



RST INSTRUMENTS LTD.

VW0420
Analog VW Interface
Instruction Manual

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VW0420 Analog VW Interface

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TABLE OF CONTENTS

1	OVERVIEW	4
2	INSTALLATION	4
2.1	SINGLE POWER SOURCE INSTALLATION	5
3	VW0420 ANALOG VW INTERFACE HOST SOFTWARE.....	6
3.1	GETTING STARTED.....	6
3.2	STATUS.....	6
3.3	SETUP	7
3.4	MONITOR	9
3.5	ENGINEERING UNITS	11
3.6	OUTPUT UNITS	13
4	VW0420 USB TO UART CONTROLLER DRIVER SET INSTALLATION – ADAPTER SN UP TO AND INCLUDING 002071	14
4.1	MICROSOFT™ WINDOWSXP INSTALLATION PROCEDURE	14
4.1.1	VW0420 USB TO UART DEVICE INSTALLATION.....	14
4.1.2	VW0420 USB TO UART CONTROLLER INSTALLATION.....	17
4.2	MICROSOFT™ WINDOWS VISTA, WINDOWS7 AND LATER INSTALLATION PROCEDURE .	21
5	VW0420 USB TO UART CONTROLLER DRIVER SET INSTALLATION – ADAPTER SN 002072 AND GREATER.....	23
5.1	MICROSOFT™ WINDOWSXP INSTALLATION PROCEDURE	24
5.1.1	VW0420 USB TO UART DEVICE INSTALLATION.....	24
5.1.2	VW0420 USB TO UART CONTROLLER INSTALLATION.....	26
5.2	MICROSOFT™ WINDOWS VISTA, WINDOWS7 AND LATER INSTALLATION PROCEDURE .	27
6	TROUBLESHOOTING	31
6.1	CONNECTION PROBLEMS.....	31
6.2	SOFTWARE STABILITY	31
6.3	STATUS BAR MESSAGES	32
7	CONTACT Us.....	33

LIST OF FIGURES

Figure 1 – Wiring Diagram	4
Figure 2 – Wiring Diagram with one power source	5
Figure 3 – Status Tab	7
Figure 4 – Setup Tab	7
Figure 5 – Custom Vibrating Wire Settings	8
Figure 6 – Decrement and Sweep Time options	8
Figure 7 – Monitor Tab	10
Figure 8 – Eng Units Tab	11
Figure 9 – Output Units	13
Figure 10 – USB to UART Controller Driver Set Installation	14
Figure 11 – New Hardware Wizard for Device	15
Figure 12 – New Hardware Wizard for Device	15
Figure 13 – New Hardware Wizard for Device – Choose Driver	16
Figure 14 – New Hardware Wizard for Device – Continue	16
Figure 15 – New Hardware Wizard for Device – File Transfer	17
Figure 16 – New Hardware Wizard for Device – Install Complete	17
Figure 17 – New Hardware Wizard for Controller	18
Figure 18 – New Hardware Wizard for Controller	18
Figure 19 – New Hardware Wizard for Controller – Choose Driver	19
Figure 20 – New Hardware Wizard for Controller – File Transfer	19
Figure 21 – New Hardware Wizard for Controller – Install Complete	20
Figure 22 – New Hardware Installed Confirmation	20
Figure 23 – WindowsXP Device Manager	21
Figure 24 – USB to UART Controller Driver Set Installation	21
Figure 25 – Install Complete	22
Figure 26 – New Hardware Status for Controller	22
Figure 27 – New Hardware Installed Confirmation	22
Figure 28 – Windows Vista, Windows 7 and later Device Manager	23
Figure 29 – Second Gen Driver Set Installation on Windows XP	24
Figure 30 – New Hardware Wizard for USB to UART	24
Figure 31 – New Hardware Wizard for USB to UART – File Transfer	25
Figure 32 – New Hardware Wizard for USB to UART – Install Complete	25
Figure 33 – New Hardware Installed Confirmation	26
Figure 34 – WindowsXP Device Manager	26
Figure 35 – Second Gen Driver Set Installation on Windows Vista, 7 and later	27
Figure 36 – USB to UART Driver Set Installation	27
Figure 37 – USB to UART Driver Set Installation – File Transfer	28
Figure 38 – USB to UART Driver Set Installation – Install Complete	28
Figure 39 – Install Complete	29
Figure 40 – New Hardware Installed Confirmation	29
Figure 41 – Windows Vista, Windows 7 and later Device Manager	30

1 OVERVIEW

The RST VW0420 provides an interface between vibrating wire instruments and factory automation systems which support 4-20 mA sensors. The vibrating wire section measures the natural frequency and temperature of the sensor. The measurements are then converted to engineering units, unit converted as required, and scaled to the 4-20 mA outputs.

2 INSTALLATION

The following diagram shows the typical connections for VW0420 instrument.

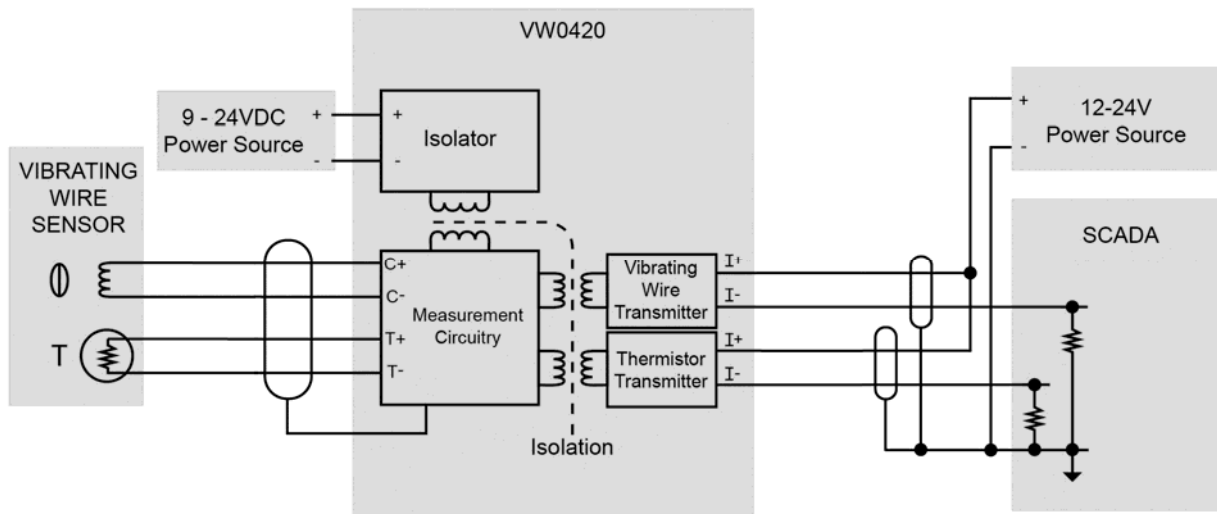


Figure 1 – Wiring Diagram

The sensor measurement circuitry is electrically isolated from the signal output subsystem, giving maximum flexibility in connecting power and signal outputs. The VW0420 power supply can be local to the device or derived from connected automation systems.

Because of the isolation, care must be taken to properly ground each subsystem and signal wire shielding.

Note

It is highly recommended to connect sensors and all external power sources as follows. This will ensure valid signals on all output terminals.

- connect vibrating wire and temperature sensors.
- attach 4-20 mA power wiring for vibrating wire and thermistor.
- connect 9-24 V power wires.

2.1 SINGLE POWER SOURCE INSTALLATION

When circuit insulation is not required, simplified installation method can be used utilizing single 12 to 24 V DC power supply. The following diagram shows this simplified installation.

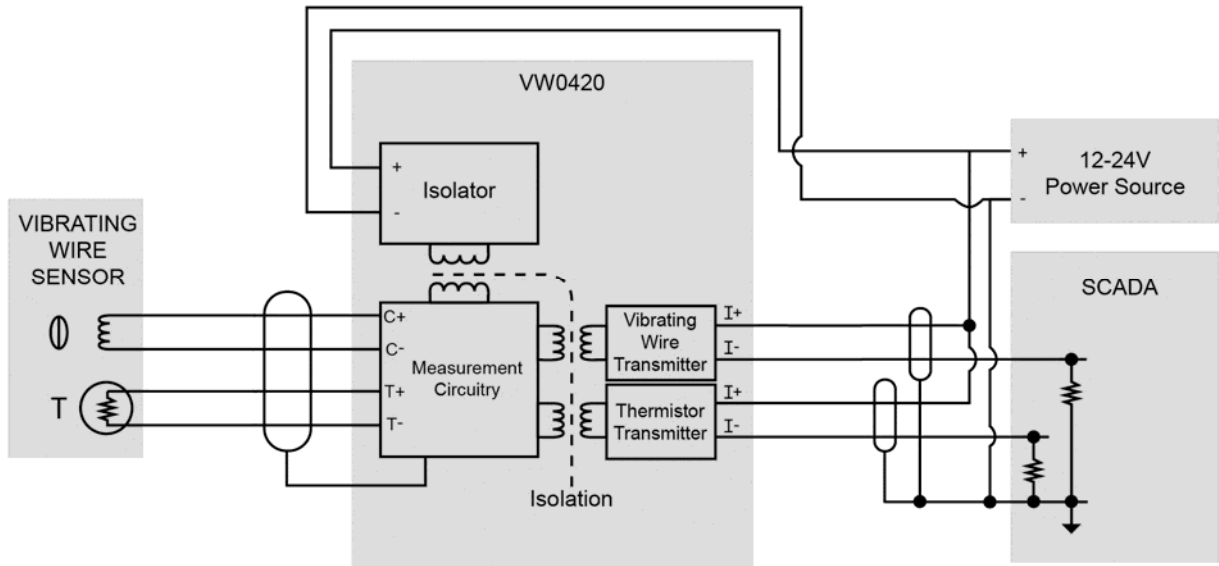


Figure 2 – Wiring Diagram with one power source

3 VW0420 ANALOG VW INTERFACE HOST SOFTWARE

The RST VW0420 Analog VW Interface Software was designed to allow easy sensor reading display and configuration of the VW0420 interface connected to PC's running Microsoft Windows. The user friendly graphical interface lets the user to view all values generated by the interface and enables modification of any options and presets offered by the VW0420 instrument.

