SIMKITS
SIMULATOR PARTS

User Manual
Attitude Indicator
with built-in
USB Controller

Calibration
&
Connecting to Flight Simulator X
and Flight Simulator 2002/4

Release 1 July2007

Contents

What software do you need?

1. When you run Microsoft Flight Simulator 2002/4
To connect the gauges to Microsoft Flight Simulator 2002/4 you will need the following software:

A. FSUIPC 3.x from Pete Dowson
This software can be downloaded from the website www.simmarket.com and is so-called payware. Since Microsoft Flight Simulator 2002/4 does not has an open interface to connect hardware like the Simkits gauges to, Pete Dowson, from the UK, has written a very good interface, opening all parameters for add-on hardware to Microsoft Flight Simulator 2002/4.

B. trc_attitude_calibration.exe
This software is used to calibrate the Turn & Bank Indicator. The calibration values are saved in the memory of the gauge microcontroller. This software comes included in the installer "**SimkitsAttitude.zip**" and can be found at the Simkits website, Support section/ Software section and can be downloaded at no cost.

C. USBFSUIPCLink.exe
This software connects the Simkits gauge to FSUIPC3.x and translates the values "read" from FSUIPC (Microsoft Flight Simulator 2002/4) into pointer movements, following the on-screen pointer positions of the gauges. This software comes included in the installer "**SimkitsAttitude.zip**" and can be found at the Simkits website, Support section/ Software section and can be downloaded at no cost.

1. When you run Microsoft Flight Simulator X
To connect the gauges to Microsoft Flight Simulator **X** you will need the following software:

A. trc_attitude_calibration.exe
This software is used to calibrate the Turn & Bank Indicator. The calibration values are saved in the memory of the gauge microcontroller. This software comes included in the installer "**SimkitsAttitude.zip**" and can be found at the Simkits website, Support section/ Software section and can be downloaded at no cost.

B. USBFSXLink.exe
This software connects the Simkits gauge directly to Microsoft Flight Simulator X (Deluxe version) and translates the values "read" from Microsoft Flight Simulator X's built-in interface (SimConnect) into pointer movements, following the on-screen pointer positions of the gauges. This software comes included in the installer "**SimkitsAttitude.zip**" and can be found at the Simkits website, Support section/ Software section and can be downloaded at no cost. and can be found at the Simkits website, Support section/ Software section and can be downloaded at no cost.

Note: the standard version of Microsoft Flight Simulator X does not offer the so-called SimConnect interface and cannot be used to connect Simkits products.

Connection Diagram for MS FS2002/4
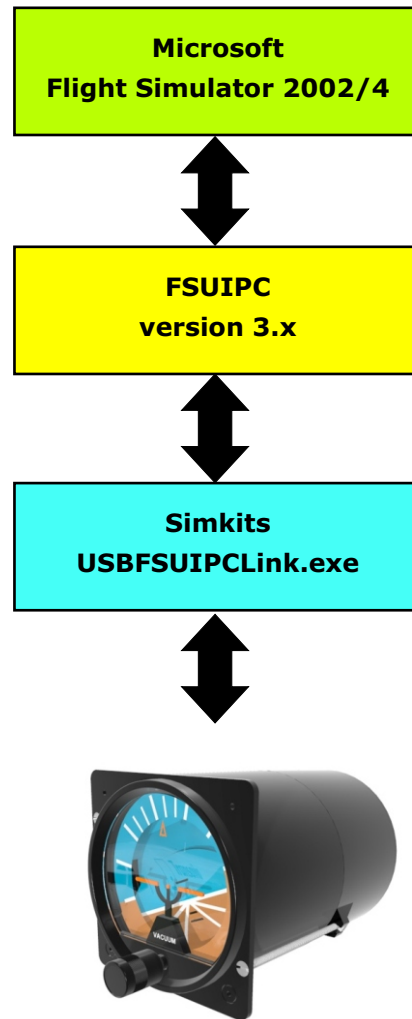
Connection Diagram for MS FSX
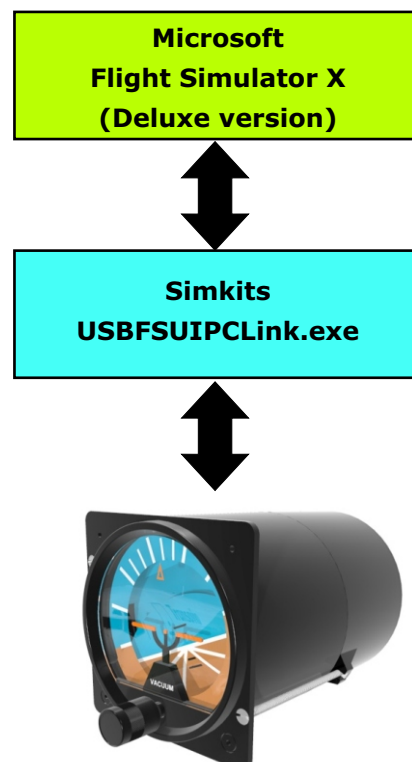
How does it work?

