

Introduction

So, you got your AX-12+ servos, you got your USB2Dynamixel, you connected things up, fire up the software, and wala! Nothing happens. Welcome to the club! There are at least four common items that will prevent things from working correctly. They are, in no special order:

- Not having power supplied to the AX-12+(s)
- Not having the USB2Dynamixel set in the correct mode
- Not knowing/selecting the correct “serial” port
- Not knowing/selecting the correct Servo ID

This Application Note will help guide you through your first connections and tests of an AX-12+ Servo using the USB2Dynamixel.

Required Materials

You will need the following items to complete this exercise (see Figure 1):

- PC Running Windows with a USB Port
- (1) USB2Dynamixel
- USB2Dynamixel Driver (Free Download—See Page 2)
- Dynamixel Configurator Software (Free Download—See Page 2)
- (1) AX-12+ Servo
- (2) Three (3) conductor Dynamixel Cables
- (1) Power Supply for Servos (7 - 10 Volts—See Notes on Page 4)



Figure 1: Required Hardware

USB2Dynamixel Driver

The USB2Dynamixel is basically a “Virtual Serial Port” that attaches to the USB on a PC. While the supplied drivers are MS Windows based, in concept, the device should work with any system that supports USB Virtual Serial Ports and has an FTDI driver available. This should include MAC, Linux and Windows CE, among others. For purposes of this Application Note, we’re sticking with Windows.

The Windows drivers are available as a free download from the USB2Dynamixel product page on the CrustCrawler web site <http://www.crustcrawler.com/electronics/USB2Dynamixel/index.php?prod=65>. The download links are in the upper right corner of the page. There is an XP only EXE version, as well as a ZIP version that supports XP and Vista. Refer to the USB2Dynamixel Manual for instructions on installing the drivers.

If you already have an up to date FTDI driver installed (e.g. for Parallax USB devices), you may not need to install these drivers, but it shouldn’t hurt to do so.

Configuration Software

There are two version of “configuration software” available. Version 1.2 (the current version) of the USB2Dynamixel manual describes the “Dynamixel Manager”. This software is somewhat “buggy”, and tends to report errors in communication with the AX-12+ servos.

The original version of the manual describes the “Dynamixel Configurator” from Best Tech. This software, while not as robust as the Dynamixel Manager, seems to be much more stable, and this is the software we’ll be using in this Application Note. It is available as a free download from the USB2Dynamixel product page on the CrustCrawler web site <http://www.crustcrawler.com/electronics/USB2Dynamixel/index.php?prod=65>. The download links are in the upper right corner of the page. Both an EXE and ZIP file version of the file is available. Both files include identical software.

To install the software, extract the EXE file from the ZIP archive (if appropriate). Run the DXCONFINST1.2.1.0.exe file and follow the onscreen instructions.

Setting the USB2Dynamixel Mode Switch

On the side of the USB2Dynamixel opposite the miniature connectors, there is a 3 position “mode” selector switch (see Figure 2).

This switch must be in the “TTL” position when working with the AX-12+ servos. The labeling on the USB2Dynamixel is molded into the plastic case and can be hard to read. The TTL selection is the position closest to the USB connector, as shown in Figure 3.