3.1 GETTING STARTED

Insert the VW0420 Host Software CD-ROM and follow the on-screen instructions for installing the software. The default directory for the software is:

C:\Programs Files\RST Instruments\VW0420 Host

This directory can be changed if desired.

Very Important

Ensure that RST VW0420 USB to UART Device Driver Set is installed correctly, as described in Section 4. These drivers are necessary for correct communication between host computer and VW0420 instrument.

When the software installation is finished, connect to the VW0420 instrument via a USB port

Once connected to the device, the software should automatically establish communication link and display connected status. If this does not occur, verify the port number and communication cable or refer to Section 6.1 for more help.

Using the software, enter the configuration settings (section 3.3, section 3.5 and section 3.6).

The Analog Interface Host Software contains five tabs: *Status*, *Setup*, *Monitor*, *Eng Units* and *Output Units*. Each tab option is explained in detail below. A Help button is available in the bottom right corner, which launches the appropriate help files when pressed.

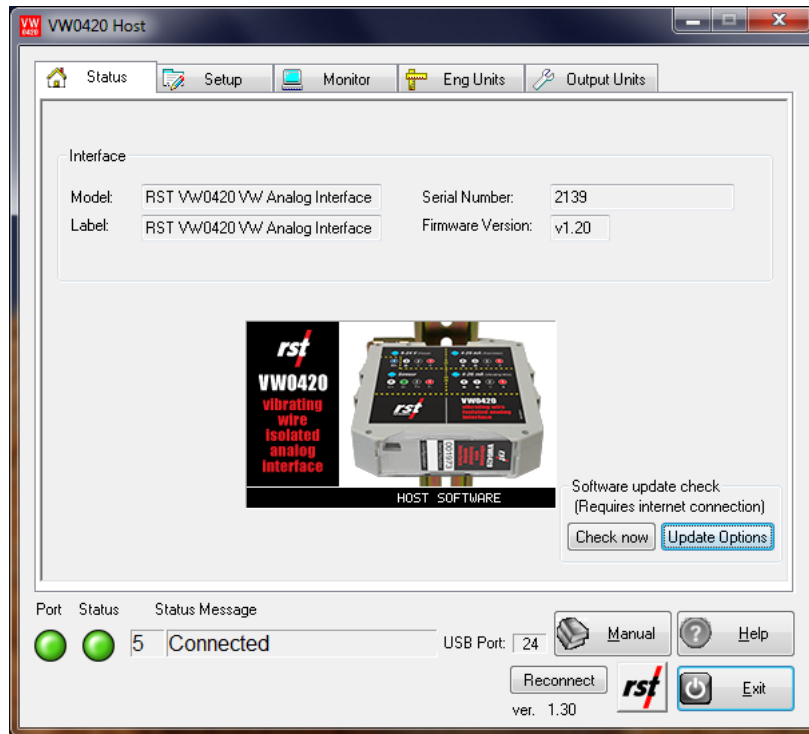
3.2 STATUS

The status tab provides information about the currently connected device.

This includes the model, name, serial number, and firmware version. Ensure that the serial number matches what is expected (in this example it is 02139). If it does not, check the status bar at the bottom of the screen to ensure a connection with the logger has been established.

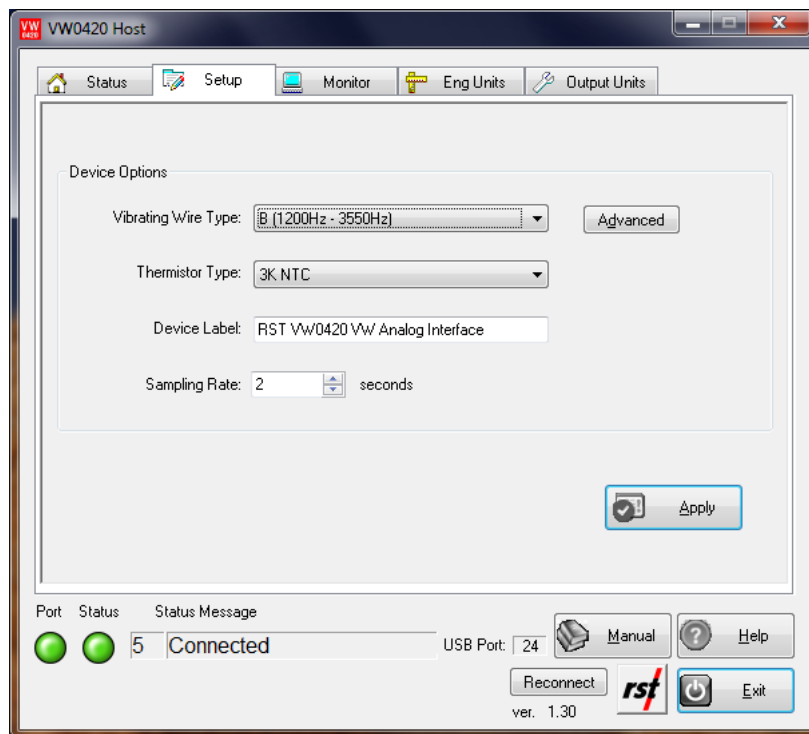
The firmware version check is performed each time the adapter is connected, as long as internet access is available.

To ensure current software is being used, click on *Check Now* to activate software update check.

**Figure 3 – Status Tab**

3.3 SETUP

The setup tab allows setting the type of vibrating wire sensor and the thermistor.

**Figure 4 – Setup Tab**

Vibrating Wire Type: A drop down menu allows the user to select from a list of preset sweep frequency settings. The software also allows a custom, user defined sweep frequency for use with non-standard vibrating wire sensors. To select this option, choose the “Custom (Advanced)” from the drop down menu, then click the “Advanced” button. Edit the required fields if necessary, and click *Edit Sweep* to determine the remaining parameters.

The dialog box titled "Vibrating wire Advanced" contains a section for "Custom VW Settings". It includes the following fields and buttons:

- Start Frequency (Hz): 1200
- End Frequency (Hz): 3550
- Delay After Sweep (ms): 75
- Receive Pulse Count: 100
- Edit Sweep** button
- Sweep Time (ms): 125
- Half Freq Count: 2
- Frequency decrement count: 9
- Load defaults button
- Load Custom button
- OK button
- Cancel button

Figure 5 – Custom Vibrating Wire Settings

The dialog box titled "Calculate Decrement and Sweep Time" displays a table of options for Half Cycle Count, Decrement, and Sweep Time (ms). Below the table is a "Recalc" button and "OK" and "Cancel" buttons.

Half Cycle Count	Decrement	Sweep Time (ms)
<input type="radio"/> 1	5	113
<input type="radio"/> 1	4	141
<input type="radio"/> 2	10	113
<input type="radio"/> 2	9	126
<input type="radio"/> 3	14	122
<input type="radio"/> 3	13	131
<input type="radio"/> 4	19	120
<input type="radio"/> 4	18	127

Sweep Time (ms): 125

Recalc

OK Cancel

Figure 6 – Decrement and Sweep Time options

Enter the desired Sweep Time and click *Recalc*. The program will calculate Decrement and Sweep Time and give option to choose optimal parameters.

Click OK button on both dialogs to write settings to VW0420 interface memory.

Thermistor Type: A drop down menu allows the user to select the type of thermistor used in the vibrating wire instrument.

Device Label: Each VW0420 instrument can be assigned unique label for easier identification. Enter a new label in edit box, if desired.

Sampling Rate: The vibrating wire sensor sampling interval can be adjusted by entering number of seconds. The shortest interval is 2 seconds, the longest is 32000 seconds.

Note

The actual measurements intervals might be off by up to 15% due to the nature of internal timers. The output current might have undefined value until sensors are sampled. This will be more significant if long sampling interval is selected. Please ensure that the device power is connected properly as outlined in Section 2.

Apply Button

After any changes have been made on the device *Setup* screen, pressing the *Apply* button saves these changes and downloads them to the instrument's memory.

3.4 MONITOR

Selecting the monitor tab sets the device into monitor mode. The top portion of the screen reports in B-units ($f^2 \times 10^{-3}$) by default, and the bottom portion show the thermistor temperature in degrees Celsius.

If successfully connected to the instrument, the sensor reading and temperature reading is updated approximately once per two seconds. Displayed values can be recalculated into desired units selected from pull down list. The temperature is shown in Celsius by default, the Fahrenheit checkbox is used to change it to Fahrenheit temperature display.

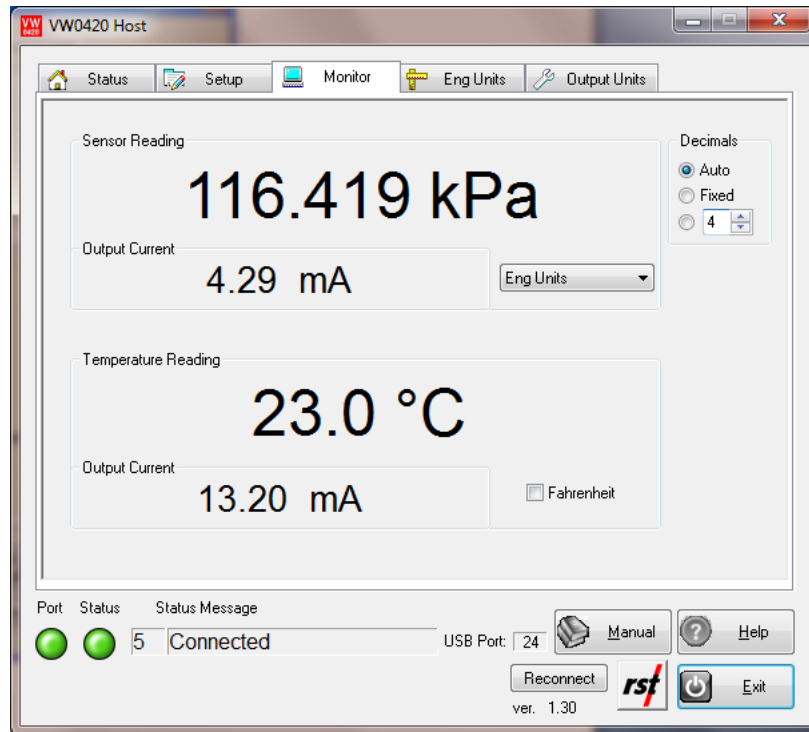
The corresponding output current is also displayed for the vibrating wire sensor and temperature reading.

