

# LLD-AIO-004

User Manual Ver.: V1.00



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# 1. Product introduction

# **1.1.Product description**



### 2. Product specifications

# **2.1.Hardware specifications System Core** ▶ BeagleBone Green Module **GPIO** ▶ Quantity : 22 ▶ Type : 3.3V CMOS ▶ 2.54mm pin header connector x 16 GPIO DIP Switch x 2 GPIO LED x 3 GPIO Beeper x 1 GPIO RS-232 port ▶ Quantity : 1 RS-232 Signal : TxD, RxD, RTS, CTS, DTR, DSR, DCD, GND ▶ Protection : 15KV ESD Static , 400W Surge Protection Connector : DB9 Male **RS-485** port $\triangleright$ Quantity : 2 ▶ RS-485 Signal : Data+, Data-, GND (support Auto Data Direction Control) Multi-Drop Nodes : 400 **b** Built-in Terminal Resistor : $120\Omega$ , Setting by Jumper (Need to open the case) ▶ Protection : 2KV isolated protection, 15KV ESD Static, 400W Surge Protection Connector: 3.5mm Terminal Block **UART** port $\triangleright$ Quantity : 2 $\lor$ UART(A) Signal : TxD $\lor$ RxD $\lor$ GND ▶ UART(B) Signal : TxD 、 GND Connector: 3.50mm Terminal Block **Digital Input** ▶ Quantity : 3 ▶ Input voltage : 5~24VDC ▶ Signal Type : Sink mode Protection : 2000Vrms optically isolated protection Connector : 3.5mm Terminal Block **BBG RS-232 Console** ▶ Quantity : 1 ▶ Signal : RS-232 (TxD, RxD, GND) Connector : 3-pin 2.54mm PIN block **Serial Port Parameter** ▶ Baud Rate : 300 ~ 921,600 bps ▶ Parity : None, Even, Odd, Mark, Space Data Bits : 5, 6, 7, 8 ▶ Stop Bit : 1, 1.5, 2 bits ▶ Flow Control(RS-232 only) : RTS/CTS, XON/XOFF, None Power ▶ Working Voltage : DC 9~24VDC Power Connector : 5.00mm Terminal Block ▶ Power Consumption : <5W (exclude USB device) ▶ Power output : 3.3V & 5V DC(1A max)

Embedded Automation & Cloud Application Power supply output contacts: : combine GPIO pin header connector with UART terminal block Others ▶ Real Time Clock (RTC): 1 Buzzer : 1 ▶ LED indicator : power, network, serial port, control signal, user defined ▶ PCB size : 98 x 102 ▶ Fixed hole :  $\Phi$ 3.50mm x 8 (Fix BBG x4 , PCB pad high x4) ▶ Applicable Temperature : 0~50°C ▶ Applicable Humidity : 20%~80% RHG **Connection to BBG** 

> 2x23 2.54 PIN block: 2 VDC Working Voltage UART: 5 **GPIO** :22 RTC(I2C):1

▶ 1x4 2.54 wafer: 1 **BBG** Console :1

#### **BeagleBone Green Built-in communication function**

Ethernet : 100Mbps , RJ45 x 1

▶ USB Host : USB 2.0 , TypeA x 1

▶ USB Client : microUSB , TypeB x 1

- (Can not be used as LLD-AIO-004 power supply input)
- ▷ SD : MicroSD socket x 1

# 2.2.LED indicator description



Power	Power indicator
	Connect the operating voltage orrectly.
System	System indicator
2	Linuxnormally completed boot. (About 15 to 20 seconds to
	start light)
<b>RS-232</b>	RS-232 data indicator
	red: Data receiving
	green : Data transmission
<b>RS-485(1)</b>	RS-485(1) data indicator
	red: Data receiving
	green : Data transmission
<b>RS-485(2)</b>	RS-485(2) data indicator
	red: Data receiving
	green : Data transmission
UART(A)	UART(A) data indicator
	red : Data receiving
	green : Data transmission
U-def1	U-def1
	User control lights
	User control by DO(Digital Output)
U-Def2	U-def2
	User control lights
	User control by DO(Digital Output)