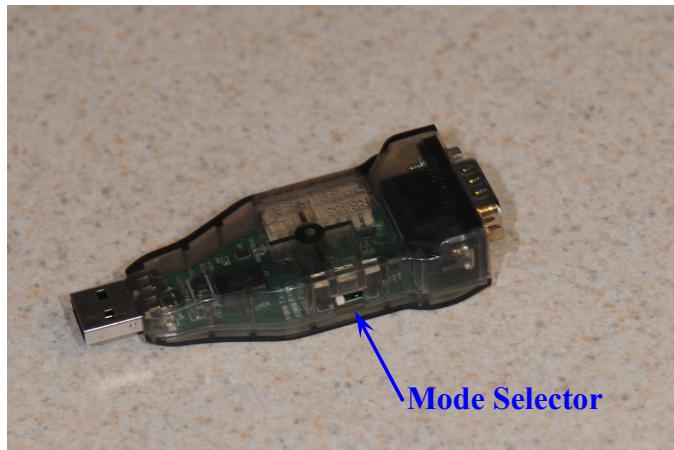


Figure 2: Mode Selector Location

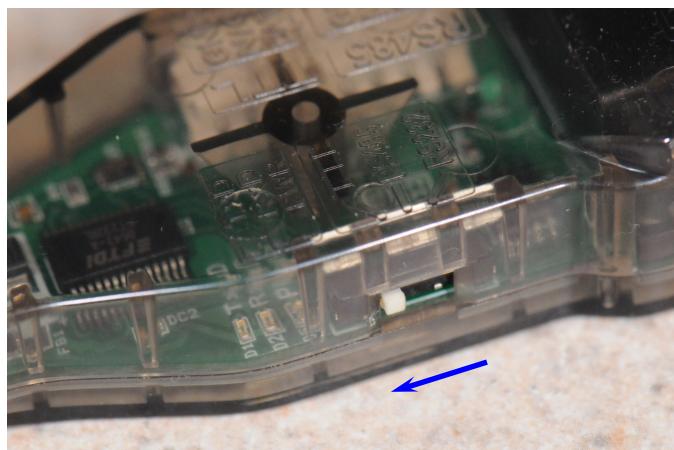


Figure 3: TTL Mode Selector Position

Power For the AX-12+ Servos

In this day of “USB Powered” everything, it is very easy to forget to power the AX-12+ servos when using the USB2Dynamixel. While it would probably be possible to power a single servo off a USB port, powering the servos this way could be asking for problems in the case of some laptops (and even desktops), and would certainly be a problem if several servos were online.

For this reason, the USB2Dynamixel does not support powering the servos from the USB port, and you must supply power from another source.

The AX-12+ servos are rated from 7 to 10 VDC. The recommended voltage is 9.6 Volts (the voltage of an 8 Cell NiCad battery pack). While the servos may work with higher and lower voltages, it is strongly recommended that you stay within this voltage range.

There are several choices for a power supply. They include battery packs, “wall warts” and full fledged regulated power supplies. For simple short term testing and basic configuration of a single servo, a simple 9 Volt “Transistor Battery” works well. Note that the battery may not last long. If some commands work (e.g. LED Off/On), but attempts at moving the servo fail, this is an indication of a low battery.

For continuous or repeated use, when working with multiple servos, or when writing software to control a robot through the USB2Dynamixel, and more robust power supply will be required.

Keep in mind that an AX-12+ servo can draw up to 900 milliamps (mA). That is just under 1 Amp. Size your power supply accordingly.



Figure 4: Possible Power Supplies (see text)

Determining the Serial Port Used by the USB2Dynamixel

Because it is a “Virtual Serial Port”, the USB2Dynamixel will not be the same “COM” port on every PC. Depending on circumstances, it may not even always be the same serial port on a given PC. (“Usually” the USB2Dynamixel will be assigned a consistent COM port on a given PC.)

The most reliable way to determine what COM port is being used is through the Device Manager. For Windows XP, this can be launched several ways, including:

- From the control panel (Classic View), select “System”, and then on the System Properties dialog “Hardware” tab, press the “Device Manager” button.
- From the control panel (Category View), select “Performance and Maintenance”, and select “System”. From the System Properties dialog “Hardware” tab, press the “Device Manager” button.
- Right click on the “My Computer” icon, and select “Properties” (usually the bottom choice). From the System Properties dialog “Hardware” tab, press the “Device Manager” button.

See Figure 5 for the System Properties dialog box, Hardware tab and Device Manger button.

