Omega USBH Transducer Command Reference

This document provides information necessary for communicating with Omega *USBH and PX409-*USB transducers through a PC communication (serial) port. This allows flexibility to use a terminal program (such as HyperTerminal), or to develop a custom API. Commands are case sensitive. Brackets **[ ]** indicate optional part of command. The following represent ASCII characters: "$^{S}_{P}$" = Space (0x20 ASCII); "$^{C}_{R}$" = Carriage return (0x0D ASCII); "$^{L}_{F}$" = Line Feed (0x0A ASCII); "**>**" = 0x3E ASCII.

Sending an invalid command, sending a command before the transducer has responded to a previous command, sending individual ASCII numbers faster than the baud rate of the sensor, or sending a number which is out of range (plus pressing the ENTER key) will return the following response from the transducer:

$^{C}_{R}$$^{L}_{F}$@command $^{S}_{P}$ unsupported $^{C}_{R}$$^{L}_{F}$>

The USB Connection appears to the PC as a Virtual Serial COM port. To communicate with the USBH transducer, the PC must be running a terminal program (such as HyperTerminal), and have the latest FTDI drivers installed (see FTDI Drivers section). The serial port connection settings are:

*USBH:		PX409-*USB	
Bits Per Second:	115200	Bits Per Second:	9600
Data Bits:	8	Data Bits:	8
Parity:	None	Parity:	None
Stop Bits:	1	Stop Bits:	1
Flow Control:	None	Flow Control:	None

In addition, for HyperTerminal, the checkboxes in "ASCII Setup", "Send line ends with line feeds" and "Echo typed characters locally" should be checked for best appearance. See the "USBH HyperTerminal Setup" section for more details.

Note: When a USBH transducer is connected to the computer's USB port, there will be a 5-7 second delay before communication can begin with the transducer. This is due to the time it takes for the USBH transducer to be enumerated by the PC, and for the transducer's firmware to boot and initialize. The first time a transducer is connected to any PC, or if the driver is updated, the time delay will be much longer, due to the extra processes that the PC must employ to install the USB driver for each COM port.

1) SNR* - Read only. Returns the transducer's serial number.

Syntax: **SNR $^{C}_{R}$ [$^{L}_{F}$]**

Returns: **SERIAL $^{S}_{P}$ NUMBER $^{S}_{P}$ = $^{S}_{P}$ xxxxxxxxx $^{C}_{R}$ $^{L}_{F}$>** Where x is a number or letter (ASCII) between 0 and 9 or A to Z (only capitals allowed).

*This command is supported only by transducers with part numbers containing USBH.

2) ENQ – Read only. Returns the transducer's Unit ID, firmware version, range, and engineering units, all in ASCII. The Unit ID for the non "H" suffix transducers (PX409USB) is "USBPX1". The Unit ID code for the PX409-*USBH is "USBPX2", and LC411*-USBH is "USBLC1".

Syntax: **ENQ $^{C}_{R}$ [$^{L}_{F}$]**

Returns**: **aaaaabb $^{C}_{R}$ $^{L}_{F}$** (transducer's Unit ID) where "a" is an Upper Case character, and b is a positive integer, returned as an ASCII character. – This field indicates the type of unit.

c.cc.cc.cccc $^{C}_{R}$ $^{L}_{F}$ (firmware version for updated product line) where c is a positive integer returned as an ASCII character.

Snnnnnnn.mmm $^{S}_{P}$ to $^{S}_{P}$ Snnnnnnn.mmm $^{S}_{P}$ xxxxxxxx $^{S}_{P}$ Z $^{C}_{R}$ $^{L}_{F}$> (transducer range and units) where both n and m are ASCII characters representing integers between 0 and 9. n has a length between 1 and 7 digits, and m has a length between 0 and 3 digits. x represents the engineering units of the transducer. x can be any ASCII character, positive integer, or symbol, and is 0-8 characters in length. x can also be omitted from the response (in this case, Z will also be omitted). Z can be A, G, D, V, or blank. S is a sign character, and is either the minus ASCII character (0x2D), or nothing. n, m, x, the decimal place, S, and Z are returned as ASCII characters. The number on the left (separated by "to") must be smaller (including the sign) than the number on the right.

****Firmware version format for PX409-*USB is cccccc $^{C}_{R}$ $^{L}_{F}$** where c is a positive integer returned as an ASCII character.

3) IFILTER - Read/Write. Reads or sets the IIR filter period (time constant).

Syntax: **IFILTER[$^{S}_{P}$ nnn] $^{C}_{R}$ [$^{L}_{F}$]** where optional nnn is 0 or 1 (disabled), or between 2 to 255

Returns: **I $^{S}_{P}$ = $^{S}_{P}$ xxx $^{C}_{R}$ $^{L}_{F}$>** where xxx is an ASCII representation of the IFILTER setting, and can be 1, 2, or 3 bytes long.

