



DropView 8400

Software

for

μ Stat 8000/8000P

μ Stat 4000/4000P



MANUAL

DS/ST48P1221/3.7



DECLARATION OF CONFORMITY

We: Metrohm DropSens, S.L.
Vivero de Ciencias de la Salud
C/ Colegio Santo Domingo de Guzmán, s/n
33010 Oviedo (Asturias); Spain

certify that the products **µStat 8000, µStat 8000P, µStat 4000 and µStat 4000P**

have been built and have undergone final type testing according to the standards:

Electromagnetic
Compatibility

Emission: EN/IEC 61326-1: 2006, EN/IEC 61000-6-3:2007,
CISPR 11: 2008
Immunity: EN/IEC 61326-1: 2006, EN/IEC 61000-6-1: 2007,
EN/IEC 61000-4-2: 2001,
EN/IEC 61000-4-3: 2006



These instruments meet the requirements of the CE mark as contained in the EU directives 2006/95/EC (LVD), 2004/108/EC (EMC). It fulfils the following specifications:

EN 61326-1 Electrical equipment for measurement, control and laboratory use – EMC requirements

Description of the instruments: Instruments for electrochemical research and voltammetric analyses

Oviedo, February 2020

David Hernández Santos, Managing Director



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1 INTRODUCTION

μ Stat 8000 is a portable **Multi Potentiostat/Galvanostat** for use with electrochemical sensors or electrochemical cells. The instrument contains a microprocessor which controls up to eight (8) independent electrochemical nodes; each one is able to apply potential or current to the electrodes and measure the current or potential response. Each node is used with electrochemical sensors or electrochemical cells with three electrodes: working electrode, reference electrode and auxiliary electrode.

With μ Stat 8000 you can perform **up to 8 different electrochemical techniques at the same time**, or carry out the study of one technique's parameter in just one step by applying the same electrochemical technique in several nodes but selecting different values for the parameter under study.

Also, μ Stat 8000 can be used in **Multichannel mode**, with up to eight (8) working electrodes sharing one auxiliary electrode and one reference electrode.

μ Stat 8000 can be connected to a PC via Wireless or by means of a USB cable.

[These instructions are also valid for μ Stat 4000]

[For "P" models such as μ Stat 8000P or μ Stat 4000P, only potentiostat techniques are available, except LPR (Linear Polarization Resistance) that is NOT included in "P" models]

REMARK

Before using the instrument for the first time, please charge the battery by connecting the included power adapter to the mains for around 6 hours

CAUTION

Do not connect the device to your computer before the software and drivers are installed. Follow the instructions below to properly connect and configure your system.

2 RECOMMENDATIONS

2.1 Voltage overload and Current underload or overload

User must take precautions with current overload, current underload or voltage overload.

Voltage overload can be found when:

- the auxiliary or the reference electrode is not properly connected,
- the conductivity of the solution is too low, which is overcome by adding an electrolyte,
- an air bubble isolates the reference electrode from the solution.

Measured current values are wrong when a current overload is detected. This occurs when the current is above 4 times the applied current range.

If currents are below 0.05 of the selected current range, a current underload occurs, since a lower current range can be applied. An underload will yield measurements with a low resolution.

2.2 Resolution and optimal current range selection

The resolution of the measurements of the potential is 0.00012 times the potential range and of the current equal to 0.00025 times the applied current range (for the lowest current range the current resolution is equal to 0.01 times the applied current range). The measurement range is -4 V to +4 V and 4 times the applied current range. The best way of obtaining an optimal current measurement resolution is to use autoranging (Current Range: Auto), but for measurements with interval times lower than 20 ms it is recommended to use a specific current range. A higher current range is selected when the current exceeds 2.5 times the applied current range. A lower current is selected when the measured current is lower than 0.25 times the applied current range.

2.3 Noise

Electrochemical sensors and cells are susceptible to noise.

Known sources of noise are:

- AC-adapters. Laptop adapter induces noise. Sensitive measurements must be performed without these adapters connected.

- Electrical equipment. Measurements in the vicinity of electrical equipment might be distorted by electrical interference. This might be eliminated by placing the cell in a faraday cage which is connected to earth or ground.
- Unshielded or too long electrode- or cell cables. The connection between μ Stat 8000 and the sensor or cell should not be extended. Especially unshielded cables used with many commercially available reference electrodes may result in high noise levels. Shorten the cables when possible.

In case the noise levels remain too high, the use of a faraday cage is required. Connect the metal cage to safety ground or to the green connector of the μ Stat 8000 electrode cable.

3 HARDWARE DESCRIPTION



Figure 1 - μ Stat 8000 Instrument

3.1 Front Panel

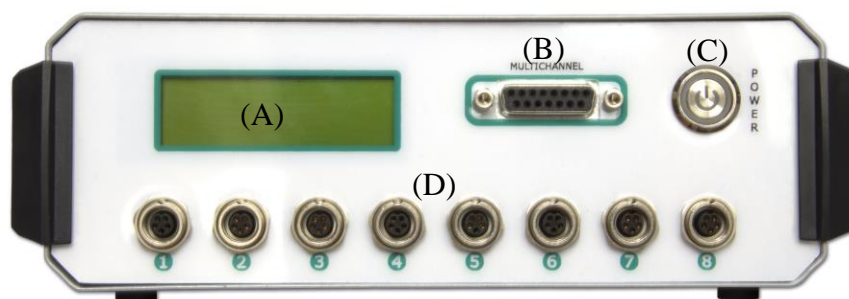


Figure 2 - Front Panel

(A) – LCD display.

(B) – Multichannel cell connection: used to connect the **DRP-CABSTATMULTI** connector (not included) in order to work with up to 8 Working Electrodes (WEs) sharing one Auxiliary Electrode (AE) and one Reference Electrode (RE).

(C) – Power (on/off) button.

(D) – Node cell connections (1 to 8): used to connect the **DRP-CABSTAT1** connectors (one included) in order to work in each node with the standard three-electrode cell configuration (WE-AE-RE). They can also be used to connect the **DRP-CAST** connectors (one included) in order to work in each node with the standard screen-printed electrode from Metrohm DropSens. For μ Stat 4000, protecting cups are covering the connections for the non available Nodes in the instrument (5-8).



Figure 3 - Electrode Cable connectors

Electrode cable connector colour codes

Red - working electrode (WE)

Black - auxiliary electrode (AE)

Blue - reference electrode (RE)

Green - ground (\perp)

3.1.1 LCD display

The LCD display shows the current status of the instrument and of each node.

3.1.1.1 Node Status

X - Node Disabled

■ - Node Enabled (stopped)


▶ - Node Enabled (running)


|| - Node Enabled (paused)

M - Node Enabled, operating under Multichannel mode

3.1.1.2 Instrument Status

USB - Connected to PC via USB

 - Connected to PC via Wireless

 - Battery level. If battery icon is full, the battery is charged

 - Battery charging

 - Power by external adapter connected (ON position)

3.2 Rear Panel



Figure 4 - Rear Panel


+5VDC – Connection used to connect the **power adapter** (included) to the μ Stat 8000.


ON/OFF – On/Off switch for power adapter connection. ON position means that the power comes from external adaptor and internal battery is charging at same time. OFF position means that power comes from internal battery who is charging at same time.

USB – Connection for **USB cable** (included).

I/O – Connection for **remote cable** (not included).

SERVICE – Connection for Professional Technical Service. Not for user use.

 **(LED)** – Illuminates when the instrument is connected to a PC via USB.

 **(LED)** – Illuminates when the instrument is connected to a PC via Wireless.

STATUS (LED) – Illuminates Green when the instrument is switched on.
Illuminates Red when battery is low.

3.3 Power supply

μ Stat 8000 incorporates a **Li-ion Battery** (6300 mAh), and can be powered also by **USB** (connected to a turned on computer) or by a **power adapter** (connected to the means).

The Li-ion Battery can be charged using the USB but power adapter connected to the instrument is recommended for this action.

Depending on the use, the battery charge can last from 1 to about 8 hours.

REMARK

Before using the instrument for the first time, please charge the battery by connecting the included power adapter to the mains for around 6 hours

4 GETTING STARTED: INSTALLATION AND SETUP

Requirements:

- Screen resolution of 1024 x 768 minimum and 1280 x 1024 advised.
- USB cable (included).
- µStat 8000 / DropView 8400 **Software installation CD-ROM** (included).
- **µStat 8000 instrument** (included).
- PC or laptop (not included), running Windows Vista, 7, 8, 8.1. or 10. The computer must have at least 2 GB of free RAM memory; 4 GB or 8 GB total installed RAM memory is recommended. Compatible with Mac OS X “Mountain Lion” or later.

4.1 Software Installation

CAUTION

Do not connect the device to your computer before the software and drivers are installed. Follow the instructions below to properly connect and configure your system.

Depending on the operating system of your computer, follow the suitable instructions.

4.1.1 Windows operating system

Insert the Software Installation CD-ROM. The Installation splash screen will be shown automatically.

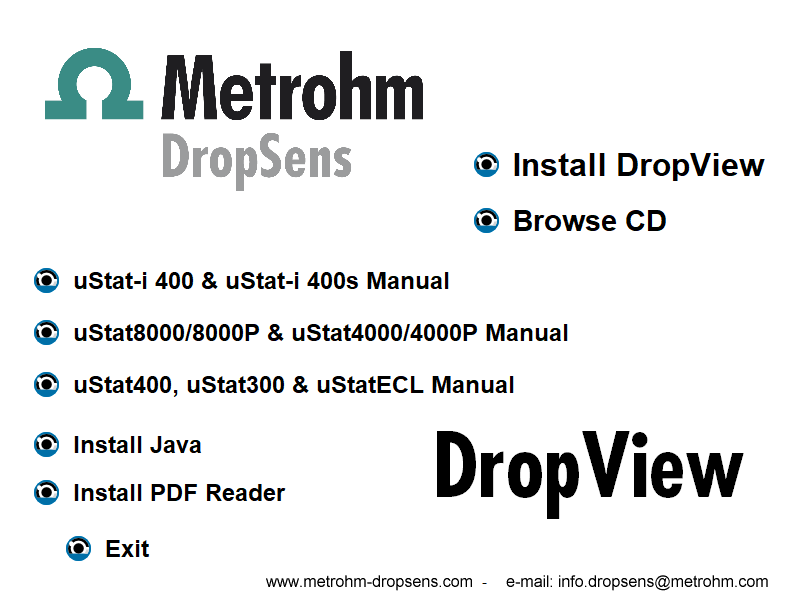


Figure 5 - Installation splash screen

In case it is not shown, browse the CD and run the “Autorun.exe” file.

Click on “**Install DropView**” (Yes) and follow the instructions in the installation wizard.

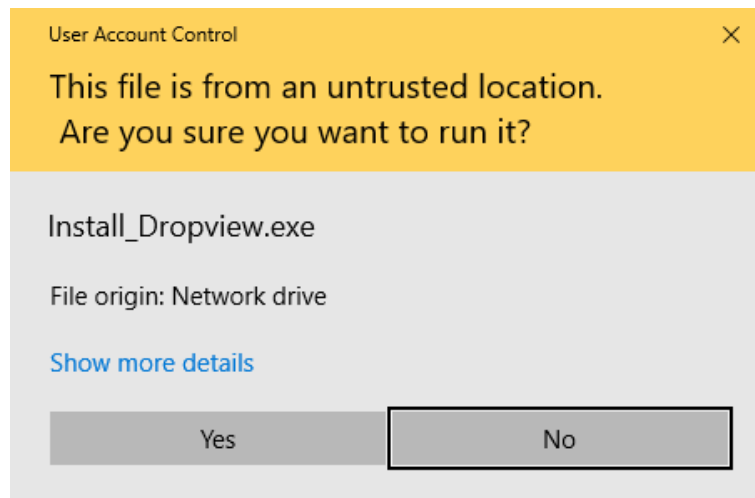


Figure 6 - Software installation confirmation dialog

1. Click on Next to start the installation of the software



Figure 7 - DropView 8400 Software installation wizard

2. Click on Install to install in the default destination folder.

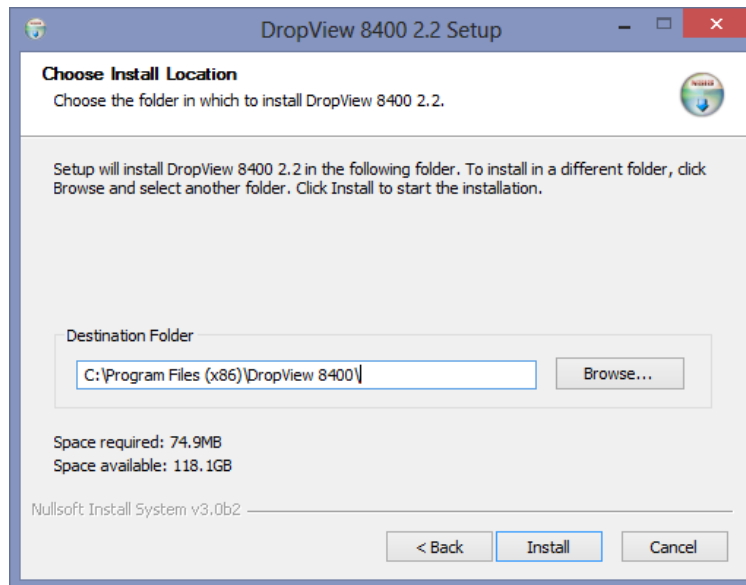


Figure 8 - DropView 8400 destination folder

Wait while the software is installing.

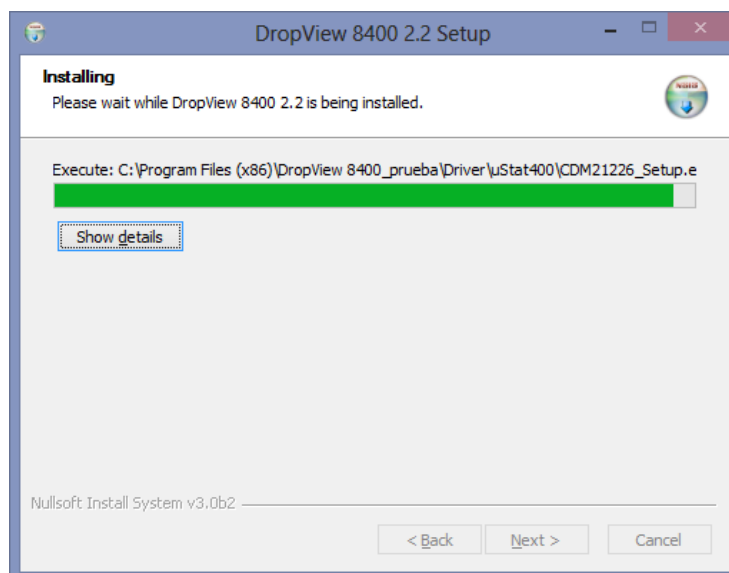


Figure 9 - Software Installation

3. When prompted don't agree the installation of the **FTDI CDM Drivers**. Press **"Cancel"** to skip this step. **µStat 8000 / µStat 4000 instrument** don't use FTDI drivers. The correct drivers must be installed following the instructions on section 4.2 except for Instruments uStat4000 / uStat4000P with Serial Numbers ST4148514 or higher, and instruments uStat8000 / uStat8000P with Serial Numbers ST812548 or higher that don't need a manual driver installation process because the driver is assigned automatically. In all cases please press **"Cancel"**.

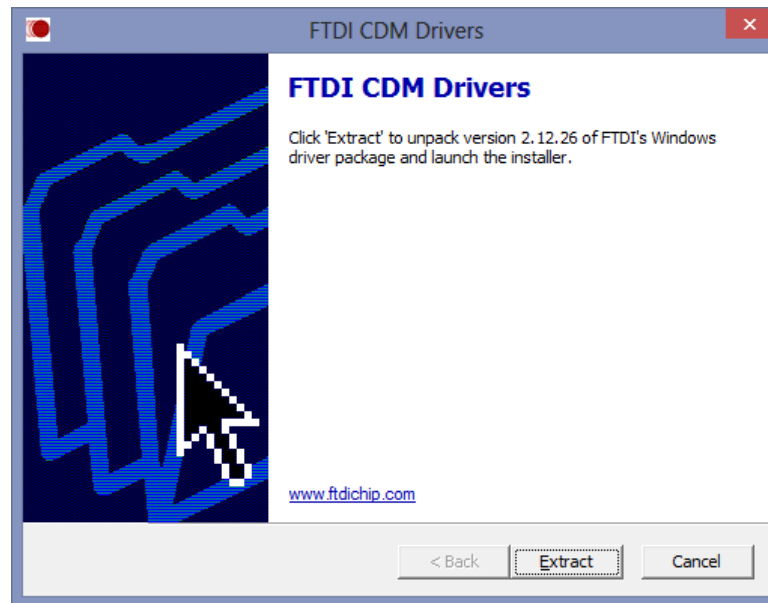


Figure 10 - Cancellation of FTDI Drivers installation

4. The software has been installed successfully. Click on Finish.

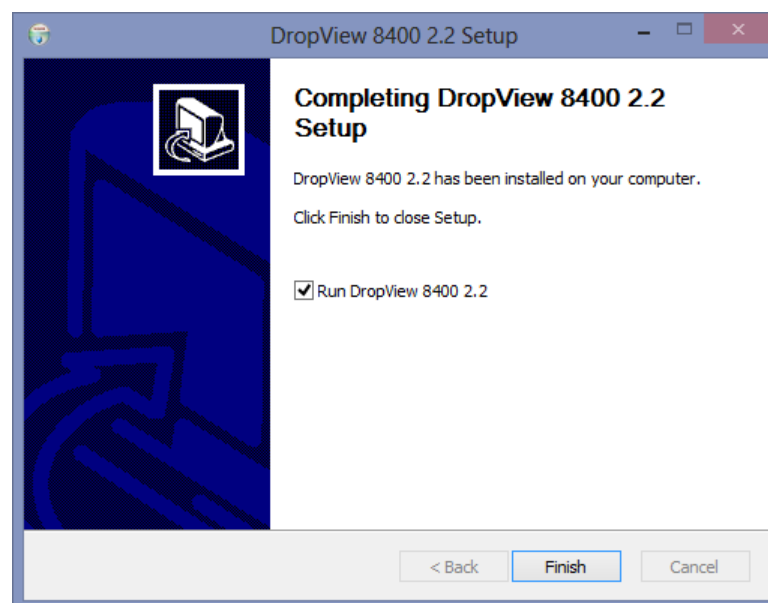


Figure 11 - Successful software installation dialog

A desktop icon “DropView 8400” and a start menu under **Windows start menu ► All programs ► DropView 8400** have been created.

4.1.2 Mac OS X operating system

Insert the Software Installation USB key (upon request). Open the USB device and looking for “software” folder.

Note: Before run DropView software, your computer must have **Java Virtual Machine (JVM)** installed. In case it is not installed in your computer, use “jre-7u51-macosx-x64.dmg” file located inside of the “software” folder.

After JVM installation (if needed), copy “DropView 8400.app” file located inside the “software” folder and paste it in a folder of you PC or laptop. The software will be open clicking over “DropView 8400.app” file.

4.2 Driver installation

Note: Instruments uStat4000 / uStat4000P with Serial Numbers ST4148514 or higher, and instruments uStat8000 / uStat8000P with Serial Numbers ST812548 or higher don't need a manual installation driver process because the driver is assigned automatically.

Please follow the corresponding instructions according to your operative system if your instrument is a uStat4000 / uStat4000P with Serial Number ST4148504 or lower, or a uStat8000 / uStat8000P with Serial Number ST812028 or lower:

4.2.1 Windows® 10

4.2.2 Windows® 8.1

4.2.3 Windows® 8

4.2.4 Windows® 7

4.2.5 Windows® Vista

4.2.1 Windows® 10

To install correctly the drivers on **Windows® 10** please note that this windows version have a “driver signature enforcement” feature that is enabled by default. **µStat 8000 instrument** drivers are recognized in some windows distributions as an unsigned drivers and when you try to install an unsigned driver, an error message like: “The third party INF does not contain digital signature information” or “The hash for the file is not present in the specified catalog file” appears.

If you are installing the instrument on a computer with **Windows® 10**, to be sure that you allow the driver to be installed, the driver signature enforcement feature must be disabled as follows:

1. Click the “Power” button to get to its menu.
2. Press the <Shift> key and click restart at the same time.
3. You will get a screen that says “Choose an option.” Select “Troubleshoot.”

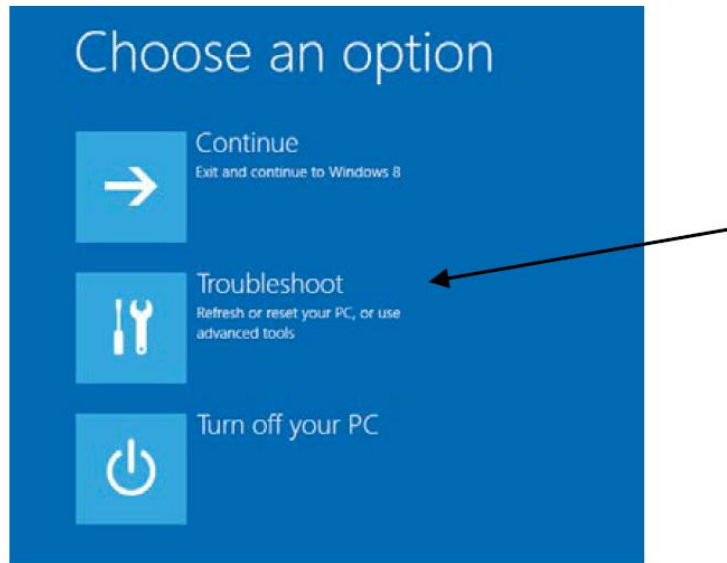


Figure 12 - Choose an option selection window

4. In the “Troubleshoot” screen, select “Advanced Options.”

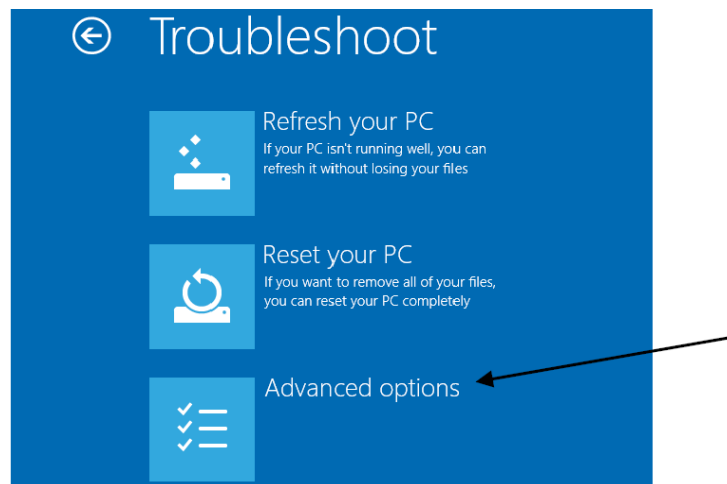


Figure 13 - Troubleshoot selection window

5. In the “Advanced Options” screen, select “Startup Settings.”

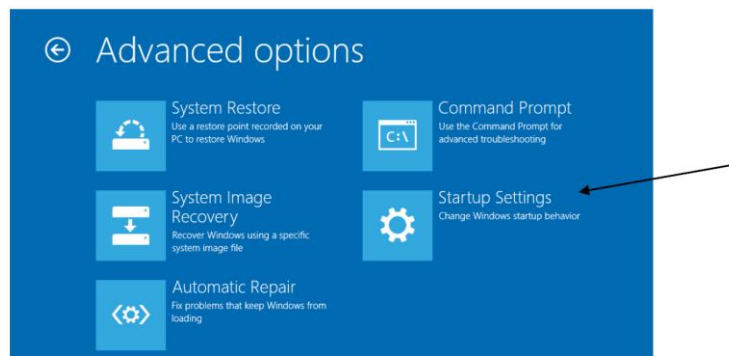


Figure 14 - Advanced options selection window

6. In the “Startup Settings” screen, click the “Restart” button.

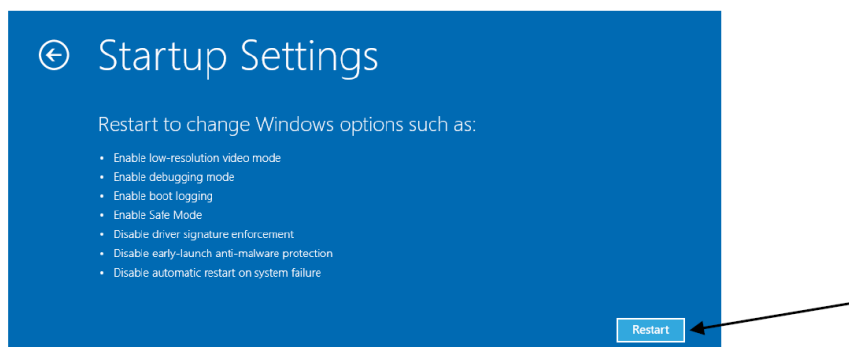


Figure 15 - Startup settings selection window

Note: If the PC is using encryption software, like BitLocker, please keep in mind that the encryption key is needed. If the driver installation process is started without the encryption key, the PC is going to be locked until you provide the key. Using an account with admin/root rights makes possible to suspend encryption protection and proceed. After the PC restarts, select item (7) “Disable driver signature enforcement”.

You will be able to install the Windows device driver successfully.

Once “driver signature enforcement” is disabled, you can install the drivers in your PC.

1. **Plug in** the μ Stat 8000 to a USB port using the original USB Cable.
2. **Turn on** the instrument by pressing the front Power button (when the instrument is on, the blue circle of Power button lights and the LCD display is turned on). The computer will automatically detect a new device. Wait until finish and then the device will be listed in Device Manager¹.
3. In the Device Manager window, locate the device under “Ports (COM & LPT). In this example the name is “Bossa Program Port (COM4).

¹ If you are unable to find “Device Manager” on your computer, please check Annex I.

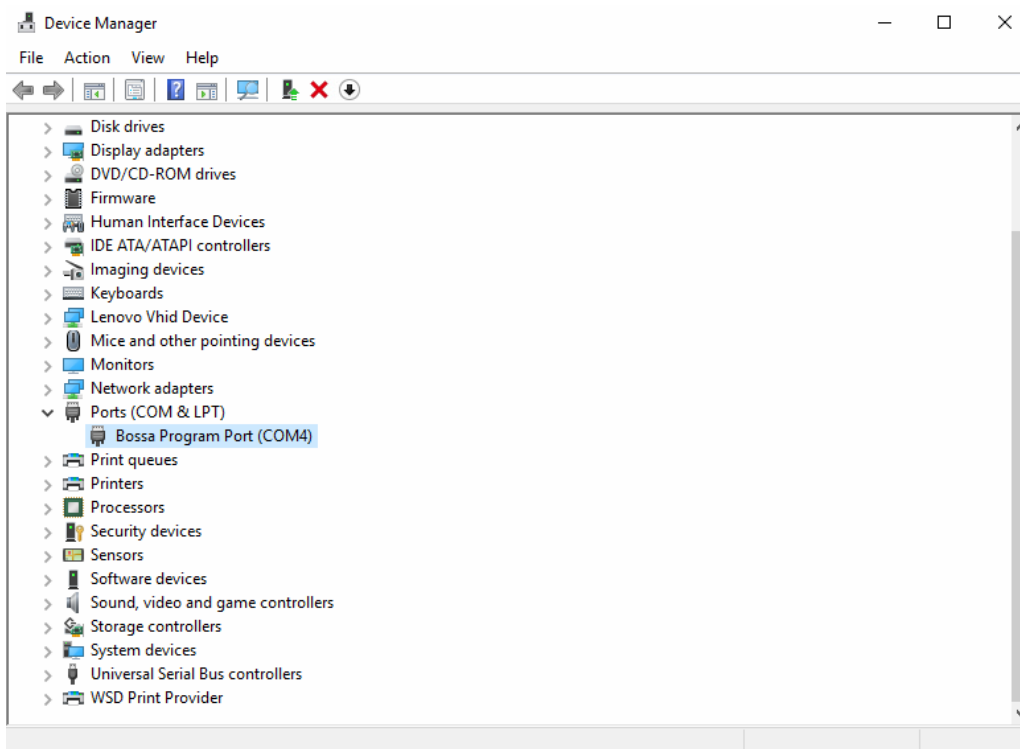


Figure 16 - Device Manager View

Note: If you aren't sure about which device is your instrument, please switching off the instrument (don't disconnect the USB cable) and look at the device manager panel, under "Ports (COM & LPT)" subsection, to see which COM port disappear. After that, switch on again the instrument and look at the device manager panel again, to see which COM port appear.

4. In the next window, the second option must be selected: "Let me pick from a list of device drivers on my computer"

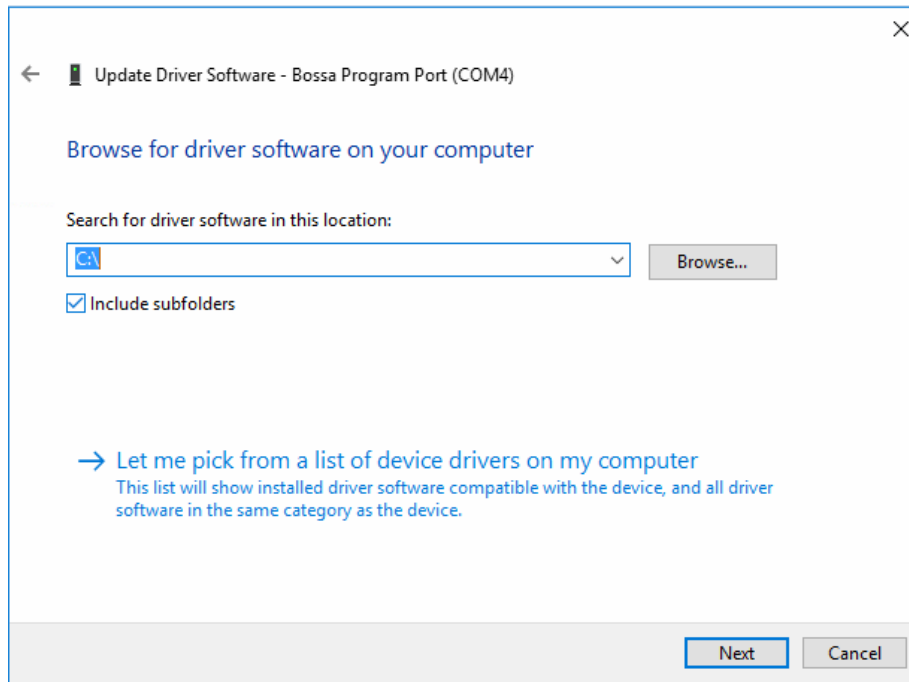


Figure 17 - Manual driver selection

5. Then, click on the button “Have a Disk” and introduce the location of the correct driver by clicking on “Browse”.

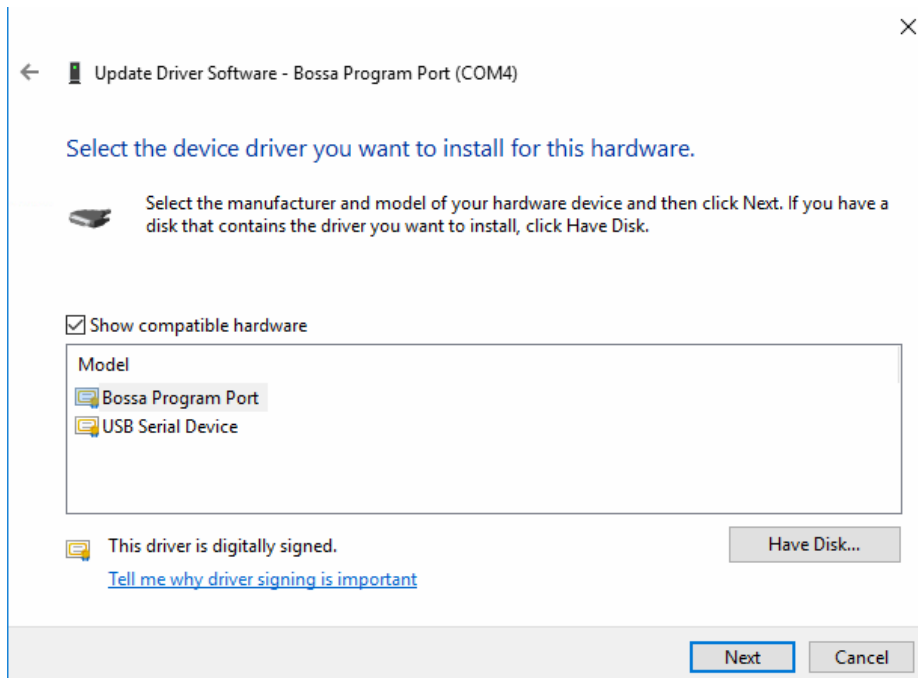


Figure 18 - Have Disk

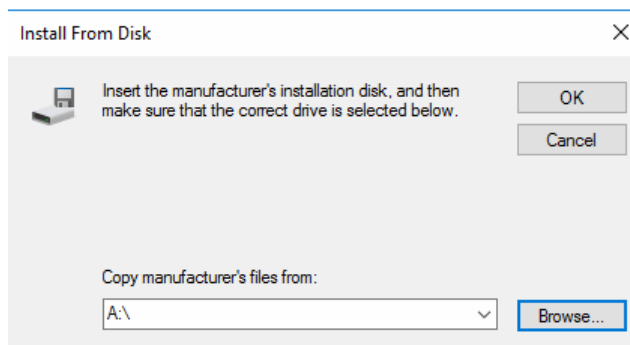


Figure 19 - Search Location

Put the exact location where the drivers are. In **Windows 10** the location is:

→ *For 32-bit versions of windows:*

C:\Program Files\DropView 8400\Driver\uStat8000\Windows 8.1 or later

→ *For 64-bit versions of windows:*

C:\Program Files (x86)\ DropView 8400\Driver\uStat8000\ Windows 8.1 or later

Or you can find also the driver on the Software Installation CD-ROM.

D:\Driver\uStat8000\Windows 8.1 or later

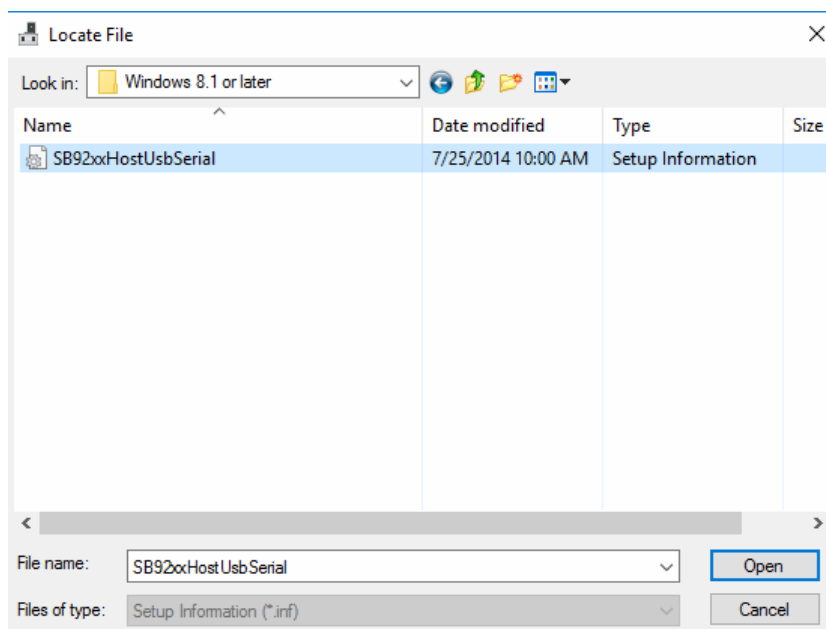


Figure 20 - Open driver folder

6. After selecting the driver, click on “Open” and then “Next” to select the driver

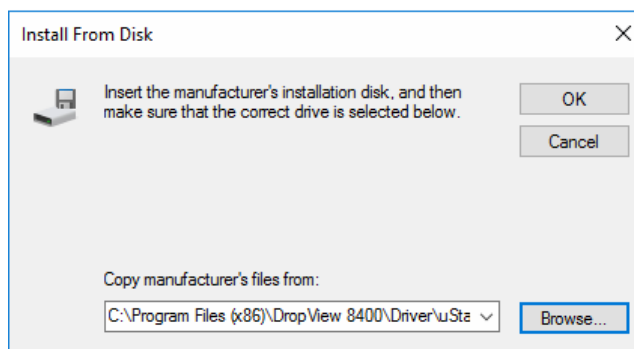


Figure 21 - Driver Location

- On **Windows 10** the driver is “uStat8000/4000” or, depending on the windows distribution, the name could be “SiBEAM SB92xx Host Serial”. Click on Next.

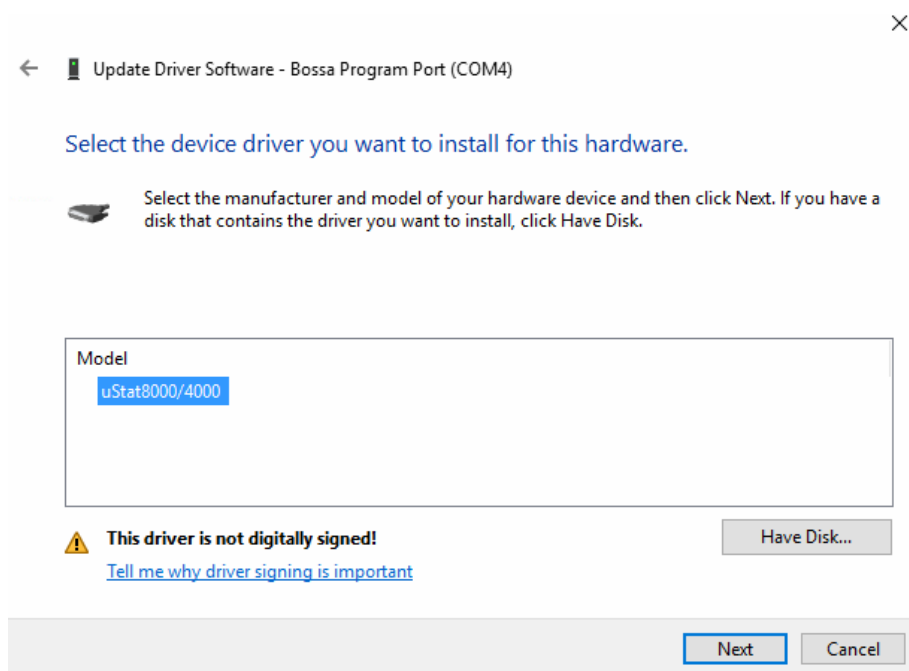


Figure 22 - Driver selection

- A warning message will prompt to you. Click on “yes” to continue with the installation

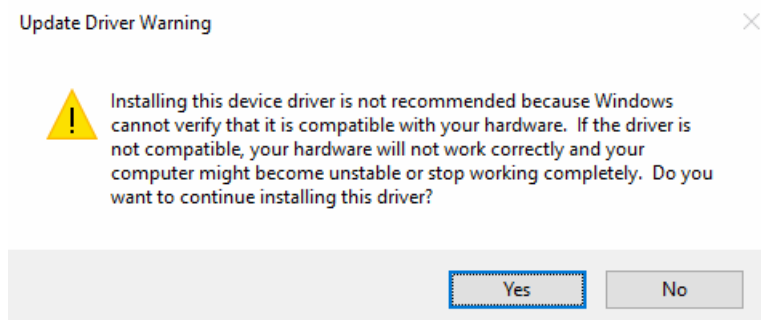


Figure 23 - Warning message

9. A windows security warning is prompted. Click on the second one to “Install this driver software anyway” and wait until finish.

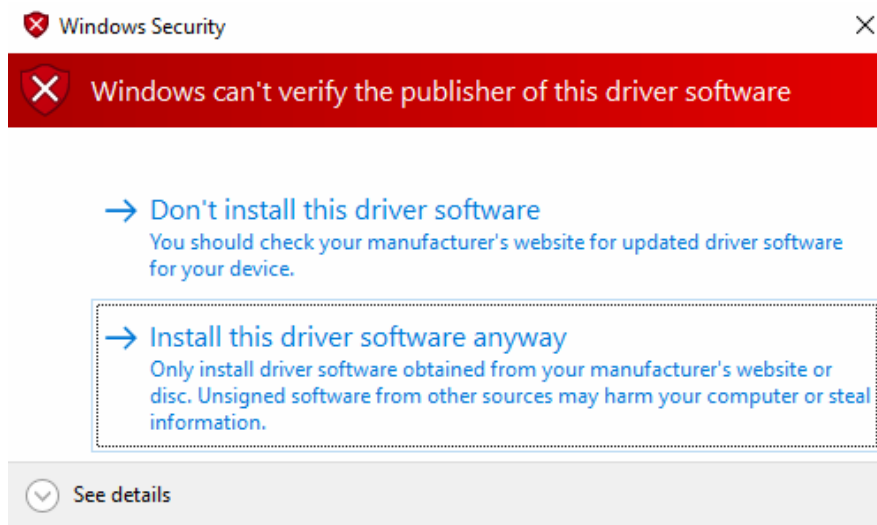


Figure 24 - Windows security

When the installation has finished, a completion screen is displayed.

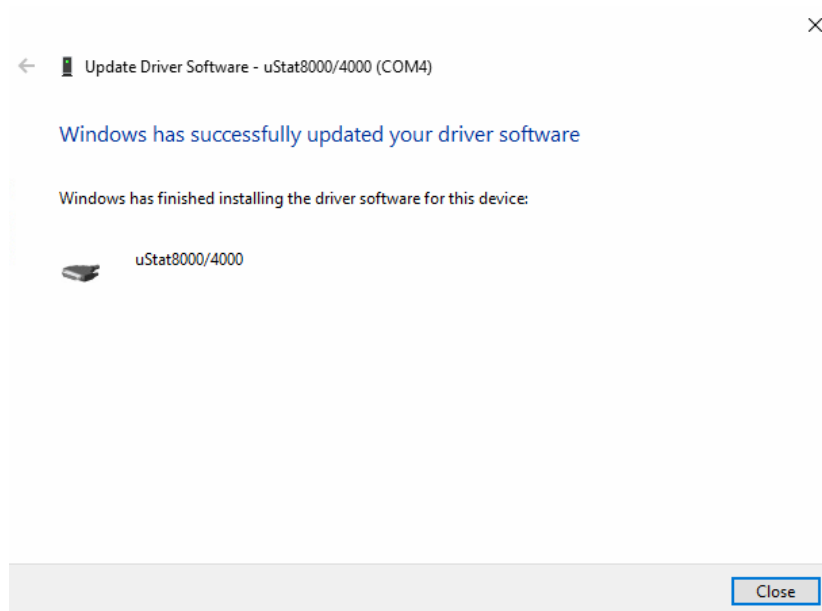


Figure 25 - Successful Driver Software Update

10. Press Close to close this window and go back to the Device Manager Window.

Note: On **Windows 10** if a message “Windows encountered a problem installing the driver software for your device (see figure 25), please remember that you must restart the computer in advanced mode before installing the driver.