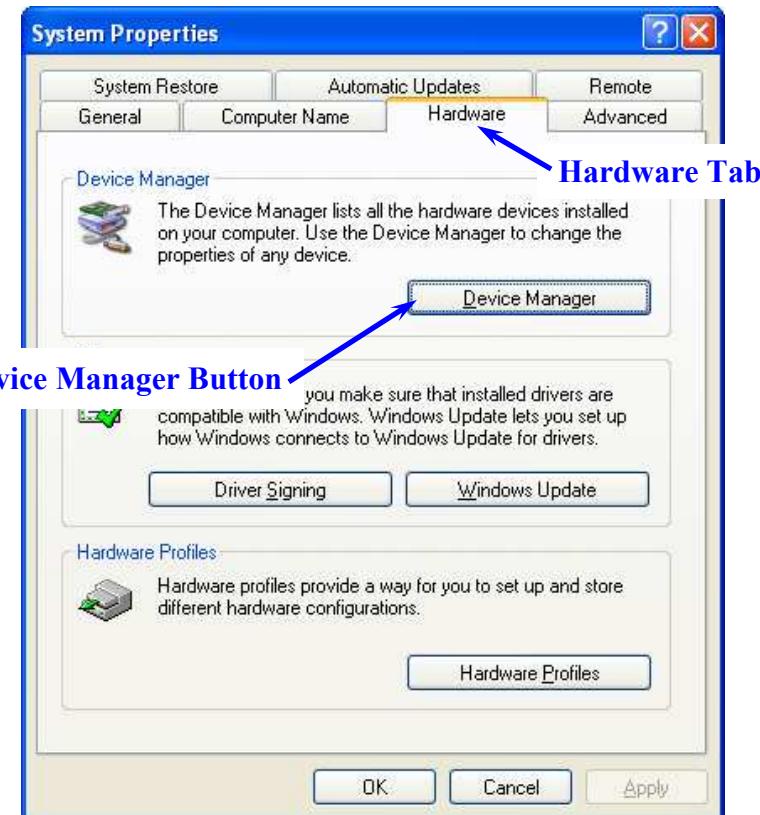


Figure 5: System Properties Dialog Box

Determining the Serial Port Used by the USB2Dynamixel (Cont)

Once the Device Manager is open, find and expand the “Ports (COM & LPT)” item. The view should look something like Figures 6 and 7. The specific items listed will vary with each PC, and what devices are currently connected.

To determine what COM Port the USB2Dynamixel uses, compare the list of ports without the USB2Dynamixel connected (Figure 6), and then with the USB2Dynamixel connected Figure 7). The “new” port listed will be the COM port that is assigned to the USB2Dynamixel. In this case, the USB2Dynamixel is using COM9.

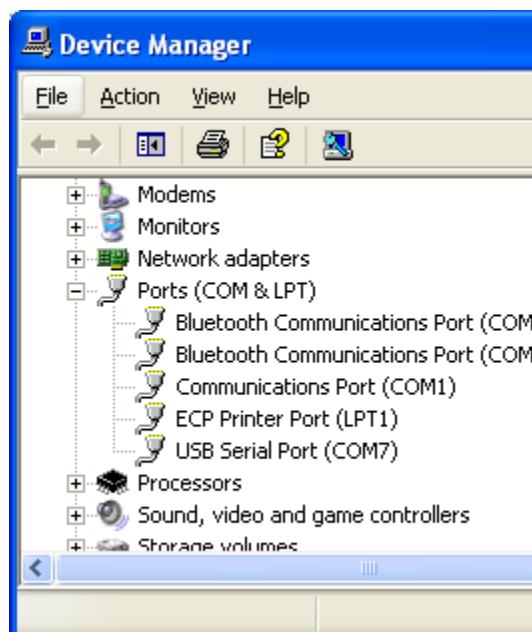


Figure 6: Device Manager with “Ports” Listing Open (USB2Dynamixel Not Connected)

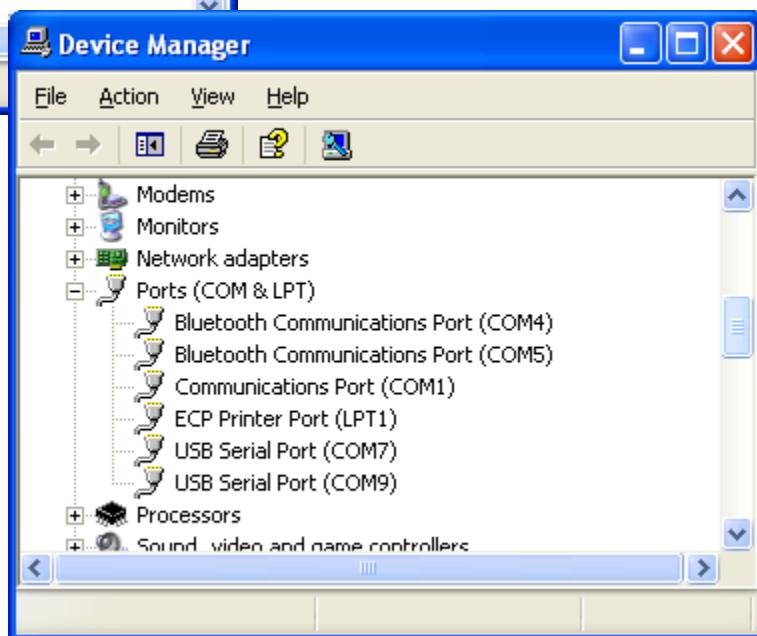


Figure 7: Device Manager with “Ports” Listing Open (USB2Dynamixel Connected as “COM9”)

Connecting the AX-12+, Power and USB2Dynamixel

Now that we have the USB2Dynamixel set to the correct mode, have a power supply, and know what COM port the USB2Dynamixel will be using, we're ready to make the physical connections. Then we can run the software to test and configure the AX-12+ servo.