# **2.3.Pin definition of each communication and control interface**

LAN1 \ LA	N2 (Ethernet)		Working Vo	oltage Input	
Pin           1           2           3           6	Signal ETX+ ETX- ERX+ ERX-	RJ45	Pin           1           2           ● DC Ran	Signal           DC +           GND           ge: 12V DC	5.00mm TB
RS-232			GPIO		
Pin           1           2           3           4           5           6           7           8           9	Signal DCD RxD TxD DTR GND DSR RTS CTS X	DB9	Pin         Signa           1         GPI001           3         GPI003           5         GPI005           7         GPI007           9         GPI009           11         GPI011           13         GPI013           15         GPI015           17         GND           19         X	Pin         Signal           2         GPI002           4         GPI004           6         GPI006           8         GPI008           10         GPI010           12         GPI012           14         GPI014           15         16           18         GND           20         DV5V	20- pin header connector
RS-232 Cor	nsole		Digital Inpu	ıt	
Pin           1           2           3	Signal TxD RxD GND	3.50mmTB	Pin           1           2           3           4           5           6	Signal DC 5V DC 3.3V GND TX(B) RX(A) TX(A)	3.50mmTB
RS-485			RS-485 Ters	minating resista	nce - Need to open the
Pin           1           2           3           4	Signal D1+ D1- GND D2+	3.50mmTB	Short Open	without Terminating resistance with Terminating resistance	
5 6	D2- GND				

# 2.4.BeagleBone Green core board and LLD-AIO-004 Cape wiring explanation

Please connect LLD-AIO-004 proprietary Console cable with BeagleBone Green's core board.

(1.) BegaleBone Green core board



When using a dedicated cable, note the wiring order. From right to left that order is from black  $\rightarrow$  white $\rightarrow$ green three colors.

(2.) LLD-AIO-004 Cape



# 2.5.Software specifications

- ▷ OS : Linux(LLD technology optimization)
- Common drivers : Ethernet 
  VART 
  RS-232 
  RS-485 
  GPIO 
  RTC
- Common service : SSH \ lighttp web server \ MSQL

▶ Example program : communication RS-232 、 RS-485 、 UART) 、 GPIO(GPIO 、 DIP Switch 、 LED 、 LLD-M01 I/Omodel)

Development environment : C Language , in Linux or Window OS

#### 2.6.Ethernet Console connection

- A. Ethernet Console Introduction
  - a. After Internet connected with LLD-AIO-004, we can controlling and operating file on the system
  - b. Connet computer with LLD-AIO-004 port by internet cable
  - > If the ordinary network lead the operation problem , can change into crossover testing
  - c. Set the computer IP to LLD–AIO-004 same network segment LLD–AIO-004 default IP is 192.168.2.127 Netmask is 255.255.255.0

#### **WINDOWS XP ENVIRONMENT SETTING**

<u>Step.01a</u> My network places  $\rightarrow$  right-click- Properties  $\rightarrow$  Ethernet $\rightarrow$  right-click-Properties ; Or hit Control panel.

📱 Wi-Fi Properties 🛛 🗙	📱 Wi-Fi Properties 🛛 🗙
Networking Sharing	Networking Sharing
Connect using:	Connect using:
🛃 Realtek 8821AE Wireless LAN 802.11ac PCI-E NIC	🛒 Realtek 8821AE Wireless LAN 802.11ac PCI-E NIC
Configure This connection uses the following items:	Configure This connection uses the following items:
<ul> <li>✓ 望口ient for Microsoft Networks</li> <li>✓ 望日 and Printer Sharing for Microsoft Networks</li> <li>✓ 望口oS 封包排程器</li> <li>✓ 通路網路通訊協定第4版(TCP/IPv4)</li> <li>▲ Microsoft LLDP 通訊協定驅動程式</li> <li>▲ Microsoft LLDP 通訊協定驅動程式</li> <li>▲ 網際網路通訊協定第6版(TCP/IPv6)</li> </ul>	✓       Client for Microsoft Networks       ▲         ✓       File and Printer Sharing for Microsoft Networks       ▲         ✓       QoS 封包排程器       ▲         ●       網際網路通訊協定第 4 版(TCP/IPv4)       ▲         ●       網際的路通訊協定第 4 版(TCP/IPv4)       ▲         ●       網際網路通訊協定第 6 版 (TCP/IPv6)       ✓          網際網路通訊協定第 6 版 (TCP/IPv6)       ✓
Install         Uninstall         Properties           Description  <	Install         Uninistall         Properties           Description         (博動控制通訊協定/網際網路通訊協定 (TCP/IP)。這是預 設的廣域網路通訊協定,提供不同網路之間的通訊能力。
OK Cancel	OK Cancel