The number of significant digits displayed in sensor reading depends on settings under *Decimals* heading. The choice of three options is given:

Auto – Number of decimal digits shown depend on value magnitude.

Fixed – Predefined by the chosen units.

Manual – number of decimal digits is adjustable in 0 to 6 range.

**Figure 7 – Monitor Tab****Note**

Engineering Units are only available when sensor calibration data and conversion method is set in Units page. Please see section 3.5 for the instructions on entering calibration data.

Until communication is established with the device, the program will display "----" in Sensor Reading and Temperature Reading fields.

When Sensor Reading is outside of the valid range, "RANGE_ERR" will be displayed and output current is set to predefined value. See Output Units in section 3.6 for more information.

3.5 ENGINEERING UNITS

Often the user may wish to report the readings directly in engineering units, rather than B-units ($I^2 \times 10^{-3}$). Data required for the conversion to engineering units is always found on the calibration sheets for the transducer.

Each transducer is shipped from the factory with a calibration sheet. If you have not received a calibration sheet, or the sheet has been lost, please contact RST Instruments and a copy will be faxed or e-mailed to you. In order to apply any changes on the Eng Units tab, the *Save & Apply* button must be pressed.

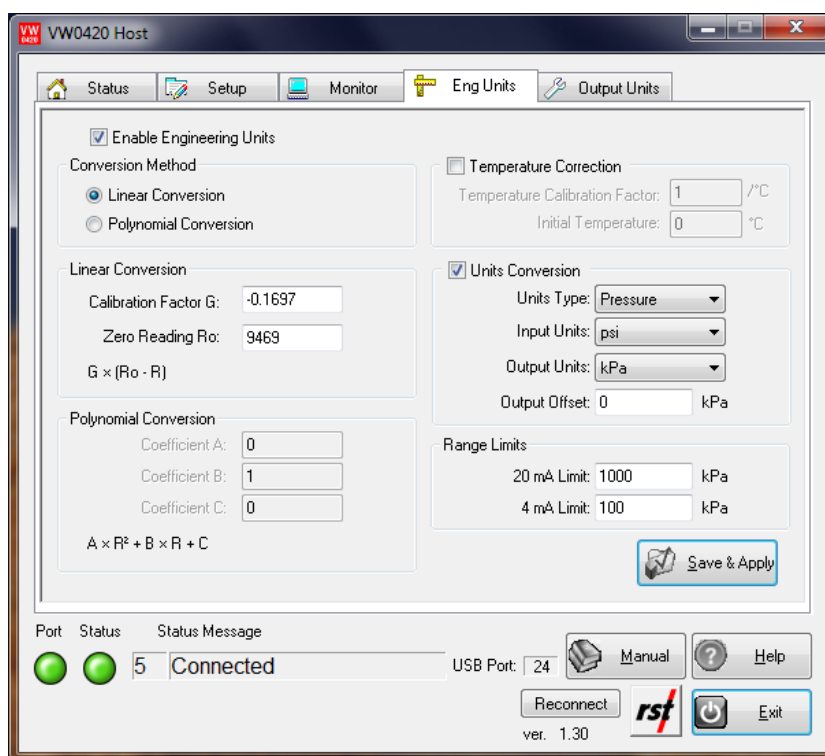


Figure 8 – Eng Units Tab

Conversion Method

The user is given an option to apply either a *Linear* or *Polynomial* Conversion. If *linear conversion* is selected, input the provided Calibration Factor and Zero Reading into the appropriate boxes.

If *polynomial conversion* is selected, input the provided coefficients (A, B & C) into the appropriate boxes.

In each case, equations used for calculations are shown for a reference.

Temperature Correction

When the Enable Temperature Correction box is checked, the software will apply a temperature correction to the data. This requires the user to enter in the temperature correction factor and an initial temperature which is found on the calibration sheet for that particular instrument.

If the calibration sheet is missing, please contact RST Instruments and a copy of the calibration sheet can be faxed or e-mailed to you.

Units Conversion

Units Type: Choose pressure or distance using the drop-down menu.

Input Units: These are the units of the calibration constants you entered into either the linear conversion or polynomial conversion methods. In general, the calibration constants reported on the calibration sheets are either in kPa/B unit or psi/B unit. In the case of strain gauges, this could be mm/B unit.

Output Units: Select the appropriate output units from the drop-down list. The conversion will be done automatically resulting in desired units displayed in Monitor tab.

Output Offset: This is a user defined offset value. Under certain circumstances, the user may wish to enter in the elevation of the pressure transducer. In this way the reported pressure will be correlated to a reference elevation (i.e. above sea level).

Range Limits

The 20 mA and 4 mA limits must be set in order for the output current to be scaled properly. These values are also editable in *Output Units* tab (see section 3.6).

Save & Apply

As a reminder, whenever **ANY** changes are made under the Engineering Units tab, the *Save & Apply* button must be pressed in order to update the device with the appropriate information.

3.6 OUTPUT UNITS

The sensor readings corresponding to upper and lower output current limits should be entered in Output Units tab. The green check mark verifies that the displayed data was successfully read from connected device. Enabling engineering calibration in Eng Units tab locks the device into engineering units mode. No other units option is then available.

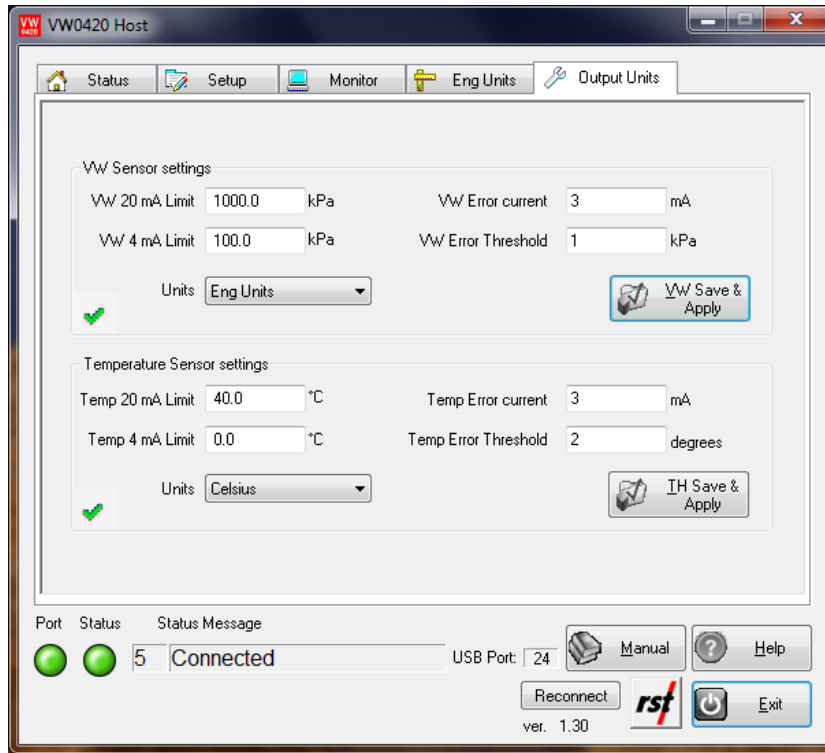


Figure 9 – Output Units

When the sensor reading exceeds preset limits by the threshold value, the output current will change to error current value.

Example:

As shown in above Figure 9, when temperature reaches 40 °C, the output current will be 20 mA. With temperature increase, the output current will stay at 20 mA until temperature reaches 42 °C (40 °C + 2 °C threshold). When temperature exceeds 42 °C, the output current will switch to Temp Error Current 3 mA. Likewise, the output current will become 3 mA when temperature drops below -2 °C.

In order to have output current switch to error value after reaching sensor limit, enter zero as threshold value.

Error current and error threshold can be edited separately for vibrating wire and temperature sensors. Press *Save & Apply* button to upload entered values into instrument's memory.

4 VW0420 USB TO UART CONTROLLER DRIVER SET INSTALLATION – ADAPTER SN UP TO AND INCLUDING 002071

Note the serial number on the adapter label. If the serial number is 002072 or greater, skip to section 5.

The VW0420 instrument requires a set of drivers installed on the host computer in order to communicate over USB communication port. All steps must be completed for USB communication to work correctly.

It is recommended to install the drivers from Microsoft Windows Update if internet connection is available. This will ensure the most up to date drivers are used. Just connect the VW0420 adapter to desktop or laptop PC using included USB cable. Follow onscreen prompts for easy installation.

In case internet connection is not available, use the included CD. Current USB drivers and software can be also downloaded from RST Instruments website <http://www.rstinstruments.com>.

The following outlines a procedure for installing the VW0420 USB to UART Controller Driver Set on Microsoft™ WindowsXP, Microsoft™ Windows Vista and Microsoft™ Windows7 platforms. The actual screenshots may differ but the steps will be very similar.

4.1 MICROSOFT™ WINDOWSXP INSTALLATION PROCEDURE

4.1.1 VW0420 USB TO UART DEVICE INSTALLATION

After successful installation of VW0420 Host software, click on "VW0420 First Gen Driver Install in RST Instruments->VW0420 Host->Tools. The following screen will be shown:



Figure 10 – USB to UART Controller Driver Set Installation

Click **Install...** and press **OK** when installation finishes.

At this time, Windows system detects installed device and starts **New Hardware Wizard**, as displayed in Figure 11.

