Future Technology Devices International Ltd

USB-COM485-PLUS2

$C \epsilon$ FC UK CA

Datasheet

1 Introduction

1.1 Functional Description

The USB-COM485-PLUS2 is a USB to a dual interface RS485 level serial UART adaptor incorporating FTDI's FT2232H Hi-Speed USB2.0 (480Mb/s) to dual serial UART interface IC device. The FT2232H handles all the USB signaling and protocols. The adaptor provides a fast, simple way to connect devices with an RS485 interface to USB.
USB-COM485-PLUS2 is a USB to a dual-port RS485 adapter.

The integrated electronics of the USB-COM485-PLUS2 utilise the FTDI FT2232H and includes RS485 level shifters plus TXD/RXD LEDs to provide a visual indication of data traffic through the module.
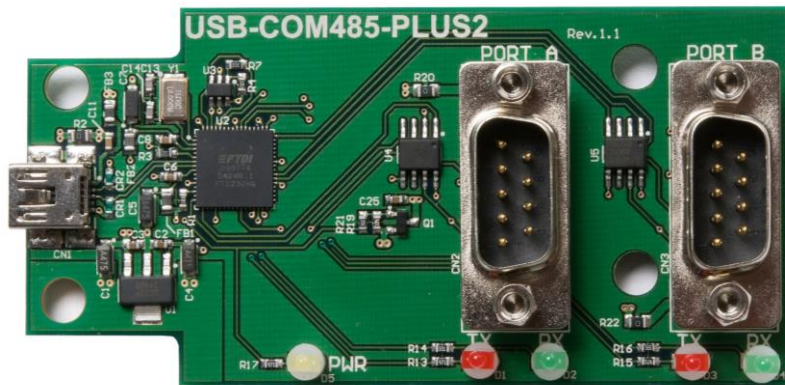
Figure 1.1 USB-COM485-PLUS2

The module uses a standard USB-B device connector for connection to an upstream host or hub port. RS485-level signals are available on an industry-standard DE-9P connector. The maximum RS485-level data rate is 10Mbps.

The USB-COM485-PLUS2 module requires USB device drivers, available free from https://ftdichip.com/, which are used to make the USB-COM485-PLUS2 appear as a Virtual COM Port (VCP). This allows existing serial communications software, such as HyperTerminal, to exchange data through the USB-COM485-PLUS2 to a legacy RS485 peripheral device.

1.2 LED Description

The USB-COM485-PLUS2 uses three LEDs to indicate a valid link as well as data traffic according to the following table:

LED Colour	Function	Description
Yellow x 1	Power	ON when USB-COM485-PLUS2 is configured and ready
Red x 2	TxD Activity	Flashes when data is transmitted from the USB-COM485-PLUS2 to the attached RS485 device
Green x 2	RxD Activity	Flashes when data is transmitted from the attached RS485 device to the USB-COM485-PLUS2

Table 1.1 – LED Description

1.3 Block Diagram
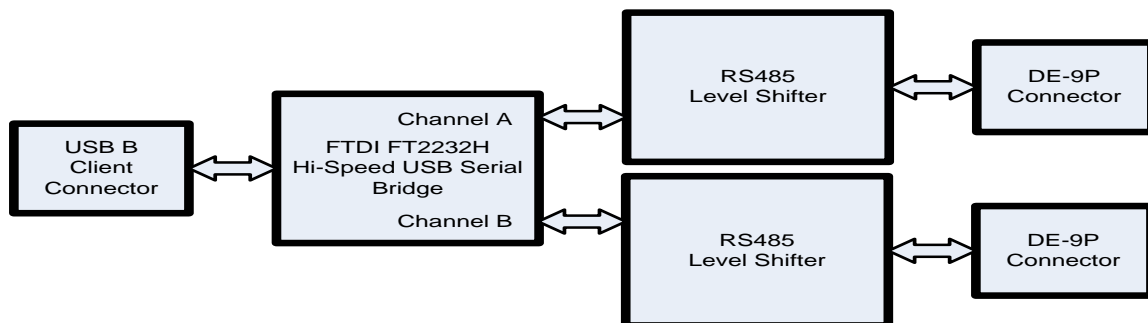
Figure 1.2 USB-COM485-PLUS2 Block Diagram

1.3.1 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.