Notice:DO not set IP address to 192.168.2.X. The Range of X is1~255.Also,do not use the same X number like LLD–AIO-004. !

#### WINDOWS 7 ENVIRONMENT SETTING

<u>Step.01b</u> Start  $\rightarrow$  Control Panel  $\rightarrow$  Network and Internet-View network status and tasks.



#### Step.02 Change adapter settings.



Embedded Automation & Cloud Application <u>Step.03</u> Ethernet(Wi-Fi)  $\rightarrow$ right-click Properties.

http://www.connections				×
← → ∨ ↑ 🔄 > Control Panel > Net	twork and Internet > Network Connections >	v Ö	Search Ne	P
Organize  Connect To Disable this	s network device Diagnose this connection »		•	?
Wi-Fi LLD_Network Realtek 8821AE Wireless © Dis Co Sta Dia © Bri Cre © De Rei	Z大網路 Notwork cable una lugged mily Controller mily Controller mily Controller mily Controller mily Controller mily Controller			
💎 Pro	operties			
2 items 1 item selected				=

<u>Step.04</u>網際網路通訊協定第4版(TCP/IPv4) → Properties.

Networking Sharing			,
Connect using:			
Realtek 882	IAE Wireless LAN 802.11a	IC PCI-E NIC	
This connection use	es the following items:	Configure	ð
<ul> <li>✓ ■ Client for M</li> <li>✓ ■ File and Pr</li> <li>✓ ■ QoS 封包</li> <li>✓ ■ 網際網路</li> <li>■ Microsoft I</li> <li>■ Microsoft I</li> <li>■ Microsoft I</li> <li>■ Microsoft I</li> </ul>	licrosoft Networks inter Sharing for Microsoft 非程器 通訊協定第 4 版 (TCP/IP Network Adapter 多工器通 LDP 通訊協定驅動程式 通訊協定第 6 版 (TCP/IP	Networks <mark>v4)</mark> 訳協定 v6)	<
<			>
Install	Uninstall	Properties	s
Description 傳輸控制通訊協 設的廣域網路通 力。	號⊂/網際網路通訊協定( ●訊協定,提供不同網路	TCP/IP)。這是 之間的通訊能	預

Embedded Automation & Cloud Application <u>Step.05</u> IP address : 192.168.2.1 ; Subnet mask :  $255.255.255.0 \rightarrow OK$ .

網際網路通訊協定第 4 版 (TCP/IPv4)	Properties	×
General		
You can get IP settings assigned autom this capability. Otherwise, you need to for the appropriate IP settings.	natically if your network supports ask your network administrator	
Obtain an IP address automatical	у	
Use the following IP address:		- II
IP address:	192.168.2.1	
Subnet mask:	255 . 255 . 255 . 0	
Default gateway:		
Obtain DNS server address autom	atically	
• Use the following DNS server addr	resses:	- II
Preferred DNS server:	168 . 95 . 1 . 1	
Alternate DNS server:	8.8.8.8	
Validate settings upon exit	Advanced	
	OK Cance	4

<u>Step.06</u> Click OK button when the setting is completed.