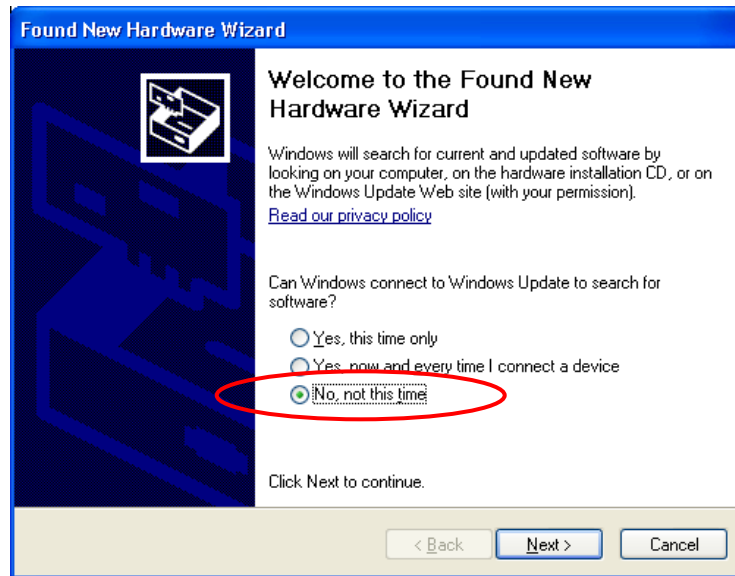


Figure 11 – New Hardware Wizard for Device

Choose **No, not this time** if asked whether or not connect to Windows Update. Click **Next**.

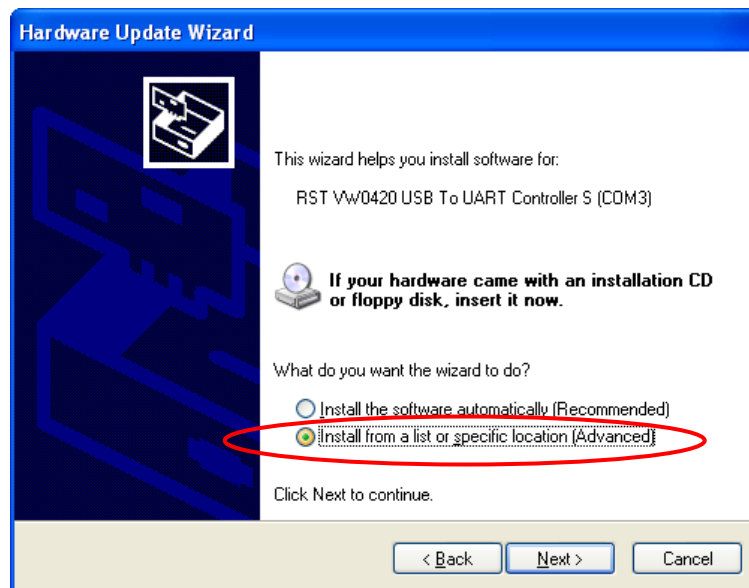


Figure 12 – New Hardware Wizard for Device

Choose **Install from a list or specific location** and click **Next**.

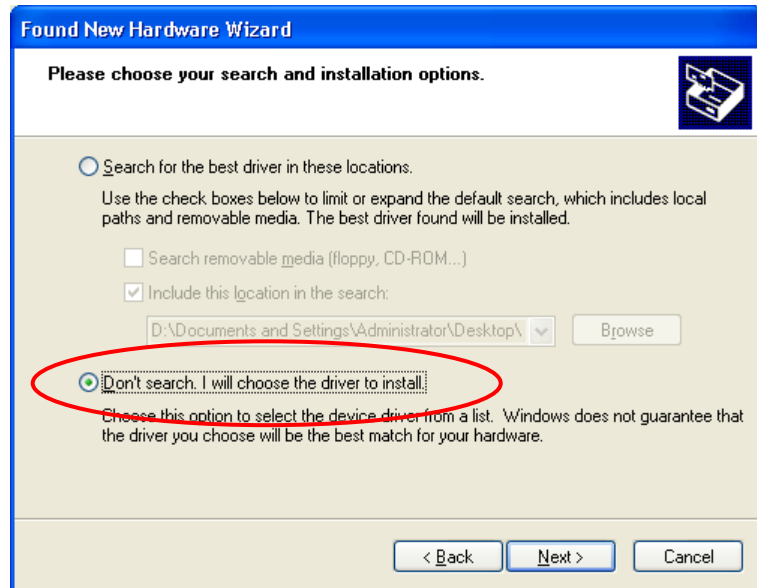


Figure 13 – New Hardware Wizard for Device – Choose Driver

Select **Don't search** and click **Next**. Click **Next** on window that follows

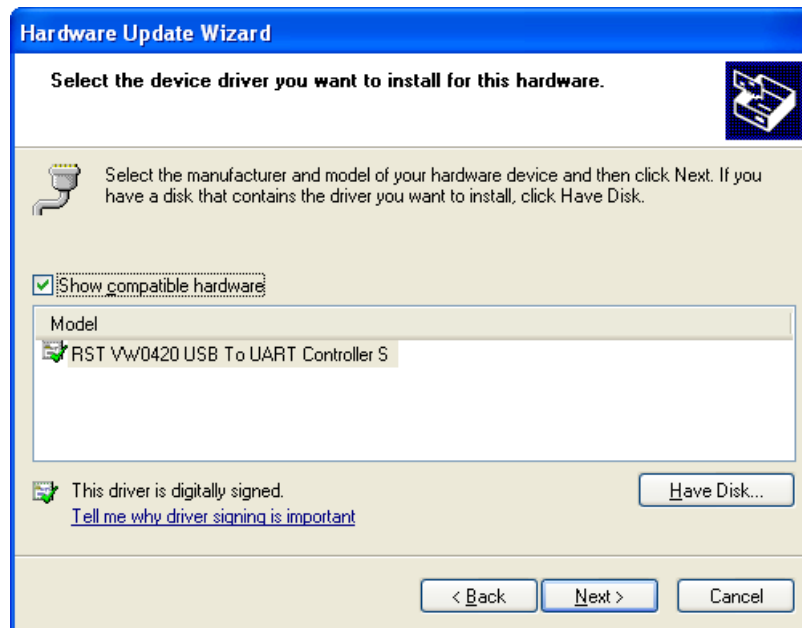


Figure 14 – New Hardware Wizard for Device – Continue

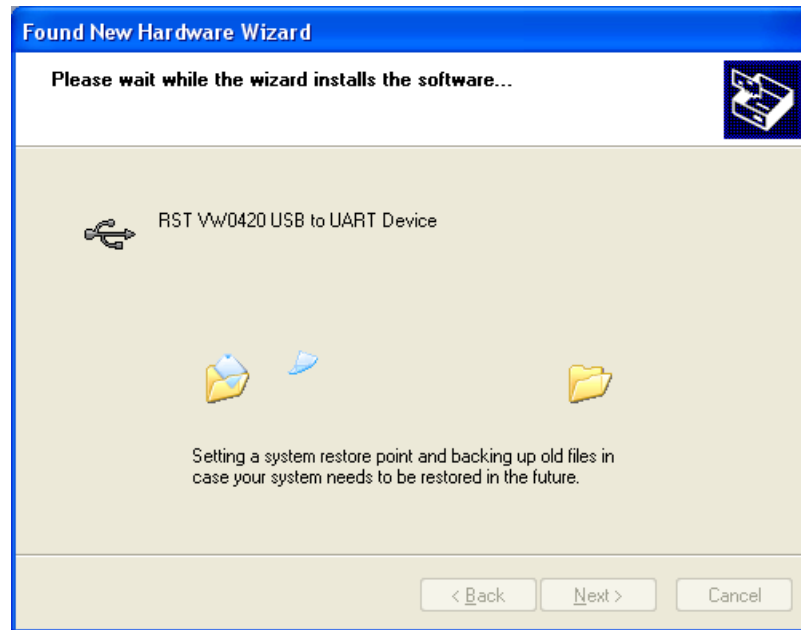


Figure 15 – New Hardware Wizard for Device – File Transfer

The Wizard will install device drivers and display the following screen. Click **Finish** to complete device drivers installation.

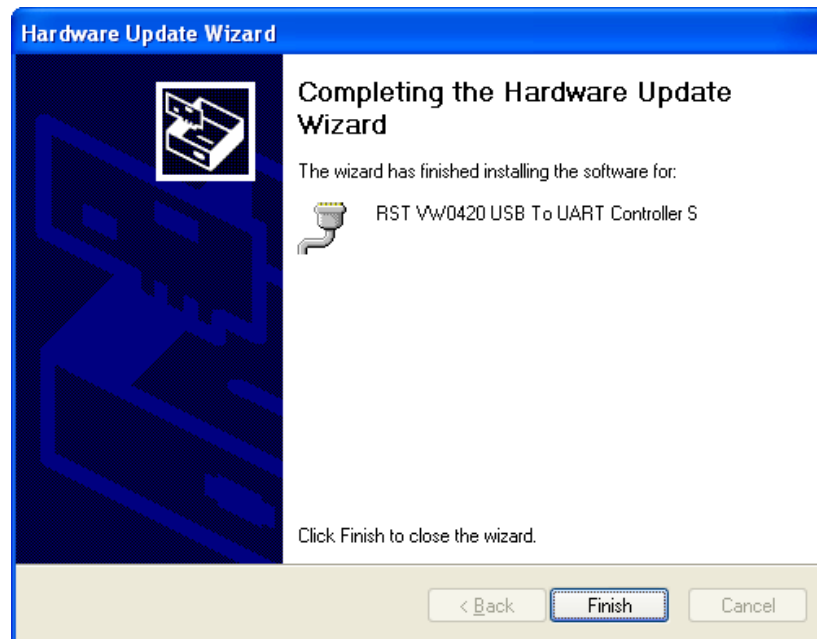


Figure 16 – New Hardware Wizard for Device – Install Complete

4.1.2 VW0420 USB TO UART CONTROLLER INSTALLATION

After successful installation of USB to UART device drivers, the VW0420 instrument should be connected to the host computer. The MS Windows system should detect the new device and display New Hardware Wizard, as shown on Figure 17.

