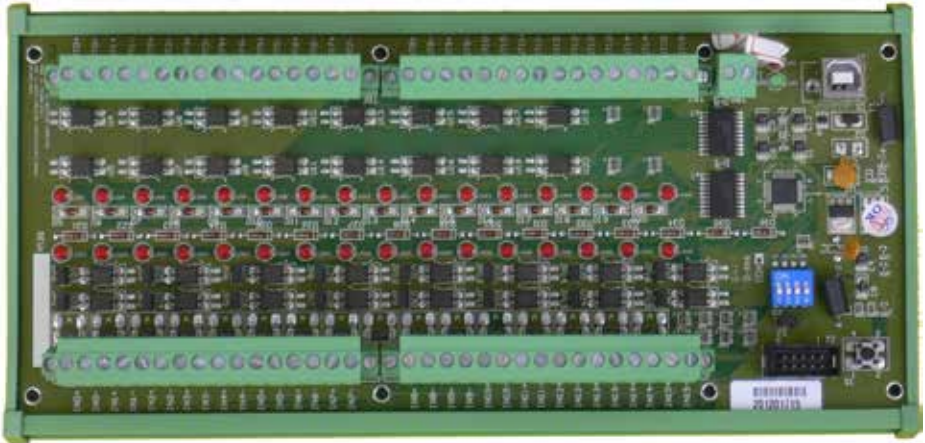


USB-I/O Manual



**16 PHOTO COUPLE INPUT /
16 PHOTO COUPLE OUTPUT CHANNELS**

UHOO-16 - DIN-Rail-Version

UPOO-16 - Board-Version

Product Code: AUSB16P/R USB 16 PHOTO ISO./ RELAY BOARD

Item-No.: UHRO-16 - DIN-Rail-version

Item-No.: UPRO-16 - Board-version

Bus: USB 2.0

Description:

16 photo couple input / 16 photo couple output channels

Input:

Input maximum load voltage is 30V

By jumper, you can select two range of voltage

0 - 4.5V off and 6V - 20V on. (0 - 20V)

0 - 16.5V off and 18 - 30V on (0 - 30V)

PC817 photo couple chips.

5000V isolation voltage.

Output:

Switching current: 10mA

Max switching current: 50mA

32 LED correspond to I/O ports activation status

Connections via Pluggable Screw Terminals

Features:

For direct DIN-Rail mounting

Also as board without DIN Rail adapter available

High Speed 8051 μ C Core

USB 2.0 Function Controller

Support USB ID 0~14 SET

POWER External DC+5V 0,5A

Software/Driver:

Windows-7/8/10 will use HID-interface and sample for programming, Linux driver and sample for programming.

Package includes the following items:

USB Board

USB cable

Software and Manual CD

The DIN-Rail-version comes with a EMI-Protection-kit

This kit is optional in the board-version!

Operating temperature range: 0 ~ 55C.

Relative humidity rage: 0 ~ 90%.

Size: 250 mm x 120 mm x 55 mm

Security Note

This device should not be used in applications where failure may result in death or injury without proper consideration and design of associated system architecture and redundant safety features. Connection and repairs are allowed only by a specialist.

When used in a machine or plant, is to ensure that after installation continues to the relevant provisions, rules and guidelines are complied with!

These products come into contact voltage, therefore to consider the applicable VDE regulations VDE 0550 / 0551, VDE 0700, VDE 0711, especially VDE 0100 and VDE 0860.

J1 USB Connection USB-B

A suitable cable is included

VCC	+5 VDC (USB VBUS POWER)
D-	Data -
D+	Data +
SGND	Signal Ground



B

USB wiring is very sensitive against EMI errors (mainly sparking when opening contacts). The U-EMI-1 Kit is included with the DIN rail version and includes two Würth folded cores for the USB data cable and a Ferrite sleeve for the power cable. If you are using a HUB, it should be protected the connection HUB/computer (U-EMI-2)! The kit includes two Würth folded cores for the USB data cable.

The cores must be mounted as shown in the illustrations, as close as possible on the connectors.

But also the avoidance of errors is very important. Therefore, the careful layout and installation of the wiring is very important!



Folding core on the USB cable to the computer



Folding core on the USB cable to the USB IO
1 or 2 x through the core

Power Supply - TB1



Internal power by USB

Do not connect external 5V!

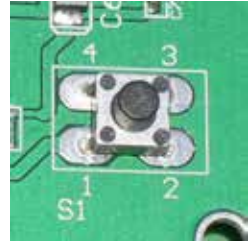
For USB-boards with relays only:

For earlier versions of the Decision-USB IO was also the possibility of the power supply via the USB bus. To get greater stability, this connection was removed. The USB bus power is not always able to provide enough power for the Relais switched on! The result is a loss of connection or "hanging" USB module. An external power supply provides a secure power supply!

USB Power Management in Windows - In Window System, USB communication might disconnect under Power Saving Mode or Sleep Mode. When connecting USB boards on PC, please make sure windows power management set in case interference with USB communication.

S1 Reset Button

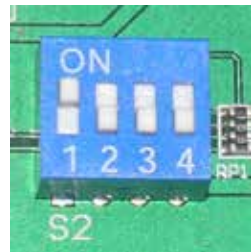
To reset the "hanging" USB-Module



S2 USB ID

Set different ID for each board

1	2	3	4	Card ID
ON	ON	ON	ON	--
OFF	ON	ON	ON	14
ON	OFF	ON	ON	13
OFF	OFF	ON	ON	12
ON	ON	OFF	ON	11
OFF	ON	OFF	ON	10
ON	OFF	OFF	ON	9
OFF	OFF	OFF	ON	8
ON	ON	ON	OFF	7
OFF	ON	ON	OFF	6
ON	OFF	ON	OFF	5
OFF	OFF	ON	OFF	4
ON	ON	OFF	OFF	3
OFF	ON	OFF	OFF	2
ON	OFF	OFF	OFF	1
OFF	OFF	OFF	OFF	0



Multiple Boards Connect

When you need to connect more than 3 boards on one PC, please make sure the following below

1. Set different ID for each board.
2. Supply external 5V to each USB board.
3. Supply external 5V to USB hub.

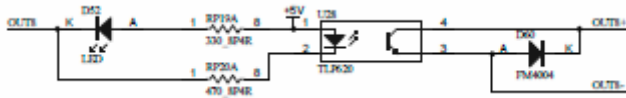
Please make sure your external 5V power supply enough for the USB I/O boards. If input voltage is below 4.8V for USB I/O board, it can't work normally and sometimes it will cause device manager keeping refreshing itself or can't recognize the device.