🏺 Wi-Fi Properties	×
Networking Sharing	
Connect using:	
Ţ Realtek 8821AE Wireless LAN 802.11ac PCI-E NIC	
Configure This connection uses the following items:	]
<ul> <li>✓ Client for Microsoft Networks</li> <li>✓ File and Printer Sharing for Microsoft Networks</li> <li>✓ QoS 封包排程器</li> <li>✓ a 網際網路通訊協定第 4 版 (TCP/IPv4)</li> <li>▲ Microsoft Network Adapter 多工器通訊協定</li> <li>▲ Microsoft LLDP 通訊協定驅動程式</li> <li>✓ a 網際網路通訊協定第 6 版 (TCP/IPv6)</li> </ul>	
Install Uninstall Properties Description 讓您的電腦能夠存取 Microsoft 網路上的資源。	
OK Cancel	



#### B. Putty operation

#### • Please copy attached file-putty.exe to Desktop and execute.

<ul> <li>x,≠, fill → 2.2 cuterier Console 土柱百姓線</li> <li>焼錄 新増資料夾</li> </ul>		▼ \$ <del>9</del> 搜尋 2.2 E	thernet Console .	主控台連線
名稱	修改日期	類型	大小	
뤎 Broadcast.exe	2011/11/22下午…	應用程式	128 KB	
🗐 Ethernet Console 主控台連線.docx	2012/5/10 下午 0	Microsoft Office	442 KB	
🛃 putty.exe	2010/12/22 下午	應用程式	444 KB	

Step.01 Host Name (or IP address) key in192.168.2.127

 $\rightarrow$ Connection type choose Telnet , Port will automatically change to 23

 $\rightarrow$ Press Open after the setting is completed.

🕵 PuTTY Configuration	<b>X</b>
Category: Session Logging Terminal Keyboard Bell	Basic options for your PuTTY session         Specify the destination you want to connect to         Host Name (or IP address)         192.168.2.127         23
Window Appearance Behaviour Translation Selection Colours Connection Data Proxy Telnet Rlogin SSH Serial	Connection type:   Raw   Image:
<u>A</u> bout	Close <u>wi</u> ndow on exit: Always Never Only on clean exit Open

Step.02 Login operation. Please refer to Telnet login



#### Login successful



#### 2.7.RS-232 Console connection

A. Serial Console introduction

Through the RS-232 interface in computer to control and execute the file operation on EBox-AIO-004 embedded system  $\circ$ 

- B. Putty operating
  - <u>Step.01</u>

Connect Console Port / RS-232(female) on EBox–AIO-004 with RS-232(male) on computer for each other.



Please copy attached file putty.exe to Desktop and execute.

8改日期 011/11/22 下午 012/5/10 下午 0 010/12/22 下午	類型 應用程式 Microsoft Office 應用程式	大小 128 KB 442 KB	
011/11/22 下午 012/5/10 下午 0 010/12/22 下午	應用程式 Microsoft Office 應用程式	128 KB 442 KB	
012/5/10 下午 0 010/12/22 下午	Microsoft Office 應用程式	442 KB	
010/12/22 下午	應用程式	444 1/10	
		444 KB	
	l		

#### <u>Step.02</u>

Select the type of connection ( Connection type → click Serial ) →Setting RS-232 Port (Serial line) and Speed [Speed (baud) : 115200] on computer. [If you don't know port number. ◆Please search ComPort at Administrator] →Setting Configure the serial line properties (Connection on left → choose Serial) [Data bits : 8 \ Stop bits : 1 \ Parity : None \ Flow control : None] →Press Open after the setting is completed.

🔀 PuTTY Configuration		X
Category:		
Logging     Terminal     Keyboard     Bell     Features     Window     Appearance     Behaviour     Translation     Selection     Colours     Connection     Data     Proxy     Telnet     Discie	Specify the destination you was Serial line COM8 Connection type: Raw Telnet Rlog Load, save or delete a stored a Saved Sessions Default Settings	ant to connect to Speed 115200 gin O SSH O Serial session Load Save Delete
About	Close <u>w</u> indow on exit: Always Never (	Only on clean exit
		x
Ne Put if Configuration		
Category:	Options controlling Select a serial line Serial line to connect to	local serial lines
Category: Session Logging Terminal Keyboard Bell	Options controlling Select a serial line Serial line to connect to	local serial lines
Category: Session Logging Terminal Keyboard Bell Features 	Options controlling Select a serial line Serial line to connect to Configure the serial line Speed (baud)	local serial lines COM8 115200
Category: 	Options controlling Select a serial line Serial line to connect to Configure the serial line Speed (baud) Data bits	local serial lines COM8 115200 8
Category: 	Options controlling Select a serial line Serial line to connect to Configure the serial line Speed (baud) Data bits Stop bits	Iocal serial lines COM8 115200 8 1
Category: 	Options controlling Select a serial line Serial line to connect to Configure the serial line Speed (baud) Data bits Stop bits Parity Flow control	Iocal serial lines COM8 115200 8 1 None None
Category: 	Options controlling Select a serial line Serial line to connect to Configure the serial line Speed (baud) Data bits Stop bits Parity Flow control	local serial lines COM8 115200 8 1 None • None •

