Hello Angles...

A First Use Guide to the SOLAR Product Series:

RS232 Interface with

LD Standard Communication Protocol.

level developments

Who Is This Guide For?

The purpose of this guide is to show the correct procedure for connecting and using the SOLAR inclinometer with a Windows PC for the first time.

This document can be followed by users of all skill levels including absolute beginners.

What products can I apply these instructions to?

This guide can be used for any SOLAR products (including 360° variants) that feature the **RS232** interface option. All applicable part numbers will start with "**SOLAR**" and end with "**RS232**".

Note: If you are using a "**SOLAR- … -RS485**" or "**SOLAR- … -RS485M**" search for your full part number on our website then go to its web page & download the document that specifically applies to your device as shown below.

Additional Information:

Take care while making all connections. To avoid damaging your product do not allow any wires to make contact with anything you do not intend (especially a source of power).

Once your connections have been made and the unit is responding correctly, please refer to the product datasheet for the full command list(s) and more information about the communication protocol.

Step 1:   Ensure You Have a Working COM Port (Hardware).

Many PCs and Laptops have a **built-In**[1] COM (communication) port which looks like this:

The above connector is known as a DB-9 Male & shouldn't be confused with "VGA" which looks like this:

If your PC or laptop doesn't have this connection you can buy a **separate**[2] USB to COM adapter. For this guide we have used the "StarTech ICUSB232DB25" which is inexpensively available online:

Step 2:   Ensure You Have a Working COM Port (Software):

On your computer go to "Device Manager" which can be accessed via the control panel:

[1] For **Built-In** COM ports:

In most cases the driver will be installed and working already. Typically this will be called "Communications Port (COM1)" meaning that "COM1" is the port we would use to communicate with the inclinometer.

[2] If you have bought a **separate** USB to COM Port:

Follow the manufacturer's instructions to install your driver and check that it has installed properly.
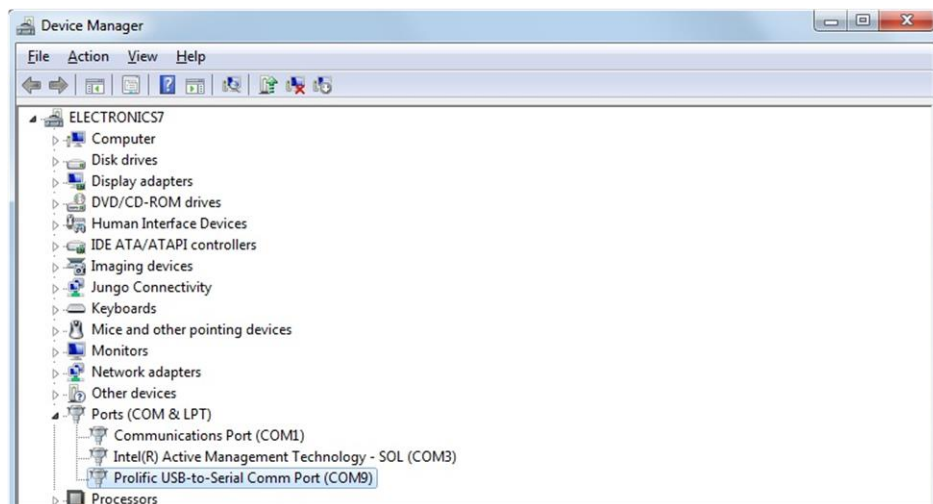
The name & port number that's automatically allocated to this device can vary. Make a note of the port number that the device has been allocated. Our example USB to COM device is using "COM9" so this is the port number we would use to communicate with the inclinometer.

[1 & 2] For both **Built-in** or **Separate** types:

If the COM device symbol looks like this: 🔌 then you will need to troubleshoot the device driver problem. (A good place to start is the website for the manufacturer of the hardware).