FTDI FT2232H

FT2232H Hi-Speed USB2.0 (480Mb/s) is a dual serial UART interface IC device. Operating system device drivers are required in order to work with the one to provide the Virtual COM Port serial functionality.

Dual RS485 Level Shifter

The RS485 level shifter converts the signals provided by the FT2232H into the voltage levels required by RS485 devices.

DE-9P Connector (Male)

The DE-9P connector is configured in an industry standard (TIA/EIA-574) pin-out to provide connection to RS485 peripherals through standard cables. See section Table 3.2.

1.4 Features

- Adds dual RS-485 serial port by connecting to a USB 2.0 Hi-Speed interface.

- Easy plug & play installation and RS-485 device connection

- Operates 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, Linux and Android device drivers

- Installs as a standard Windows COM port

- 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

- FIFO: 4K byte transmit buffer, 4K byte receive buffer

- RS-485 data signals: Data+, Data-, GND

- Powered by USB port. No external power adapter required. +5V output available.

- Serial port speed up to 10Mbps

- Serial Communication Parameters

    o Parity: None, Even, Odd

    o Data bits: 7, 8

    o Flow control: X-ON/X-OFF, None

- Two DE-9P male connector

- LEDs indicate USB Enumeration, RxD, TxD for monitoring port status & easy diagnostics

- Operating temperature of -40°C to +85°C

- Echo and non-Echo two modes can be selected.

1.5 Performance Figures

Parameter	Performance
USB Interface	480Mbps USB 2.0 Hi-Speed
RS485 Interface	Standard Windows baud rates (300bps to 921.6Kbps) Custom baud rates (300bps to 10Mbps) through baud rate aliasing. See FTDI Application Note: Configuring FT232R, FT2232 and FT232BM Baud Rates
Max Cable Length	USB = 5m, RS485 =12m (at 10Mbps)

Table 1.2 - Performance Figures

Part Number	Description
USB-COM485-PLUS2	USB-COM-Plus Hi-Speed USB to dual-Port RS485 module

Table 1.3 - Ordering Information

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2 Installation

2.1 Example Applications and Configurations

2.1.1 Wiring

Insert the A-plug into an available USB Host or Hub port. Insert the mini-B-plug into the USB mini-B-receptacle on the USB-COM485-PLUS2.

DTE Pin Number	Signal Name	Expected Connect Signal
1	DATA- = Transmit/Receive Data, negative polarity Also Terminator 2	DATA- Pin 2 of 120R Terminating Resistor. Only Required if the USB-COM485-PLUS2 is the first or last device in a multi-drop RS485 System, to meet RS485 Termination Requirements.
2	DATA+ = Transmit/Receive Data, positive polarity	DATA+
3	Terminator 1	Pin 1 of 120R Terminating Resistor. Only Required if the USB-COM485-PLUS2 is the first or last device in a multi-drop RS485 System, to meet RS485 Termination Requirements.
4	N/A	N/A
5	GND = signal ground	GND
6	N/A	N/A
7	echo enable terminal 1	Local echo function control. Connect to pin 8 can disable the local echo function. The local echo is enabled by default.
8	echo enable terminal 2	Local echo function control. Connect to pin7 can disable the local echo function. The local echo is enabled by default.
9	PWR = +5V DC output	PWR

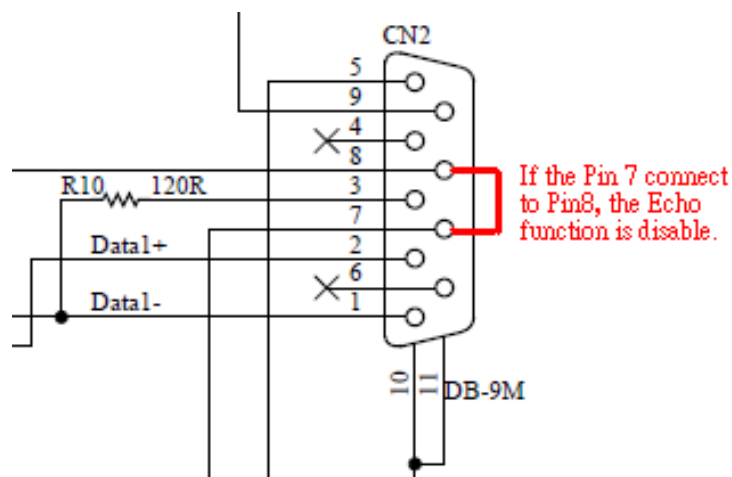**Table 2.1 – RS485 DTE to DCE connection**