#### Step.03

Account password default is'root'. But the password word is hidden and will not be displayed .



#### <u>Step.04</u>

Complete login •





#### <u>Step.05</u>

If the input is wrong, need to enter the account and password again.

B COM3 - PuTTY	_ 0 <mark>_</mark> X	
The IP Address for eth0 is: 192.168.2.127 LLD-BBG login: root Password:		*
Login incorrect LLD-BBG login:		
		-

# STEP.01 Press System in Control Panel

System and Security				
← → ∽ ↑ 🔩 > Control Panel	System and Security	v Ū	Search Co	<i>.</i> ۸
Control Panel Home • System and Security	Security and Maintenance Review your computer's status and resolve issues   🗣 Change User Account Control settings			
Network and Internet Hardware and Sound	Troubleshoot common computer problems  Vindows Firewall  Check firewall status   Allow an app through Windows Firewall			
User Accounts Appearance and Personalization	System View amount of RAM and processor speed   SAllow remote access   Launch remote assistance   See the name of this computer			
Clock, Language, and Region Ease of Access	Power Options Change battery settings   Change what the power buttons do   Change when the computer sleeps			
	File History Save backup copies of your files with File History   Restore your files with File History			
	Backup and Restore (Windows 7) Backup and Restore (Windows 7)   Restore files from backup			
uuu	Storage Spaces Manage Storage Spaces			
	Work Folders Manage Work Folders			
1	Administrative Tools Free up disk space   Defragment and optimize your drives    Create and format hard disk partitions   View event logs    Create and format hard disk partitions			
I	Flash Player (32-bit)			

# STEP.02 Click Device Manager

System			- L ×
← → × ↑ Ӯ > Control P	Panel > System and Security > Sys	tem	V Ö Search Co A
Control Panel Home	View basic information	about your computer	
Remote settings System protection Advanced system settings	Windows edition Windows 10 Home © 2016 Microsoft Corpora	Windows edition	
	System		
	Processor: Installed memory (RAM): System type: Pen and Touch:	Intel(R) Core(TM) i5-4200H CPU @ 2.80GHz 2.80 GHz 8.00 GB (7.89 GB usable) 64-bit Operating System, x64-based processor No Pen or Touch Input is available for this Display	
			Support Informati
	Computer name, domain, and	workgroup settings	
	Computer name: Full computer name: Computer description:	Wayne-NB Wayne-NB	Change settings
	Workgroup:	WORKGROUP	
	Windows activation	ad the Microsoft Software License Terms	
	Product ID: 00326-10000-0	00000-AA115	Change product key
See also			
Security and Maintenance			

<u>STEP.03</u> We can find Comm Port under option port (COM and LPT). Notice: "裝置管理員" means Device Manager under.



<u>STEP.04</u> Choose the active port.

🕵 PuTTY Configuration		×
Putty Configuration Category: Catego	Options controlling le Select a serial line Serial line to connect to Configure the serial line Speed (baud) Data bits Stop bits Parity Flow control	COM8 9600 8 1 None XON/XOFF V
About	Op	ven Cancel

