 to 7 used to communicate with other HART devices.	
FTP Client	Enable the FTP Client to upload files from the PAC to a remote FTP server on a PC. (FAQ-151) The Soft-GRAF g_Alarm and g_Logger1 HMI objects also support FTP Client. (FAQ-146)	
Soft-GRAF HMI	Provide support for the Soft-GRAF HMI. The user can design the HMI screen using the Soft-GRAF Studio on the PC and then download it to the PAC to display the HMI on the PAC. (FAQ-146)	

### Optional I/O Functions (Refer to ISaGRAF PAC I/O Selection Guide for I/O Module list)

PWM Output	High Speed PWM Module	I-7088, I-8088W, I-87088W: 8-ch PWM outputs, software support 1 Hz ~ 100 kHz (non-continuous), duty: 0.1~99.9%
	DO Module as PWM	8-ch max. 250 Hz max. For Off=2 & On=2 ms. Output square wave: Off: 2~32766 ms, On: 2 ~ 32766 ms. Optional DO Boards: I-8037W, 8041W, 8041AW, 8042W, 8050W, 8054W, 8055W, 8056W, 8057W, 8060W, 8063W, 8064W, 8068W, 8069W. (Relay Output boards cannot generate fast square wave)
Counter, Encoder, Frequency	Parallel DI Counter	8 ch. max. for 1 controller. Counter val: 32 bit. 250 Hz max. Min. ON & OFF width must >2 ms. Optional DI boards: I-8040W, 8040PW, 8042W, 8046W, 8048W, 8050W, 8051W, 8052W, 8053W, 8053PW, 8054W, 8055W, 8058W, 8063W.
	Serial DI Counter	Counter input: 100 Hz max. Counter value: 0 ~ 65535 (16 bit) Optional Serial I-87K DI boards: I-87040W, 87046W, 87051W, 87052W, 87053W, 87053W-A5, 87054W, 87055W, 87058W, 87059W, 87063W.
	Remote DI Counter	All remote I-7K/I-87K DI modules support counters. 100 Hz max. value: 0 ~ 65535
	High Speed Counter	I-87082W: 100 kHz max., 32-bit; I-8084W: 250 kHz max., 32-bit
	Encoder	I-8093W: 3-axis Encoder Module, max. 1M Hz for quadrant input mode, max. 4 MHz for pulse/direction and cw/ccw input mode. (FAQ-112) I-8084W: 250 kHz max., 4-ch encoder, pulse/direction or up/down or A/B phase (Quad. mode). Not support Encoder Z-index. (FAQ-100)
	Frequency	I-87082W: 2-ch, 1 Hz ~ 100 kHz; I-87088W: 8-ch, 0.1 Hz ~ 500 kHz; I-8084W: 8-ch, 1 Hz ~ 250 kHz;
Motion	Motion Control	Can be integrated with one or several I-8092F (2-axis) or I-8094F/I-8094 (4-axis). (XP-8047-CE6 not supported)

\* Note: The COM6 ~ COM33 ports are located in the expansion boards if they are installed in slots 1~7 of ISaGRAF XPAC. The COM1 port on XP-8047-CE6 is RS-232; COM1 on other ISaGRAF XPAC is for internal communication with I-87K modules installed in slots only.

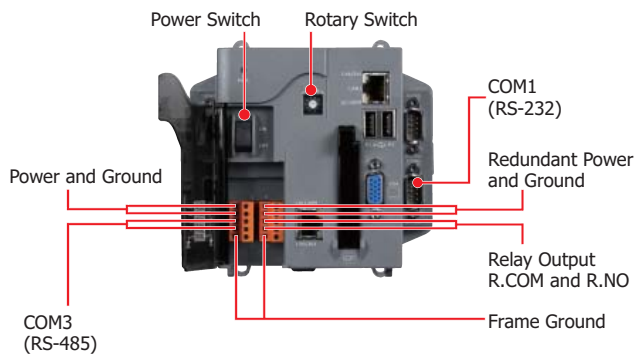
\* ISaGRAF FAQ: [www.icpdas.com](http://www.icpdas.com) > Support > FAQ > ISaGRAF Soft-Logic PAC

\* ICP DAS recommends using NS-205/208 or RS-405/408 (Ring Switch) Industrial Ethernet Switches.

