USB-87P1/2/4/8 User Manual

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ICP DAS, Co., LTD www.icpdas.com

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Contents

2. Hardware Configuration 9 2.1. Specifications 9 2.2. Appearance 10 2.3. Dimensions 13 2.4. Mounting the USB-87Pn 15 2.5. Installing the I/O Modules 16 3. Getting Started 18 3.1. Hardware Configuration 19 3.2. Software Configuration 21 4. Setting up the USB-87Pn 25 4.1. Setting up the USB-87Pn 25 4.1. Setting up (/O Modules without Auto Configuration 33 4.4. Project Backup and Quick Recovery 35 4.1. Saving the Configure File 36 4.2. Loading the Configuration File 36 4.3. Loading the Configure File 36 4.4.1. Suing the Configure File 36 4.2. Loading the Configure File 36 4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5.1. PACSDK 47	1.		Introduct	tion	1
2.1. Specifications 9 2.2. Appearance 10 2.3. Dimensions 13 2.4. Mounting the USB-87Pn 15 2.5. Installing the I/O Modules 16 3. Getting Started 18 3.1. Hardware Configuration 19 3.2. Software Configuration 21 4. Setting up the USB-87Pn 25 4.1. Seatching the USB-87Pn 25 4.2. Configuring I/O Modules 27 4.3. Accessing I/O Modules 27 4.4.1. Saving the Configure File 36 4.4.2. Loading the Configure File 36 4.4.3. Loading the Configure File 38 4.4.3. Loading and Writing the Configure File 40 4.5. Operating in Off-line Mode 42 42 5.1. PACSDK. 46 5.2. PACSDK. 46 5.2. PACSDK. 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49	2.		Hardwar	e Configuration	9
2.2. Appearance 10 2.3. Dimensions 13 2.4. Mounting the USB-87Pn 15 2.5. Installing the I/O Modules 16 3. Getting Started 18 3.1. Hardware Configuration 19 3.2. Software Configuration 21 4. Setting up the USB-87Pn 25 4.1. Searching the USB-87Pn 25 4.2. Configuring I/O Modules 27 4.3. Accessing I/O Modules 27 4.3. Accessing I/O Modules 27 4.4. Saving the Configure File 36 4.4.2. Loading the Configure File 36 4.4.3. Loading the Configure File 36 4.4.3. Loading the Configure File 40 4.5. Operating in Off-line Mode 42 5.1 PACSDK 46 5.2. Software Development Kits (SDK) 45 5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3.1. Procedure for using the InduSoft b		2.1	. Spe	cifications	9
2.3. Dimensions 13 2.4. Mounting the USB-87Pn 15 2.5. Installing the I/O Modules 16 3. Getting Started 18 3.1. Hardware Configuration 19 3.2. Software Configuration 21 4. Setting up the USB-87Pn 25 4.1. Searching the USB-87Pn 25 4.2. Configuring I/O Modules 27 4.3. Accessing I/O Modules without Auto Configuration 33 4.4. Project Backup and Quick Recovery 35 4.1. Saving the Configure File 36 4.4.2. Loading the Configure File 36 4.4.3. Loading the Configure File 36 4.4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 46 5.2. PACSDK 46 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.1. Procedure for using the		2.2	2. App	pearance	0
2.4. Mounting the USB-87Pn 15 2.5. Installing the I/O Modules 16 3. Getting Started 18 3.1. Hardware Configuration 19 3.2. Software Configuration 21 4. Setting up the USB-87Pn 25 4.1. Searching the USB-87Pn 25 4.2. Configuring I/O Modules 27 4.3. Accessing I/O Modules without Auto Configuration 33 4.4. Project Backup and Quick Recovery 35 4.1. Saving the Configure File 36 4.2. Loading the Configure File 36 4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5.1. PACSDK 46 5.2. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft. 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.1. Procedure for using the OPC Server 53 5.4. NAP OPC Server 53		2.3	B. Dim	nensions	3
2.5. Installing the I/O Modules 16 3. Getting Started 18 3.1. Hardware Configuration 19 3.2. Software Configuration 21 4. Setting up the USB-87Pn 25 4.1. Seating UP the USB-87Pn 25 4.2. Configuring I/O Modules 27 4.3. Accessing I/O Modules without Auto Configuration 33 4.4. Project Backup and Quick Recovery 35 4.1. Saving the Configure File 36 4.4.2. Loading the Configure File 36 4.4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 45 5.1. PACSDK. 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON Indusoft. 49 5.3.1. Procedure for using the InduSoft bundled driver 53 5.4. NAP OPC Server 53 5.4. NAP OPC Server 53 5.4. NAP OPC Server 53		2.4	. Mo	unting the USB-87Pn	5
2.5. Instamuly life by 0 Modules 10 3. Getting Started 18 3.1. Hardware Configuration 19 3.2. Software Configuration 21 4. Setting up the USB-87Pn 25 4.1. Seatting Up the USB-87Pn 25 4.2. Configuring I/O Modules 27 4.3. Accessing I/O Modules without Auto Configuration 33 4.4. Project Backup and Quick Recovery 35 4.4.1. Saving the Configure File 36 4.4.2. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 45 5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.4.1. Parcedure for using the InduSoft bundled driver 59 5.4.1. Procedure for using the OPC Server 53 5.4.1. Procedure for using the OPC Server 53		2 5	i Inct	alling the U/O Modules	۔ د
3. Getting Started 18 3.1. Hardware Configuration 19 3.2. Software Configuration 21 4. Setting up the USB-87Pn 25 4.1. Searching the USB-87Pn 25 4.2. Configuring I/O Modules. 27 4.3. Accessing I/O Modules without Auto Configuration 33 4.4. Project Backup and Quick Recovery 35 4.1. Saving the Configure File 36 4.2. Loading the Configure File 36 4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 45 5.1. PACSDK. 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C : Fr		2.5	. 113t		,
3.1. Hardware Configuration 19 3.2. Software Configuration 21 4. Setting up the USB-87Pn 25 4.1. Searching the USB-87Pn 25 4.2. Configuring I/O Modules 27 4.3. Accessing I/O Modules without Auto Configuration 33 4.4. Project Backup and Quick Recovery 35 4.4.1. Saving the Configure File 36 4.4.2. Loading the Configure File 36 4.4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 45 5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.1. Procedure for using the OPC Server 53	3.		Getting S	Started1	3
3.2. Software Configuration. 21 4. Setting up the USB-87Pn 25 4.1. Searching the USB-87Pn 25 4.2. Configuring I/O Modules 27 4.3. Accessing I/O Modules without Auto Configuration 33 4.4. Project Backup and Quick Recovery 35 4.4.1. Saving the Configure File 36 4.4.2. Loading the Configure File 36 4.4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 45 5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn w		3.1	. Har	dware Configuration	9
4. Setting up the USB-87Pn 25 4.1. Searching the USB-87Pn 25 4.2. Configuring I/O Modules 27 4.3. Accessing I/O Modules without Auto Configuration 33 4.4. Project Backup and Quick Recovery 35 4.1. Saving the Configure File 36 4.2. Loading the Configure File 36 4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 45 5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C: Frame Ground 62		3.2	2. Soft	tware Configuration2	1
4.1. Searching the USB-87Pn 25 4.2. Configuring I/O Modules 27 4.3. Accessing I/O Modules without Auto Configuration 33 4.4. Project Backup and Quick Recovery 35 4.4.1. Saving the Configure File 36 4.4.2. Loading the Configure File 36 4.4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 45 5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C: Frame Ground 62	4.		Setting u	ıp the USB-87Pn	5
4.2. Configuring I/O Modules		4.1	. Searchi	ng the USB-87Pn	5
4.3. Accessing I/O Modules without Auto Configuration 33 4.4. Project Backup and Quick Recovery 35 4.4.1. Saving the Configure File 36 4.4.2. Loading the Configure File 38 4.4.3. Loading and Writing the Configuration File 38 4.4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 45 5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C: Frame Ground 62		47	Configu	ر ring I/Q Modules کې	7
4.9. Accessing NO Would's without Auto Configuration 35 4.4. Project Backup and Quick Recovery 35 4.4.1. Saving the Configure File 36 4.4.2. Loading the Configure File 38 4.4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 45 5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C: Frame Ground 62		л <u>-</u>	. conjigu	na 1/0 Modules without Auto Configuration	ָ ב
4.4. Project Backup and Quick Recovery		4.5	. Accessii	Declare and Oxicle Decement	, ,
4.4.1. Joining the Configure File 30 4.4.2. Loading and Writing the Configuration File 38 4.4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 45 5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C: Frame Ground 62		4.4	·. Project	Backup and Quick Recovery	י ה
4.4.3. Loading and Writing the Configuration File 40 4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 45 5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C: Frame Ground 62			4.4.1. Jav 4.4.7 I	oading the Configure File	8
4.5. Operating in Off-line Mode 42 5. Software Development Kits (SDK) 45 5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C: Frame Ground 62			4.4.3. L	oading and Writing the Configuration File	b
5. Software Development Kits (SDK) 45 5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C: Frame Ground 62		4.5	5. Operati	ing in Off-line Mode	2
5.1. PACSDK 46 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C: Frame Ground 62	5.		Software	P Development Kits (SDK)	5
5.1. FACSDK PC LabVIEW 47 5.2. PACSDK PC LabVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C: Frame Ground 62		51			۔ د
5.2. PACSDR PC LUDVIEW 47 5.3. DCON InduSoft 49 5.3.1. Procedure for using the InduSoft bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value) 50 5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C: Frame Ground 62		5.1			, ,
5.3. DCON InduSoft		5.2			′ ~
5.3.1. Procedure for using the indusort bundled driver 49 5.3.2. InduSoft Example (Reading an analog input value)		5.3		JN InduSoft	,
5.3.2. Industrie (Reading an analog input value)			5.3.1. P 5.2.2 II	rocedure for using the indusort bundled driver	9
5.4. NAP OPC Server 53 5.4.1. Procedure for using the OPC Server 53 5.4.2. OPC Server Example (Reading an analog input value) 54 Appendix A : Compare USB-87Pn with I-87Kn 56 Appendix B: Error Code – Causes and Solution 57 Appendix C: Frame Ground 62		_	J.J.Z. II		, ,
5.4.1. Procedure for using the OPC Server		5.4	I. NAF	P OPC Server	3
Appendix A : Compare USB-87Pn with I-87Kn			5.4.1. P	Procedure for using the OPC Server	3
Appendix A : Compare USB-87Pn with I-87Kn			5.4.2. (ארט Server Example (Reading an analog input value)54	4
Appendix B: Error Code – Causes and Solution	A	ppe	ndix A : C	Compare USB-87Pn with I-87Kn 50	5
Appendix C: Frame Ground	A	ppe	ndix B: E	rror Code – Causes and Solution5	7
· · · · · · · · · · · · · · · · · · ·	A	ope	ndix C: Fi	rame Ground	2