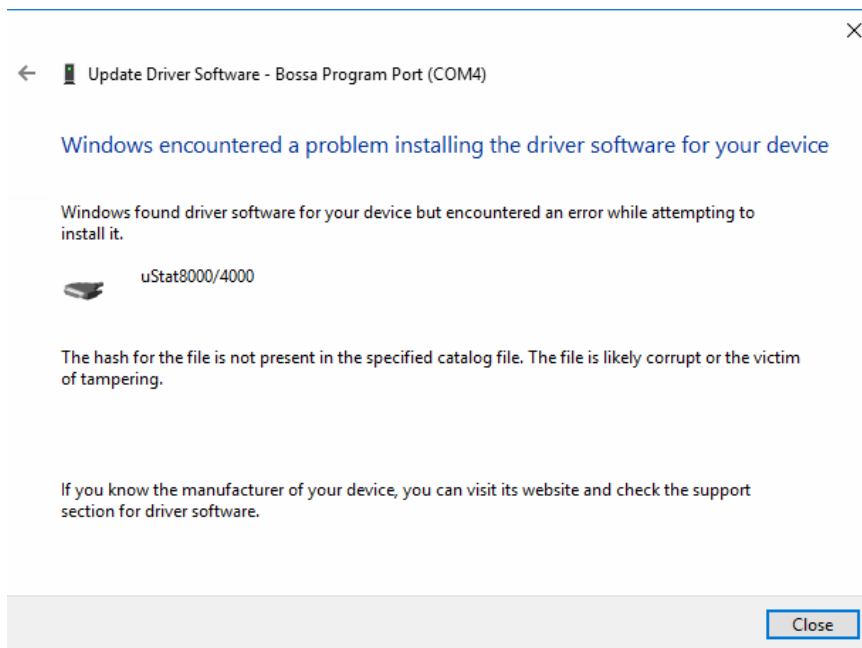


Figure 26 - Windows encountered a problem

On **Windows 10**, the correct driver “uStat8000/4000” or “SiBEAM SB92xx Host Serial” will be displayed under Port (COM & LPT) tree.

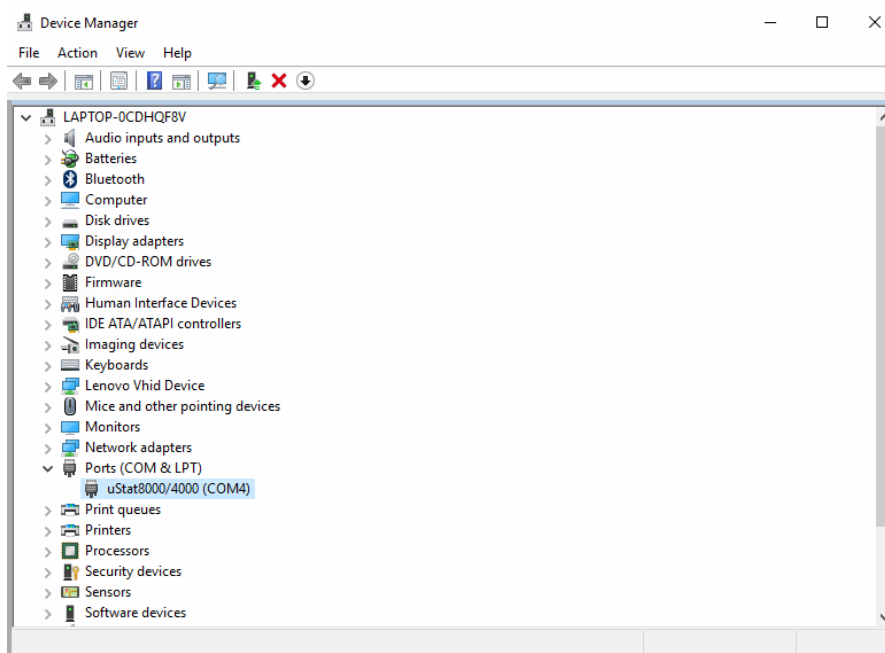


Figure 27 - Successful Driver Software Update

The above screen shot displays a correct installation. The device is now ready to use on COM4.

Note: Not all devices will install to COM4. The COM port allocation is determined by the installation wizard on the basis of the next free com port as designated in the PC registry.

4.2.2 Windows® 8.1

To install correctly the drivers on **Windows® 8.1** please note that all these windows versions have a “driver signature enforcement” feature that is enabled by default. **µStat 8000 instrument** drivers are recognized in some windows distributions as an unsigned drivers and when you try to install an unsigned driver, an error message like: “The third-party INF does not contain digital signature information” or “The hash for the file is not present in the specified catalog file” appears.

If you are installing the instrument on a computer with **Windows® 8.1**, to be sure that you allow the driver to be installed, the driver signature enforcement feature must be disabled as follows:

1. Click the “Power” button to get to its menu.
2. Press the <Shift> key and click restart at the same time.
3. You will get a screen that says “Choose an option.” Select “Troubleshoot.”

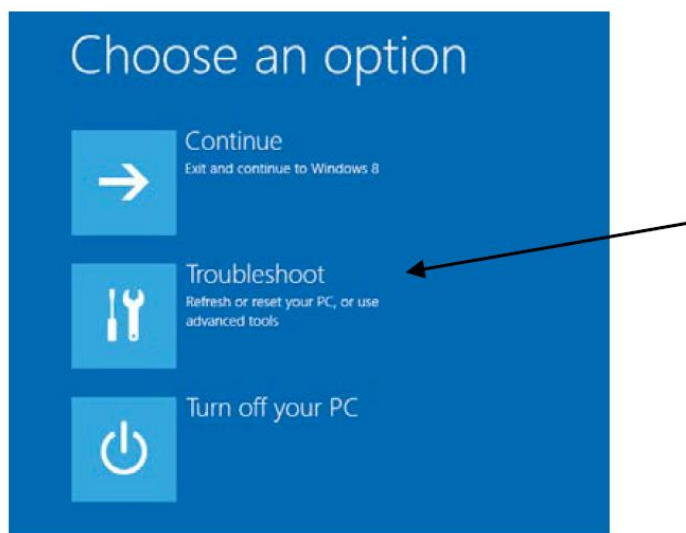


Figure 28 - Choose an option selection window

4. In the “Troubleshoot” screen, select “Advanced Options.”

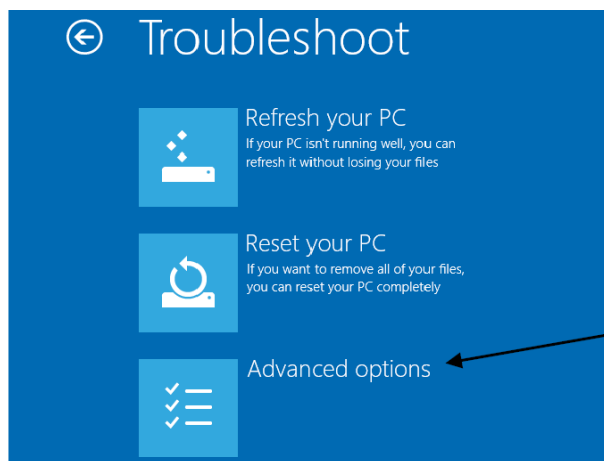


Figure 29 - Troubleshoot selection window

5. In the “Advanced Options” screen, select “Startup Settings.”

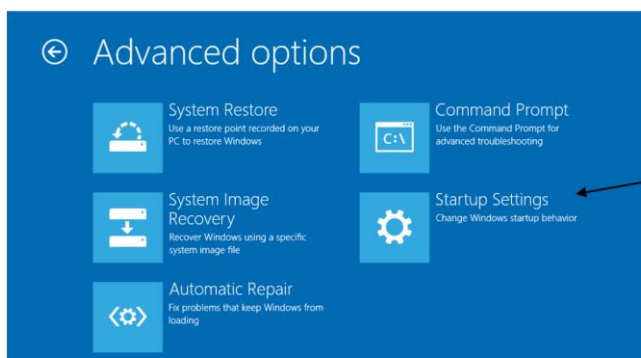


Figure 30 - Advanced options selection window

6. In the “Startup Settings” screen, click the “Restart” button.

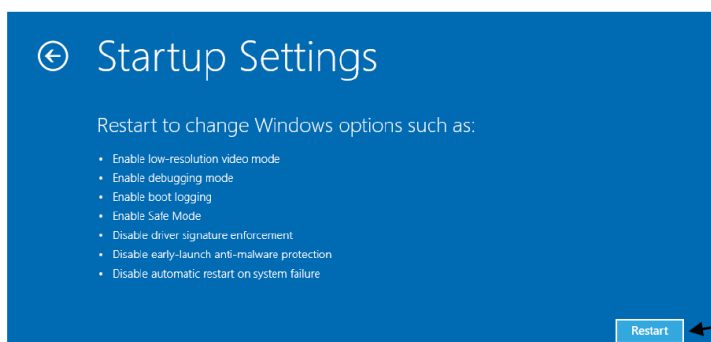


Figure 31 - Startup settings selection window

Note: If the PC is using encryption software, like BitLocker, please keep in mind that the encryption key is needed. If the driver installation process is started without the encryption key, the PC is going to be locked until you provide the key. Using an account with admin/root rights makes possible to suspend encryption protection and proceed to install the drivers with the driver signature enforcement disabled.

7. After the PC restarts, select item (7) “Disable driver signature enforcement”.
You will be able to install the Windows device driver successfully.

Once “Driver Signature Enforcement” is disabled, you can install the correct drivers on your PC.

1. **Plug in** the μ Stat 8000 to a USB port using the original USB Cable.
2. **Turn on** the instrument by pressing the front Power button (when the instrument is on, the blue circle of Power button lights and the LCD display is turned on). The computer will automatically detect a new device. Wait until finish and then the device will be listed in Device Manager².
3. In the Device Manager window, locate the device under “Ports (COM & LPT)”. In this example, the name is “Bossa Program Port (COM4)”.

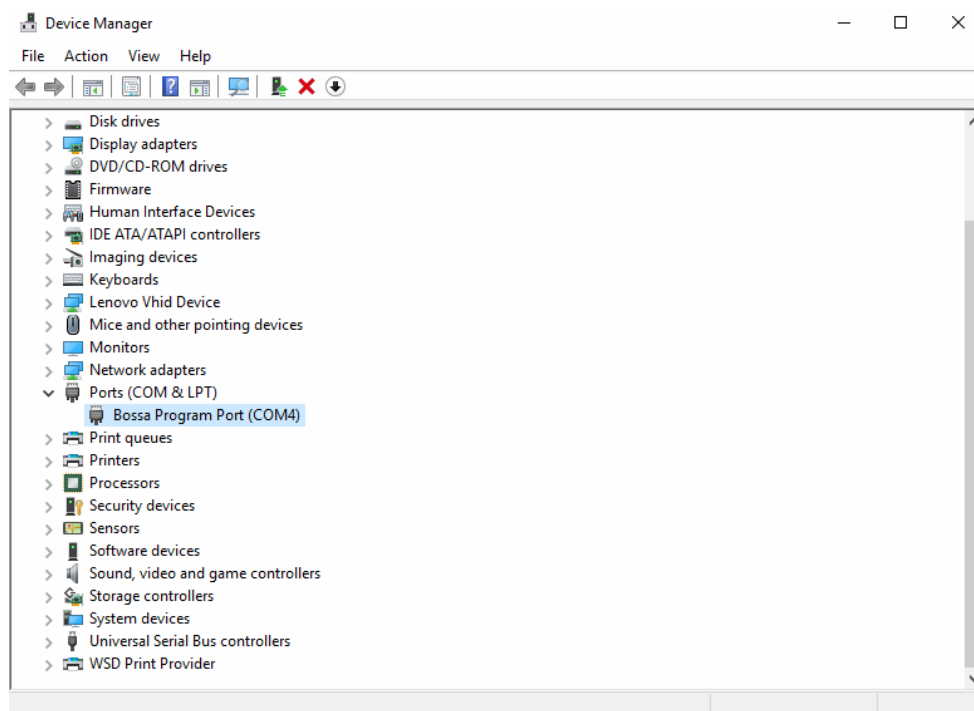


Figure 32 - Device Manager View

Note: If you aren't sure about which device is your instrument, please switch off the instrument (don't disconnect the USB cable) and look at the device manager panel, under “Ports (COM & LPT)” subsection, to see which COM port disappear. After that, switch on again the instrument and look at the device manager panel again, to see which COM port appear.

4. Right click on the device to bring up a menu. From the displayed menu select “Update Driver Software...”

² If you are unable to find “Device Manager” on your computer, please check Annex I.

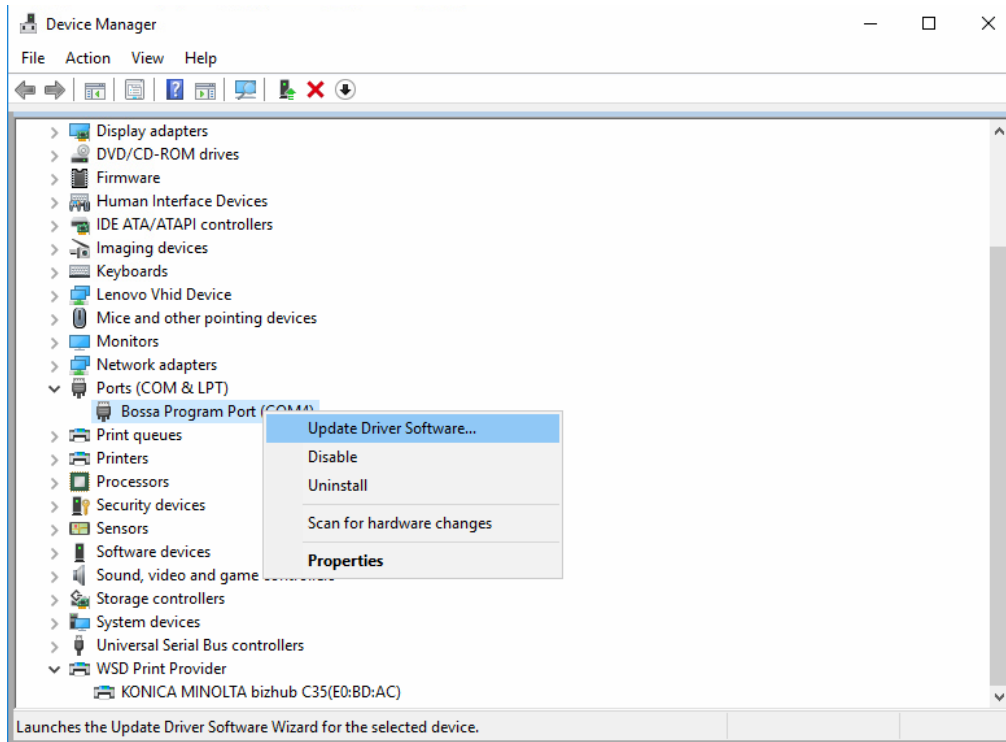


Figure 33 - Update Driver Software

5. This then displays the option for an automatic search or a manual search. Select the second option to browse manually.

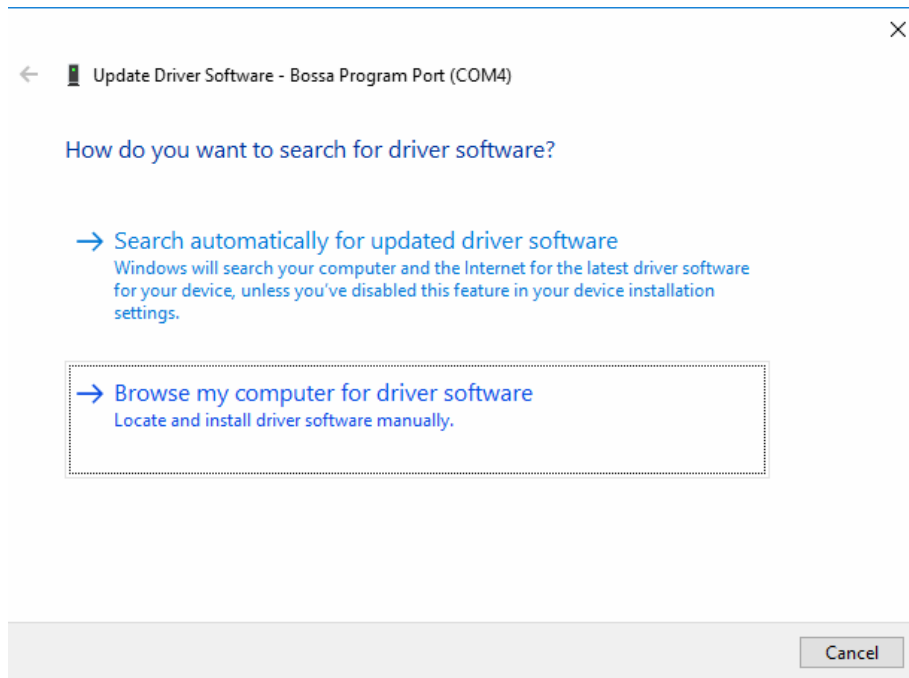


Figure 34 - Browse my computer for driver software

6. In the next window, the second option must be selected: “Let me pick from a list of device drivers on my computer”

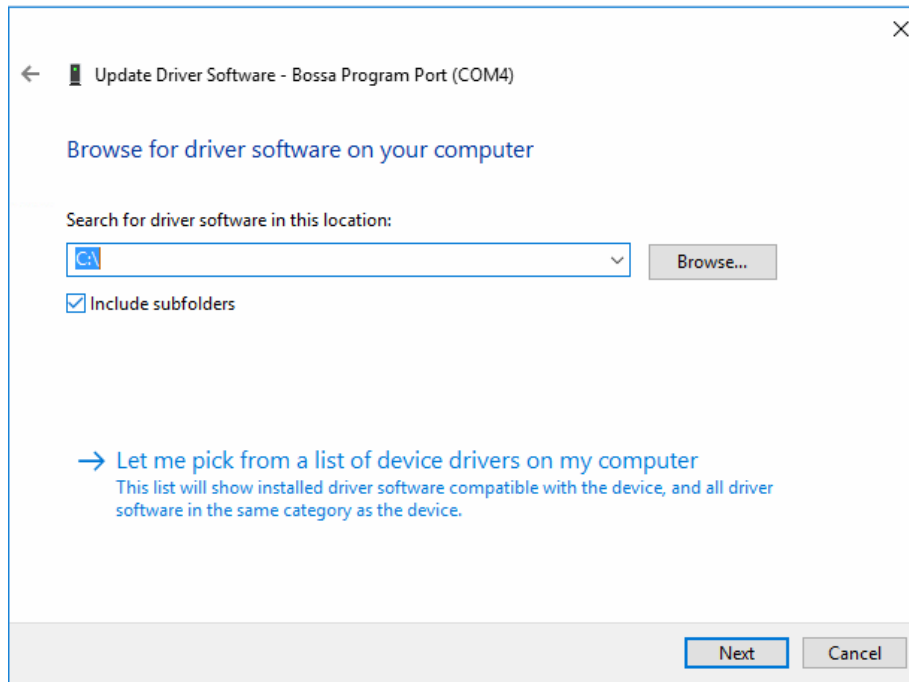


Figure 35 - Manual driver selection

7. Then, click on the button "Have a Disk" and introduce the location of the correct driver by clicking on "Browse"

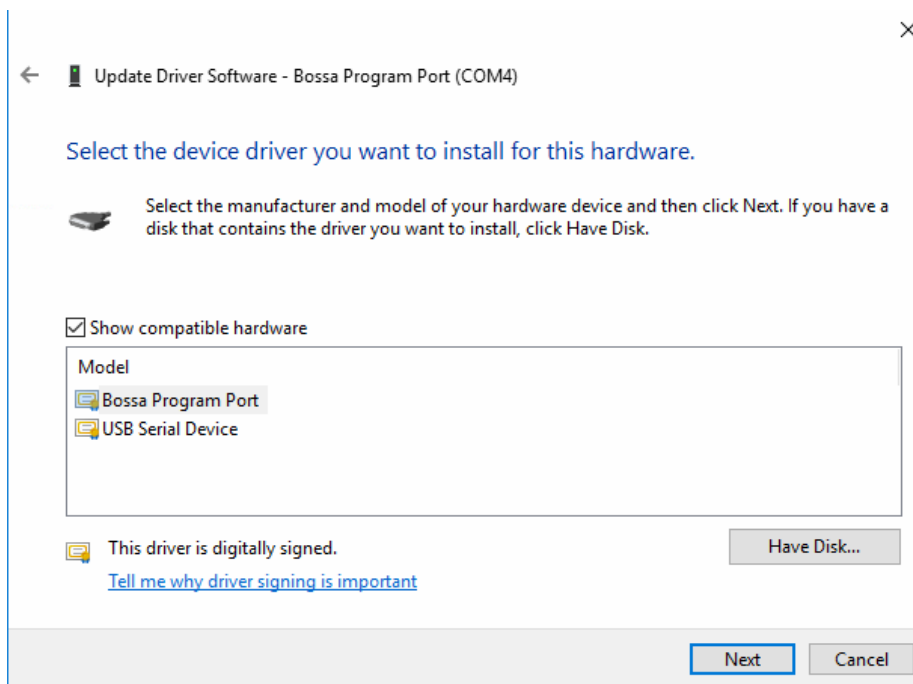


Figure 36 - Have Disk

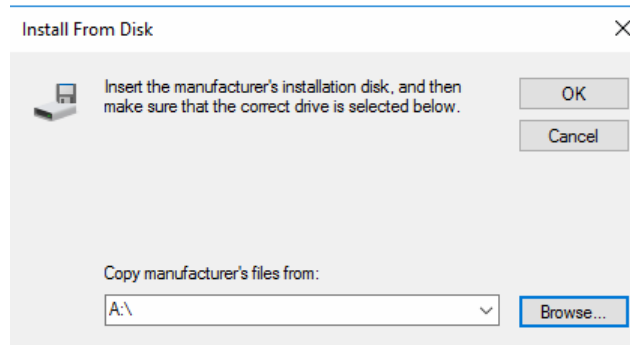


Figure 37 - Search Location

Put the exact location where the drivers are. In **Windows 8.1** the location is:

➔ *For 32-bit versions of windows:*

C:\Program Files\DropView 8400\Driver\uStat8000\Windows 8.1 or later

➔ *For 64-bit versions of windows:*

C:\Program Files (x86)\ DropView 8400\Driver\uStat8000\ Windows 8.1 or later

Or you can find also the driver on the Software Installation CD-ROM.

D:\Driver\uStat8000\Windows 8.1 or later

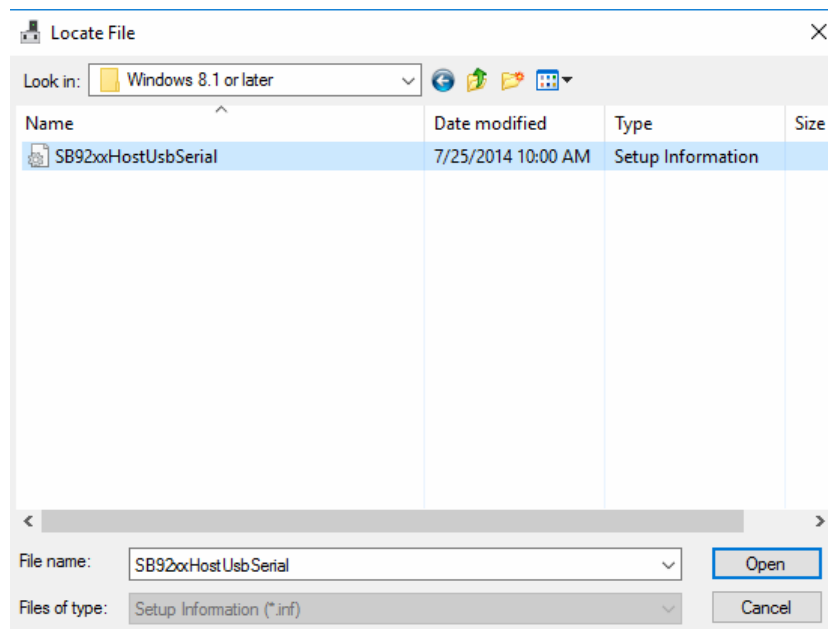


Figure 38 - Open driver folder

8. After selecting the driver, click on “Open” and then “Next” to select the driver

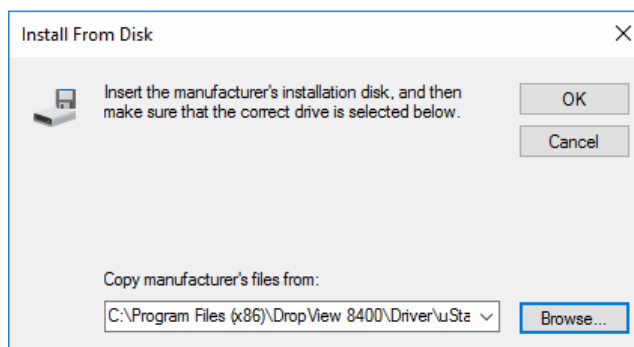


Figure 39 - Driver Location

9. On **Windows 8.1** the driver is “uStat8000/4000” or, depending on the windows distribution, the name could be “SiBEAM SB92xx Host Serial”. Click on Next.

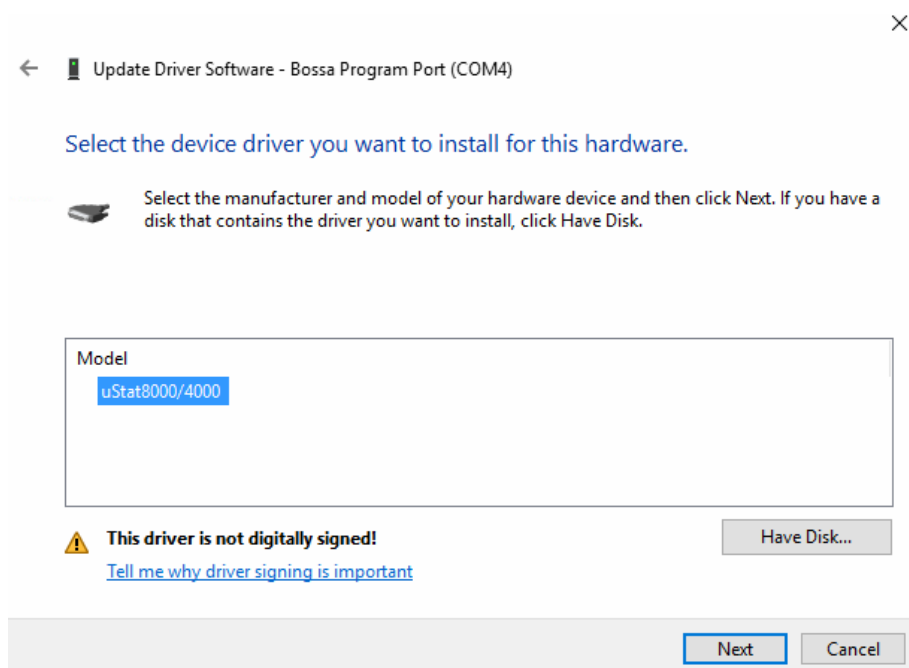


Figure 40 - Driver selection

10. A warning message will prompt to you. Click on “yes” to continue with the installation

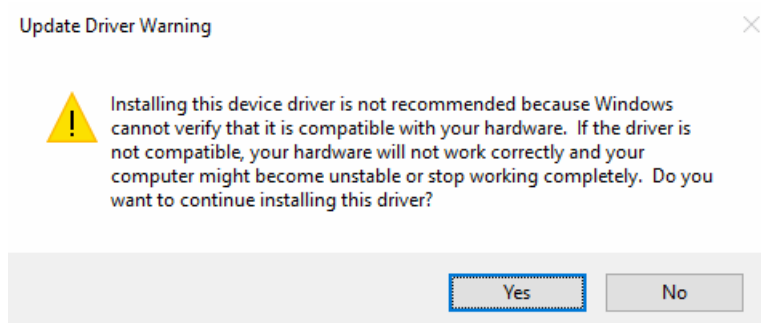


Figure 41 - Warning message

11. A windows security warning is prompted. Click on the second one to “Install this driver software anyway” and wait until finish.

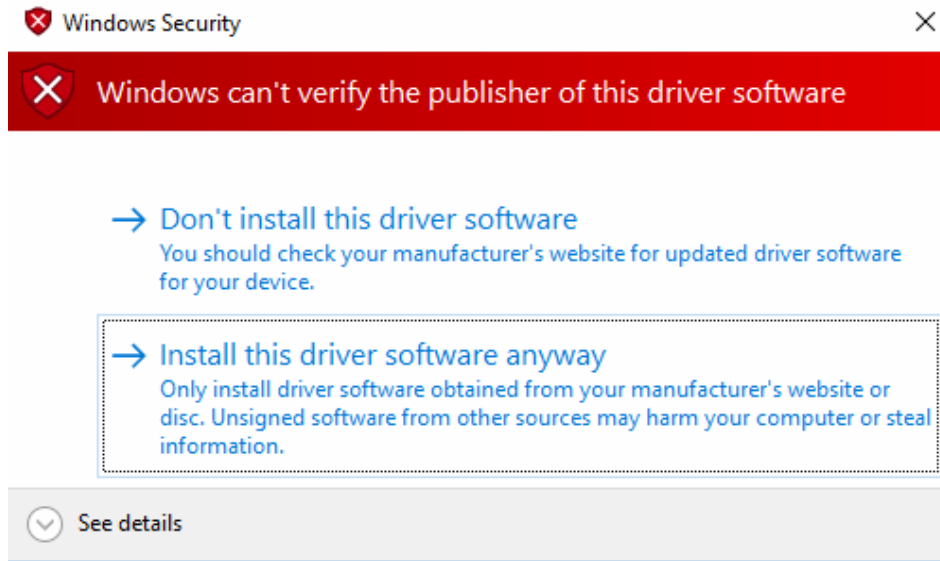


Figure 42 - Windows security

When the installation has finished, a completion screen is displayed.

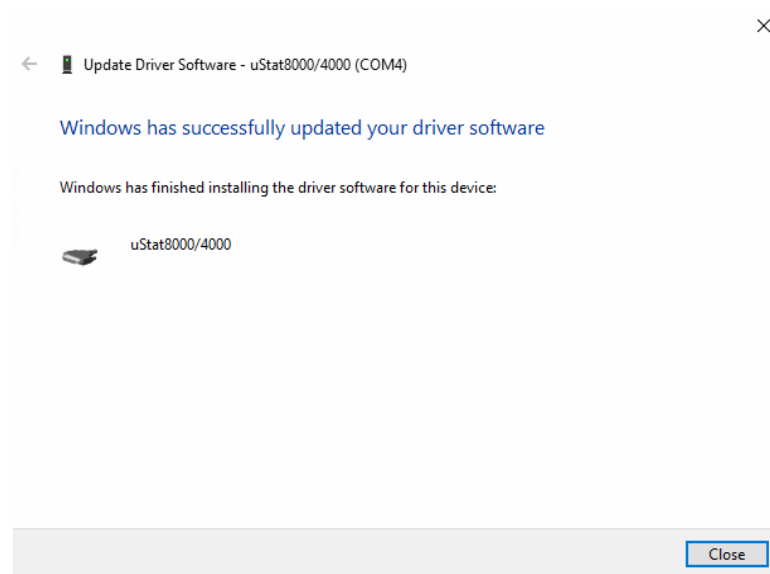


Figure 43 - Successful Driver Software Update

12. Press Close to close this window and go back to the Device Manager Window.

Note: On **Windows 8.1**, if a message “windows encountered a problem...” is displayed (see figure 44), please remember that you must restart the computer in advanced mode before installing the driver.

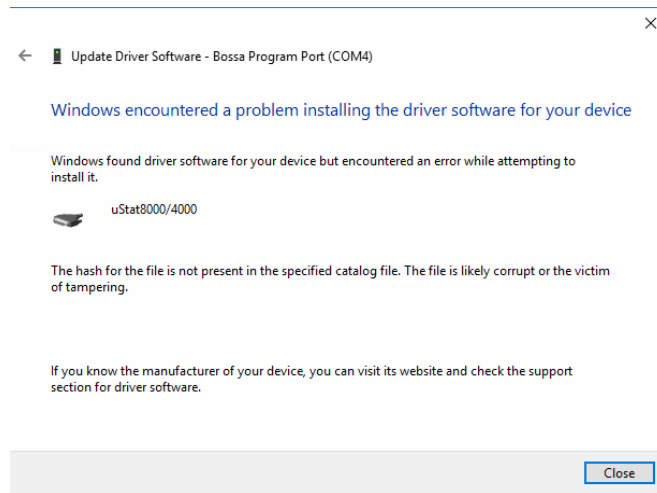


Figure 44 - Windows encountered a problem

On **Windows 8.1**, the correct driver “uStat8000/4000” or “SiBEAM SB92xx Host Serial” will be displayed under Port (COM & LPT) tree.

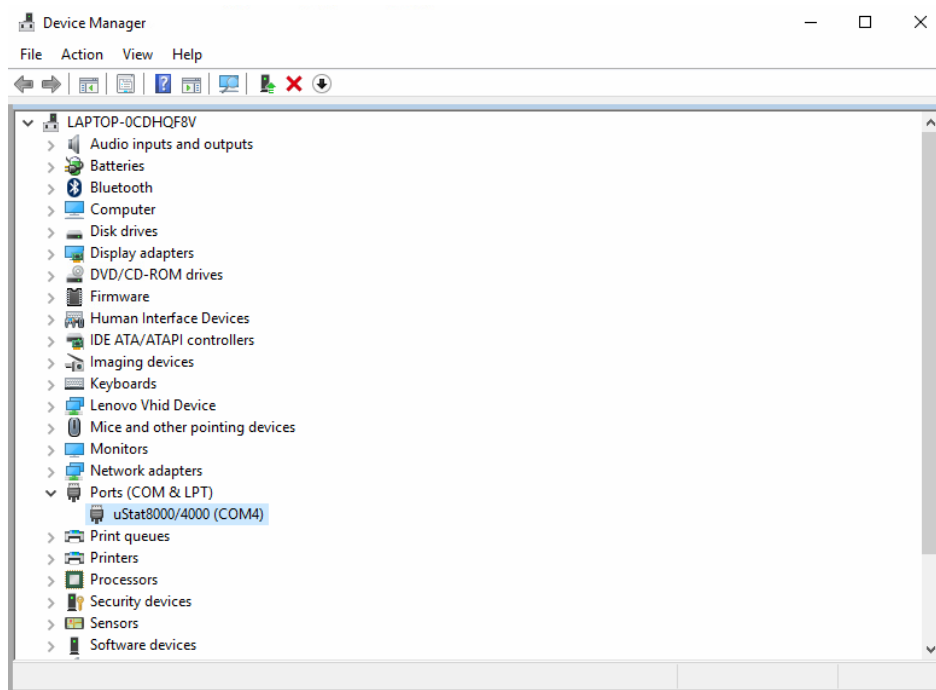


Figure 45 - Successful Driver Software Update

The above screen shot displays a correct installation. The device is now ready to use on COM4.

Note: Not all devices will install to COM4. The COM port allocation is determined by the installation wizard on the basis of the next free com port as designated in the PC registry.

4.2.3 Windows® 8

To install correctly the drivers on **Windows® 8** please note that all these windows versions have a “driver signature enforcement” feature that is enabled by default. **µStat 8000 instrument** drivers are recognized in some windows distributions as an unsigned drivers and when you try to install an unsigned driver, an error message like: “The third party INF does not contain digital signature information” or “The hash for the file is not present in the specified catalog file” appears.

If you are installing the instrument on a computer with **Windows® 8**, to be sure that you allow the driver to be installed, the driver signature enforcement feature must be disabled as follows:

1. Click the “Power” button to get to its menu.
2. Press the <Shift> key and click restart at the same time.
3. You will get a screen that says “Choose an option.” Select “Troubleshoot.”

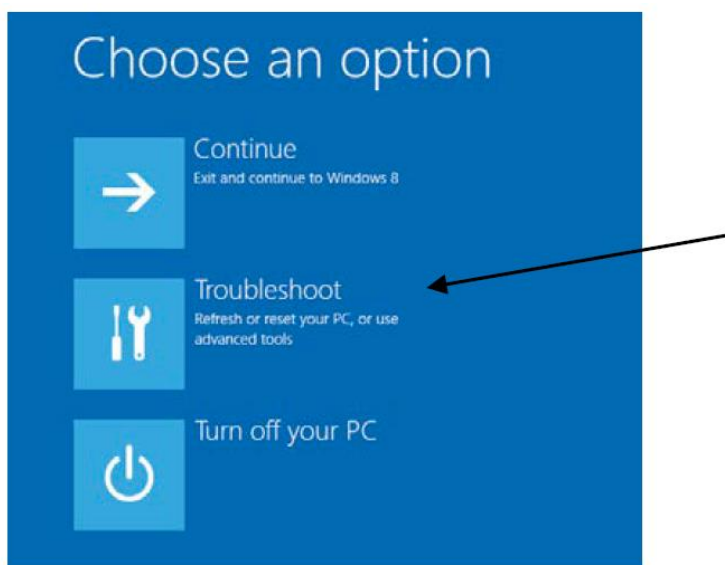


Figure 46 - Choose an option selection window

4. In the “Troubleshoot” screen, select “Advanced Options.”

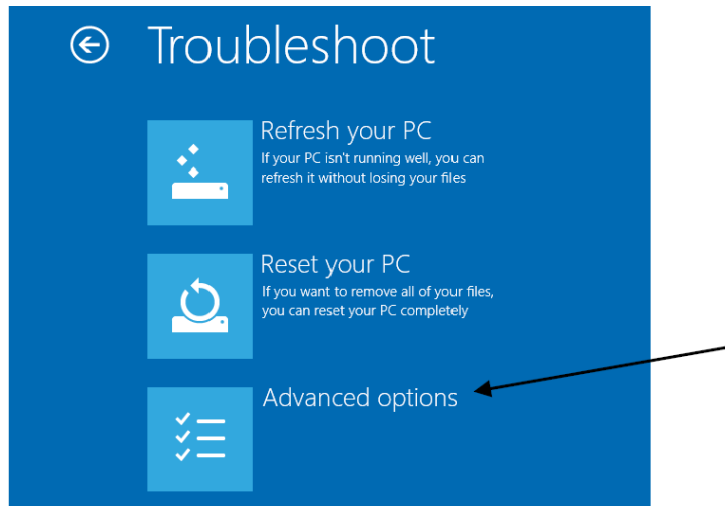


Figure 47 - Troubleshoot selection window

5. In the “Advanced Options” screen, select “Startup Settings.”

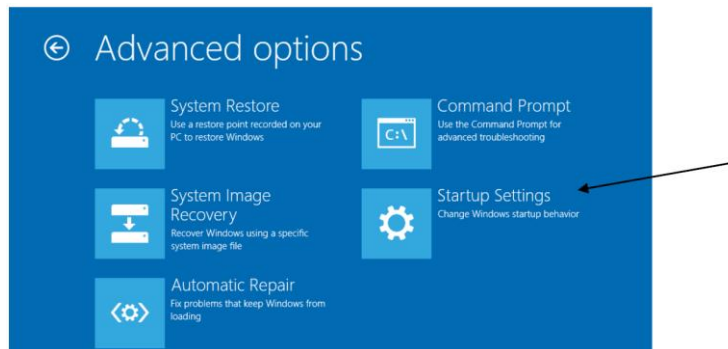


Figure 48 - Advanced options selection window

6. In the “Startup Settings” screen, click the “Restart” button.

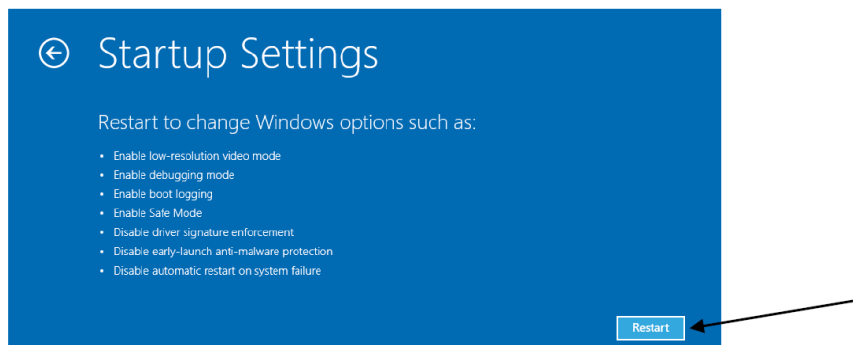


Figure 49 - Startup settings selection window

Note: If the PC is using encryption software, like BitLocker, please keep in mind that the encryption key is needed. If the driver installation process is started without the encryption key, the PC is going to be locked until you provide the key. Using an account with admin/root rights makes possible to suspend encryption protection and proceed to install the drivers with the driver signature enforcement disabled.

7. After the PC restarts, select item (7) “Disable driver signature enforcement”. You will be able to install the Windows device driver successfully.

Now you can manually install the suitable drivers.

1. **Plug in** the μ Stat 8000 to a USB port using the original USB Cable.
2. **Turn on** the instrument by pressing the front Power button (when the instrument is on, the blue circle of Power button lights and the LCD display is turned on). The computer will automatically detect a new device. Wait until finish and then the device will be listed in Device Manager³.

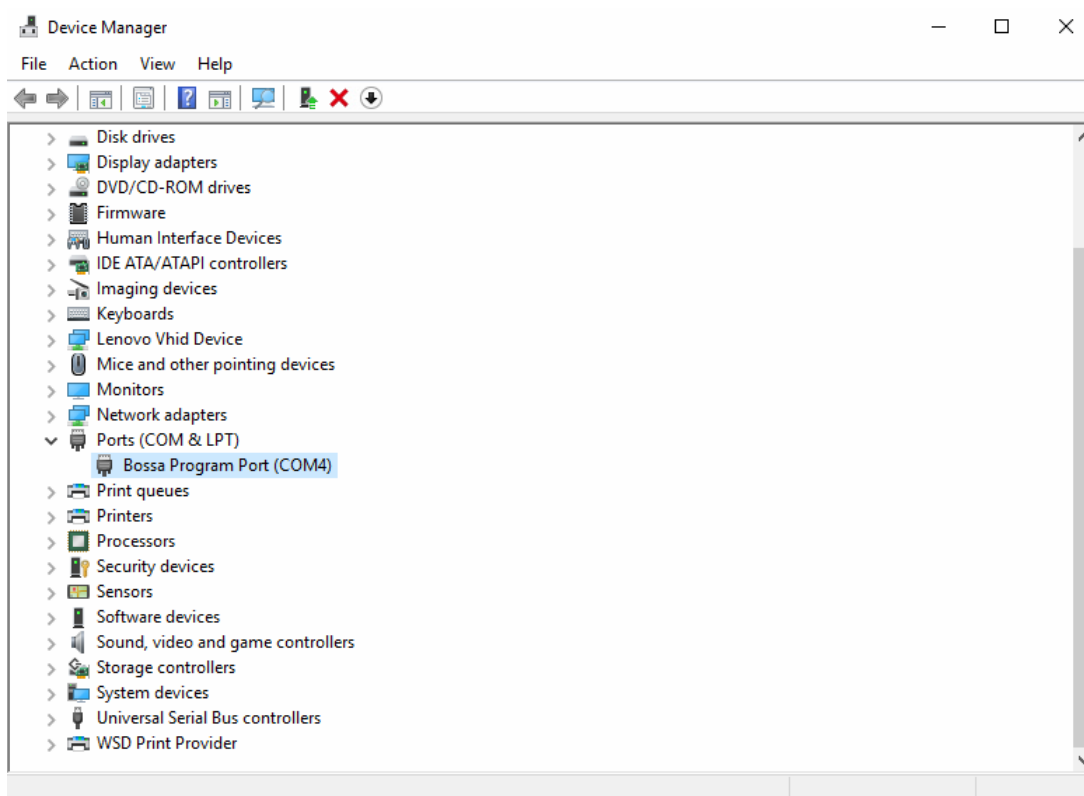


Figure 50 - Device Manager View

3. In the Device Manager window, locate the device under “Ports (COM & LPT)”. In this example the name is “Bossa Program Port (COM4).”

Note: If you aren’t sure about which device is your instrument, please switch off the instrument (don’t disconnect the USB cable) and look at the device manager panel, under “Ports (COM & LPT)” subsection, to see which COM port disappear. After that, switch on again the instrument and look at the device manager panel again, to see which COM port appear.

³ If you are unable to find device manager on your computer, please check Annex I.

Right click on the device to bring up a menu. From the displayed menu select “Update Driver Software...”