TB4/5 Relay-Output

Pin	Signal	Description
1	OUT0+	Opto-isolator Ch. 00 + Output
2	OUT0-	Opto-isolator Ch. 00 - Output
3	OUT1+	Opto-isolator Ch. 01 + Output
4	OUT1-	Opto-isolator Ch. 01 - Output
5	OUT2+	Opto-isolator Ch. 02 +Output
6	OUT2-	Opto-isolator Ch. 02 - Output
7	OUT3+	Opto-isolator Ch. 03 + Output
8	OUT3-	Opto-isolator Ch. 03 - Output
9	OUT4+	Opto-isolator Ch. 04 + Output
10	OUT4-	Opto-isolator Ch. 04 - Output
11	OUT5+	Opto-isolator Ch. 05 + Output
12	OUT5-	Opto-isolator Ch. 05 - Output
13	OUT6+	Opto-isolator Ch. 06 + Output
14	OUT6-	Opto-isolator Ch. 06 - Output
15	OUT7+	Opto-isolator Ch. 07 + Output
16	OUT7-	Opto-isolator Ch. 07 - Output

Pin	Signal	Description
1	OUT8+	Opto-isolator Ch. 08 + Output
2	OUT8-	Opto-isolator Ch. 08 - Output
3	OUT9+	Opto-isolator Ch. 09 + Output
4	OUT9-	Opto-isolator Ch. 09 - Output
5	OUT10+	Opto-isolator Ch. 10 + Output
6	OUT10-	Opto-isolator Ch. 10 - Output
7	OUT11+	Opto-isolator Ch. 11 + Output
8	OUT11-	Opto-isolator Ch. 11 - Output
9	OUT12+	Opto-isolator Ch. 12 + Output
10	OUT12-	Opto-isolator Ch. 12 - Output
11	OUT13+	Opto-isolator Ch. 13 + Output
12	OUT13-	Opto-isolator Ch. 13 - Output
13	OUT14+	Opto-isolator Ch. 14 + Output
14	OUT14-	Opto-isolator Ch. 14 - Output
15	OUT15+	Opto-isolator Ch. 15 + Output
16	OUT15-	Opto-isolator Ch. 15 - Output

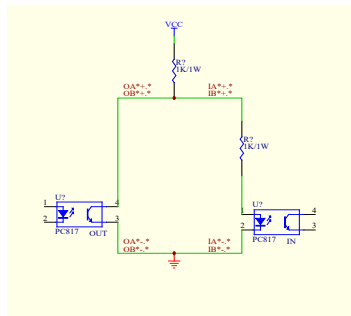
Schematic Outputs



Loopback Diagnostic

To test your 16 channel photo isolator input/output card, we recommend you use loopback circuit shown in below. Where IA*+ means input channel+ and IA*- means input channel-, OA*+ means output channel+ and OA*- means output channel-. * means channel number. Please note that, if you use IA2+, you must connect its pair IA2- ... ,otherwise if may short the circuit.

In this experiment, if VCC larger than 10V, then it input HIGH to input channel, otherwise it input LOW; your program can get this digital signal easily. If no VCC voltage input, the output channel will be loopback to input channel, it means when output channel HIGH then input channel get HIGH, when output LOW then input channel get LOW.



Installation

The decision-computer USB devices use the HID (human interface device). The HID belongs to the generic device class is integrated in the operating system. If a new HID device is connected, no driver installation is required. The functions for access and control of HID hid.dll you can find in the Windows System32 folder.

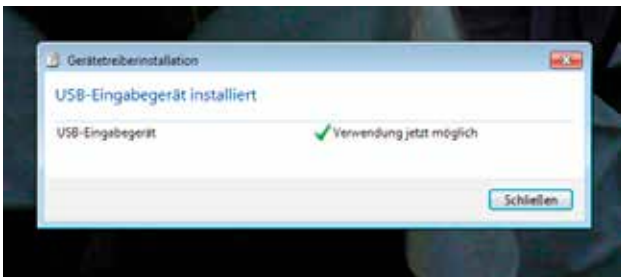
Windows 7 installation example



1. Power supply 5V connect

2. USB connect

3. USB input device - device driver software is successfully installed



4. USB input device - use now possible



5. In the Control Panel, you can find the Decision-USB module now

6. Ready to use

SOFTWARE PROGRAMMING UNDER WINDOWS AND LINUX

On Windows, we offer a function library and dll file as programming help. See the manual „USBIDII_Manual.pdf“ and demo code in VB/VC / Delphi on the decision-Studio CD.

We offer a C-source Linux users for direct access to the USB devices. See „Dcihid 0.5.1.tgz“ manual and example.

DIAGNOSTICS UNDER WINDOWS/XP

USB test Program.exe is a diagnostic tool to test USB devices on Windows/XP. The USB test software can be found on the decision-Studio CD.

The examples and drivers be developed continuously. See the latest on the decision-computer-Merz „Service CD“.