Step 3: **Connect the Inclinometer wires to the COM Port:**

Full RS232 connections for the SOLAR inclinometer are as follows:

SOLAR Wire Colour	Solar Wire Function	Connects to... (Function)	...On DB-9 Pin Number
Red	+ve Power Input	+ve Supply (9 to 30V)	Not connected to DB-9
Blue	0V Power input & RS232 GND	0V Supply & COM GND.	5
Yellow	RS232 Transmit	RS232 Receive	2
Green	RS232 Receive	RS232 Transmit	3

As the built-in COM port / USB to COM device is fitted with a male type connector you will need a female type connector to make the necessary solder connections:
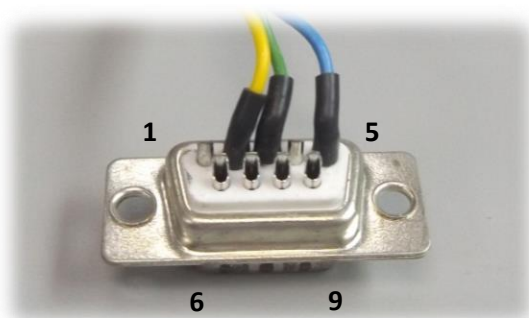
*(Back side of the female DB-9 connector & the required Inclinometer connections)*

Step 4: **Connecting the Inclinometer to the Power Supply / Power Source:**

Ensure the power source is switched off & connect the Inclinometers red wire to the +Ve node.
The power source should provide between 9V (minimum) & 30V (maximum).
If you are using a battery or have no on/off option available then leave the red wire disconnected for now.

Connect the blue wire to the 0V (-Ve) node of the power source whilst it's still connected to pin 5 of the DB-9 connector as shown in the illustration below.
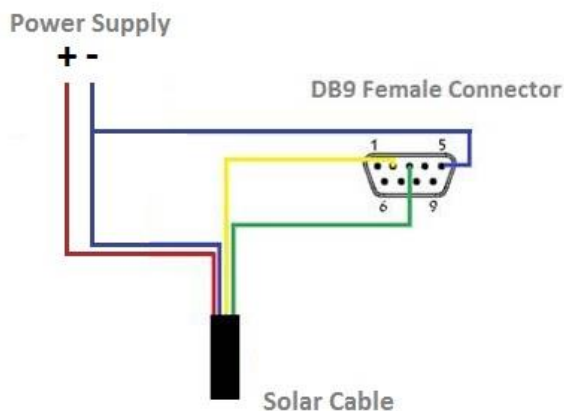
Continued overleaf...

There are many ways to achieve this & for this demonstration we've used a simple straight-through connections box with stackable banana plugs and spring terminal posts. Here is our complete setup:
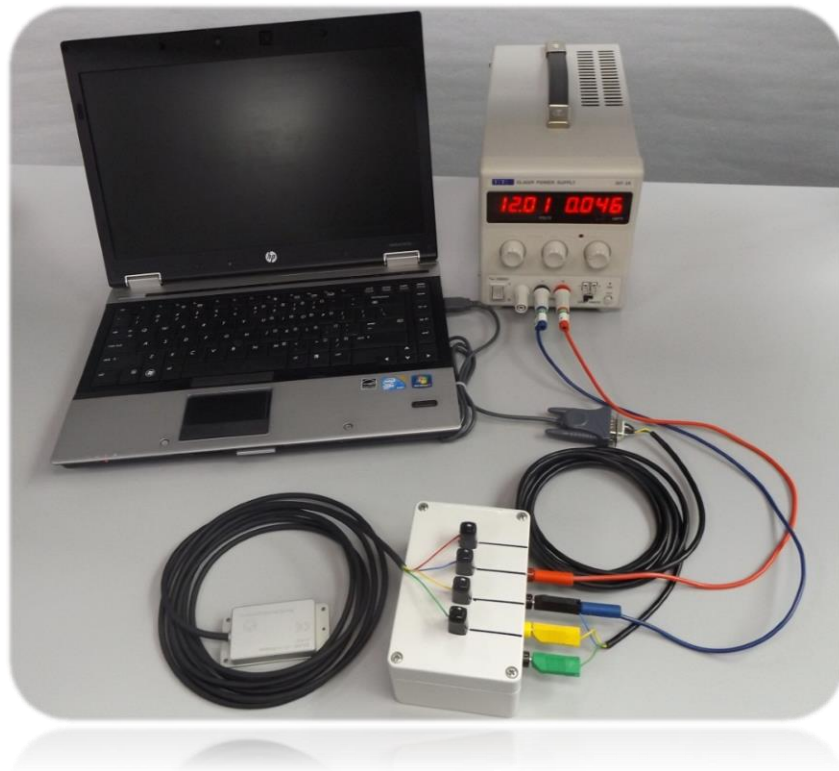