1. Introduction

USB-87Pn series is an intelligent I/O expansion unit, it features USB communication interface, hot swap, and most of all, USB-87Pn can connects to various I/O signals in the field by plugging in properly kind of **High profile I-87K I/O modules**. It is used 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.

USB-87Pn is designed with a wide power input range from +10 to 30VDC and a wide operating temperature range from -25°C to 75°C for running in harsh and noisy environment. It simplifies installation and maintenance of I/O modules with hot swap 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 and OPC Server. The I-87K series I/O modules plugged in the USB-87Pn can be easily integrated into variant software system.



Features

Hot Swap

The USB-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 USB-87Pn. When the USB-87Pn is power on or an I-87K I/O module is plug in, the USB-87Pn automatically check and restore these configurations to each I-87K I/O modules on it.

Easy Duplicate System

Using the DCON Utility Pro, you can easily make a backup of the I-87K module configurations and write to another USB-87Pn. This design can easily and quickly duplicate multiple USB-87Pn units with the same configuration.



► Easy Maintenance and Diagnostic

The basic configurations (Auto Config, ON/OFF) are set by the DIP switch. The operator can use only one screwdriver to set the USB-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 damage, the user just need to get a new module of the same model to replace the damaged one. And then check the LED indicators to know whether the replacement is performed correctly. The design of **Auto Config** dip switch and slot LED indicators are helpful for ease maintenance with no need of a PC or a laptop.

Communication

USB interface

The USB-87Pn is equipped with USB communication interface. It requires no converter, plug and play at run time, very simple and convenient to connect with your PC.

DCON protocol

The DCON protocol for communicating with I-87K series I/O modules plugged in a USB-87Pn is a simple command/response protocol. All commands and responses are in easy used ASCII format.

Rugged Industrial Environment

Dual watchdog design

The I-87K series I/O modules provides module watchdog and host watchdog. The module watchdog is a hardware watchdog; the host watchdog is a software watchdog. The module watchdog is designed to automatically reset the microprocessor when the module hangs. The host watchdog monitors the host controller (PC or PLC). The output of module can go to the Safe Value state when the host fails.

Programmable power on and Safe Value

Power on value is applied when the USB-87Pn unit is powered on or reset by module watchdog timeout, while Safe value is applied when host watchdog timeout occurs. They are programmable for analog and digital channels to prevent unexpected outputs when a module or a host fails.

- Wide range power input (10~30 VDC)
- Wide range operating temperature (-25 °C ~ +75 °C)

► Fully Software Support

USB-87Pn provides free and easy-to-use configuration utility, a variety of software development kits (including demo programs) and drivers for integrating USB-87Pn I/O expansion units into SCADA systems, allowing you to get started easily.