There are other ways to make these connections, but this is one of the more simple ways of making the connection for testing and configuring a single servo.

Step 1: Connect AX-12+ to USB2Dynamixel

Using one of the 3 Conductor Dynamixel cables, firmly press one end of the cable into the TTL Port of the USB2Dynamixel, and the other end into one of the connectors on the AX-12+ Servo (use either one of the two connections). The TTL connection on the USB2Dynamixel is the small connector opposite the Mode switch with 3 connectors (See Figure 8).

The connectors are "polarized" and the cable ends will only fit into the connectors one way. See figures 8 - 12.

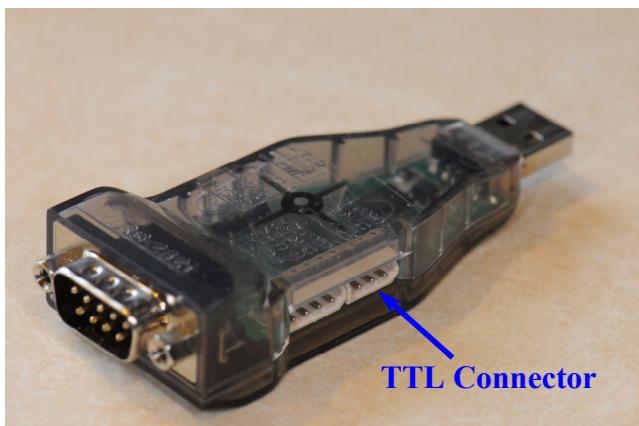


Figure 8: USB2Dynamixel Connections

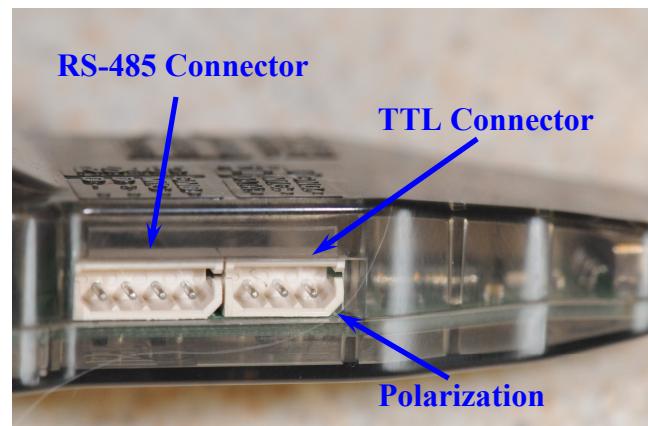


Figure 9: USB2Dynamixel TTL and RS-485 Connections
(Also note connection polarization)

Step 1: Connect AX-12+ to USB2Dynamixel (Cont)

