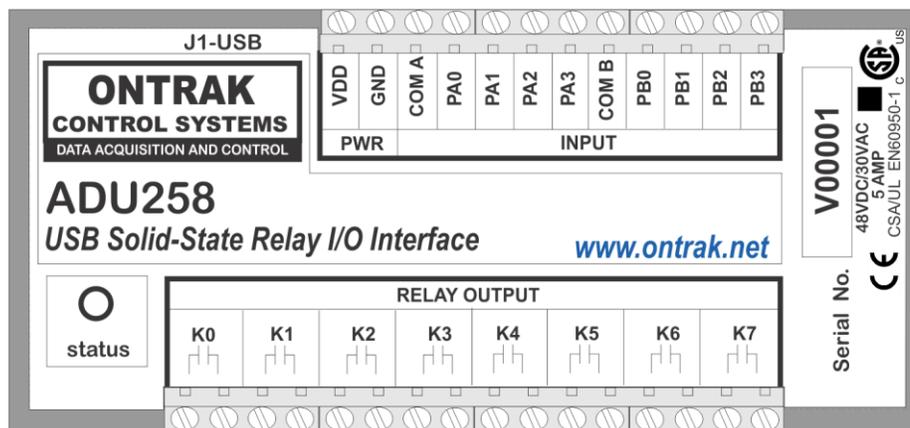
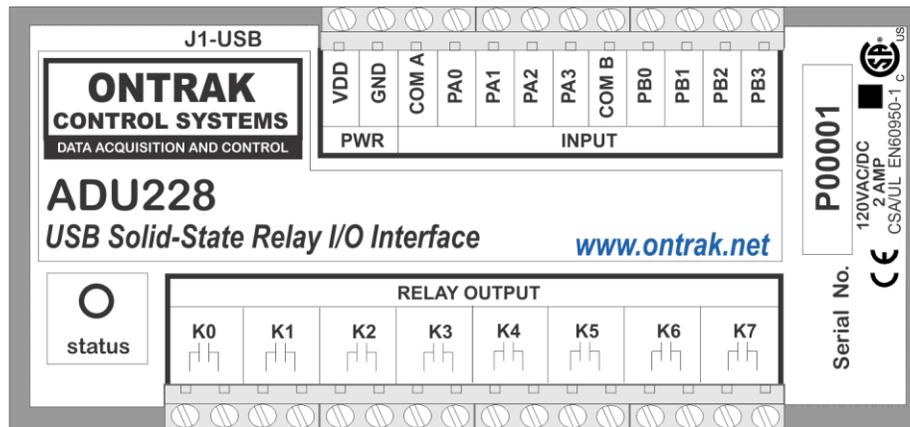


# ADU228/ADU258

## USB Solid-State Relay I/O Interface

### User Manual

Ver 1.0



# EU Declaration of Conformity

We, the undersigned,

<b>Manufacturer:</b>	Ontrak Control Systems Inc.
<b>Address, City</b>	764 Notre Dame Avenue, Unit 1, Sudbury
<b>Province, Country, Postal Code</b>	Ontario CANADA P3A2T2
<b>Phone and FAX</b>	(705) 671-2652 (705) 671-6127 ( FAX)
<b>Email Address</b>	tom@ontrak.net

certify and declare under our sole responsibility that the following Apparatus:

<b>Model No:</b> ADU228/ADU258	<b>SN:</b> P00001 and higher, V00001 and higher
<b>Description:</b>	<b>USB Solid-State Relay I/O Interface</b>
<b>Brand:</b>	<b>Ontrak Control Systems Inc.</b>

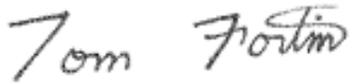
Conforms with the essential requirements of the EMC Directive 2004/108/EC, via Annex II, based on the following specifications applied:

<b>RF Emissions</b>	<i>EN55011:2009/A1:2010 Class B</i>
<b>ESD Immunity</b>	<i>IEC 61000-4-2:2008 Level 2 Criterion B</i>
<b>RF Immunity</b>	<i>IEC 61000-4-3:2006 +A1:2007 +A2:2010 Level 2 Criterion B</i>
<b>Safety</b>	<i>EN60950-1 2<sup>nd</sup> Edition (CSA/UL )</i>

And therefore complies with the essential requirements and provisions of the EMC directive.