4) MFILTER – Read/Write. Reads or sets the Moving Average filter order.

Syntax: **MFILTER[$^{S}_{P}$ nnn] $^{C}_{R}$ [$^{L}_{F}$]** where optional nnn is 0 or 1 (disabled), or between 2 to 63 (extra position holds place if expansion is later desired).

Returns: **I $^{S}_{P}$ = $^{S}_{P}$ xxx$^{C}_{R}$ $^{L}_{F}$>** where xxx is an ASCII representation of the MFILTER setting, and can be 1, 2, or 3 bytes long.

5) AVG* – Read/Write. Reads or sets the number of data points to be averaged for the boxcar average filter. Valid values are 0, 2, 4, 8 and 16. Note: the output rate is determined by the RATE command setting divided by this value (excluding 0). AVG x sets the averaged number. Note: the boxcar changes the rate of the readings returned by the PC command. This is because the boxcar averages the specified number of readings given by **nn**, and outputs one reading for the group.

Syntax: **AVG[$^{S}{}_{P}$ nn] $^{C}{}_{R}$ [$^{L}{}_{F}$]** Where nn is an optional number.

Returns: **AVG $^{S}{}_{P}$ = $^{S}{}_{P}$ xx $^{C}{}_{R}$ $^{L}{}_{F}$>** Where x is 0 or 1 (disabled), or 2, 4, 8 and 16

*This command is supported only by transducers with part numbers containing USBH.

6) RATE* – Read/write. Reads or sets the transducer update rate. Valid Values are 0=5sps, 1=10sps, 2=20sps, 3=40sps, 4=80sps, 5=160sps, 6=320sps, 7=640sps, 8=1000sps.

Syntax: **RATE [$^{S}{}_{P}$ nn] $^{C}{}_{R}$ [$^{L}{}_{F}$]** where nn = a 1-2 digit positive integer representing samples per second as defined above (two bytes for future flexibility)

Returns: **RATE $^{S}{}_{P}$ =xx $^{C}{}_{R}$ $^{L}{}_{F}$>** where xx is an ASCII representation of the RATE setting (as defined above), and can be 1-2 bytes long.

*This command is supported only by transducers with part numbers containing USBH.

7) PC* – Starts continuous stream of readings from the transducer, at an update rate specified by the RATE command. Data is in 4 byte IEEE 754 format (1 bit sign, 8 bits exponent, 23 bits significand (mantissa)), plus sync byte, plus packet type. Data is post filter, and is a scaled floating point representation of the transducer's native engineering units. Data is sent Little Endian to be compatible with the PC.

Syntax: **PC $^{C}{}_{R}$ [$^{L}{}_{F}$]**

Returns: 6 to 10 byte packet (If one or more data bytes are 0xAA, a 0xAA bit stuff byte is added after each 0xAA data byte occurrence, whereby the sync byte is the only occurrence of a single 0xAA byte. This allows the user PC software to parse each message accurately and easily.

Byte #	1	2	3	3a	4	4a	5	5a	6	6a
Data Format	AA	3B	XX	AA	XX	AA	XX	AA	XX	AA
Description	sync	packet type	LSB float	bit stuff**	data	bit stuff**	data	bit stuff**	MSB float	bit stuff**

*XX = 0x00 to 0xFF

** optional- only included if previous data byte is 0xAA, otherwise not present

Note: Stream must be stopped (PS command) before any other command can be executed.

*This command is supported only by transducers with part numbers containing USBH.

8) PS* - Stops continuous stream of readings.

Syntax: **PS** ${}^{C}{}_{R}$**[**${}^{L}{}_{F}$**]**

Returns: Null

*This command is supported only by transducers with part numbers containing USBH.

9) P – Sends single ASCII reading (decimal point also sent as ASCII). Data is post filter, and scaled to the native engineering units and type of transducer.

Syntax: **P** ${}^{C}{}_{R}$**[**${}^{L}{}_{F}$**]**

Returns: (Variable length ASCII packet) ${}^{C}{}_{R}{}^{L}{}_{F}$**>**

Example: "`-0.016` ${}^{S}{}_{P}$ `PSI` ${}^{S}{}_{P}$ `G`${}^{C}{}_{R}{}^{L}{}_{F}$**>**"

will be "**2D 30 2E 30 31 36 20 50 53 49 20 47 0D 0A 3E**" hex.

10) B* – Sends single Binary reading.

Syntax: **B** ${}^{C}{}_{R}$**[**${}^{L}{}_{F}$**]**

Returns: Transducer sends 6 byte packet (see "PC" command for data format).

*This command is supported only by transducers with part numbers containing USBH.

11) SHUNT – Controls the internal shunt calibration resistor.