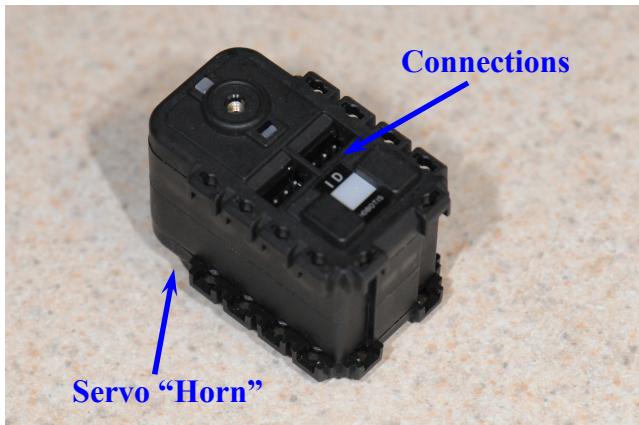


Figure 10: AX-12+ Servo and Connections

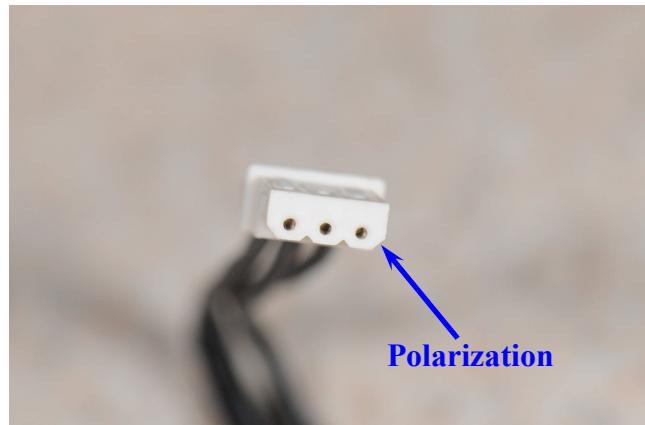


Figure 11: Cable End Showing Polarization

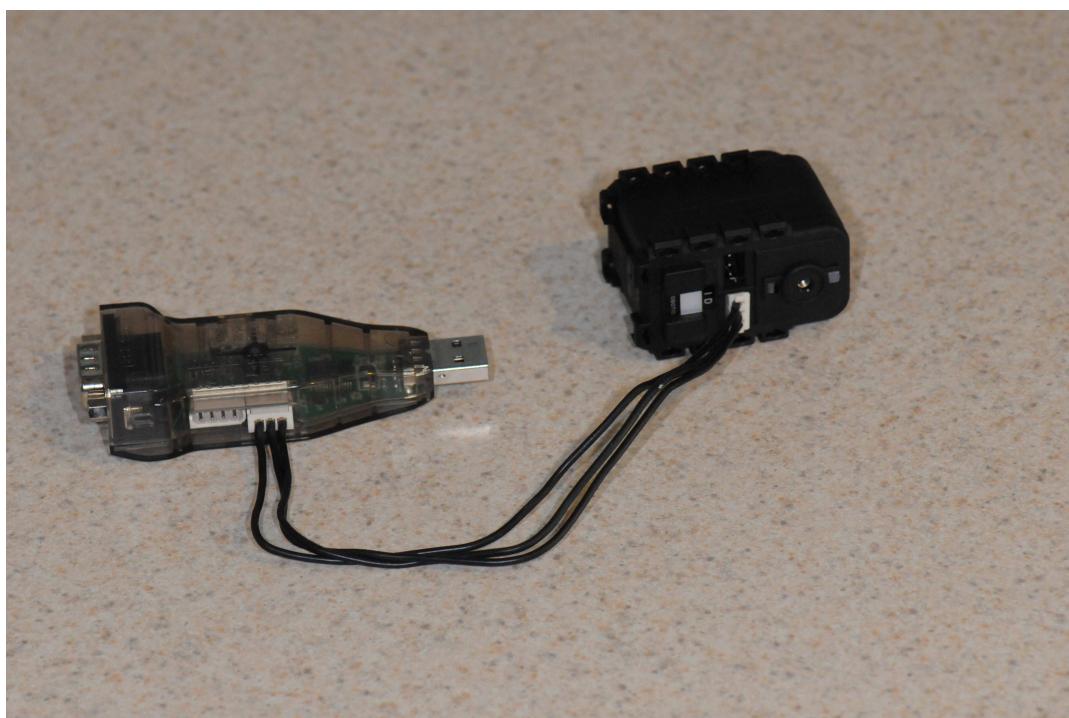


Figure 12: USB2Dynamixel and Servo Connected.

Step 2: Connect Power to the AX-12+

Using one of the 3 Conductor Dynamixel Cables, firmly press one end of the cable into remaining connector on the AX-12+ Servo. The other end of the cable will be connected to your power supply. See Figures 13 & 14.

Figure 13 shows the detail of using two solderless breadboard “jumper wires” to connect power to the loose end of the 3 Conductor Dynamixel Cable. Holding the beveled corners of the connector down, and looking at the face of the connector, the negative (-) power connection goes to the left most socket, and the positive (+) goes to the center connection. The right most connection is the “signal” and should be left unconnected.