The technical documentation is kept at the following address:

<b>Company:</b>	Ontrak Control Systems Inc.
<b>Address, City</b>	764 Notre Dame Ave, Unit 1, Sudbury
<b>Country, Postal Code</b>	Canada P3A 2T2
<b>Phone Number</b>	(705) 671-2652
<b>Fax, Email</b>	(705) 671-6127 tom@ontrak.net

<b>Name of Person binding the manufacturer.</b>	
Tom Fortin- Director Ontrak Control Systems Inc	January 10, 2018 Sudbury , Ontario, CANADA



# Table Of Contents

1.	What is Included and Where to Start	4
2.	ADU228/ADU258 Features	4
3.	The ADU228/ADU258 STATUS LED	5
4.	AduHidTest USB Device Test Program	6
5.	ADU228/ADU258 Command Summary	10
6.	ADU228/ADU258 Command Descriptions	11
	6a) Relay Commands	11
	6b) Digital Input Commands	12
	6c) Event Counter Commands	14
	6d) Watchdog Timer Commands	16
7.	Specifications	17
8.	Dimensions	18

# 1. What is Included and Where to Start

The ADU228/ADU258 ships complete with a 10' USB cable, and this User Manual.

A complete SDK including DLL, programming language examples, and AduHidtest software is available at:  
<http://www.ontrak.net/programming.htm>

First time users should first review the ASCII command set for the ADU228/ADU258 and then use AduHidTest USB test software to become familiar with the operation of the various features of the product.

Note: The AduHid DLL requires one of the following Windows operating systems, XP, Vista, Windows 7, Windows 8 or Windows 10. The programming section of the web site also contains examples for use with various other operating systems and provides details that allow use of the ADU228/ADU258 without using the Windows based AduHid DLL

## 2. ADU228/ADU258 Features

- Bus Powered, no external power supply required.
- 8, N. O. PhotoMOS SSR outputs rated 2.0A @ 120VAC, 2.0A @ 120VDC (**ADU228**)
- 8, N. O. PhotoMOS SSR outputs rated 5.0A @ 30VAC, 5.0A @ 48VDC (**ADU258**)
- 8 Digital inputs suitable for contact or TTL Input, also accept up to 24VDC
- 8, 16-bit event counters associated with digital Inputs.
- CSA/UL Approved, CE Marked
- High Retention USB connector.
- High quality PhotoMOS relays switch AC or DC loads.
- Bi-colour LED status indicator.
- High quality cage-clamp type terminal blocks.
- Uses standard HID drivers included with Windows XP,8,10
- Mini-driver (DLL) provided for use with VB, VC, LabVIEW and TestPoint
- Programming examples and sample code included for VB, VB.NET, Visual C++
- Meets IEC61000-4-2 ESD protection for USB port.
- Available as standard flange mount or optional DIN rail mount.



CAUTION: The ADU228/ADU258 features CSA/UL EN60950-1 2<sup>nd</sup> edition safety certification for primary insulation. For applications requiring double insulation, additional protection should be provided by user in end application.

### 3. The ADU228/ADU258 STATUS LED

The ADU228/ADU258 STATUS LED is a bi-colour (Red/Green) led indicator used to identify the status of the ADU228/ADU258 USB connection.

The LED modes are;

- RED -ADU228/ADU258 powered but not enumerated.
- GREEN -ADU228/ADU258 powered and enumerated by host computer.
- OFF -ADU228/ADU258 disconnected from USB bus OR host computer has entered SLEEP/SUSPEND mode.

The ADU228/ADU258 can be connected to the USB bus via the enclosed 10' A-B USB cable. The cable provides both power and communications connections to the ADU228/ADU258. When first connected, the STATUS led will turn RED indicating power is applied. For Windows operating systems, a message may flash on the screen indicating;

**New hardware Found**  
**ADU228/ADU258 USB Solid-State Relay I/O Interface**

Depending on the version of Windows, the host may prompt to search for a driver. Select,

**Let Windows Search for a Driver**

and click next.

After several seconds, the STATUS led will turn green indicating enumeration is complete. The enumeration process is completely transparent to the application program as the ADU228/ADU258 is a full-speed USB HID class device. Enumeration is completed by the Windows (or other) operating system standard USB HID drivers. The ADU228/ADU258 can be connected directly to the host hub or externally powered hubs.



**Caution: (Use of System Sleep):** If the operating system allows the host computer to enter sleep mode, attached USB devices will be set to suspend mode. In this mode the power draw of the ADU228/ADU258 drops to less than 2.5mA (USB2.0 Specification). **In suspend mode the ADU228/ADU258 relay outputs are all reset to OFF and the Status LED is turned off. Once the host computer is revived from sleep/suspend mode, the ADU228/ADU258 status LED will turn on, however, the relay outputs will remain OFF.** Ensure system power settings are set such that the host computer does not enter sleep mode during normal operation.



**Caution:** If the operating system **USB Selective Suspend** is enabled, after the ADU228/ADU258 is physically connected and enumerated (LED Green), the host may suspend the connection if no handle is opened to the ADU228/ADU258. This will cause the LED to turn off. The LED will turn green again once a handle is opened to the ADU228/ADU258. This is normal operation. In host applications the handle should be opened at the start of the application and remain open until the application closes, or the ADU228/ADU258 functionality is no longer required.