Once you've made all of the necessary connections you can switch on the power source or connect the red wire to "+" if using a battery.

Step 5:   Connecting an Inclinometer to the Level Developments Inclinometer App:

We recommend using the inclinometer app before attempting to create your own more advanced commands, this ensures that you have the correct connections and your hardware is working as it should.

Download and install the application from our website:
https://www.leveldevelopments.com/wp/wp-content/uploads/software/Inclinometer_App.zip
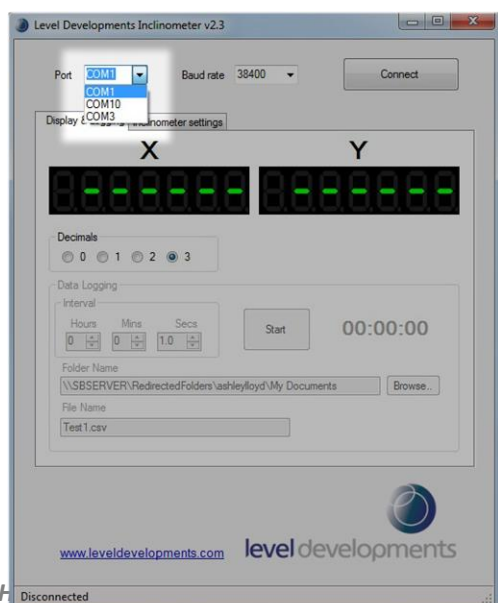
Run the Inclinometer App and select the port number that was determined earlier in Step 2.

By default the inclinometers baud rate setting is 38400(bps), ensure this is selected and click on "Connect".

You should now see angles being displayed on the screen.

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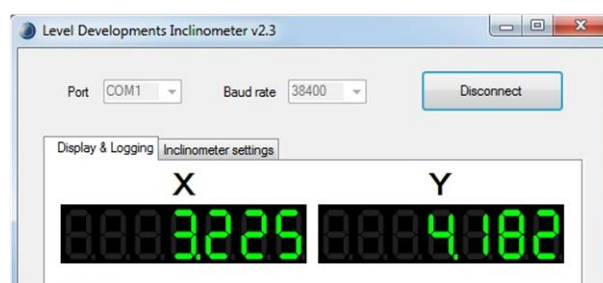
Step 6: **Sending Your Own Commands Using an RS232 Terminal / Serial Monitor Program:**

To create your own commands you will need a serial monitoring application. For the purpose of this demonstration we are using Docklight but there are many to choose from. *The layout and terminology used in your terminal program may vary*.
A free trial version of Docklight can be downloaded from *https://docklight.*de with some minor limitations. Please see their website for more information.