DCON Utility Pro for configurating I/O modules and monitoring real-time data

DCON Utility Pro V 4.2.0.7						
	СМД		1			FAQ
⊡ COM5:*	ID	Address	Baud Rate	Checksum	Format	Status
-87018R:02:A:0:N81:DCON	USB-87P4	1[01h]	115200	Disabled	N,8,1	Auto Config. En
-87064:03:A:0:N81:DCON	-87018R	2[02h]	115200	Disabled	N,8,1	87PN Slot 0
-87028U:04:A:0:N81:DCON	-87064	3[03h]	115200	Disabled	N,8,1	87PN Slot 1
-87055:05:A:0:N81:DCON	-87028U	4[04h]	115200	Disabled	N,8,1	87PN Slot 2
	-87055	5[05h]	115200	Disabled	N,8,1	87PN Slot 3

USB-87P4Firmware[A401]						×
	Auto Configuratio	n Configure D	ata Error Code References	Commands Log		
	Configured I/O	Addr.[Hex]	Slot Configuration Status	Set As Scanned	Write To 87PN	Scanned I/O
ON ↑	87018R ~	02	[00] OK		Configure	87018R
U_OFF	87064 ~	03	[00] OK		Configure	87064
Auto Config.	87028U ~	04	[00] OK		Configure	87028U
	87055 ~	05	[00] OK		Configure	87055
					\smile	
	Exit Save	e configuratior	Load Configurations	Load configura	tions and write to	
CPU Module						

EZ Data Logger

EZ Data Logger is small data logger software. It can be applied to small remote I/O system. With its user-friendly interface, users can quickly and easily build a data logging software without any programming skill.



■ Support Variant Software Development Toolkits

DLL library, ActiveX, LabVIEW toolkit, InduSoft driver, DasyLab driver and Linux driver are included.

2. Hardware Configuration

2.1. Specifications

Models	USB-87P1	USB-87P2	USB-87P4	USB-87P8						
Communication Ir	terface									
Port Type	1 x US	1 x USB Type B Connector (3000 VDC Isolated)								
ESD Protection	±4 K (Contact Discharge	and ±8 K Air Disc	harge						
Communication Protocol		DCON Protocol	(ASCII Format)							
нмі										
DIP Switch		1-bit for Auto	Configuration							
LED Indicators										
I/O LED Indicator	1	2	4	8						
System LED Indicator	1 x P	1 x Power, 1 x System, 1 x Auto Configuration								
I/O Expansion										
I/О Туре		High Profile	I-87K series							
Slots	1	2	4	8						
Mechanical										
Dimensions (mm) (W x H x D)	64 x 120 x 111	95 x 132 x 111	188 x 132 x 111	312 x 132 x 111						
Installation		DIN-Rail, W	all mounting							
Power										
Input Range		+10 ~ 30 VDC	(1 kV Isolated)							
Reverse Polarity Protection		Ye	es							
Consumption	1.0	W	2.0 W	2.4 W						
Power Board Driving	5.0 W	8.0 W	30.0	D W						
Environmental										
Operating Temperature	-25°C to +75°C									
Storage Temperature		-30°C to	o +80°C							
Humidity		10 ~ 90% RH, I	non-condensing							

2.2. Appearance

USB-87P2



USB-87P4



The details of these items are as follows:

System LED Indicators

LED Indicator	Color	Status	Description
PWR	Red	On	Power is on.
SPDV	Groop	On	All of the I/O modules pass test
5.ND1	Green	Flashing	One or more I/O modules are not configured.
Auto	Green	On	Auto Config. is in ON position.
Config.		Off	Auto Config. is in OFF position.
	Red	On	The module is not the same as configured.
Slot n		Flashing	The module is not configured.
		Off	The module is configured and performed correctly, or there is no module installed in this slot.

Auto Config Dip Switch

The built-in **Auto Configuration** function of USB-87Pn allows users to pre-configure the I/O modules and store the information in USB-87Pn, even though those modules are offline. If the **Auto Configuration** is enabled, the USB-87Pn will automatically configure a new module according to the pre-configuration.

The factory default position of the **Auto Config**. dip switch is ON to enable the **Auto Configuration** function.



Power Connector

The USB-87Pn has a 3-wire terminal for +10 ~ 30 VDC power input.



USB Port

The USB-87Pn comes equipped with a USB Type B female connector on the front. A USB 2.0 type A male to type B male cable is included with USB-87P2/ USB-87P4/USB-87P4 to connect with PC.



Module Description

Default Setting									
Address	Baud Rate	te Parity		a Length	Stop bit	Checksum			
01	115,200	None	one 8		1	Disable			
USB-87P series CPU Board Description									
LED	LED Description		N	OFF	Flashing (100ms)	Flashing (2sec)			
S.RDY	DY System Ready		ady	/	Configuring	Failure			
Auto Config	Config Auto Configuration		ble	Disable	/	/			
Slot	Slot Status	/		Normal	Configuring	Failure			



2.3. Dimensions

USB-87P1/USB-87P2/USB-87P4/USB-87P8



USB-87P1

USB-87P2





USB-87P8



2.4. Mounting the USB-87Pn

Wall/Panel mounting



DIN Rail mounting



2.5. Installing the I/O Modules

USB-87Pn has 1/2/4/8 I/O slots and only supports High Profile I-87K series I/O modules.

Align circuit card with slot and press firmly to seat module into connector
 Align Here
 Align Here

Tips & Warnings



It is recommended to turn off the power to the USB-87Pn when wring the I/O modules which are installed in the slots.

2. Pull top and bottom locking tabs toward module face. Click indicates lock is engaged.



3. Wiring using the terminal block.



3. Getting Started

l

Before starting any task, please check the package contents. If any of the following package contents are missing or damaged, contact your dealer, distributor.



The USB 2.0 type A male to type B male cable is included with USB-87P2/ USB-87P4/ USB-87P4 only.

3.1. Hardware Configuration

NOTE: USB-87Pn is available for **High Profile I-87K I/O modules** only, please **DO NOT** use Low Profile I/O modules.

1. Wire the USB-87Pn unit to power and PC.



2. Make sure that the Auto Config switch is in ON position (auto configuration enabled).



3. Plug in the High Profile I/O modules and power on the USB-87Pn unit.

Example: Plugging I-87018R in Slot 0

(I-87018R is a High Profile analog input module.)



High Profile





Low Profile



I-87018R is auto-configured: Baud Rate: 115200 Checksum: Disable Net Address: 2

Note: The Net Address of USB-87Pn is fixed to 1.



- After a module is plugged in, the slot indicator flashes once per 2 seconds.
- When software configuration is completed, the LED becomes off.
- If module communication is not correct, the LED is always on.

3.2. Software Configuration

- 1. Install the USB-87Pn driver https://www.icpdas.com/en/download/show.php?num=2974
- 2. Download the DCON Utility Pro and decompress it https://www.icpdas.com/en/download/show.php?num=1046
- 3. Run DCON_Utility_Pro.exe to search the USB-87Pn (e.g. USB-87P4)



- Check the COM port number created for the USB-87Pn in Device Manager under Ports (COM & LPT) section.
- Select the COM port on the "Configuration Search Options" dialog box, make sure that 115200 bps is checked on Baud Rate tab and click the Start Search button.

4. Click on the name of the searched module.



5. Make sure that the module name (e.g. I-87018R) is displayed in the text box for Addr 02 (slot 0) in the Scanned I/O column, and click the **Set As Scanned** button.