## 4. AduHidTest USB Device Test Program

AduHidTest is a Windows based USB device test program used to test the connection of ADU data acquisition devices to a USB port. The program is also a useful tool to allow programmers to become familiar with the ADU228/ADU258 command set. AduHidTest software can be downloaded from the Ontrak website at: <http://www.ontrak.net/programming.htm> . Note that the program requires the AduHid.dll to operate and it should be copied to the same directory as the AduHidTest.exe file.

There are three steps in using a USB device in any application software. The three steps are;

1. Obtain a handle for the USB device.
2. Send commands to the USB device.
3. Receive data from the USB device.

### **STEP 1: Obtain a handle for the ADU228/ADU258**

A handle is a unique code that application software uses to identify a USB device for the purpose of reading and writing to the device. A USB bus can have up to 128 devices connected to a single host and there are three criteria that can be used to open a handle. The three criteria are, Vendor ID, Product ID and Serial Number. If a single device is connected to the bus, any of the three criteria may be used. If multiple devices are connected, we recommend using the Serial Number to open the handle.

( All ADU devices have their unique serial number printed on the top label )

When run, the AduHidtest Software will display the following window.

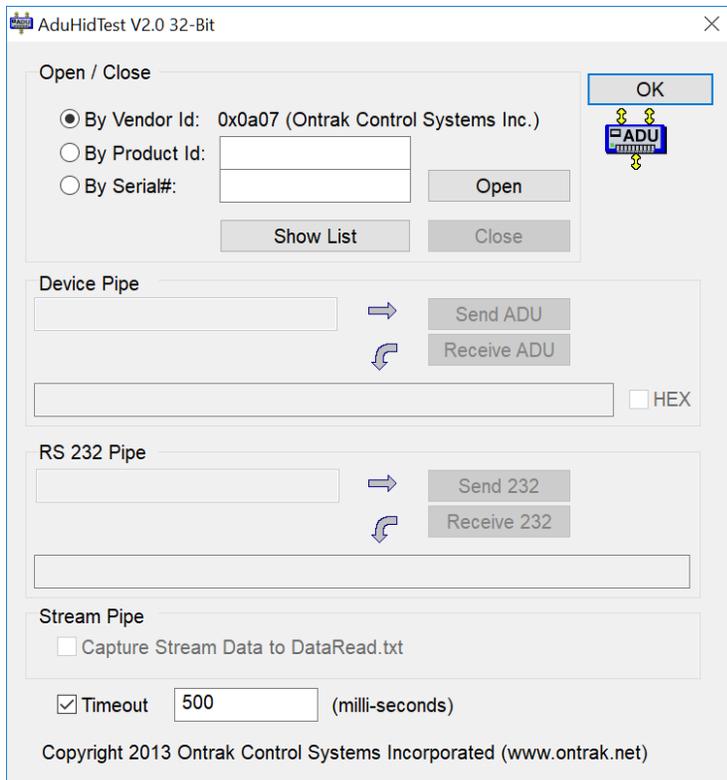


Figure 1: AduHidTest Software Window

The Open/Close section of the window is where the handle is determined. Click on the **Show List** button to view the devices connected to the USB bus. (Note: Only ADU devices will be listed ) Figure 2 is the window that appears when the **Show List** Button is clicked.

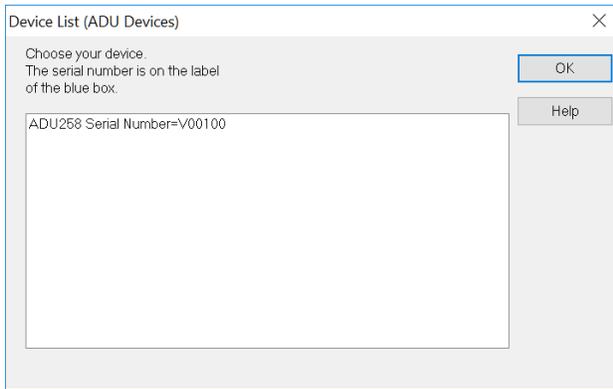


Figure 2: **ShowList** Window

The window indicates that there is one ADU228 connected with serial number V00100. Select the device by double clicking on the text **“ADU258 serial number = V00100”**. The AduHidTest main window will now display the product ID and Serial number. Click the **By Serial #** radio button and then click **Open** to open the handle to the selected ADU258.

