



## Connective Peripherals Pte Ltd

# USB2-H-600X-M FAMILY Hi-Speed USB to Multi-Ports RS422 Adapter

## Data Sheet

**Document Reference No.: CP\_000017**

**Version 1.1**

**Issue Date: 2019-03-12**

Part Number				
USB2-H-6016-M	USB2-H-6008-M	USB2-H-6004-M	USB2-H-6002-M	USB2-H-6001-M

The USB2-H-600X-M provides a simple method of adapting legacy serial devices with RS422 interfaces to modern USB ports by incorporating the FTDI's Hi-Speed USB bridge chips. The adaptor which is contained within a metal enclosure is either USB powered or externally powered (depends on the number of ports) or can supply an output of +5VDC @ up to 80mA on the 5mm terminal block connectors or 30mA on the Pin 9 of DB9 connectors. Indicator LEDs provide functional status.

The USB2-H-600X-M family have been tested to be compliant with both FCC Part 15 Subpart B and European EMC Directive.

**Connective Peripherals Pte Ltd**  
**178 Paya Lebar Road, #07-03 Singapore 409030**  
**Tel.: +65 67430980 Fax: +65 68416071**

E-Mail (Support): [support@connectiveperipherals.com](mailto:support@connectiveperipherals.com) Web: [www.connectiveperipherals.com/products](http://www.connectiveperipherals.com/products)

Neither the whole nor any part of the information contained in, or the product described in this manual, may be adapted or reproduced in any material or electronic form without the prior written consent of the copyright holder. This product and its documentation are supplied on an as-is basis and no warranty as to their suitability for any particular purpose is either made or implied. Connective Peripherals Pte Ltd will not accept any claim for damages howsoever arising as a result of use or failure of this product. Your statutory rights are not affected. This product or any variant of it is not intended for use in any medical appliance, device or system in which the failure of the product might reasonably be expected to result in personal injury. This document provides preliminary information that may be subject to change without notice. No freedom to use patents or other intellectual property rights is implied by the publication of this document. Connective Peripherals Pte Ltd, 178 Paya Lebar Road, #07-03 Singapore 409030. Registered Number: 201617872E

## **Table of Contents**

<b>1</b>	<b>Introduction</b>	<b>4</b>
1.1	<b>Functional Description</b>	<b>4</b>
1.2	<b>LED Description</b>	<b>7</b>
1.3	<b>Block Diagram</b>	<b>7</b>
1.3.1	Single Port Block Diagram	7
1.3.2	Dual Port Block Diagram	8
1.3.3	Four, Eight and Sixteen Ports Block Diagram	8
1.3.4	Block description	9
1.4	<b>Features</b>	<b>9</b>
1.5	<b>Performance Figures</b>	<b>11</b>
<b>2</b>	<b>Installation</b>	<b>12</b>
2.1	<b>Hardware Configurations</b>	<b>12</b>
2.1.1	Wiring	12
2.2	<b>Device Driver Installation</b>	<b>13</b>
2.2.1	Microsoft Windows	13
2.2.2	Mac OS X, Linux, Windows CE	17
<b>3</b>	<b>Connections</b>	<b>18</b>
3.1	<b>External Connectors</b>	<b>18</b>
3.1.1	USB	18
3.1.2	RS422	18
3.1.3	5mm Terminal Block	19
<b>4</b>	<b>Termination and BIAS Resistors Setting</b>	<b>22</b>
<b>5</b>	<b>Electrical Details</b>	<b>25</b>
5.1	<b>USB</b>	<b>25</b>
5.2	<b>104</b>	<b>25</b>
5.3	<b>105</b>	<b>25</b>
5.4	<b>5V Power Adapter</b>	<b>25</b>
5.5	<b>RS422</b>	<b>25</b>
5.6	<b>RS422</b>	<b>26</b>
<b>6</b>	<b>Physical Environment Details</b>	<b>27</b>
6.1	<b>Storage Temperature</b>	<b>27</b>

6.2	Operating Temperature.....	27
<b>7</b>	<b>Physical Dimensions .....</b>	<b>28</b>
7.1	USB2-H-6001-M Dimension.....	28
7.2	USB2-H-6002-M Dimension.....	30
7.3	USB2-H-6004-M Dimension.....	31
7.4	USB2-H-6008-M Dimension.....	32
7.5	USB2-H-6016-M Dimension.....	33
<b>8</b>	<b>Environmental Approvals &amp; Declarations .....</b>	<b>34</b>
8.1	EMI Compatibility.....	34
8.2	Safety .....	34
8.3	Environmental.....	34
8.4	Reliability.....	34
8.5	Import / Export Information .....	35
<b>9</b>	<b>Troubleshooting .....</b>	<b>36</b>
9.1	Hardware.....	36
9.2	Device Driver .....	36
9.3	Technical Support .....	37
<b>10</b>	<b>Contact Information.....</b>	<b>38</b>
<b>Appendix A – List of Figures and Tables.....</b>		<b>39</b>
	List of Figures .....	39
	List of Tables.....	39
<b>Appendix B – Revision History .....</b>		<b>41</b>

# 1 Introduction

## 1.1 Functional Description

The USB2-H-600X-M family are a USB to RS422 level serial UART adaptor incorporating FTDI's FT4232H, FT2232H and FT232H Hi-Speed USB2.0 (480Mb/s) to serial UART interface IC device. The FTDI Chips handle all the USB signaling and protocols. The adaptor provides a fast, simple way to connect devices with an RS422 interface to USB.

The integrated electronics of the USB2-H-100X-M utilise the FTDI FT4232H, FT2232H or FT232H and includes RS422 level shifters plus TXD/RXD LEDs to provide a visual indication of data traffic through the module.



**Figure 1.1 - USB2-H-6001-M**



**Figure 1.2 - USB2-H-6002-M**



**Figure 1.3 - USB2-H-6004/6008/6016-M**

The module uses a standard USB B device connector for connection to an upstream host or hub port. RS422-level signals, including modem handshake signals, are available on an industry-standard DE-9P connector. The Single and Dual port module also provide 5mm terminal block connector, customer can use these signals friendly. The maximum RS422-level data rates are 8Mbps for each port.

The USB2-H-600X-M modules require USB device driver, available free from <http://www.ftdichip.com/Drivers/VCP.htm>, which are used to make the USB2-H-600X-M appear as

Virtual COM Ports (VCP). This allows existing serial communications software, such as HyperTerminal, to exchange data through the USB2-H-600X-M to a legacy RS422 peripheral device.

## 1.2 LED Description

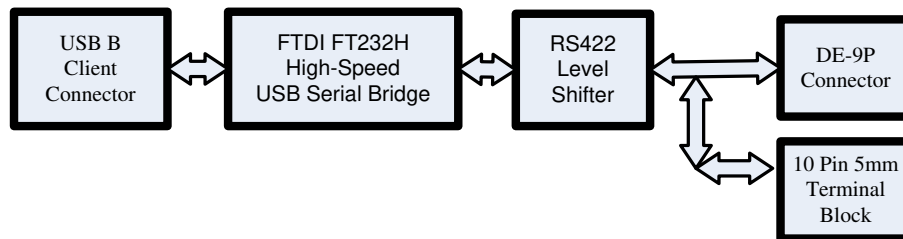
The USB2-H-600X-M has three types of LEDs to indicate a valid link as well as data traffic according to the following table:

LED Colour	Function	Description	LED quantity
Yellow	Enumerated	ON when USB2-H-600X-M is configured and ready	1
Red	TxD Activity	Flashes when data is transmitted from the USB2-H-600X-M to the attached RS422 device	Each ports have one TXLED
Green	RxD Activity	Flashes when data is transmitted from the attached RS422 device to the USB2-H-600X-M.	Each ports have one RXLED

**Table 1.1 – LED Description**

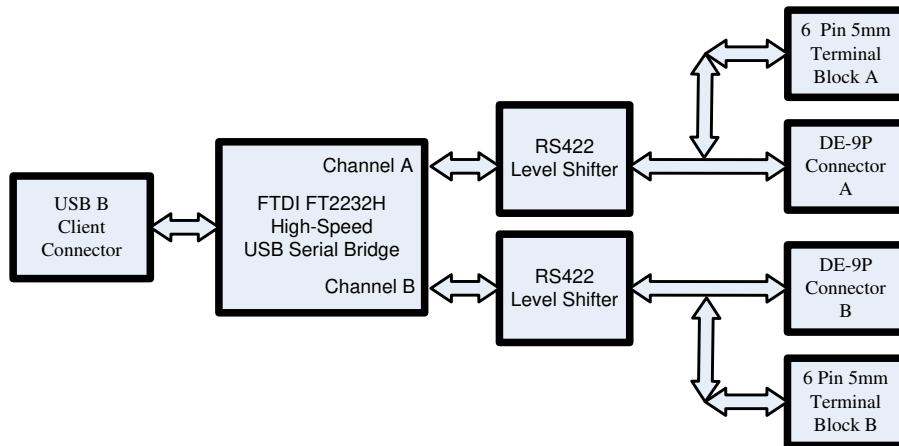
## 1.3 Block Diagram

### 1.3.1 Single Port Block Diagram



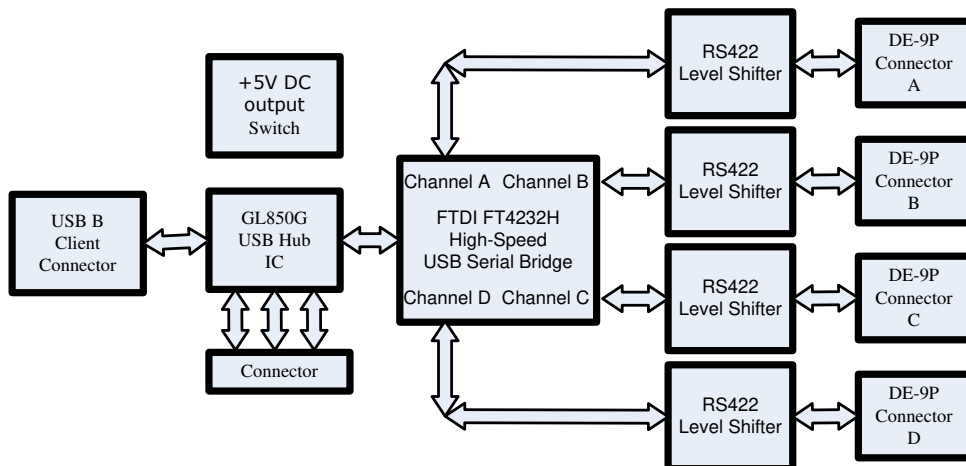
**Figure 1.4 - USB2-H-6001-M Block Diagram**