USB-87P4Firmware[A401]					×
	Auto Configuration Configure	Data Error Code References Commande Log			
	Configured I/O Addr.[He	[3] Slot Configuration Status Set As Scanned	Write To 87PN	Scanned I/O	
ON ↑	Empty ~ 02	[01] Module scanned in Empty slot	Configure	87018R	
OFF	Empty ~ 03	[00] OK	Configure	Empty	•
Auto Config.	Empty ~ 04	[00] OK	Configure	Empty	
	Empty ~ 05	[00] OK	Configure	Empty	

6. After the module name shows in the Configured I/O column, click the **Configure** button for it (Addr 02, slot 0).

USB-87P4Firmware[A401]							×
	Auto Configuration	Configure Da	ata Error Code References C	ommands Log			
	Configured I/O	Addr.[Hex]	Slot Configuration Status	Set As Scanned	Write To 87PN	Scanned I/O	
ON ↑	87018R ~	02	[01] Module scanned in [Empty slot	Configure	87018R	
	Empty ~	03	[00] OK		Configure	Empty	
Auto Config.	Empty ~	04	[00] OK		Configure	Empty	
	Empty ~	05	[00] OK		Configure	Empty	

7. Configure the module and click the **Exit** button.

18 87018R [Off	1 87018R [Offline Configuration]							
Configuration	Al (ommands Log	Summary						
[05] +/- 2.5	V							
	Al Value	CJC Offset						
CH:00	+00.0000	0.00 + -						
CH:01	+00.0000	0.00 + -						
CH:02	+00.0000	0.00 + -						
☑ CH:03	+00.0000	0.00 + -						
✓ CH:04	+00.0000	0.00 + -						
CH:05	+00.0000	0.00 + -						
✓ CH:06	+00.0000	0.00 + -						
CH:07	+00.0000	0.00 + -						
Enable/Di	sable Module CJC	00.00 + _ Temperatur						
\sim								
Exit	12							
	1							

8. Click the Write to 87Pn button and click the Yes button in the pop-up box.



9. Click the Start Search icon to search module again.



10. Click the I/O module name to view real-time data on the module.



4. Setting up the USB-87Pn

In this chapter, we will use DCON Utility Pro to complete software configuration of the USB-87Pn. Please confirm that PC and power are connected to USB-87Pn. (Refer to <u>Chapter 3</u>)

- 4.1. Searching the USB-87Pn
- 4.2. Configuring I/O Modules
- 4.3. Accessing I/O Modules without Auto Configuration
- 4.4. Project Backup and Quick Recovery
- 4.5. Operating in Off-line Mode

4.1. Searching the USB-87Pn

At first, please run **DCON_Utility_Pro.exe** then click the **Connection Options** icon, select the COM Port and baud rate for communicating with the USB-87Pn. You can check your PC's "Device Manager" to make sure which COM number is assigned for the driver. Then click the "**Start Search**" button.

	Address Baud Hate Checksum Pormat Status
	Connection Search Options ×
\rightarrow (COM5 V Start 0 End 255
2	Baud Rate Protocol Checksum Format
	☑ 115200 □ 57600 □ 38400 □ 19200
	☑ 9600 □ 4800 □ 2400 □ 1200
	Timeout 300 ms
	Search RU-87PN Addr. Mode
	Search and Get I/O Configurations
	Start Search Exit
-	3

Or click the Start Search icon to start the search function.



At the first time you can search "USB-87Pn" only, because I/O modules in slots are not configured. The first 2 X characters in [X,X,O,O] in Status field represent that modules in slot 0 and 1 are not configured or not correct. The following 2 O characters mean that modules in slot 2 and 3 are correct or there are no modules in the two slots.



4.2. Configuring I/O Modules

1. Click **USB-87Pn** to open the configuration window.



USB-87Pn can store I/O modules configuration, so the name of a pre-configured module will be displayed in the relevant field in **Configured I/O** section (4) when the configuration window opens. Empty indicates that there is no module configured in this slot.



No	Name	Description
1	Scanned I/O	The I/O module scanned in search process.
2	Addr.[Hex]	The address for communicating with the module in slot.
3	Slot Configuration Status	The configuration status for the I/O module in slot.
4	Configured I/O	Empty: no configuration data for this slot Module name: module configured for this slot

2. Click the **Set As Scanned** button, the module name in **Scanned I/O** field will be shown in the Configured I/O field, and then click the **Configure** button to set the I/O module.



3. Set properly parameters for each module and then click the **Exit** button.

🛢 87018R [Offline Configuration] X								
Configuration	AI	Commands Log	Summary					
Protocol (IN	IT*)	DCON	~					
Address		2	[02H]					
Baud Rate	(INIT*)	115200	~					
Data Forma	at (INIT*	N,8,1	~					
Checksum	(INIT*)	Disabled	~					
Analog For	mat	Engineering Fo	rm ~					
60/50 Hz		60Hz	~					
Type Code		[05] +/- 2.5 V	~					
				Set Module Configurations				
Exit	M							

 After all the modules on the USB-87Pn are configured, click the Write to 87PN button, and click the Yes button on the popup confirmation boxes. The finish message for each slot will be shown in the bottom pane (2), and the Slot Configuration Status for new modules are [00]OK (3).

USB-87P4Firmware[A401]		1	×
	Auto Configuration Configure Data Error Code References Commands Log		
	Configured I/O Addr.[Hex] Slot Configuration Status Set As Scanned	Write To 87PN	Scanned I/O
ON ↑	87018R V 02 [00] OK	Configure	87018R
	87064 V 03 [00] OK	Configure	87064
 Auto Config.	Empty ~ 04 [00] OK	Configure	Empty
	Empty ~ 05 [00] OK	Configure	Empty
L _	Exit Save configurations Load Configurations Load configurat	tions and write to	
	Slot 0OK		
	Slot 1OK		
2	Slot 2OK		
3 🖲	Slot 3OK		
_ Slot_	2		
USB-87P4			
CPU Module			
1 04.21GE1_Get1 Hota	swapsiotowid 15[

5. Click the **Start Search** icon again, you can see each plugged I/O module name listed under the USB-87Pn.



6. Click the module name to open its configuration window. Real-time data on the module can be viewed in the window.

₿ US8-87 -87 -87	P4:01:A:0:NB1:DCON 0188:02:A:0:NB1:DCON 064:03:A:0:NB1:DCON	ID <u>USB-87P4</u> -87018R 87064	Address B 101h] 1: 2[02h] 1: 3[03h] 1:	laud Rate C 15200 D 15200 D 15200 D	Checksum Disabled Disabled	Format N.8.1 N.8.1 N.8.1	Status Auto Config En 87PN Slot 0 87PN Slot 1	able[0,0,0,0]	Description [DCON]4*Slot Auto Configuration USB Un [DCON]8*AI (mA,mV,V,Thermocouple) [DCON]8*DO
87018R Firm	ware[B206]					×			
Configuration	AI Commands L	og Summary							
[05] +/- 2.5									
CH:00	-00.0005	0.00 +	-						
CH:01	-00.0006	0.00							
CH:02	+01.7202	0.00							
	+01.7206	0.00 87	064 Firmware(A	108]					×
	+01 7206	0.00	Configuration	DO Host	WDT Cor	nmands Li	og Summary		
	+01 7207	0.00	Bit Status						
	101.7207	0.00	CH:00	🗹 CH:01	CH:	02 🗆	СН:03 🖂 С	H:04 🗌 CH	105 🗹 CH.06 🖾 CH:07
CH:06	+01.7208	0.00	Set [Pow	er-on Value]	Set	Safe Valu	ie]		
✓ CH:07 ✓ Enable/D	+01.7209 isable Module CJ	0.00 C 00.	Read D Read P Read Sa	O ower-on Valu afe Value	e				
Exit									
Exit			Exit						

In conclusion, if an I-87K I/O module does not install correctly under **Auto Config. Enable** mode, it will be forbidden to function and you can't search or configure it in DCON Utility Pro.