Syntax: **SHUNT [**${}^{S}{}_{P}$ **n]** ${}^{C}{}_{R}$**[**${}^{L}{}_{F}$**]** where n = 1 or 0 (1 means the Shunt resistor is applied, 0 means not applied). Omit **[**${}^{S}{}_{P}$ **n]** to obtain the current status of the shunt resistor.

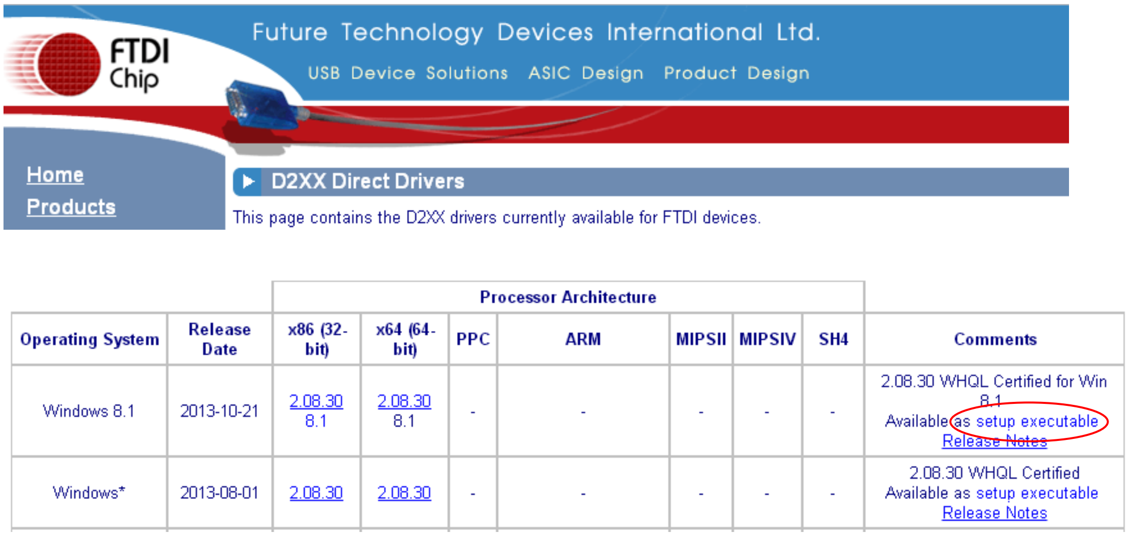
Returns: **SHUNT** ${}^{S}{}_{P}$ **=x** ${}^{C}{}_{R}{}^{L}{}_{F}$**>** where x is an ASCII representation of the SHUNT setting (as defined above), and is 1 byte long.

Note: This command is supported only by transducers with part numbers containing USBH that contain an internal shunt calibration resistor.

FTDI Drivers

Before connecting the transducer to the computer, verify that the latest FTDI drivers are installed on the computer. The Windows D2XX drivers are located at:

http://www.ftdichip.com/Drivers/D2XX.htm. For ease of use, click on the “setup executable” link, as shown in the screen shot of FTDI’s website below:


FTDI Chip
Future Technology Devices International Ltd.
USB Device Solutions ASIC Design Product Design
Home
Products