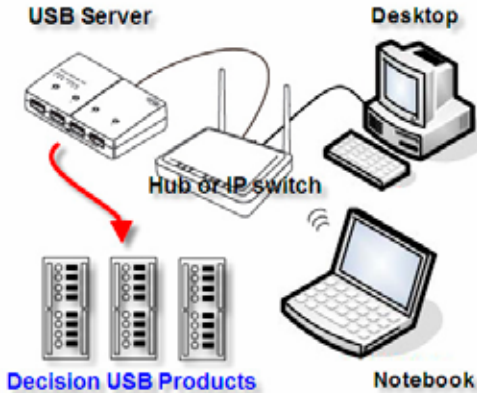
An important way to get more informations you find at <http://www.usb-industrial.com>

Software support on the short way: <http://www.usb-industrial.com/support.html>

USB Industrial.com Overview:

Windows Support	2010/04 USBIDII.dll 2.0.0.4	This package includes Dynamic-link library which is developed by Decision Computer to communicate with the USB Series Device. It can be included in multiple computer language (VB6, VC6, VB.NET, C# Delphi) under Windows.
Watchdog Timer		This watchdog timer is a kind of software timer that triggers a system reset or other corrective action if the main program, due to some fault condition. The intention is to bring the system back from the unresponsive state into normal operation. This function is new released and please contact us to get further information.
VCP driver	(For LABKIT Only)	Virtual COM port (VCP) drivers cause the USB device to appear as an additional COM port available to the PC. Application software can access the USB device in the same way as it would access a standard COM port. This function is only implemented in USBLABKIT
Linux Support	dcihid - 0.5.1 Basic function library and demo program 2009.05.01	This package includes a c library and a demo program which is developed by Decision Computer to communicate with the USB Series Device under Linux. It also includes a ReadMe file to demonstrate how to use it and package's format is .tgz.
Firmware Update	Firmware Hex file Download	This Package includes a driver and a software which is developed by Decision Computer to update the newest firmware into the USB Series Device. When new version of firmware is released, user can follow the instructions to update the firmware.
LabVIEW Support	LabVIEW 8 LabVIEW 2009	This package includes manual and examples which demonstrate how to connect and develop USB Series Device under LabVIEW, which is a well-known platform and development environment for a visual programming language from NI.
ProfilAB Support		This package includes manual and examples which demonstrate how to connect and develop USB Series Device under ProfilAB, which is a well-known platform and development environment for a visual programming language from Abacom.
Init Value Setting Tool	(For Output Channel)	The Init Value Setting Tool is a software tool to set init value for output channel. User can use this tool to plan output channel as default high or default low when power on.
Data Acquisition and Remote Monitoring Tool		The Data Acquisition and Remote Monitoring Tool (DARMT) is a software tool to record high/low state reports at local computer, and transmit them to FTP site to achieve data acquisition and remote monitoring

USB by LAN or Wireless



The remote control of Decision USB products by LAN or wireless with a remote-PC is very simple with a multi port USB Server

Because no driver should be installed to the installation and programming is very easy.

Under Windows, are the external USB I/O directly in the Device Manager and can be connect or control such as in the original host PC.

Firmware Update Manual

USBBootloader.exe is the tool software to update firmware into the USB SerialDevice Board developed by Decision Computer. When you get a new version of firmware (.hex), you can follow the steps to update firmware to the board.

1. Remove the external input signal Voltage and only support device power.
2. Set Board Id 15 (All on) for Update Mode and press the Reset button.
3. Connect PC to the Board by USB
4. If this is the first to use this function, please indicate the driver install path to the Driver Folder to install the driver.
5. Open the Software USBBootloader.exe and press the Open button and indicate the hex file and then press the Download button to update firmware.
6. Set Board Id between 0 ~ 14 and press Reset button and connect PC again.

Communication JP1 - only option!

Some unused holes (2 x 5) for JP1 are located on the board. Here a serial port can be added at a special version, with an optional expansion board, RS-232 or RS-422/RS-485. The ports are controlled via the USB. Please contact us if necessary

Strong electromagnetic sources, such as power lines, large electric motors, switches, or welders can cause strong electromagnetic interference. Video monitors and cables are strong sources of interference.

If the cable must be led by an area with significant electromagnetic interference, shielded cables with grounding on the source should be used.

Avoid placing your cable parallel to a high-voltage line! to minimize adverse effects, insert the cable at right angle to the power line.

PC817XJ0000F Series

DIP 4pin General Purpose Photocoupler

*4-channel package type is also available.
(model No. **PC847XJ0000F Series**)



■ Description

PC817XJ0000F Series contains an IRED optically coupled to a phototransistor.

It is packaged in a 4pin DIP, available in wide-lead spacing option and SMT gullwing lead-form option.

Input-output isolation voltage(rms) is 5.0kV.

Collector-emitter voltage is 80V and CTR is 50% to 600% at input current of 5mA.

■ Features

1. 4pin DIP package
2. Double transfer mold package (Ideal for Flow Soldering)
3. High collector-emitter voltage (V_{CE0} :80V)
4. Current transfer ratio (CTR : MIN. 50% at $I_F=5$ mA, $V_{CE}=5$ V)
5. Several CTR ranks available
6. High isolation voltage between input and output ($V_{iso(rms)}$: 5.0 kV)
7. Lead-free and RoHS directive compliant

■ Agency approvals/Compliance

1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. **PC817**)
2. Package resin : UL flammability grade (94V-0)

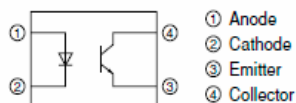
■ Applications

1. I/O isolation for MCUs (Micro Controller Units)
2. Noise suppression in switching circuits
3. Signal transmission between circuits of different potentials and impedances

Notice The content of data sheet is subject to change without prior notice.