For example, the **Auto Config. Enable [X,X,O,O]** in Status column means that the configuration for modules in first two slots are not completed or not corrected. You need click "**USB-87P4**" to set these I/O modules.



In the configure window, you can see the scanned module name in "Scanned I/O" column. Click the **Set As Scanned** button to assign module name and click "**Configure**" to setup the I/O module according to the user's demand. Finally click **Write to 87PN** for the settings to take effect.

USB-87P4Firmwa	are[A401]							Х
	DY		Configure D	ata				
		Configured I/O	Addr.[Hex]	Slot Configuration Status	Set As Scanned	Write To 87PN	Scanned I/O	
	on ↑	Empty ~	02	[01] Module scanned in	n Empty slot	Configure	87018R	
	↓ OFF	Empty ~	03	[01] Module scanned in	n Empty slot	Configure	87064	
A	uto Config.	Empty ~	04	[00] OK		Configure	Empty	
		Empty ~	05	[00] OK		Configure	Empty	



As above, all the settings for each module are configured correctly, and then search the module again, you can see each plugged I/O module name listed under the USB-87Pn name and you can read the real-time data on the I/O modules now.



The **Auto Config. Enable [O,O,O,O]** means that each module in slot is correct configuration. If a module is damaged, you don't need to shutdown the power, just remove the damaged module and install a new one of the same model. USB-87Pn will write the previous settings to the module automatically.



4.3. Accessing I/O Modules without Auto Configuration

Setting the **Auto Config.** dip switch in the OFF position and then powering on the USB-87Pn unit can disabled the auto configuration function. The USB-87Pn will **not** automatically compare whether the current I/O module is consistent with the information stored in the unit in advance.



In **Auto Config. Disable** mode, DCON Utility Pro can be used to configure and access the I-87K I/O modules even they are not configured. Therefore, when you perform searching in DCON Utility Pro, you could see both the model name of USB-87Pn and I-87K I/O modules.

The status of USB-87Pn shows **Auto Config. Disable [O, O, O, O]**. It means that auto configuration is disabled now and you can open a configuration window to set up an I-87k module by clicking the module name.



18 87018R Firm	ware[B206]	×	
Configuration	AI	Commands Log	g Summary	
[05] +/- 2.5	V			
	AI V	alue	CJC Offset	
✓ CH:00	-00	0005	0.00 + -	
✓ CH:01	-00	0005	0.00 + -	
CH:02	+01	.7246	0.00 + -	
✓ CH:03	+01	87064 Firmware[A108]	1	×
CH:04	+01	Configuration DO	Host WDT Commands Log Summary	
CH:05	+01	Bit Status		
		CH:00] CH:01 ☑ CH:02	CH:0
✓ CH:06	+0	Set [Power-or	on Value] Set [Safe Value]	
CH:07	+01	Read DO		
		○ Read Power-	r-on Value	
✓ Enable/D	isabl	O Read Safe V	Value	
Exit				
		Exit		
		下午 02:03 :: OUTPU	JT_DO[@0305]; [>]; [6 ms]==>OK	

During the auto configuration disabled period, you cannot set the USB-87Pn unit. The following error message will appear when you click the name of USB-87Pn unit.

Notication	Х
USB-87P4 is Auto Config. Disable !Please Enable Auto Config. first.	
ОК	

When auto configuration is disabled, you won't be able to fix a damaged I/O module by replacing with a new one only, because their settings (e.g. type code) are different. You have to re-configure the module for maintaining the normal operation.

4.4. Project Backup and Quick Recovery

When you completed the module configuration, you can quickly backup all the settings for system backup, system recovery and mass configuration. You can specify the file name and add comments into the file for easy to manage and maintain multiple project files at the same time. The default location of a project file is the **auto_config** folder in DCON Utility Pro.

[SYSTEM] Section 1: Unit Name **UNIT=87P4** [[COMMENTS] Section 2: Created date time and Date Time=2008/3/10 下午 03:33:32 Description= description for configuration file. Write Description For Configuration File [Slot0 Comments] ID=87019R Firmware=A201h Section 3: Configuration description **MODULE CONFIG=** Net Address=> 2 for each module by slot. Baudrate=> 115200 Format=> 2's Complement Format CHANNEL_ENABLE_STATUS= &hFF ****** [Slot0] Section 4: The Configuration Commands for ID=87019R TOTAL=1C each slot. C00=2502000A0221F

The INI file explains as follows:

4.4.1. Saving the Configure File

When all modules are configured properly, you can save the settings as a file to recover the USB-87Pn settings since it is carelessly changed, or to duplicate a USB-87Pn unit with exactly the same I/O modules and settings.

- 1. Complete all the settings for each I/O module.
- 2. Click the **Save configurations** button, input the description or notes for this configuration file and click **OK**.



3. Finally, enter the file name and click **Save**.

Save As		2 🔀	
Save in:	auto_config	· 🖬 🍎 🖬 👻	
My Recent Documents Desktop My Documents My Computer		Input the file name and click "Save" to save the file.	
	File name:	87P4Demo Save	100
My Network Places	Save as type:	*.ini Cancel	5

The default path is defined in "DCON Utility Pro_PC\ auto_config".

> DCON_Utility_Pro_PC_4205 >	auto_config	~
87P4Demo.INI	2023/3/20下午 02:30	
readme.txt	2013/9/23 下午 05:23	
📓 usb-87pn.INI	2023/3/13 上午 10:43	

4.4.2. Loading the Configure File

You can load the configuration file from DCON Utility Pro to USB-87Pn to recover the I/O settings or to duplicate another USB-87Pn with exactly the same I/O modules and settings.

- 1. Click the Load Configurations button.
- 2. Select your configuration file and click the Open button.





Open		2 🗙
Look in: My Recent Documents Desktop My Documents	auto_confij 87p4Demo	Select the file name and click "Open" to open the file.
My Network Places	File name: Files of type:	87p4Demo Open .ini ✓ Cancer ☐ Open as read-only

3. Check the description for the configuration file and click the **OK** button.



4. Click the Configure button to check whether the settings for each module are correct.



5. Click the Write to 87PN button to write the configuration to the USB-87Pn.



4.4.3. Loading and Writing the Configuration File

If you have confirmed that the configuration file is correct, using the **Load configuration and** write to button can help you to speed up the settings.

USB-87P4Firmware[A401]							×
	Auto Configuratio	Configure D	ata Error Code References	Commands Log			
	Configured I/O	Addr.[Hex]	Slot Configuration Status	Set As Scanned	Write To 87PN	Scanned I/O	
ON	87018R ~	02	[00] OK		Configure	87018R	
OFF	87064 ~	03	[00] OK		Configure	87064	
Auto Config.	Empty ~	04	[00] OK		Configure	Empty	
	Empty ~	05	[00] OK		Configure	Empty	
n <i>r</i>							
	Exit Save	e configuratior	Load Configurations	Load configurat	ions and write to		

- 1. Click the Load configuration and write to button.
- 2. Select your configuration file and click the **Open** button.