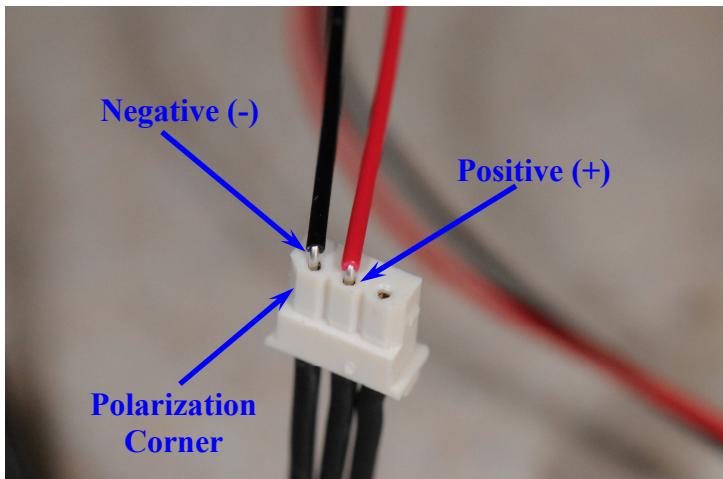


Figure 13: Power Connections to Dynamixel Cable

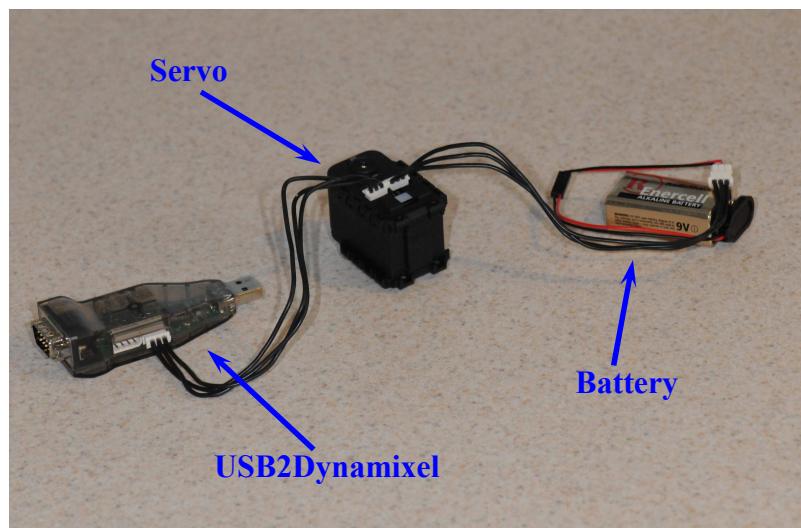


Figure 14: Completed Assembly

Step 3: Connect the Assembly to a USB Port

Now simply connect the USB2Dynamixel to a USB Port on your computer. See Figure 15.

When plugged into a USB Port, the red Power LED on the USB2Dynamixel should be lit as shown in Figure 15.