Open your application and locate the project settings window. In Docklight this can be accessed by double-clicking the highlighted area below or going to tools, project settings.
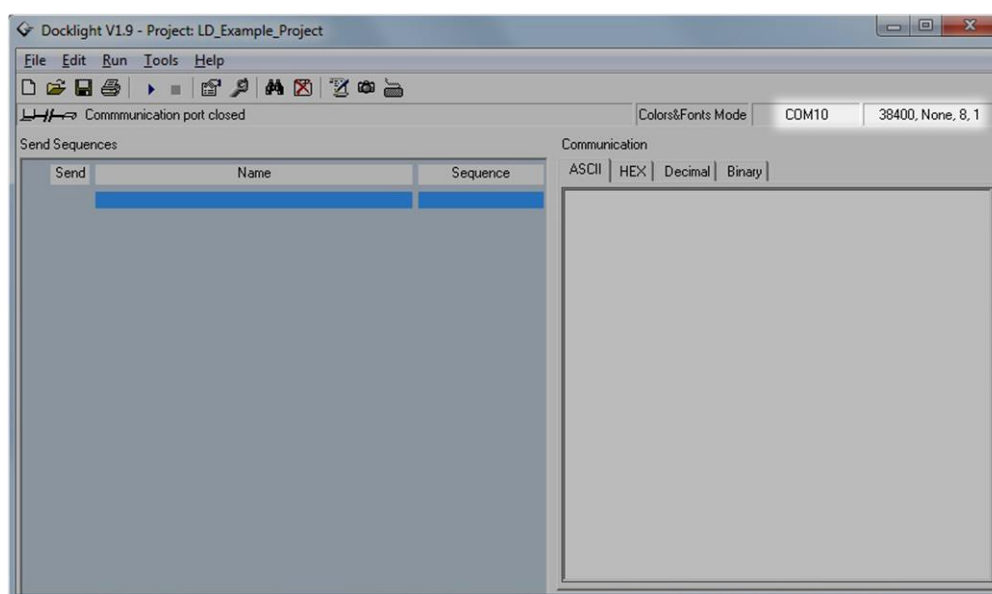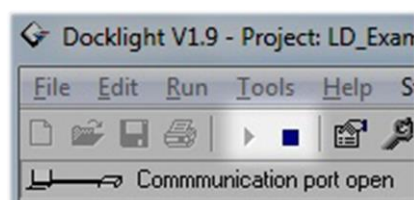

You can then change the COM channel (port number) to match the value determined in step 2.
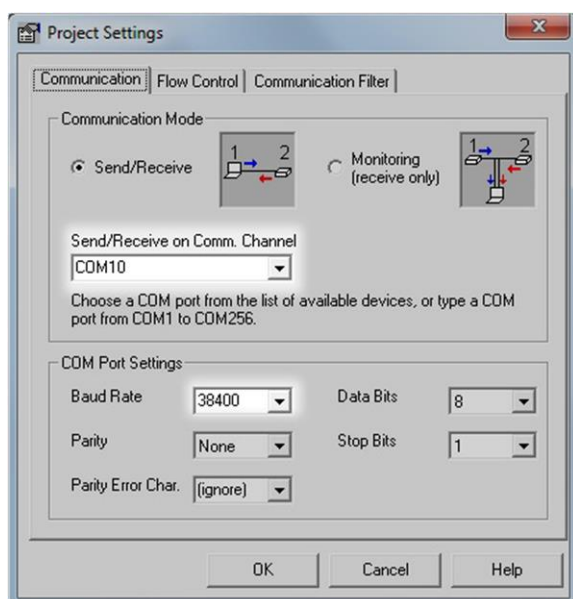
The default baud setting for all SOLAR sensors is 38400, with 8 data bits, 1 stop bit and no parity.
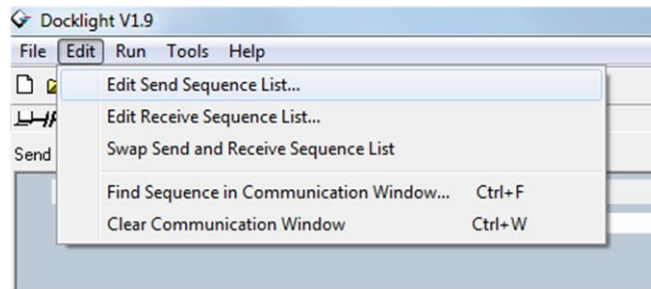
Click OK then open the port by clicking on the ▶ button:

Once the port is open, the ■ button should be visible as shown below:

The ■ button can then be used to close the port if required. (Note: the port can only be open in 1 application at a time).
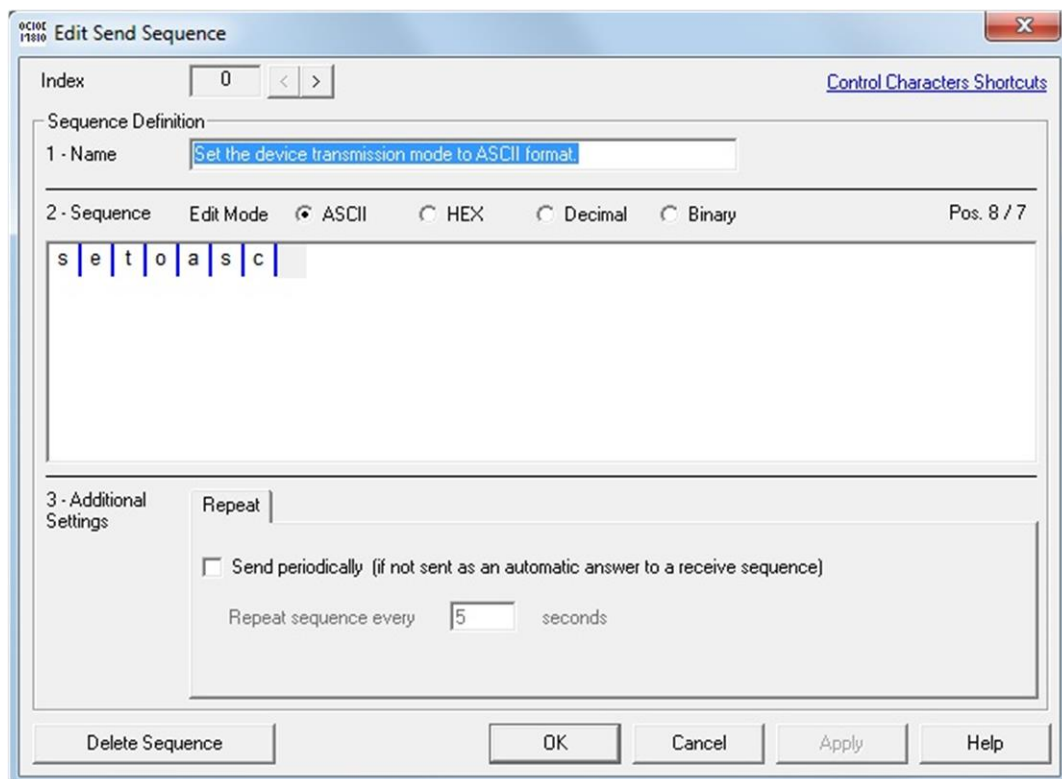
You can now begin to create the commands to send to the Inclinometer. To do this go to Edit, Edit Send Sequence List…

This will open the window shown below. You can see that we've given our first command a description (highlighted) and created our first command in the sequence window.

By default all SOLAR inclinometers are set to respond in 32bit signed integer mode which can't be read by eye, so the first command we will send to the device is "setoasc". This will change the output (response) mode to ASCII format.

Note that all send sequences in the LD command set must be 7 bytes long and lower case.



Once you have filled in the send sequence press OK.