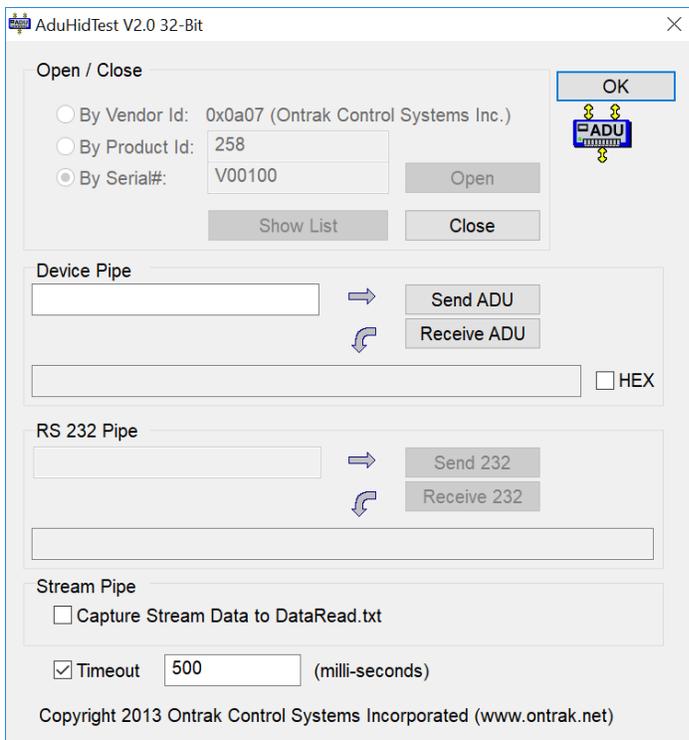


Figure 3: Handle Open to ADU258

**STEP 2: Sending Commands to the ADU228/ADU258**

Once connected, you may now send commands to the available "pipes" on the ADU228/ADU258 device. Pipes are the individual connections to functional sections of the ADU228/ADU258. The **Device Pipe** is used to send standard ASCII ADU commands to control the peripherals built into the ADU228/ADU258. The ADU228/ADU258 does not use the **RS232** or **Stream** pipes. Type "**SK0**" (set relay K0) into the device pipe send window and click **Send ADU**. An **OK** will appear beside the **Send ADU** button if successful and the ADU228/ADU258 relay K0 will close. Note that ADU commands are not case sensitive.

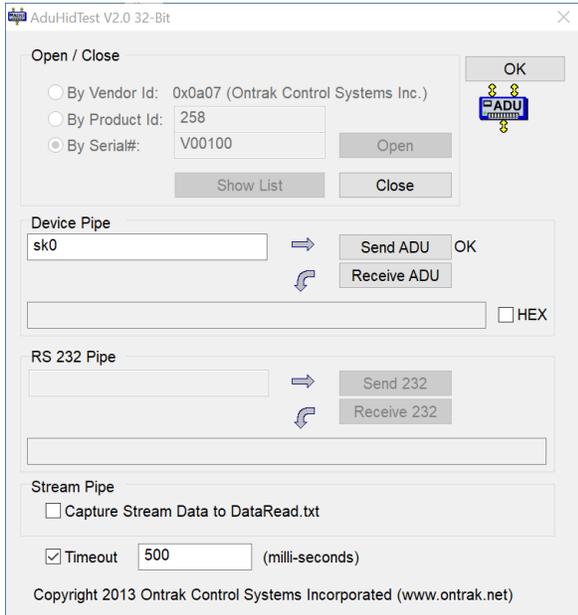


Figure 4: Sending "SK0" Command

### STEP 3: Receiving Data from the ADU228/ADU258

Some commands will cause a response to be sent from the ADU228/ADU258 back to the host computer. For example, if an "RE3" (read event counter on PA3) command is sent, the ADU228/ADU258 will send back the value of the event counter. To read responsive commands, simply click the **Receive ADU** button and the data will be displayed.