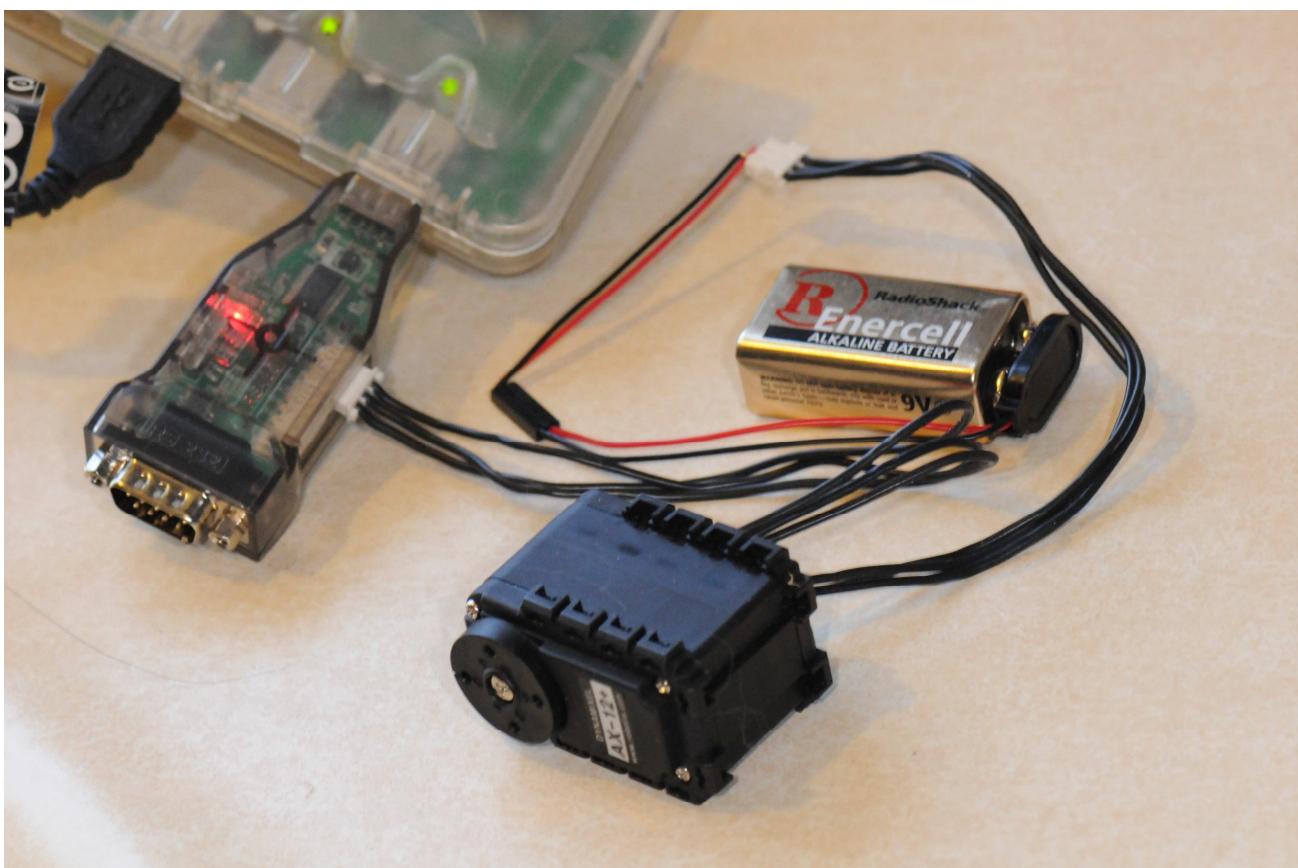


Figure 15: Connected to a USB Port

Step 4: Run the Dynamixel Configurator Software

Start the Dynamixel Configurator Software. The default view is shown in Figure 16.

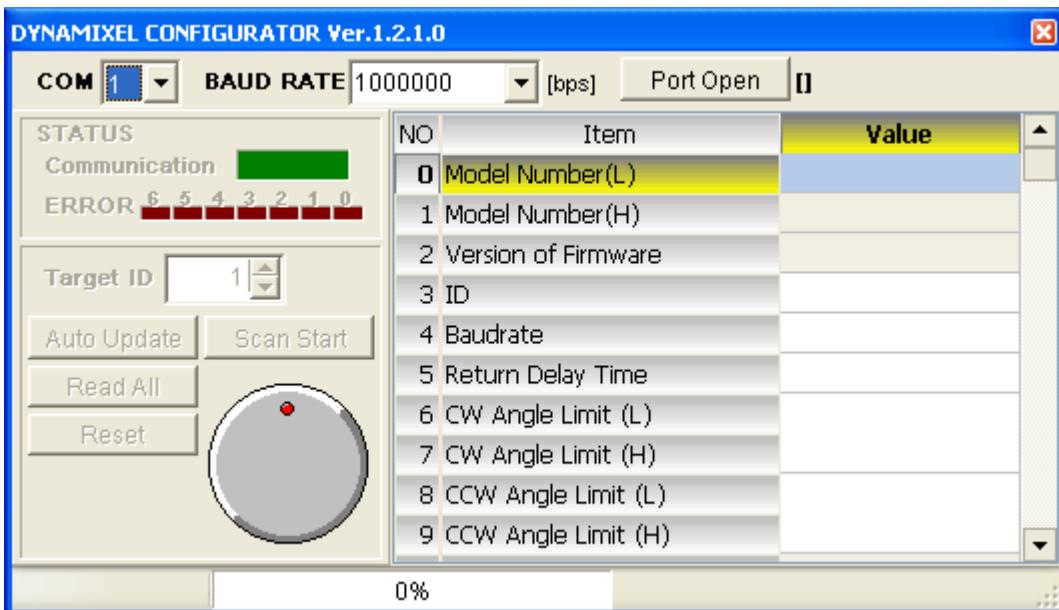


Figure 16: Dynamixel Software Default View

Set the COM Port to the one used by the USB2Dynamixel as found on Pages 5 & 6 (see Figure 17). The figure shows COM 9. Your setting will probably be different. The software will “remember” your COM Port Setting.