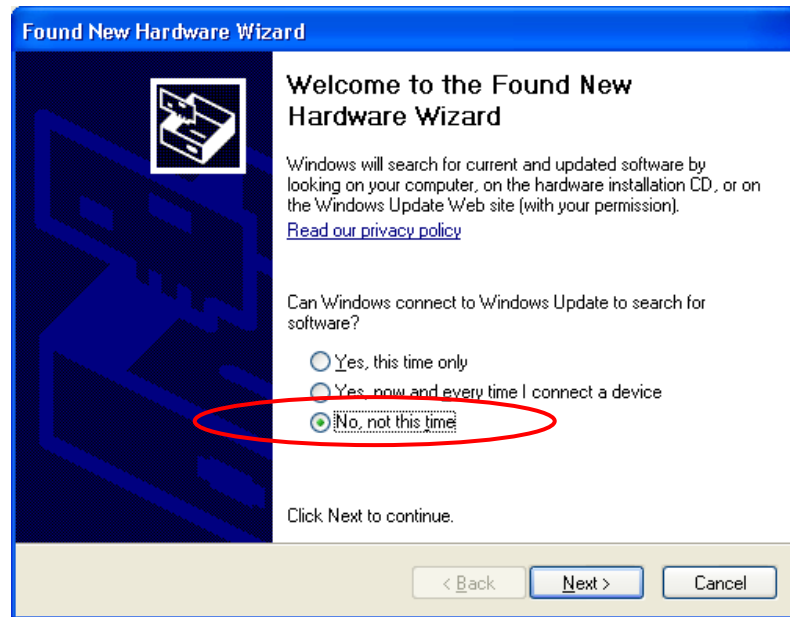


Figure 17 – New Hardware Wizard for Controller

Installing USB to UART Controller device drivers procedure is very similar to the previously described steps for installing USB to UART Device drivers. Figure 18 through Figure 21 show every step for a reference.

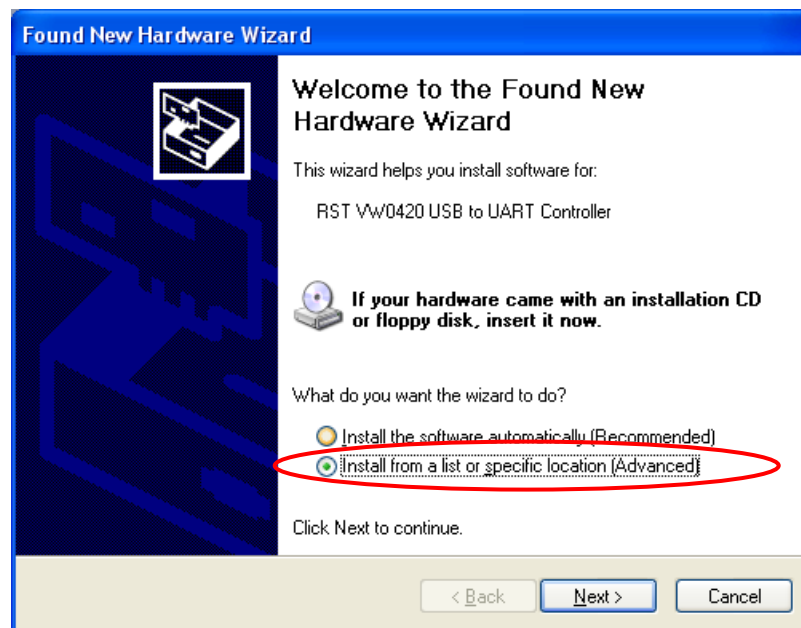


Figure 18 – New Hardware Wizard for Controller

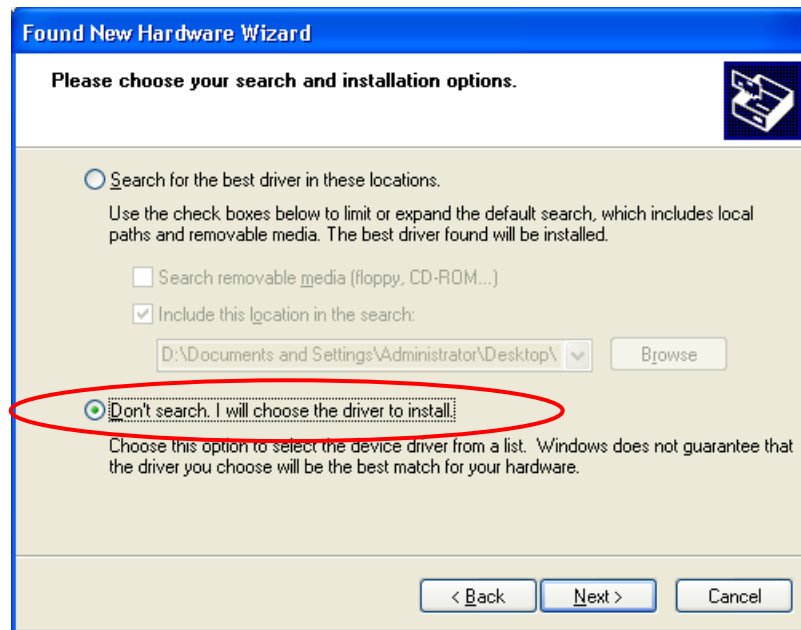


Figure 19 – New Hardware Wizard for Controller – Choose Driver

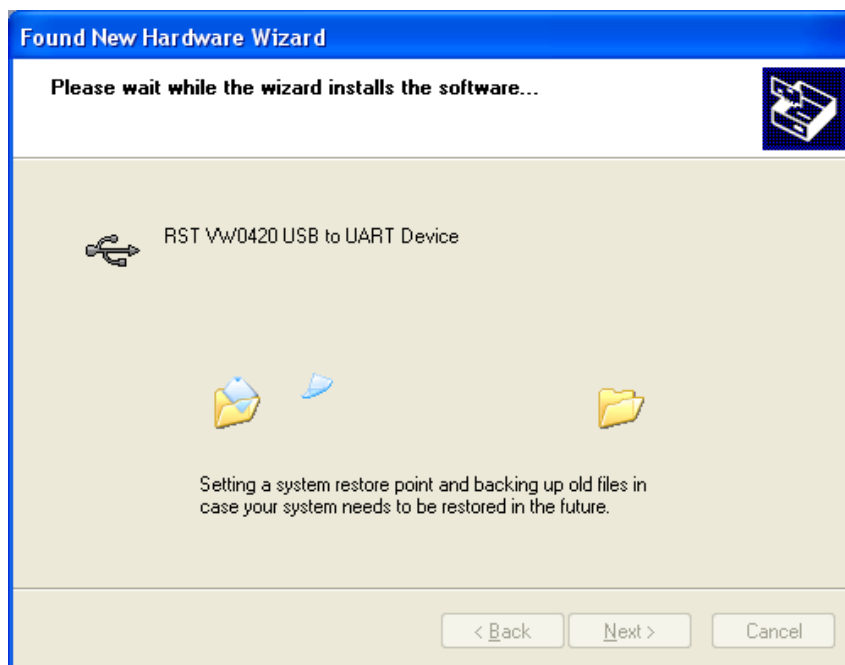


Figure 20 – New Hardware Wizard for Controller – File Transfer

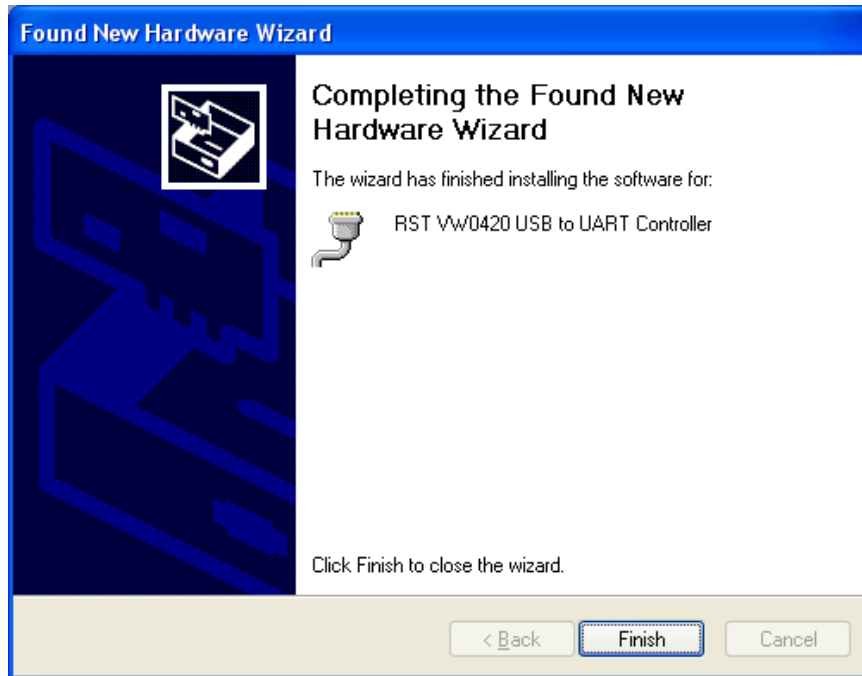


Figure 21 – New Hardware Wizard for Controller – Install Complete

After successful installation, the yellow message balloon (Figure 22) should be shown in the lower right hand corner stating that all device drivers are installed and ready to use.