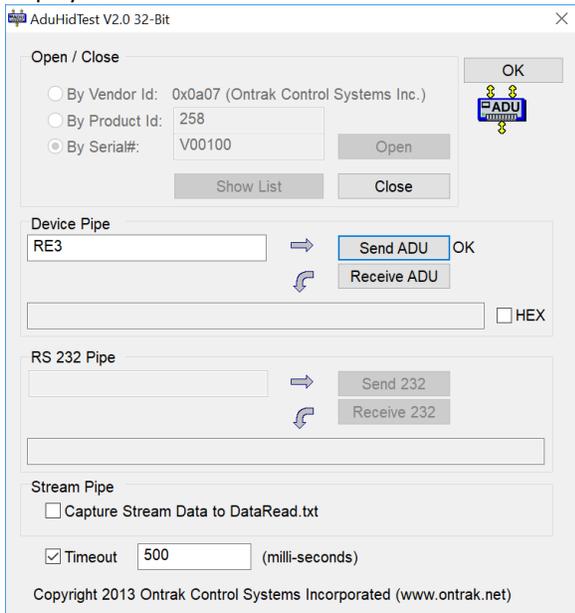


Figure 5: Sending "RE3" Command

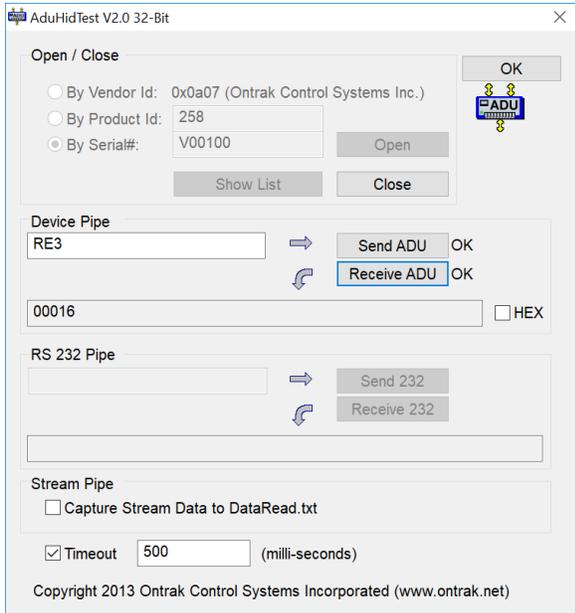


Figure 6: Receiving Data

The received data indicates Event counter 3 is at 16 counts. These procedures can be repeated using the various commands available on the ADU228/ADU258. The AduHidTest software is an invaluable tool to allow programmers to become familiar with any ADU product.

## 5. ADU228/ADU258 Command Summary

### Relay Commands (PORT K)

<b>SKn</b>	Sets relay specified by n (n = 0 to 7)
<b>RKn</b>	Resets relay specified by n (n = 0 to 7)
<b>MKddd</b>	Sets PORT K to decimal value ddd (ddd=000 to 255)
<b>RPKn</b>	Returns value of relay specified by n. (n = 0 to 7)
<b>PK</b>	Returns value of PORTK in decimal format.

### Digital Input Commands (PORT A and PORT B)

<b>RPyn</b>	Returns status of input line in PORT y specified by n (n= 0, 1, 2 or 3) (y =A or B)
<b>RPy</b>	Returns status of PORT y in binary format. (y =A or B)
<b>Py</b>	Returns status of PORT y in decimal format. (y =A or B)
<b>RI</b>	Returns status of PORT A and PORT B in decimal format.

### Event Counter Commands (PORT A and PORT B)

<b>REn</b>	Returns present count of event counter (n = 0 - 7)
<b>RCn</b>	Returns present count and clears event counter (n = 0 - 7)
<b>DBn</b>	Sets de-bounce time of event counters (n=0, 1 or 2) (0 =10ms, 1 = 1ms, 2 = 100us)
<b>DB</b>	Returns present de-bounce setting.

### Watchdog Commands

<b>WDn</b>	Sets watchdog timeout length. (n=0,1,2 or 3) (0=WD OFF, 1=1s, 2=10s, 3=1min)
<b>WD</b>	Returns watchdog setting.

## 6. ADU228/ADU258 Command Descriptions

### 6a) Relay Commands

The ADU228/ADU258 features eight solid-state PhotoMOS type relay outputs. They are configured as PORT K with individual assignments of K0 thru K7. The relay contacts have no polarity requirements and switch either AC or DC loads.



CAUTION: Power dissipation of PhotoMOS relays increases with switching speed. At full-load rating, the maximum recommended switching speed is 1 CPS. The ADU228/ADU258 is **not** recommended for PWM applications. Recommended switching speed can be safely exceeded only for applications operating at 20% or less of rated current. For example, pulsing of PLC type inputs.

<b>SKn</b>	Sets relay specified by n (n = 0 to 7)
Ex.	
SK4	Closes relay K4
<b>RKn</b>	Resets relay specified by n (n = 0 to 7)
Ex.	
RK3	Opens relay K3
<b>MKddd</b>	Sets PORT K to value ddd (ddd = 000 to 255)
Ex.	
MK255	Turns on all relays
<b>RPKn</b>	Returns value of relay specified by n. (n = 0 to 7)
Ex.	
RPK0	Returns value of relay K0
0	Response (relay K0 is presently OPEN)
<b>PK</b>	Returns value of PORTK in decimal format. Response is 3 bytes (000 to 255 in decimal)
Ex.	
PK	
128	Response (K7 is closed (SET), K0-K6 are open (RESET))