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This will save the new command into the sequence list as shown below. You can now send the command to the Inclinometer by clicking on the "—>" button. This will print the command "setoasc" (Tx) into the monitor window & and the inclinometer should respond (Rx) with "OK" to indicate success.
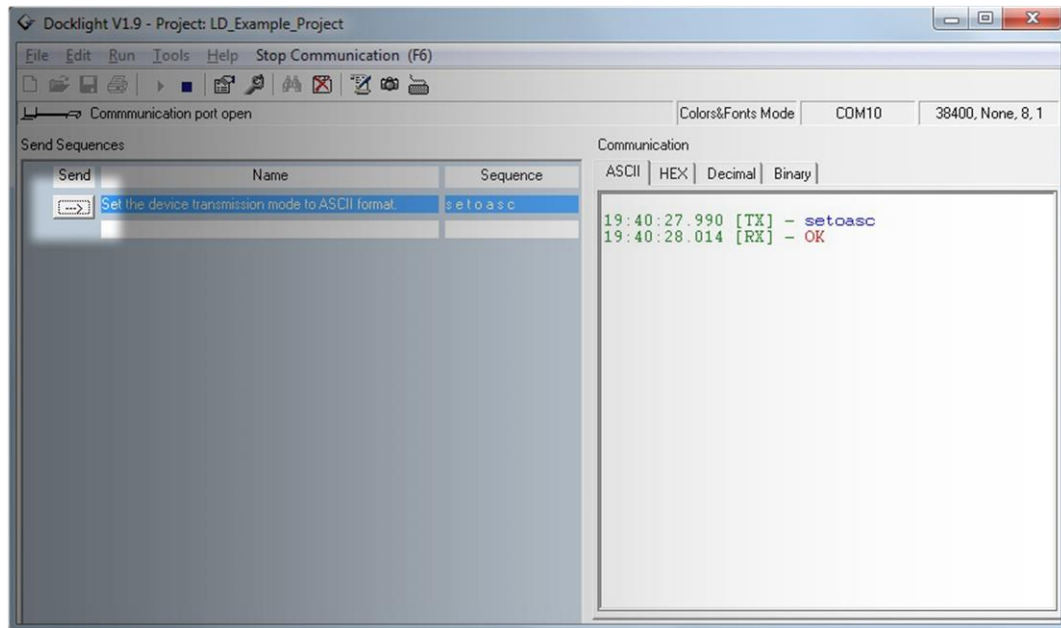
You can now create a 2nd command to request the angles from the Inclinometer.
Open the "Edit Sequence List…" as shown before and click on the ">" button to go to a new blank command.
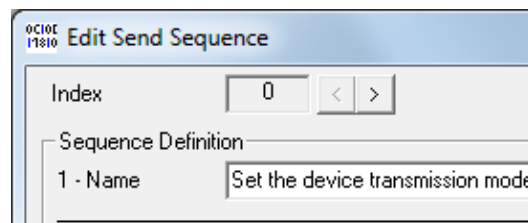
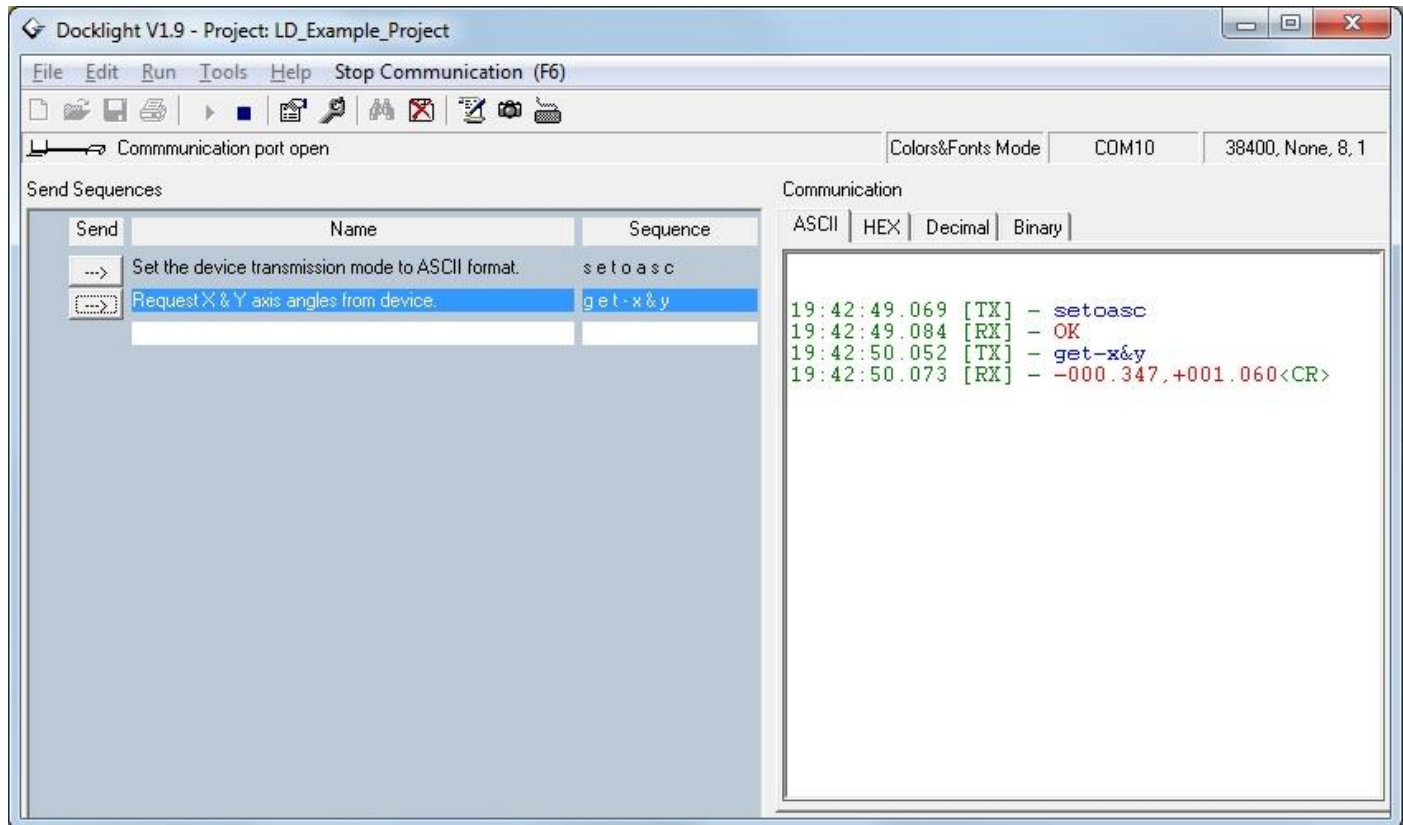Create the new command "get-x&y" as shown below then click on OK.
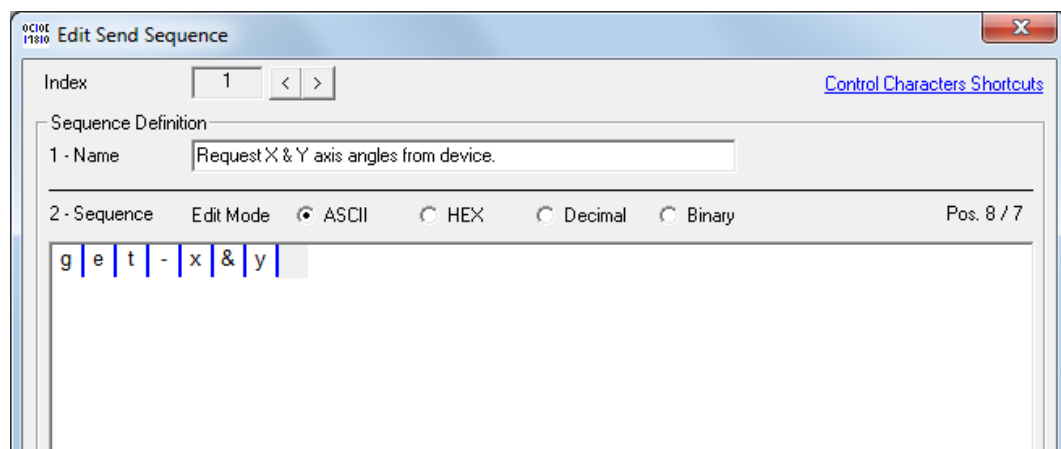
(If you are using a SOLAR-360-X-RS232 use the command "get-360" instead)

Send the new command to Inclinometer by clicking on the "—>" button.

The inclinometer should now respond with an 18 byte string in the following format:

±xxx.xxx,±yyy.yyy<CR>

(For 360° products this will return a 9 byte string such as ±025.430<CR>)

& That's It!

You can now use the "get-x&y" command to read angles from your Inclinometer and these techniques to build on your collection of send sequences using the full list of commands as described on the product datasheet.

If you need more information or have a query relating to the use of your SOLAR inclinometer, please get in touch with tech@leveldevelopments.com, we'll be happy to assist you.