**1.3.2 Dual Port Block Diagram**

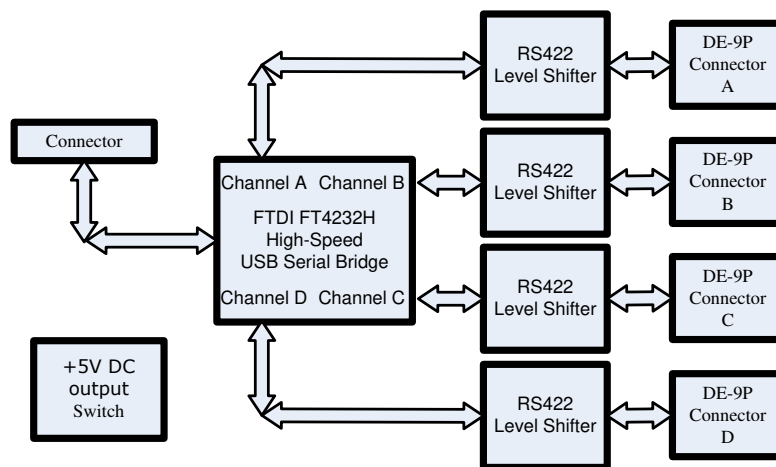


**Figure 1.5 - USB2-H-6002-M Block Diagram**

**1.3.3 Four, Eight and Sixteen Ports Block Diagram**



**Figure 1.6 - USB2-H-6004/6008/6016-M Main Board Block Diagram**



**Figure 1.7 - USB2-H-6008/6016-M Daughter Board Block Diagram**



### 1.3.4 Block description

#### **USB B Client Connector**

This connector provides the interface for connection to a USB Host or Hub port. The maximum cable length is 5 meters, according to the USB 2.0 specification.

#### **Genesys GL850G**

The Genesys GL850G is advanced version Hub solutions which fully comply with Universal Serial Bus Specification Revision 2.0.

#### **FTDI FT4232H**

The FTDI FT4232H provides the Hi-Speed USB-to-Serial conversion. Operating system device drivers are required in order to work with the FT4232H to provide the quad Virtual COM Port serial interfaces.

#### **FTDI FT2232H**

The FTDI FT2232H provides the Hi-Speed USB-to-Serial conversion. Operating system device drivers are required in order to work with the FT2232H to provide the dual Virtual COM Port serial interfaces.

#### **FTDI FT232H**

The FTDI FT232H provides the Hi-Speed USB-to-Serial conversion. Operating system device drivers are required in order to work with the FT232H to provide the one Virtual COM Port serial interface.

#### **RS422 Level Shifter**

The RS422 level shifter converts the signals provided by the Hi-Speed USB-to-Serial conversion of FTDI into the voltage levels required by RS422 devices.

#### **DE-9P Connector (Male)**

The DE-9P connector is configured in an industry standard (TIA/EIA-574) pin-out to provide connection to RS422 peripherals through standard cables.

#### **5mm Terminal Block**

There are 5mm terminal block connectors provide the connection to RS422 peripherals devices.

#### **+5V DC Output Switch**

This switch can disable/Enable the +5VDC to an external devices.

#### **Main Board**

This is using on 4 and 16 ports product. When product is 4-ports that use a main board, when product is 16-ports product that use two main boards.

#### **Daughter board**

This is using on 8 and 16 ports product. When product is 8-ports that use a daughter board, when product is 16-ports product that use two daughter boards.

## 1.4 Features

- RS-422 serial ports by connecting to Hi-Speed USB 2.0 interface.
- Easy plug & play installation and RS-422 device connection
- Provide USB2.0 Hi-Speed(480Mbps) interface and works with USB 1.1 & 2.0 Host and Hub ports
- Industry Standard FTDI chip set & device drivers for maximum compatibility
- Microsoft Windows® WHQL-certified, Mac OS X, Linux and Windows CE device drivers
- Installs as standard Windows COM ports
- COM port number can be changed to any available COM port number, to support HyperTerminal, or any other serial communications software application running in Windows
- Supports Windows Server 2008, 2003, Vista, XP 2000, Linux, Mac OS X
- FIFO: USB2-H-6004/6008/6016-M - FT4232H 2K byte transmit buffer, 2K byte receive buffer  
USB2-H-6002-M - FT2232H 4K byte transmit buffer, 4K byte receive buffer  
USB2-H-6001-M - FT232H 1K byte transmit buffer, 1K byte receive buffer
- RS-422 data signals: TxD+, TxD-, RxD+, RxD-, RTS+, RTS-, CTS+, CTS-, GND
- Single, dual and quad Ports product are Powered by USB port. No external power adapter is required. Note that they can also be powered from external power adapter.
- Serial port speed up to 8Mbps
- Serial Communication Parameters
  - Parity: None, Even, Odd
  - Data bits: 7, 8
  - Flow control: RTS/CTS, X-ON/X-OFF, None
- The standard DE-9P male connectors
- LEDs indicate USB Enumeration, RxD, TxD for monitoring port status & easy diagnostics
- Operating temperature of -40°C to +85°C
- 5mm terminal block connectors
- +5V DC power provides external devices
  - The maximum current of 4, 8 and 16 port are 30mA
  - The maximum current of 1 and 2 port are 80mA

**Note:** The Windows CE5.0 can only support COM0~COM9, When the FTDI COM ports are over the Windows CE available COM ports, you cannot use FTDI COM port.

**Note:** HyperTerminal is no longer provided with Windows 7/Vista.

## 1.5 Performance Figures

Parameter	Performance
USB Interface	480Mbps USB 2.0 High-Speed
RS422 Interface	Standard Windows baud rates (300bps to 921.6Kbps) Custom baud rates (300bps to 10Mbps) through baud rate aliasing. See FTDI Application Note: <a href="#">AN_120 Aliasing VCP Baud Rates</a>
Max Cable Length	USB=5m, RS422=12m (for 10Mbps)

**Table 1.2 - Performance Figures**

Part Number	Description
USB2-H-6016-M	Hi-Speed USB to 16-Port RS422 module
USB2-H-6008-M	Hi-Speed USB to 8-Port RS422 module
USB2-H-6004-M	Hi-Speed USB to quad-Port RS422 module
USB2-H-6002-M	Hi-Speed USB to dual-Port RS422 module
USB2-H-6001-M	Hi-Speed USB to single-Port RS422 module

**Table 1.3 - Ordering Information**

## 2 Installation

### 2.1 Hardware Configurations

#### 2.1.1 Wiring

Insert the A-plug of USB cable into an available USB Host or Hub port. Insert the B-plug of USB cable into the B-receptacle on the USB2-H-600X-M.

The USB2-H-600X-M family follow EIA-422 standard as a Data Terminal Equipment (DTE) device. If the RS422 equipment being connected is a Data Communication Equipment (DCE) device, it's typical that a straight-through cable can be used.

DTE Pin Number	Signal Name	Expected Connect Signal
1	TXD- = Transmit Data, negative polarity	RXD-
2	TXD+ = Transmit Data, positive polarity	RXD+
3	RXD+ = Receive Data, positive polarity	TXD+
4	RXD- = Receive Data, negative polarity	TXD-
5	GND = signal ground	GND
6	RTS- = Request To Send, negative polarity	CTS-
7	RTS+ = Request To Send, positive polarity	CTS+
8	CTS+ = Clear To Send, positive polarity	RTS+
9	CTS- = Clear To Send, negative polarity	RTS-

**Table 2.1 – RS422 DTE to DCE connection with straight-through cable**

Some serial devices may require certain handshake signals to be connected. Refer to your device manual for cabling details. When you use the handshake signals, please disable the +5V DC power output of SW3.

#### Switch Setting

The USB2-H-6004-M, USB2-H-6008-M and USB2-H-6016-M have this +5V Output disable/enable switch. This can be changed as shown in the following table:

SW Position	Ports Position	Open (off)	Closed (on)	SW Position	Ports Position		
4 Ports product			5V Out Disable	16 Ports product			
SW1	1	CN4		5V Out Enable	SW1	1	CN4
	2	CN3				2	CN3
	3	CN2				3	CN2

	4	CN1				4	CN1
8 Ports product						1	CN8
SW1	1	CN4			SW2	2	CN7
	2	CN3				3	CN6
	3	CN2				4	CN5
	4	CN1					
SW2	1	CN8			SW3	1	CN 12
	2	CN7				2	CN 11
	3	CN6				3	CN 10
	4	CN5				4	CN 9
					SW4	1	CN 16
						2	CN 15
						3	CN 14
						4	CN 13

**Table 2.2 – Switch Setting Configuration of the 4, 8 and 16 ports product**

**5V Out:**

The CTS- pin of each channel can alternatively be used to output a +5V supply if the RI function is not required. This +5V supply is available after the USB2-H-600X-M family are fully enumerated and device drivers are loaded.

The single and dual port models do not have the switch as the +5V output is only available on the terminal block on these models. They can provide a 5V output with a maximum current of 80mA (when using USB BUS power), or when using the external power adapter the maximum current can be increased.

**2.2 Device Driver Installation**

The USB2-H-600X-M Series adaptor drivers are available for download from:

<http://www.ftdichip.com/Drivers/VCP.htm>.