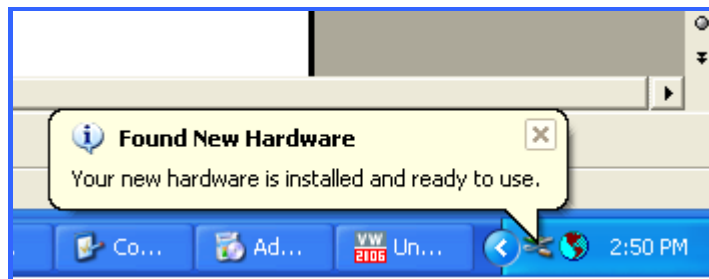


Figure 22 – New Hardware Installed Confirmation

Alternatively, correct installation of the device drivers can be verified by navigating to the *Windows Control Panel*, choosing *System* and then selecting the *Hardware* tab. Clicking on *Device Manager* will bring up the following screen:

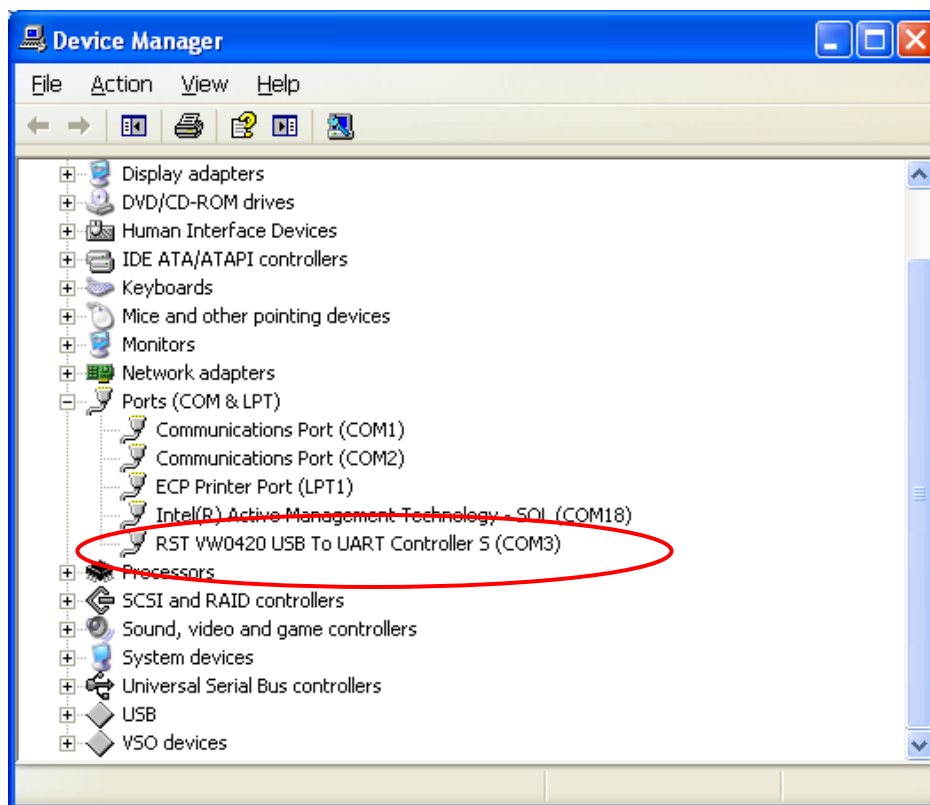


Figure 23 – WindowsXP Device Manager

If the driver was installed correctly, the RST VW0420 USB to UART Controller port will appear as in Figure 23 above. If the driver has not been installed correctly, yellow exclamation mark will appear next to the device. Once the above has been verified, note the COM number which has been assigned to the USB serial port. This will vary from computer to computer, in this example it is COM3.

Close the device manager and launch the VW0420 Host Software. The VW0420 Host Software should now connect to the VW0420 instrument.

4.2 MICROSOFT™ WINDOWS VISTA, WINDOWS7 AND LATER INSTALLATION PROCEDURE

After successful installation of VW0420 Host software, click on "VW0420 First Gen Driver Install" in RST Instruments->VW0420 Host->Tools. The following screen will be shown:



Figure 24 – USB to UART Controller Driver Set Installation

Click **Install...** and then press **OK** when installation finishes.

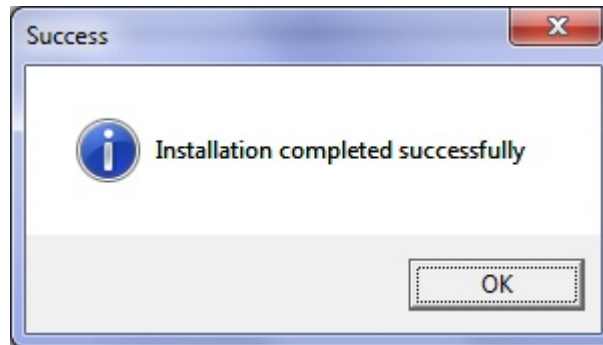


Figure 25 – Install Complete

After successful installation of USB to UART device drivers, the VW0420 instrument should be connected to the host computer. Press any key on VW0420 instrument to power up the unit, if not already done so. The MS Windows system should detect the new device and display hardware installation status, as shown on Figure 26.



Figure 26 – New Hardware Status for Controller

After successful installation, the yellow message balloon (Figure 27) should be shown in the lower right hand corner stating that all device drivers are installed and ready to use.

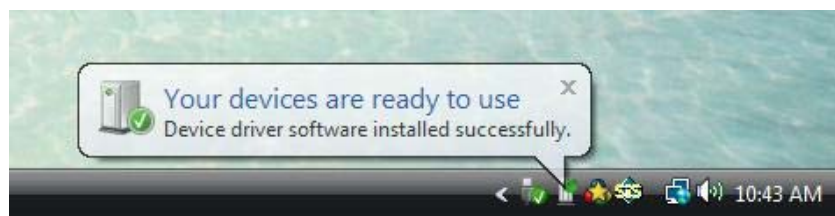


Figure 27 – New Hardware Installed Confirmation

Alternatively, correct installation of the device drivers can be verified by navigating to the *Windows Control Panel* and choosing *System*. Clicking on *Device Manager* will bring up the following screen:

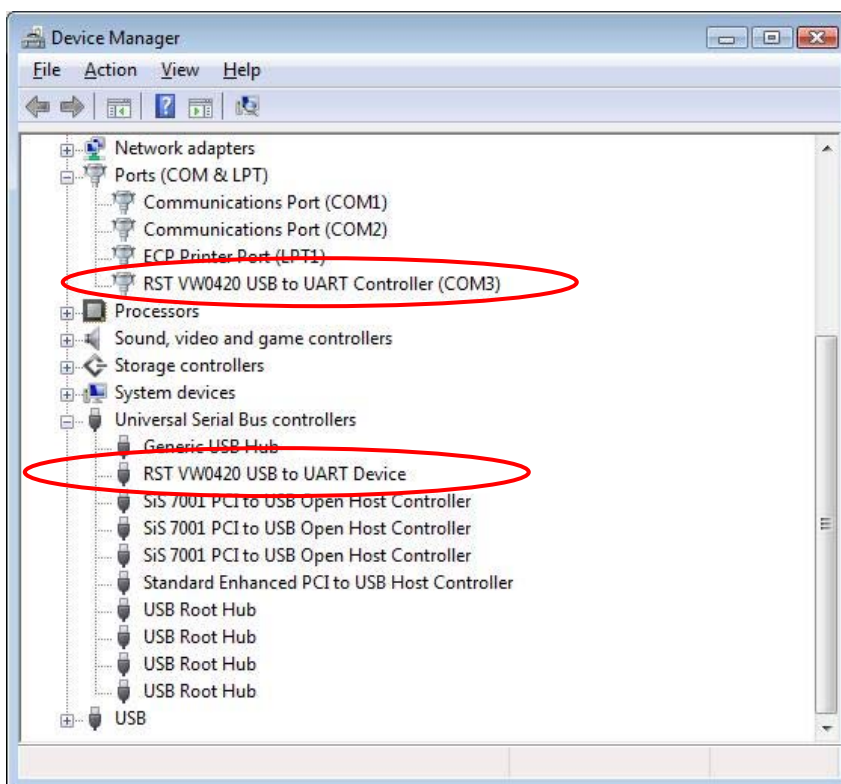


Figure 28 – Windows Vista, Windows 7 and later Device Manager

If the driver was installed correctly, the RST VW0420 USB to UART Controller port will appear as in Figure 28 above. If the driver has not been installed correctly, yellow exclamation mark will appear next to the device. Once the above has been verified, note the COM number which has been assigned to the USB serial port. This will vary from computer to computer, in this example it is COM3.

Close the device manager and launch the VW0420 Host Software. The VW0420 Host Software should now connect to the VW0420 Adapter. Confirmation can be made by looking at the status bar (Figure 3).

5 VW0420 USB TO UART CONTROLLER DRIVER SET INSTALLATION – ADAPTER SN 002072 AND GREATER

Note the serial number on the adapter label. If the serial number is 002071 or less, go back to section 4.

The VW0420 instrument requires a set of drivers installed on the host computer in order to communicate over USB communication port. All steps must be completed for USB communication to work correctly.

It is recommended to install the drivers from Microsoft Windows Update if internet connection is available. This will ensure the most up to date drivers are used. Just connect the VW0420 adapter to desktop or laptop PC using included USB cable. Follow onscreen prompts for easy installation.

In case internet connection is not available, use the included CD. Current USB drivers and software can be also downloaded from RST Instruments website <http://www.rstinstruments.com>.

The following outlines a procedure for installing the VW0420 USB to UART Controller Driver Set on Microsoft™ WindowsXP, Microsoft™ Windows Vista and Microsoft™ Windows7 platforms. The actual screenshots may differ but the steps will be very similar.

5.1 MICROSOFT™ WINDOWSXP INSTALLATION PROCEDURE

5.1.1 VW0420 USB TO UART DEVICE INSTALLATION

After successful installation of VW0420 Host software, click on "VW0420 Second Gen Driver Install" in RST Instruments->VW0420 Host->Tools. The following screen will be shown:

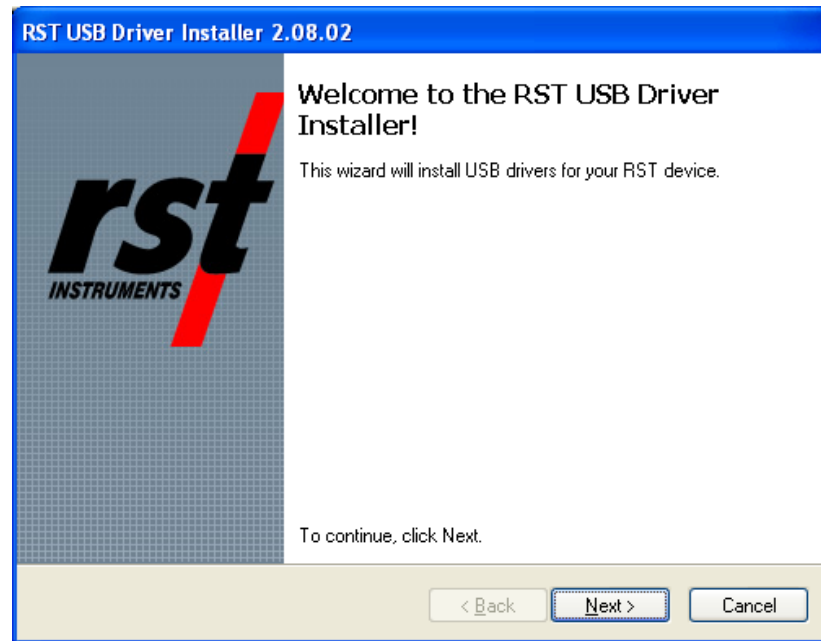


Figure 29 – Second Gen Driver Set Installation on Windows XP

Click **Next**.