The Simkits USB driven **Attitude Indicator** is a so-called "stand-alone" product. This means that the product is complete (including two servos) to be controlled directly from your PC running Microsoft Flight Simulator (2002, 2004 or FSX) using Simkits interface software (to be downloaded from the Simkits Support section on the internet at **www.simkits.com**).

When you want to connect the gauge to Microsoft Flightsimulator 2002/4 you will need also the third party software FSUIPC3, to be downloaded from the website **www.simmarket.com**. To find it quickly, enter "FSUIPC" in the search field on the simmarket website.

When you use Microsoft Flightsimulator X, you do not need any other software than from Simkits, which can be downloaded from the support section of the Simkits website at **www.simkits.com.**

The product contains its own Microcontroller on the small PCB. This Microcontroller contains software which is able to control both the servos and the lighting.
The Microcontroller PCB also contains a small memory chip, which holds the calibration values (even if power is disconnected).

What does the dip switch do?

Since you can theoretically connect up to 64 of the same type of this Simkits Attitude Indicator to your PC there must be a way to distinguish one from another.
Therefore Simkits has designed the gauge in such a way, that you can alter the "identity" of the gauge by setting a so-called dip switch.
The identity is "TRC GAUGE" with a 2 digit number added, like TRC GAUGE 00, TRC GAUGE 01, TRC GAUGE 02, etc. Please note that "00" is a valid number for a computer. Using the dip switches, you can create a unique identity for each gauge and number them from 00 to 63, creating 64 different identities.

For the Attitude Indicator it is recommended to use the dipswitch settings creating the identity 60 and 61.
When on the PCB all dipswitches of the red colored switch are set to ON, the number 62 or 63 can be choosen by moving the slide switch which is accessible through the bottom opening of the Turn & Bank Indicator housing.

The settings of the slide switch and the dip switches create a binary value. Although the dip switches are physically numbered from 1 to 5, their values for the setting is binary as follows:

Slide switch = 1	**3 = 8**
1 = 2	**4 = 16**
2 = 4	**5 = 32**

By using a combination of these 6 switches, you can create any value between 0 and 63 (included) but the value 62 or 63 is recommended). Simply "add" the value of each switch set together. More about the dipswitches and examples can be found on the next page.

Why calibration

As every scale on a gauge is different, the software "needs to know" once how servos control the movement of the little aircraft and the slip ball. T

How to connect multiple gauges to my PC?

The Simkits Attitude Indicator is powered via the USB connection. The servos inside the gauge do consume a maximum of approx. 400 mA. in total. Under normal circumstances the standard USB port of your PC can handle the necessary power for this gauge (the official output for each USB connector on your PC is 500mA). However, we recommend to use a separate USB HUB with additional power to connect the Simkist Turn & Bank Indicator to your PC. More on separate HUBs can be found at the Simkits website or from your local computer products supplier.

How does the gauge connect to Flight Simulator?