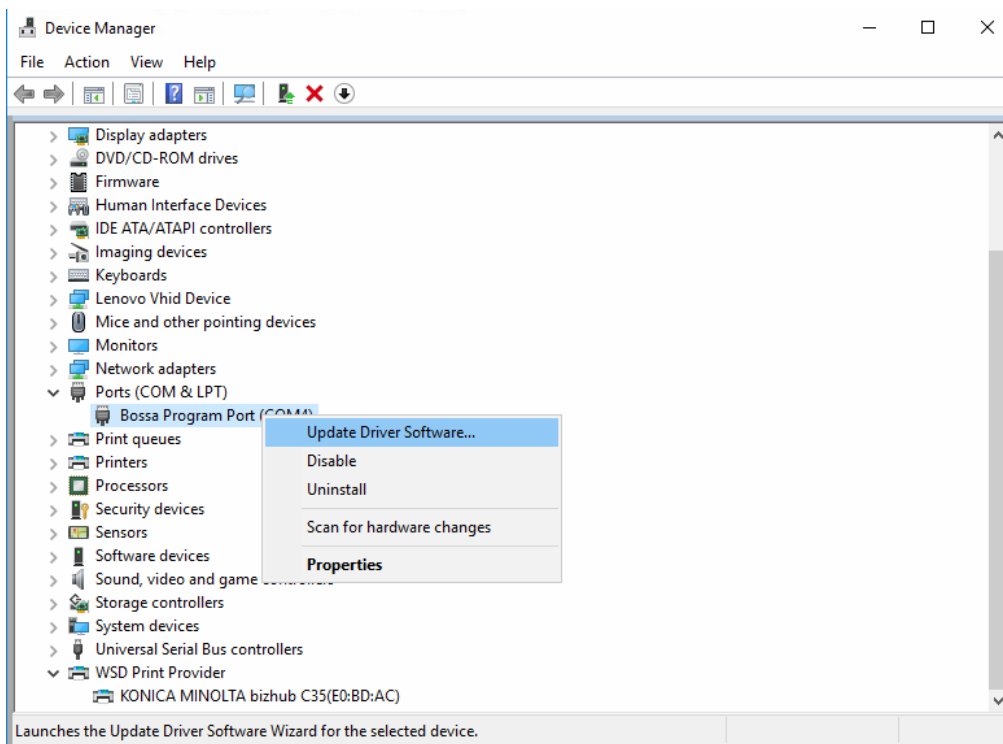


Figure 51 - Update Driver Software

4. This then displays the option for an automatic search or a manual search. Select the second option to browse manually.

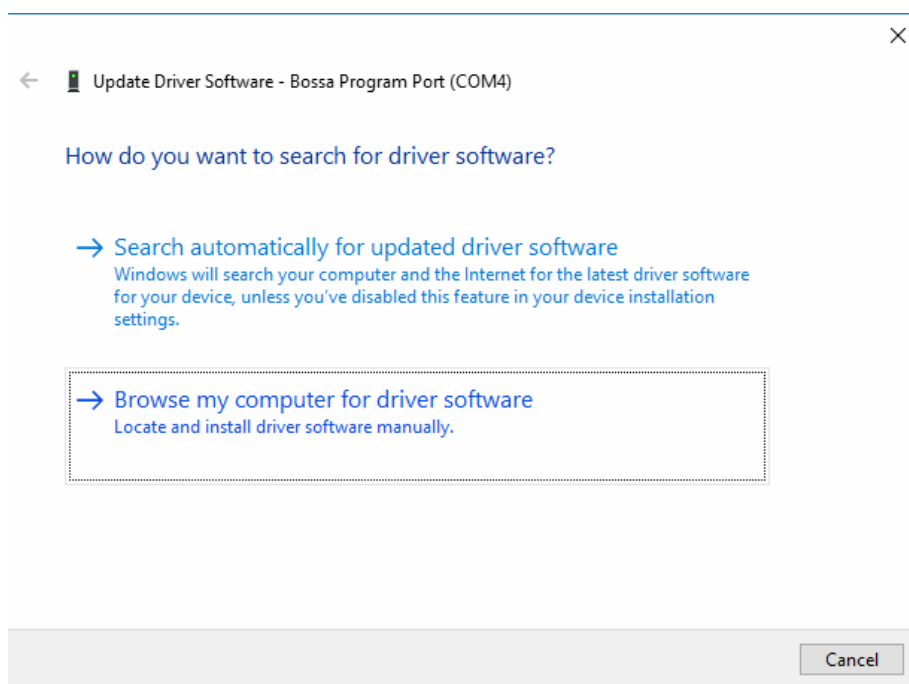


Figure 52 - Browse my computer for Driver Software

5. In the next window, the second option must be selected: “Let me pick from a list of device drivers on my computer”

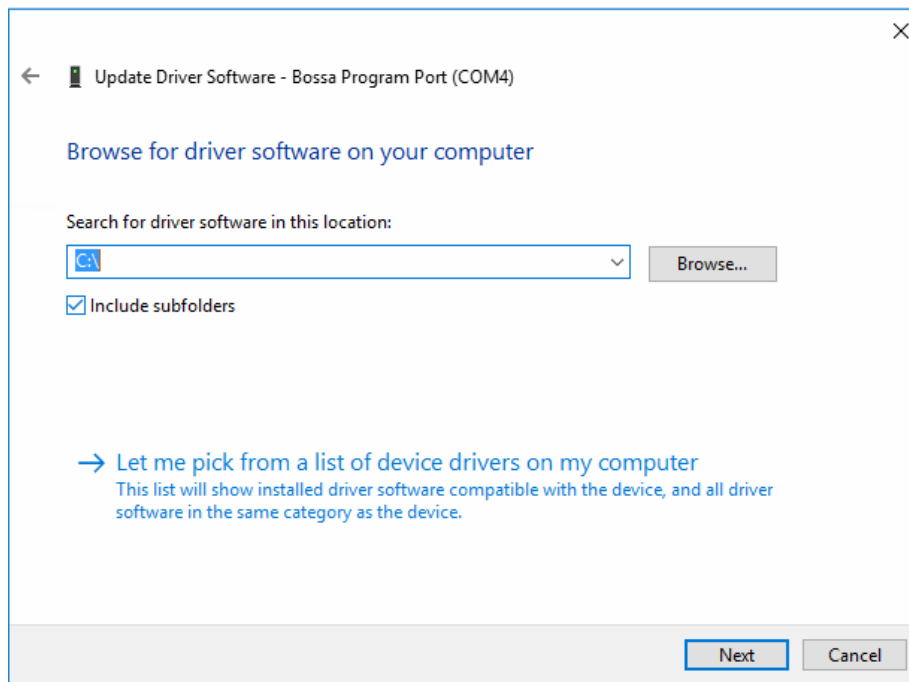


Figure 53 - Manual driver selection

6. Then, click on the button “Have a Disk” and introduce the location of the correct driver by clicking on “Browse”

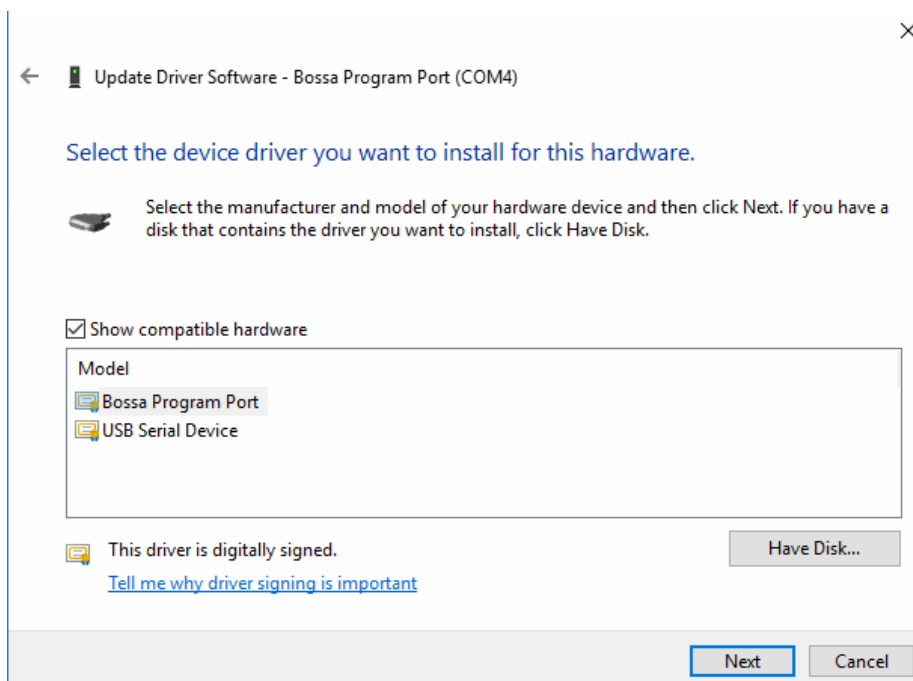


Figure 54 - Have Disk

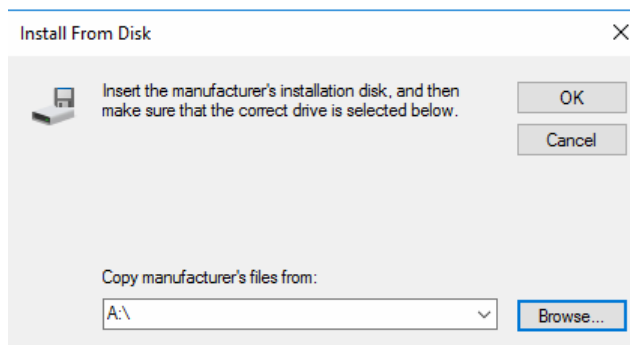


Figure 55 - Search Location

Put the exact location where the drivers are. In **Windows 8.0** the location is:

➔ *For 32-bit versions of windows:*

C:\Program Files\DropView 8400\Driver\uStat8000\Windows Vista-7-8\32-bits

➔ *For 64-bit versions of windows:*

C:\Program Files (x86)\ DropView 8400\Driver\uStat8000\Windows Vista-7-8\64-bits

Or you can find also the driver on the Software Installation CD-ROM:

D:\Driver\uStat8000\Windows Vista-7-8

If you have Windows® 8 32-bits go to section 4.2.3.1, if you have Windows® 8 64-bits please go to section 4.2.3.2.

4.2.3.1 Windows® 8 32-bits

7. After selecting the “atm6124_virtualserial.inf” file, click on “Open” to select the path, and then click on OK.

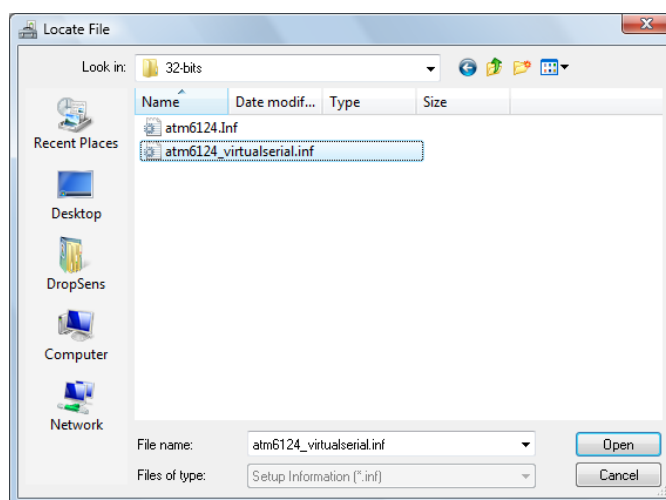


Figure 56 - Open driver folder

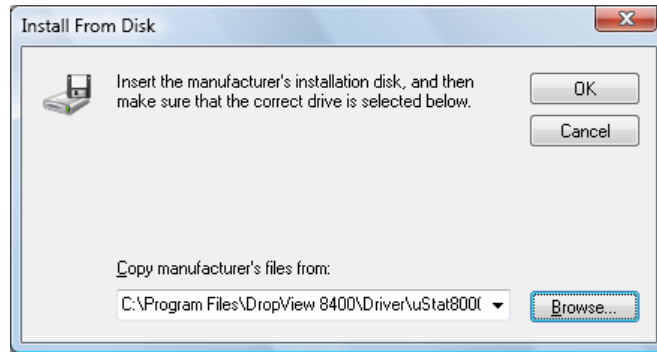


Figure 57 - Driver Location

8. On **Windows 8 32-bits**, the correct driver is call “WinARM CDC Demo (Virtual COM)”. Click on “Next” to select the driver.

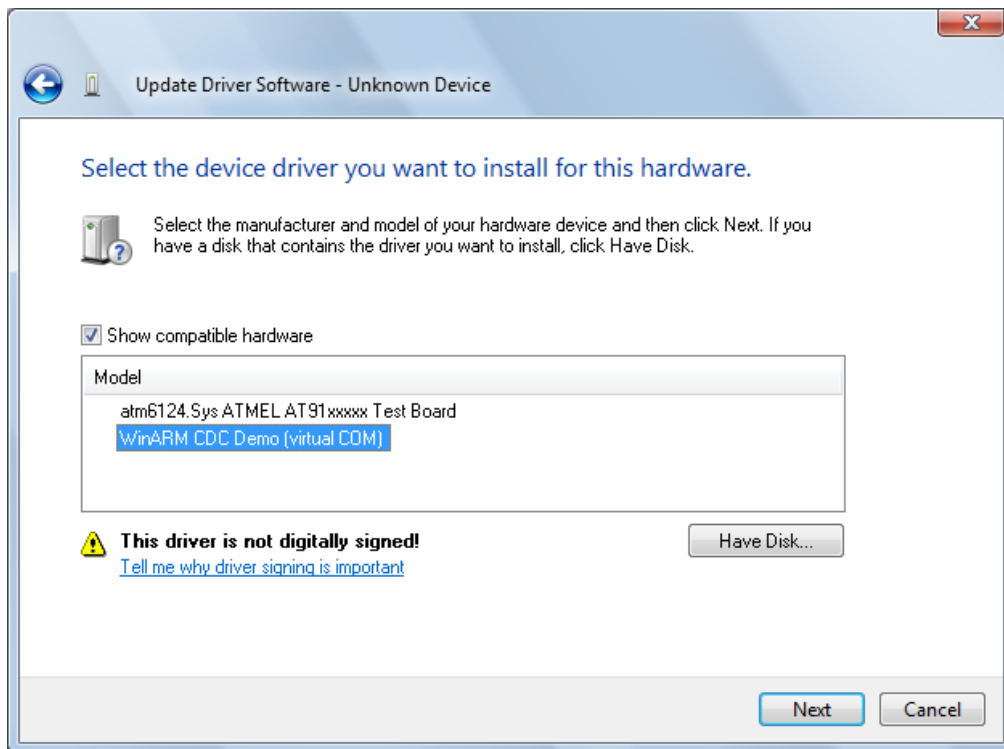


Figure 58 - Driver selection

9. A windows security warning is prompted. Click on the second one to “Install this driver software anyway” and wait until finish.

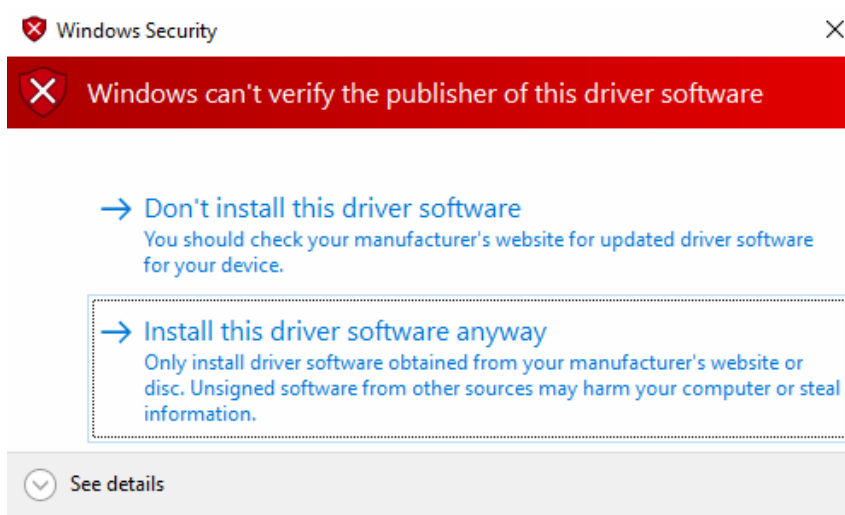


Figure 59 - Windows security

When the installation has finished, a completion screen is displayed.

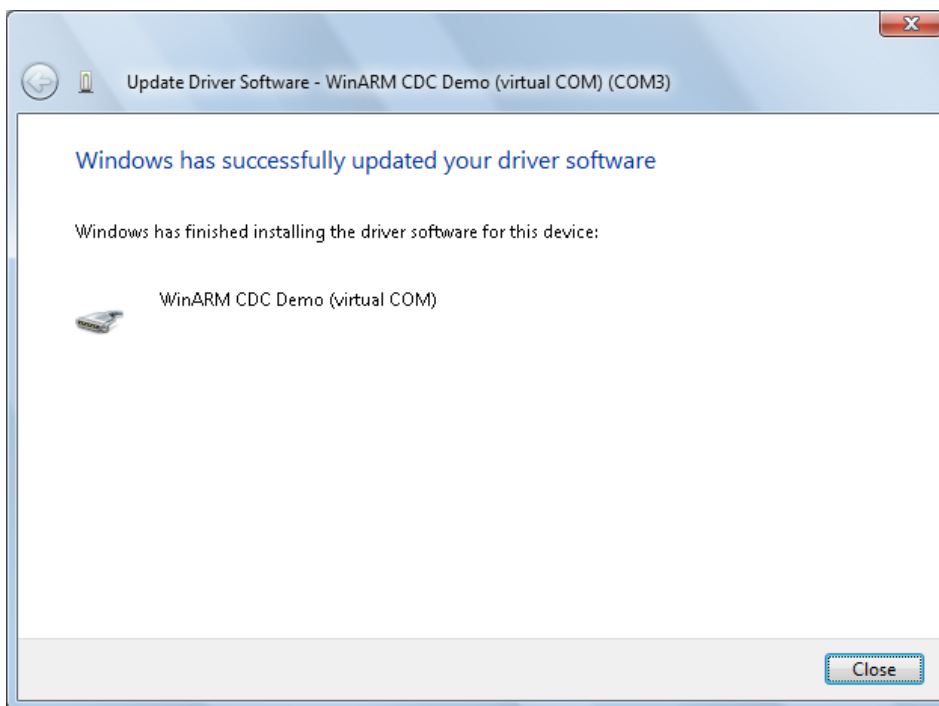


Figure 60 - Successful Driver Software Update

10. Press Close to close this window and go back to the Device Manager Window.

Note: On **Windows 8**, if a message “windows encountered a problem...” is displayed (see figure 61), please remember that you must restart the computer in advanced mode before installing the driver.

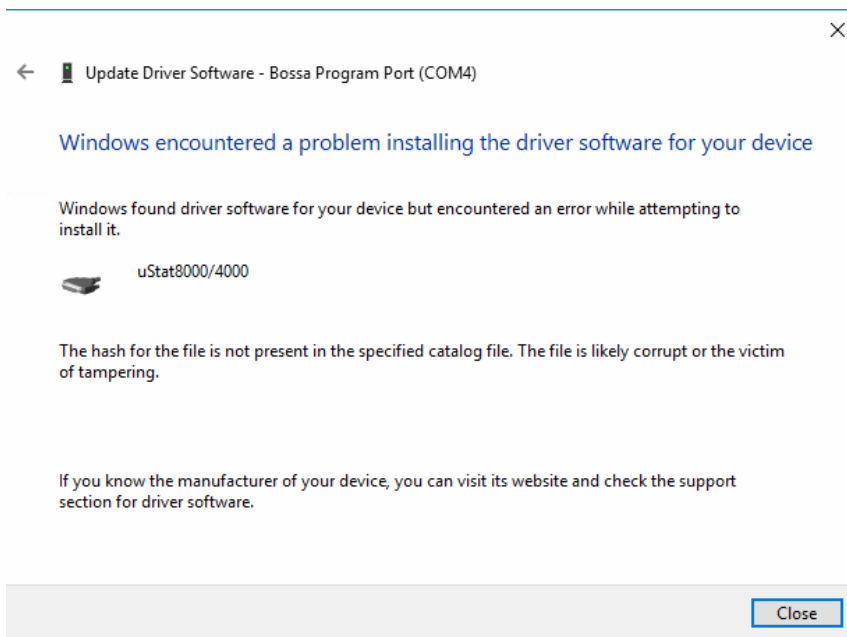


Figure 61 - Windows encountered a problem

On **Windows 8 32-bits**, the correct driver “WinARM CDC Demo (virtual COM)” will be displayed under Port (COM & LPT) tree.

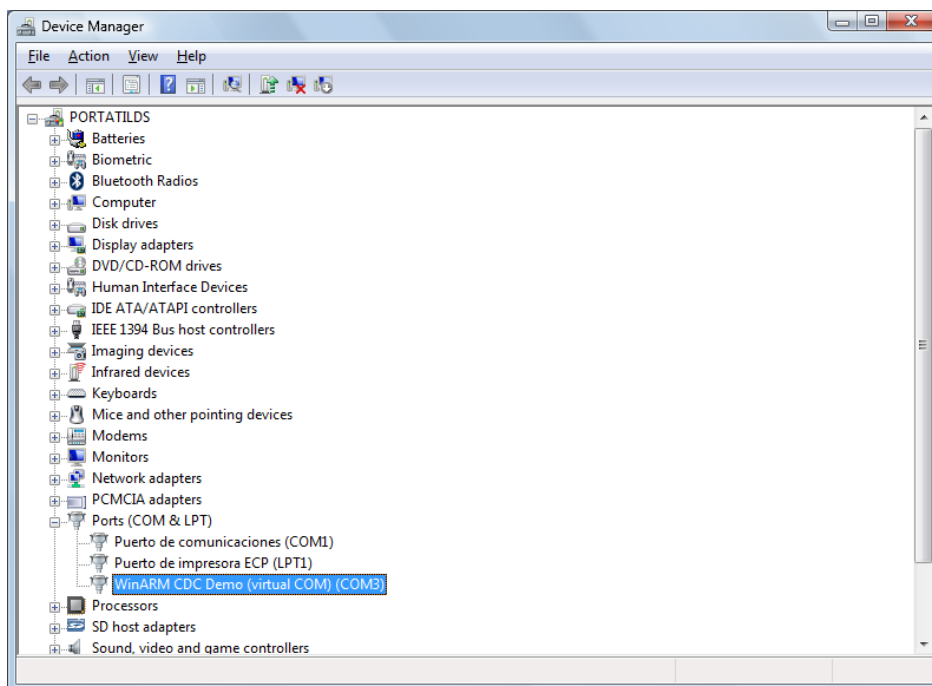


Figure 62 - Successful Driver Software Update

The above screen shot displays a correct installation. The device is now ready to use on COM3.

NOTE: Not all devices will install to COM3. The COM port allocation is determined by the installation wizard on the basis of the next free com port as designated in the PC registry.

4.2.3.2 Windows® 8 64-bits

7. After selecting the “atm6124_cdc.inf” file, click on “Open” to select the path, and then click on OK.

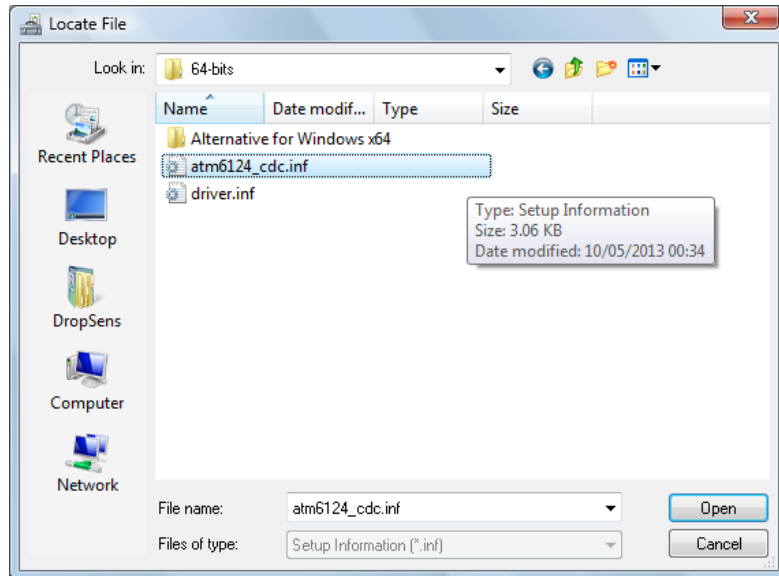


Figure 63 - Open driver folder

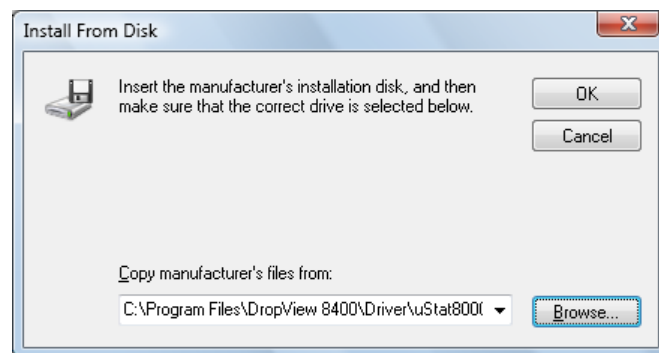


Figure 64 - Driver Location

8. On **Windows 8 64-bits**, the correct driver is call “AT91 USB to Serial Converter”. Click on “Next” to select the driver.

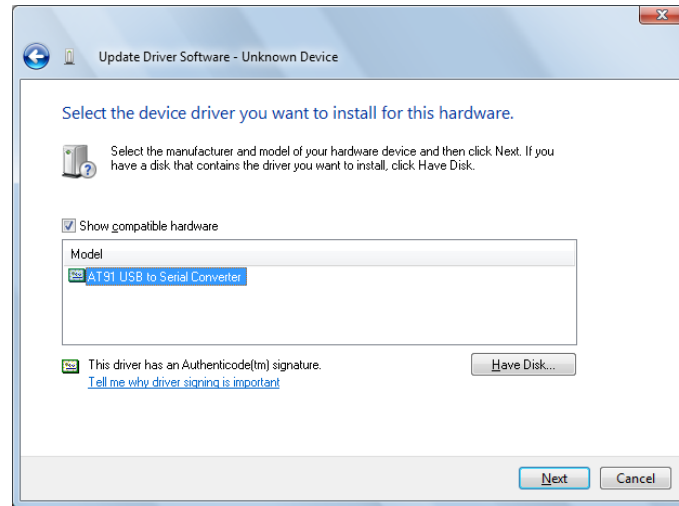


Figure 65 - Driver selection

9. Click on Install to accept the installation of the selected driver

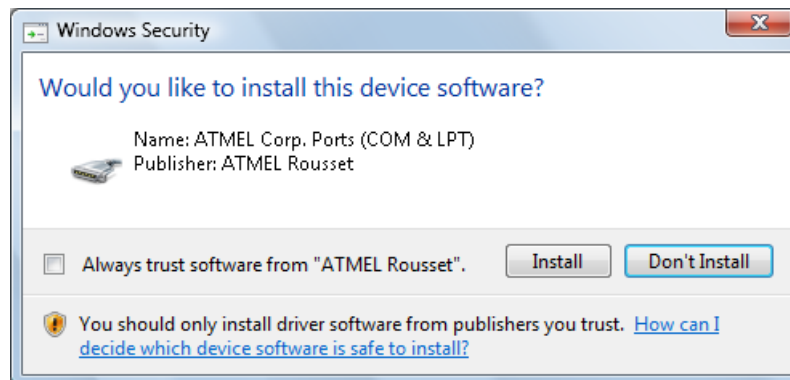


Figure 66 - Windows Security

When the installation has finished, a completion screen is displayed.

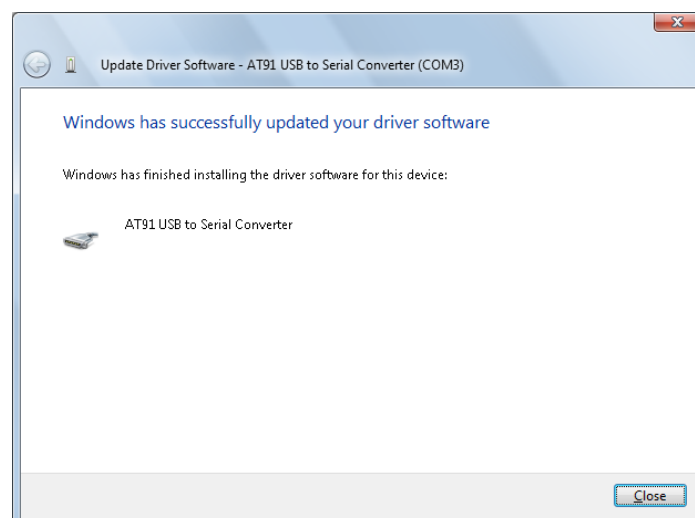


Figure 67 - Successful Driver Software Update

10. Press Close to close this window and go back to the Device Manager Window.

On **Windows 8 64-bits**, the correct driver “AT91 USB Serial Converter” will be displayed under Port (COM & LPT) tree.

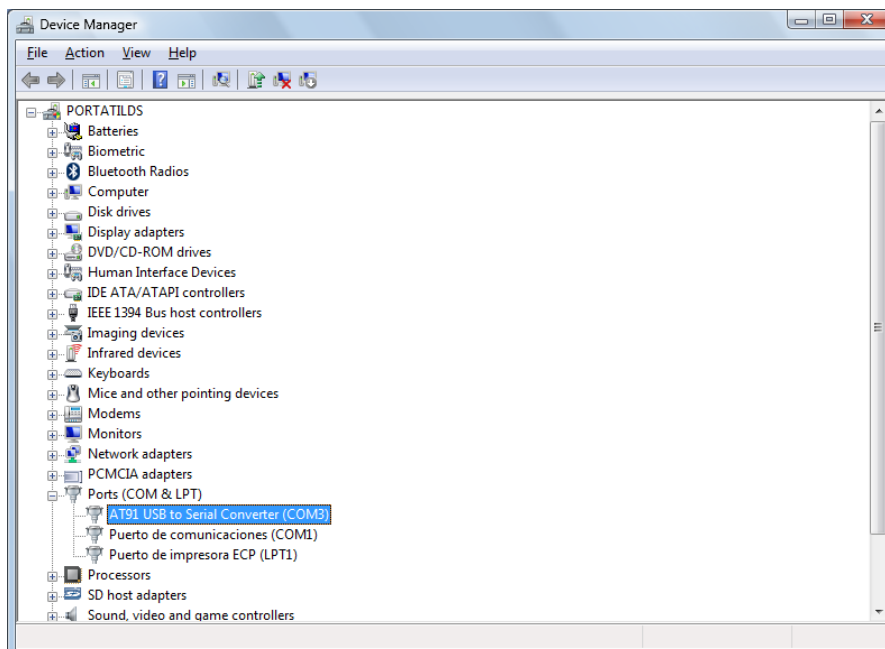


Figure 68 - Successful Driver Software Update

The above screen shot displays a correct installation. The device is now ready to use on COM3.

Note: Not all devices will install to COM3. The COM port allocation is determined by the installation wizard on the basis of the next free com port as designated in the PC registry.

NOTE: Depending on the PC model, the correct driver for **windows 8 64-bits** is the one under the folder “Alternative for Windows x64”. Please if you have problems using “AT91 USB to Serial Converter” drivers, change the driver to this alternative one.

4.2.4 Windows® 7

1. **Plug in** the μ Stat 8000 to a USB port using the original USB Cable.
2. **Turn on** the instrument by pressing the front Power button (when the instrument is on, the blue circle of Power button lights and the LCD display is turned on). The computer will automatically detect a new device. Wait until finish and then the device will be listed in device manager⁴.
3. In the Device Manager window, locate the device under “Ports (COM & LPT)”. In this example the name is “Bossa Program Port (COM4)”.

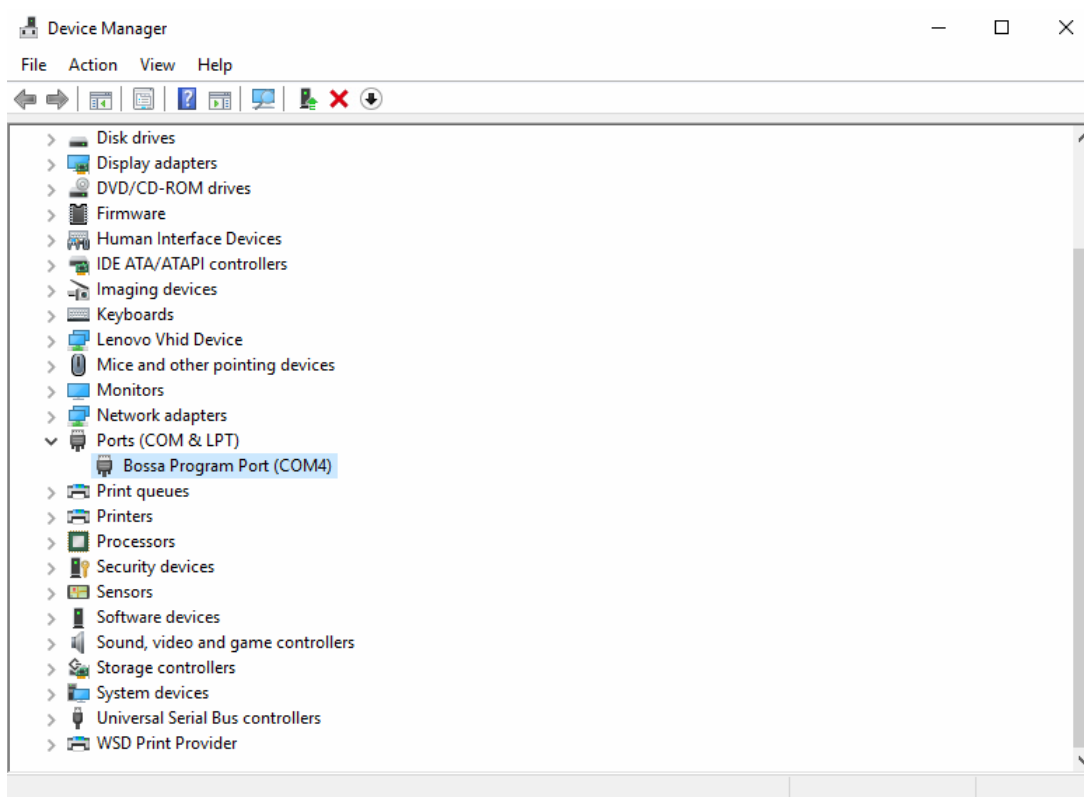


Figure 69 - Device Manager View

4. Right click on the device to bring up a menu. From the displayed menu select “Update Driver Software...”

⁴ If you are unable to find “Device Manager” on your computer, please check Annex I.

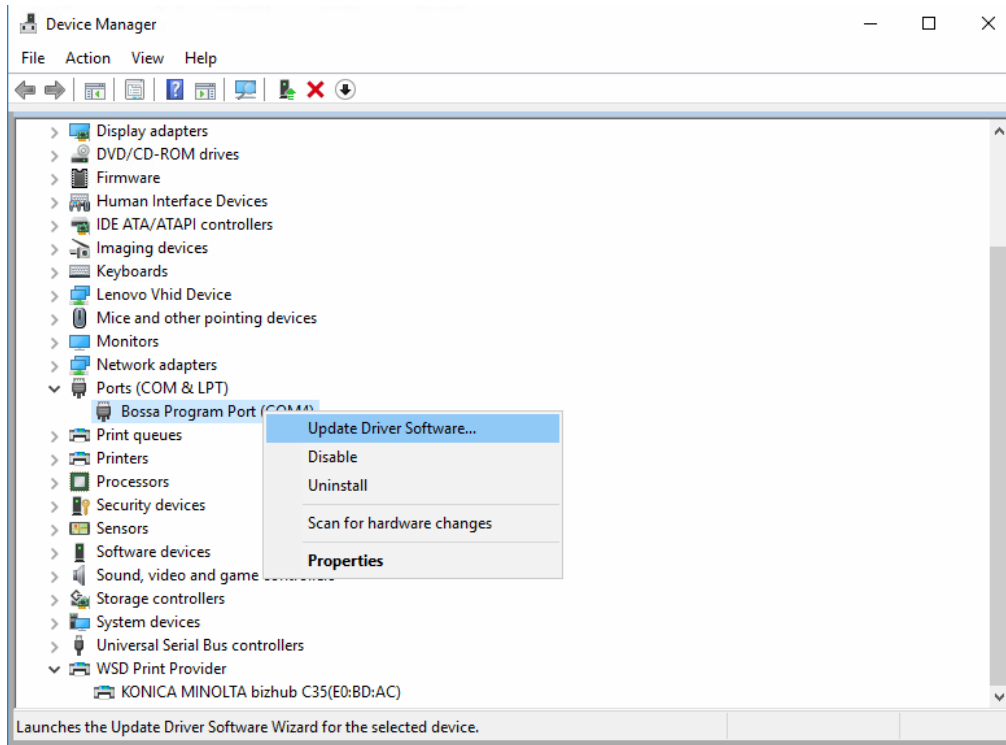


Figure 70 - Update Driver Software

5. “Update Driver Software...” displays the option for an automatic search or a manual search. Select the second option to browse manually.

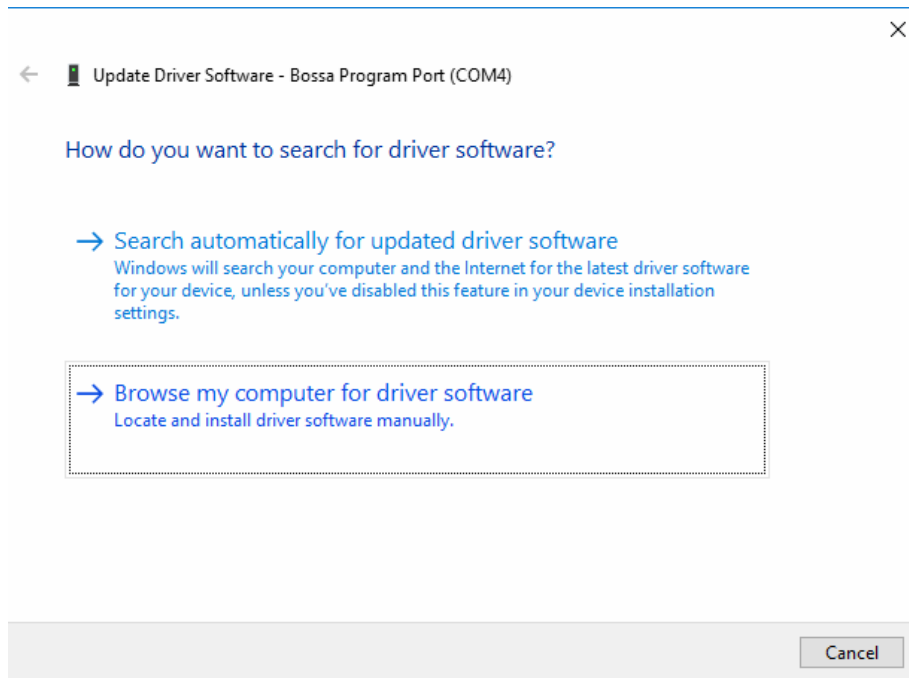


Figure 71 - Browse my computer for Driver Software

6. In the next window, the second option must be selected: “Let me pick from a list of device drivers on my computer”

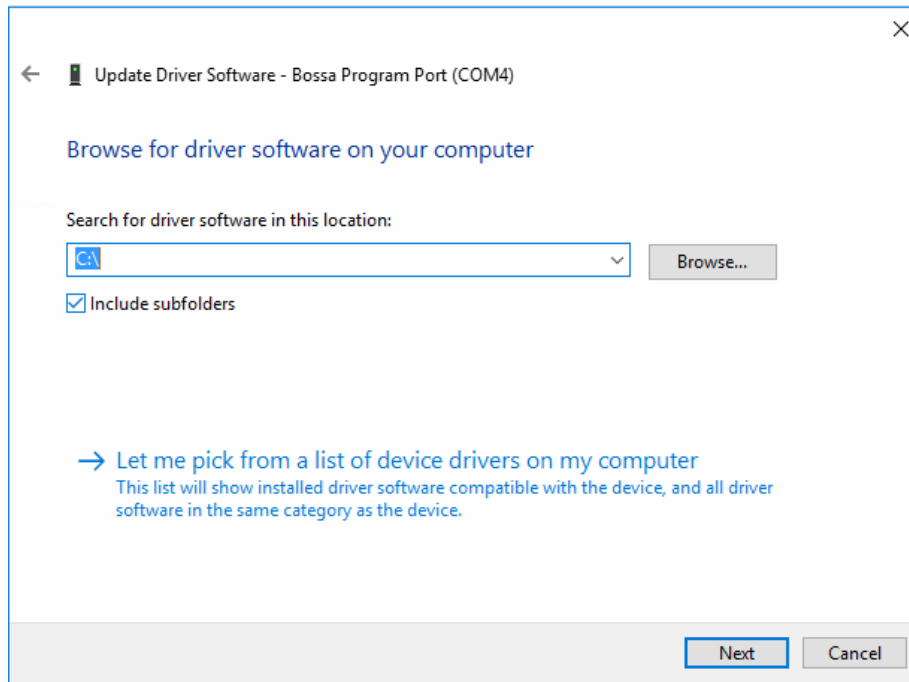


Figure 72 - Manual driver selection

7. Then, click on the button "Have a Disk" and introduce the location of the correct driver by clicking on "Browse"

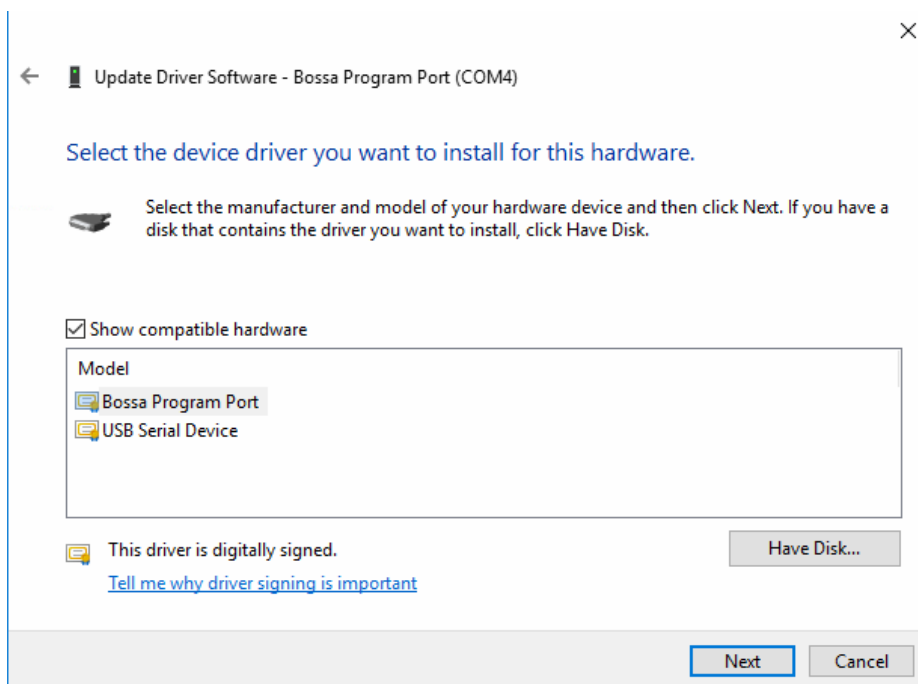


Figure 73 - Have Disk

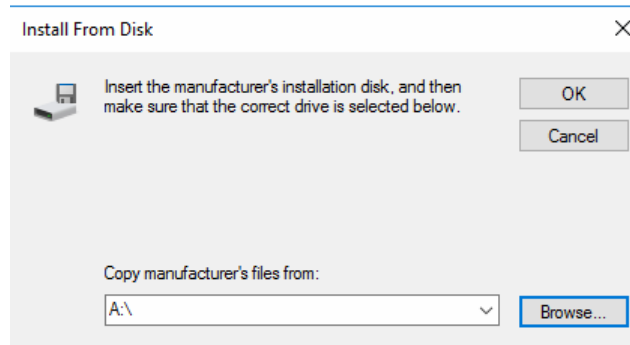


Figure 74 - Search Location

Put the exact location where the drivers are. In **Windows 8.0** the location is:

→ *For 32-bit versions of windows:*

C:\Program Files\DropView 8400\Driver\uStat8000\Windows Vista-7-8\32-bits

→ *For 64-bit versions of windows:*

C:\Program Files (x86)\ DropView 8400\Driver\uStat8000\Windows Vista-7-8\64-bits

Or you can find also the driver on the Software Installation CD-ROM.