## 6b) Digital Input Commands (PORT A and PORT B)

The ADU228/ADU258 device contains two 4-bit input ports labelled PORT A and PORT B. Both input ports are isolated from all other external connections, and from each other, using opto-isolators with better than 3000V isolation. Each of the two input ports has a COM connection (COM A and COM B) associated with it for connection of input device common voltages. Input devices can be connected using external DC voltages of up to 28V. The VDD output terminals provide a nominal 5VDC output that can be used as a supply to connect dry contact inputs (switches, pushbuttons etc.) to the digital inputs. When using the internal VDD supply to connect dry contact inputs, GND must be connected to COM A or COM B (or both) to allow a return path for input current. Figure 6A shows how dry contacts can be connected using the ADU228/ADU258 internal supply. Note that GND is connected to COM A.

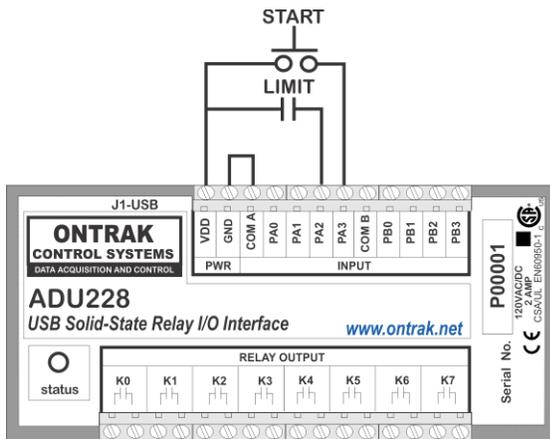
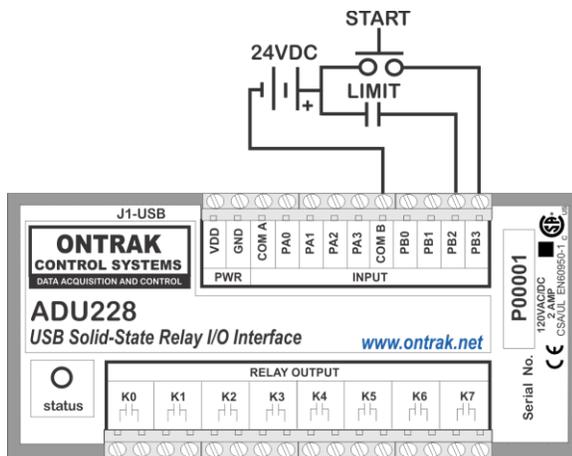


Figure 6A: Dry Contact Connections Using Internal VDD Supply.

Figure 6B demonstrates the connection of dry contact inputs using an external DC supply. Note that the common of the external supply is connected to COM B, as the inputs used in this example are PB2 and PB3.



CAUTION: When using an external supply with input devices make NO connection to VDD or GND terminals.

Figure 6B: Dry Contact Connections Using External Supply

**RPyn** Returns status of input line in PORT y specified by n (n= 0 , 1, 2 or 3) (y =A or B)  
Ex.  
RPA2  
1 Response (PA2 is high)

**RPy** Returns status of PORT A in binary format. (y =A or B)  
Response is 4 bytes (0000 to 1111 binary) (order is MSB-LSB)  
Ex.  
RPA  
0100 Response (PA2 is High, PA0, PA1 and PA3 are Low)

**Py** Returns status of PORT y in decimal format. (y =A or B)  
Response is 2 bytes (00 to 15 in decimal)  
Ex.  
PA  
15 Response (All lines of PORTA are High)

The following command has been included to allow polling of both digital ports with a single command. The response to the PI command is an 8 bit response represented in decimal format ( 000 to 255 ). The LSB of the response is PA0 and the MSB is PB3.

**PI** Returns status of PORT A and PORT B in decimal format.  
Response is 3 bytes (000 to 255 in decimal)

Ex1.  
PI  
128 Response (PB3 is HIGH, all others are LOW)

Ex2.  
PI  
003 response (PA0 and PA1 are HIGH, all others are LOW)

## 6c) Event Counter Commands

Each digital input line of PORT A and PORT B has an event counter associated with it. The event counters count low to high transitions and are stored in a 16-bit counter that can be read, or, read and cleared. The event counters are numbered 0 to 7 and count from 00000 to 65535 followed by a rollover to 00000. The following table identifies the counter assignments;

Counter	PORT Assignment
0	PA0
1	PA1
2	PA2
3	PA3
4	PB0
5	PB1
6	PB2
7	PB3

The event counters are read using either the RE command, or the RC command if the counter is to be cleared following the read.

**REx** Returns present count of event counter ( $x = 0 - 7$ )  
Response 5 bytes (00000 to 65535 in decimal)

Ex.