The gauge can connect to 3 different Microsoft Flight Simulators: FS2002, FS2004 and FSX.

For Microsoft Flight Simulators: FS2002 and FS2004 you will need FSUIPC from Pete Dowson (see "How does it work"). This is because MS FS2002 and 2004 do not have an interface to exchange parameters with the outside world. Pete Downson has written a very good interface to acces the internals of MS FS2002 and 2004.

Microsoft Flight Simulator X has such an interface, developed by Microsoft, called SimConnect.

When you use FSX, you do not need any additional software from third parties. The Simkits software allows you to connect to Microsoft Flight Simulator directly, but only using the **Microsoft Flight Simulator X Deluxe edition**.

More complex gauges

As the Simkits Attitude Indicator with built-in USB Controller is one product out of a new series of gauges, also other gauges will be offered soon or are already available at the time of publishing of this manual:

- the Aircraft Gauge (one kit offers the possibility to built one instrument out of 74 different models)
- the light control (a USB device which can control the lighting in all new USB gauges)
- the Turn & Bank Indicator *)
- the ADF, Altimeter and Heading Indicator *)
- the VOR1 and VOR2 *)
- the TRC472 Switches *)
- the Trimwheel *)
- the Flaps Switch *)
- the Gear Switch
- the Tank Switch
- the Keylock Starter Switch *)
- the Yoke system
- Throttle, Prop and Mixture (Cessna style)
- Dual Throttle Quadrant (Dual Engine, Beechcraft style)
- Warning Panel
- Tank Switch

and many more, all in random order.

*) These products also have dip switches to create more than a single product in a setup (for example 2 trim wheels can be set as one vertical trim and one horizontal trim, one can have an altimeter left and one right in the panel, etc.

And of course, if you have already a CCU, you can use the existing CCU and expand using the USB gauges! They will not conflict with eachother.

Calibration for other Simkits gauges

Some of the more complex Simkits USB gauges (like an Altimeter, Heading Indicator, Attitude Indicator, etc.) cannot be calibrated using the "standard" calibration software. Therefore calibration for other gauges than the Simkits Aircraft Gauge is accomplished by separate graphical enhanced calibration software. For the Attitude Indicator this calibration software is called **trc_attitude_calibration.exe** and it is included in the installer.

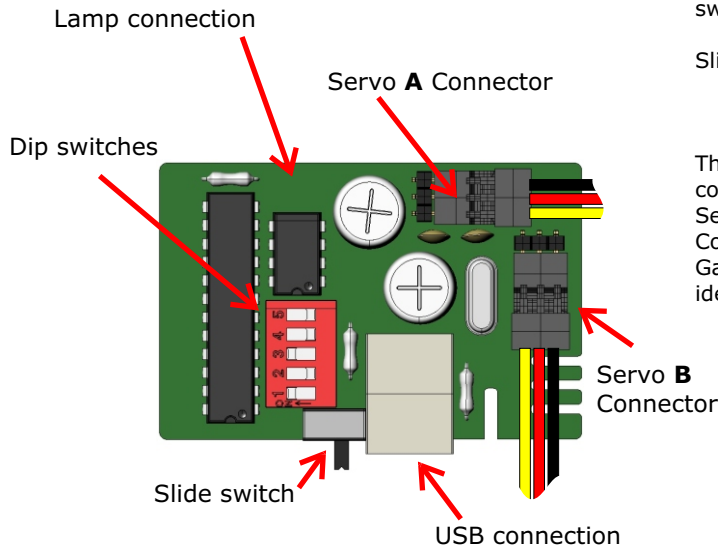## Connecting different Simkits gauges models simultaneously to Microsoft Flight Simulator

During the release of more Simkits gauges models, also new versions of the connection software USBFSXLink.exe and USBFSUIPCLink.exe will be released, which are able to connect these more complicated gauges to Microsoft Flight Simulator 2002/4 or Microsoft Flight Simulator X (Deluxe version). Some instruments may also have their own driver software. Multiple software drivers can run at the same time on your computer, all connecting gauges and instruments to Microsoft Flight Simulatir (FS9 or FSX).