3. Wait for OK messages for each slot to appear in the bottom pane.

USB-87P4Firmware[A401]								×
	Auto Configuration	Configure Da	ata Error Code	e References C	Commands Log			
	Configured I/O	Addr.[Hex]	Slot Configu	ration Status	Set As Scanned	Write To 87PN	Scanned I/O	
ON	87018R ~	02		[00] OK		Configure	87018R	
OFF	87064 ~	03		[00] OK		Configure	87064	
Auto Config.	Empty ~	04		[00] OK		Configure	Empty	
	Empty ~	05		[00] OK		Configure	Empty	
0 ● 1 ● 1 ● 2 ● 3 ● J 3 ● J Slot – USB-87P4 CPU Module	Exit Save	configuration	IS Load Co); [25 ms]==>0	Load configurat	ions and write to		

4.5. Operating in Off-line Mode

DCON Utility Pro provides the function of setting I/O modules offline, allowing you to edit configuration files for remote users, or to edit I/O module configuration in advance without connecting with a USB-87Pn unit. And then you can copy the file to another computer which is connecting with a USB-87Pn and write the configuration into the USB-87Pn via DCON Utility Pro. It is convenient for remote support or system backup.

- 1. Click the Offline Configuration for 87PN icon on the toolbar of DCON Utility Pro.
- 2. Confirm the parameters and click **OK** on the popup box.

DCON Utility Pro V 4.2.0.5			U			
₹ ▶ 11		СМД		Ð	FAQ	
	ID	Address	Baud Rate	Checksum	Format Status	
				~		
	87PN Series C	Off-Line Configure		×		
	Select 87PN I	Model				
	Model ID	RU-87P4	~			
	Addr. Mode	OFF	 ✓ Help 			
	Address	1	~			
	Checksum	Disable	~			
	Baud Rate	115200	~			
		ОК				

- **3.** Select the model number in the drop-down menu corresponding to the slot that the module will be plugged in.
- 4. Click the relevant **Configure** button to edit the parameters for the module.

RU-87P4 [Offline]							×
DWP C DDY	Auto Configuration	Configure Da	ta Error Code Referen	nces (Commands Log		
	Configured I/O	Addr.[Hex]	Slot Configuration S	tatus	Set As Scanned	Write To 87PN	Scanned I/O
Address	×	02		2		Configure	Empty
Н	×	03		2		Configure	Empty
P SCO AL	×	04		2		Configure	Empty
L a contraction	×	05		12		Configure	Empty
						/	4
Auto Config.		2				/	
N/A Checksum		3			4		
Baud Rate							
N/A-							
Sw1	Exit Save	configuration	s Load Configura	tions	Load configural	ions and write to	
0 🍎							
10							
2							
CPU Module							

5. After finishing the configuration for all I/O modules, click "**Save configurations**" to save the settings as a *.ini file.

						\sim
Auto Configuration	Configure Date	ta Error Code References	Commands Log			
Configued I/O	Addr.[Hex]	Slot Configuration Status	Set As Scanned	Write To 87PN	Scanned I/O	
87018R ~	02	-		Configure	Empty	
87004 ~	03	-		Configure	Empty	
~	04	-		Configure	Empty	
~	05	-		Configure	Empty	
5	configuration		Load configura	tions and write to		
Exit Save			Load configura	tions and write to		

6. Enter the description to note the configuration file and click OK.



7. Enter the file name and click the **Save** button.

Save in	auto_config		E 💣 📰•	
My Recent Documents Desktop My Documents		Input the file nar and click "Save" save the file.	me to	
	File name:	Power Monitoring System	•	Save
My Network	Save as type:	∫*.ini	<u> </u>	Cancel

The default path is defined in "**DCON Utility Pro_PC_xxxx\ auto_config**". Now you can copy the file to another PC which is connecting with a USB-87Pn and refer to section 4.4.3 to write the configuration file into the USB-87Pn.

D:\ DCON_Utility_Pro_PC\auto_config	
~	
Power Monitoring System.INI	2023/3/21 上午 11:34
readme.txt	2013/9/23 下午 05:23

5. Software Development Kits (SDK)

The ICP DAS provides a series of free software development kits enables the customer to be fast and simply completes the system setup. Related software tools are in the CD, please refer to following diagram:



5.1. PACSDK

PACSDK provides program developers to read the program interface which used on control I/O modules, the position of CD place provides a few basic and simple examples, user can understand how to read the control I/O module through the DLL in following examples:

Supported Windows OS for PC

Windows XP/7/10/11

All documents for PACSDK are located at CD or website (latest version):

CD: \ Napdos\Driver\PACSDK

PACSDK can be used on C,C++,C#, Delphi, Borland C, etc. development environment.

The latest manuals and examples can be downloaded from the following website: https://www.icpdas.com/en/product/guide+Software+Development Tools+PAC SDK

5.2. PACSDK PC LabVIEW

PACSDK PC LabVIEW is based on PACSDK, it can be used to read data from I-7000/8000/87k series I/O modules or write data to those IO modules via DCON protocol in LabVIEW. It can be downloaded from

https://www.icpdas.com/en/download/show.php?num=1845

After downloading the **PACSDK PC LabVIEW** package and unzip it, you can find the demo for I-7000/I-87K I/O modules in 7k_87k folder.

PACSDK —	7k_87k Demo for I-7000 and I-87k I/O modules on 87K unit
	others Demo for sending and receiving string of ASCII characters
	x64_dll Dll file for 64-bit LabVIEW
	x86_dll Dll file for 32-bit LabVIEW
	IO.IIb Sub-vis of PACSDK
	PACSDK.dll DII file for 32-bit LabVIEW

The PACSDK.dll in PACSDK directory is for 32-bit LabVIEW. If you are using 64-bit LabVIEW, please first copy the PACSDK.dll in the x64_dll folder to the PACSDK directory to replace the original one, and then open the demo.

Take reading the AI data from I-87018R in slot 0 (address 2) as an example:

- 1. Open the demo_87k_ai_all.vi in the 7k_87k folder.
- 2. Enter the COM port created by USB-87Pn driver, baud rate 115200 (fixed), N,8,1 in the **COM Port configuration** text box.
- 3. Enter the module address and total AI channel count
- 4. Run the demo to view the data.
- 5. Click the **Exit** button to end the demo.

demo_87k_ai_allvi				-		2
s Edit Xiew Project Operate	Iools Window H	elp			3	
1. Set the COM port configur 2. Run the program, check th 3. The AI data will show in the 4. Click Exit to guit RUN mod	ation, Al module addres e com port handle is not chart e	s, total Al channel count FFFFFFF				
COM port configuration	A) dista	Waveform Chart	Plot 0			
COM5,115200,N,8,1	Ch0 0	1.8-				
Al model is address.	Ch 1 1E-4	1.6-				
2	Ch 2 1.7324	1.4-				
And all offerend encoder	Ch 3 1.7328	1.2-				
8	Ch4 1.7328					
	Ch 5 1.7329	ride on				
	Ch 6 1.7329	LA VA				
com port handle	Ch 7 1.733	0.6-				
4188	Carden Sector	0.4-				
FFFFFFFF means open com po	rterror.	. 0.2-				
1	100					
	240	0-	100			
		-	Time			
					_	