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

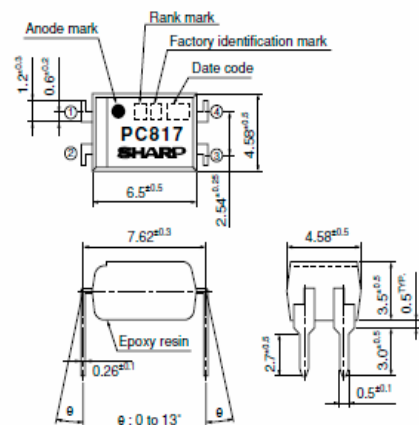
Internal Connection Diagram



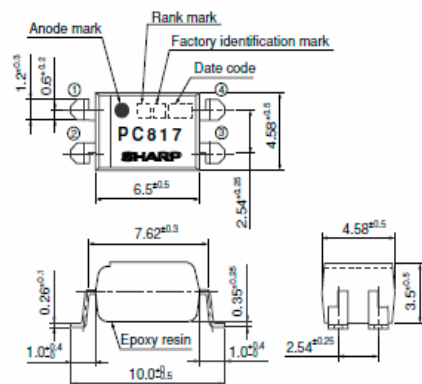
Outline Dimensions

(Unit : mm)

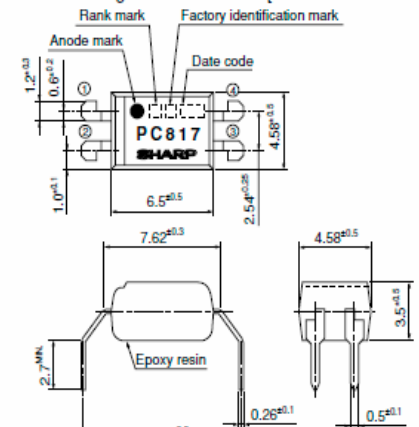
1. Through-Hole [ex. PC817XJ000F]



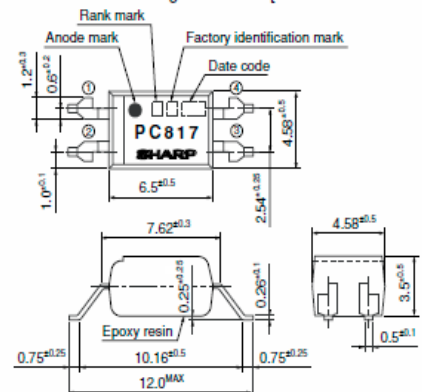
2. SMT Gullwing Lead-Form [ex. PC817XJ000F]



3. Wide Through-Hole Lead-Form [ex. PC817XFJ000F]



4. Wide SMT Gullwing Lead-Form [ex. PC817XFJ000F]



■ Absolute Maximum Ratings (T_a=25°C)

	Parameter	Symbol	Rating	Unit
Input	Forward current	I _F	50	mA
	*1 Peak forward current	I _{FM}	1	A
	Reverse voltage	V _R	6	V
Output	Power dissipation	P	70	mW
	Collector-emitter voltage	V _{CEO}	80	V
	Emitter-collector voltage	V _{ECO}	6	V
	Collector current	I _C	50	mA
	Collector power dissipation	P _C	150	mW
	Total power dissipation	P _{tot}	200	mW
	*2 Isolation voltage	V _{iso (mm)}	5.0	kV
	Operating temperature	T _{opr}	-30 to +100	°C
	Storage temperature	T _{stg}	-55 to +125	°C
	*3 Soldering temperature	T _{sot}	260	°C

*1 Pulse width≤100μs, Duty ratio : 0.001

*2 40 to 60%RH, AC for 1minute, f=60Hz

*3 For 10s

■ Electro-optical Characteristics (T_a=25°C)

	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	
Input	Forward voltage	V _F	I _F =20mA	-	1.2	1.4	V	
	Peak forward voltage	V _{FM}	I _{FM} =0.5A	-	-	3.0	V	
	Reverse current	I _R	V _R =4V	-	-	10	μA	
	Terminal capacitance	C _t	V=0, f=1kHz	-	30	250	pF	
Output	Collector dark current	I _{CEO}	V _{CE} =50V, I _B =0	-	-	100	nA	
	Collector-emitter breakdown voltage	BV _{CEO}	I _C =0.1mA, I _B =0	80	-	-	V	
	Emitter-collector breakdown voltage	BV _{ECO}	I _E =10μA, I _B =0	6	-	-	V	
Transfer characteristics	Collector current	I _C	I _B =5mA, V _{CE} =5V	2.5	-	30.0	mA	
	Collector-emitter saturation voltage	V _{CE(sat)}	I _B =20mA, I _C =1mA	-	0.1	0.2	V	
	Isolation resistance	R _{ISO}	DC500V, 40 to 60%RH	5×10 ¹⁰	1×10 ¹¹	-	Ω	
	Floating capacitance	C _f	V=0, f=1MHz	-	0.6	1.0	pF	
	Cut-off frequency	f _c	V _{CE} =5V, I _C =2mA, R _L =100Ω, -3dB	-	80	-	kHz	
	Response time	Rise time	t _r	V _{CE} =2V, I _C =2mA, R _L =100Ω	-	4	18	μs
		Fall time	t _f		-	3	18	μs