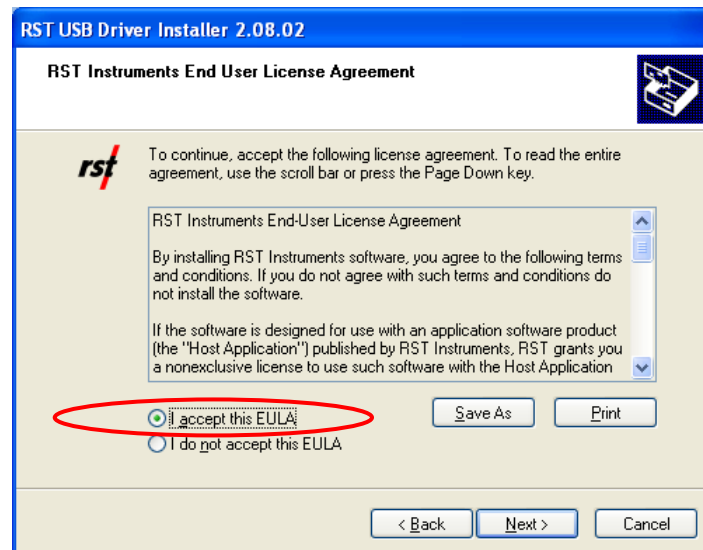


Figure 30 – New Hardware Wizard for USB to UART

Select your acceptance of RST Instruments End User License Agreement, click **Next**.

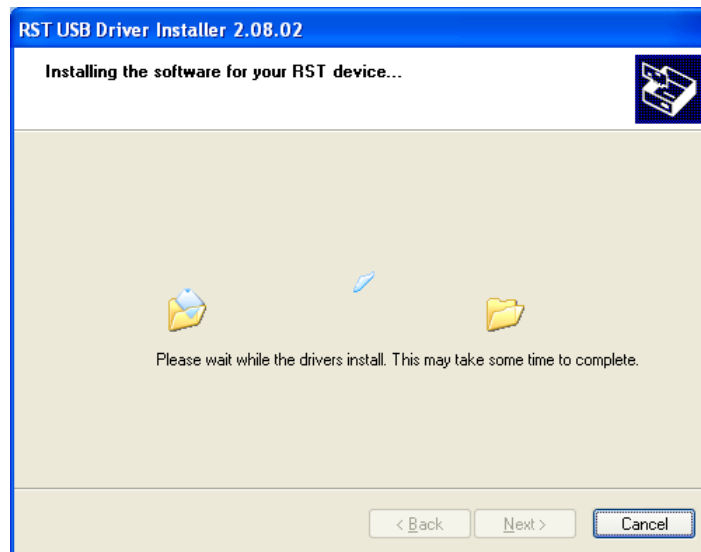


Figure 31 – New Hardware Wizard for USB to UART – File Transfer

The Wizard will install device drivers and display the following screen. Click **Finish** to complete device drivers installation.



Figure 32 – New Hardware Wizard for USB to UART – Install Complete

5.1.2 VW0420 USB TO UART CONTROLLER INSTALLATION

After successful installation of USB to UART device drivers, connect the VW0420 Adapter to desktop or laptop PC using included USB cable. The MS Windows system should detect the new device and display the yellow message balloon (Figure 33) in the lower right hand corner stating that all device drivers are installed and ready to use.

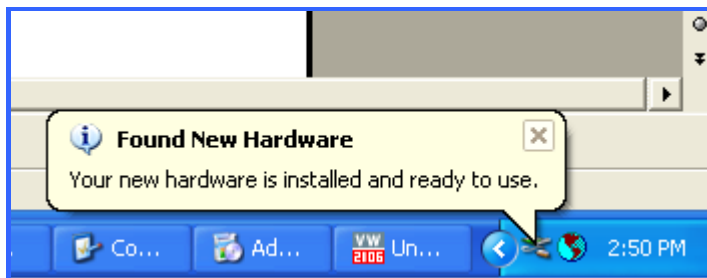


Figure 33 – New Hardware Installed Confirmation

Alternatively, correct installation of the device drivers can be verified by navigating to the *Windows Control Panel*, choosing *System* and then selecting the *Hardware* tab. Clicking on *Device Manager* will bring up the following screen:

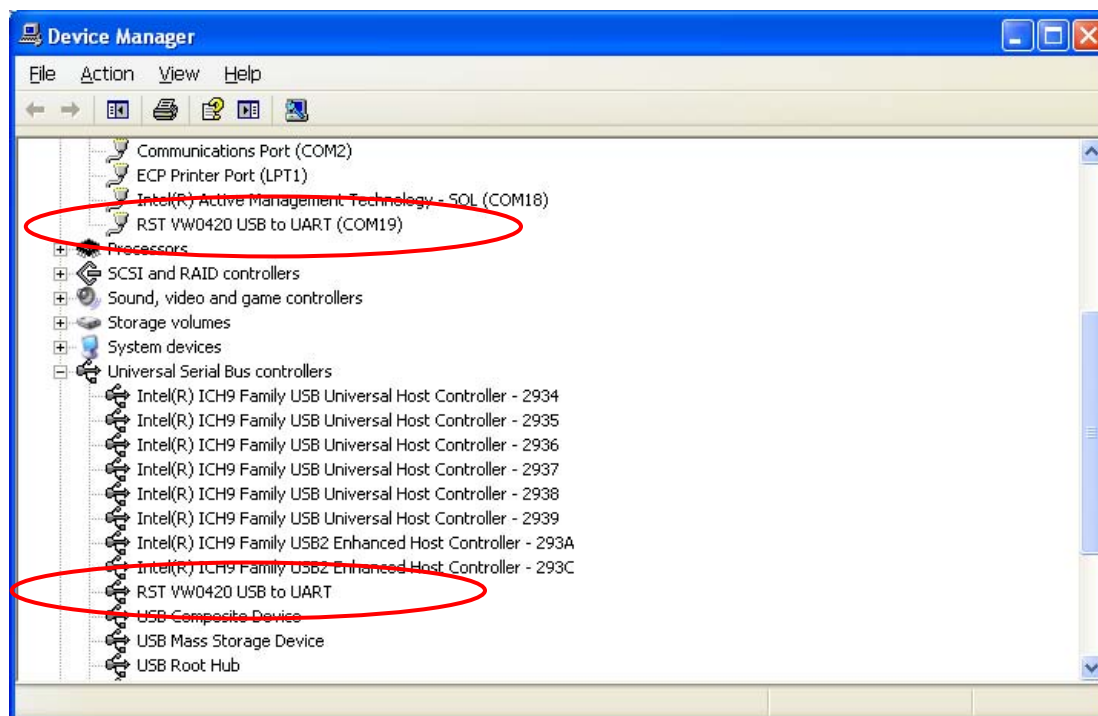


Figure 34 – WindowsXP Device Manager

If the driver was installed correctly, the RST VW Adapter VW0420 USB to UART Controller port will appear as in Figure 34 above. If the driver has not been installed correctly, yellow exclamation mark will appear next to the device. Once the above has been verified, note the COM number which has been assigned to the USB serial port. This will vary from computer to computer, in this example it is COM19.

Close the device manager and launch the VW0420 Host Software. The VW0420 Host Software should now connect to the VW0420 Adapter. Confirmation can be made by looking at the status bar (Figure 3).

5.2 MICROSOFT™ WINDOWS VISTA, WINDOWS7 AND LATER INSTALLATION PROCEDURE

After successful installation of VW0420 Host software, click on "Second Gen Driver Install" in RST Instruments->VW0420 Host->Tools. The following screen will be shown:



Figure 35 – Second Gen Driver Set Installation on Windows Vista, 7 and later

Click **Next**, the following dialog appears:

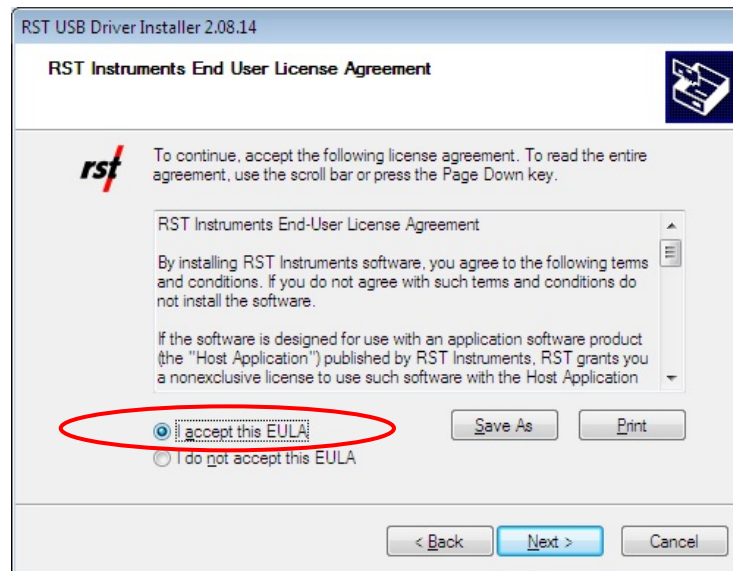


Figure 36 – USB to UART Driver Set Installation

Select your acceptance of RST Instruments End User License Agreement, click **Next**.