D:\Driver\uStat8000\Windows Vista-7-8

If you have Windows 7 32-bits go to section 4.2.4.1. If you have Windows 8 64-bits, please go to section 4.2.4.2.

4.2.4.1 Windows® 7 32-bits

8. After selecting the “atm6124_virtualserial.inf” file, click on “Open” to select the path, and then click on OK.

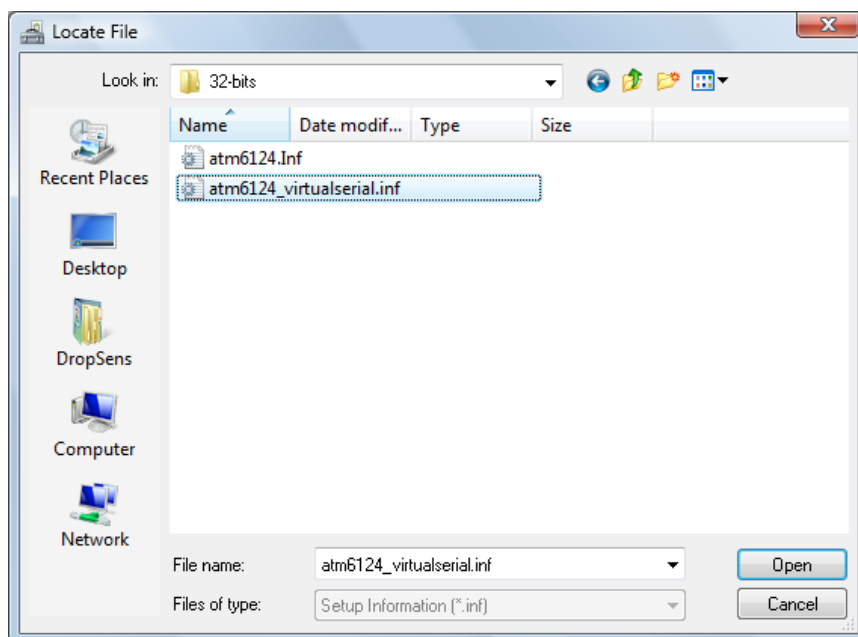


Figure 75 - Open driver folder

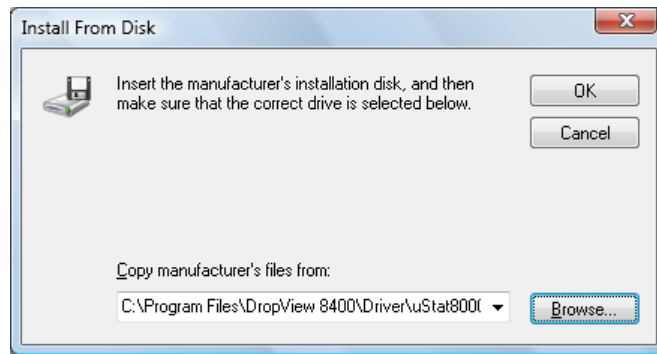


Figure 76 - Driver Location

9. On **Windows 7 32-bits**, the correct driver is call “WinARM CDC Demo (Virtual COM)”. Click on “Next” to select the driver.

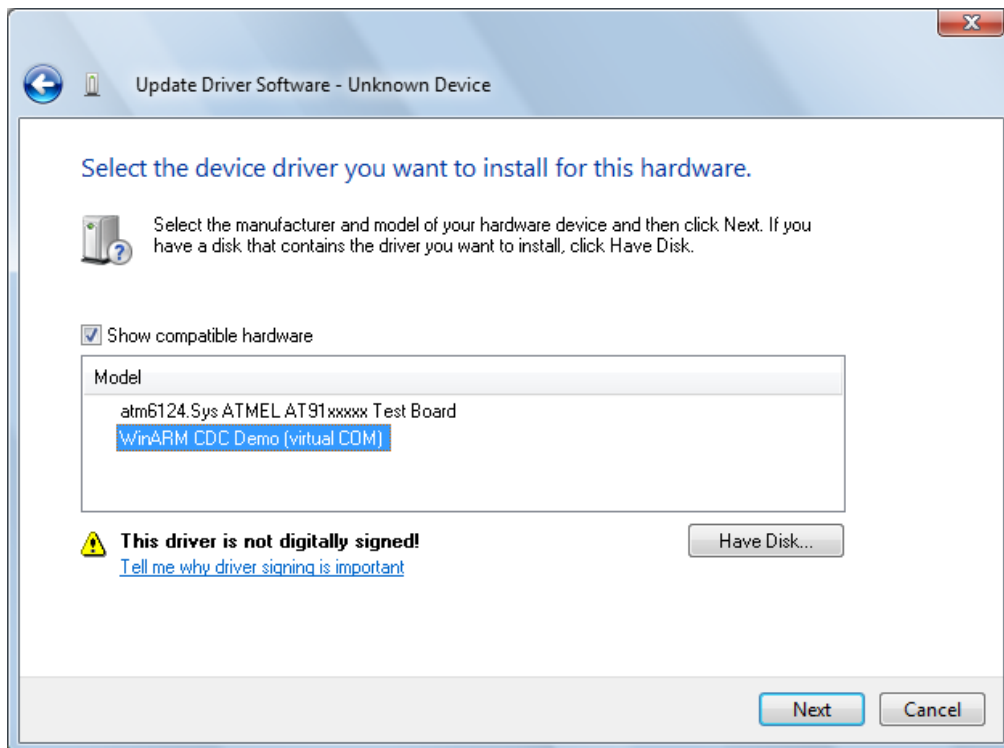


Figure 77 - Driver selection

10. A windows security warning is prompted. Click on the second one to “Install this driver software anyway” and wait until finish.

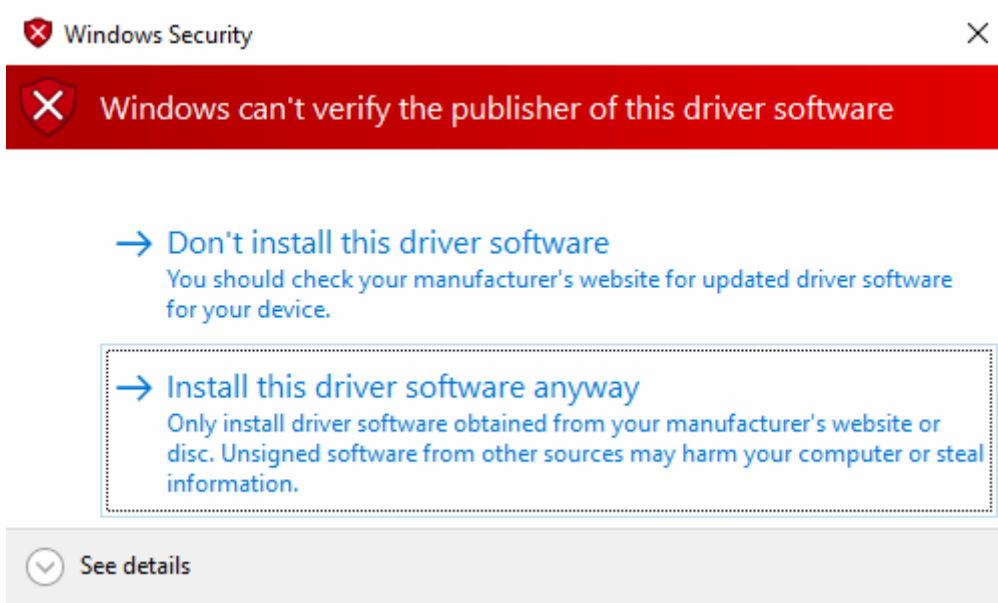


Figure 78 - Windows security

When the installation has finished, a completion screen is displayed.

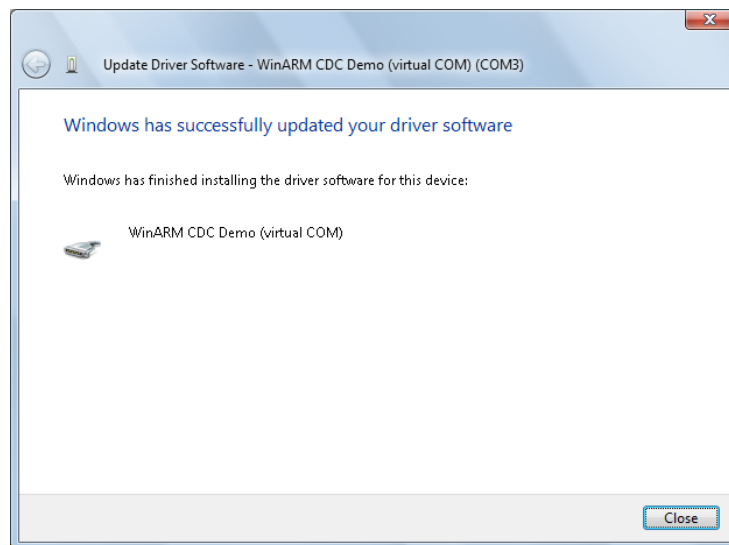


Figure 79 - Successful Driver Software Update

11. Press Close to close this window and go back to the Device Manager Window.

On **Windows 7 32-bits**, the correct driver “WinARM CDC Demo (virtual COM)” will be displayed under Port (COM & LPT) tree.

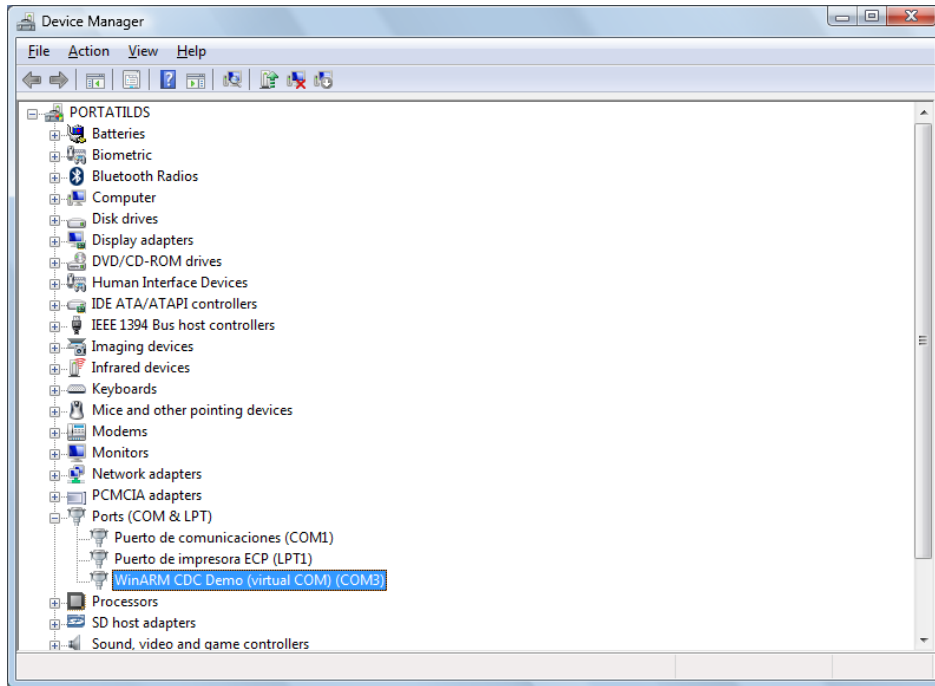


Figure 80 - Successful Driver Software Update

The above screen shot displays a correct installation. The device is now ready to use on COM3.

Note: Not all devices will install to COM3. The COM port allocation is determined by the installation wizard on the basis of the next free com port as designated in the PC registry.

4.2.4.2 Windows® 7 64-bits

8. After selecting the “atm6124_cdc.inf” file, click on “Open” to select the path, and then click on OK.

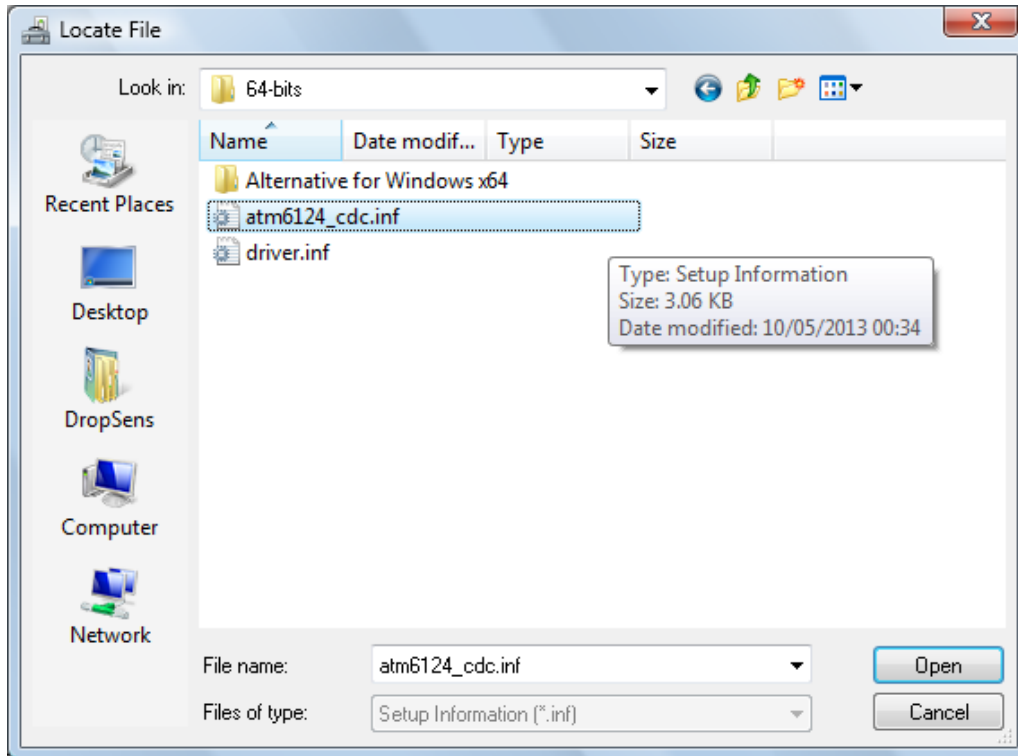


Figure 81 - Open driver folder

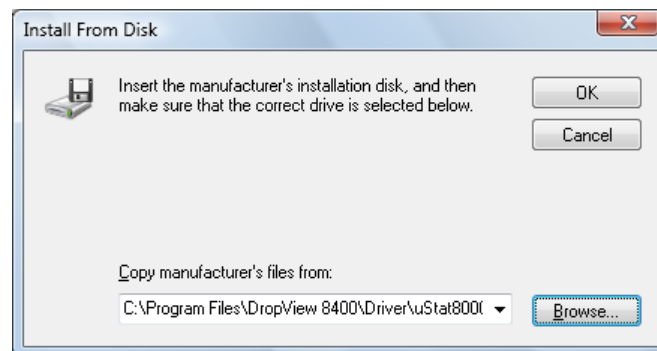


Figure 82 - Driver Location

9. On **Windows 7 64-bits**, the correct driver is call “AT91 USB to Serial Converter”. Click on “Next” to select the driver.

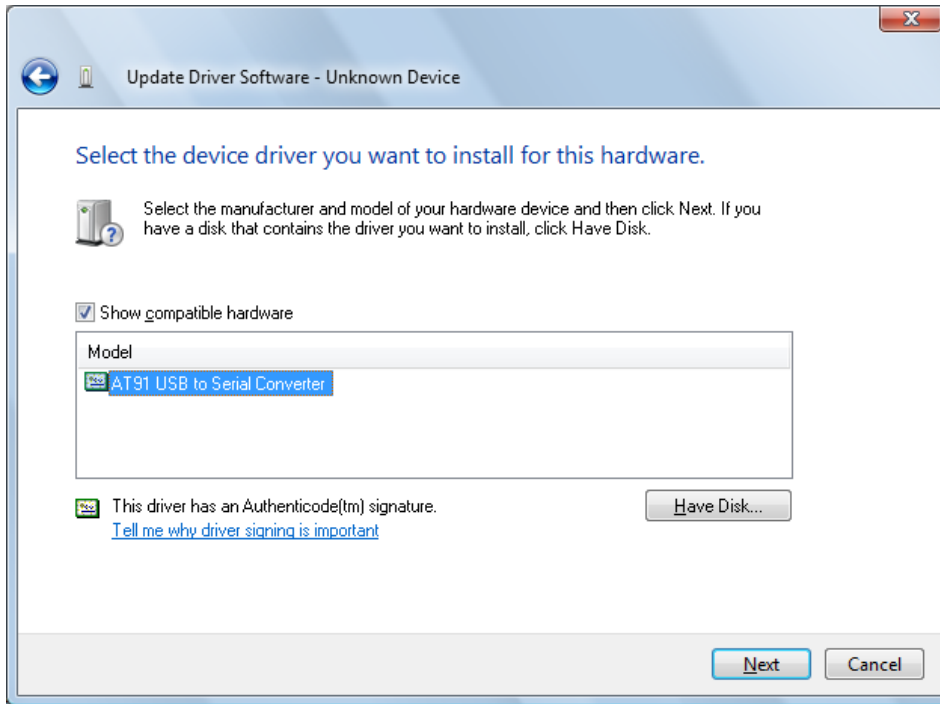


Figure 83 - Driver selection

10. Click on Install to accept the installation of the selected driver

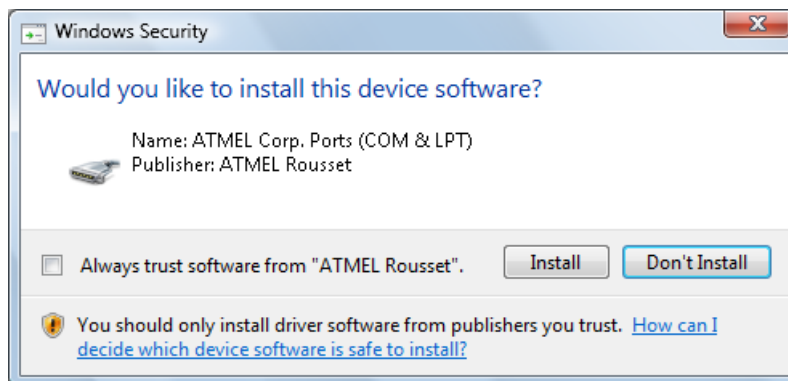


Figure 84 - Windows security

When the installation has finished, a completion screen is displayed.

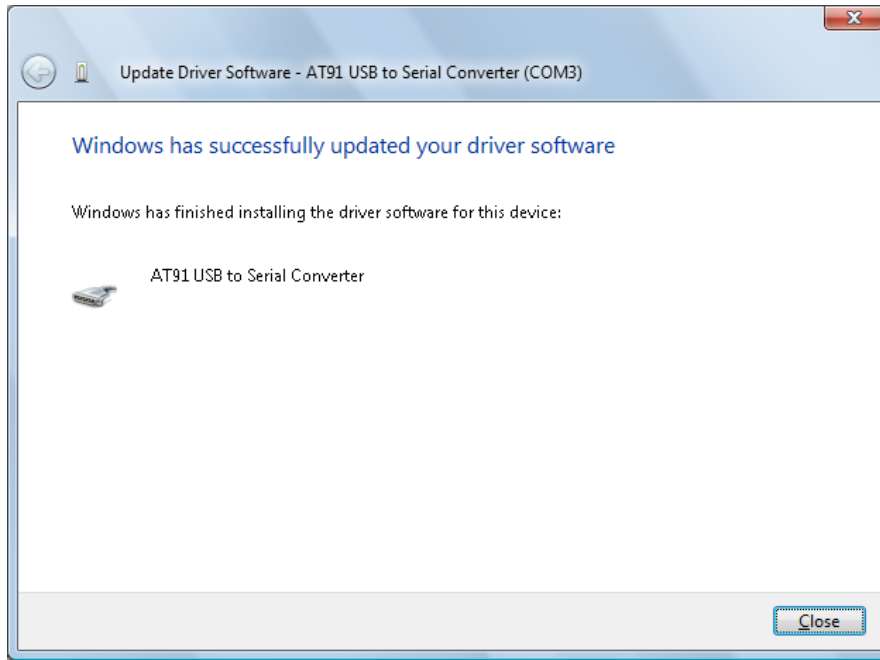


Figure 85 - Successful Driver Software Update

11. Press Close to close this window and go back to the Device Manager Window.

On **Windows 7 64-bits**, the correct driver “AT91 USB Serial Converter” will be displayed under Port (COM & LPT) tree.

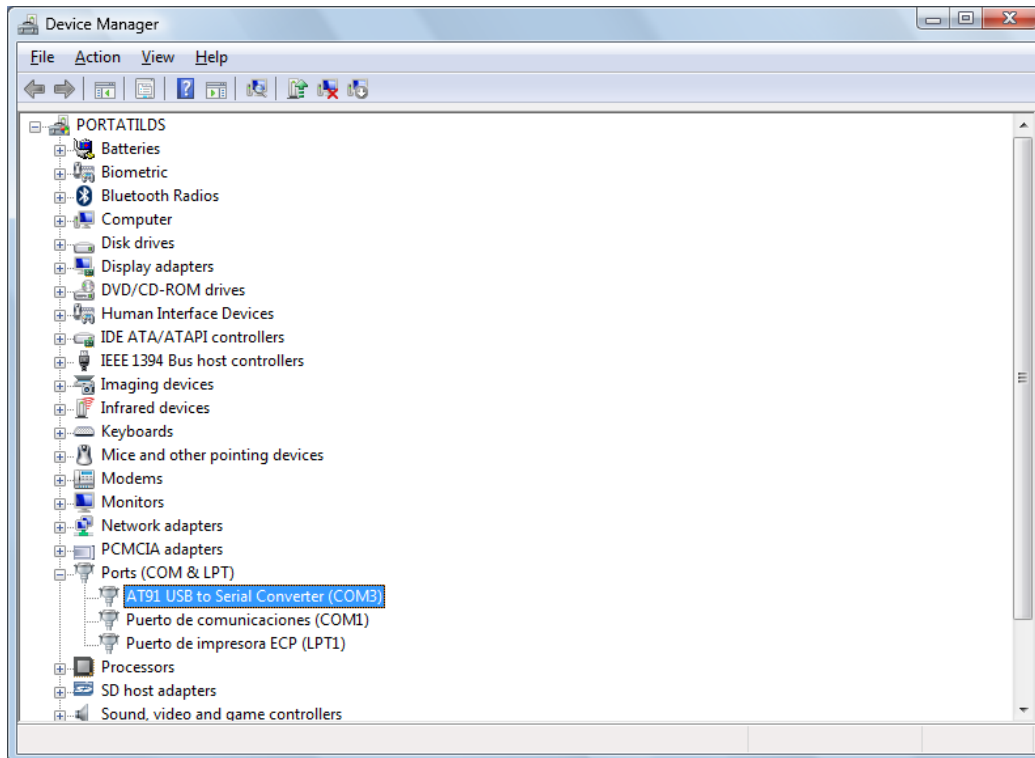


Figure 86 - Successful Driver Software Update

The above screen shot displays a correct installation. The device is now ready to use on COM3.

Note: Not all devices will install to COM3. The COM port allocation is determined by the installation wizard on the basis of the next free com port as designated in the PC registry.

NOTE: Depending on the PC model, the correct driver for **windows 7 64-bits** is the one under the folder “Alternative for Windows x64”. Please if you have problems using “AT91 USB to Serial Converter” drivers, change the driver to this alternative one.

4.2.5 Windows® Vista

1. **Plug in** the μ Stat 8000 to a USB port using the original USB Cable.
2. **Turn on** the instrument by pressing the front Power button (when the instrument is on, the blue circle of Power button lights and the LCD display is turned on). The computer will automatically detect a new device and a pop-up window will be displayed.

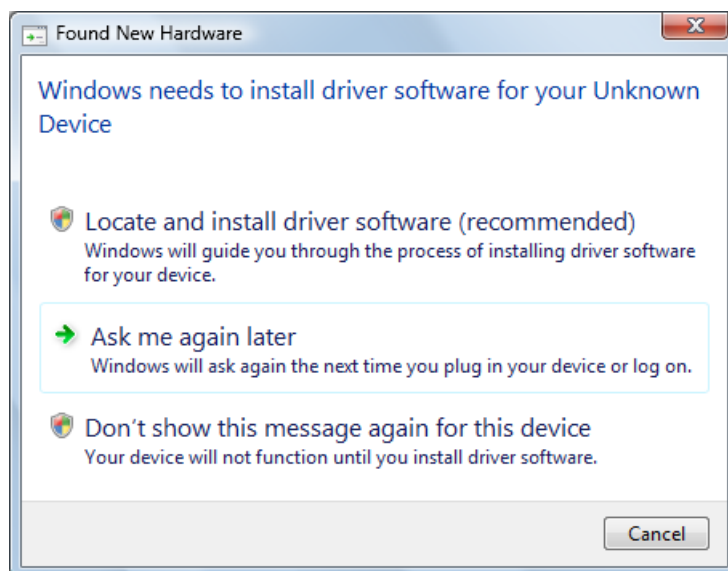


Figure 87 - Driver Installation Windows Vista

3. Click on the last option “Don’t show this message again for this device” to abort the automatic installation process.

4. An unknown device will be listed in device manager⁵:

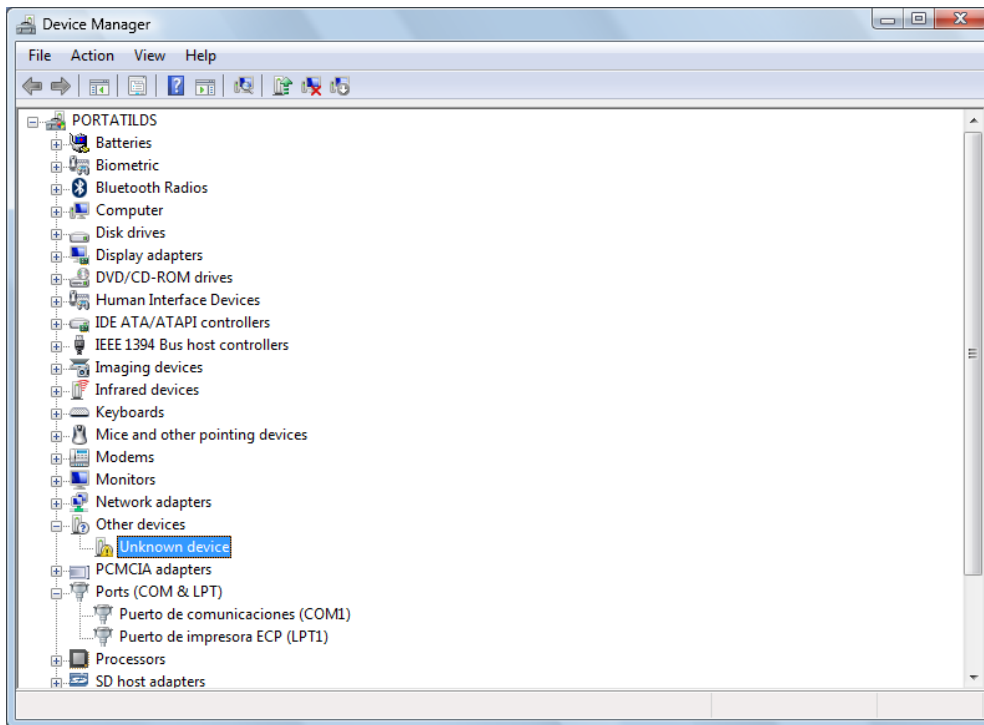


Figure 88 - Unknown device

5. In the Device Manager window, locate the “Unknown device” under “other devices”. Right click on the Unknown device to bring up a menu. From the displayed menu select “Update Driver Software...”

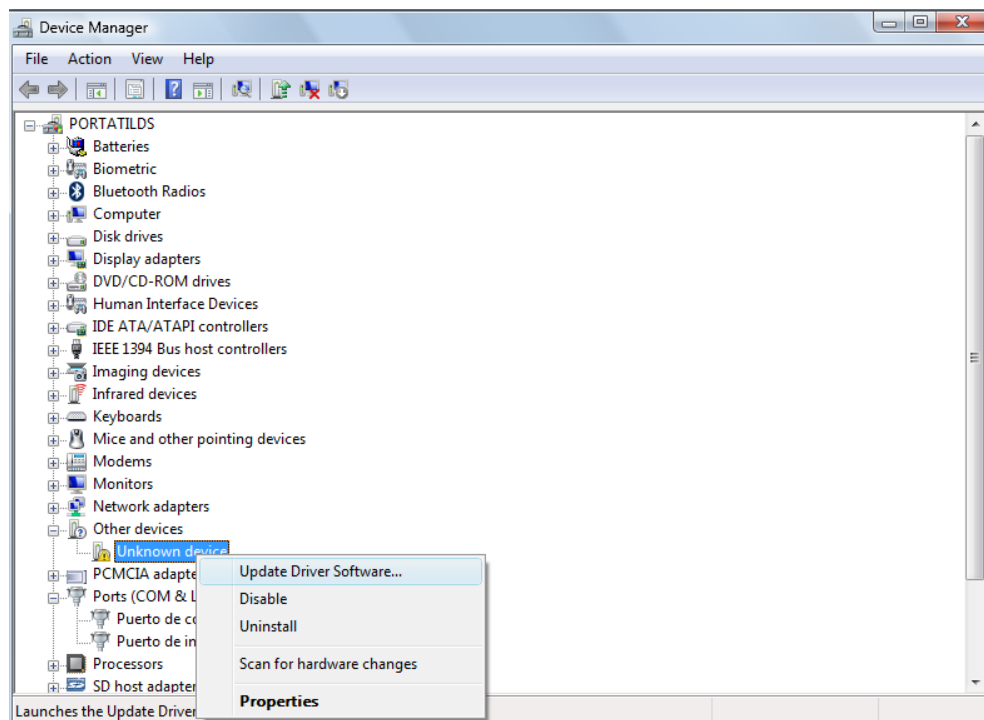


Figure 89 - Update Driver Software

⁵ If you are unable to find “Device Manager” on your computer, please check Annex I.

6. “Update Driver Software...” displays the option for an automatic search or a manual search. Select the second option to browse manually.

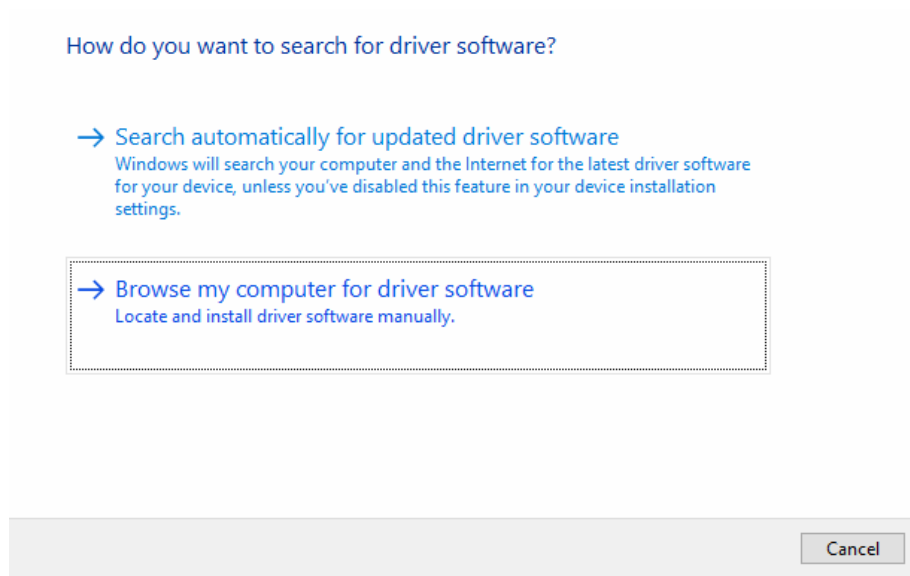


Figure 90 - Browse my computer for Driver Software

7. In the next window, the second option must be selected: “Let me pick from a list of device drivers on my computer”

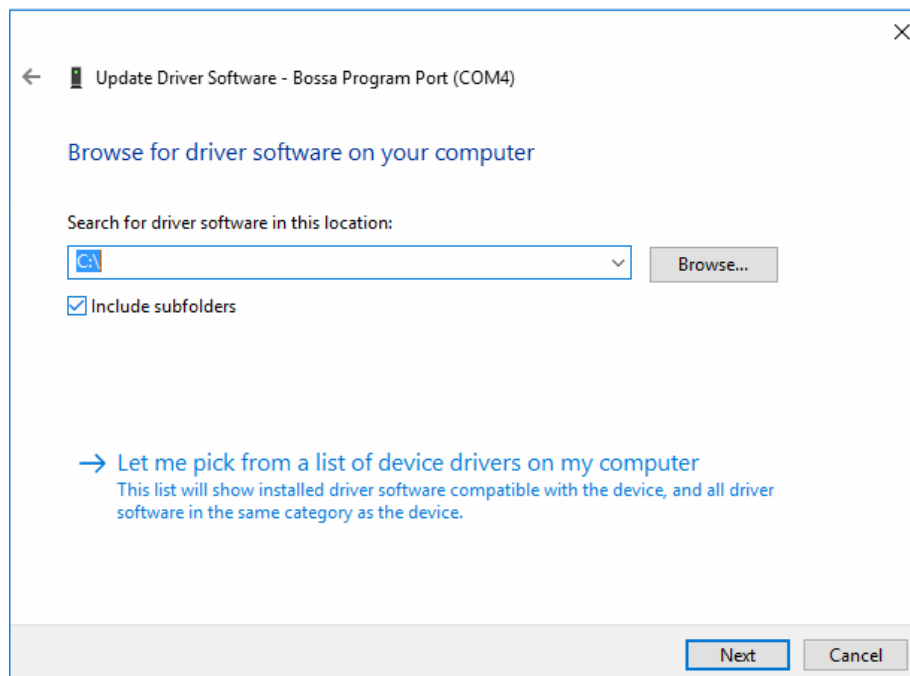


Figure 91 - Manual driver selection

8. Then, a list with different type of devices is shown. Select “Show all devices” and click on Next

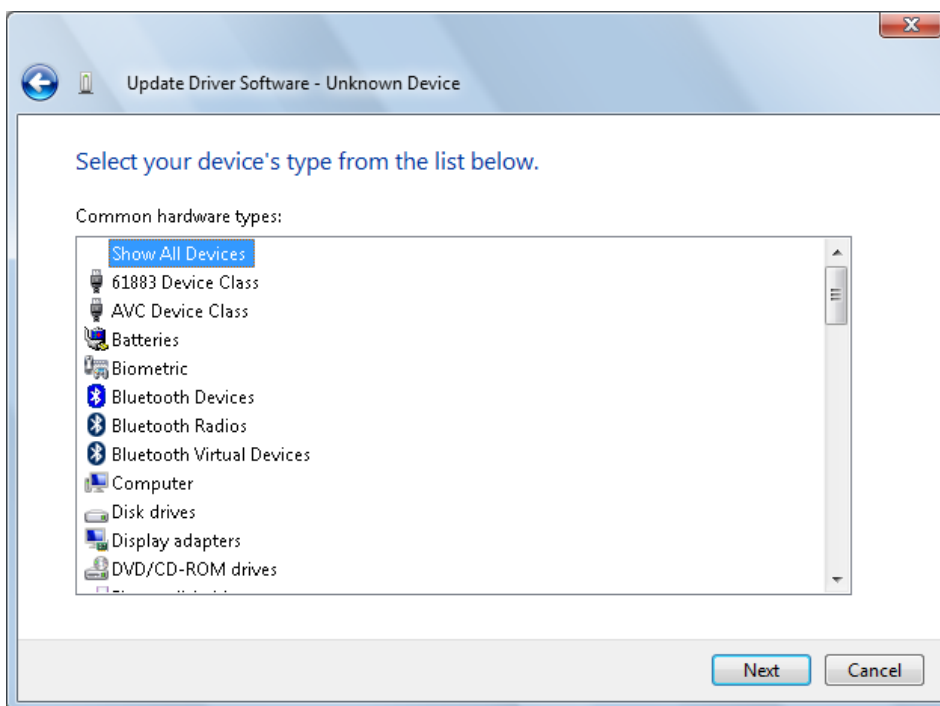


Figure 92 - Show all devices

9. Then, click on the button “Have a Disk” and introduce the location of the correct driver by clicking on “Browse”

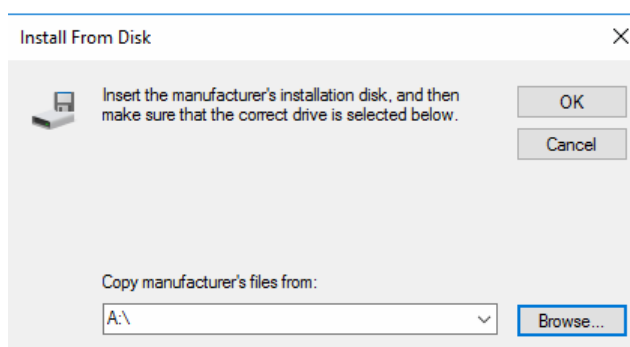


Figure 93 - Search Location

Put the exact location where the drivers are. In **Windows Vista** the location is:

→ For 32-bit versions of windows:

C:\Program Files\DropView 8400\Driver\uStat8000\Windows Vista-7-8\32-bits

→ For 64-bit versions of windows:

C:\Program Files (x86)\ DropView 8400\Driver\uStat8000\Windows Vista-7-8\64-bits

Or you can find also the driver on the Software Installation CD-ROM.

D:\Driver\uStat8000\Windows Vista-7-8

If you have Windows ® Vista 32-bits, please go to section 4.2.5.1. If you have Windows® Vista 64-bits, go to section 4.2.5.2.

4.2.5.1 Windows® Vista 32-bits

10. After selecting the “atm6124_virtualserial.inf” file, click on “Open” to select the path, and then click on OK.

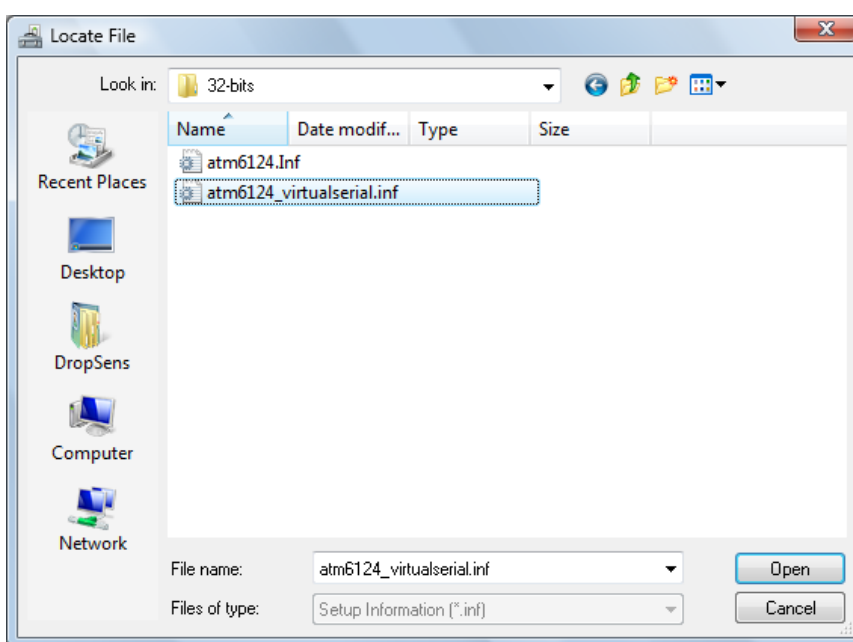


Figure 94 - Open driver folder

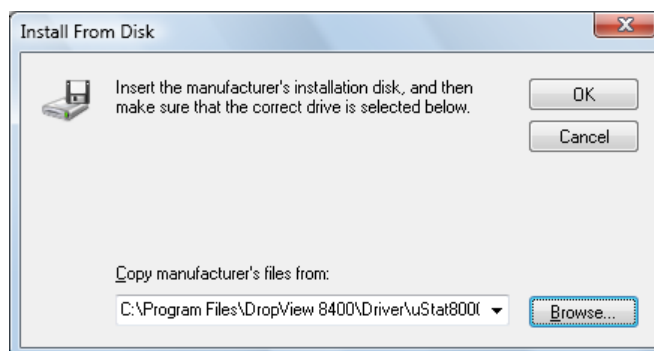


Figure 95 - Driver Location

11. On **Windows Vista 32-bits**, the correct driver is call “WinARM CDC Demo (Virtual COM)”. Click on “Next” to select the driver.

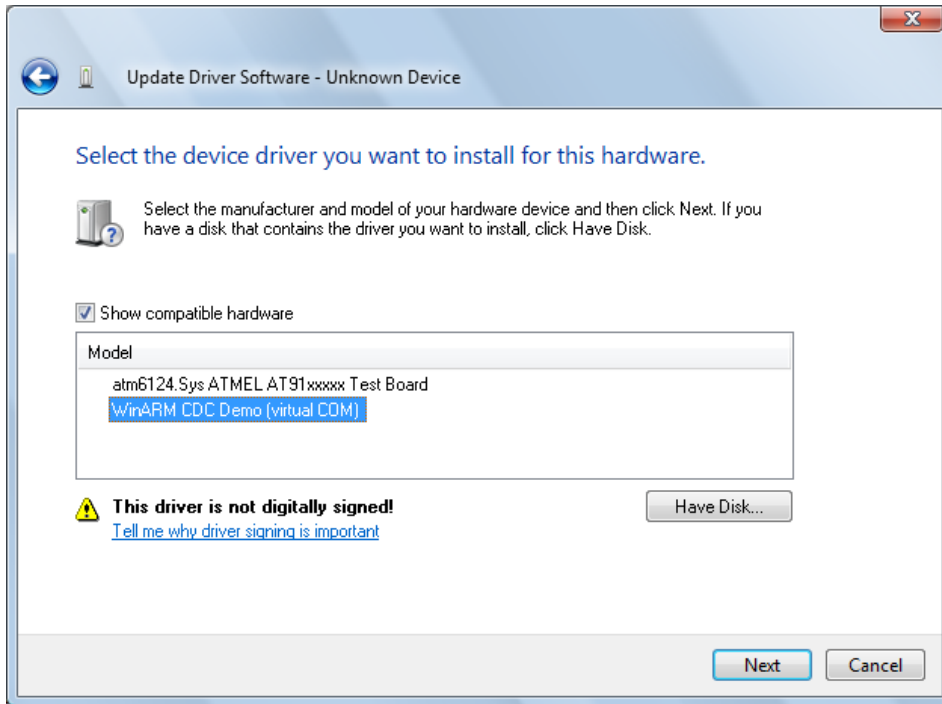


Figure 96 - Driver selection

12. A windows security warning is prompted. Click on the second one to "Install this driver software anyway" and wait until finish.