List of available gauges to connect to

As internally in Microsoft Flight Simulator there is in principle only 1 Attitude Indicator, using Simkits you can connect more than one physical instrument to the flight simulator software. You choose the number for the Turn & Bank Indicator you like to calibrate from the pull down menu in the calibration software (choose TRC Gauge 60 or TRC Gauge 61).
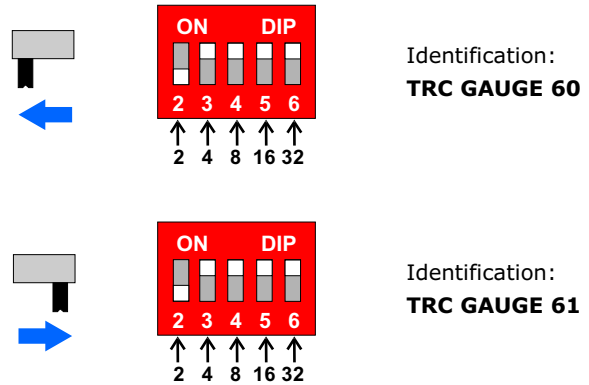
USB Controller

Lamp connection

Servo **A** Connector

Dip switches

Servo **B** Connector

Slide switch

USB connection

USB Dip Switch examples

There are 5 dip switches, numbered from 1 to 5 and one slide switch. Each dip switch has it's own value, as below:

Slide switch = 1	3 = 8
1 = 2	4 = 16
2 = 4	5 = 32

This is a so-called digital table. By setting a certain dip switch combination, the USB Controller can be given a number. Setting dip switch 1, 2, 3, 4 and 5 to on, gives the USB Controller the value 62 (TRC GAUGE 62 = recommended). Gauges can be numbered from 0 to 63 offering 64 different identities.

Identification:
TRC GAUGE 60

Identification:
TRC GAUGE 61

Identification

You can have up to a maximum of 64 Simkits USB Aircraft Gauges (the type with one or two pointers), Turn & Bank Indicators and Attitude Indicators with built-in USB Controller connected to your computer, plus mostly 2 of each more complex navigation gauges like Altimeter, Heading Indicator, VOR1, VOR2 and ADF.
Since most computers have only a few USB ports, you need to use a so-called USB HUB with additional power supply (7-port HUBS are available from the Simkits Website or at any computer store) to control and power up the gauge.

The gauge identifies itself as a so-called HID device towards Windows (XP or Vista is recommended). This means that you do not need a separate USB driver for this device. The Simkits Aircraft Gauge is recognized by Windows at first connection.

The "name" of the Turn & Bank Indicator in Windows is "TRC GAUGE 60" up to "TRC GAUGE 61" when the dip switches are set as recommended.
The HID device can be found in the Windows system 'Human Interface Devices" and each gauge is displayed as 'USB-HID". The settings of the dip switch is read out by the on-board microprocessor of the USB controller and the HID recognizable name is dynamically generated and forwarded over the USB connection to the PC at the time of connection. Changing the dip switch while the controller is connected to the PC (not recommended!) does not change the identification! The USB controller has to be disconnected and connected again to your PC in order to bring the new dip switch setting in action and for your PC to recognize the gauge with the new numbering.