Fig.7 Forward Current vs. Forward Voltage

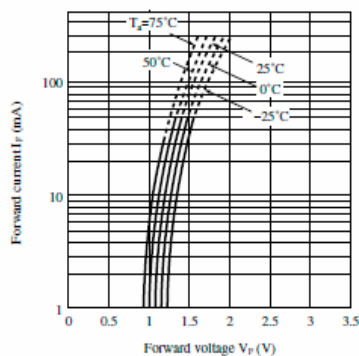


Fig.8 Collector Current vs. Collector-emitter Voltage

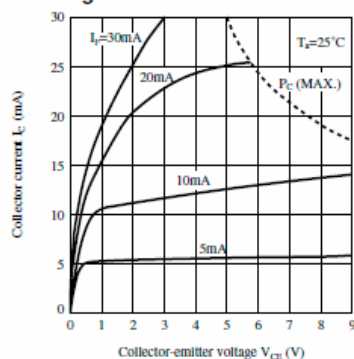


Fig.9 Relative Current Transfer Ratio vs. Ambient Temperature

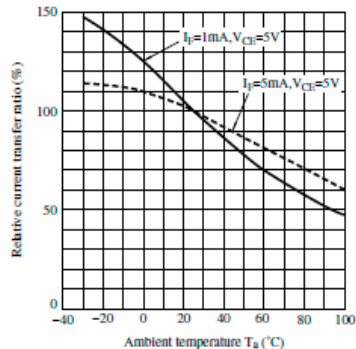


Fig.10 Collector - emitter Saturation Voltage vs. Ambient Temperature

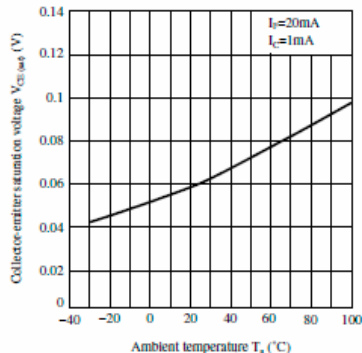


Fig.11 Collector Dark Current vs. Ambient Temperature

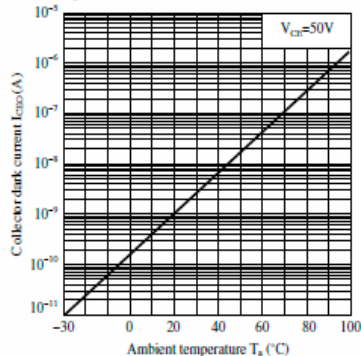


Fig.12 Collector-emitter Saturation Voltage vs. Forward Current

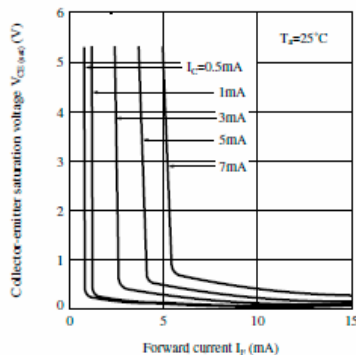


Fig.13 Response Time vs. Load Resistance

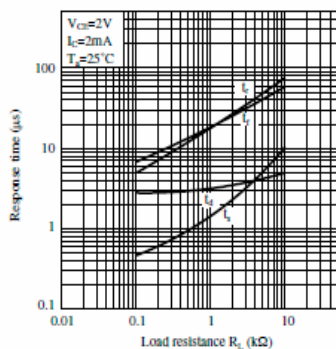
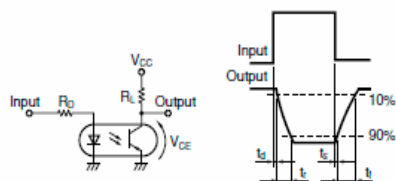


Fig.14 Test Circuit for Response Time



Please refer to the conditions in Fig.13.

Fig.15 Frequency Response

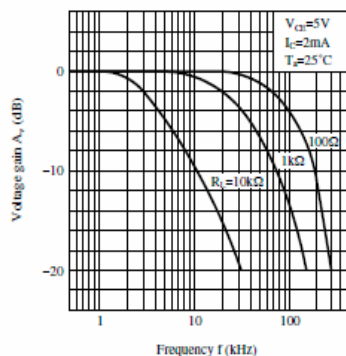
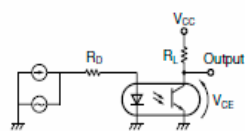


Fig.16 Test Circuit for Frequency Response



Please refer to the conditions in Fig.15.

Remarks : Please be aware that all data in the graph are just for reference and not for guarantee.

CERTIFICATE




VERIFICATION OF COMPLIANCE

APPLICANT DESICION GROUP INC.

ADDRESS 4th Floor, No. 31, Alley 4, Lane 36, Sec. 5, Ming-Shen
East Road, Taipei Postal code: 10576, Taiwan, R.O.C.

EQUIPMENT USB Automation I/O board

MODEL NAME AUSB series

TRADE NAME 

REPORT NO. WSCE1608014

STANDARD(S) EMI --- EN 55032 CLASS B: 2012
 EN 61000-3-2: 2014
 EN 61000-3-3: 2013
 EMS --- EN 55024: 2010
 IEC 61000-4-2 : 2008
 IEC 61000-4-3 : 2006+A1: 2007+A2:2010
 IEC 61000-4-4 : 2012
 IEC 61000-4-5 : 2014
 IEC 61000-4-6 : 2013
 IEC 61000-4-8 : 2010
 IEC 61000-4-11 : 2004

The above equipment was tested by WEISHANG Certification Co., Ltd. for compliance with the requirements set forth in the EUROPEAN COUNCIL Directive 2014/30/EU and the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance.

Approved By: _____


Brian Yu / Manager

Issued Date: SEP. 06, 2016



WEISHANG Certification Corp.
12F.-5, No.27-1, Ln. 168, Kangning St., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

DECLARATION OF CONFORMITY

For the following equipment :

Equipment : USB Automation I/O board

Model Name: AUSB series

Applicant: DESICION GROUP INC.

Address: 4th Floor, No. 31, Alley 4, Lane 36, Sec. 5, Ming-Shen East Road,
Taipei Postal code: 10576, Taiwan, R.O.C.

Is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility (2014/30/EU). For the evaluation regarding the electromagnetic compatibility, the following standards were applied :

EN 55032 CLASS B: 2012

EN 61000-3-2: 2014

EN 61000-3-3: 2013

EN55024: 2010

IEC 61000-4-2: 2008

IEC 61000-4-3: 2006+A1: 2007+A2:2010

IEC 61000-4-4: 2012

IEC 61000-4-5: 2014

IEC 61000-4-6: 2013

IEC 61000-4-8: 2010

IEC 61000-4-11: 2004

The following manufacturer/importer is responsible for this declaration :

Person responsible for marking this declaration :

Casper Kan Chang

201609 6

(Place)

(Date)

(Signature)



A.1 Copyright

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Each piece of SmartLab package permits user to use SmartLab only on a single computer, a registered user may use the program on a different computer, but may not use the program on more than one computer at the same time.

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A.2 Warranty Information

SmartLab warrants that for a period of one year from the date of purchase (unless otherwise specified in the warranty card) that the goods supplied will perform according to the specifications defined in the user manual. Furthermore that the SmartLab product will be supplied free from defects in materials and workmanship and be fully functional under normal usage.