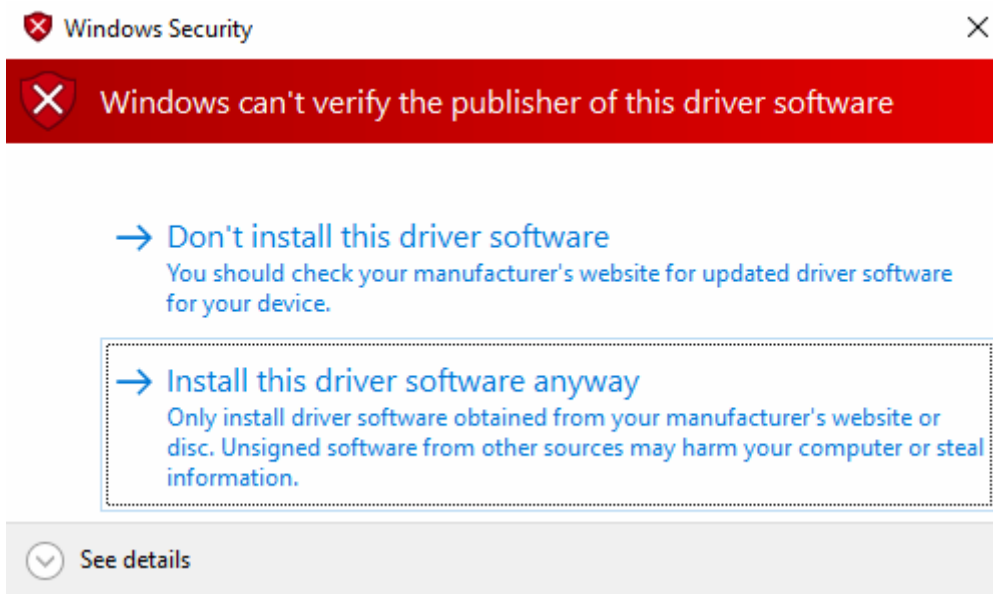


Figure 97 - Windows security

When the installation has finished, a completion screen is displayed.

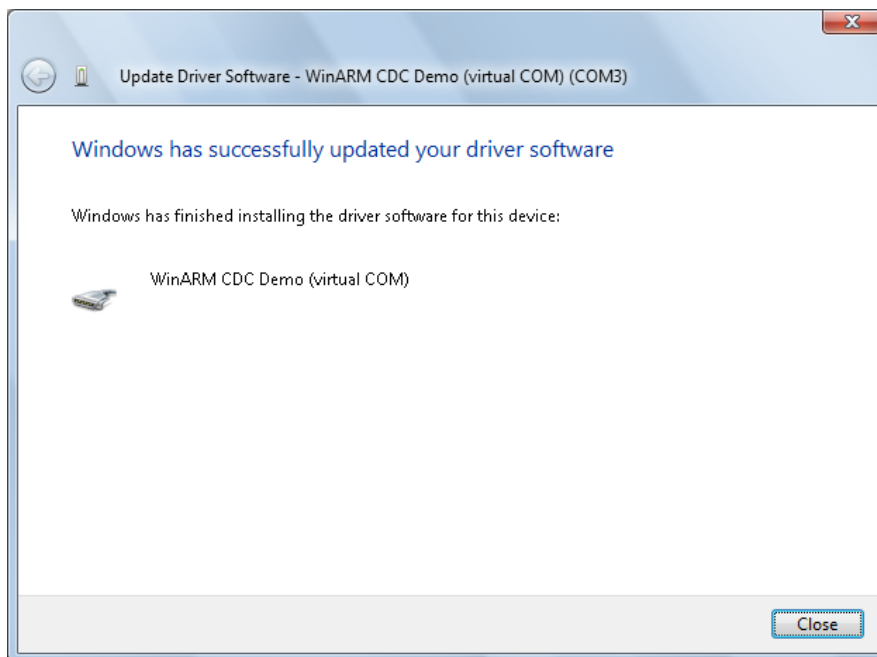


Figure 98 - Successful Driver Software Update

13. Press Close to close this window and go back to the Device Manager Window.

On **Windows Vista 32-bits**, the correct driver “WinARM CDC Demo (virtual COM)” will be displayed under Port (COM & LPT) tree.

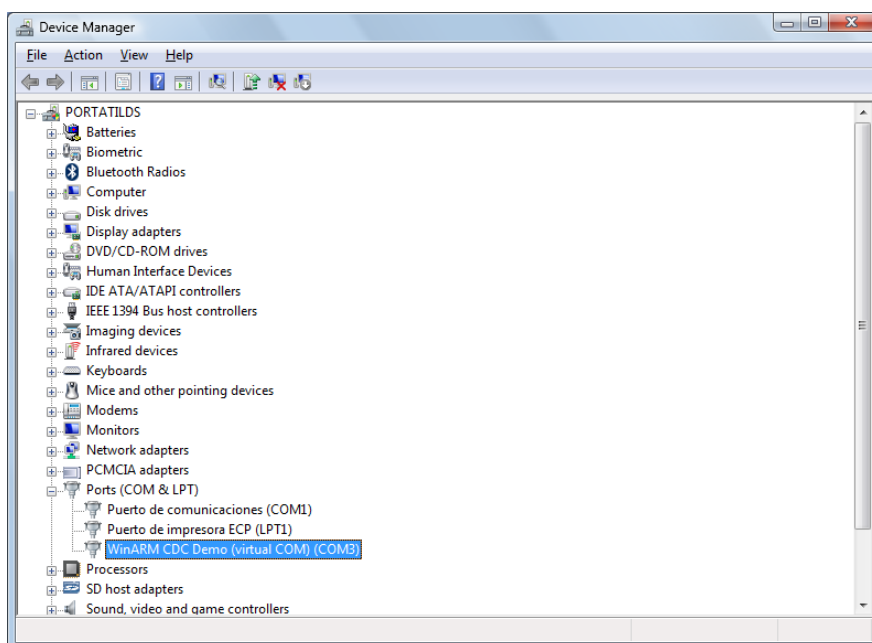


Figure 99 - Successful Driver Software Update

The above screen shot displays a correct installation. The device is now ready to use on COM3.

Note: Not all devices will install to COM3. The COM port allocation is determined by the installation wizard on the basis of the next free com port as designated in the PC registry.

4.2.5.2 Windows® Vista 64-bits

10. After selecting the “atm6124_cdc.inf” file, click on “Open” to select the path, and then click on OK.

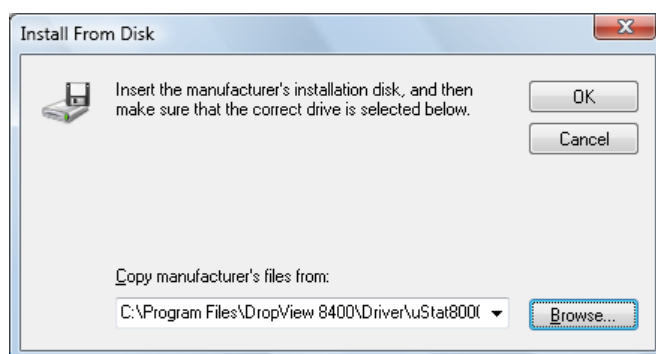
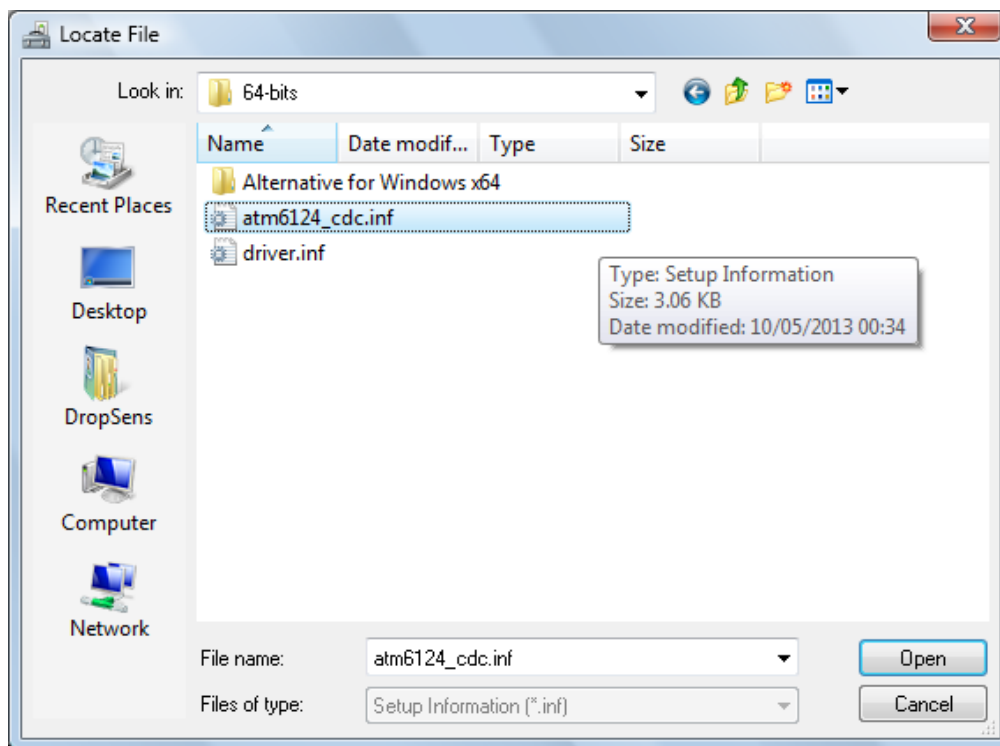


Figure 100 – Open driver folder and location

11. On **Windows Vista 64-bits**, the correct driver is call “AT91 USB to Serial Converter”. Click on “Next” to select the driver.

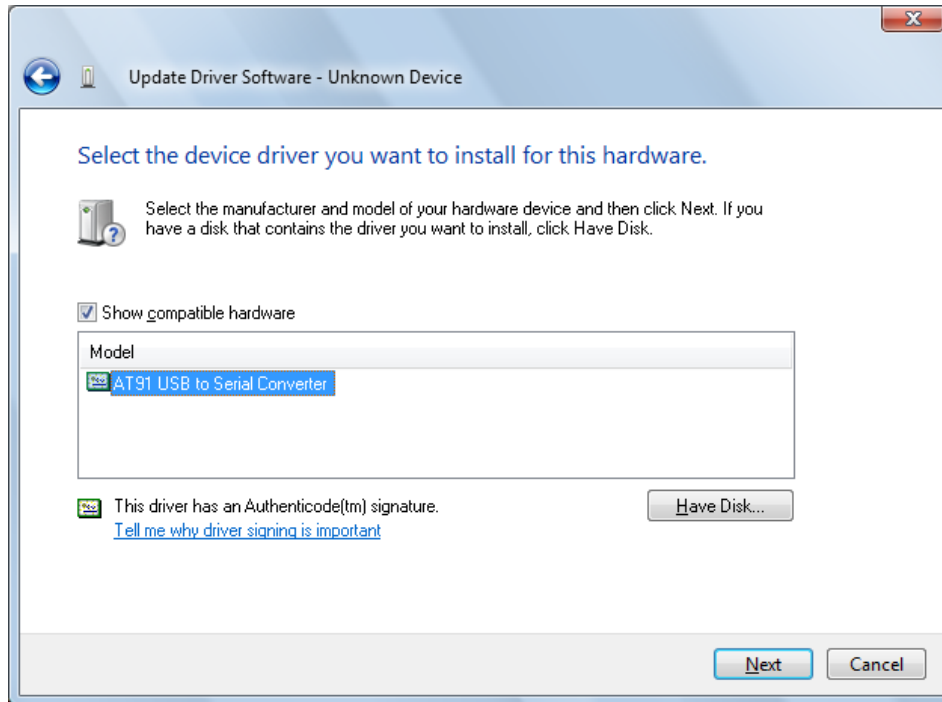


Figure 101 - Driver selection

12. Click on Install to accept the installation of the selected driver

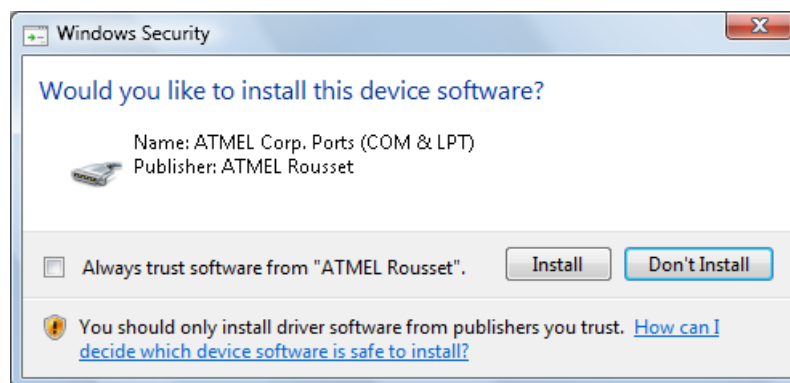


Figure 102 - Windows security

When the installation has finished, a completion screen is displayed.

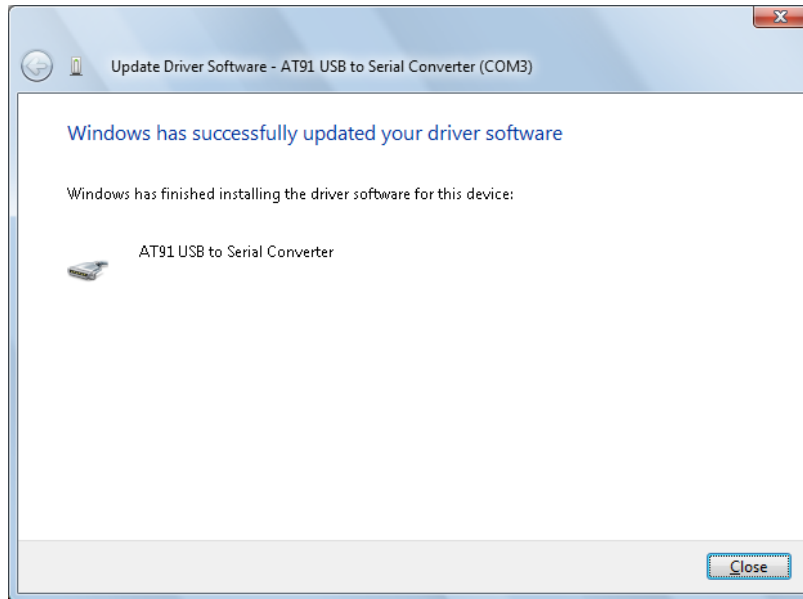


Figure 103 - Successful Driver Software Update

13. Press Close to close this window and go back to the Device Manager Window.

On **Windows Vista 64-bits**, the correct driver “AT91 USB Serial Converter” will be displayed under Port (COM & LPT) tree.

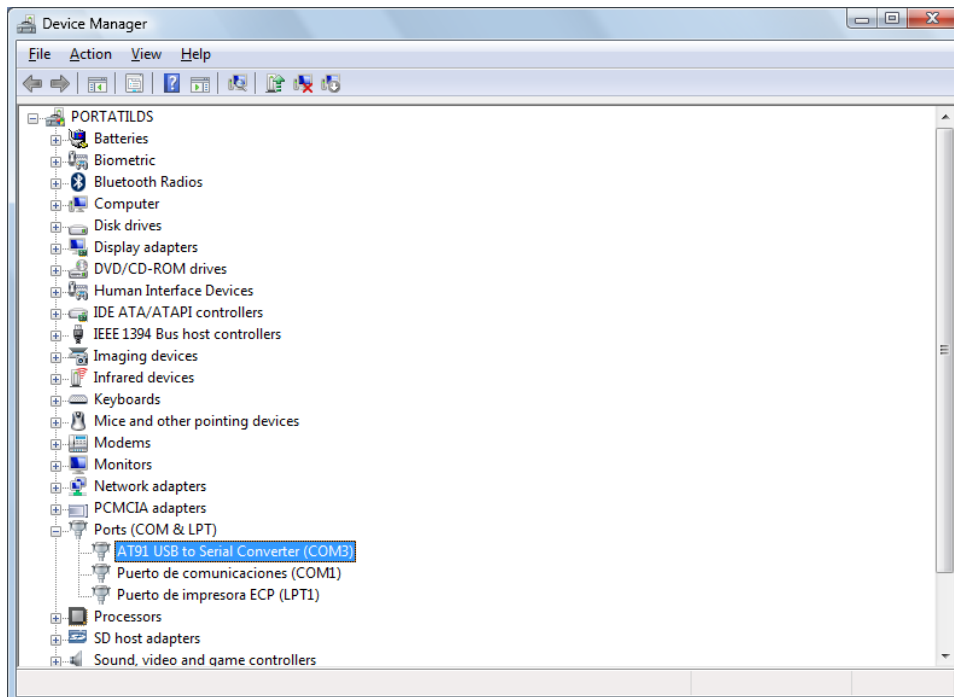


Figure 104 - Successful Driver Software Update

The above screen shot displays a correct installation. The device is now ready to use on COM3.

Note: Not all devices will install to COM3. The COM port allocation is determined by the installation wizard on the basis of the next free com port as designated in the PC registry.

NOTE: Depending on the PC model, the correct driver for **windows 7 64-bits** is the one under the folder “Alternative for Windows x64”. Please if you have problems using “AT91 USB to Serial Converter” drivers, change the driver to this alternative one.

4.2.6 μ Stat4000 with S/N ST4148514 or higher, μ Stat8000 with S/N ST812548 or higher

If your instrument is a uStat4000 / uStat4000P with Serial Number ST4148514 or higher, or a uStat8000 / uStat8000P with Serial Number ST812548 or higher the driver will be installed automatically. The driver “USB Serial COM Port“ will be displayed under Port (COM & LPT) tree.

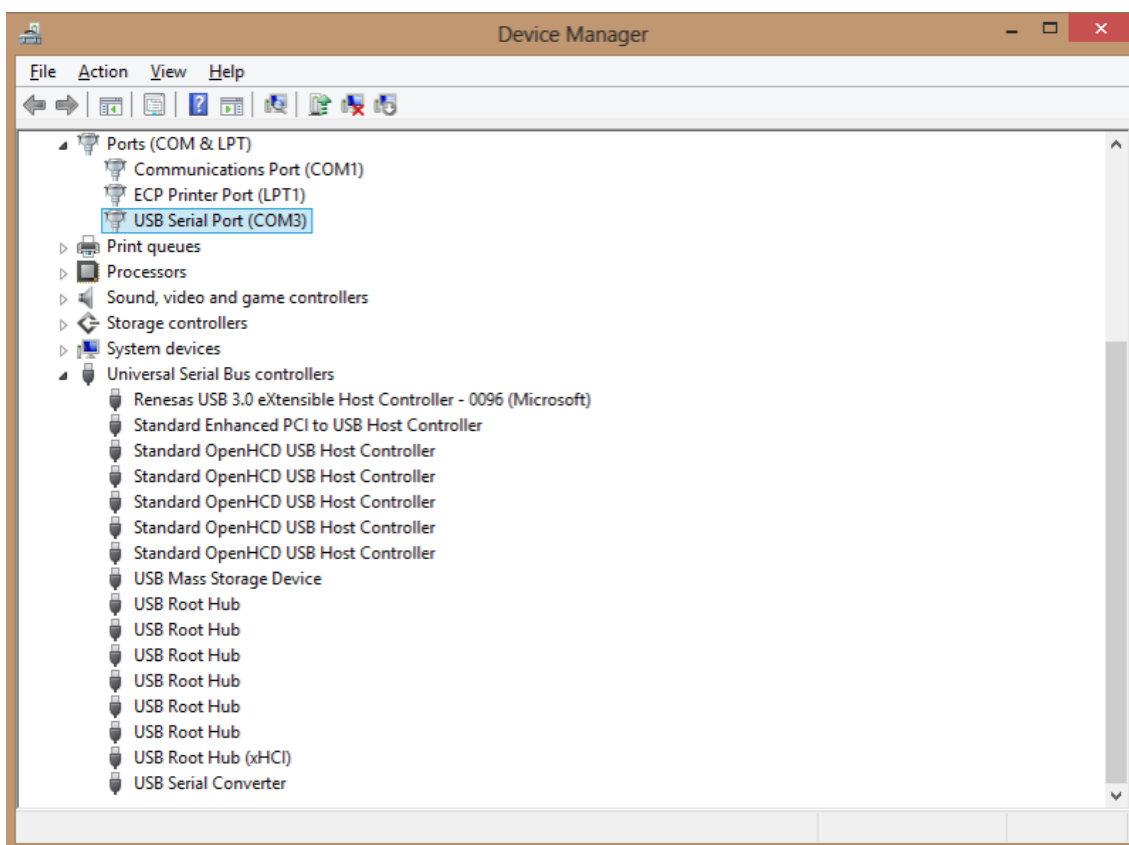


Figure 105 - Successful Driver for μ Stat4000 with S/N ST4148514 or higher and μ Stat8000 with S/N ST812548 or higher

Note: Not all devices will install to COM3. The COM port allocation is determined by the installation wizard on the basis of the next free com port as designated in the PC registry.

4.3 Wireless link, via Bluetooth, to a computer

This option is not available on Mac OS X devices.

1. **Turn on** the μ Stat 8000 by pressing the front Power button (when the instrument is on, the blue circle of Power button lights and the LCD display is turned on).

2. **Connect Bluetooth in your computer** (add a Bluetooth device) and search for wireless devices (check your PC or Bluetooth dongle instructions).

3. Select **STAT8000** and **Pair** it to the computer (check your PC instructions). The internal code of μ Stat 8000 is “1234”.

If the connection is correct, the correct driver is installed automatically and “Standard Serial over Bluetooth link” is displayed under Port (COM & LPT) tree of the Device Manager⁶.

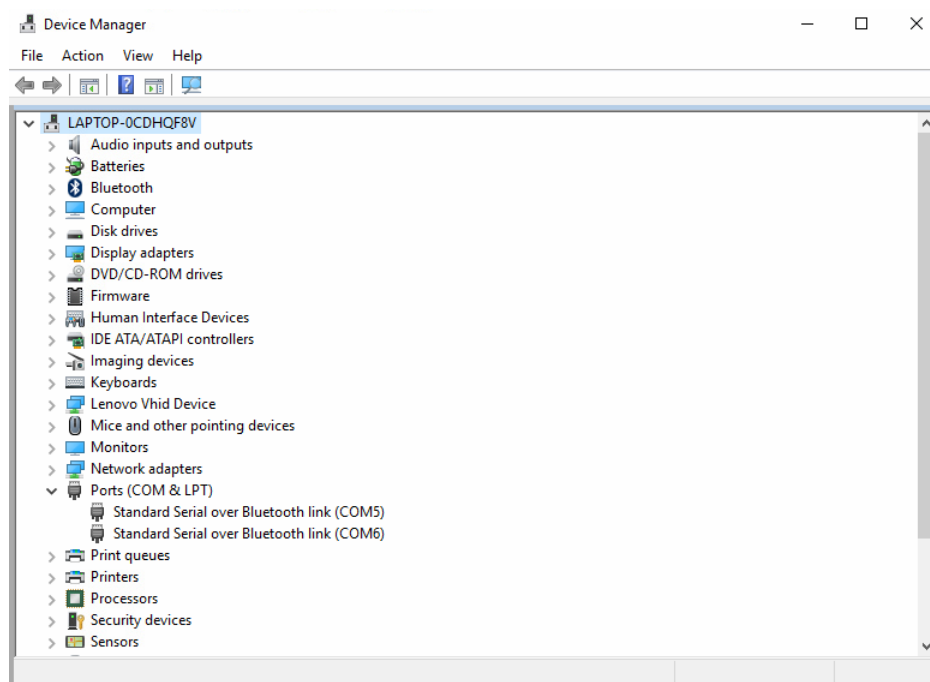


Figure 106 - Bluetooth virtual ports installation

The above screen shot displays a correct installation. The device is always paired to two different Bluetooth links (COM5 and COM6 on the below example). One is the **outgoing** port and the other is the **incoming** port. The Bluetooth connection with the instrument is always through the **outgoing** port.

⁶ If you are unable to find “Device Manager” on your computer, please check Annex I.

4. Connect the DropView8400 to the instrument using automatic mode connection (manual mode is not recommended if you don't know which is the outgoing port, still if it is required please go to the following section).

Note: Not all devices will install to COM5 or COM6. The COM port allocation is determined by the installation wizard on the basis of the next free com port as designated in the PC registry.

4.3.1 Manual connection DropView 8400 and instrument

To connect using manual mode, you must know the **outgoing** Bluetooth COM port. Follow these instructions to know which Bluetooth COM port is the **outgoing** port:

4.3.1.1 Windows® 10

1. On **windows 10**, except if classic Start Menu is selected, by right click on the Microsoft logo at the bottom left hand corner of the screen and select **Control Panel**:

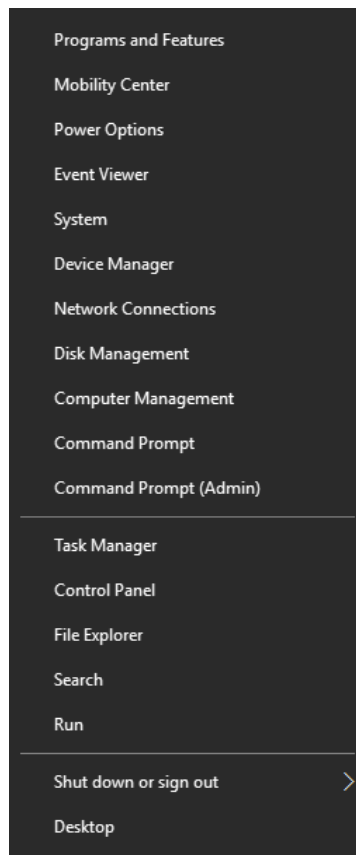


Figure 107 - Control Panel Access

2. From the Control Panel window select Device and Printers and then look for a device call “STAT8000”.

Note: If there is no device STAT8000 displayed, please try to pair again the Wireless device with the computer.

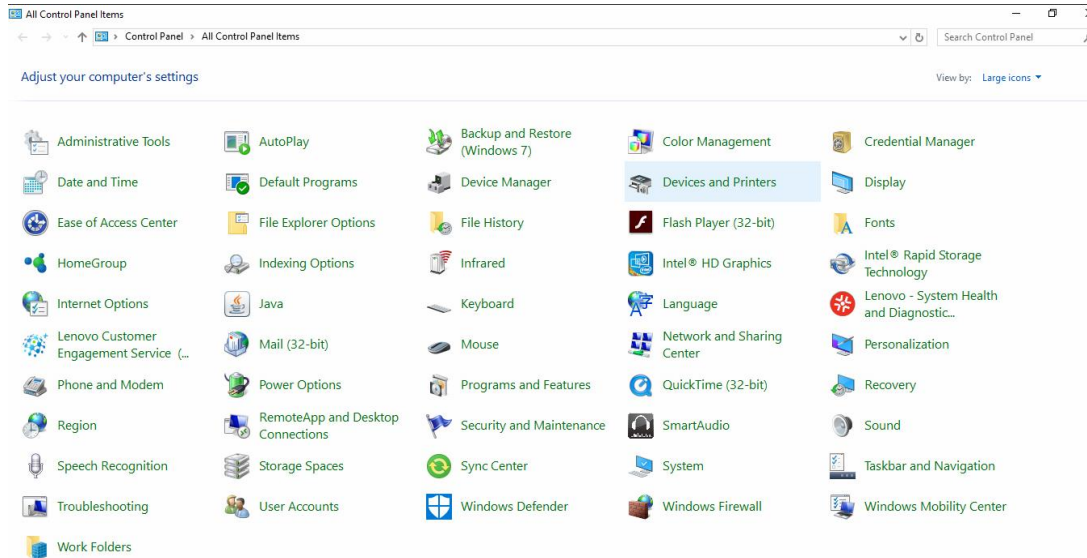


Figure 108 - Control Panel Access

3. Right click on the device STAT8000 to bring up a menu. From the displayed menu select “Properties”.

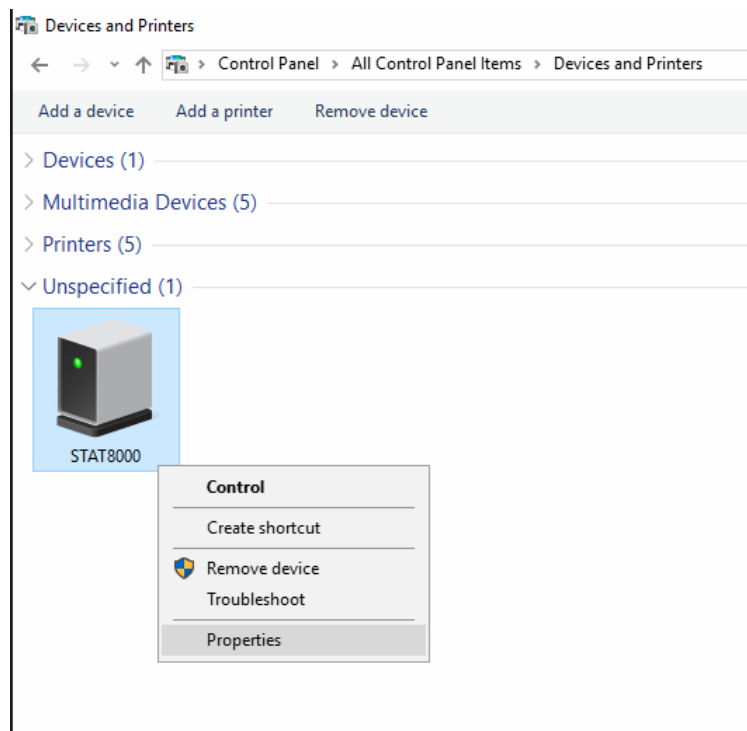


Figure 109 - Properties

4. Click on the tab “Services”. The COM port associate to the ”Serial (SPP) “Bluetooth Serial Port” is the **outgoing** port.

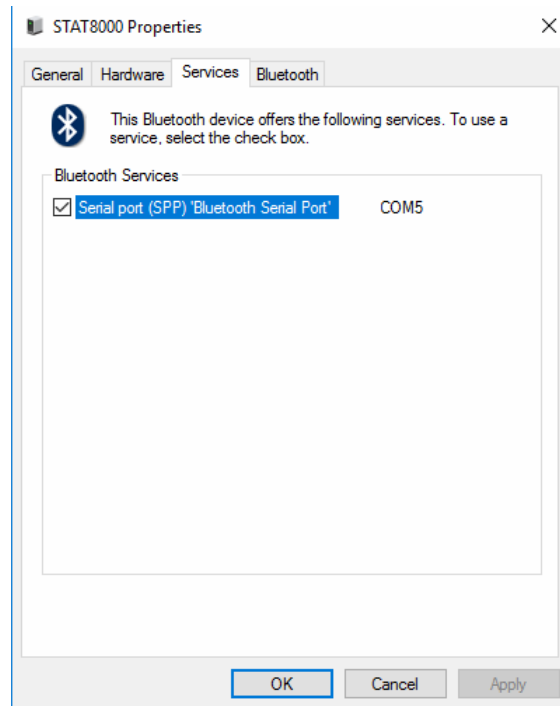


Figure 110 - Outgoing Bluetooth port

4.3.1.2 Windows® 10 classic start menu

1. On **windows 10 with classic start menu**, move the mouse to the bottom right hand corner of the screen. When the following window pops up, select the Settings button and then select control panel.

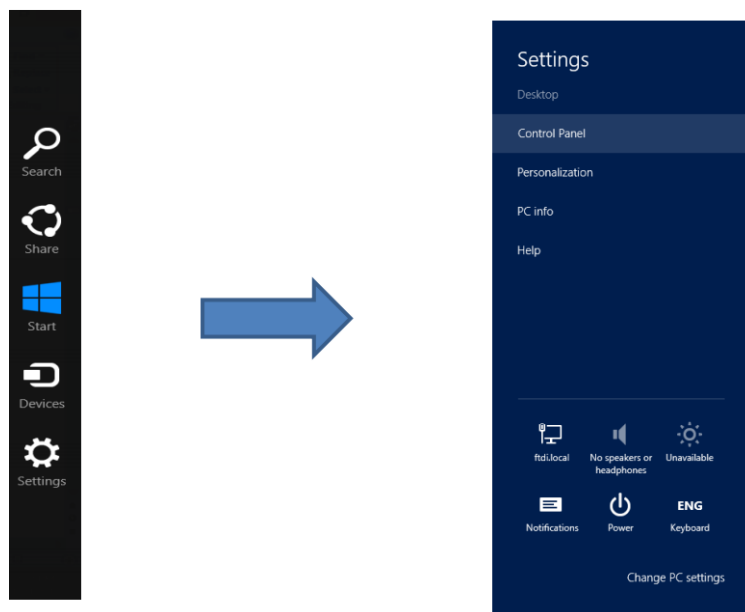


Figure 111 - Settings → control panel

2. From the Control Panel window select Hardware and Sound.

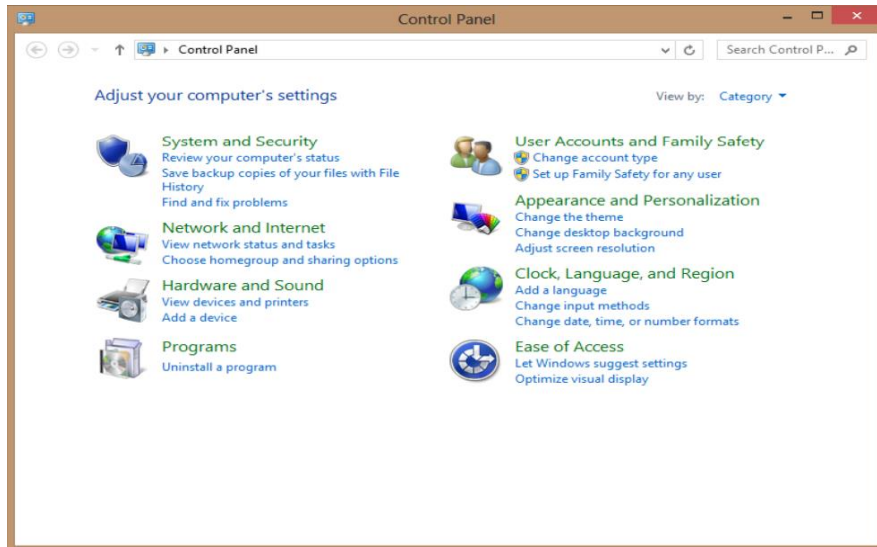


Figure 112 - Control panel → Hardware and Sound

3. At the next screen select Devices and Printers option:

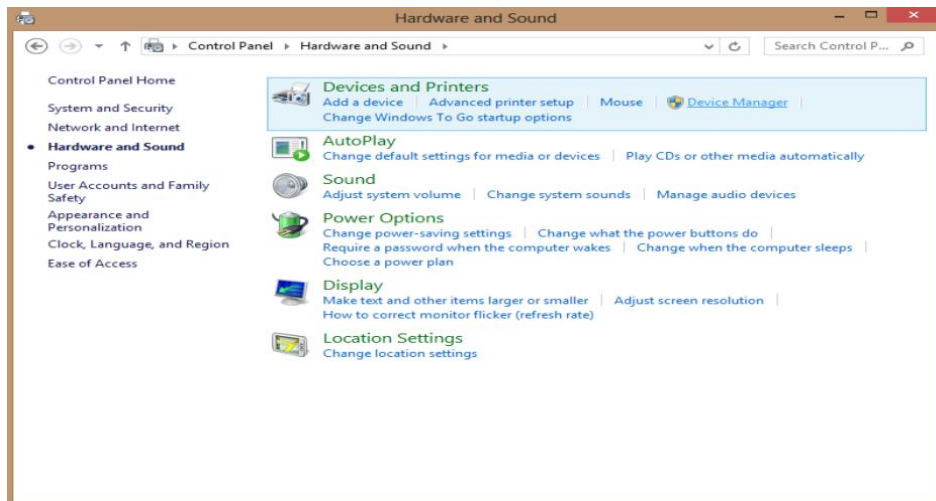


Figure 113 - Hardware and Sound → Devices and Printers

4. Right click on the device STAT8000 to bring up a menu. From the displayed menu select “Properties”.

5. Click on the tab “Services”. The COM port associate to the “Serial (SPP) “Bluetooth Serial Port” is the **outgoing** port.

4.3.1.3 Windows® 8.1

1. On **windows 8.1**, move the mouse to the bottom right hand corner of the screen. When the following window pops up, select the Settings button and then select control panel.

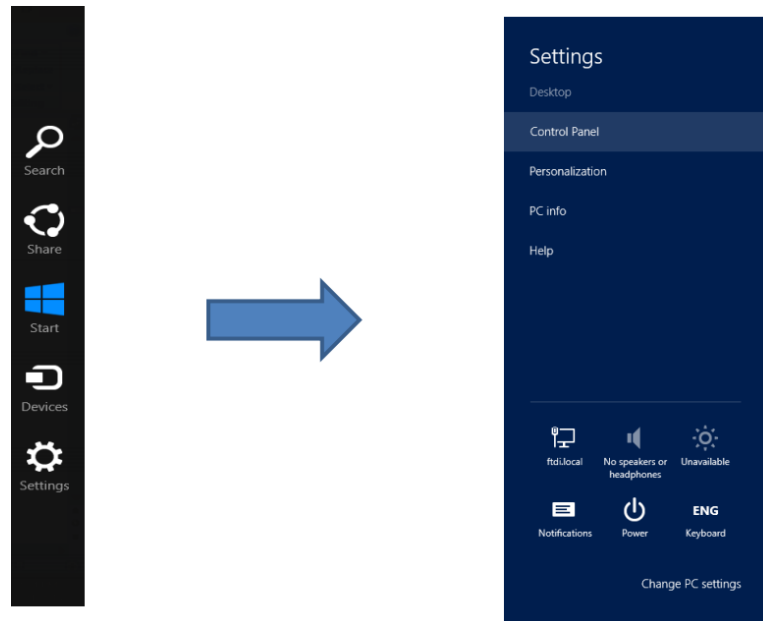


Figure 114 - Settings → control panel

2. From the Control Panel window select Hardware and Sound.

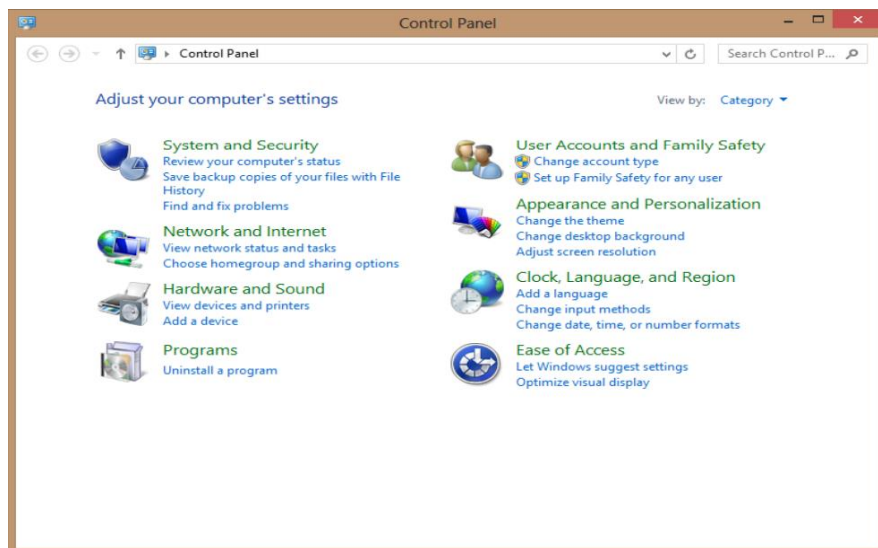


Figure 115 - Control panel → Hardware and Sound

3. At the next screen select Devices and Printers option:

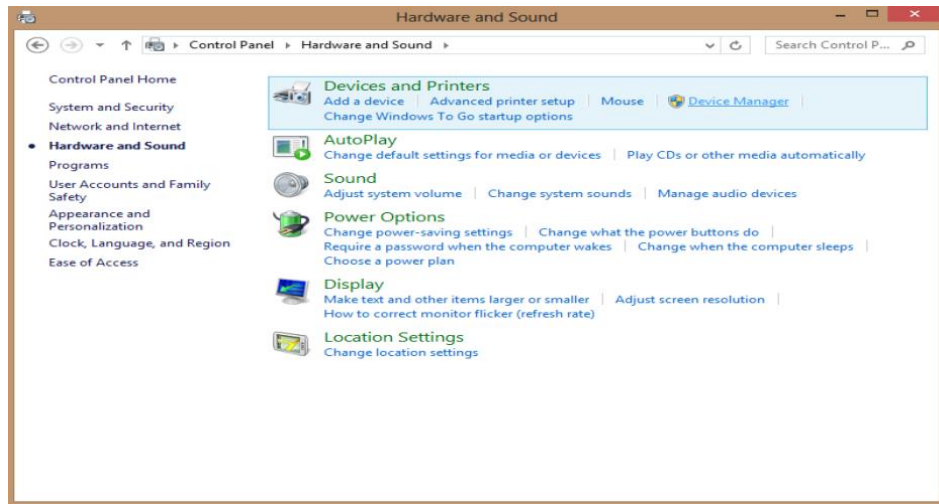


Figure 116 - Hardware and Sound → Devices and Printers

4. Right click on the device STAT8000 to bring up a menu. From the displayed menu select "Properties".
5. Click on the tab "Services". The COM port associate to the "Serial (SPP) "Bluetooth Serial Port" is the **outgoing** port.

4.3.1.4 Windows® 8

1. On **windows 8**, move the mouse to the bottom right hand corner of the screen. When the following window pops up, select the Settings button and then select control panel.

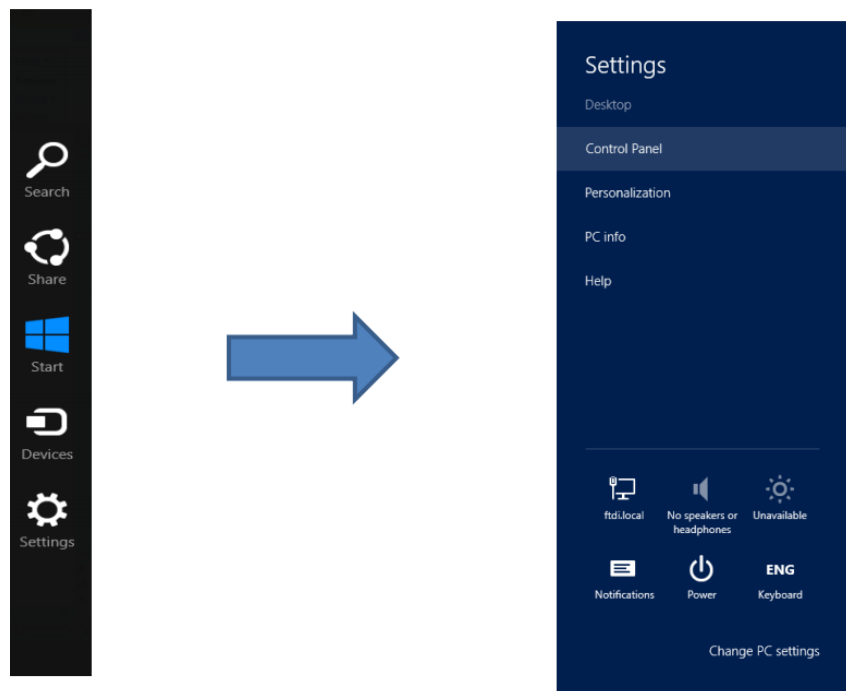


Figure 117 - Settings → control panel

2. From the Control Panel window select Hardware and Sound.

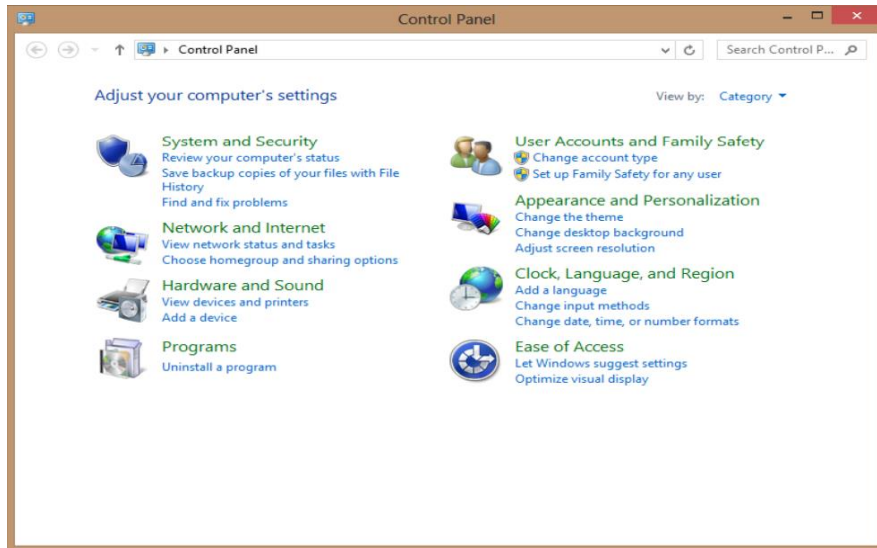


Figure 118 - Control panel → Hardware and Sound

3. At the next screen select Devices and Printers option:

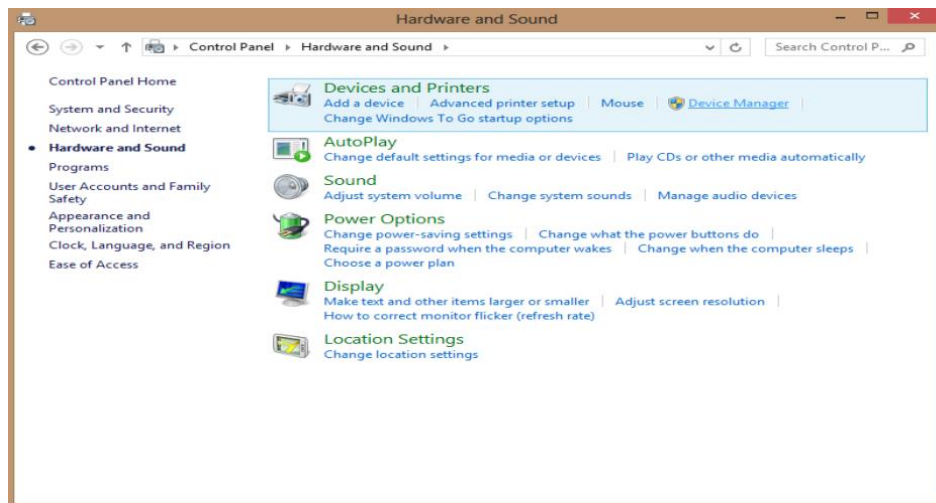


Figure 119 - Hardware and Sound → Devices and Printers

4. Right click on the device STAT8000 to bring up a menu. From the displayed menu select "Properties".

5. Click on the tab "Services". The COM port associate to the "Serial (SPP) "Bluetooth Serial Port" is the **outgoing** port.