Installing the software

First download the file "**SimkitsTurnBank.zip**", which you can find at www.simkits.com/software.php. When you have unzipped the file in a directory, you will see 2 files: setup.exe and SimkitsUSB.msi (the installer). Now start "setup.exe" by double clicking on the file icon or file name.
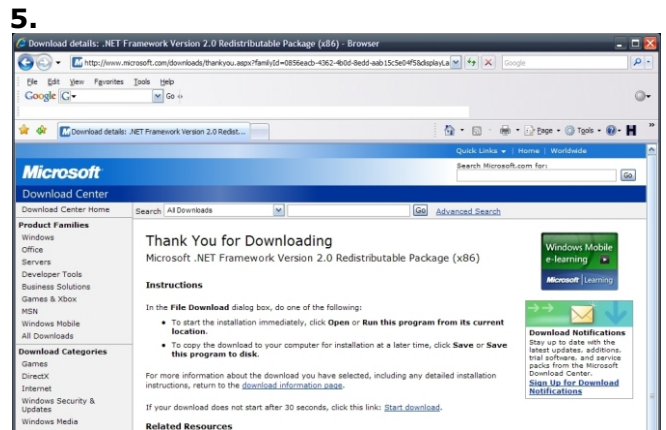
1.
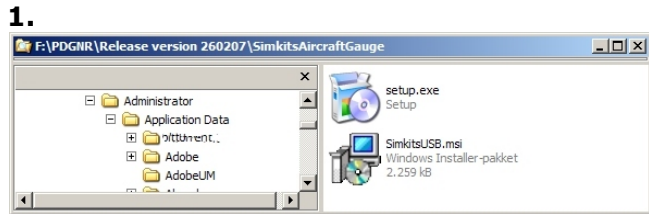
If this is the first time you download software which uses the so-called "Microsoft dot.net" (.net) environment, you will see the next screen (**2**). If you do not see this screen, but instead you see the screen number **12**, continue reading as from screen number **12**. You obviously have the "dot.net" system files already on your PC installed.

2.
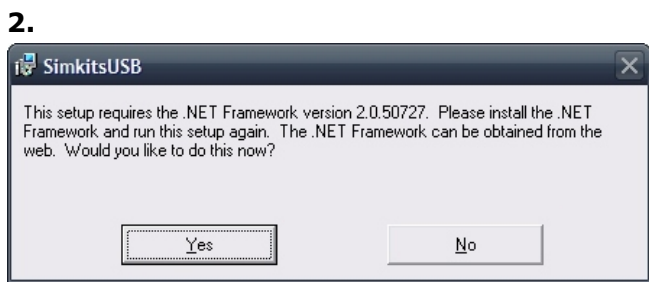
To install the .NET framework, you should be conencted to the internet prior to continue now. If you are not connected to the internet, please do so now. When you have clicked "Yes" on the window in picture 2, you computer will connect to the Microsoft internet site where you can download the necessary .NET system files.

3.
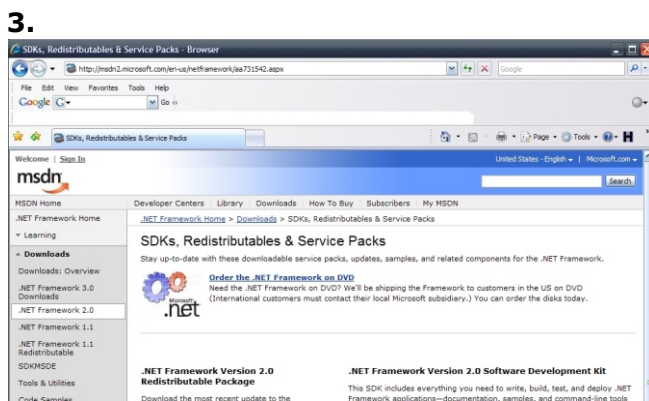
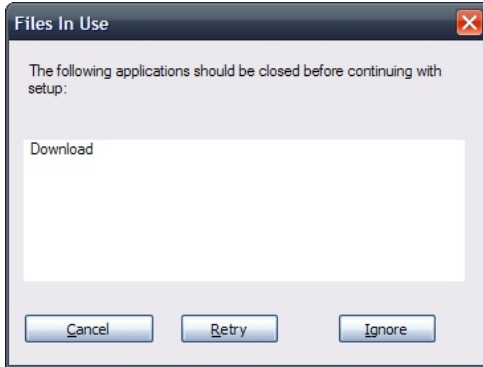Now choose on the web page "Download X86 version". This presents screen no. **3**, where you press "Run".

4.

5.

Follow the directions as given in screen 5.

6.