RE1

00023 Response (PA1 has seen 23 low to high transitions)

**RCx** Returns present count and clears event counter ( $x = 0 - 7$ )  
Response 5 bytes (00000 to 65535 in decimal)

Ex.

RC3

00156 Response (PA3 has seen 156 low to high transitions, event counter 3 is cleared)

### 6c) Event Counter Commands (continued)

The de-bounce time of the event counters can be set from 100us to 10ms (DEFAULT = 1 ms) using the DB command as outlined below;

**DBn**            Sets de-bounce time of event counters (n=0,1 or 2)  
(0 =10ms, 1 = 1ms (Default), 2 = 100us)

Ex.

DB0            De-bounce is set to 10ms

**DB**            Returns present de-bounce setting.

Ex.

DB

0            Response (De-bounce is currently set to 10ms)

## 6d) Watchdog Commands

The ADU228/ADU258 features a host watchdog function. The host watchdog, when enabled, resets both relays, and resets the watchdog setting to 0 (WD OFF), when a watchdog timeout occurs. Following the enabling of the watchdog timer, commands must be continuously received by the ADU228/ADU258 within the selected timer interval or a watchdog timeout will occur. After a watchdog timeout occurs, the watchdog setting must be reloaded. The host application should poll the watchdog setting to determine if a watchdog timeout has occurred. Note that the watchdog timer is reset when any command is received by the ADU228/ADU258. This includes invalid commands.

**WDn** Sets watchdog timeout length.  
(0=WD OFF, 1=1s, 2=10s, 3=1min)

Ex.

**WD2** Sets the watchdog timeout to 10 seconds and enables watchdog timer.

**WD** Returns watchdog setting.

Ex.

**WD**

**3** Response (WD timeout setting is 1 minute)



**Caution: (Use of System Sleep):** If the operating system allows the host computer to enter sleep mode, attached USB devices will be set to suspend mode. In this mode the power draw of the ADU228/ADU258 drops to less than 2.5mA (USB2.0 Specification). **In suspend mode the ADU228/ADU258 relay outputs are all reset to OFF and the Status LED is turned off. Once the host computer is revived from sleep/suspend mode, the ADU228/ADU258 status LED will turn on, however, the relay outputs will remain OFF.** Ensure system power settings are set such that the host computer does not enter sleep mode during normal operation.



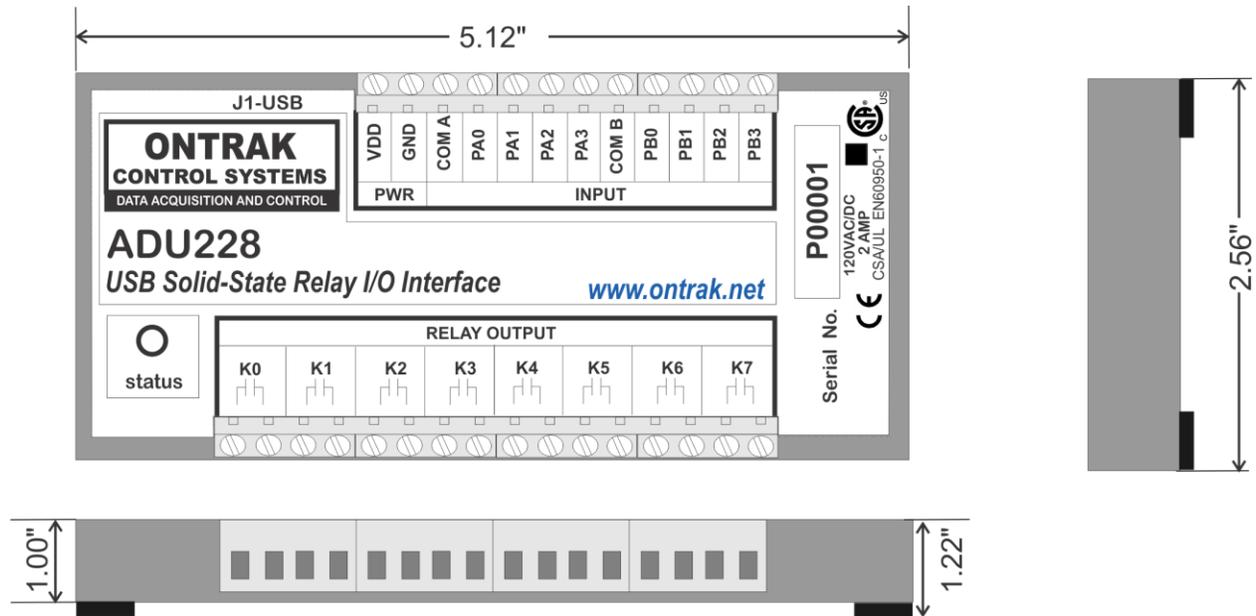
**Caution:** If the operating system **USB Selective Suspend** is enabled, after the ADU228/ADU258 is physically connected and enumerated (LED Green), the host may suspend the connection if no handle is opened to the ADU228/ADU258. This will cause the LED to turn off. The LED will turn green again once a handle is opened to the ADU228/ADU258. This is normal operation. In host applications the handle should be opened at the start of the application and remain open until the application closes, or the ADU228/ADU258 functionality is no longer required.