4.3.1.5 Windows® 7

1. On **windows 7** - Press the Windows start button to bring up the start menu and select "Control Panel"

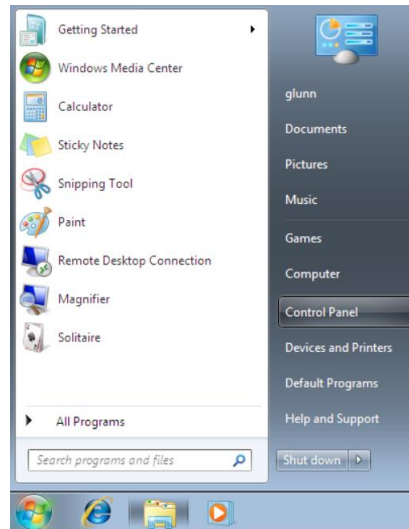


Figure 120 - Access to control panel

2. From the Control Panel window select Hardware and Sound.



Figure 121 - Control panel → Hardware and Sound on windows 7

3. At the next screen select Devices and Printers:

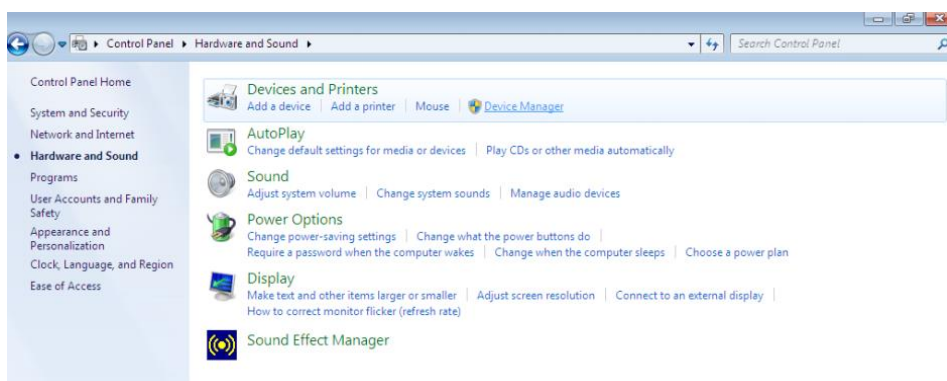


Figure 122 - Hardware and Sound → Devices and Printers

4. Right click on the device STAT8000 to bring up a menu. From the displayed menu select "Properties".

5. Click on the tab “Services”. The COM port associate to the ”Serial (SPP) “Bluetooth Serial Port” is the **outgoing** port.

4.3.1.6 Windows® Vista

1. On **windows Vista** – Press the Windows start button to bring up the start menu and select “Control Panel”.

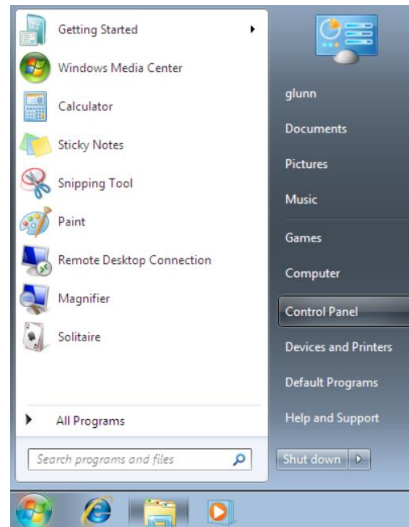


Figure 123 - Access to control panel

2. From the Control Panel window select Hardware and Sound.



Figure 124 - Control panel → Hardware and Sound on windows Vista

3. At the next screen select “Bluetooth Devices”:

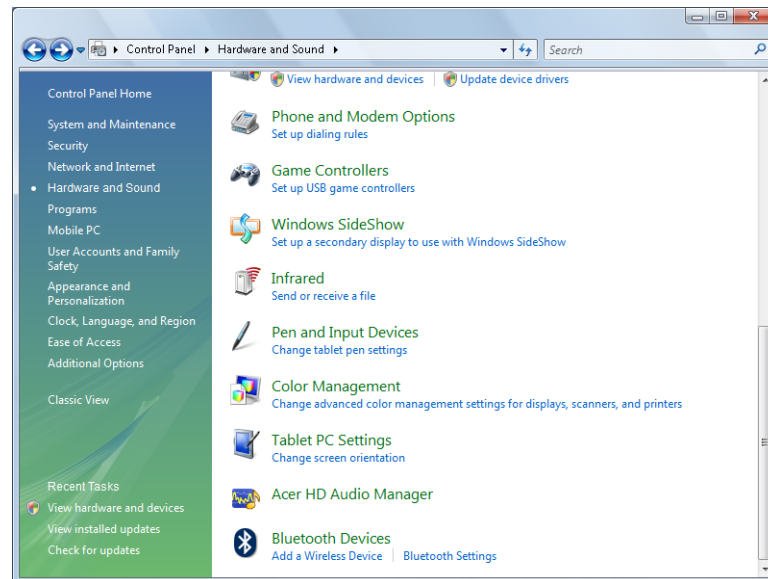


Figure 125 - Hardware and Sound -> Bluetooth Devices

4. Right click on the device STAT8000 to bring up a menu. From the displayed menu select “Properties”.

5. Click on the tab “Services”. The COM port associate to the ”Serial (SPP) “Bluetooth Serial Port” is the **outgoing** port.

4.4 Trouble shooting/ Error messages

4.4.1 Error Message: Potentiostat not found

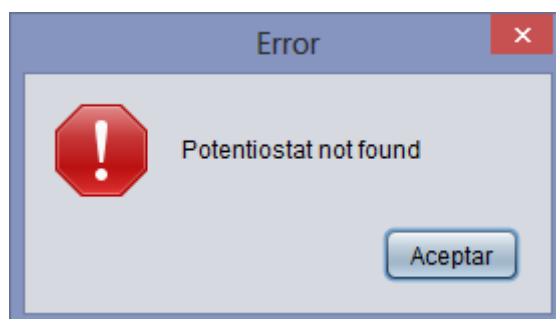


Figure 126 - Potentiostat Connection Error

Check Action	Corrective Action / Solution
Have you proceed with automatically driver installation during software installation?	Please proceed with the driver installation described on section 4.2.
If you have done driver installation according to section 4.2	Please close the software, open again and try to connect using manual mode. Please follow the instruction detailed on section 5.1.1 for manual connection.

4.4.2 Error Message: Not valid Potentiostat ID

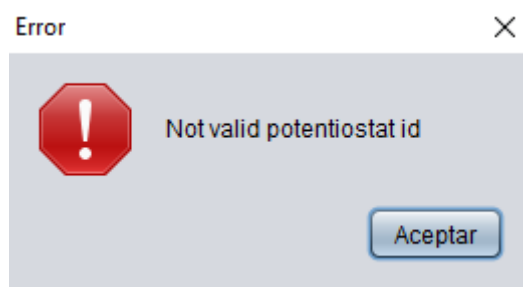


Figure 127 - Potentiostat ID Connection Error

Check Action	Corrective Action
If you have done driver installation according to section 4.2	<ul style="list-style-type: none"> - Close the software. - Turn off the instrument and wait 10 seconds. - Turn on again the instrument and wait 10

	<p>seconds.</p> <ul style="list-style-type: none"> - Open the software and try connection again.
	<p>Please charge the instrument overnight or plug the instrument to the wall using the original power supply and turn on the rear panel switch.</p>

4.4.3 Error Message: Time out Error

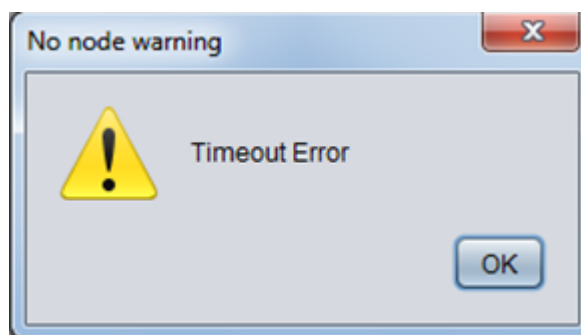


Figure 128 - Time out error

Check Action	Corrective Action
<p>If you have done driver installation according to section 4.2, please go to Device Manager window and check the installed driver.</p>	<p>Update the driver to the one corresponding to your operative system (see section 4.2.)</p>

5 SOFTWARE

DropView 8400 software provides the control of all instrument functions. An intuitive interface helps the user to control all the operating modes, which will be described later. The next Figure shows the software interface layout for PC (for netbooks please see below), with its different areas:

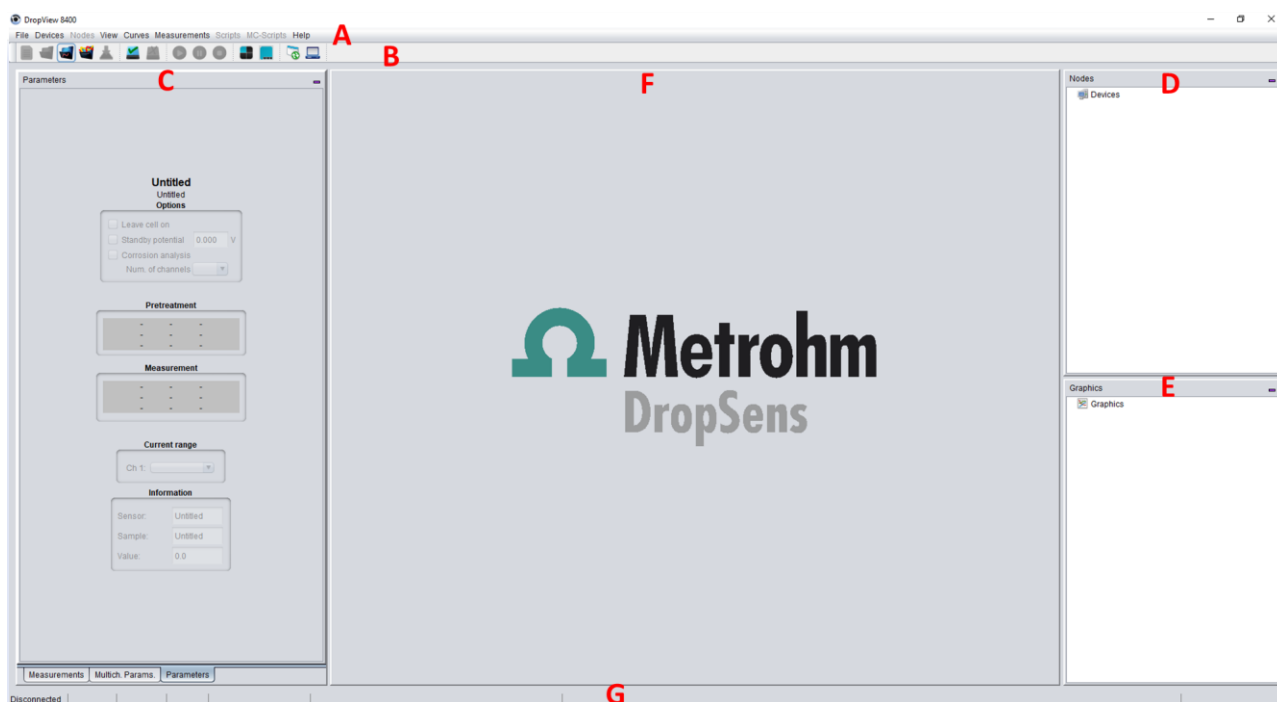


Figure 129 - DropView 8400 interface

- A** – Menu Bar
- B** – Shortcuts Bar
- C** – Parameters and Data Analysis Area
- D** – Nodes Control Area
- E** – Graphics Control Area
- F** – Graphics Display Area
- G** – Status Bar

A – Menu Bar

Includes the different menus to control most of the software options.

B – Shortcuts Bar

Includes shortcut buttons to some of the most used options.

C – Parameters and Data Analysis Area

The “Parameters” tab is the area where the technique parameters for the selected node in Nodes Control Area are shown (editable parameters). It also shows the technique parameters of the recorded curve selected in Graphics Control Area (non-editable parameters).

The “Multich. Params.” tab shows the editable or non-editable parameters for the “Node M” in Nodes Control Area (if selected) or for the multichannel recorded curve in Graphics Control Area (if selected), respectively.

The “Data Analysis” tab shows the measured peak data of all the recorded curves shown in Graphics Control Area (selected or not).

D – Nodes Control Area

Shows the Nodes status.

E – Graphics Control Area


Shows the list of all the recorded curves for all the enabled nodes (see 5.2) and for all the opened graphic files (see 5.4.3).


F – Graphics Display Area

Shows the graphic windows for the enabled nodes (see 5.2) and for the opened graphic files (see 5.4.3).

G – Status Bar

Shows real-time information about the electrochemical experiment run.

The “Default workspace” button  in the “Shortcuts Bar” places all the areas to the default PC configuration.

The “Netbook optimised workspace” button  in the “Shortcuts Bar” changes the areas display in order to fit them better when a netbook is being used with the instrument.

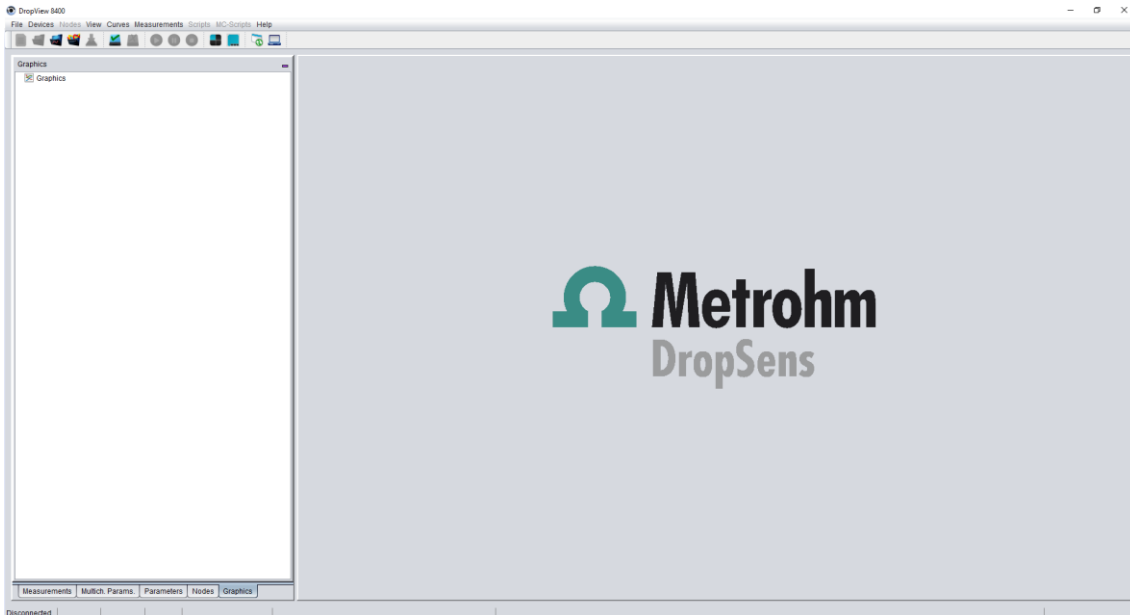




Figure 130 - Netbook optimised workspace

Nevertheless, the areas can be dragged and placed in a custom way by the user.

The “Show mosaic graphics” button  in the “Shortcuts Bar” places the active graphic windows in a mosaic all-view mode.

The “Show tab graphics” button  in the “Shortcuts Bar” shows the graphic windows in a tab view mode.

5.1 Connecting the instrument to the software


5.1.1 USB connection

Plug in the μ Stat 8000 to the USB port.

Turn on the μ Stat 8000.

Open DropView 8400.


Press the “**Connect device**” button  located in the “Shortcuts Bar” or click on “Devices \rightarrow Connect” in the “Menu Bar”.

μ Stat 8000 is connected to the software when the “Disconnect from device” button is available  and “USB” is displayed on the LCD.

If “unknown Application” message error is displayed, please try to connect the instrument in manual mode. Click on “Devices \rightarrow Manual Connect” in the “Menu Bar”, choose the Virtual COM port where the instrument is connected and click on Connect.

If you don't know in which port the instrument is, please follow the instruction detailed on section 4.3.


Establish connection to μ Stat 8000 each time you run DropView 8400 software.



Disconnect the software from the instrument by clicking on  before closing the software.

5.1.2 Wireless connection

Turn on the μ Stat 8000. Turn on Bluetooth in your computer.

Run DropView 8400.


Press the **“Connect device”** button  located in the “Shortcuts Bar” or click on “Devices \rightarrow Connect” in the “Menu Bar” (see section 5).

μ Stat 8000 is connected to the software when the “Disconnect from device” button is available  and the Wireless symbol () is displayed on the LCD.

If “unknown Application” message error is displayed, please try to connect the instrument in manual mode. Click on “Devices \rightarrow Manual Connect” in the “Menu Bar”, choose the Virtual COM port where the instrument is connected and click on Connect.

If you don't know in which port the instrument is, please follow the instruction detailed on section 4.4.

Establish connection to μ Stat 8000 each time you run DropView 8400 software.

Disconnect the software from the instrument by clicking on  before closing the software.

5.2 Working with Nodes

The list of Nodes appears in the Nodes Control Area. Only physical available nodes appear in the Nodes Control Area.

Nodes can be Enabled or Disabled according to user needs. Enabled Nodes are coloured, and Disabled Nodes are in grey. To **Enable or Disable a Node**, *right click on the Node* and select the desired option. You can also Enable or Disable nodes in the “Nodes” menu of the “Menu Bar”.

The next Figure shows an example of the Nodes Control Area for μ Stat 4000 (where Nodes 1 and 2 are enabled), and for μ Stat 8000 (where Nodes 1 to 5 are enabled).

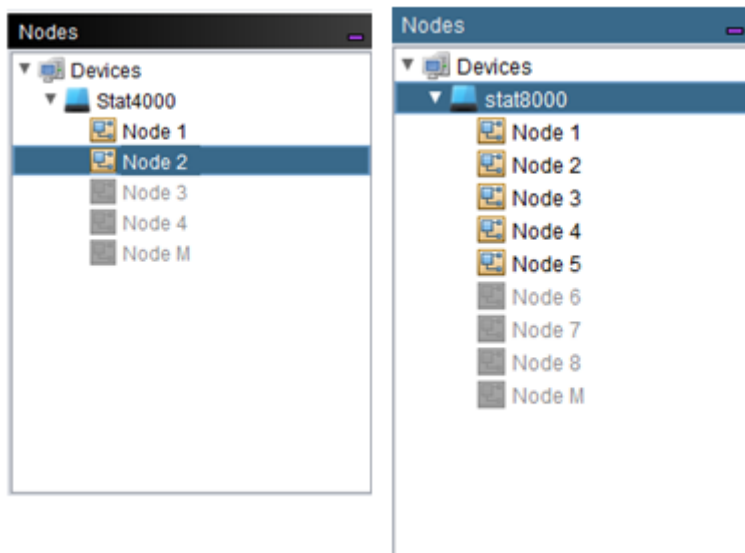


Figure 131 - Examples of Nodes Control Area

The next Figure shows an example of the Nodes Control Area for μ Stat 4000 (where Node M -Multichannel Node- is enabled using 3 channels -nodes 1 to 3-, and where Node 4 is also enabled), and for μ Stat8000 (where Node M -Multichannel Node- is enabled using 3 channels -nodes 1 to 3-, and where Node 6 is also enabled).

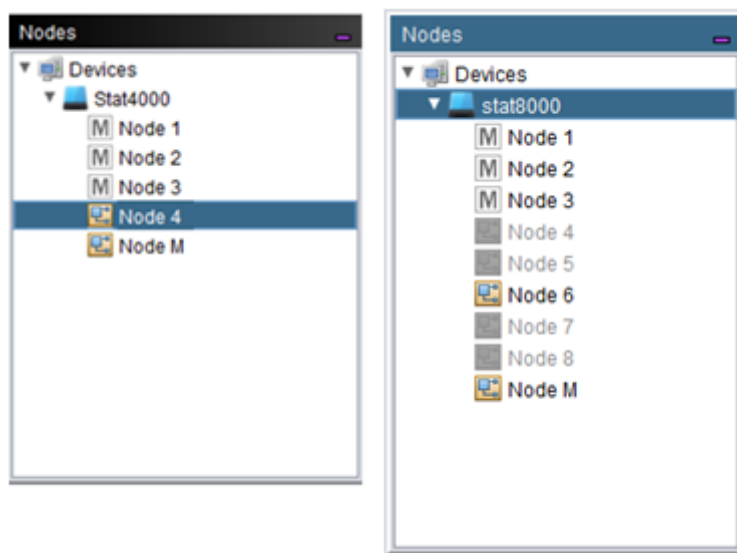



Figure 132 - Examples of Nodes Control Area with Node M enabled

If Node M is enabled and using, for example, 3 channels, then individual Nodes 1, 2 and 3 cannot be used as they are involved in the Multichannel setup.

You can set the same or different electrochemical techniques to the enabled nodes. In order to **assign a technique to a node**, right click *on the node* and click on “Select technique” option; choose the technique and press “Accept”. You can also assign a technique to a node by clicking on the *symbol*  of the “Shortcuts Bar” or in the “*Select technique*” option in the “Nodes” menu of the “Menu Bar”.

If you want to **assign the same technique to different nodes**, go to the “*Select technique*” option in the “Nodes” menu of the “Menu Bar”.

A disabled node is automatically enabled if a technique is assigned to it.

The method (technique + parameters) of one node can be **copied** to other nodes by clicking on the “*Copy method to nodes...*” option in the “Nodes” menu.

Each enabled node generates an associated graphic window in the Graphics Display Area (see section 5.4.4) and a “Graphics of node” root in the Graphics Control Area.

5.3 Measuring

µStat 8000 allows performing simultaneous electrochemical measurements in the enabled nodes. These nodes can be configured with the same or with different techniques.

5.3.1 Readings

In order to prepare the instrument to perform simultaneous measurements, you can follow the next steps:

Enable the needed nodes as explained above.


Select the adequate **technique** for each node, as explained above.

For each node, select the **parameters** of its technique and the current range in the “Parameters” tab (and in the “Multich. Params.” tab if “Node M” is enabled).



For each node, tick the “**Leave cell on**” option in the “Parameters” tab if you want to leave cell on after measurement. The potential fixed after measurement will be the last potential or current applied during the technique. This option is not available in PSAF technique.

For each node, tick the “**Standby Potential**” option in the “Parameters” tab if you want to leave the cell at a specific voltage value after measurement. This option is not available for following techniques: PAD, MAD and galvanostatic techniques except OCP.

For each node, tick the Corrosion “**Corrosion analysis**” option in the “Parameters” tab if you want to see the graphic in corrosion mode (Potential Vs Current with current axis on log10 scale) (only available for LSV, CV and LPR techniques).

Click “**Run**” button  in the “Shortcuts Bar” (or click on “Devices → Run” in the “Menu Bar”) to start the measurement.

All the measurements will start **simultaneously** in all enabled nodes. Depending on the technique and specific parameters of each node, each measurement will last according to the method.

A measurement can be **paused or stopped** with the buttons   in the “Shortcuts Bar”.

During the measurement, **one curve for each node** will be displayed in each node window in the Graphics Display Area. At the end of each measurement, the recorded curve for each node will be listed in the Graphics Control Area.

Recorded curves or methods can be **saved** in different ways and combinations (see 5.4).

5.3.2 Parameters

µStat 8000 provides the possibility to apply the following techniques:

Voltammetric techniques:

■ Linear Sweep Voltammetry	LSV
■ Cyclic voltammetry	CV
■ Square Wave Voltammetry	SWV
■ Differential Pulse Voltammetry	DPV
■ Normal Pulse Voltammetry	NPV
■ Differential Normal Pulse Voltammetry	NDP
■ Alternating Current Voltammetry	ACV
■ Linear Polarization Resistance	LPR

Amperometric techniques:

■ Amperometric Detection	AD
■ Zero Resistance Amperometry	ZRA
■ Fast Amperometry	FA
■ Pulsed Amperometric Detection	PAD
■ Coulometric Detection	COUL

Potentiometric techniques:

■ Linear Sweep Potentiometry	LSP
■ Cyclic Potentiometry	CP

- Potentiometric Detection POT
- Open Circuit Potentiometry OCP
- Fast Potentiometry FP
- Potentiometric Stripping Analysis (faradaic) PSAF
- Potentiometric Stripping Analysis (galvanostatic) PSAG

The “Parameters” and the “Multich. Params.” tabs contain all the parameters for each technique. For “Node M”, the “Parameters” tab contains the common parameters for all the channels, while the “Multich. Params.” tab contains the parameters that can be set individually for each channel.

The ‘Sensor’ and ‘Sample’ textboxes in “Parameters” tab can be used to describe the sensor used and the sample that is measured.

With the “Current range” frame, the applicable current range during the measurement can be selected. If “Auto” is selected, the instrument will select the most optimal current range automatically.

5.3.2.1 Parameters of voltammetric techniques

Pretreatment

- Econd* Conditioning potential. Potential applied before the deposition stage is started. It is only relevant when $t_{cond} > 0$ s.
- Edep* Deposition potential. Potential applied during the deposition stage. It is only relevant when $t_{dep} > 0$ s.
- tcond* Conditioning time.
- tdep* Deposition time.
- tequil* Equilibration time.

Measurement

- Ebegin* Potential where scan starts. The applicable range of the potential is -4.096 V to +4.096 V.
- Evtx1* (CV) Potential where scan direction is reversed. The applicable range of the potential is -4.096 V to +4.096 V.
- Evtx2* (CV) Potential where scan direction is reversed again or where scan stops (if $E_{vtx2} = E_{begin}$). The applicable range of the potential is -4.096 V to +4.096 V.
- Eend* Potential where scan stops.
- Estep* Step potential.

<i>Eamp</i>	Pulse Amplitude.
<i>Epuls</i>	(DPV, NDPV) Pulse potential.
<i>Ebase</i>	(NPV, NDPV) Base potential.
<i>tpuls</i>	(DPV, NDPV) Pulse time.
<i>tint</i>	(NPV, NDPV, ACV) Interval time.
<i>tmod</i>	(NPV, NDPV, ACV) Modulation time.
<i>Freq</i>	(SWV, ACV) Frequency.
<i>nscans</i>	(CV) Number of scans.
<i>Srate</i>	Applied scan rate.
<i>dE/dt lim</i>	(LPR) The technique start when differential OCP average value is less than this value (cutoff).
<i>tmaxOCP</i>	(LPR) maximum time in OCP mode. The technique will start after this time if dE/dt lim is not reach in the meantime.
<i>tprecond</i>	(LPR) Equilibration time for LPR.

The sequence of a measurement, except in **LPR** is:

- 1) Conditioning stage (if *tcond* is not zero): Apply *Econd*, during *tcond*.
- 2) Deposition stage (if *tdep* is not zero): Apply *Edep*, during *tdep*.
- 3) Equilibration stage (if *teq* is not zero): Apply *Ebegin*, during *teq*.
- 4) Start measurement at *Ebegin* and continue until *Eend* with steps of *Estep* value, with the specified Scan rate. In CV the scan starts at *Ebegin* and is continued by reversing the scan direction at *Evtx1*. Scan direction is reversed again if *Evtx2* is different from *Ebegin*.

The sequence of a measurement in **LPR** is:

- 1) Conditioning stage (if *tcond* is not zero): Apply *Econd*, during *tcond*.
- 2) Deposition stage (if *tdep* is not zero): Apply *Edep*, during *tdep*.
- 3) Start OCP measurement during at least 5 seconds. The OCP value is measured each 0.1 seconds and the average of the values during the first 5 seconds is calculated. After that, the difference between the average of the last 5 seconds and the previous average, divided by 0.1 seconds, is calculated (*dE/dt*), and if this value is lower than the *dE/dt lim*, or the *tmaxOCP* time is reached, the last OCP average value is stored and used in the next step. If OCP cutoff value is not desired, please write "-1" in *dE/dt lim*; doing this, OCP measurement will be done during all *tmax OCP* time and the last OCP average value is stored and used in next step.
- 4) Equilibration stage (if *tprecond* is not zero): Apply OCP+*Ebegin*, during *tprecond*.

5) Start measurement at OCP+Ebegin (this OCP is the last OCP average value) and continue until OCP+Eend, with steps of Estep value and with the specified Scan rate.

5.3.2.2 Parameters of amperometric techniques

Pretreatment

<i>Econd</i>	Conditioning potential. Potential applied before the deposition stage is started. It is only relevant when $t_{cond} > 0$ s.
<i>Edep</i>	Deposition potential. Potential applied during the deposition stage. It is only relevant when $t_{dep} > 0$ s.
<i>tcond</i>	Conditioning time.
<i>tdep</i>	Deposition time.
<i>tequil</i>	Equilibration time.

Measurement

<i>E</i>	(AD, FA, COUL) Potential during measurement. The applicable range of the potential is -4 V to +4 V.
<i>Interval</i>	(AD, FA, ZRA, COUL) Time between two points of the measurements.
<i>E_{1,2,...,5}</i>	(PAD) Potential pulses (applied during their corresponding $t_{1,2,...,5}$).
<i>E_i</i>	(PAD) Integration potential (applied during t_i).
<i>t_{1,2,...,5}</i>	(PAD) Potential pulse times (at their corresponding $E_{1,2,...,5}$).
<i>t_i</i>	(PAD) Integration time (at E_i).
<i>t</i>	Total time of measurement.

The sequence of a measurement in **AD, FA and COUL** is:

- 1) Conditioning stage (if t_{cond} is not zero): Apply E_{cond} , during t_{cond} .
- 2) Deposition stage (if t_{dep} is not zero): Apply E_{dep} , during t_{dep} .
- 3) Equilibration stage (if t_{eq} is not zero): Apply E , during t_{eq} .
- 4) Start the measurement at E during t seconds.

The sequence of a measurement in **ZRA** is:

- 1) Conditioning stage (if t_{cond} is not zero): Apply E_{cond} , during t_{cond} .
- 2) Deposition stage (if t_{dep} is not zero): Apply E_{dep} , during t_{dep} .
- 3) Equilibration stage (if t_{eq} is not zero): Wait t_{eq} seconds at open circuit.
- 4) Start the measurement during t seconds at open circuit.

Note: To perform ZRA measurements, current can be measured using WE and Ground electrode connector ends for better stability.

The sequence of measurement in **PAD** is:

- 1) Conditioning stage (if t_{cond} is not zero): Apply E_{cond} , during t_{cond} .
- 2) Deposition stage (if t_{dep} is not zero): Apply E_{dep} , during t_{dep} .
- 3) Equilibration stage (if t_{eq} is not zero): Apply E_1 , during t_{eq} .
- 4) Start the measurement following the potential waveform in the order 1,2,3,4,5,i as follows: Apply Potential pulses $E_{1,2,\dots,5}$ during their corresponding times $t_{1,2,\dots,5}$ (if a t_i is zero, its potential pulse is not applied); current is registered at E_i during t_i .

5.3.2.3 Parameters of potentiometric techniques

Pretreatment

<i>I_{cond}</i>	Conditioning current. Current applied before the deposition stage is started. It is only relevant when $t_{cond} > 0$ s.
<i>I_{dep}</i>	Deposition current. Current applied during the deposition stage. It is only relevant when $t_{dep} > 0$ s.
<i>E_{cond}</i>	(PSAG, PSAF) Conditioning potential. Potential applied before the deposition stage is started. It is only relevant when $t_{cond} > 0$ s.
<i>E_{dep}</i>	(PSAG, PSAF) Deposition potential. Potential applied during the deposition stage. It is only relevant when $t_{dep} > 0$ s.
<i>t_{cond}</i>	Conditioning time.
<i>t_{dep}</i>	Deposition time.
<i>t_{equil}</i>	Equilibration time.

Measurement

<i>I_{begin}</i>	(LSP, CP) Current where scan starts.
<i>I_{vtx1}</i>	(CP) Current where scan direction is reversed.
<i>I_{vtx2}</i>	(CP) Current where scan direction is reversed again or where scan stops (if $I_{vtx2} = I_{begin}$).
<i>I_{end}</i>	(LSP) Current where scan stops.
<i>I_{step}</i>	(LSP, CP) Step current.
<i>I</i>	(PD, FP) Current during measurement.
<i>E_{limit}</i>	(PSAG, PSAF) Potential limit.
<i>$nscans$</i>	(CP) Number of scans.
<i>S_{rate}</i>	(LSP, CP) Applied scan rate.
<i>$Interval$</i>	(POT, FP, OCP) Time between two measurements.
<i>t</i>	(POT, FP, OCP) Total time of measurement.

t_{max} (PSAG, PSAF) Maximum measurement time.
S. Cur. (PSAG) Applied current.

The sequence of a measurement in **LSP and CP** is:

- 1) Conditioning stage (if t_{cond} is not zero): Apply I_{cond} , during t_{cond} .
- 2) Deposition stage (if t_{dep} is not zero): Apply I_{dep} , the during t_{dep} .
- 3) Equilibration stage (if t_{eq} is not zero): Apply I_{begin} , during t_{eq} .
- 4) Start measurement at I_{begin} and continue until I_{end} with steps of I_{step} value, with the specified Scan rate. In CP the scan starts at I_{begin} and is continued by reversing the scan direction at I_{vtx1} . Scan direction is reversed again if I_{vtx2} is different from I_{begin} .

The sequence of a measurement in **POT and FP** is:

- 1) Conditioning stage (if t_{cond} is not zero): Apply I_{cond} , during t_{cond} .
- 2) Deposition stage (if t_{dep} is not zero): Apply I_{dep} , during t_{dep} .
- 3) Equilibration stage (if t_{eq} is not zero): Apply I_{begin} , during t_{eq} .
- 4) Start the measurement at I during t seconds.

The sequence of a measurement in **OCP** is:

- 1) Conditioning stage (if t_{cond} is not zero): Apply E_{cond} , during t_{cond} .
- 2) Deposition stage (if t_{dep} is not zero): Apply E_{dep} , during t_{dep} .
- 3) Start the measurement during t seconds at open circuit.

Note: To perform OCP measurements, potential can be measured using RE and Ground electrode connector ends for better stability.

The sequence of measurement in **PSAG and PSAF** is:

- 1) Conditioning stage (if t_{cond} is not zero): Apply E_{cond} , during t_{cond} .
- 2) Deposition stage (t_{dep} is not zero): Apply E_{dep} , during t_{dep} .
- 3) Equilibration stage (if t_{eq} is not zero): Apply E_{dep} , during t_{eq} .
- 4) Start the measurement applying S. Cur. (in PSAG) or at open circuit (in PSAF) until reaching E_{limit} or t_{max} .

5.3.3 Limits of some specific parameters

<i>Pretreatment</i>	
Conditioning stage duration:	0 – 1300 s
Deposition stage duration:	0 – 1300 s
Equilibration stage duration:	0 – 1300 s
<i>General parameters</i>	
Ebegin, Eend, Ebase, Evtx1, Evtx2:	-4 V to +4 V
Step potential:	1 mV to 500 mV
Pulse potential:	1 mV to 250 mV
Scan rate:	1 ms up to 1.3 s per step

<i>Technique specific parameters</i>		
SWV	Frequency: Amplitude:	1 Hz to 400 Hz 1 mV to 250 mV
DPV, NPV, NDP	Modulation time: Pulse time:	1 ms to 1300 ms 1 ms to 1300 ms
ACV	Frequency: Amplitude:	2 Hz to 250 Hz 5 mV to 250 mV (RMS)
LPR	dE/dt lim: tmax OCP: tprecond:	-1 μ V/s to 1000 μ V/s 5 s to 6550 s 0 s to 1300 s
Chrono Methods (AD, PD, OCP, ZRA, COUL)	Interval time: Run time:	0.1 s to 1300 s Hours (65000 points)
Fast Chrono Methods (FA, FP)	Interval time: Run time:	1 ms to 1300 ms Hours (65000 points)
PAD	Pulse time: Interval time: Run time:	1 ms to 1300 ms 10 ms to 1300 ms Hours (65000 points)
PSA	Potential limit:	\pm 4 V

5.3.4 Validation

After every changed parameter the method is automatically validated for **errors**. In case any parameter is wrong or out of the specified limits, an error is shown and explained in a textbox above the wrong parameter, and the parameter textbox turns to red colour.

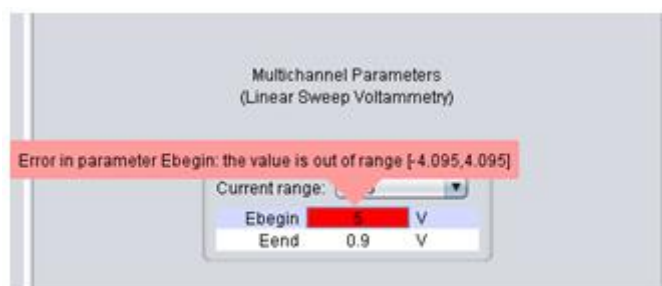


Figure 133 - Error in parameter

A method can be exported to a *.csv file by clicking on the “Export method...” option in the “File” menu of the “Menu Bar”.

5.4 Curves

After a measurement, one curve for each node will be displayed in each node window in the Graphics Display Area. Also, the recorded curve for each node will be listed in the Graphics Control Area.

5.4.1 Curve files


Curve files can be saved, with different extensions for each technique. The extensions are as follows:

.mtl:	LSV
.mtc:	CV
.mts:	SWV
.mtd:	DPV
.mtnp:	NPV
.mtnd:	NDPV
.mtac:	ACV
.mtlpr:	LPR
.mta:	AD
.mtp:	PAD
.mtfa:	FA
.mtzr:	ZRA
.mtcou:	COUL
.mtlp:	LSP
.mtcp:	CP
.mtpo:	PD
.mtfp:	FP
.mtzc:	OCP
.mtpa:	PSAG
.mtpz:	PSAF

When a **curve is saved**, the associated method with which it was recorded is also saved within the same file (then, when the curve is opened, the associated method is shown, non-editable, in the “Parameters and Measurements Area” – see 5.4.2).

Additionally, you can also **save in a file only the method** displayed in the “Parameters and Measurements Area”. In this case, the files extensions are the same than those of the curve files, but removing the first “m” (i.e., a method file of a LSV technique is a *.tl file). To save a method, click on “File → Save method...” in the “Menu Bar” and select the enabled node from which you want to save the method file. To load a saved method, click on “File → Load method...” in the “Menu Bar”.

5.4.2 Saving curves

To save the curves recorded for the enabled nodes and displayed in the Graphics Control Area, click on “Save as...” button  on the “Shortcuts Bar”, or click on “File → Save as...” in the “Menu Bar”.

A window will appear asking to select the nodes to save the curves:

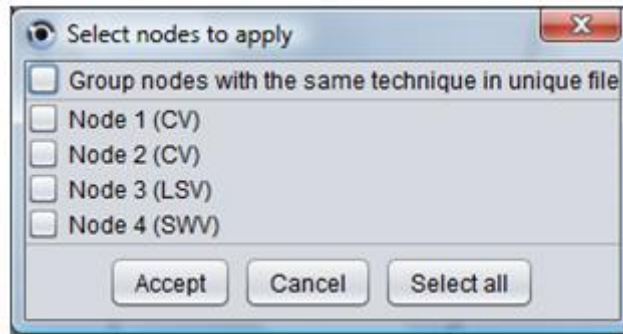


Figure 134 - Save curves window

You can save several curves in one file, but only if they were recorded using the same technique. By clicking in “Group nodes with the same technique in unique file”, if you select several nodes with the same technique then only one file for this technique will be saved, having all the curves overlaid.


For example, for the above “Save curves window” Figure:


- a) If all nodes are selected and “Group nodes with the...” is also selected, then 3 files will be saved: one *.mtc file containing two curves (those of Node 1 and Node 2), one *.mtl file containing the curve of Node 3, and one *.mts file containing the curve of Node 4.
- b) If all nodes are selected but “Group nodes with the...” is not selected, then 4 files will be saved: one *.mtc file containing the curve of Node 1, another *.mtc file containing the curve of Node 2, one *.mtl file containing the curve of Node 3, and one *.mts file containing the curve of Node 4.
- c) If only Node 3 is selected, then 1 file will be saved: one *.mtl file containing the curve of Node 3.


By clicking on “File → Save visible curves...” you can save only the visible curves displayed in the Graphics Control Area.

By clicking on “File → Save graphic as...” you can save the “file graphics” curves displayed in the Graphics Control Area (any Node associated).

5.4.3 Loading curves

You can **load saved curves** to the node window of any enabled node in the “Graphics Display Area” by clicking on the “Load” button  in “Shortcuts Bar”, or by clicking on “File → Load...” in the “Menu Bar”, and selecting the desired file.

You can also **overlay saved curves** in a node window by clicking on the “Overlay” button  in the “Shortcuts bar” or by clicking on “File → Overlay...” in the “Menu Bar”, and selecting the desired file.

You can also **open a saved curve** without loading it to any enabled node window, but opening it as a “file graphic”. To do this, click on “Open file graphic” button  in the “Shortcuts Bar” or click on “File → Open file graphic...” in the “Menu Bar”, and select the desired file.

5.4.4 Recover from backup

This software is recording backup data during the whole experiment. For those cases in which your experiment finishes improperly, you can recover all measured data until failure occurs. Click on “File → Recover from backup” in the “Menu Bar” and select the desired file. Backup files are stored chronologically, with unique name based on the date and time in which the experiment start (YYYYMMDD-hhmmss.backup).