**2.2.1 Microsoft Windows**

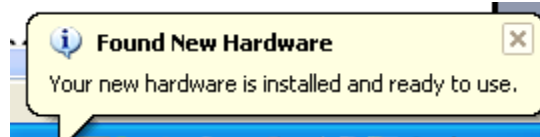
With the device drivers being Windows Hardware Quality Labs (WHQL) certified, they are also available through download directly from the Microsoft® Windows® Update service. This is the best choice when connecting the USB2-H-600X-M Series to a computer running Windows Vista. Additional installation options are noted below:

**Installation Executable on Windows XP**

- 1) Login to your system as Administrator, or a user with Administrator rights.
- 2) Prior to connecting the USB2-H-600X-M Series to the USB Host or Hub port, download the latest device driver version from <http://www.ftdichip.com/Drivers/VCP.htm>

Operating System	Release Date	x86 (32-bit)	x64 (64-bit)	Comments
Windows*	2011-04-12	<a href="#">2.08.14</a>	<a href="#">2.08.14</a>	<a href="#">2.08.14 WHQL Certified</a> Available as <a href="#">setup executable</a> <a href="#">Release Notes</a>
	2011-08-26	<a href="#">2.08.17 (Beta)</a>	<a href="#">2.08.17 (Beta)</a>	<a href="#">2.08.17 Beta Version</a> <a href="#">Release Notes</a>

- 3) Run this executable to install the device drivers.
- 4) Connect the USB2-H-600X-M Series to your computer. A notification will appear near the task bar indicating that new hardware has been installed and is ready for use. It is normal if this notice appears twice.



**Figure 2.1 - Hardware Ready**

### **Windows Update shown on Windows XP**

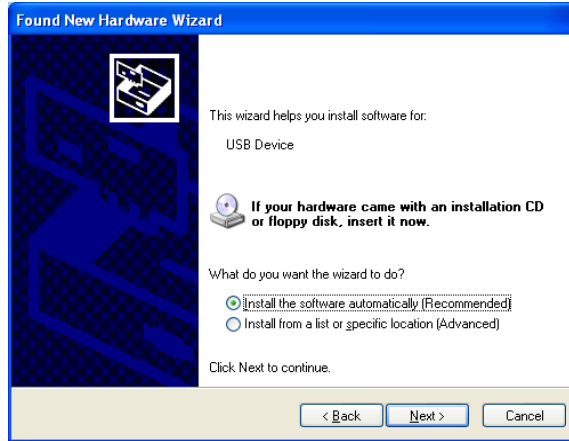
You must have an active Internet connection and the Windows Update Service enabled.

- 1) Connect the USB2-H-600X-M Series to your USB Host or Hub.
- 2) The “Found New Hardware” Wizard will appear. The first dialog should ask whether it is acceptable to use the Windows Update Service to find the device driver.



**Figure 2.2 – Found New Hardware Wizard**

- 3) Select one of the “Yes” choices and click “Next”.
- 4) The following screen appears:



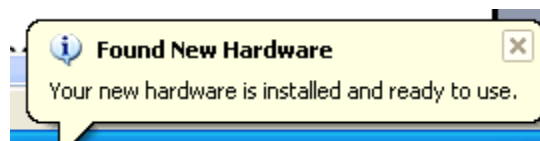
**Figure 2.3 – Automatic Install**

- 5) Wait while the driver is found, downloaded, and installed. This step may take a couple minutes depending on the Internet speed.
- 6) After the files are found and installed, click "Finish" to complete the installation.



**Figure 2.4 - Complete Hardware Installation**

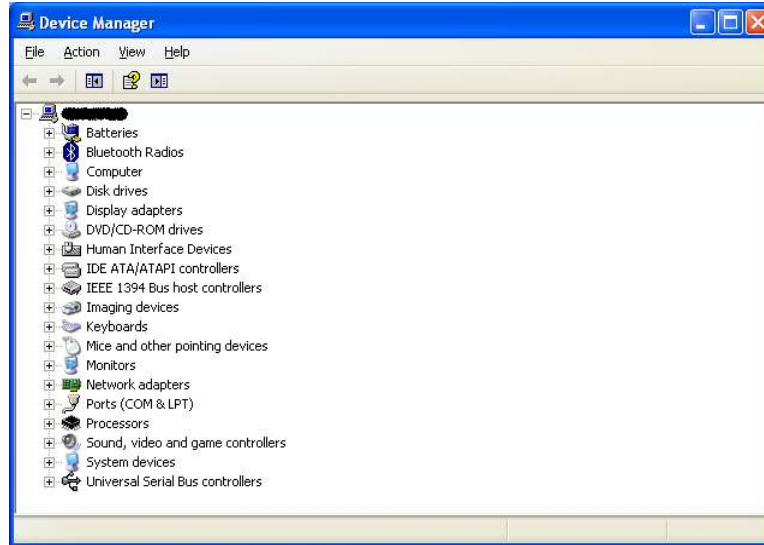
- 7) Steps 2 through 6 will repeat. The first time installs the basic USB Serial Converter in the USB device tree. The second time installs the Virtual COM Port layer in the Ports tree and assigns the COM port number.
- 8) When both portions of the device driver have been installed successfully, the following message will appear, indicating that the device is ready.



**Figure 2.5 - Hardware Ready**

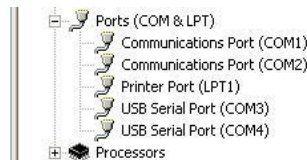
### **COM Port Assignment**

Next, to determine which COM port has been assigned, open the Windows Device Manager from the System Control Panel.



**Figure 2.6 - Device Manager**

Click on the Plus “+” sign next to the Ports tree to list the available COM port. You will see “USB Serial Port”, followed by a COMn assignment. In the figure below, the USB2-H-600X-M-Dual port are assigned to COM3 to COM4, so how many COM Ports are depend on your device.



**Figure 2.7 - COM Port Assignment**

Use this COM port number with your application software in order to access the USB2-H-600X-M.

If an application requires use of a different COM port number, the assignment may be changed through the Advanced Driver Options settings.

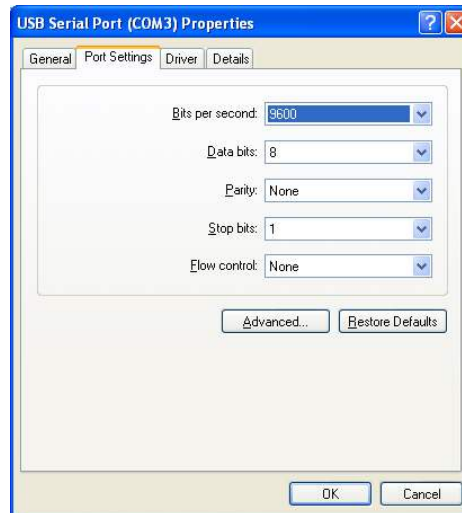
From the Device Manager listing above, right-click on the USB Serial Port and select Properties.



**Figure 2.8 – Access COM Port Properties**

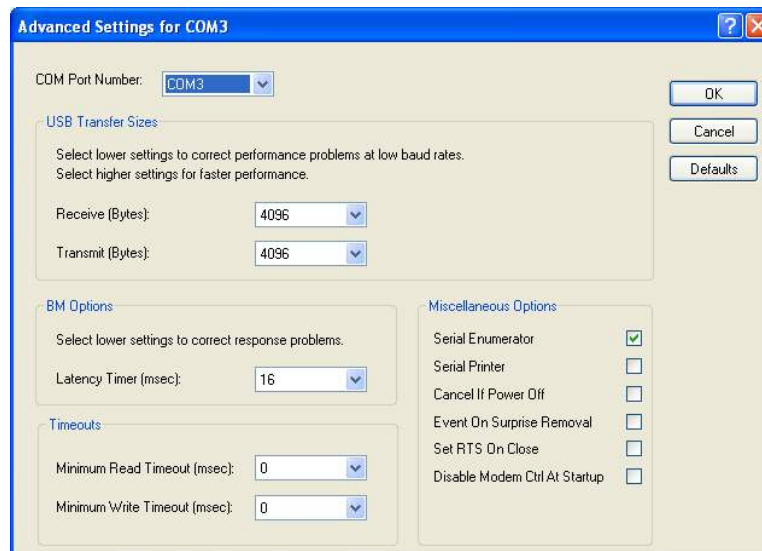
Next, click on the “Port Settings” tab.





**Figure 2.9 - Settings Tab**

Then click on the “Advanced...” button.



**Figure 2.10 - Advanced Options**

This will display the various advanced settings. Note the COM port assignment in the upper left. Clicking on the drop-down list will display the available port numbers. Select one that is not in use and click OK on each dialog box to activate the selection. Windows will remember this COM port number.

### 2.2.2 Mac OS X, Linux, Windows CE

Device drivers and FTDI installation guides for Mac OS X, Linux and Windows CE are available for download on the Connective Peripherals web site. Follow the respective FTDI installation guides for the chosen operating system.

The Windows CE5.0 can only support COM0~COM9, When the FTDI COM ports are over the Windows CE available COM ports, you could not use FTDI COM port.

### 3 Connections

#### 3.1 External Connectors

##### 3.1.1 USB

The USB2-H-600X-M family are a downstream USB 2.0 High-speed Device. A standard USB Series "B" receptacle is mounted inside the USB2-H-600X-M FAMILY to facilitate connection to an upstream USB Host or Hub.

Pin Number	Pin Type	Description
1	Power	VBUS – USB Power provided from upstream USB Host or Hub
2	Bidirectional	D- = USB data signal, negative polarity
3	Bidirectional	D+ = USB data signal, positive polarity
4	Ground	GND = USB signal ground
Shield	Case Ground	Drain = typically connected to the host PC case

**Table 3.1 – USB "B" Receptacle Pin-Out**

##### 3.1.2 RS422

The four RS422 ports are configured as Data Terminal Equipment (DTE), with a 9-contact D-Sub Pin connector. Pin assignments are according to TIA/EIA-422.

Pin Number	Pin Type	Description
1	Output	TXD- = Transmit Data, negative polarity
2	Output	TXD+ = Transmit Data, positive polarity
3	Input	RXD+ = Receive Data, positive polarity
4	Input	RXD- = Receive Data, negative polarity
5	Ground	GND = signal ground
6	Output	RTS- = Request To Send, negative polarity
7	Output	RTS+ = Request To Send, positive polarity
8	Input	CTS+ = Clear To Send, positive polarity
9	Input or PWR Output	CTS- = Clear To Send, negative polarity or +5V DC output

**Table 3.2 – DE-9P RS422 Pin-Out**

In addition, The CTS- Pin of 4, 8 and 16 Ports can provide +5VDC to an external device with a maximum current draw of 30mA once the 4, 8 and 16 Port products have been enumerated by the system, and the Pin 9 of single and dual port models only have the RI function.