5.3. DCON InduSoft





Bundled driver for InduSoft

Supported module: I-7000/8000/87K Series (With DCON Protocol) Supported OS: Windows 98/NT/2K/XP/CE File Location: CD: \Napdos\Driver\DCON_InduSoft

5.3.1. Procedure for using the InduSoft bundled driver

Step 1: Read the basic and important documents

Readme.txt: contains the basic and important information, including:

Files on the shipped CD

Reversion.txt: contains the reversion information, including

- Bugs fixed
- New modules supported

Step 2: Install the InduSoft bundled driver by executing

CD:\Napdos\Driver\DCON_InduSoft\Setup\setup.exe

Step 3: Read the manuals describing how to start

- The DCON.pdf user's manual describes how to use the InduSoft bundled driver
- **Step 4:** Run the demo programs (ICPDriverTest.zip) to test I/O modules and learn the functions

5.3.2. InduSoft Example (Reading an analog input value)

The following is an example of reading analog values from an I-87018 inserted in slot 0 of an 8410/8810.

Step 1: Run the DCON Utility to configure the I/O modules

- Step 2: Run InduSoft and create a new project
- Step 3: Include the DCON driver



Step 4: Setup DCON driver



Step 5 : Insert tags to connect to I/O modules

The address format is [Address : Module ID : Slot : Channel]

Project: MYTEST.APP	DCON991 DBW		
	Description:		
DDE Settings	Input		ncrease priority
Help	Read Trigger:	Enable Read when Idle: Read Completed:	Read Status:
Datab	RdTr	RdEn	
	Write Trigger:	Enable Write on Tag Change: Write Complete	d: Write Status:
	Station:	Header:	· · · · · · · · · · · · · · · · · · ·
		Al	
		2	Max
	1	Tag Name Address	Div Add _
	1 AI[0]	01:8017:0:0	
	2 AI[1]	01:8017:0:1	
	3 AI[2]	01:8017:0:2	
	4 AI[3]	01:8017:0:3	
	5 AI[4]	01:8017:0:4	
	6 AI[5]	01:8017:0:5	
	7 AI[6]	01:8017:0:6	

Step6 : Arrange all the components on the form

📲 Main.scr			×
Settings	Ch0	##.###	
COM port =1	Ch1	##.###	<u></u>
Baudrate = 115200	Ch2	##.###	<u> </u>
Address = 01 Slot = 0	Ch3	##.###	
Checksum = Disable	Ch4	##.###	<u> </u>
Timeout = 1000ms	Ch5		-
	Ch6	##.###	
	Ch7	##.###	÷

Step7: Double click the text box to assign a tag to it.

	Rheat Properties		
B	-pa Replace H	int: Text I/O	
A	Tag/Expression: AI[0		
S	Minimum Value:	Input Enabled Fm	: Decimal
C	Maximum Value;	🗖 🗖 Password 🗖 Confirm	Security
T	E-Sign VK: KU	se Default> 💌 Disable:	0
	rana ranana ranana ra	Ch6 ##.##	

Step8 : Run the project

Settings	Ch0	3.56
COM port =1	Ch1	5.55
Baudrate = 115200	Ch2	3.57
Address = U1 Slot = 0	Ch3	9.98
Checksum = Disable	Ch4	8.54
Timeout = 1000ms	Ch5	5.63
	Ch6	5.58
	Ch7	6.02

5.4. NAP OPC Server





Modbus embedded controller ISaGRAF embedded controller

Supported OS:

Windows 98/NT/2K/XP/CE

File Location:

CD:\Napdos\NapOPCSvr

OPC (OLE for Process Control) is the first standard resulting from the collaboration of a number of leading worldwide automation suppliers working in cooperation with Microsoft. Originally based on Microsoft's OLE COM (component object model) and DCOM (distributed component object model) technologies, the specification defined a standard set of objects, interfaces and methods for use in process control and manufacturing automation applications to facilitate interoperability. The COM/DCOM technologies provided the framework for software products to be developed. There are now hundreds of OPC Data.

5.4.1. Procedure for using the OPC Server

Step 1: Read the basic and important documents

Readme.txt: contains the basic and important information, including

- Files on the shipped CD
- Reversion.txt: contains the reversion information, including
 - Bugs fixed
 - New modules supported

Step 2: Install the OPC Server by executing

- CD:\Napdos\NapOPCSvr\NapOPCServer.exe
- **Note:** If there is an older version of Nap OPC Server installed on the PC, It must be uninstalled before installing the new version.

Step 3: Read the manuals describing how to start

The NapOPCSvr.pdf is the user's manual describing how to use the OPC Server

5.4.2. OPC Server Example (Reading an analog input value)

The following is an example of reading analog values from an I-87018 inserted in slot 0 of an 8410/8810.

Step 1: Run the DCON Utility to configure the I/O modules **Step 2:** Run the OPC Server to search for I/O modules on COM1

Name		Туре		Channel/L	ocation	
	COM 1 auto Reto Sec 921600 57600 4800 Select	✓ 46080 ☐ 38400 ☐ 2400 А11		☑ Cle 2400 ☑ 200 ☑ 200 ☑	ar Module: 115200 9600	s
	ddress (1 to tart 0 ind 255	255)	Checksun Disable Enable	d j	out (mSec) 500	

New Open Save Device Group	Tag Gener.	Search Expand Shrink	Monitor
E 8810_1	Name	Туре	Channel/Lo
😑 📊 8018_SO	8 Ch00	Analog Output	0
AIs	8 Ch01	Analog Output	1
E 1 8042_S1	8 Ch02	Analog Output	2
DIs DOs H 8041_S2	8 Ch03	Analog Output	3
E 1 8024_S3			

Step 3: Save the configuration and close the OPC Server **Step 4:** Run SCADA software to connect to the OPC Server

The OPC Server user's manual lists the procedures for the following SCADA software:

LabVIEW	National	
■ iFix	InduSoft	Citect

Please refer to "Chapter 4 Connecting to the OPC Server" for more details.

Appendix A : Compare USB-87Pn with I-87Kn

Note: I-87K I/O modules are divided into two groups; one is high profile and the other is low profile. Only high profile I-87K series I/O modules support Hot Swap and Auto-Configuration function correctly.

Supported	USB-87Pn with Auto Config. Enable	USB-87Pn with Auto Config. Disable	I-87Kn
I-87K Low Profile module			0
I-87K High Profile module		3	
I-87K module Hot Swap	0	3	
Auto- Communication parameter Setup	0	0	
Auto-Configuration			

USB-87Pn & I-87Kn I/O expansion unit comparison



High Profile

Low Profile



Please refer to web page: https://www.icpdas.com/en/product/p02.php?root=537&kind=543

Appendix B: Error Code – Causes and Solution

When a module is inserted in the expansion slot of USB-87Pn, the auto configuration function in USB-87Pn will detect the module name and confirm that the module is consistent with the pre-configured information. In the following diagram, the search result only find out the USB-87P4 and an 87019R in slot 0, the Status column shows **Auto Config. Enable [O,X,X,X]**

ID	Address	Baud Rate	Checksum	Format	Status	Description	Comments
USB-87P4	1[01h]	115200	Disabled	N,8,1	Auto Config. Enable[O,X,X,X]	[DCON]4*Slot Auto Configuration USB Unit	Supported
-87018R	2[02h]	115200	Disabled	N,8,1	87FN Stat 0	[DCON]8*Al (mA,mV,V,Thermocouple)	Supported

Click the **USB-87P4** name to open the configuration window to know the module status. The status code in **Slot Configuration Status** column use different background color to represent different error message.