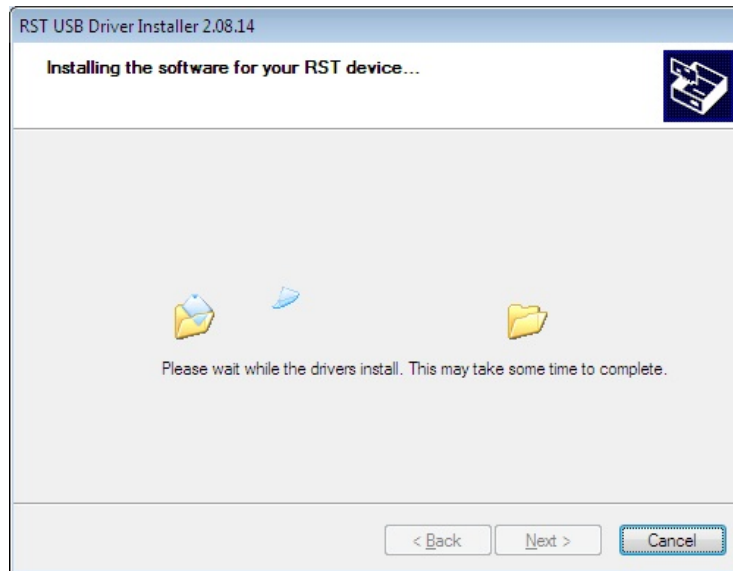


Figure 37 – USB to UART Driver Set Installation – File Transfer

The Wizard will install device drivers and display the following screen. Click **Finish** to complete device drivers installation.



Figure 38 – USB to UART Driver Set Installation – Install Complete

After successful installation of USB to UART device drivers, connect the VW0420 Adapter to desktop or laptop PC using included USB cable.

The MS Windows system should detect the new device and complete the USB serial port installation, as shown on following dialogs:

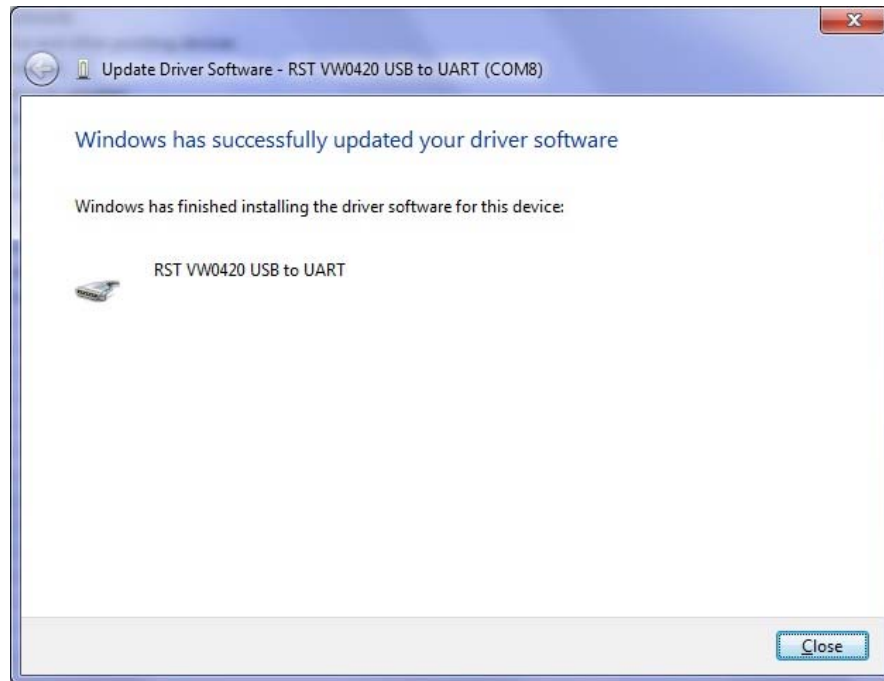


Figure 39 – Install Complete

Click **Close** and MS Windows will display the yellow message balloon (Figure 40) in the lower right hand corner stating that all device drivers are installed and ready to use.

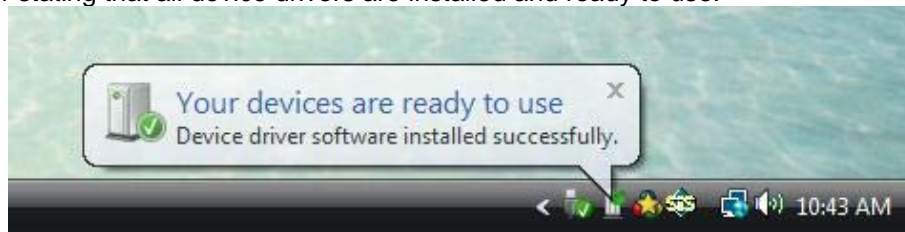


Figure 40 – New Hardware Installed Confirmation

Alternatively, correct installation of the device drivers can be verified by navigating to the *Windows Control Panel* and choosing *System*. Clicking on *Device Manager* will bring up the following screen:

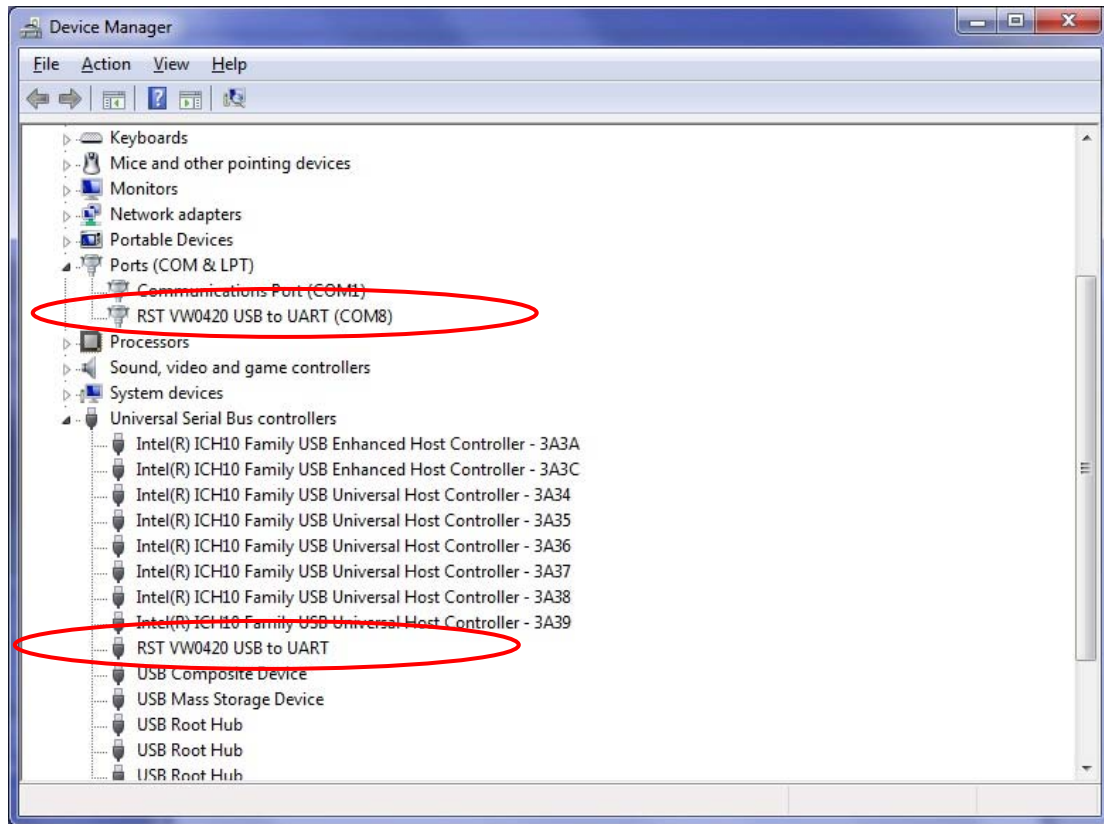


Figure 41 – Windows Vista, Windows 7 and later Device Manager

If the driver was installed correctly, the RST VW0420 Adapter USB to UART port will appear as in Figure 41 above. If the driver has not been installed correctly, yellow exclamation mark will appear next to the device. Once the above has been verified, note the COM number which has been assigned to the USB serial port. This will vary from computer to computer, in this example it is COM6.

Close the device manager and launch the VW0420 Host Software. The VW0420 Host Software should now connect to the VW04 Adapter. Confirmation can be made by looking at the status bar (Figure 3).

6 TROUBLESHOOTING

6.1 CONNECTION PROBLEMS

Upon launching, the Analog Interface software will try to connect to the VW0420 instrument using current communication settings. Once connected, the port and status indicators turn green and the *Status* screen should display logger information.

The connection status is displayed on status bar. If the connection fails (status indicators are red or yellow, or status screen shows no status data), take note of the message and number displayed, then find the corresponding description in the Table 1: Status Messages.

1. Port not open: The communication port is being used by some other application.
Solution: Close other windows applications that might be using serial port assigned to Interface Software. To change or verify port, click on *Port* button.
2. Connecting to the logger message continuously displayed.
Solution: Verify that the USB communication cable is connected and connections are tight.
3. State Errors, Reading Errors, Memory Read Errors: Check cable for damage. Replace serial communication cable if in doubt.

6.2 SOFTWARE STABILITY

The Interface Software real time readout relies on continuous data transmission over serial communication port. This transmission may be occasionally interrupted by other computer activity resulting with program freezing or displaying erroneous data. If this happens, Interface Software needs to be closed down and restarted. Always close software when changing loggers or reconnecting serial communication cable.

6.3 STATUS BAR MESSAGES

The following table lists the status bar messages with descriptions.

#	Status Message	Description
1	Communication port open	Communication port is open
2	Unable to open communication port	Some other application is using this port
3	Connecting to the device	Software is trying to connect to the device
4	Connection not established	Software was unable to connect to the device
5	Connection established to the device	Software was able to connect to the device
6	Reading device settings	All device settings are copied to the software for display
7	Error during settings read	Error occurred during settings read
8	Idle	Idle time between status or data reads
9	New device detected	Device exchanged with another device, software reset
10	Device settings successfully read	All device settings were successfully transferred to software
11	Error reading device settings	Error occurred during reading device settings
12	Connection Error	Connection attempts timed out
13	Writing device settings	All displayed settings are being transferred to the device
14	Error during settings write	Error during settings write

Table 1: Status Messages

7 CONTACT US

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