Figure 2.1 USB-COM485-PLUS2 Termination resistor and echo disable

2.2 Driver Support

Royalty free VIRTUAL COM PORT (VCP) and D2XX Direct Drivers are available for the following Operating Systems (OS):

- Windows

- Linux

- Mac

- Android (J2xx / D2xx only)

See the following website link for the full driver support list including OS versions and legacy OS.

https://ftdichip.com/drivers/

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.

D2XX Direct Drivers allow direct access to the USB device through a DLL. Application software can access the USB device through a series of DLL function calls. The functions available are listed in the D2XX Programmer's Guide document which is available from the Documents section of our website.

Please also refer to the Installation Guides webpage for details on how to install the drivers.

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. Simply plug the device into the Windows PC and the drivers should load automatically if the PC is connected to the internet. Additional installation instructions can be found on the Installation Guides page of our website.

2.2.2 Mac OS, Linux and Android

Device drivers and FTDI installation guides for Mac OS X, Linux and Android are available for download on the FTDI Chip website. Follow the respective FTDI Installation Guides for the chosen operating system.

3 Connections

3.1 External Connectors

3.1.1 USB

The USB-COM485-PLUS2 is a downstream USB 2.0 Device. A standard USB mini type "B" receptacle is mounted inside the USB-COM485-PLUS2 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	ID	No connected
5	Ground	GND = USB signal ground
Shield	Case Ground	Drain = typically connected to the host PC case

Table 3.1 – USB mini type "B" Receptacle Pin-Out

3.1.2 RS485

The RS485 ports are configured as Data Terminal Equipment (DTE), with a 9-contact D-Sub Pin connector. Pin assignments are according to TIA/EIA-485. In addition, pin9 of DB9 provides +5VDC to an external device with a maximum current draw of 450mA once the USB-COM485-PLUS2 has been enumerated by the system. Both D-type connectors have a similar connection as described in Table 3.2.

Pin Number	Pin Type	Description
1	Input/Output	DATA- Pin 2 of 120R Terminating Resistor. Only Required if the USB-COM485-PLUS2 is the first or last device in a multi-drop RS485 System, to meet RS485 Termination Requirements.
2	Input/Output	DATA+
3	Input	Pin 1 of 120R Terminating Resistor. Only Required if the USB-COM485-PLUS2 is the first or last device in a multi-drop RS485 System, to meet RS485 Termination Requirements.
4	N/A	N/A
5	GND = signal ground	GND
6	N/A	N/A
7	Input	Pin 7 of the local echo control. Connect to pin 8 of the echo control to disable local echo. Default is that local echo is enabled.
8	Output	Connect to pin 7 of the echo control to disable local echo. Default is that local echo is enabled.
9	PWR = +5V DC output	PWR

Table 3.2 – DE-9P RS485 Pin-Out

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4 Electrical details

4.1 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.
I_{cc}	USB current***		30	50	mA	***Does not include power supplied to external device connected to pin 9 of both ports.

Table 4.1 - USB Electrical Details

4.2 RS485

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V_{trans}	Transmitter output voltage swing	2			V	RL = 50R□□CL = 50pF
V_{rec}	Receiver input voltage range	-7		+12	V	RL = 50R□□CL = 50pF
ESD HBM	N/A		±15		KV	For all RS-485 Inputs and Outputs pin

Table 4.2 – RS485 Electrical Details

4.3 Power Output

The USB-COM485-PLUS2 provides +5V DC for an external device that requires power on pin9 of DB9. The maximum allowable current is 500mA, including the circuitry of the USB-COM485-PLUS2 itself. Up to 450mA may be used by the external device. The +5V output is only enabled when the USB interface is not in suspend.

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
I_O	Output Power Current	0		250*	mA	USB interface is not in SUSPEND. *This is total current between the 2 ports.