### 3.1.3 5mm Terminal Block

The single and dual port product also provides another interface for customer using that is 5mm terminal block connector. Each RS422 signals also connected through a 5mm terminal block connector. This is shown in the following table:

#### Single Port Terminal Block

Single Port Terminal Block		
Terminal Block Pin Number	Pin Type	Description
1	Output	TXD- = Transmit Data, negative polarity
2	Output	TXD+ = Transmit Data, positive polarity
3	Input	RXD+ = Receive Data, positive polarity
4	Input	RXD- = Receive Data, negative polarity
5	Ground	GND = signal ground
6	Output	RTS- = Request To Send, negative polarity
7	Output	RTS+ = Request To Send, positive polarity
8	Input	CTS+ = Clear To Send, positive polarity
9	Input	CTS- = Clear To Send, negative polarity
10	PWR output	+5V DC output

**Table 3.3 –USB2-H-6001-M Terminal Block interface**

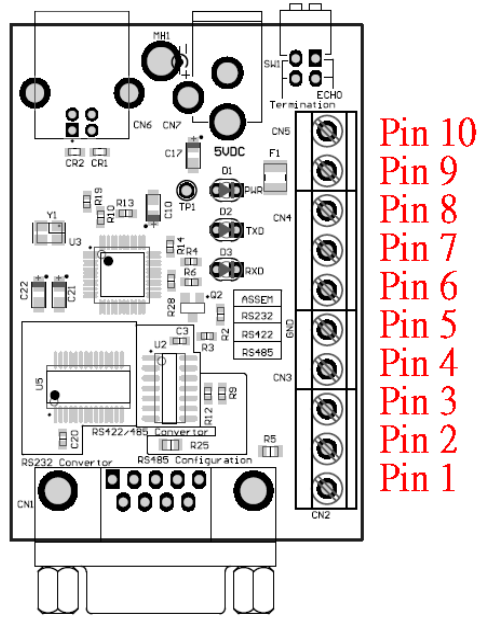
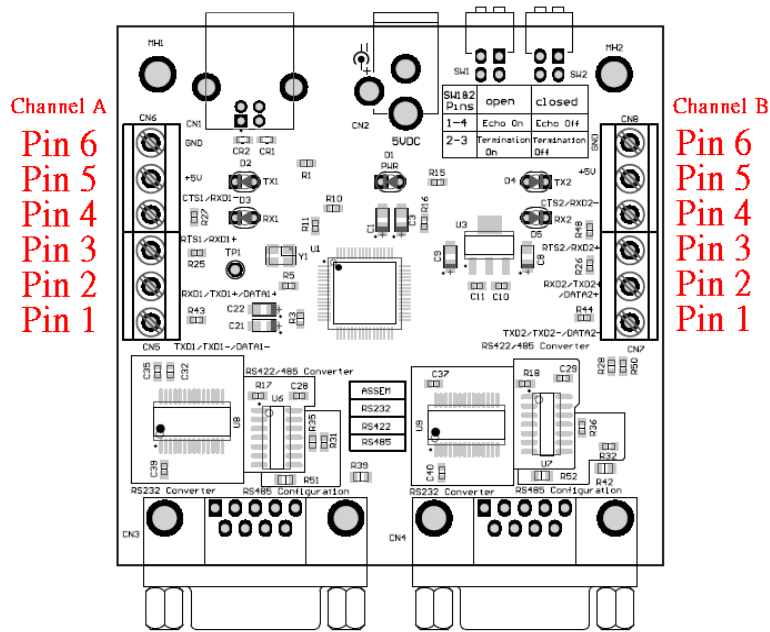


Figure 3.1 - USB2-H-6001-M Terminal Block Connector Assignment

**Dual Port Terminal Block**

Dual Port Terminal Block		
Terminal Block Pin Number (Channel 1 and Channel 2)	Pin Type	Description
1	Output	TXD- = Transmit Data, negative polarity
2	Output	TXD+ = Transmit Data, positive polarity
3	Input	RXD+ = Receive Data, positive polarity
4	Input	RXD- = Receive Data, negative polarity
5	PWR output	+5V DC output
6	Ground	GND = RS422 signal ground

Table 3.4 -USB2-H-6002-M Terminal Block interface



**Figure 3.2 - USB2-H-6002-M Terminal Block Connector Assignment**

In addition, one pin of terminal block connector can provide +5VDC to an external device with a maximum current draw of 80mA once the USB2-6001/6002-M has been enumerated by the system.

## 4 Termination and BIAS Resistors Setting

Figure 4.1 shows a general-purpose RS-422 network. Each node has a transceiver that interfaces between RS-422 and TTL logic levels. The each link of TXD, RXD pairs also has two 10KΩ biasing resistors which hold the line in a known state when no drivers are enabled. The USB2-H-600X-M units have internal biasing circuits. The default values are a 10K Ω pullup from line Data+ to VCC, and a 10K Ω pulldown from line Data- to ground. However, adding a termination resistor defeats their ability to bias the line and so additional external resistors may be required (see Figure 4.2). With no termination and when no drivers are enabled, the biasing resistors hold line Data+ more positive than line Data-. The RTS and CTS pairs don't need to have the bias resistors because the drivers are always enabled when devices are powered on.

RS-422 protocol also supports multi-devices in a network. One device is transmitting and all others are receiving in this case. If there are over 20 devices in the network, the parallel value of all TX/RX bias resistors will reduce to 500 Ω, and the value will be too small and the transceiver output may not drive the signal to high or low correctly. Removing the internal biasing resistors from some units will improve the signal quality in this case. There should not be issues if the parallel value of bias resistors is over 500 Ω.

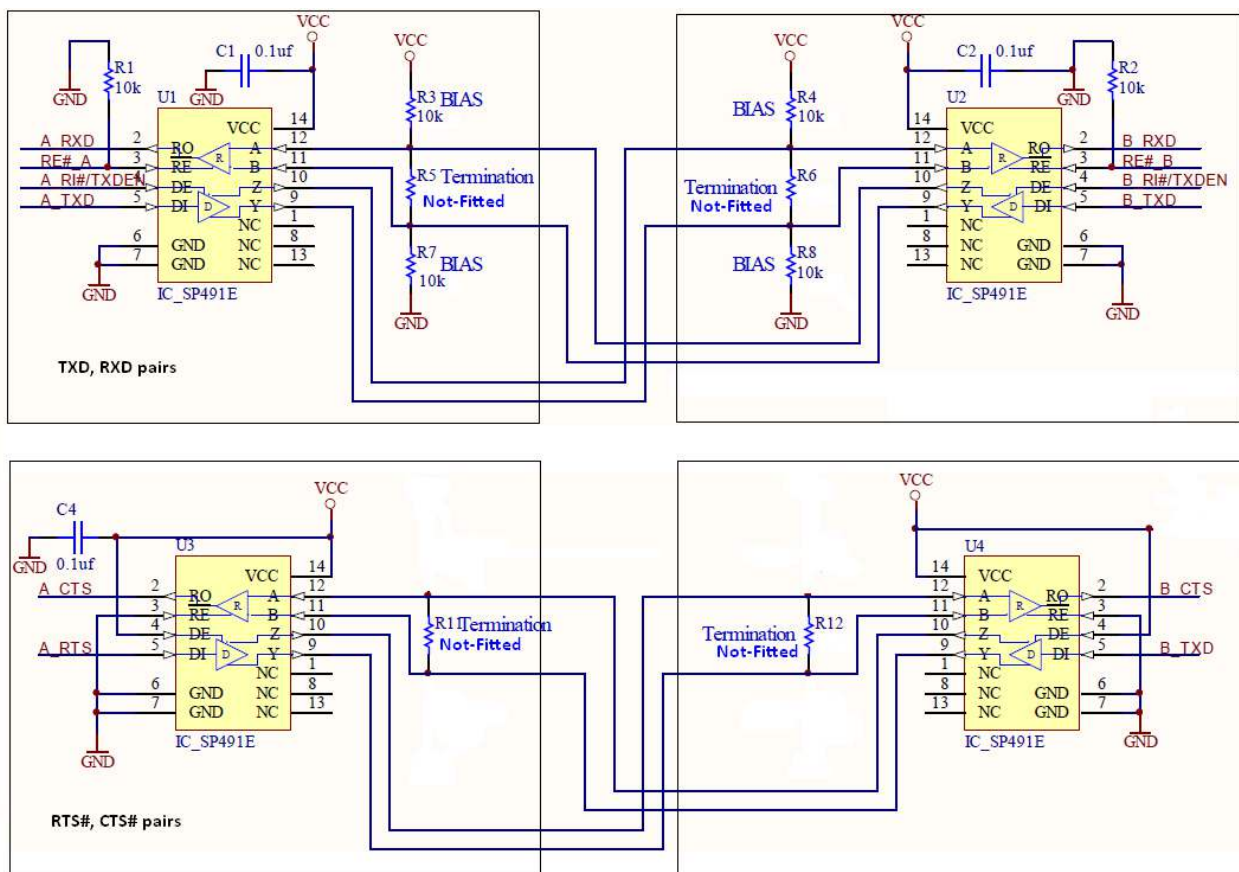
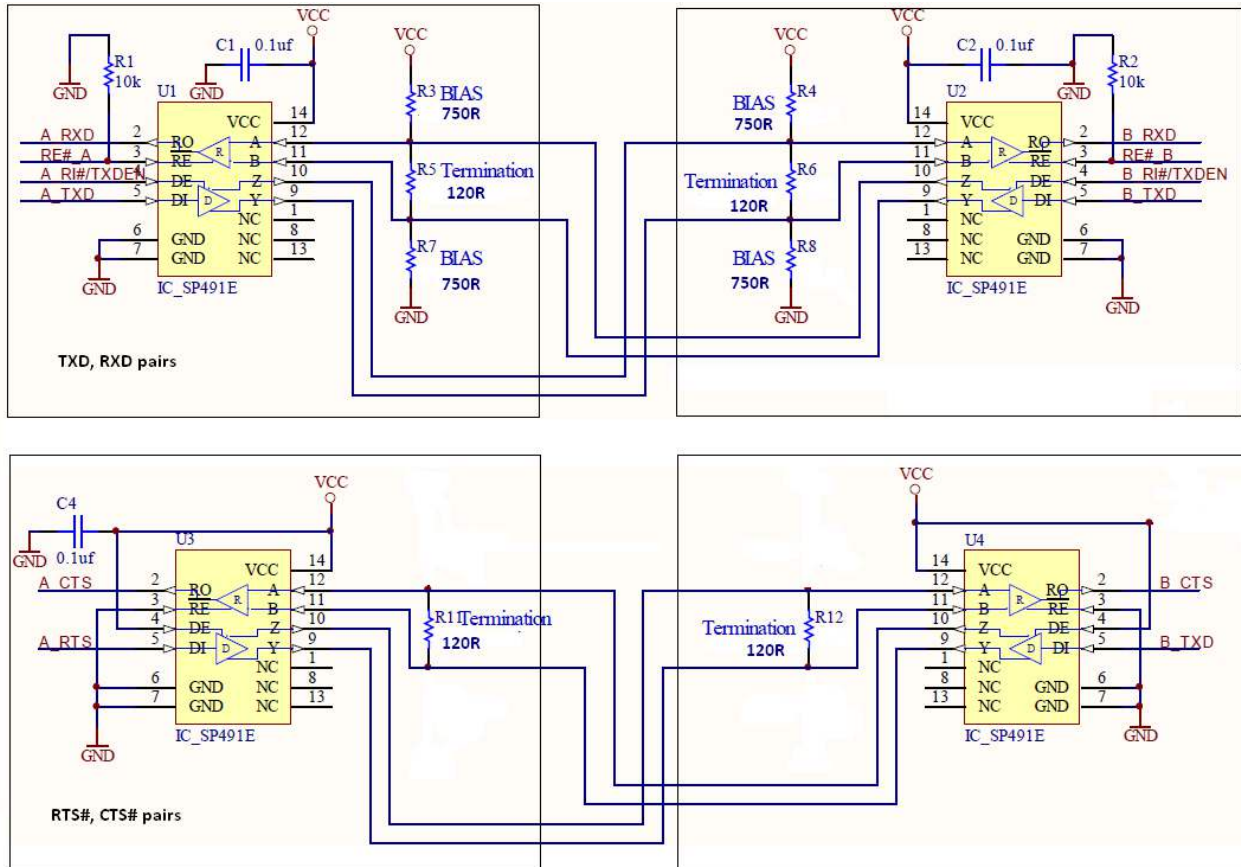