## 7. Specifications

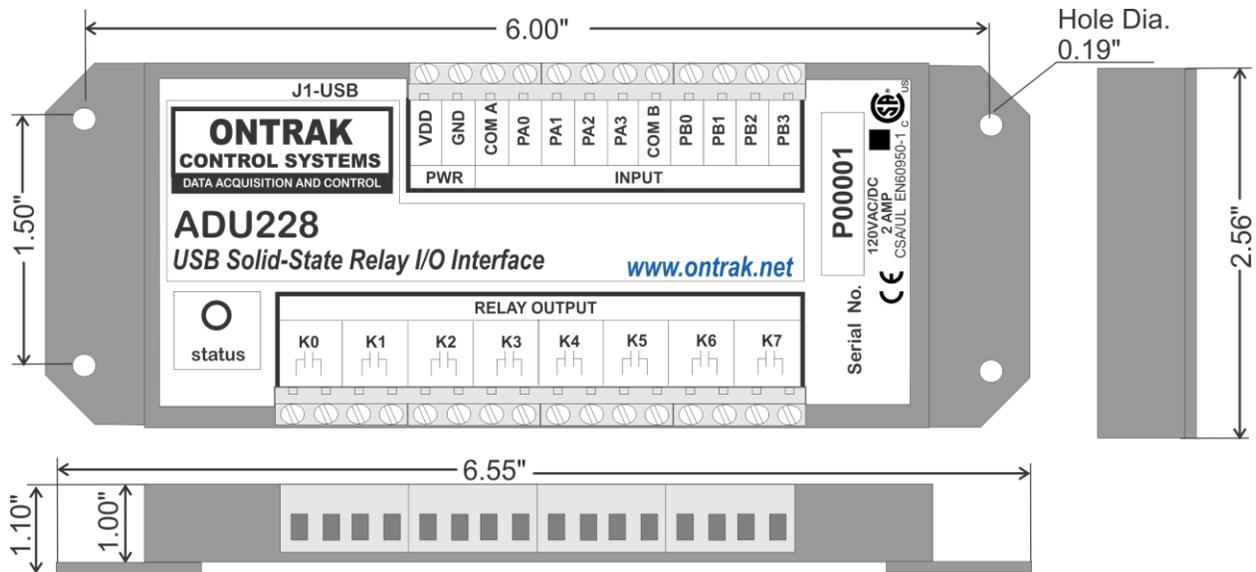
Supply Voltage	NONE (Bus Powered)	
USB Supply Current (relays de-energized)	14mA Typical	20mA Max
USB Supply Current (relays energized)	160mA Typical	180mA Max
USB Connection Type	Full -Speed USB 1.1	
Operating Temperature	-25C to 85C Max	
Type	PhotoMOS – Normally Open	
Isolation Voltage	2500Vrms	
<b>Digital Inputs ( 8 )</b>		
Vin HIGH (MAX)	28 VDC	
Vin HIGH (MIN)	2 VDC	
Vin LOW(MAX)	0.7 VDC	
Vin LOW (MIN)	0 VDC	
Input Z	2700 ohms	
<b>Event Counters (8)</b>		
Resolution	16 Bits	
Input Type	Contact, TTL, Voltage up to 28VDC	
Max Frequency	1KHz	
Input Z	2700 ohms	
Programmable Debounce	10ms, 1ms, or 100us	
<b>PhotoMOS Relay Outputs (8)</b>		
	<b>ADU228</b>	<b>ADU258</b>
AC Ratings	2Amps@120VAC	5Amps@30VAC
DC Ratings	2Amps@120VDC	5Amps@48VDC
On-State Resistance Typical	180mOhm	15mOhm
On-State Resistance Maximum	350mOhm	30mOhm
Relay Used	AQZ207G	AQZ202G
Maximum Operating Speed	1 CPS at full load	
Safely Approvals	CSA/UL EN60950-1 2 <sup>nd</sup> Edition	
<a href="#">Mounting Options</a>	Desktop ( STANDARD), Flange Mount , DIN Rail	

## 8. Dimensions

### DESKTOP (STANDARD)



### FLANGE (OPTIONAL)



(See [www.ontrak.net](http://www.ontrak.net) for DIN Rail options and dimensions.)