Take into account that backup data will be stored to a limited storage. Oldest backup data files will be deleted according to storage limitation rules.

5.4.5 Graphics Display Area

In this area the graphic windows for the enabled nodes and for the opened graphic files are shown. Normal **tab-based view** allows seeing each window at its higher size, being the other windows hidden and accessible by clicking on the corresponding tab.

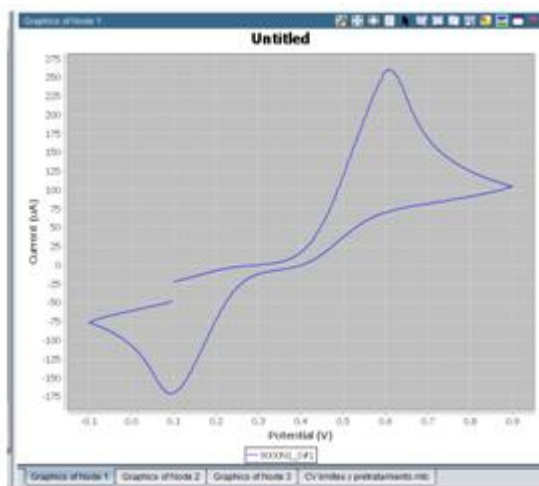



Figure 135 - Tab-based view of Graphics Display Area

By clicking on the “Show mosaic graphics” button  in the “Shortcuts Bar”, a **mosaic** format is displayed.

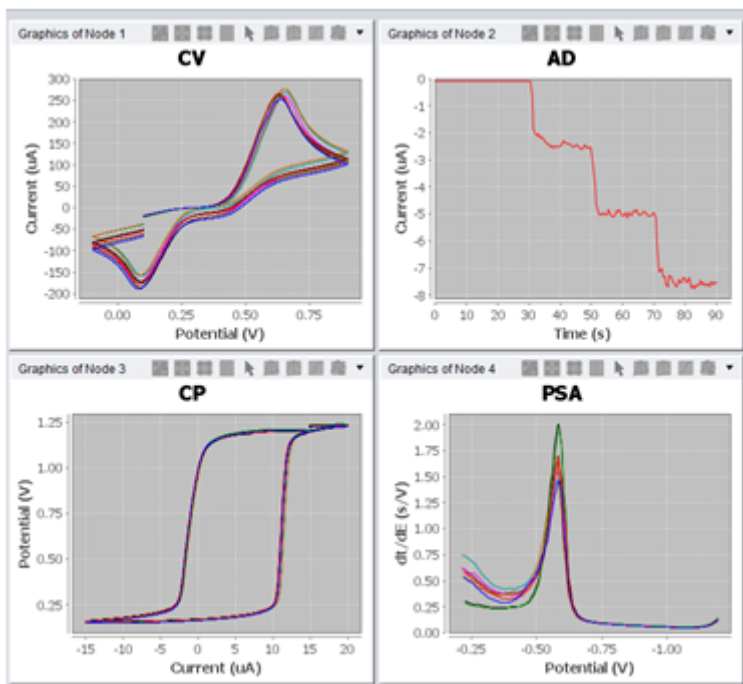


Figure 136 - Mosaic format of Graphics Display Area

It is also possible to drag the available windows, change their size and place them in the desired custom position.

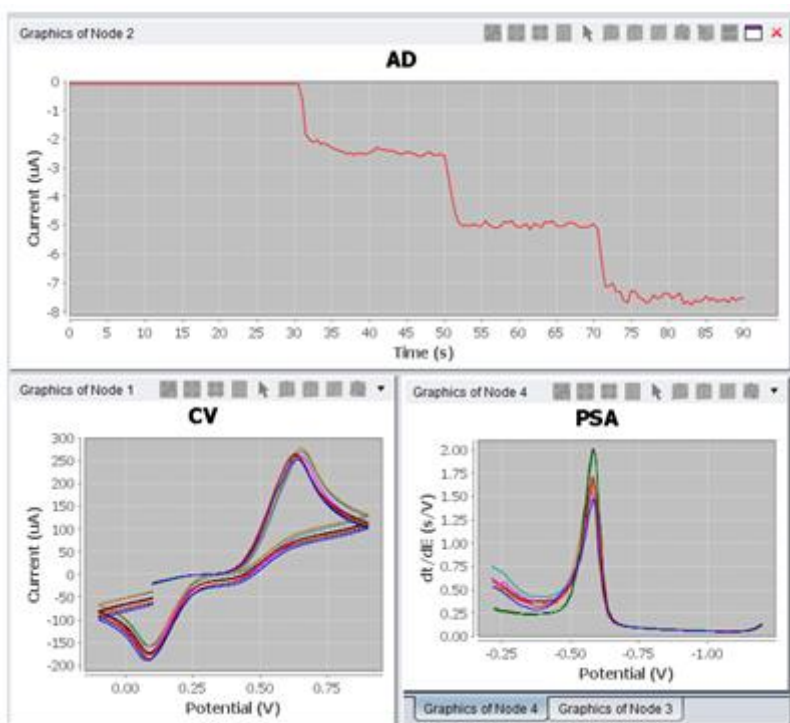


Figure 137 - Custom view format of Graphics Display Area

Using the “**View**” menu in the “Menu Bar” it is possible to change several properties of the Graphics Display Area or of each individual window plot. Also, by **right clicking on a window**, it is possible to change or delete the graphic title, zoom or scale the plot, as well as printing it or saving it as a *.png image file.

5.4.5.1 3D Plot

A **3D plot** of the curves can be displayed by clicking on the “3D plot...” option in the “View” menu of the “Menu Bar”.

First, the curves that will be 3D displayed must be selected in the “Select curves” window that appears after clicking on the “3D plot...” option. Several curves can be selected using the conventional “Ctrl+Click” or “Shift+Click” actions.

After selecting the curves, the “3D settings...” window allows to configure the 3D curves display

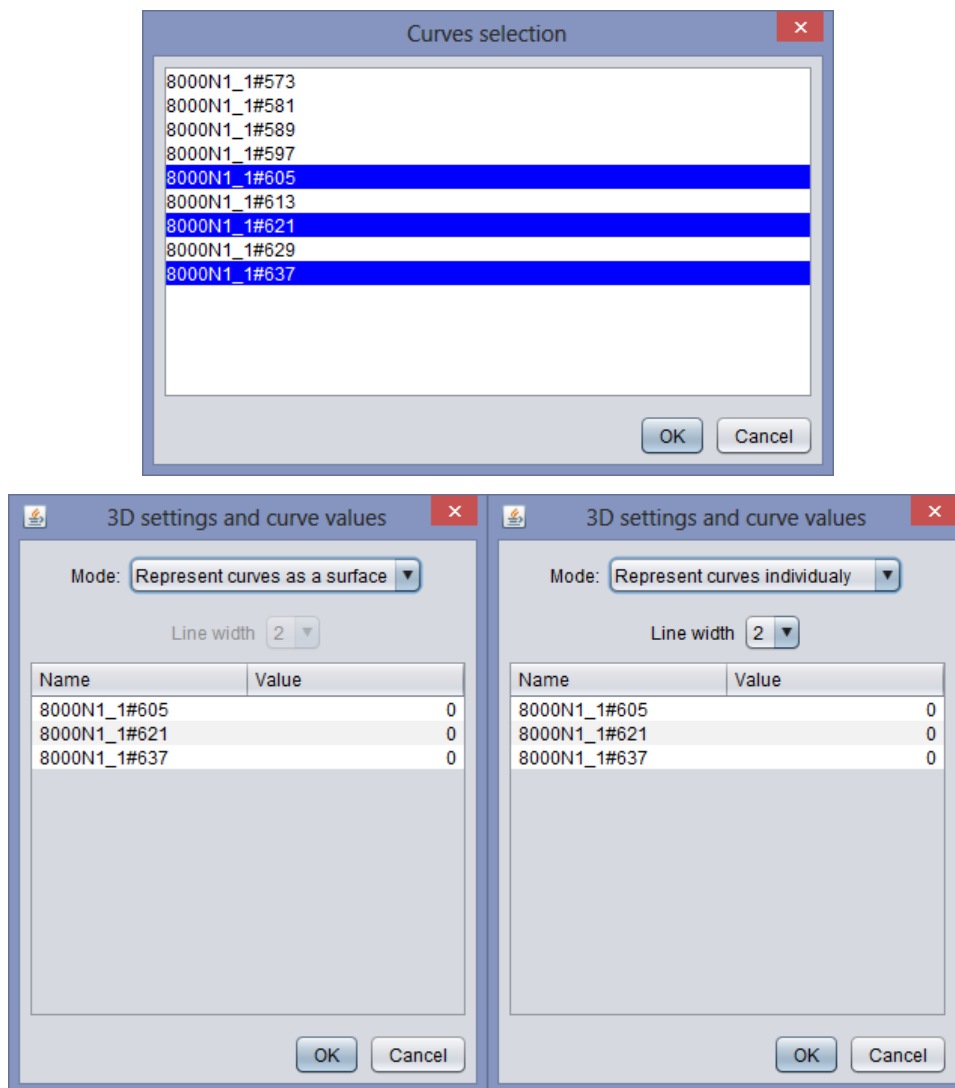


Figure 138 - Select Curves window for 3D plot and settings windows

The “Value” for each curve can be changed.

The curves can be represented individually or as a surface. If represented individually, the Line width of the curves can be change.

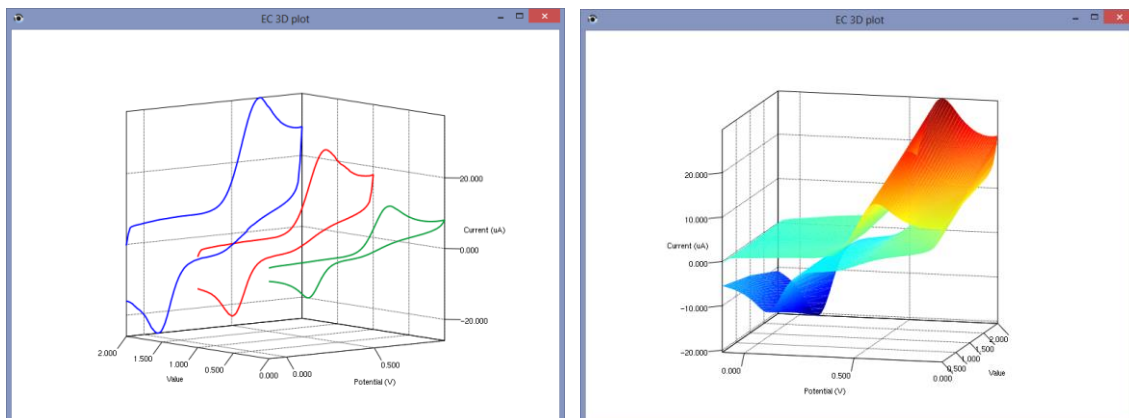


Figure 139 - 3D plots

Tips for managing the plot in this window are described below:

- Rotate:* Left click and drag mouse
- Scale:* Roll mouse wheel
- Z Shift:* Right click and drag mouse
- Animate:* Double left click
- Stop Animate:* Left click
- Save as .png:* click “s” on the keyboard

5.4.5.2 OCP data

Using “Linear Polarization Resistance” technique (LPR), OCP data will be presented on a real time pop-up window. This window can be activated or deactivated before running the experiment, by clicking on “View → OCP data” and selecting yes or no.

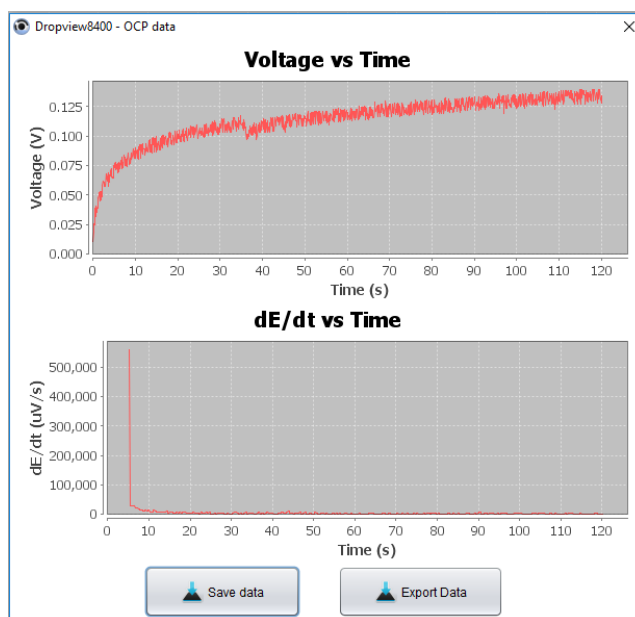


Figure 140 - OCP data real time window

OCP data recorded can also be exported as *.csv format by clicking the “Export Data” button of the window, as well as, saved by clicking on the “Save data” button. In this case (Save data), user will be required to save two different files, one for the OCP raw data and one for the dE/dt data.

5.4.6 Working with curves

Using the “Curves” menu in the “Menu Bar” or by right clicking on a curve shown in the “Graphics Control Area”, you can change the curve properties or work with the displayed curves.

It is possible to change the **name** and the **colour** of the curve.

Curves can be **visible or not** by selecting the Visibility options.

Curves can be **deleted** with the Erase options.

“**Baseline**” option allows you to find the baseline curve (“create baseline”) from the selected curve by choosing the number of points (double points in Cyclic techniques) on the curve and the order of polynomial fitting desired. Once you have selected all necessary points, a baseline curve is created and now you can subtract from the selected curve this baseline by clicking on “subtract baseline” or you can “remove baseline”.

“**Derivate Curve**” option allows you to derivate vs time a selected curve listed in the “Graphics Control Area”.

“**Subtract**” option allows you to subtract, from the selected curve, other one among those listed in the “Graphics Control Area”.

“**Smooth**” option allows you to apply Savitzky-Golay smoothing to the selected curve.

“**Forward and Backward scan**” option applies to curves recorded using a differential electrochemical technique, and displays the original forward and backward curves.

“Corrosion -> Analysis” available only for LSV, CV and LPR curves, allows the user to change the representation of the curve to **Corrosion** view and shows the user a dialog where he can see the calculated values of “Ecorr” and “Rp” and is able to introduce the values of the “Surface area”, “Equivalent weight” and “Density” (the values are only saved in the curve and used for calculus after click on Save parameters). In the same dialog, the user can choose between a Tafel Slope analysis or a Fit analysis over the corrosion plot.

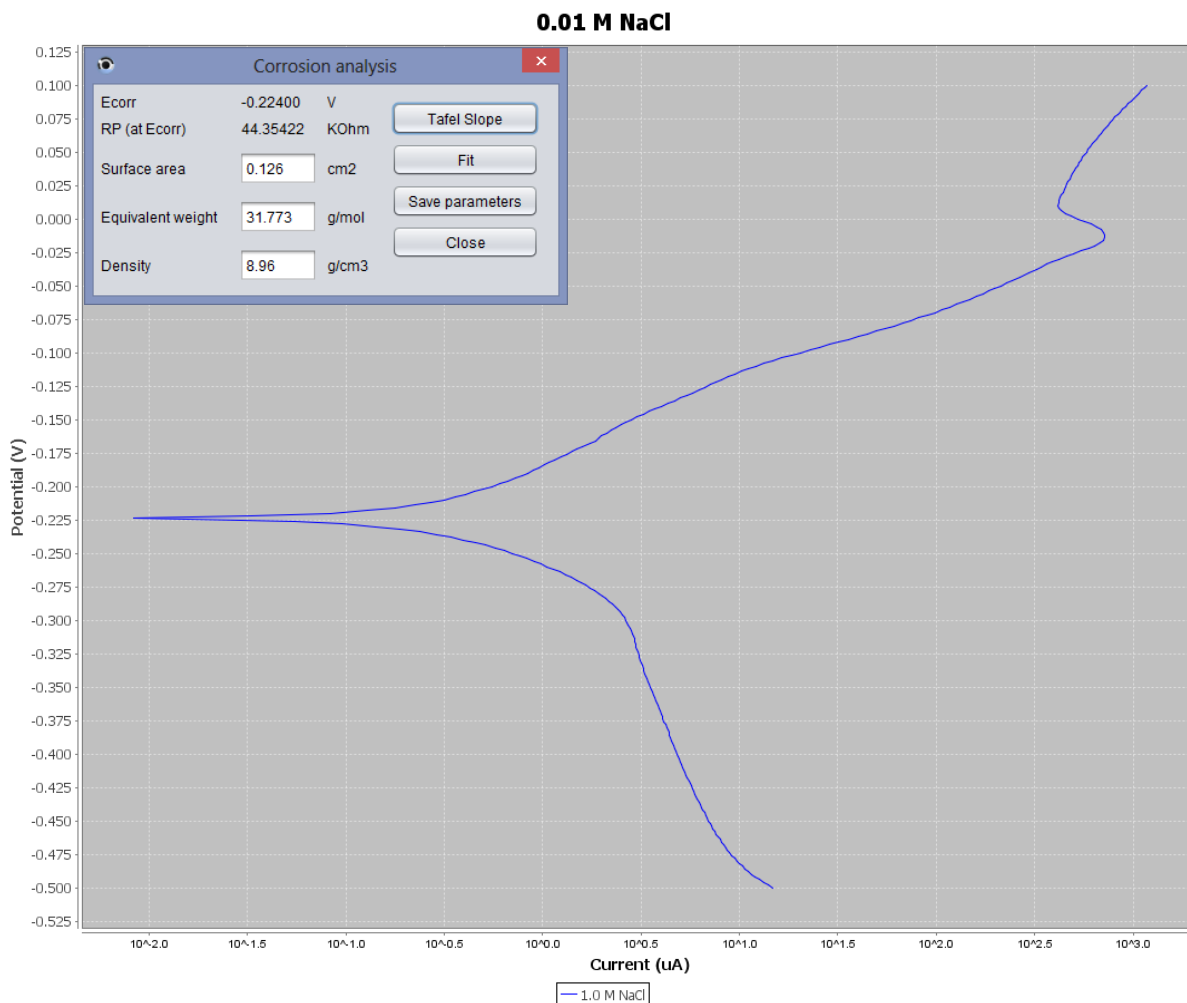


Figure 141 - Basic Tafel analysis

“Tafel Slope” and “Fit” options shows at first the following information to the user:

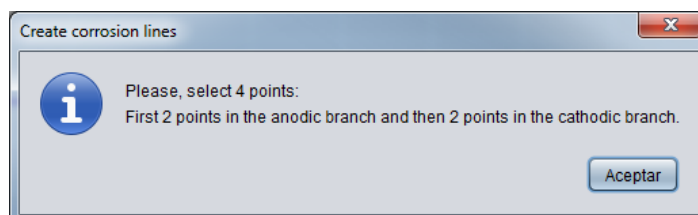


Figure 142 - Corrosion lines dialog

And, after selecting the points, the corrosion lines (cathodic and anodic) are drawn and the crossing point is calculated and showed in the plot. Beside that, in the case of “Fit”, a fitting curve is plotted over the Experimental data and on both cases, a series of calculations are realized and a more complete dialog is showed to the user.

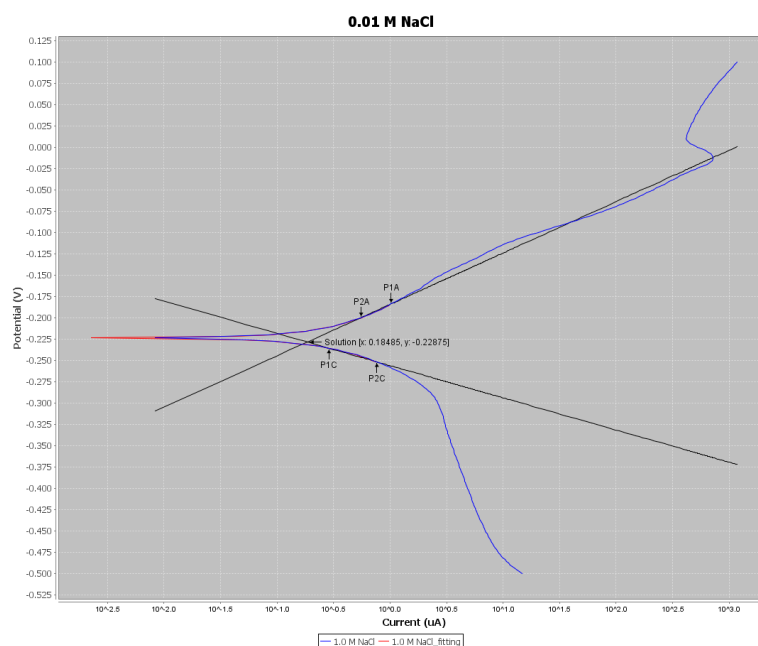
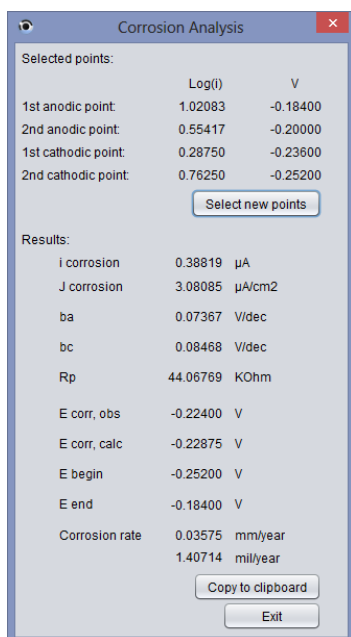
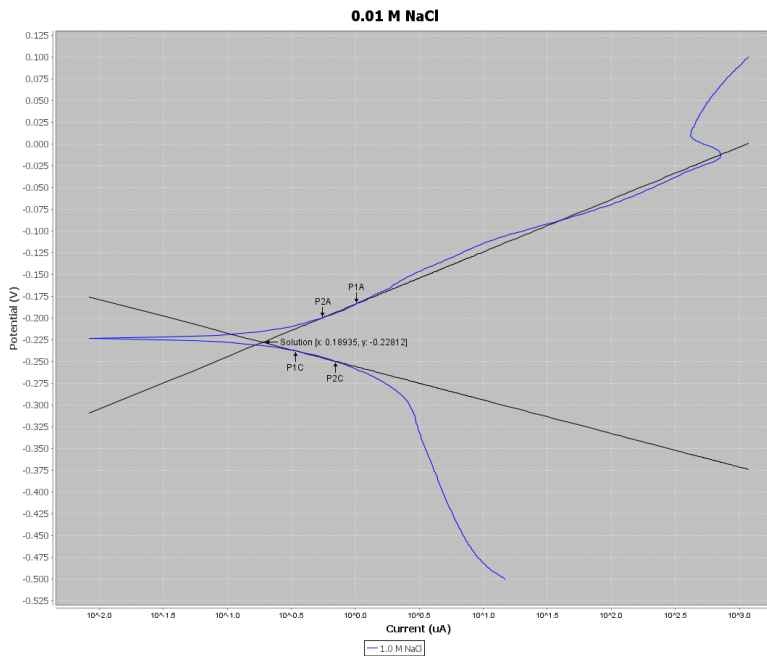
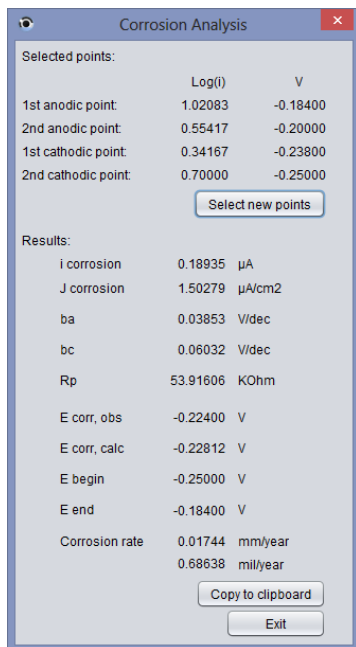


Figure 143 - Tafel Slope (up) and Fit (down) analysis

“Erase Corrosion lines” option is available under right click button over selected curve.

The Tafel slope analysis provides a quick estimation of the corrosion rate and the polarization resistance. The corrosion rate is calculated from the estimated corrosion current, i_{corr} , obtained from the intercept of the two linear segment of the Tafel slope. Selecting the Fit analysis, the fit also performs a curve fit based on the Butler-Volmer expression which allows for a more accurate determination of the corrosion current, polarization resistance and corrosion rate.

In the Corrosion Analysis Dialog, the user can see, first off all, the coordinates of the selected plot, and is possible to select again the points by click on “Select new points” button. In the Results section, the following information is showed, after calculations:

i corrosion: Current at the intersection of cathodic and anodic Tafel lines.

J corrosion: Density of current.

b_c : Cathodic slope.

b_a : anodic slope.

R_p : Resistance polarization.

$E_{corr, obs}$: Corrosion potential at minimum current.

$E_{corr, calc}$: Corrosion potential at the intersection of cathodic and anodic Tafel lines.

E begin: 2nd cathodic point.

E end: 1st anodic point.

Corrosion rate: Rate of Corrosion.

“**Corrosion -> Set parameters**” available only for LSV, CV and LPR curves, allows the user to set the same values of the “Surface area”, “Equivalent weight” and “Density” to all the curves plotted on graphic window (or selected ones). The values are only saved in the curve after click on “Set”.

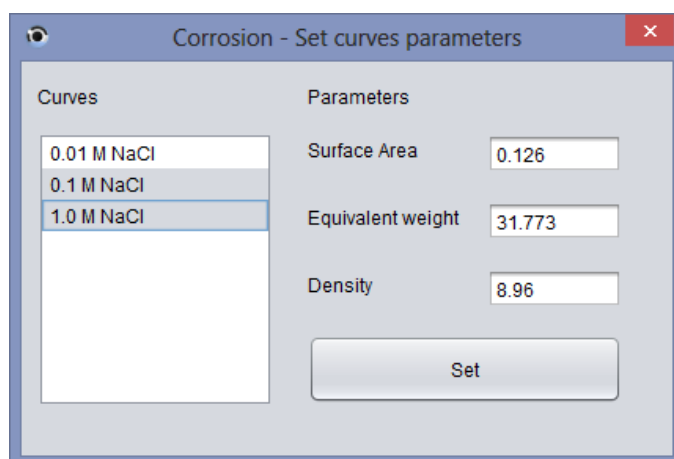


Figure 144 - Corrosion Set parameters panel

“**PSA graph**” option applies to curves recorded using the Potentiometric Stripping Analysis techniques, and allows to change the graph view between the “E vs. t” plot and the “dt/dE vs. E” plot.

Data of the selected curve can be **exported** to a *.csv file with “Export” option or can be copied to clipboard with “Copy to clipboard” option. With “Export all graphic window curves...” option, all the displayed curves in the selected graphic window will be exported to a *.csv file.

If “**Remove curves on run**” is selected, all the displayed curves are deleted when a new scan starts; if it is not selected, curves recorded in a new scan overlay the displayed curves.

5.4.7 Data Analysis: Measurement tools

Peak data are shown in “Data Analysis” tab of “Parameters and Data Analysis Area”. Each peak is labelled and data are displayed below its corresponding curve name.

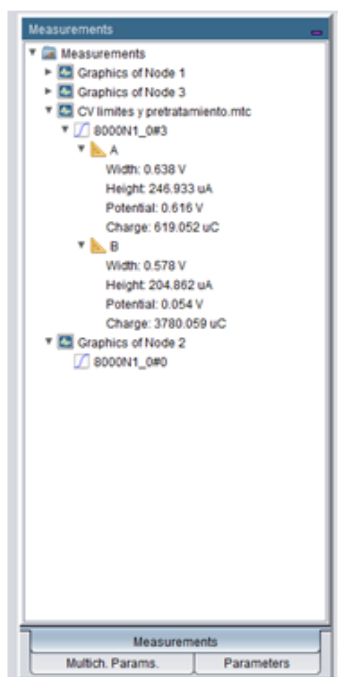


Figure 145 – Data Analysis Tab

Peak measurement tools are shown in the “Data Analysis” menu in the “Menu Bar” and also in each graphic window in the Graphics Display Area. The Data Analysis tools are:



OnCurve measurement tool

Mark peaks (curve baseline). Click to select; right click to unselect.



Free measurement tool

Mark peaks (free baseline). Click to select; right click to unselect.



Step measurement tool

Mark levels. Click to select; right click to unselect. To measure a level, first mark the baseline (2 points) and then select the highest point of the level.



Automatic peak measurement tool

Mark peaks (automatic). Click to mark all the relevant peaks automatically.

The available information is:

- **Height** of the peak from the baseline of the measurement.
- **Width*** of the peak at half height from the baseline of the measurement (not available with “Step measurement tool”).
- **Position** at which the maximum of the peak is.
- **Charge*** as the area under the peak and the baseline of the measurement curve respect to the time (voltammetric and amperometric techniques).
- **Area*** under the peak curve respect to the X axis
- **Peak Area*** as the area under the peak and the baseline of the measurement. The same as Charge in Amperometric techniques.
- **Start** as the first point selected for peak measurement
- **End** as the last point selected for peak measurement

*Not available on “Step measurement Tool”.

“Export measurements...” option in “Data Analysis” menu of “Menu Bar” allows you to export the measurement results to a *.csv file.

5.5 Script Programming

DropView 8400 allows **configuring and programming measurement sequences** by using the Script tool (“Script” menu in the “Menu Bar”).

Configuration must be made with the “Script editor...” tool.

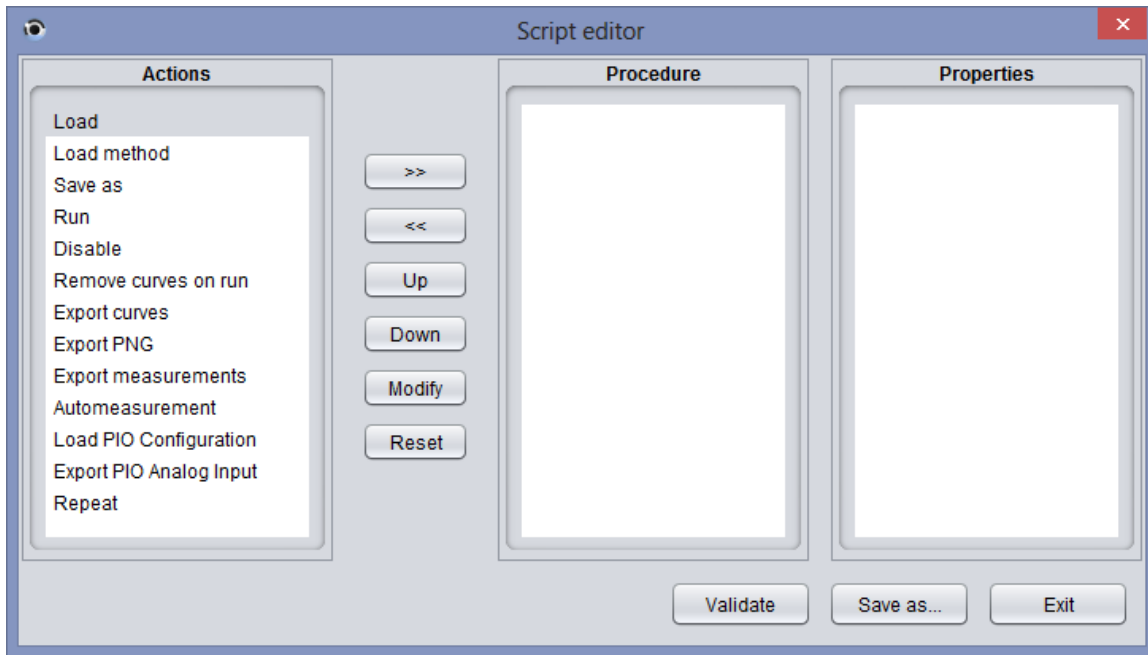


Figure 146 - Script Editor

In order to **program a sequence of actions** or measurements, you must add the chosen actions from the “Actions” box to the “Procedure” box, in the adequate order starting from top to bottom (you can later modify their position with the “Up” and “Down” buttons). Once an action is added to “Procedure”, if it is a file-dependent one such as “Load method” (where a method file must be selected) or “Save as” (where a file name and saving location must be indicated) you will be prompted to select, name, locate, etc. the files by emerging windows that will guide you through all the process. The “Properties” box shows the specific properties of each programmed Action by clicking on it. In order to modify the properties, a “Modify” button is available.

The script can be manually **validated** by using the “Validate” button. The script is automatically validated before it is being executed, when it is loaded and when it is saved. In case of occurring an error during the validation process, an emerging window will show where the error is located.

The edited script can be **executed** by clicking on “Execute” option.

Once the script is edited, you can click on “Save as...” and save the file (extension *.scr). Load of saved script files can be done by clicking on “Load...” option. Also, a script can be executed directly from a saved file by clicking on “Load and execute...” option.

5.5.1 Script Programming Commands

The following Commands are available in the Script editor.

- **Load:** To load a previous saved technique.

- **Load method:** To load a previous saved method.
- **Save as:** After Run, to save the results in a DropView format file.
- **Run:** To start the experiment.
- **Disable:** Not supported by this potentiostats models.
- **Remove curves on run:** To remove all existing curves before a run
- **Export curves:** To export the data of the curves in .csv format.
- **Export PNG:** To export the curves as an image in .png format
- **Export measurements:** To export the measurement results in .csv format.
- **Automeasurement:** to search and measure peaks automatically.
- **Load PIO Configuration:** To load a PIO configuration file to be execute during the run (see 5.6 section).
- **Export PIO Analog Input:** To export the analog input incoming data in .csv format If this option has been configured in the loades PIO configuration file (see 5.6 section).
- **Repeat:** This command repeats the following “n” number of Commands (Orders), a specified number of Times.

5.6 External Digital and Analog Input/Output

The Digital and Analog Inputs/Outputs can be configured with the “**Peripheral Configuration**” option in “Devices” menu of the “Menu Bar”. The displayed window allows you to enable or not the desired Programmable I/O (PIO) pins. You can also save a specific configuration in order to add for example into a script (see previous section 5.5) or you can load a previous saved PIO file.

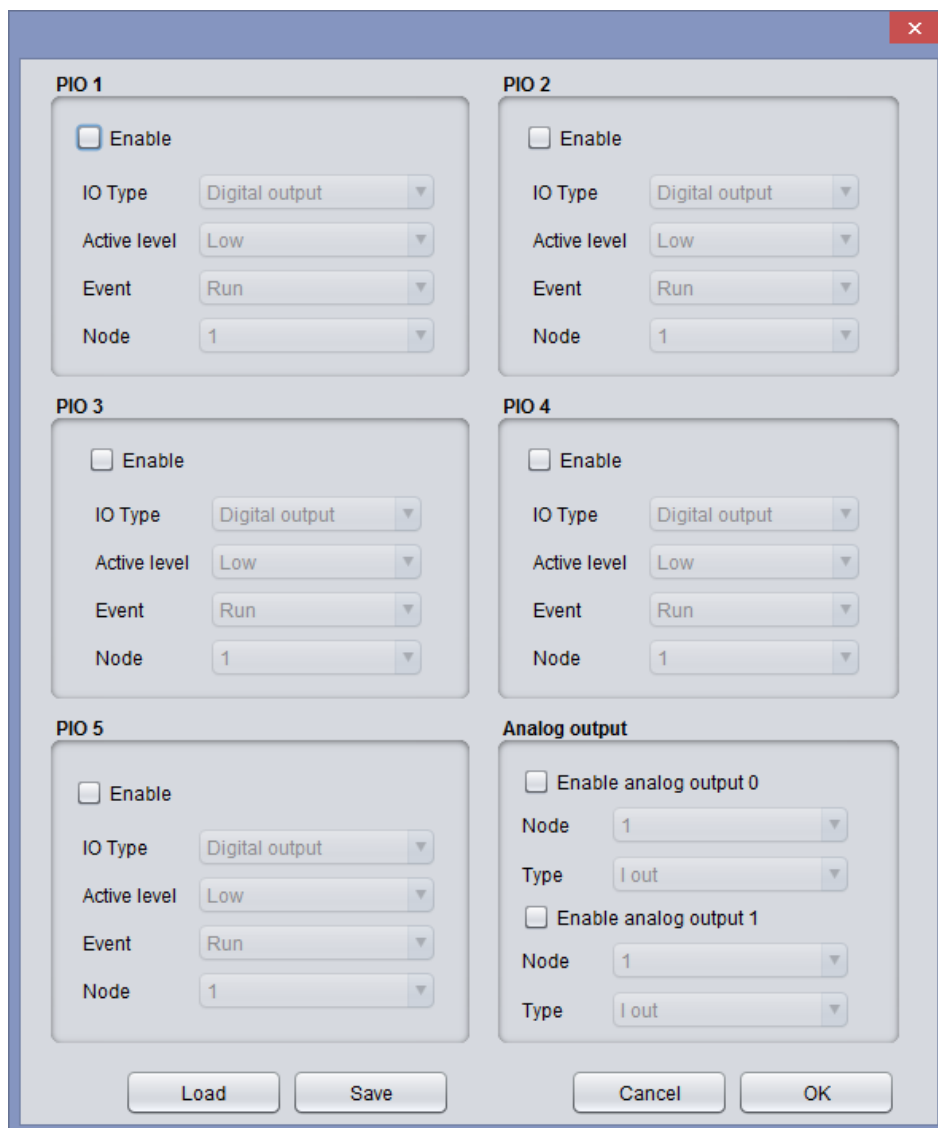


Figure 147 - Setup IO pins window

The “IO Type” option allows you to select the pin to be a Digital input, Digital output or Analog input.

If “**Digital output**” or “**Digital input**” is enabled, you can select “Active Level” High (signal) or Low (no signal) and associate an “Event” when this level occurs. The available events are:

OUTPUT	INPUT
Run	Run
Stop	Stop
Pause	Pause
Conditioning time	
Deposition time	
Equilibration time	
Measurement time	

Each enabled PIO must be associated to one of the enables nodes.

If “**Analog Input**” is enabled, the input voltage versus time is registered and displayed in an emerging window. Registry starts with the beginning of the potentiostat measurement. The allowed voltage range for the “Analog input” is from 0 to 3.3 V, with 3.3 mV precision.

If any of the “**Analog Output**” is enabled, the current or potential registered on the selected node is sent in voltage (from 0 to 3.3 V) through the pin of the corresponding “Analog Output”.

The voltage sent for registered 0 V or 0 A is always 1.65 V (half of total Analog Output range, which is 3.3 V).

The voltage/current scale is always $0.825V / (\text{current range})$. Current range must not be set in “Auto” if “Analog Output” is used, but in any of the nine fixed current ranges. The following examples show the voltage sent depending on the selected current range:

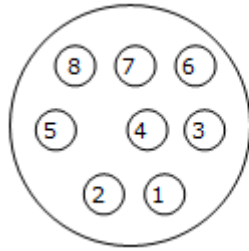
Current Range: 10 μA	
Registered Current	Voltage Sent
+40 μA	3.300 V
+20 μA	2.475 V
0 μA	1.650 V
-20 μA	0.825V
-40 μA	0.000 V

Current Range: 100 nA	
Registered Current	Voltage Sent
+400 nA	3.300 V
+200 nA	2.475 V
0 nA	1.650 V
-200 nA	0.825 V
-400 nA	0.000 V

For registered voltages, -4.096 V in the potentiostat corresponds to 0 V in the Analog Outputs, and +4.096 V corresponds to 3.3 V in the Analog Outputs. The following example shows the voltage sent depending on the registered voltage:

Galvanostatic mode	
Registered Voltage	Voltage Sent
+4.096 V	3.300 V
+2.048 V	2.475 V
0.000 V	1.650 V
-2.048 V	0.825 V
-4.096 V	0.000 V

The pins position in the I/O connector is shown in the next Figure:



1: Ground	5: PIO 5
2: AO0	6: PIO 1
3: AO1	7: PIO 2
4: PIO 4	8: PIO 3

Figure 148 - I/O Connector

5.7 Manual Control Script Programming

DropView 8400 allows **configuring and programming sequences of Commands and their related measurements** by using the Manual Control Script tool (“MC-Scripts” menu in the “Menu Bar”).

Configuration must be done with the “Manual Control Script Editor...” tool.

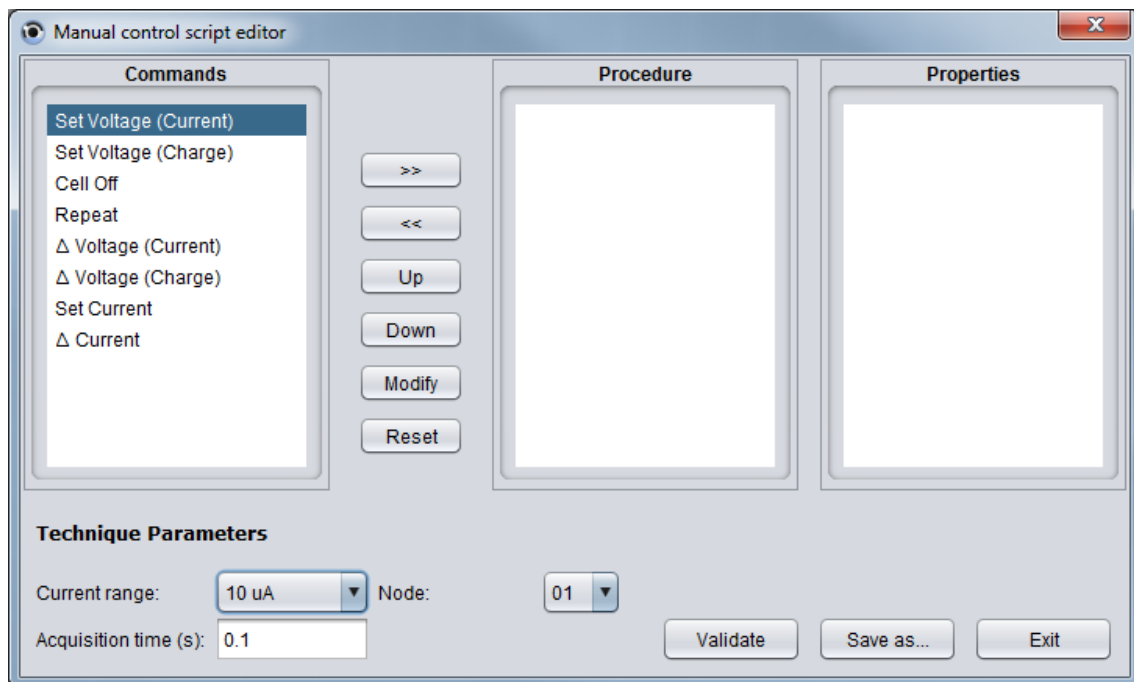


Figure 149 - Manual Control Script Editor

In order to **program a sequence of Commands** and their related measurements, the chosen commands must be added from the “Commands” box to the “Procedure” box, in the adequate order starting from top to bottom (their position can be later modified with the “Up” and “Down” buttons).

Every time a command is added to the “Procedure” box, you will be prompted, by an emerging window, to fill the parameter values that the command needs to work.

The “Properties” box shows the specific properties of each programmed Command by clicking on it.

The script can be applied only to one Node, which can be selected.

The script can be manually **validated** by using the “Validate” button. The script is automatically validated before it is executed, when it is loaded and when it is saved. In case of occurring an error during the validation process, an emerging window will show where the error is located.

Once the script is edited, you can select “Save as...” and save the manual control script in a file (extension “.mcs”). Load of previously saved scripts can be done by choosing the “Load...” option of the menu. A script can also be loaded and executed directly from a saved file by selecting the “Load and execute...” option.

The edited script can be **executed** by clicking on “Execute” in the “Manual Control” menu. Doing this, an emerging window will display the recorded graphic of the experiment. Once the experiment is finished (or Aborted by the user), by clicking on “Save data” the recorded curve can be saved as a “.mcd” file. This “.mcd” file can later be opened with the “Open File Graphic” button (see 5.4.3).

5.7.1 Manual Control Script Programming Commands

The following Commands are available in the Manual Control Script.