In the event of the failure of a SmartLab product within the specified warranty period, SmartLab will, at its option, replace or repair the item at no additional charge. This limited warranty does not cover damage resulting from incorrect use, electrical interference, accident, or modification of the product.

All goods returned for warranty repair must have the serial number intact. Goods without serial numbers attached will not be covered by the warranty.

The purchaser must pay transportation costs for goods returned. Repaired goods will be dispatched at the expense of SmartLab.

To ensure that your SmartLab product is covered by the warranty provisions, it is necessary that you return the Warranty card.

Under this Limited Warranty, SmartLab's obligations will be limited to repair or replacement only, of goods found to be defective a specified above during the warranty period. SmartLab is not liable to the purchaser for any damages or losses of any kind, through the use of, or inability to use, the SmartLab product.

SmartLab reserves the right to determine what constitutes warranty repair or replacement.

Return Authorization: It is necessary that any returned goods are clearly marked with an RA number that has been issued by SmartLab. Goods returned without this authorization will not be attended to.

**USB
Dynamic Industrial Interface
V 2.0.1.9**

**A Universal
Application Programming Interface
To Data Acquisition Products**

Users Manual

Design & Implementation by
Decision Computer International Company

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1. Introduction

This document provides the USB Dynamic Industrial Interface Specifications, including all function calls, and operating procedures.

Disclaimer:

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2. Features

The USB Dynamic Industrial Interface (USBDI) was created to provide a standard way to access the functionality provided by all USB data acquisition products. Specifically, the USBDI provides the following features:

Platform-independent

The library is compatible under Windows 98, Windows ME, Windows 2000, windows XP, Vista, and Win7. The compatibility under these operation systems guarantees that programs written for either operating system will work unchanged on the other, even without recompilation.

Abstracts Card Functionality from Card Design

The interface concentrates on a card's functionality and hides the user from having to know specifics about the card design, for example, which port needs to be accessed in order to access specific functionality. All details of the card implementation are hidden from the user.

Multiple Device Support

You could access device by its name or by its information (device type, id index).

Programming Language Independent

The library provides a language independent way to access the USB industrial I/O cards, by using a Dynamic-Link-Library architecture.

3. Device Type Definition

Below are names for device types and its' corresponding defined value:

USB_16PIO	0x01	// USB 16 Channel Photo Input / 16 Channel Photo Output Board
USB_LABKIT	0x02	// USB LABKIT
USB_16PR	0x03	// USB 16 Channel Photo Input / 16 Channel Relay Output Board
USB_STARTER	0x04	// USB STARTER
USB_8PR	0x06	// USB 8 Channel Photo Input / 8 Channel Relay Output Board
USB_4PR	0x07	// USB 4 Channel Photo Input / 4 Channel Relay Output Board
USB_8PI	0x08	// USB 8 Channel Photo Input Board
USB_8RO	0x09	// USB 8 Channel Relay Output Board
USB_16PI	0x0A	// USB 16 Channel Photo Input Board
USB_16RO	0x0B	// USB 16 Channel Relay Output Board
USB_32PI	0x0C	// USB 32 Channel Photo Input Board
USB_32RO	0x0D	// USB 32 Channel Relay Output Board
USB_IND	0x0E	// USB Industry Board
USB_M_4IO	0x10	// USB Mini 4 I/O

Notice : Please use this function to open USB_14ADDA or USB_16ADDA.

4. Data Types of Function calls

Since the USBDI was developed in the C++ language, some data types used may not be present in the programming language you want to use. Please find the following data type conversion table for your convenience:

HANDLE	An opaque 32-bit integer
BYTE	A 8-bit unsigned integer
BOOL	A 32-bit integer, either 0 (FALSE) or 1 (TRUE)
DWORD	A 32-bit unsigned integer
HWND	A 32-bit integer representing a valid handle to a Window
LPTSTR	A 32-bit flat pointer to a zero terminated string
LPBOOL	A 32-bit flat pointer to a variable of type BOOL
LPBYTE	A 32-bit flat pointer to a variable of type BYTE
LPDWORD	A 32-bit flat pointer to a variable of type DWORD

Also note that the DLL employs the Standard Call (Pascal) calling mechanism, which is used for all system. USBDI as well and is compatible with VB, VC, Delphi, .NET, and notice the variable with same type name may have different define in different program language. For example, in Visual Basic 6, the width of Integer is 16 bits and the width of Long is 32 bits, but in Visual Basic. Net, the width of Integer becomes 32 bits and the width of Long becomes 64 bits. If you declare variable with different width from our define, it may cause some run-time error.

5. Functions to open and close Devices

hid_OpenDevice

This function opens a device for further access by USB. Please do not use this function to open USB_14ADDA or USB_16ADDA.

Declaration

```
HANDLE hid_OpenDevice ( DWORD device_type,  
                        DWORD device_id );
```

Parameters

device_type The type of the device to open.
device_id Device's id on the Board.

For more information, please see "Device Type Table & ID Table" following below.

Return value

A valid handle representing the device, or INVALID_HANDLE_VALUE (-1) if an error occurred. For USB_STARTER, there is no ID selection and device_id = 0

Example

```
HANDLE hDevice = hid_OpenDevice(Device Type, Device Index); if (hDevice == INVALID_  
HANDLE_VALUE)  
{  
  MessageBox (NULL, "Open Failed!", "Error", MB_OK);  
}
```

hid_CloseDevice

This function closes a device by USB.

Declaration

```
BOOL    hid_CloseDevice (HANDLE hDevice)
```

Parameters

hDevice A valid device handle.

Return value

TRUE if successful, FALSE otherwise.

Example

```
hid_CloseDevice(hDevice);
```

com_OpenDevice

This function opens a device for further access by Serial Port. Please use this function to open USB_14ADDA or USB_16ADDA.

Declaration

```
HANDLE com_OpenDevice ( DWORD device_type,  
                        DWORD device_id,  
                        DWORD port_num );
```

Parameters

device_type	The type of the device to open.
device_id	Device's id on the board. For more information, please see "Device Type Table & ID Table" following below.
port_num	Com Port Num to open.