# 3. Combination experiment of LLD-AIO-004 with LLD-M01

# 3.1. Wiring

(1.) LLD-AIO-004



## (2.) LLD-M01



(3.) Complete wiring





# **3.2.** Upload execution file

Upload the file via FTP

(1.) Open FTP key in Default IP: 192.168.2.127 ID/PWD: root

🔁 root@1921682127 - FileZilla						= 0 - X
● 「「「「」」」」」」」」」」」」」」」」」」」」」」」」」」」」」」」」」	書號(8) 說明(出) 有新品	(‡( <u>N)</u> )				
主機(H): 192168.2.127 使用書名編(L): rc	ot #3500	···· ·	e í	快速通嫁(Q) ·		
状態 記録 状態 正在取得目錄列表 状態 成功取得 "/home/root" 的目錄 状態 正在影除 4 復編集 化 "/home/root"						
本地站台 C:\Users\Peterson\Desktop\AlO004\			· 連號站台: /h	ome/root		
	Win7_64bit_Driver_v3.14.3 PD Utility	e_whqu	6 2 /	ne root		
编四名编	橫宮大小 橫宮護型	最後修改的間		福富大小 福宮通型	最後修改時間 權限	擁有人/群組
istofjava jar I Chello, sve I gpio.exe I serialtest.exe	1,435 JAR 福富 7,278 唐弗威式 11,493 唐用磁式 9,508 厘用磁式	2016/10/6 下午 0 2016/10/6 下午 0 2016/10/6 下午 0 2016/10/6 下午 0		28	<b>9</b> 万.表	
< ≰ 優備載 總共大小: 29,714 Byte	m	,	空目線.			
伺服器/本地爆震 方向 蠻樂	Ψġ.	大小 優先曜 狀態				
着碳的描意 傳輸失敗 傳輸成功					7 888 存款支	••

(2.) Select the executable file to upload, Upload as shown below

7 root@192168.2.127 - FileZilla										
植具白 编辑区 检視公 序输口 伺服器(3)	書類(13) 説明(1	9 有新版本位	DI							_
	11 R S A									
主機(出): 192.168.2.127 使用者名稱(以): #	oot	業額(₩): ●	••• 通报場(	D:	快速連線(Q) ·					
1.型: 正在取得 "/home/root" 的目錄列表 1.型: 計算伺服器的時蓋角移量 代題: 伺服器時差角 504921600 彩. 元證: 成功取得 "/home/root" 的目錄										
本地站台: C:\Users\Peterson\Desktop\AlO004	e).			道博站台: /	home/root					
	_Win7_64bit_Drive	r_v3.14.3.6_W	HQL	0- <u>2</u> / 0-2 h	ome i root					
偏离名稱	橫當大小	橫高線型	最後修改的間	橫震名稱	^ _ g	廣大小	領食調査	最後信改時間	權限	擁有人/群組
→	1,435 7,278 11,493 9,508	JAR 爆雲 直用程式 唐用程式	2016/10/6 下午 0 2016/10/6 下午 0 2016/10/6 下午 0 2016/10/6 下午 0	🧰 🗊 gpio.exe	0	11,493	應用程式	2000/1/1 上年	-nw	00
副取 1 個檔案, 結共大小: 11,493 Byte				1 保備室 統法	共大小: 11,493 Byte					
周服職/本地爆業 方向 邊跡	相支		大小 優先曜 祆發							
等候的檔案 傳驗失敗 傳驗成功(1)								721-		

(3.) Change the executable permissions

(3-1.) Check if the files you just uploaded are present (instruction : ls –l)

🗗 192.168.2.127 - PuTTY	x
<pre>login as: root root@192.168.2.127's password: Last login: Sat Jan 1 00:01:51 2000 from 192.168.2.11 root@LLD-BBG:~# 1s root@LLD-BBG:~# root@LLD-BBG:~# root@LLD-BBG:~# is -1 total 12 -rw 1 root root 11493 Jan 1 2000 gpio.exe root@LLD-BBG:~#</pre>	
	-

(3-2.)key in instruction :chmod +x file name(Example:gpio.exe) , As shown below



## 3.3. Execute program

This case is a GPIO control example

Program description :

- (1) execute gpio.exe 1 : System, U-def1, U-def2 LED turns on and off on LLD-AIO-004 board
- (2) execute gpio.exe 2 : Buzzer will make" Be Be" sound twice on LLD-AIO-004 board
- (3) execute gpio.exe 3 : Read DIP Switch status
- (4) execute gpio.exe 4 : Control LLD-M01 DO and read DI status

execute gpio.exe 4 as follows:



LLD-M01 Execution state