Follow the steps as given in the screens **6**, **7** and **8**.
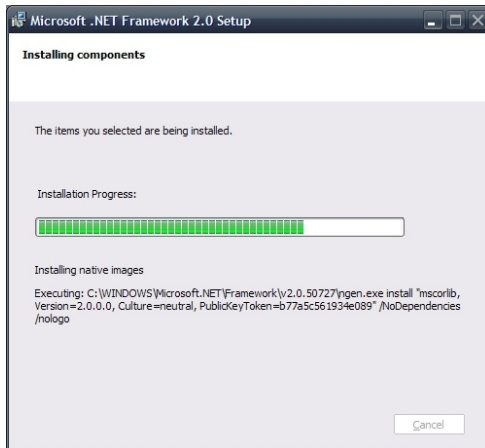

7.

8.
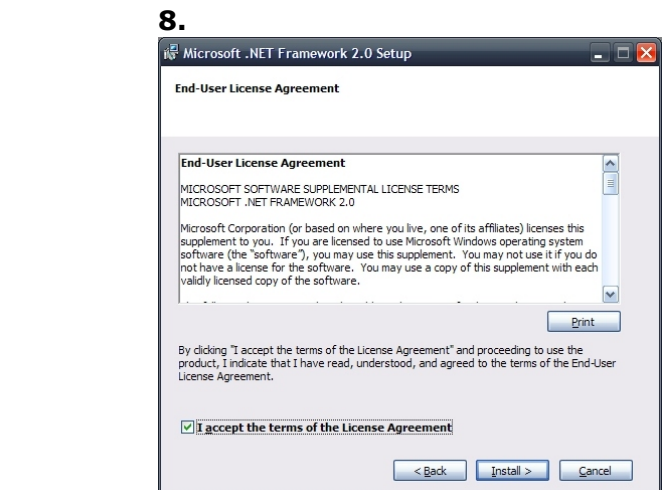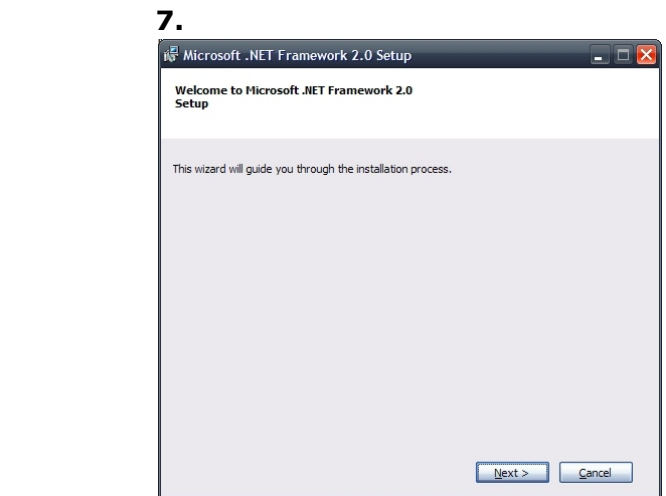
When the download is finished, screen No. **9** will be shown. This screens asks you to close the internet explorer used to download and the .NET files.

9.

When you have closed the Internet Explorer, the installation of the .NET files will start as shown in picture No. **10.**
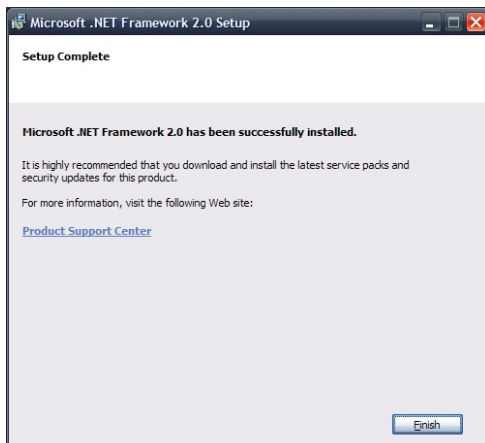
10.