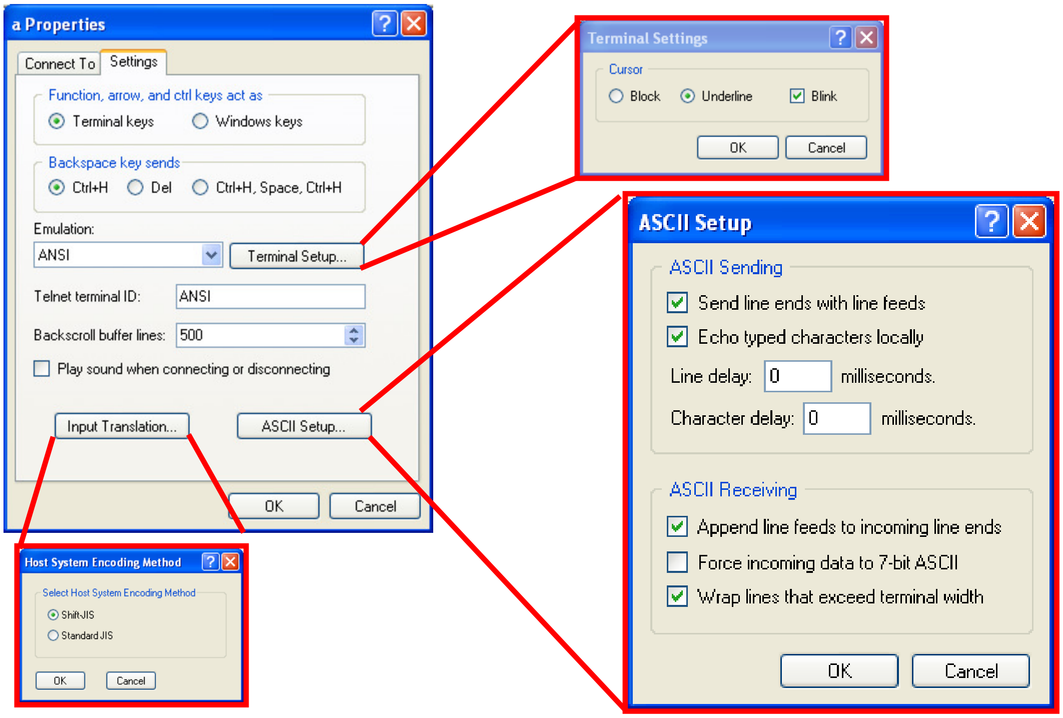
D2XX Direct Drivers

This page contains the D2XX drivers currently available for FTDI devices.

		Processor Architecture							
Operating System	Release Date	x86 (32-bit)	x64 (64-bit)	PPC	ARM	MIPSII	MIPSIV	SH4	Comments
Windows 8.1	2013-10-21	2.08.30 8.1	2.08.30 8.1	-	-	-	-	-	2.08.30 WHQL Certified for Win 8.1 Available as setup executable Release Notes
Windows*	2013-08-01	2.08.30	2.08.30	-	-	-	-	-	2.08.30 WHQL Certified Available as setup executable Release Notes

HyperTerminal Setup

Setup HyperTerminal with the following settings:



a Properties — Connect To | Settings

Function, arrow, and ctrl keys act as: ● Terminal keys ○ Windows keys

Backspace key sends: ● Ctrl+H ○ Del ○ Ctrl+H, Space, Ctrl+H

Emulation: ANSI [Terminal Setup...]

Telnet terminal ID: ANSI

Backscroll buffer lines: 500

□ Play sound when connecting or disconnecting

[Input Translation...] [ASCII Setup...]

[OK] [Cancel]

Terminal Settings

Cursor: ○ Block ● Underline ☑ Blink

[OK] [Cancel]

ASCII Setup

ASCII Sending

☑ Send line ends with line feeds

☑ Echo typed characters locally

Line delay: 0 milliseconds.

Character delay: 0 milliseconds.

ASCII Receiving

☑ Append line feeds to incoming line ends

□ Force incoming data to 7-bit ASCII

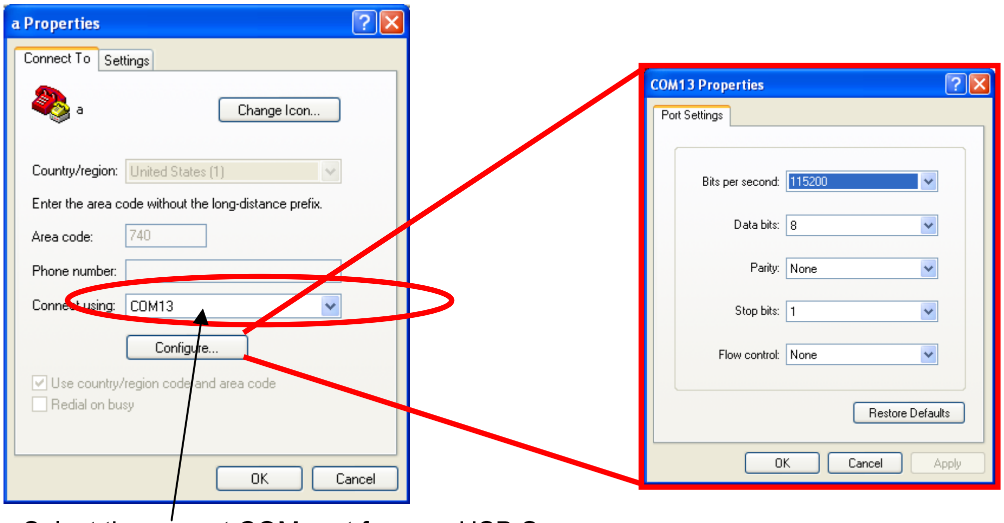
☑ Wrap lines that exceed terminal width

[OK] [Cancel]

Host System Encoding Method

Select Host System Encoding Method: ● Shift-JIS ○ Standard JIS

[OK] [Cancel]



a Properties — Connect To | Settings

a [Change Icon...]

Country/region: United States (1)

Enter the area code without the long-distance prefix.

Area code: 740

Phone number:

Connect using: COM13

[Configure...]

☑ Use country/region code and area code

□ Redial on busy

[OK] [Cancel]

COM13 Properties — Port Settings

Bits per second: 115200

Data bits: 8

Parity: None

Stop bits: 1

Flow control: None

[Restore Defaults]

[OK] [Cancel] [Apply]

Select the correct COM port for your USB Sensor