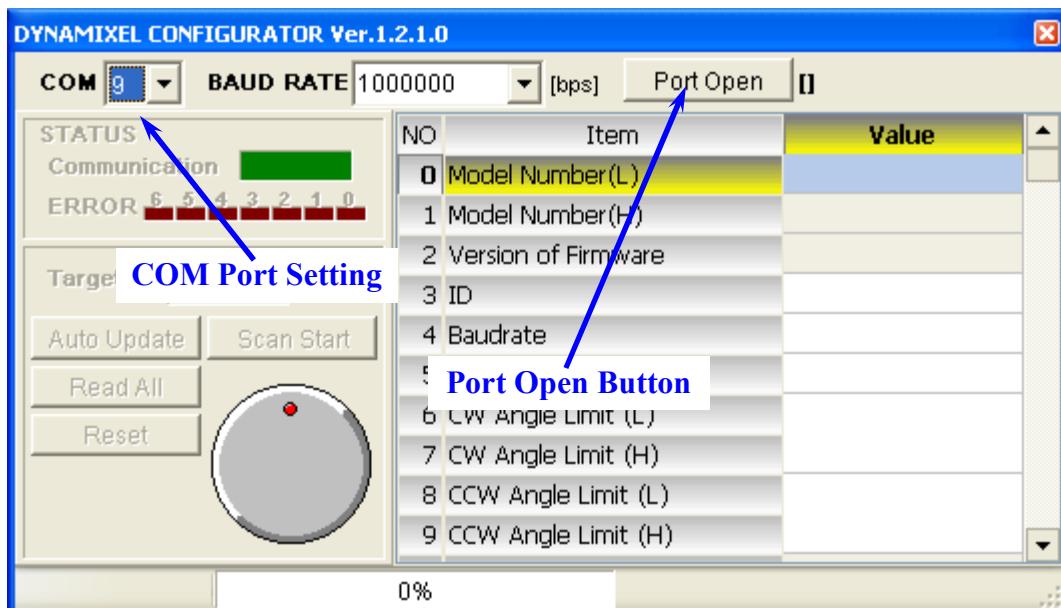


Figure 17: Setting the COM Port

Step 4: Run the Dynamixel Configurator Software (Cont)

Press “Port Open” button (see Figure 17). The button caption will change to “Port Close”.

Press the “Scan Start:” button. This will scan the Dynamixel network and fill the value table as Devices (Servos and Sensors) are found. In this case, an AX12 was found with ID “1” (See Figure18).

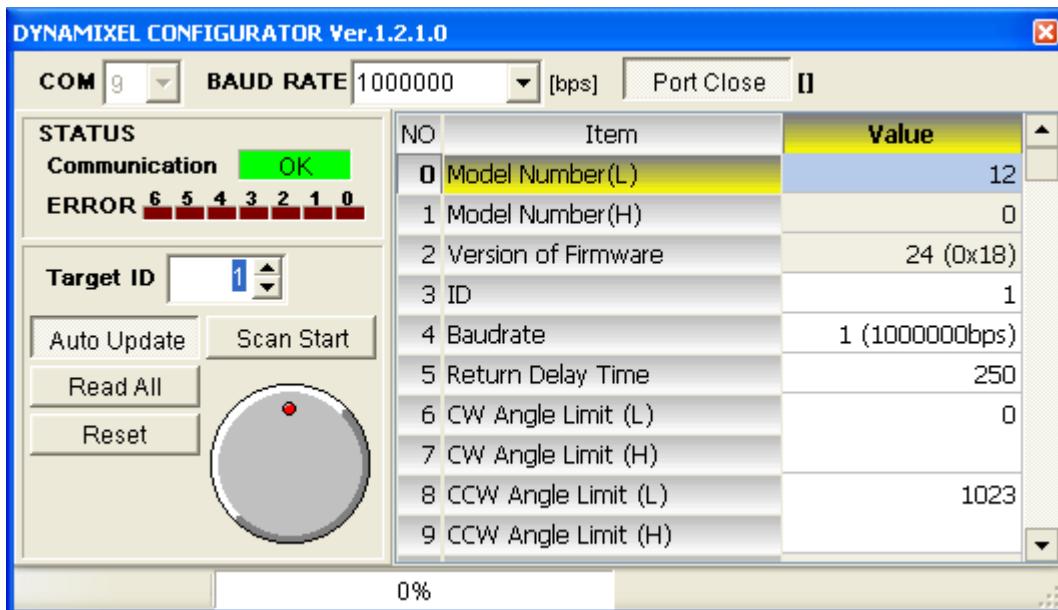


Figure 18: Scanned Dynamixel AX-12+

By rotating the dial with a mouse, the servo horn should also rotate.

Other Application Notes will discuss more in depth on how to use the Dynamixel Configurator software, and what can be done with it.



Application Note
Connecting the AX-12+ to the USB2Dynamixel

By: John W. Raffensperger, Jr.

Revision: 0.1

Date: March 14, 2008

Page 13 of 13

Feedback

The CrustCrawler team would love to hear your feedback. If you found this information useful, please let us know. More important, if you found this information inaccurate, or if it didn't meet your expectations, we would really like to hear from you on how we could make this Application Note better. Feel free to contact anyone on the CrustCrawler Team:

Mike Gebhard: Mike.Gebhard@CrustCrawler.com

Alex Dirks: sales@CrustCrawler.com

John Raffensperger: john@raffy.us