Return value

A valid handle representing the device, or INVALID_HANDLE_VALUE (-1) if an error occurred.

Example

```
HANDLE hDevice = com_OpenDevice(Device Type, Device Index, 1); if (hDevice == INVALID_  
HANDLE_VALUE)  
    MessageBox (NULL, "Open Failed!", "Error", MB_OK);
```


com_CloseDevice

This function closes a device by Serial Port.

Declaration

```
BOOL com_CloseDevice(HANDLE hDevice)
```

Parameters

hDevice A valid device handle.

Return value

TRUE if successful, FALSE otherwise.

Example

```
com_CloseDevice(hDevice);
```

Remarks

Please see "Serial_Communication.pdf" to set hardware for serial communication, and USB_LAB-KIT, USB_STARTER, USB_8PR are not supported by serial communication.

Device Type Table

Product	device_type
USB_16PIO	0x01
USB_LABKIT	0x02
USB_16PR	0x03
USB_STARTER	0x04
USB_8PR	0x06
USB_4PR	0x07
USB_8PI	0x08
USB_8RO	0x09
USB_16PI	0x0A
USB_16RO	0x0B
USB_32PI	0x0C
USB_32RO	0x0D
USB_IND	0x0E
USB_M_4IO	0x10

Device ID Table

(Switch Setting on the Device Board)



Switch Setting	device_id
1, 2, 3, 4 OFF	0
2, 3, 4 OFF, 1 ON	1
1, 3, 4 OFF, 2 ON	2
3, 4 OFF, 1, 2 ON	3
1, 2, 4 OFF, 3 ON	4
2, 4 OFF, 1, 3 ON	5
1, 4 OFF, 2, 3 ON	6
4 OFF, 2, 3, 4 ON	7
1, 2, 3 OFF, 4 ON	8
2, 3 OFF, 1, 4 ON	9
1, 3 OFF, 2, 4 ON	10
3 OFF, 1, 2, 4 ON	11
1, 2 OFF, 3, 4 ON	12
2 OFF, 1, 3, 4 ON	13
1 OFF, 2, 3, 4 ON	14
1, 2, 3, 4 ON	Firmware update

6. Functions for digital input/output

hid_SetDigitalByte

This function sets or clears a byte on a digital output line by USB.

Declaration

```
BOOL hid_SetDigitalByte ( HANDLE hDevice,  
                          DWORD dwPort,  
                          BYTE byPortState  
                          );
```

Parameters

hDevice	A valid device handle, previously obtained from hid_OpenDeviceDevice
dwPort	The index of the port on the card to manipulate. The first port has index 0. For more information, please see "Write Address Table" following below.
byPortState	The new state of the port

Return value

TRUE if successful, FALSE otherwise.

If an error occurred, GetLastError() may return the following values:

ERROR_INVALID_PARAMETER - The handle passed was invalid, or the port number was out of range for the device selected.

Example

```
HANDLE hDevice = hid_OpenDevice(0x01,0);  
if (hDevice != INVALID_HANDLE_VALUE)  
{  
    hid_SetDigitalByte( hDevice, 0, 0xFF); // set's all bits on the first port  
    hid_CloseDevice(hDevice);  
}
```

com_SetDigitalByte

This function sets or clears a byte on a digital output line by Serial Port.

Declaration

```
BOOL com_SetDigitalByte ( HANDLE hDevice,  
                          DWORD dwPort,  
                          BYTE byPortState  
                          );
```

Parameters

hDevice	A valid device handle, previously obtained from com_OpenDevice
dwPort	The index of the port on the card to manipulate. The first port has index 0. For more information, please see "Write Address Table" following below.
byPortState	The new state of the port

Return value

TRUE if successful, FALSE otherwise.

If an error occurred, GetLastError() may return the following values:

ERROR_INVALID_PARAMETER - The handle passed was invalid, or the port number was out of range for the device selected.

Example

```
HANDLE hDevice = com_OpenDevice(0x01,0);  
if (hDevice != INVALID_HANDLE_VALUE)  
{  
    com_SetDigitalByte( hDevice, 0, 0xFF); // set's all bits on the first port  
    com_CloseDevice(hDevice);  
}
```

Remarks

Please see "Serial_Communication.pdf" to set hardware for serial communication, and USB_LAB-KIT, USB_STARTER, USB_8PR are not supported by serial communication.

Write Address Table

Product	dwPort	Content
USB_16PIO	0x02	OUT07 to OUT00
	0x03	OUT15 to OUT08
USB_LABKIT	0x03	P1D07 to P1D00
	0x03	P1D07 to P1D00
USB_16PR	0x02	OUT07 to OUT00
	0x03	OUT15 to OUT08
USB_8PR	0x01	OUT07 to OUT00
	0x02	DIO7 to DIO0
	0x03	DIO15 to DIO8
USB_4PR	0x02	OUT03 to OUT00
USB_8RO	0x02	OUT07 to OUT00
USB_16RO	0x02	OUT07 to OUT00
	0x03	OUT15 to OUT08
USB_32RO	0x00	OUT07 to OUT00
	0x01	OUT15 to OUT08
	0x02	OUT23 to OUT16
	0x03	OUT31 to OUT24
USB_IND	0x00	Port 0
	0x01	Port 1
	0x02	Port 2
	0x03	Port 3
	0x04	Port 4
	0x05	Port 5
	0x06	Port 6
	0x07	Port 7
	0x08	DIO
	0x0D	IOCONFIG
USB_M_4IO	0x02	OUT03 to OUT00

hid_GetDigitalByte

This function reads a complete byte from a digital input port of a device by USB.

Declaration

```
BOOL hid_GetDigitalByte ( HANDLE hDevice,  
                          DWORD dwPort,  
                          LPBYTE lpbyPortState  
                        );
```

Parameters

hDevice	A valid device handle, previously obtained from hid_OpenDeviceDevice
dwPort	The index of the port on the card to manipulate. The first port has index 0. For more information, please see "Read Address Table" following below.
lpbyPortState	A pointer to a variable of type BYTE receiving the new state of the port

Return value

TRUE if successful, FALSE otherwise.