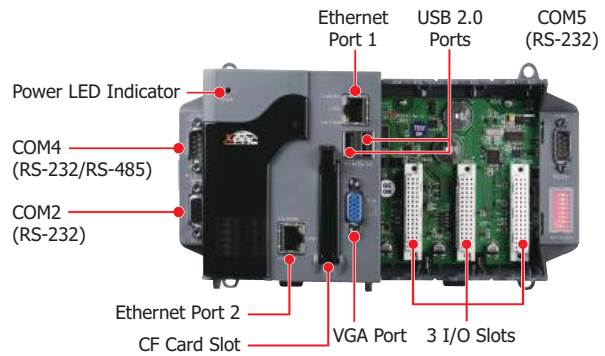


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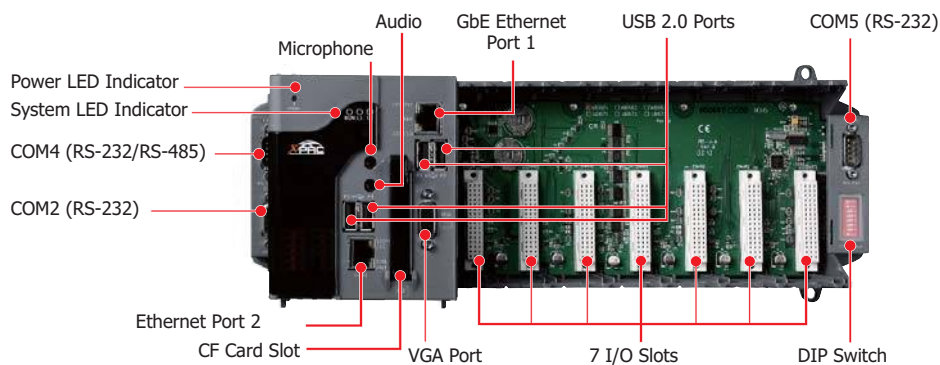
XP-8047-CE6



XP-8347-CE6



XP-8747-Atom-CE6



## Ordering Information:

<b>XP-8047-CE6 CR</b>	0 I/O slot WinCE 6.0 Based ISaGRAF PAC (OS: Multi-Language version) (RoHS)
<b>XP-8347-CE6 CR</b>	3 I/O slots WinCE 6.0 Based ISaGRAF PAC (OS: Multi-Language version) (RoHS)
<b>XP-8747-CE6 CR</b>	7 I/O slots WinCE 6.0 Based ISaGRAF PAC (OS: Multi-Language version) (RoHS)
<b>XP-8147-Atom-CE6 CR</b>	1 I/O slot WinCE 6.0 Based Standard XPAC (OS: Multi-Language version) (RoHS)
<b>XP-8347-Atom-CE6 CR</b>	3 I/O slots WinCE 6.0 Based Standard XPAC (OS: Multi-Language version) (RoHS)
<b>XP-8747-Atom-CE6 CR</b>	7 I/O slots WinCE 6.0 Based Standard XPAC (OS: Multi-Language version) (RoHS)

**Note:** Call to discuss your needs for customized XP-8000-Atom-CE6 modules

## Accessories:

ISaGRAF Development Software	
ISaGRAF-256	ISaGRAF Workbench Software Ver.3 (256 I/O Tags) with one USB Dongle
ISaGRAF-32	ISaGRAF Workbench Software Ver.3 (32 I/O Tags)
<b>Note:</b> No upgrade service from ISaGRAF-32 to ISaGRAF-256 is available. (ISaGRAF-32 can be used to control more than 32 I/O tags. Please refer to Ch. 3.4 of the ISaGRAF User Manual.)	
DP-660	24 VDC/2.5 A, 60 W and 5 VDC/0.5 A, 2.5 W Power Supply with DIN-Rail Mounting
DP-1200 CR	24 VDC/5.0 A, 120 W Power Supply with DIN-Rail Mounting (RoHS)
MDR-60-24 CR	24 VDC/2.5 A, 60 W Power Supply with DIN-Rail Mounting (RoHS)
NS-205 CR / NS-208 CR	5-port/8-port Unmanaged Industrial 10/100 Ethernet Switch with Plastic Case (RoHS)
RS-405 CR / RS-408 CR	5-port 8-port Real-time Redundant Ring Switch (RoHS)
TPM-4100/TP-4100	10.4" (800 x 600) Resistive Touch Panel Monitor with RS-232 or USB Interface Accessories: VGA Cable, RS-232 Cable, USB Cable, Mounting Clamps and Screws