Figure 4.1 – RS422 Network

Adding terminations will reduce voltage reflections that can cause the receiver to misread logic levels. The receiver sees reflected voltages as output switches, and the line settles from its initial current to its final current. The termination eliminates reflections by making the initial and final currents equal. The circuit has two 120-Ω terminating resistors connected in parallel, at or just beyond the final node at each end of the link. One end of the link also has two 750-Ω biasing resistors. The below figure shows the example when adding termination



**Figure 4.2 – RS422 Network with terminations**

The final current is a function of the line termination, the receivers' input impedance, and the line's series impedance. In a typical RS-422 line without a termination, the initial current is greater than the final current because the characteristic impedance is less than the receivers' combined input impedance. On a line without a termination, the first reflection occurs when the initial current reaches the receiver. The receiver's input can absorb only a fraction of the current. The rest reflects back to the driver. As the current reverses direction, its magnetic field collapses and induces a voltage on the line. As a result, the receiver initially sees a greater voltage than what was transmitted.

When the reflected voltage reaches the driver, which has lower impedance than the line, the driver absorbs some of the reflection and bounces the rest back to the receiver. This reflection is of opposite polarity to the first reflection and causes the receiver to see a reduced voltage. The reflections bounce back and forth like this for a few rounds before they die out and the line settles to its final current.

If the line terminates with a resistor equal to the line's characteristic impedance, there are no reflections. When the initial current reaches the termination, it sees exactly what it was expecting—a load equal to the line's characteristic impedance. The entire transmitted voltage drops across the load. In a network with two parallel terminations, the drivers drive two lines with each ending at a termination.

When two 120Ω terminations are added, the difference between Data+ and Data- shrinks to a few millivolts if the bus is idle, much less than the required 200 mV. The solution is to add smaller resistors in parallel with the internal biasing so that a greater proportion of the series voltage drops across the termination. The RTS/CTS pair will not have such issues requiring the additional of adding bias resistors because the transmission is always enabled.

The size of the biasing resistors is a trade-off. For a greater voltage difference and higher noise immunity on an idle line, use smaller values. For lower power consumption and a greater differential voltage on a driven line, use larger values.

The below tables 4.1 shows the components associated with the bias resistors in each module. All termination resistors in the USB2-H-600X-M can be enabled or disabled by switches. Please refer to table 2.12 for details. The user can also remove or modify the bias resistors to meet their requirements. The default values for the internal biasing resistors are 10KΩ.

Modules Name	Bias Resistor Numbers	
	Daughter Board	Main Board
USB2-H-60016-M	(R41,R47),(R46,R48),(R49,R67),(R66,R68)	(R38,R40),(R39,R41),(R42,R48),(R47,R49)
USB2-H-6008-M	(R41,R47),(R46,R48),(R49,R67),(R66,R68)	(R38,R40),(R39,R41),(R42,R48),(R47,R49)
USB2-H-6004-M	(R38,R40),(R39,R41),(R42,R48),(R47,R49)	
USB2-H-6002-M	(R51,R53),(R52,R54)	
USB2-H-6001-M	R25,R26	
Modules Name	Termination Resistor Numbers	
	Daughter Board	Main Board
USB2-H-60016-M	(R27,R31),(R28,R32),(R29,R33),(R30,R34)	(R30,R34),(R31,R35),(R32,R36),(R33,R37)
USB2-H-6008-M	(R27,R31),(R28,R32),(R29,R33),(R30,R34)	(R30,R34),(R31,R35),(R32,R36),(R33,R37)
USB2-H-6004-M	(R30,R34),(R31,R35),(R32,R36),(R33,R37)	
USB2-H-6002-M	(R19,R22),(R20,R23)	
USB2-H-6001-M	R7,R8	

**Table 4.1 –Bias and Termination Resistor Numbers of Each Modules**



## 5 Electrical Details

### 5.1 USB

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
USB_VCC	Input Power Voltage*	4.25	5.0*	5.25	V	*Present when USB cable is attached and USB Host or Hub powered.
1 port	I <sub>cc</sub> USB current		5.2 104	5.3 105	mA	***Does not include power supplied to external device when CTS- pin is configured for +5V output
2 ports			220	240		
4 ports			360	380		

Table 5.1 - USB Electrical Details

### 5.4 5V Power Adapter

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
5V Power adapter_VCC	Power Voltage	4.75	5	5.25	V	Adapter provide 5V 2A of power.
8 ports	I <sub>cc</sub> 5V current		795	815	mA	***Does not include power supplied to external device when CTS- pin is configured for +5V output
16 ports			1515	1535		

Table 5.2 - 5V Power Adapter Electrical Details

### 5.5 RS422

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V <sub>trans</sub>	Transmitter output voltage swing	2			V	RL = 50R□□CL = 50pF
V <sub>rec</sub>	Receiver input voltage range	-7		+12	V	RL = 50R□□CL = 50pF
ESD HBM	N/A		±15		KV	For all RS-422 Inputs and Outputs pin

Table 5.3 - RS422 Electrical Details

## 5.6 RS422

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
<b>Receiver Input</b>						
VCM	Common-mode input voltage range	-7	+12		V	
IN	Input Current			1.0	mA	VIN = +12V
				-0.8		VIN = -7V
VTH	Differential Threshold Voltage, VTH	-0.2		+0.2	V	
VIHYST	Input Hysteresis		20		mV	
RIN	Input Resistance, RIN	12	15		kΩ	
<b>Transmitter Output</b>						
VOD	Differential Output Voltage, dVOD	1.5		5	V	With RL = 54Ω. CL = 50pF *
<b>ESD Tolerance</b>						
ESD HBM	RS422 Inputs and Outputs		±15		kV	
EN61000-4-2ContactDischarge	RS-485 Inputs and Outputs		±8		kV	
EN61000-4-2AirGapDischarge	RS-485 Inputs and Outputs		±15		kV	

**Table 5.4 – RS422 Electrical Details**

## 6 Physical Environment Details

### 6.1 Storage Temperature

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
T	Storage Temperature Range	-65		+150	°C	

Table 6.1 - Storage Temperature

### 6.2 Operating Temperature

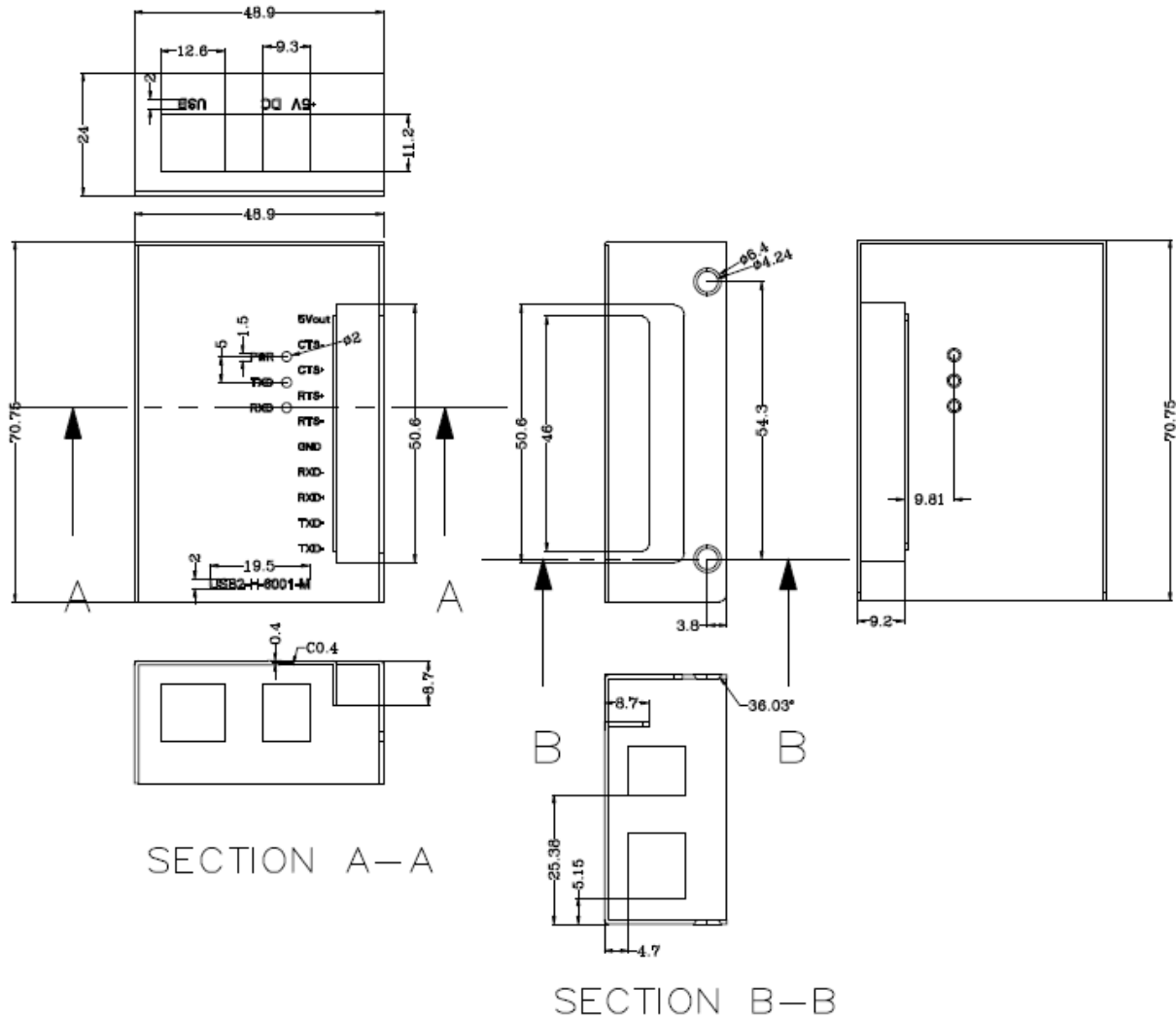
Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
T	Operating Temperature Range	-40		+85	°C	5% to 95% RH, non condensing