Table 4.3 - Power Output for USB-COM485-PLUS2

5 Mechanical Details

5.1 Module Mechanical Dimensions

Dimensions are in mm. The PCB height is dominated by the D-type connectors and is 17mm +/- 2mm (this includes the tails of the D-type connectors soldered pins).
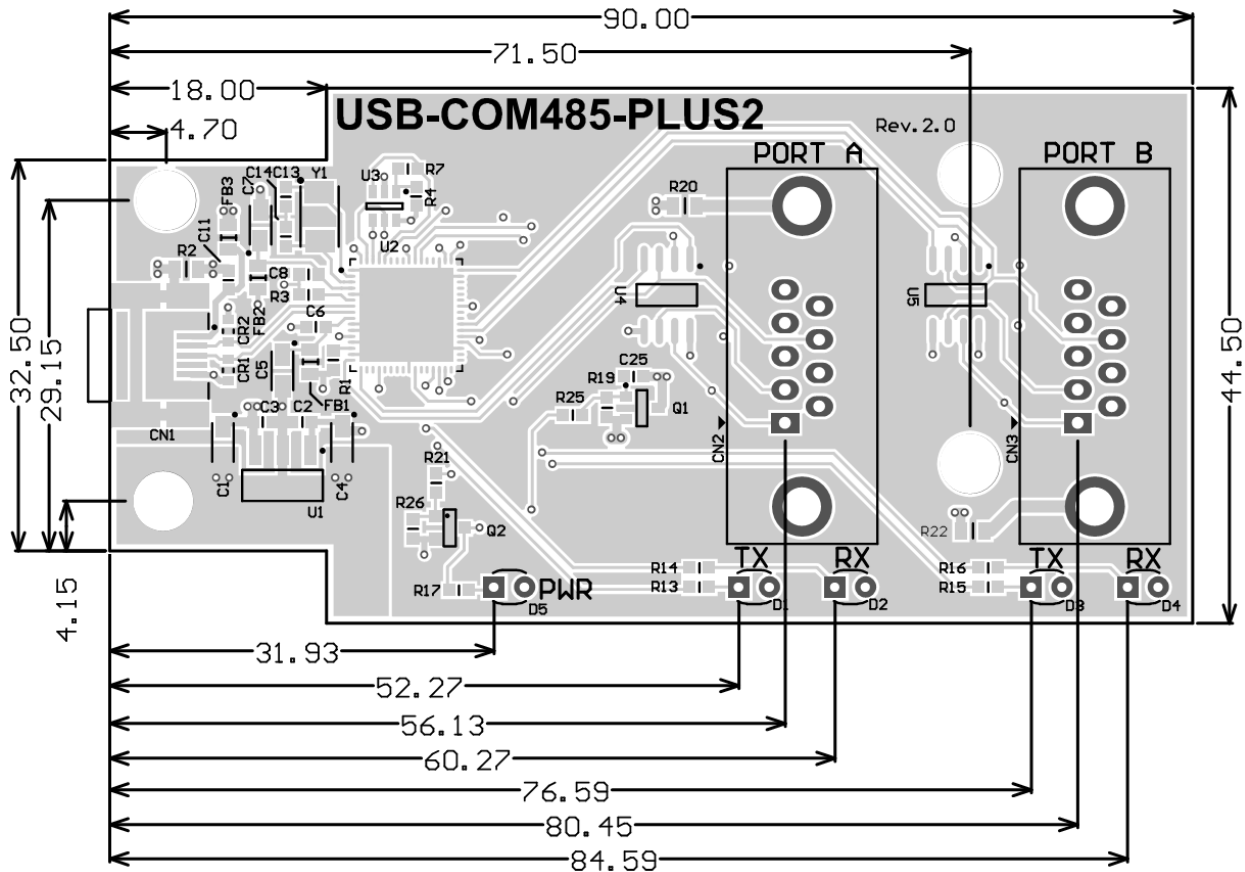

Figure 5.1 - USB-COM485-PLUS2 PCB Dimensions

6 Physical Environment Details

6.1 Storage

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

Table 6.1 - Storage Temperature

6.2 Operating

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

Table 6.2 - Operating Temperature

7 Environmental Approvals & Declarations

7.1 EMI Compatibility

FCC, UKCA and CE

The USB-COM485-PLUS2 has 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.