- **Set voltage (Current):** This command activates the cell and sets a voltage Value (in mV), for a specified Time (in s), or until any of the specified Cutoff current values (in μA) is reached.
- **Set voltage (Charge):** This command works the same way as the previous one, but the Cutoff is a charge value (in μC).
- **Set current:** This command activates the cell and sets a current Value (in μA), for a specified Time (in s), or until any of the specified Cutoff voltage values (in mV) is reached.
- **Cell Off:** This command sets the cell off for the specified Time (in s), or until any of the specified Cutoff current values (in μA or in mV, depending on the “Limit type” selected) is reached.
- **Δ Voltage (Current):** This command activates the cell and programs an increase or decrease of applied potential for a specified time. The configurable parameters to do this are:
 - Start potential (in mV).
 - Total Time of the experiment (in s).

- Potential Step (in mV). *Positive value* for potential increase, or *negative value* for potential decrease.
- Step time (in s).

The command is active for the specified Time, or until any of the specified Cutoff current values (in μA) is reached.

- **Δ Voltage (Charge):** This command works as the previous one, but the Cutoff is a charge value (in μC).
- **Δ Current:** This command activates the cell and programs an increase or decrease of applied current for a specified time. The configurable parameters to do this are:
 - Start current (in μA).
 - Total Time of the experiment (in s).
 - Current Step (in μA). *Positive value* for potential increase, or *negative value* for potential decrease.
 - Step time (in s).

The command is active for the specified Time, or until any of the specified Cutoff potential values (in mV) is reached.

- **Repeat:** This command repeats the following “n” number of Commands (Orders), a specified number of Times.

5.7.2 Technique Parameters

Some general “**Technique Parameters**” must also be programmed, and are applied to the whole Procedure:

- **Current range:** allows selecting the adequate current range.
- **Acquisition time:** sets up the interval time each point of the curve is registered and displayed in the graphic. Minimum value is 0.1 s.
- **Node:** The node to use in the Manual Control Script.

5.7.3 Examples

Example 1: Multipulsed Amperometric Detection + Linear Sweep voltammetry

Figure 26 shows a Manual Control Script that simulates a multipulsed amperometric detection followed by a linear sweep voltammetry.

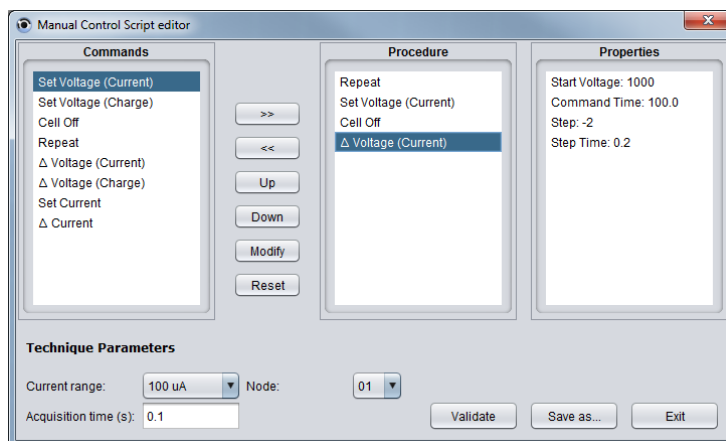
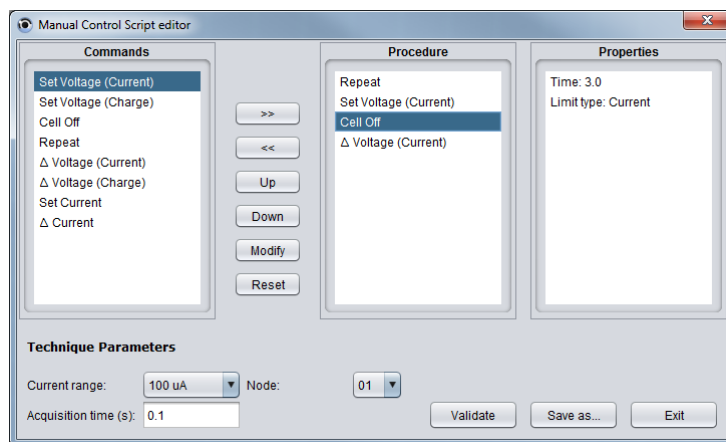
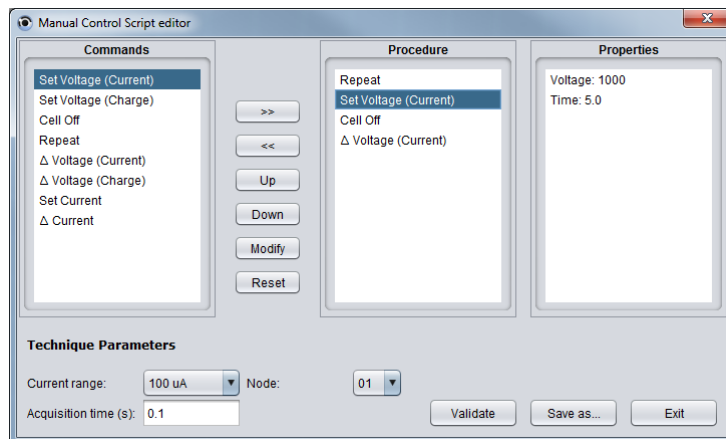
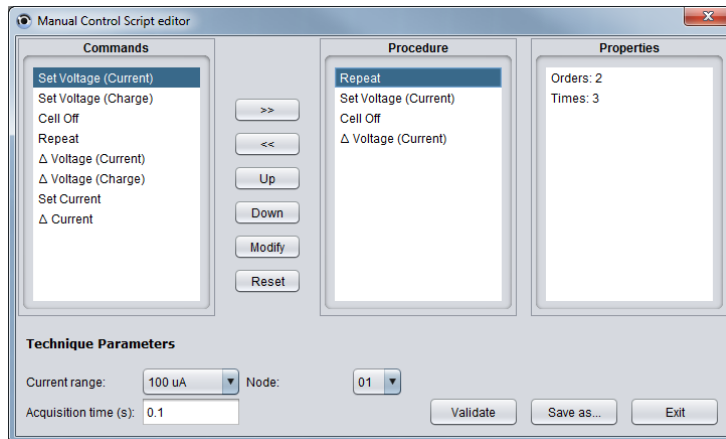


Figure 150 - Manual Control Script Example 1

After executing the script using a 10 kOhm resistance connected between WE and CE+RE, the result is the one showed in Figure 27.

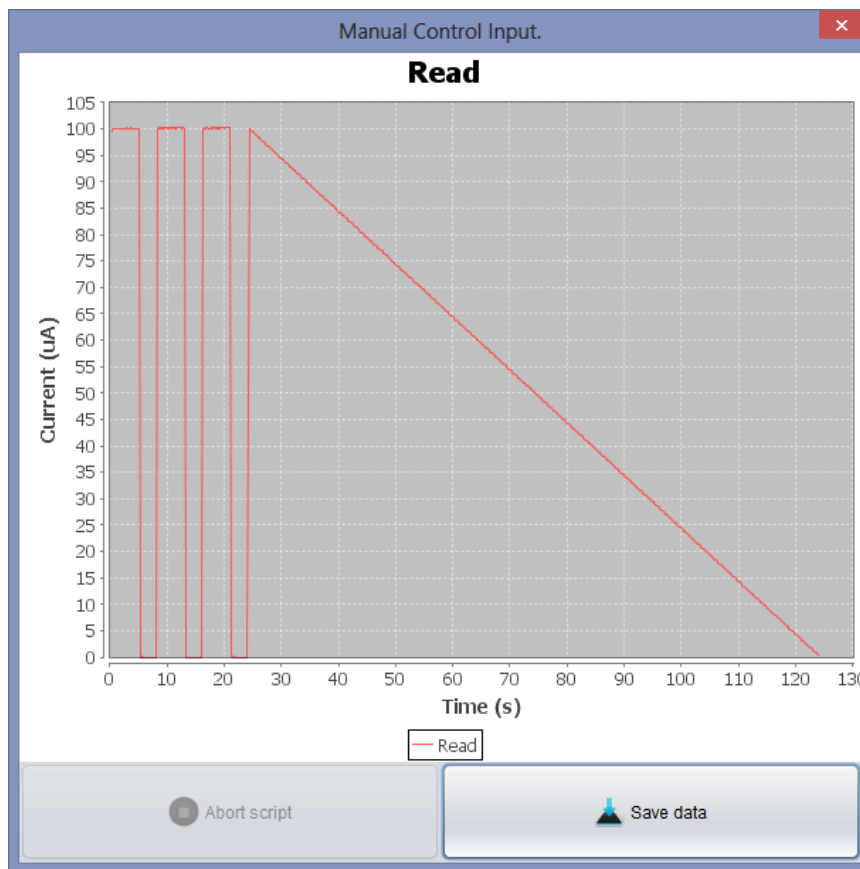


Figure 151 - Manual Control Script Example 1 Result

Example 2: Charge/Discharge Li-ion battery potential profile

Figure 28 shows the graphic curve obtained after executing a Manual Control Script that makes a current charge/discharge potential profile (with cutoff values), using a Li-ion battery.

The script Repeats (10 times) a Set current of 50 mA for 1000 s (with a Cutoff at 3.4 V) followed by a Set current of -50 mA for 1000 s (with a Cutoff at 3.1 V).

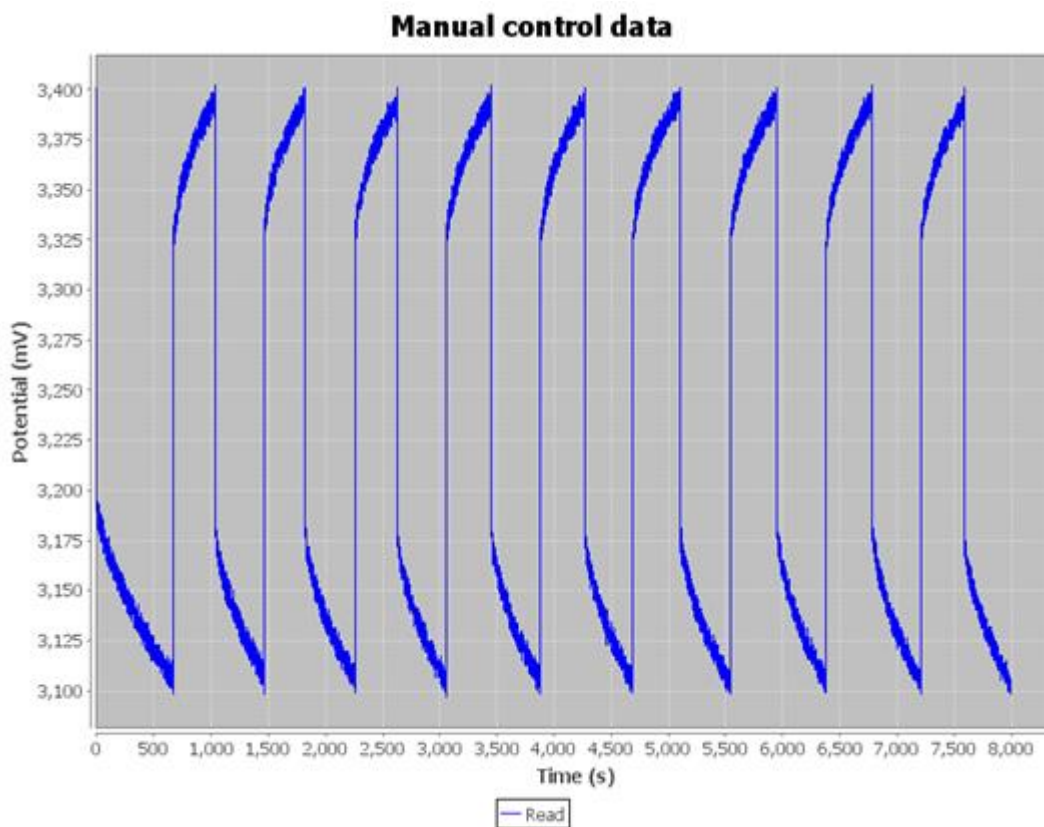


Figure 152 - Manual Control Script Example 2 Result

Figure 28 is a “.png” image (see 5.4.4) of the “.mcd” file opened with the “Open File Graphic” button.

6 INSTRUMENT SPECIFICATIONS

- Power	Li-ion Battery (6150 mAh) USB DC charger adapter compatible (5 V, 15 W)
- PC interface	Wireless, USB
- Operating modes	8x 1 Channel Potentiostat/Galvanostat 1x 8 Channel Potentiostat
- DC-Potential range	±4 V
- Current ranges (potentiostat)	±1 nA to ±100 mA (9 ranges)
- Maximum measurable current	±80 mA
- Potential ranges (galvanostat)	±100 mV, ±1 V (2 ranges)
- Applied potential resolution:	1 mV
- Measured Current Resolution	0.025 % of current range (1 pA on lowest current range)
- Applied Current Resolution	0.1 % of current output range
- Measured Potential Resolution	0.012 % of potential range
- Potential Accuracy	± 0.2 %
- Current Accuracy	≤ 0.5 % of current range at 100 nA to 1 mA ≤ 1% of current range at 10 mA to 100 mA
- External inputs/outputs	•5 Digital Input/Output pins [PIO 1, PIO 2, PIO 3, PIO 4, PIO 5] •3 Analog Inputs multiplexing PIO1, PIO2, PIO3 •2 Analog Outputs (configurable I-out or E-out)
- Indicators	LCD display in front panel
- Dimensions	22.2 cm x 20.5 cm x 7.5 cm (L x W x H)
- Weight	1.6 kg

6.1 Firmware update

Firmware can be updated with available updates (*.hex file). To update firmware, follow the next steps:

- a) Plug in the μ Stat 8000 via USB and run the program “Firmware uploader uStat 8000” that it is located in Start → All programmes → DropView 8400 → uStat8000_updater.exe

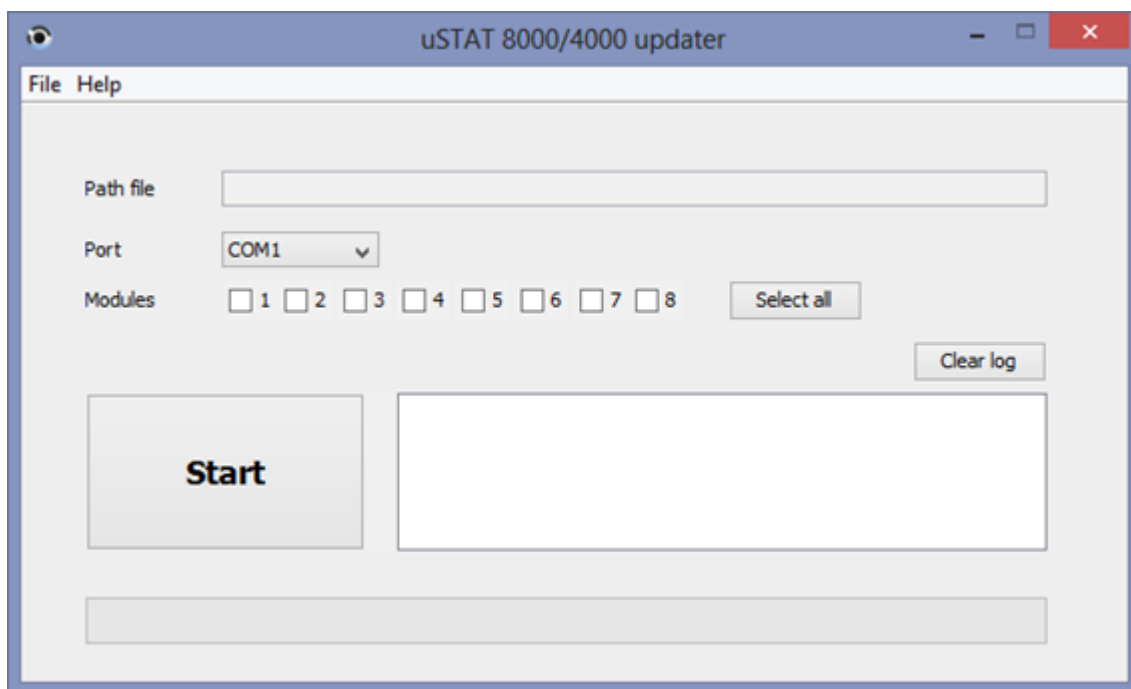


Figure 153 - Firmware uploader uStat 8000

- b) Click on File → Load and browse for the corresponding *.hex file.
- c) Select the COM port where the potentiostat is connected (see Annex I).
- d) Click on “Select all” to update the firmware of all nodes. Click on “Start”. Wait until update is finished successfully. Do not disconnect the μ Stat 8000 while update is in progress. Update can take several minutes.
- e) Turn off the μ Stat 8000. Then turn it on again.
- f) μ Stat 8000 is ready to be used with the updated firmware.

7 ANNEX I: How to find Device Manager in my computer

7.1 Windows 10

Device Manager can be found as follow on **windows 10**, except if classic Start Menu is selected, by right click on the Microsoft logo at the bottom left hand corner of the screen and select Device Manager

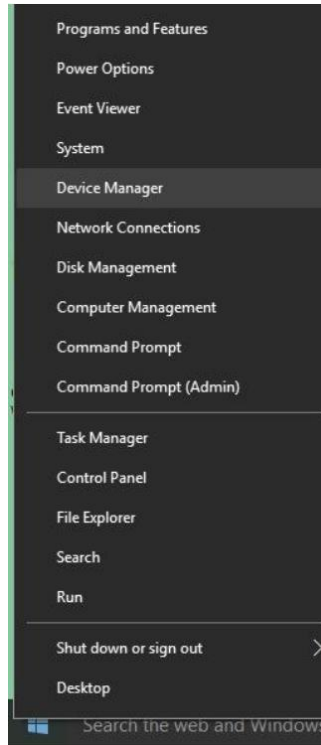


Figure 154 - Device Manager Access on Windows 10

On **windows 10 with classic start menu**, move the mouse to the bottom right hand corner of the screen. When the following window pops up, select the Settings button and then select control panel.

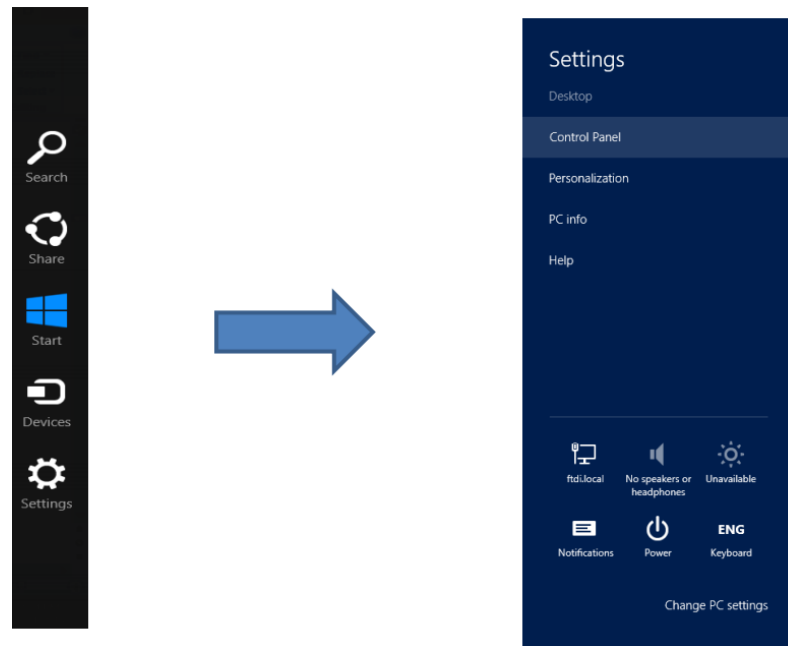


Figure 155 - Settings → control panel

1. From the Control Panel window select Hardware and Sound.

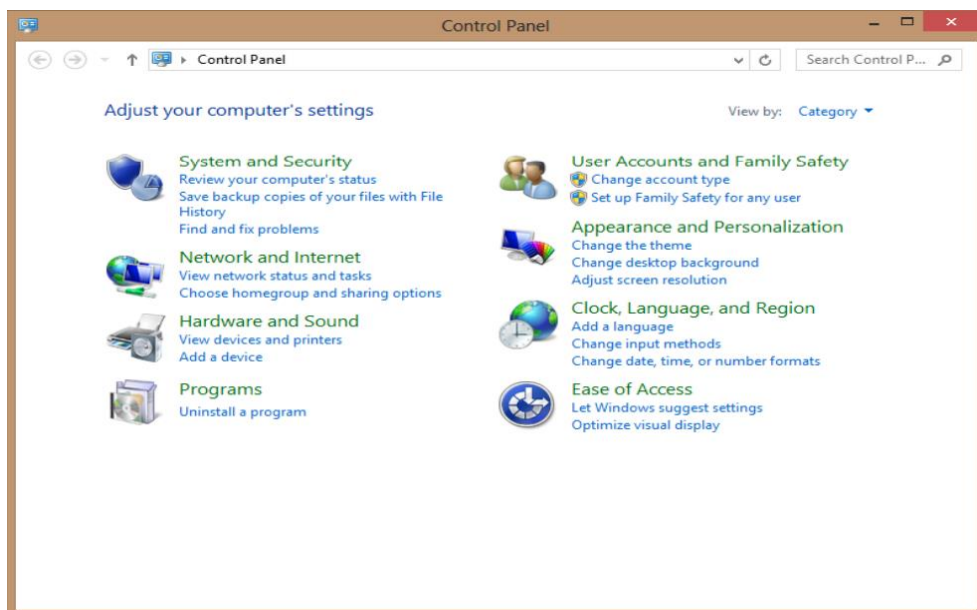


Figure 156 - Control Panel → Hardware and Sound

2. At the next screen select Device Manager, under Devices and Printers option:

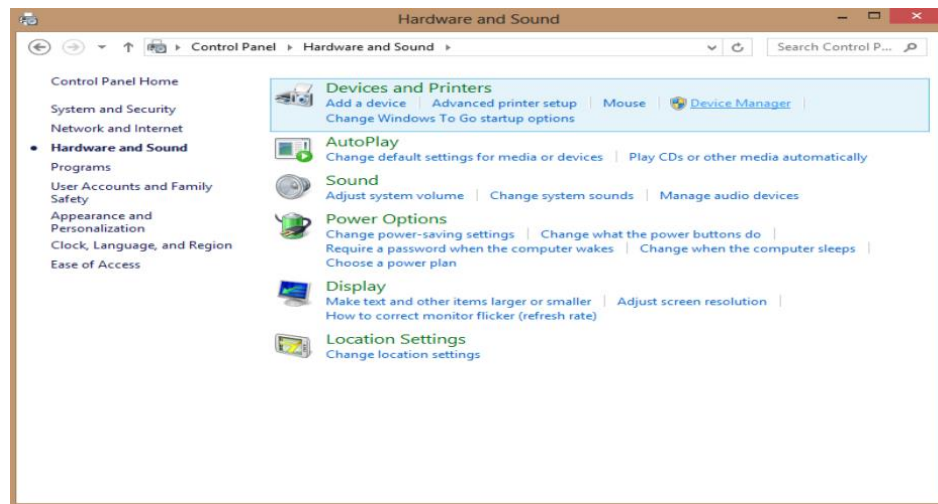


Figure 157 - Hardware and Sound → Devices and Printers → Device Manager

7.2 Windows 8.1

1. On **windows 8.1** move the mouse to the bottom right hand corner of the screen. When the following window pops up, select the Settings button and then select control panel.

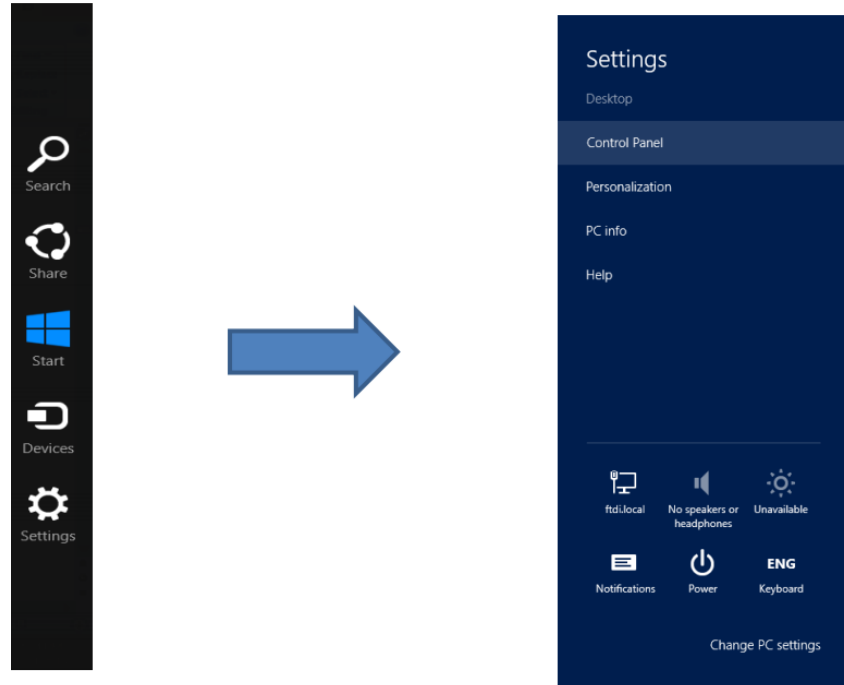


Figure 158 - Settings → control panel

2. From the Control Panel window select Hardware and Sound.

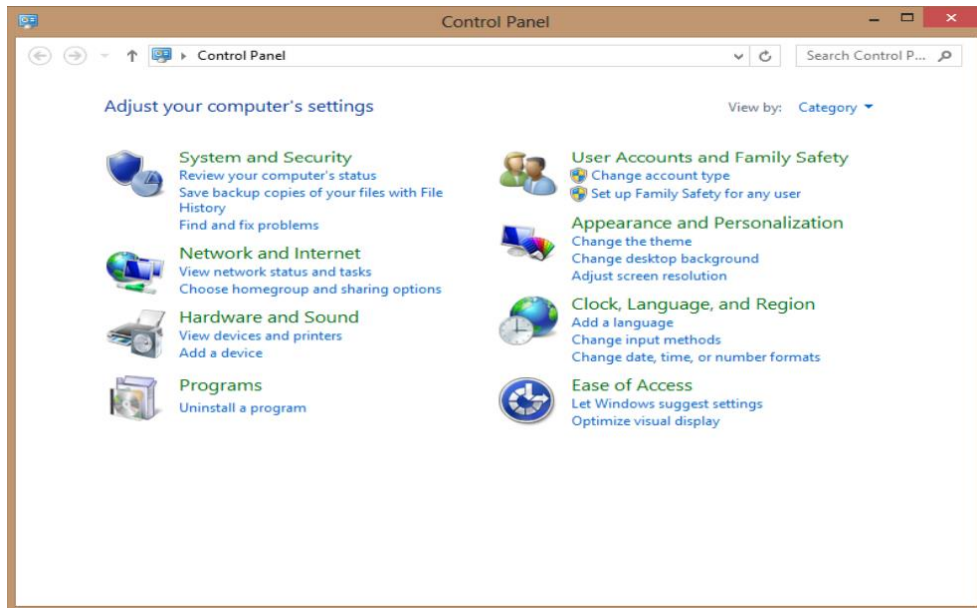


Figure 159 - Control panel → Hardware and Sound

3. At the next screen select Device Manager, under Devices and Printers option:

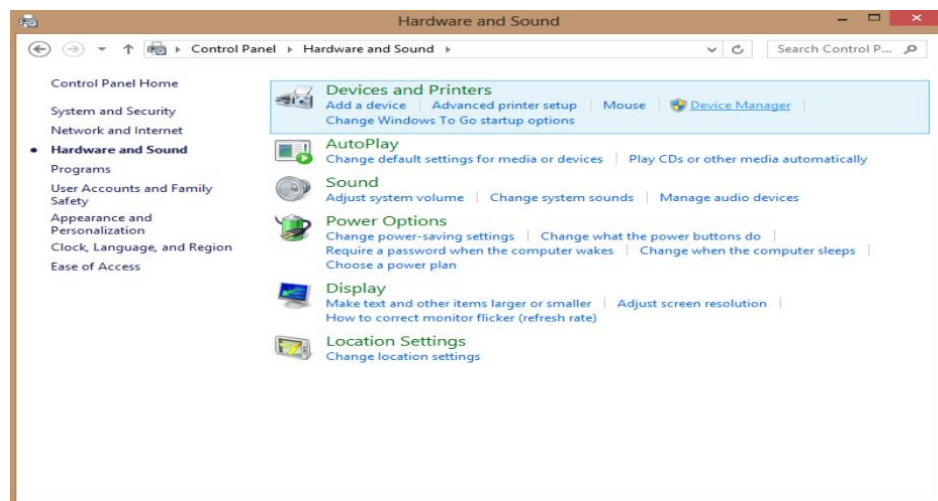


Figure 160 - Hardware and Sound → Devices and Printers → Device Manager

7.3 Windows 8

1. **On Windows 8** - move the mouse to the bottom right hand corner of the screen. When the following window pops up, select the Settings button and then select control panel.

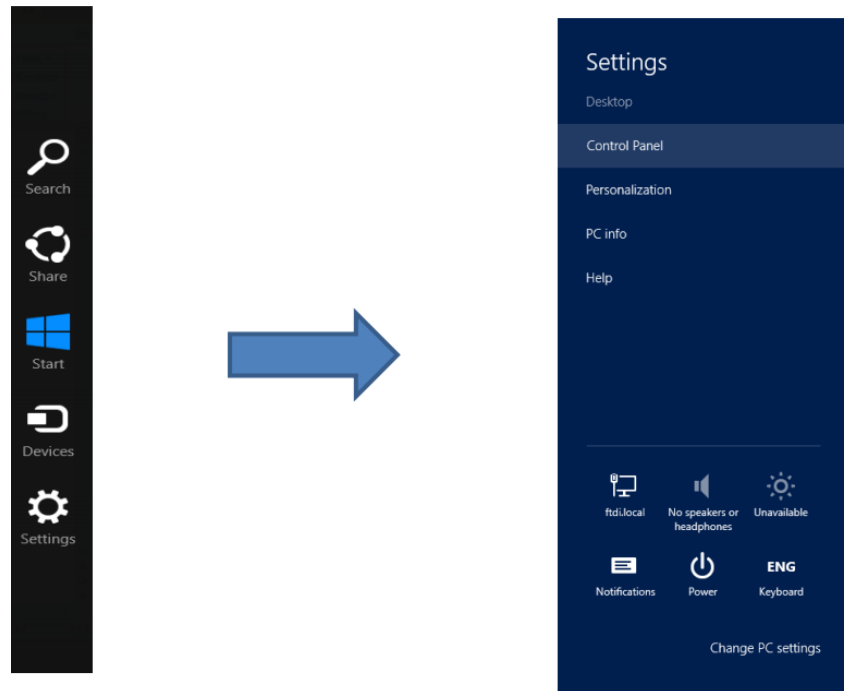


Figure 161 - Settings → control panel

2. From the Control Panel window select Hardware and Sound.

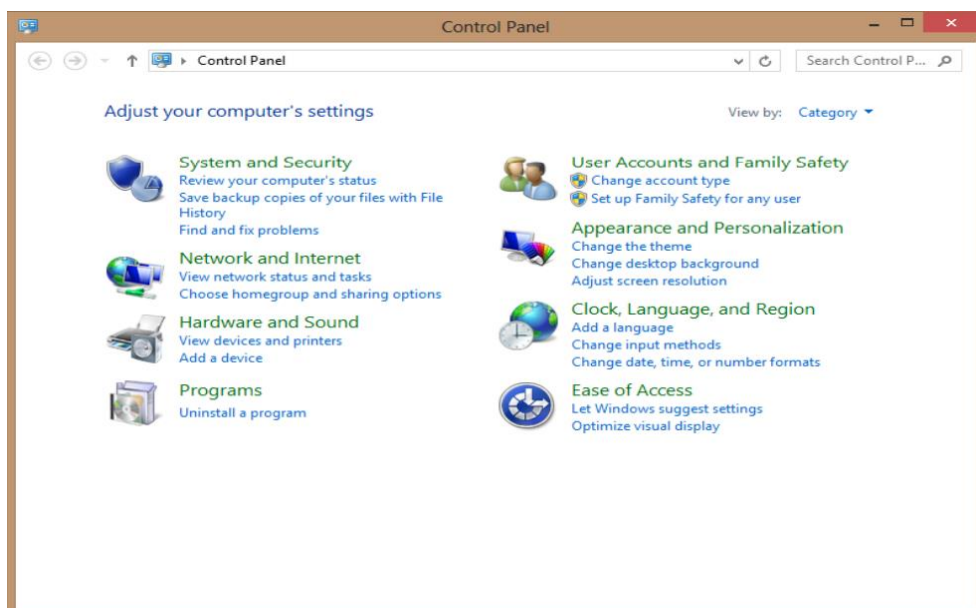


Figure 162 - Control panel → Hardware and Sound

3. At the next screen select Device Manager, under Devices and Printers option:

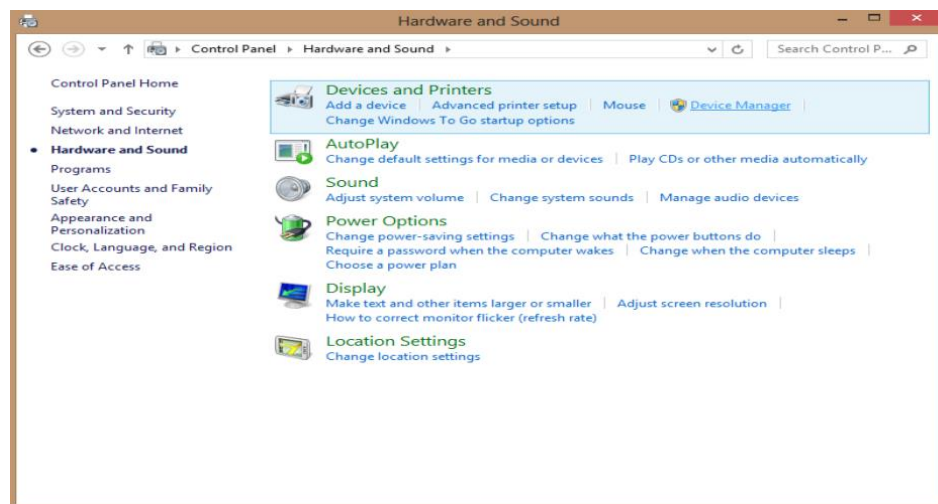


Figure 163 - Hardware and Sound → Devices and Printers → Device Manager

7.4 Windows 7

1. On **Windows 7** - Press the Windows start button to bring up the start menu and select "Control Panel"

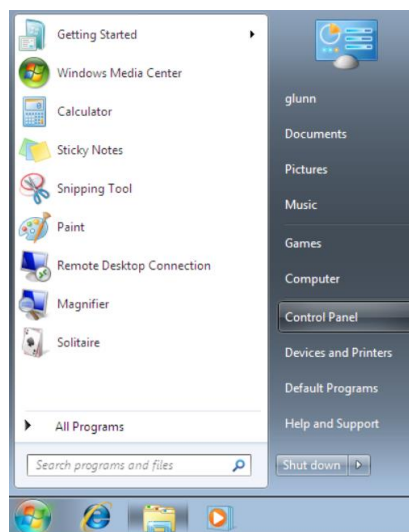


Figure 164 - Access to control panel

2. From the Control Panel window select Hardware and Sound.



Figure 165 - Control panel → Hardware and Sound on windows 7

3. At the next screen select Device Manager, under Devices and Printers option:

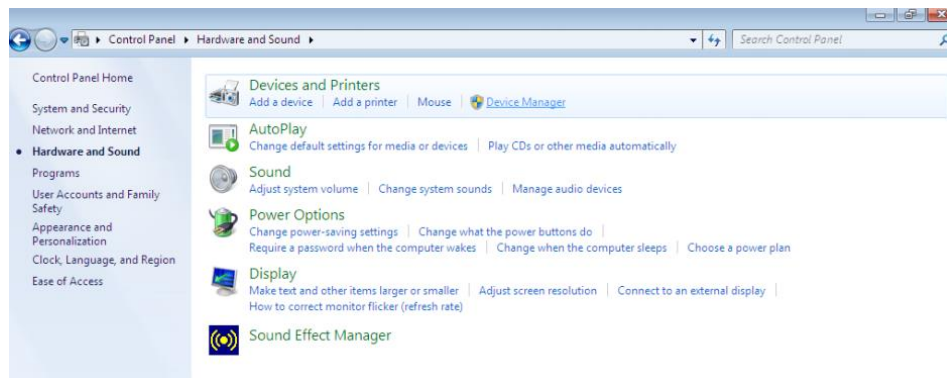


Figure 166 - Hardware and Sound → Devices and Printers → Device Manager on Windows 7

7.5 Windows Vista

1. On **windows Vista** - Press the Windows start button to bring up the start menu and select “Control Panel”

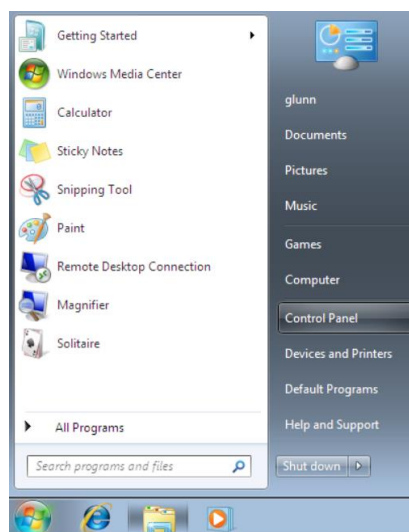


Figure 167 - Access to Control Panel

2. From the Control Panel window select Hardware and Sound.



Figure 168 - Control panel → Hardware and Sound on Windows Vista

3. At the next screen select Device Manager option:

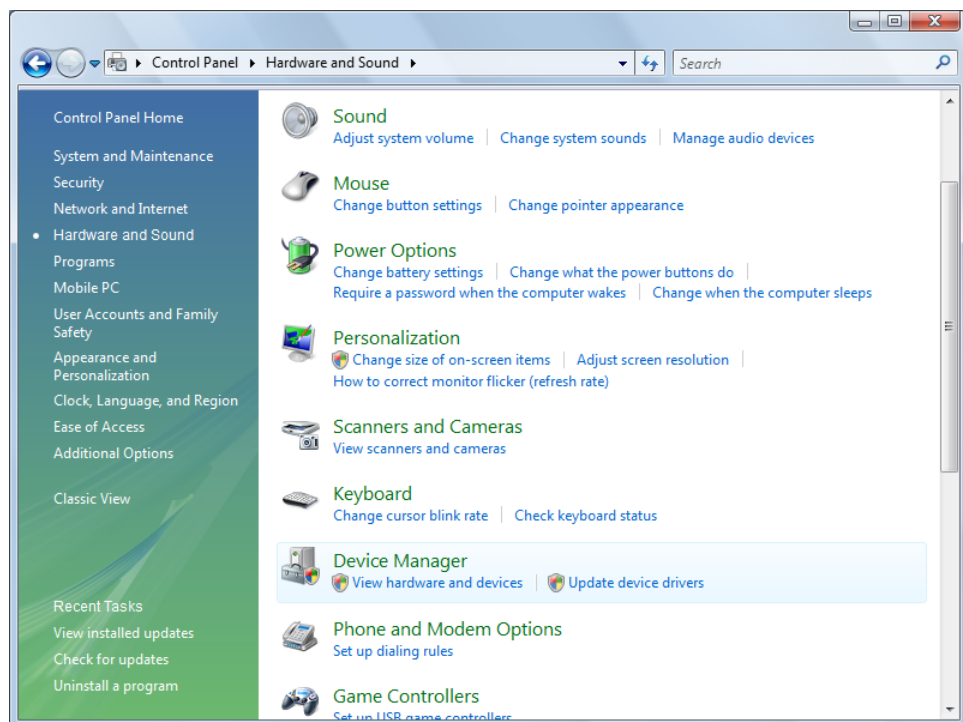


Figure 169 - Hardware and Sound → Device Manager on windows Vista

8 ANNEX II: How to know in which COM port the instrument is

These instructions are for Windows 7. Similar way in XP, Vista, Windows 8, Windows 8.1 or Windows 10.

Go to “Device Manager” following the instruction on previous Annex I section.

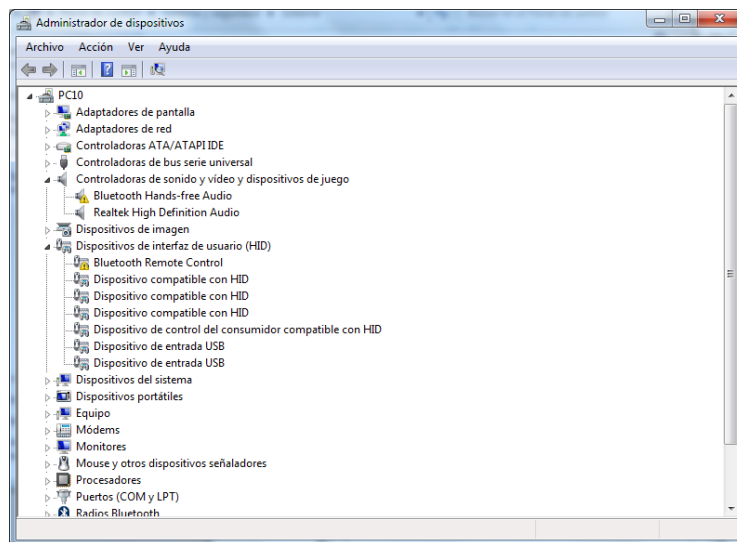


Figure 170 - Device manager

Go to Ports (COM and LPT) and look at the port of your potentiostat.

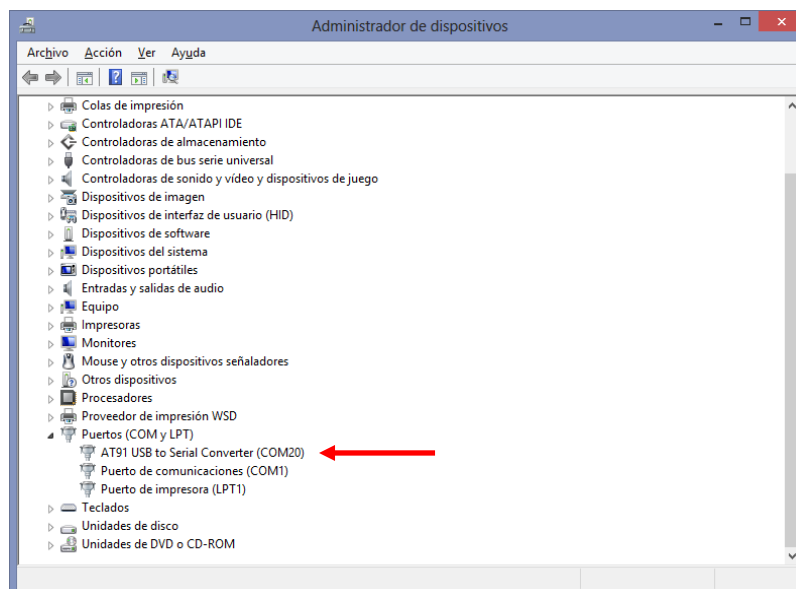
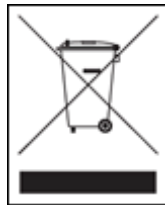


Figure 171 - USB Serial COM Port Number

Look at the list. The number of the port is just in the text. In this example, COM20 is the number of the COM port where the instrument is connected.



Processing of electric and electronic equipment at the end of their service

This symbol, affixed to the product or its packaging, indicates that the product must not be processed with household waste. It must be brought to an electric and electronic waste collection point for recycling and disposal. By ensuring the appropriate disposal of this product you also help in preventing potentially negative consequences for the environment and human health. The recycling of materials helps preserve our natural resources. For further information regarding the recycling of this product, please contact your municipality or local waste disposal centre.