Table 6.2 - Operating Temperature

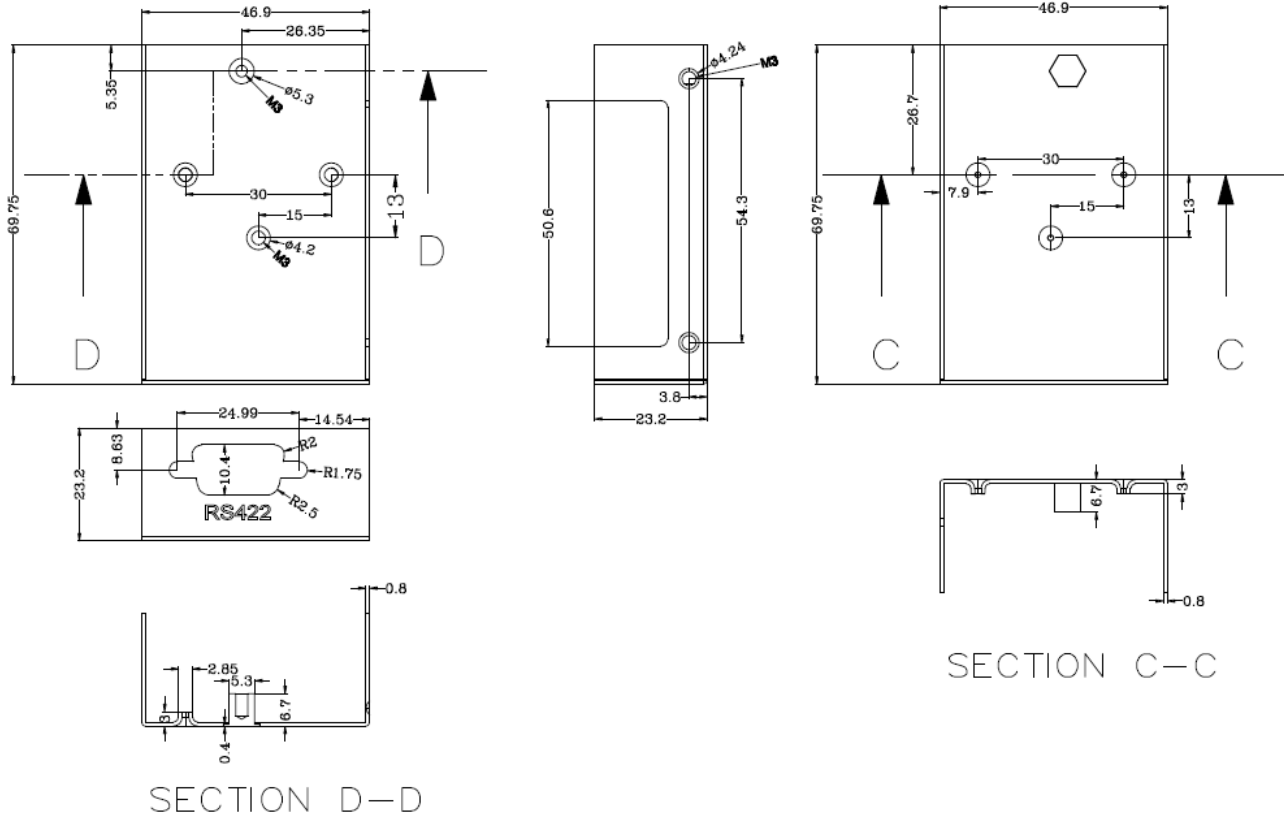
## 7 Physical Dimensions

All dimensions are in mm, and the tolerances are +/-0.1mm.