7.2 Safety

The USB-COM485-PLUS2 is defined as Limited Power Supply (LPS) device, with operating voltages under 60VDC.

7.3 Environmental

The USB-COM485-PLUS2 is a lead-free device that complies with the following environmental directives: RoHS, WEEE, REACH, PFOS and DecaBDE.

7.4 Reliability

The USB-COM485-PLUS2 is 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.

7.4.1 MTTF

The Mean Time To Failure is calculated at TBD hours.

7.5 Import / Export Information

Import / Export Information	
Country of Origin	China
Harmonized Code	TBD
Product Description	USB to RS485 Development Module, Dual Port
USA ECCN	EAR99 – No License Required

Table 7.1 - Import / Export Information

8 Troubleshooting

8.1 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.

RS485 cables – check the following:

- Check for specific handshake requirements of your RS485 peripheral.

- Because there are no handshake signals, ensure the application is set to "No Hardware Handshake", or equivalent.

- Test the port with a loop-back connector. Connect DATA+ to DATA+, DATA- to DATA-. Use a simple terminal program to check that data is transmitted and received.

8.2 Device Driver

Ensure the latest device driver is in use. See https://ftdichip.com/

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: https://ftdichip.com/document/installation-guides/

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 2.13. 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 RS485 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 RS485 device and *uncheck the Serial Enumerator* option, also found on the Advanced driver options screen in Figure 2.13.

- 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: https://ftdichip.com/document/installation-guides/

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9 Contact Information

Future Technology Devices International Limited
Unit 1, 2 Seaward Place, Centurion Business Park
Glasgow G41 1HH
United Kingdom
Tel: +44 (0) 141 429 2777
Fax: +44 (0) 141 429 2758

E-mail (Sales)	sales1@ftdichip.com
E-mail (Support)	support1@ftdichip.com
E-mail (General Enquiries)	admin1@ftdichip.com
Web Site URL	https://ftdichip.com/
Web Shop URL	https://ftdichip.com/

Branch Office – Taipei, Taiwan

Future Technology Devices International Limited (Taiwan)
2F, No. 516, Sec. 1, NeiHu Road
Taipei 114
Taiwan, R.O.C.
Tel: +886 (0) 2 8797 1330
Fax: +886 (0) 2 8751 9737

E-mail (Sales)	tw.sales1@ftdichip.com
E-mail (Support)	tw.support1@ftdichip.com
E-mail (General Enquiries)	tw.admin1@ftdichip.com
Web Site URL	https://ftdichip.com/

Branch Office – Tigard, Oregon, USA

Future Technology Devices International Limited (USA)
7130 SW Fir Loop
Tigard, OR 97223-8160
USA
Tel: +1 (503) 547 0988
Fax: +1 (503) 547 0987

E-Mail (Sales)	us.sales@ftdichip.com
E-Mail (Support)	us.support@ftdichip.com
E-Mail (General Enquiries)	us.admin@ftdichip.com
Web Site URL	https://ftdichip.com/

Branch Office – Shanghai, China

Future Technology Devices International Limited (China)
Room 1103, No. 666 West Huaihai Road,
Shanghai, 200052
China
Tel: +86 21 62351596
Fax: +86 21 62351595

E-mail (Sales)	cn.sales@ftdichip.com
E-mail (Support)	cn.support@ftdichip.com
E-mail (General Enquiries)	cn.admin@ftdichip.com
Web Site URL	https://ftdichip.com/

Distributor and Sales Representatives

Please visit the Sales Network page of the FTDI Web site for the contact details of our distributor(s) and sales representative(s) in your country.

10 Appendix A – List of Figures and tables

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Appendix B - Revision History

Document Title: USB-COM485-PLUS2 Datasheet

Document Reference No.:   FT_000136

Clearance No.:   FTDI# 104

Product Page: Documents

Document Feedback: Send Feedback

Revision	Changes	Date
Version Draft	First Draft	06-07-2009
Version 1.0	First Release	27-08-2009
Version 1.1	Modified the description of Echo function	25-01-2010
Version 1.2	Edited Section 1.3.1, Removed the statement "A standard "A to B" cable is provided"	12-04-2010
Version 1.3	Added more details to dimensions drawing	06-05-2011
Version 1.4	Added UKCA compliance and logo. Updated driver section and links.	11-07-2023