USB-87P4Firmware[A401]					×
	Auto Configuration Configur	e Data Error Code References C	ommands Log		
	Configured I/O Addr.[He	x] Slot Configuration Status	Set As Scanned	Write To 87PN	Scanned I/O
ON ↑	87018R ~ 02	[00] OK		Configure	87018R
	87064 ~ 03	[06] Can not find m	nodule	Configure	Empty
Auto Config.	Empty ~ 04	[01] Module scanned in	Empty slot	Configure	87064
	Empty ~ 05	[01] Module scanned in	Empty slot	Configure	87055
Exit Save configurations Load Configurations Load configurations and write to I Image: Configuration of the second					
1,					

Refer to the following table, you can find more information about error code and LED lamp status.

Table 1 : The Error Code in Auto Config. Enable mode

Error Code	Slot LED (Red)	Status	Description	Solution
00H	Dark (ok)	ОК	ОК	None
			1. There is a module scanned in this empty setting slot.	1. Remove the module
01H	Flashing	Module scanned in		Reconfigure it with DCON Utility.
	(warning)	Empty Slot	2. The first time to setup, no initial value.	1. Click "Set As Scanned" button and configure module again
				2. Click "Write To 87Pn" button to write settings to 87Pn.
			Configure failure:	1. Check the I-87K I/O module's firmware.
028	Flashing (Warning)	Commands not compatible	This is a 87K I/O module firmware compatibility problem	* Run Dcon Utility→Terminal→Dcon command Line→ setup Baud Rate→Command: \$AAF (EX. 01F) →Send
0211			Some commands at this slot might be too	* You can see the version, Respond=!01A1.9
			but it is not serious for system operation.	Update the 87K I/O module with a new firmware version.
	Bright <mark>(Error)</mark>		Configure failure:	
03H		Configuration Failed	Some commands are not supported by this 87K I/O module and this error will be serious for system operation.	 Check the 87K I/O module firmware Update the 87K I/O module with a new firmware version.
		nt (r) Configuration format	Configure failure:	1. Run DCON Utility
04H	Bright <mark>(Error)</mark>		The format of configured commands is wrong for DCON Protocol.	 Click the "Write To 87Pn" button to write the settings to 87Pn CPU again.
05H	Bright	Read	The memory data is failed :	1. Run DCON Utility.

	(Error)	Configuration failed	The configured commands are wrong for DCON Protocol.	 Click the "Write To 87Pn" button to write the settings to 87Pn CPU again.
06H	Bright <mark>(Error)</mark>	Cannot find module	The configured module at this slot has been removed. It is empty now.	 Please insert a correct module as previous configured one. Or configure with DCON Utility as "Empty" and click the "Write To 87Pn" button to write the configuration to 87Pn CPU.
			Configure failure:	
07H	Bright <mark>(Error)</mark>	ht Incorrect module name	The module inserted in this slot is not the same as previous configured.	The insert & configure module name are different, insert the correct one or run the Dcon Utility to modify the settings accord with the module name.
	Bright <mark>(Error</mark>)		Configure failure:	1. Please restart the power to initialize to I/O module
08H		Internal INIT* pin failed	The INIT Pin is failed to connect with the GND and module failed to initialize.	 If it still failed to initialize, send it back to factory to check. Note: USB-87Pn only supports high profile 87K I/O modules.
09Н	Bright (Error) Module address over 255 (FFh) The module address is over 255 (FFh).		The module address is over 255 (FFh).	The maximum address of 87P1 is 254 (FEh) 87P2 is 253 (FDh) 87P4 is 251 (FBh) 87P8 is 247 (F7h)
0AH	Bright <mark>(Error</mark>)	The command count saved to 87Pn is not the same as DCON Utility	This error might be caused by following reasons. 1. Command length error. 2. Command checksum error. 3. Communication error during the process of writing commands to 87Pn.	Please configure this 87K I/O module with DCON Utility, and click the "Write To 87Pn" button to write the configuration to 87Pn CPU again.

ОВН	3H Bright (Error) Module response failed		This error might be caused by following reasons. Module response failed above 5 times.	Please restart the power to initialize to I/O module, or configure this 87K I/O module with DCON Utility, and click the "Write To 87Pn" If I/O module often becomes 0xBh error, it may something caused communication failed between 87Pn and I/O module. User can send ~AARCxx command to set XX second to reset I/O module when 0xBH error appears. (XX range is 0~ 0xFF ,can be set 0~256 second)
ОСН	HBright (Error)Module name invalidThe module inserted in this slot is not the same as previous configured.HBright (Error)Module Init command invalidThis error might be caused by command no complete on I/O module		The module inserted in this slot is not the same as previous configured.	Module is not 87K high profile I/O modules. Note:87Pn only supports 87K high profile I/O modules, Please replace it as 87K I/O module
0DH			This error might be caused by command not complete on I/O module	Reconfigure it with DCON Utility. 1. Click "Set As Scanned" button and configure module again 2. Click "Write To 87Pn" button to write settings to 87Pn.

Table 2 : The Error Code in Auto Config. Disable mode

Error Code	r Slot LED Status (Red)		Description	Solution	
80H	H Dark (ok) Initialize ok setup success		None		
81H	Bright (Error) Internal INIT*		The INIT Pin is failed to connect with the GND and module failed to initialize.	If it still fails after restart the 87Pn many time please send the 87K I/O module back to facto to check.	
82H	Bright (Error) Module address over 255 (FFh)		The module address is over 255 (FFh).	The maximum address of 87P1 is 254 (FEh) 87P2 is 253 (FDh) 87P4 is 251 (FBh) 87P8 is 247 (F7h)	

You can see the LED signals on 87Pn CPU module to know whether the 87Pn is operating properly. Please refer to appendix.

	Auto Config. LED (Green)	S.RDY LED (Green)	Slot Status LED (Red)			
Auto Config. Enable						
No Error		Always ON	Always OFF			
Warning	Always ON	Always ON	Flash			
Failed		Flash	Always ON			
Auto Config. Disable						
No Error		Always ON	Always OFF			
Failed	Always OFF	Flash	Always ON			

Appendix C: Frame Ground

Electronic circuits are constantly vulnerable to Electro-Static Discharge (ESD), which become worse in a continental climate area. Some I-7000, M-7000 and I-8000 series modules feature a new design for the frame ground, which provides a path for bypassing ESD, allowing enhanced static protection (ESD) capability and ensures that the module is more reliable.

The following options will provide a better protection for the module:

The USB-87Pn has a metallic board attached to the back of the plastic basket. When it is mounted on DIN rail, the metallic board is in contact with the DIN rail. Therefore, when the DIN rail is connected with the earth ground, the USB-87PN is also connected with the earth ground at the same time.