### 7.1 USB2-H-6001-M Dimension

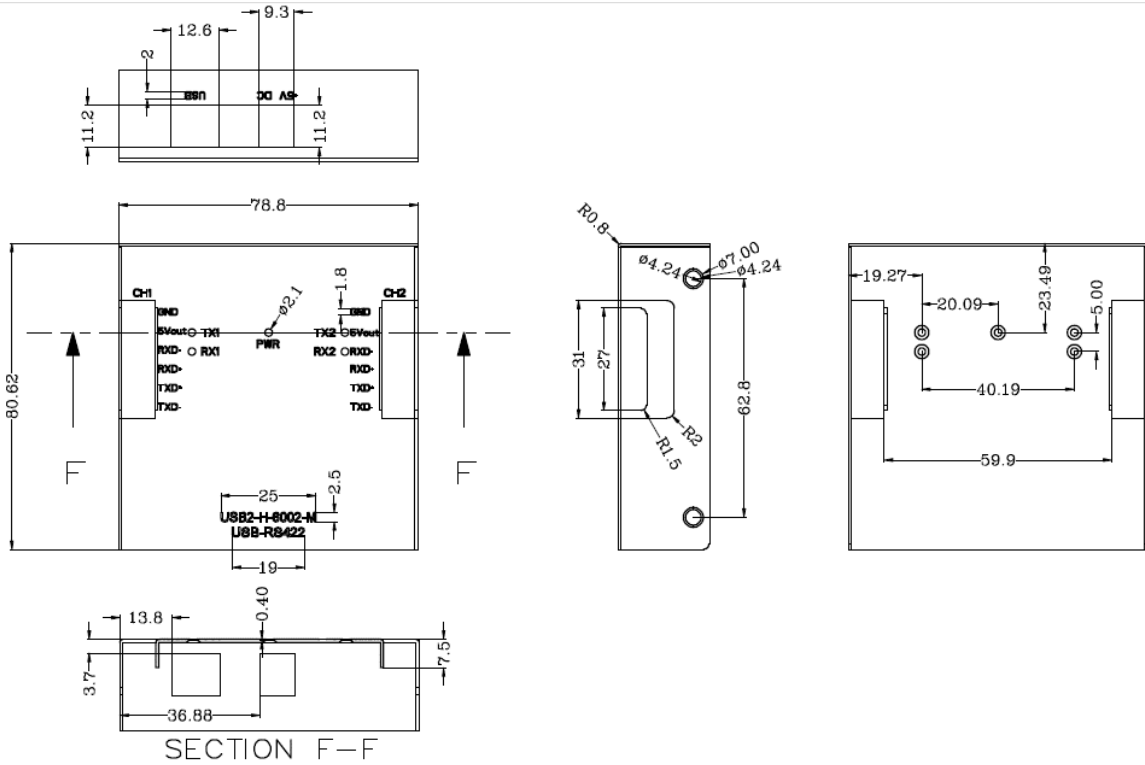


**Figure 7.1 - USB2-H-6001-M Top Cover of Dimension**

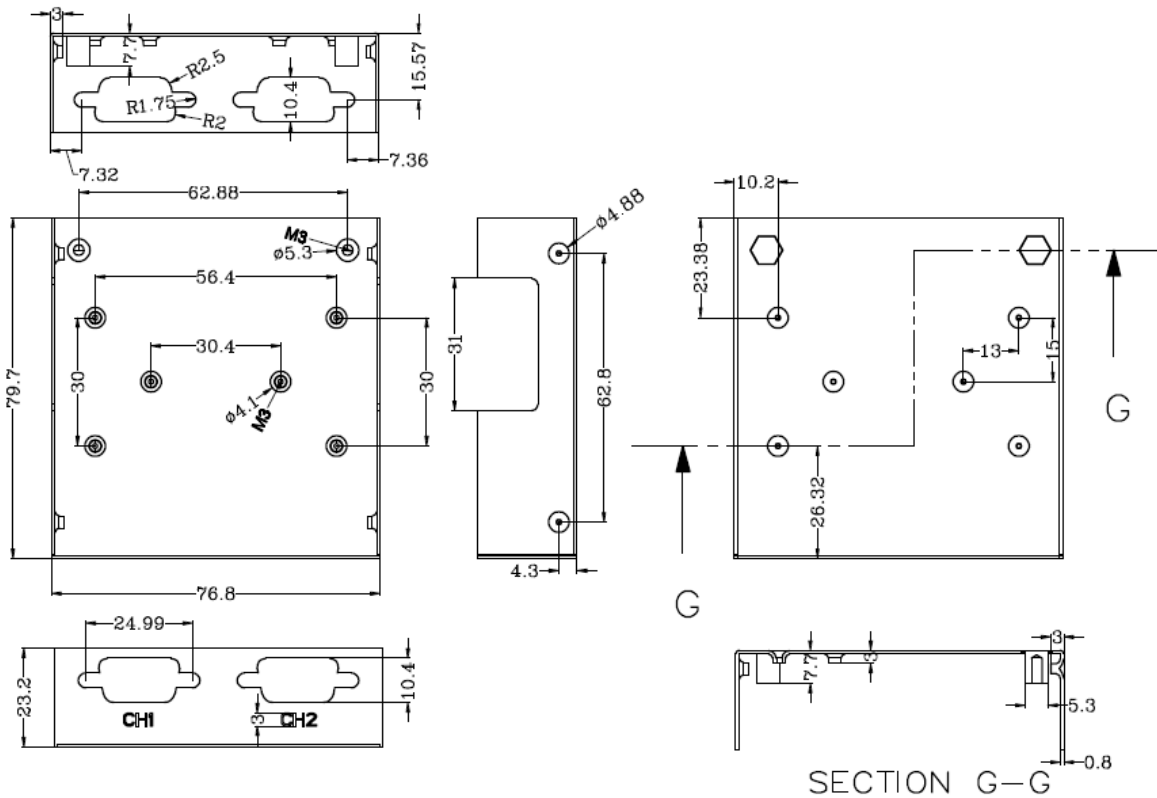


**Figure 7.2 - USB2-H-6001-M Bottom Cover of Dimension**

## 7.2 USB2-H-6002-M Dimension

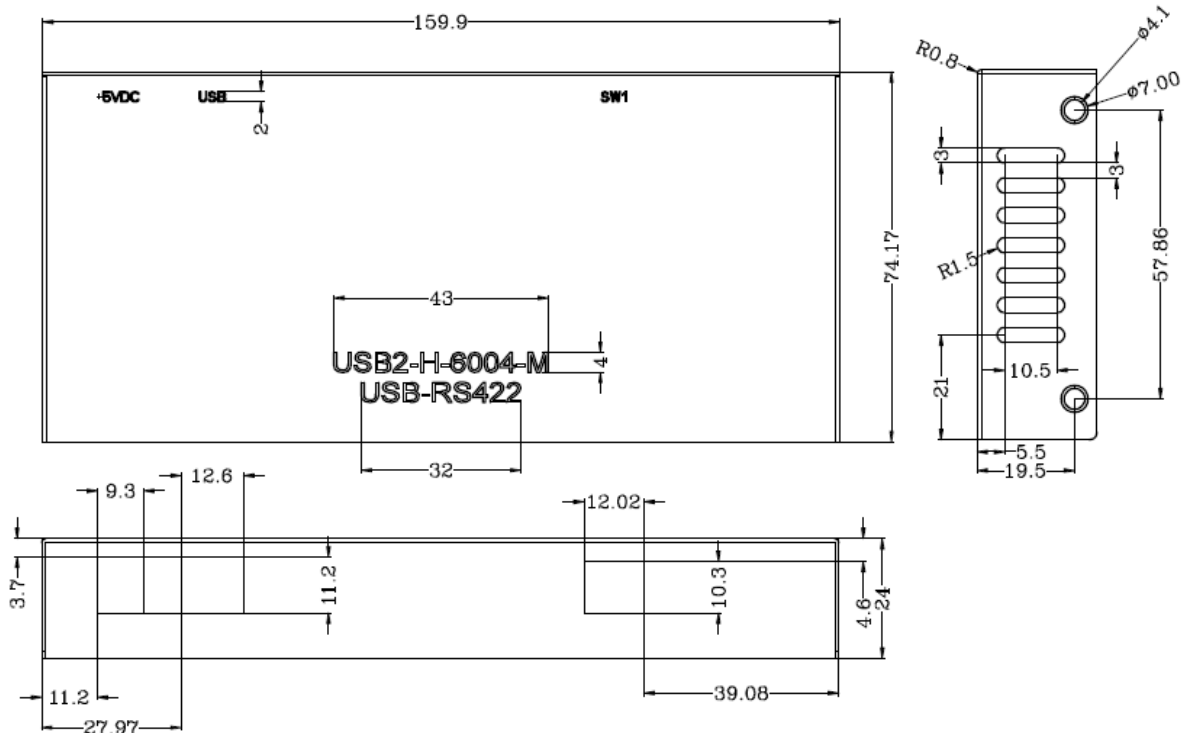


**Figure 7.3 - USB2-H-6002-M Top Cover of Dimension**

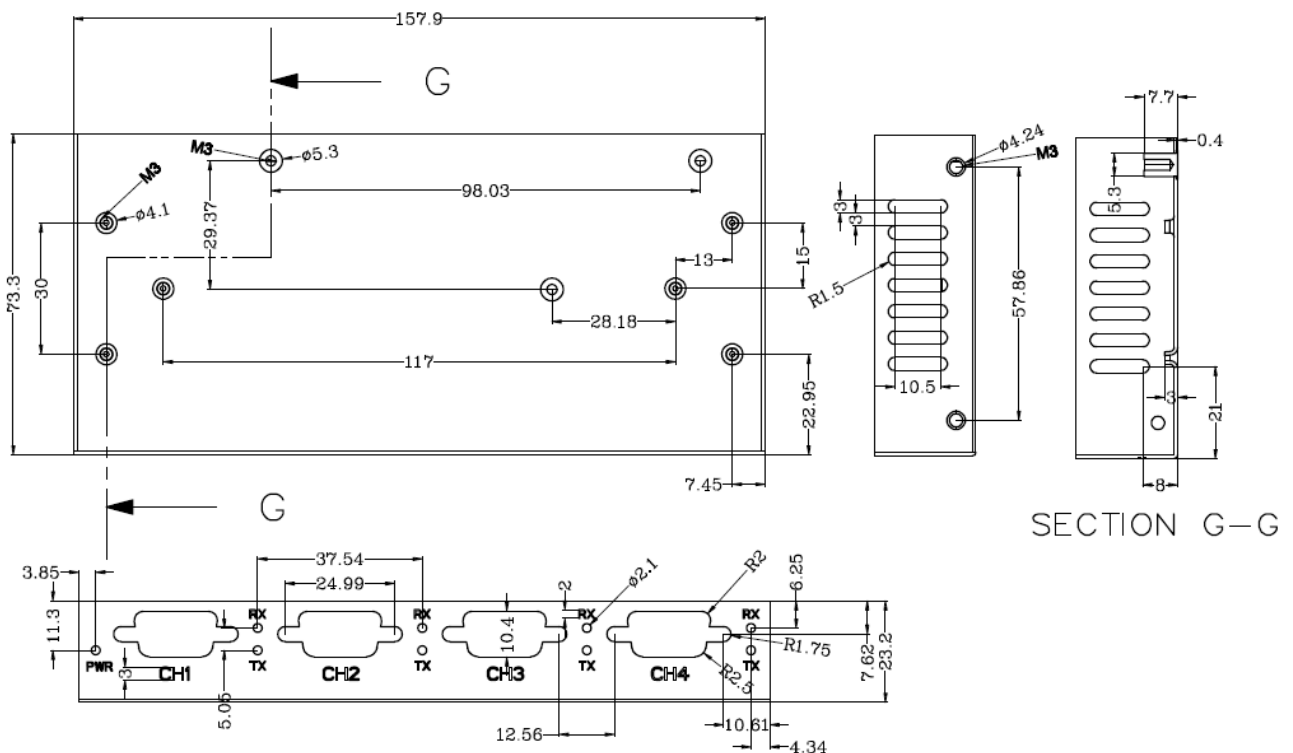


**Figure 7.4 - USB2-H-6002-M Bottom Cover of Dimension**

### 7.3 USB2-H-6004-M Dimension



**Figure 7.5 - USB2-H-6004-M Top Cover of Dimension**

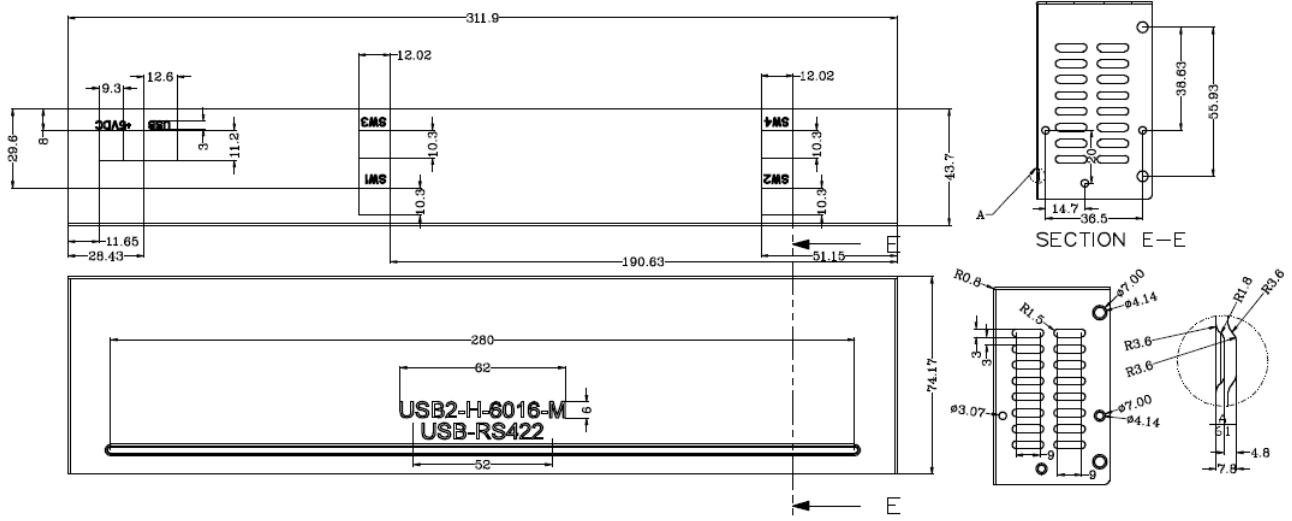


**Figure 7.6 - USB2-H-6004-M Bottom Cover of Dimension**

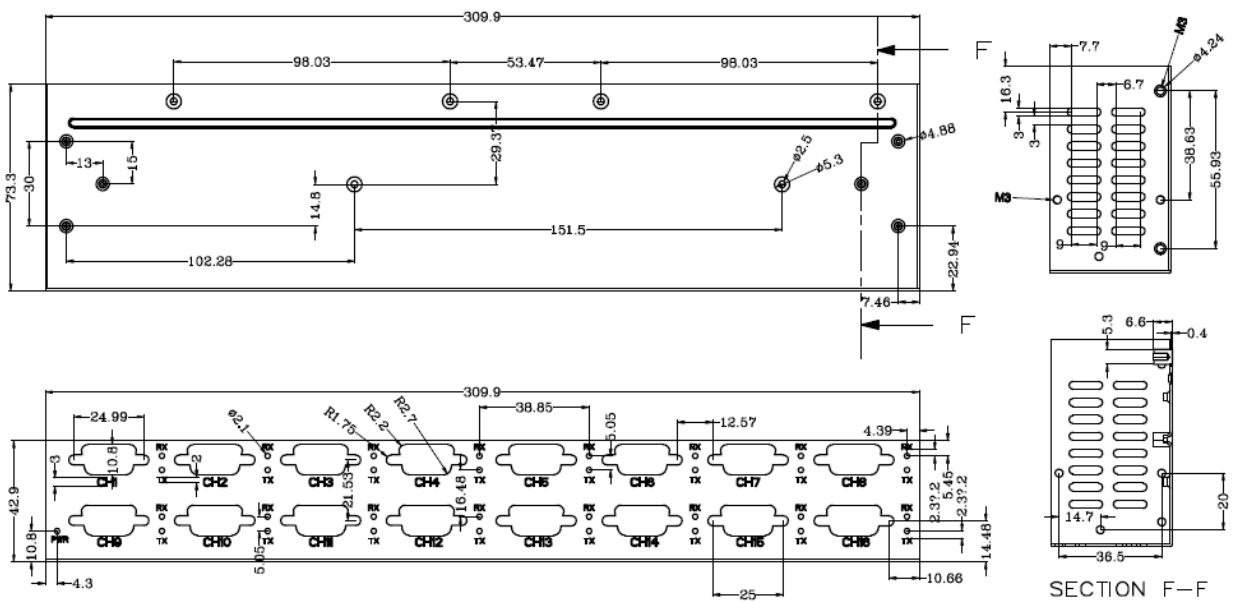




### 7.5 USB2-H-6016-M Dimension



**Figure 7.9 - USB2-H-6016-M Top Cover of Dimension**



**Figure 7.10 - USB2-H-6016-M Bottom Cover of Dimension**

## 8 Environmental Approvals & Declarations

### 8.1 EMI Compatibility

#### FCC and CE

The USB2-H-600X-M family have been tested to be compliant with both FCC Part 15 Subpart B and European EMC Directive.



**NOTE:** This is a Class B product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.



**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### 8.2 Safety

The USB2-H-600X-M family are defined as Limited Power Supply (LPS) device, with operating voltages under 60VDC.

### 8.3 Environmental

The USB2-H-600X-M family are a lead-free device that complies with the following environmental directives: RoHS, WEEE, REACH, PFOS and DecaBDE.

### 8.4 Reliability

The USB2-H-600X-M family are designed as a robust USB-Serial module for use in many environments. There are no user-serviceable parts. Any failure will require a replacement of the unit.

## 8.5 Import / Export Information

Import / Export Information	
Country of Origin	China
Harmonized Code	8471-80-1000
Product Description	USB to RS422 Development Module, Single/Dual/Quad/Eight/Sixteen COM Port
USA ECCN	EAR99 – No License Required

**Table 8.1 - Import / Export Information**

## 9 Troubleshooting

### 9.1 Hardware

Cables are the most common sources of trouble with external devices.

Check the following:

- USB cable is properly inserted at both ends
- Computer power is ON
- Computer is not in Sleep or Standby
- If a USB Hub is used, be sure it is set for "Self-Powered" operation
- If a USB Hub is used, be sure all cables are properly inserted
- If all the above are OK, the Yellow LED should be lit, indicating the device has been recognized by the USB subsystem.

RS422 cables – check the following:

- Output signals (TXD+, TXD-, RTS+, RTS-) are connected to the respective inputs (RXD+, RXD-, CTS+, CTS-) in each direction.
- Check for specific handshake requirements of your RS422 peripheral.
- If handshake signals are not used, ensure the application is set to "No Hardware Handshake", or equivalent.
- Test the port with a loop-back connector. Connect TXD+ to RXD+, TXD- to RXD-, RTS+ to CTS+ and RTS- to CTS-. Use a simple terminal program to check that data is transmitted and received.

### 9.2 Device Driver

Ensure the latest device driver is in use. See <http://www.ftdichip.com/Drivers/VCP.htm>.

If other devices with FTDI chips are installed in the system, check with all manufacturers of these devices for the latest device drivers.

See the FTDI installation guides for additional details: <http://ftdichip.com/Documents/InstallGuides.htm>

Common Windows Device Driver Troubles:

- **DEVICE TIMES OUT:** The default settings of the device driver assume typical data transfers of hundreds to thousands or more bytes at a given time. Some applications, such as a GPS device, only send data in short packets, often only a few bytes. If this is the case, it may be necessary to adjust the driver buffer size and/or latency timer to smaller values. These values can be adjusted through the advanced driver options as noted in Figure 2.10. The buffer size can be reduced to 64 bytes. The latency timer can be set as low as 2ms. A setting of 1ms will cause unnecessary USB traffic and could adversely affect data transmission.
- **ERRATIC MOUSE POINTER:** The device driver defaults to query an attached device to find out whether it is a mouse or modem, consistent with native COM port operation. Some RS422 peripherals constantly send short packets of data, causing the host system to "think" a mouse or modem has been attached. These short packets will interfere with normal mouse operation causing the pointer to jump around the screen. If this happens, disconnect the RS422 device and *uncheck the Serial Enumerator* option, also found on the advanced driver options screen in Figure 2.10.