If an error occurred, GetLastError() may return the following values:

ERROR_INVALID_PARAMETER – The handle passed was invalid, or the port number was out of range for the device selected.

Example

```
HANDLE hDevice = hid_OpenDevice(0x01,0); if (hDevice != INVALID_HANDLE_VALUE)  
{  
  hid_GetDigitalByte( hDevice, 0, &byState); // reads the state of the first input port hid_  
  CloseDevice(hDevice);  
}
```

com_GetDigitalByte

This function reads a complete byte from a digital input port of a device by Serial Port.

Declaration

```
BOOL com_GetDigitalByte ( HANDLE hDevice,  
                          DWORD dwPort,  
                          LPBYTE lpbyPortState  
                          );
```

Parameters

hDevice	A valid device handle, previously obtained from com_OpenDevice
dwPort	The index of the port on the card to manipulate. The first port has index 0. For more information, please see "Read Address Table" following below.
lpbyPortState	A pointer to a variable of type BYTE receiving the new state of the port

Return value

TRUE if successful, FALSE otherwise.

If an error occurred, GetLastError() may return the following values:

ERROR_INVALID_PARAMETER – The handle passed was invalid, or the port number was out of range for the device selected.

Example

```
HANDLE hDevice = com_OpenDevice(0x01,0);  
if (hDevice != INVALID_HANDLE_VALUE)  
{  
    com_GetDigitalByte( hDevice, 0, &byState); // reads the state of the first input port  
    com_CloseDevice(hDevice);  
}
```

Remarks

Please see "Serial_Communication.pdf" to set hardware for serial communication, and USB_LAB-KIT, USB_STARTER, USB_8PR are not supported by serial communication.

Read Address Table

Product	dwPort	Content
USB_16PIO	0x00	IN07 to IN00
	0x01	IN15 to IN08
USB_LABKIT	0x02	P0D07 to P0D00
USB_STARTER	0x02	P0D07 to P0D00
USB_16PR	0x00	IN07 to IN00
	0x01	IN15 to IN08
USB_8PR	0x00	IN07 to IN00
	0x02	DIO7 to DIO0
	0x03	DIO15 to DIO8
	0x10	JP9/JP10 Settings
USB_4PR	0x00	IN03 to IN00
USB_8PI	0x00	IN07 to IN00
USB_16PI	0x00	IN07 to IN00
	0x01	IN15 to IN08
USB_32PI	0x00	IN07 to IN00
	0x01	IN15 to IN08
	0x02	IN23 to IN16
	0x03	IN31 to IN24
USB_IND	0x00	Port 0
	0x01	Port 1
	0x02	Port 2
	0x03	Port 3
	0x04	Port 4
	0x05	Port 5
	0x06	Port 6
	0x07	Port 7
	0x08	DIO
	0x0D	IOCONFIG

	0x10	Port 0 default value
	0x11	Port 1 default value
	0x12	Port 2 default value
	0x13	Port 3 default value
	0x14	Port 4 default value
	0x15	Port 5 default value
	0x16	Port 6 default value
	0x17	Port 7 default value
	0x18	Port DIO default value
	0x19	Input/output default setting
USB_M_4IO	0x00	IN03 to IN00

Remarks

In USB_8PR, we provide 2 digital ports for user to define either as input or output. It can be defined by Jumper 10 and Jumper 11 on the board. And we can use `hid_GetDigitalByte / com_GetDigitalByte` function to read Jumper State to determine which port is either input or output.

`hid_GetDigitalByte(hDevice, 0x10, &byState);` // or use `com_GetDigitalByte` for serial communication

When JP9 is closed, DIO7 - DIO0 is for Input. The fifth bit of `byState` is 0

When JP9 is opened, DIO7 - DIO0 is for Output. The fifth bit of `byState` is 1

When JP10 is closed, DIO15 – DIO8 is for Input. The sixth bit of `byState` is 0

When JP10 is opened, DIO15 – DIO8 is for Output. The sixth bit of `byState` is 1

7. Functions for reset hardware device

hid_ResetHW

This function directly resets the hardware device by USB. And all channels on the board will load default value. If you need to control the device again, please use hid_open to get the handle again.

Declaration

BOOL hid_ResetHW(HANDLE hDevice)

Parameters

hDevice A valid device handle.

Return value

TRUE if successful, FALSE otherwise.

Example

```
hid_ResetHW (hDevice);
```

com_ResetHW

This function directly resets the hardware device by Serial Port. And all channels on the board will load default value.

Declaration

BOOL com_ResetHW(HANDLE hDevice)

Parameters

hDevice A valid device handle.

Return value

TRUE if successful, FALSE otherwise.

Example

```
com_ResetHW(hDevice);
```

8. Functions for analog input/output

hid_GetAnalogChannel

This function reads a complete word from an analog input port of a device by USB.

Declaration

```
BOOL hid_GetAnalogChannel ( HANDLE hDevice,  
                           DWORD dwPort,  
                           LPDWORD lpdwPortState  
                           );
```

Parameters

hDevice	A valid device handle, previously obtained from hid_OpenDeviceDevice
Port	The index of the port on the card to manipulate. The first port has index 0.
lpdwPortState	A pointer to a variable of type DWORD receiving the new state of the port

Return value

TRUE if successful, FALSE otherwise.

If an error occurred, GetLastError() may return the following values:

ERROR_INVALID_PARAMETER - The handle passed was invalid, or the port number was out of range for the device selected.

Example

```
HANDLE hDevice = hid_OpenDevice(0x02,0); // USB_LABKIT  
if (hDevice != INVALID_HANDLE_VALUE)  
{  
    hid_GetAnalogChannel ( hDevice, 0, &dwState); // reads the state of the first analog input port  
    hid_CloseDevice (hDevice);  
}
```

Remarks

This function now only enable in USB_LABKIT and USB_STARTER device. The range of dwPort is from 0~7.