- **COM PORT IN USE:** Windows keeps track of all COM port assignments. If multiple FTDIChip products have been connected to a single system, the COM port number will increase, even if the other devices are not attached. If the higher COM port assignments are not acceptable for the application, known unused COM port numbers should be uninstalled according to the FTDI installation guide: <http://ftdichip.com/Documents/InstallGuides.htm>.

### 9.3 Technical Support

Technical support may be obtained from your nearest Connective Peripherals office. See details below.

E-Mail (Support): [support@connectiveperipherals.com](mailto:support@connectiveperipherals.com)

Web: <http://www.connectiveperipherals.com/products>

## 10 Contact Information

### Global Headquarters – Singapore

Connective Peripherals Pte Ltd  
178 Paya Lebar Road  
#07-03  
Singapore 409030

Tel: +65 67430980  
Fax: +65 68416071

E-Mail (Sales)	<a href="mailto:sales@connectiveperipherals.com">sales@connectiveperipherals.com</a>
E-Mail (Support)	<a href="mailto:support@connectiveperipherals.com">support@connectiveperipherals.com</a>
Web Site URL	<a href="http://www.connectiveperipherals.com">http://www.connectiveperipherals.com</a>
Web Shop URL	<a href="http://www.connectiveperipherals.com">http://www.connectiveperipherals.com</a>

## Appendix A – List of Figures and Tables

### List of Figures

Figure 1.1 - USB2-H-6001-M.....	4
Figure 1.2 - USB2-H-6002-M.....	5
Figure 1.3 - USB2-H-6004/6008/6016-M .....	6
Figure 1.4 - USB2-H-6001-M Block Diagram .....	7
Figure 1.5 - USB2-H-6002-M Block Diagram .....	8
Figure 1.6 - USB2-H-6004/6008/6016-M Main Board Block Diagram .....	8
Figure 1.7 - USB2-H-6008/6016-M Daughter Board Block Diagram .....	8
Figure 2.1 - Hardware Ready .....	14
Figure 2.2 – Found New Hardware Wizard.....	14
Figure 2.3 – Automatic Install .....	15
Figure 2.4 - Complete Hardware Installation .....	15
Figure 2.5 - Hardware Ready .....	15
Figure 2.6 - Device Manager .....	16
Figure 2.7 - COM Port Assignment .....	16
Figure 2.8 – Access COM Port Properties.....	16
Figure 2.9 - Settings Tab .....	17
Figure 2.10 - Advanced Options.....	17
Figure 3.1 - USB2-H-6001-M Terminal Block Connector Assignment.....	20
Figure 3.2 - USB2-H-6002-M Terminal Block Connector Assignment.....	21
Figure 4.1 – RS422 Network .....	22
Figure 4.2 – RS422 Network with terminations .....	23
Figure 7.1 - USB2-H-6001-M Top Cover of Dimension .....	28
Figure 7.2 - USB2-H-6001-M Bottom Cover of Dimension .....	29
Figure 7.3 - USB2-H-6002-M Top Cover of Dimension .....	30
Figure 7.4 - USB2-H-6002-M Bottom Cover of Dimension .....	30
Figure 7.5 - USB2-H-6004-M Top Cover of Dimension .....	31
Figure 7.6 - USB2-H-6004-M Bottom Cover of Dimension .....	31
Figure 7.7 - USB2-H-6008-M Top Cover of Dimension .....	32
Figure 7.8 - USB2-H-6008-M Bottom Cover of Dimension .....	32
Figure 7.9 - USB2-H-6016-M Top Cover of Dimension .....	33
Figure 7.10 - USB2-H-6016-M Bottom Cover of Dimension .....	33

### List of Tables

Table 1.1 – LED Description .....	7
Table 1.2 - Performance Figures .....	11

Table 1.3 - Ordering Information .....	11
Table 2.1 - RS422 DTE to DCE connection with straight-through cable.....	12
Table 2.2 - Switch Setting Configuration of the 4, 8 and 16 ports product .....	13
Table 3.1 - USB "B" Receptacle Pin-Out .....	18
Table 3.2 - DE-9P RS422 Pin-Out .....	18
Table 3.3 -USB2-H-6001-M Terminal Block interface.....	19
Table 3.4 -USB2-H-6002-M Terminal Block interface.....	20
Table 4.1 -Bias and Termination Resistor Numbers of Each Modules .....	24
Table 5.1 - USB Electrical Details .....	25
Table 5.2 - 5V Power Adapter Electrical Details.....	25
Table 5.3 - RS422 Electrical Details.....	25
Table 5.4 - RS422 Electrical Details .....	26
Table 6.1 - Storage Temperature .....	27
Table 6.2 - Operating Temperature .....	27
Table 8.1 - Import / Export Information .....	35



## Appendix B – Revision History

Revision	Changes	Date
1.0	Initial release	2012-01-19
1.1	Re-branding to reflect the migration of the product from EasySync to Connective Peripherals name – logo change, copyright changed, contact information Changed, all internal hyperlinks changed.	2019-03-12