When you screen No. **11** the installation of the Microsoft .NET environment is completed.
Screen **12** shows the continuation of the actual Simkits USB Aircraft Gauge software, needed to control the Simkits USB Aircraft Gauge.

11.

Installation of the software necessary to drive the Simkits USB Aircraft Gauges from SM FS2004 of from FS-X.
Now follow the directions as given in screen **12** to continue installation of the software.
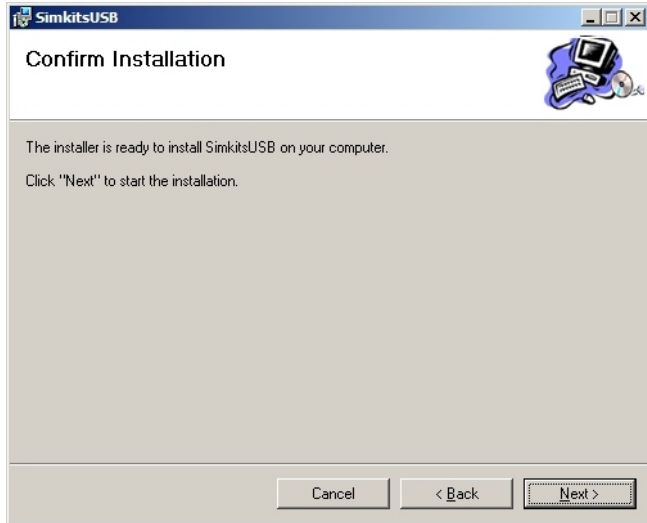
12.

Screen **13** asks you to install the files in a certain folder. If you are satisfied with the proposed folder, press "Next".
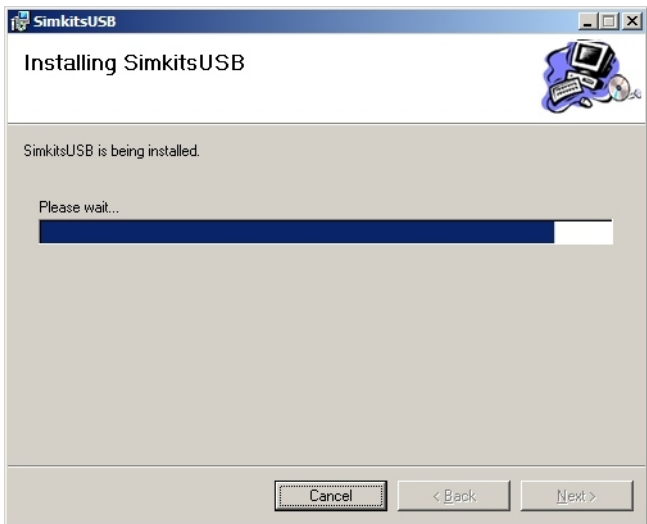
13.
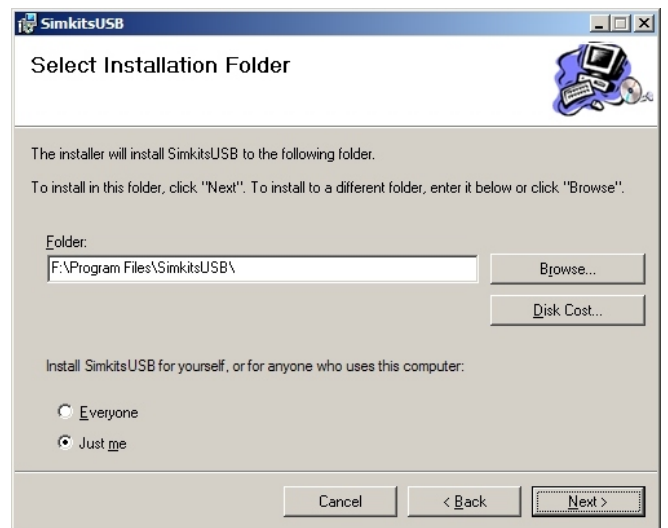
Screen **14** asks to re-confirm the choosen installation folder. Press "Next" to continue.
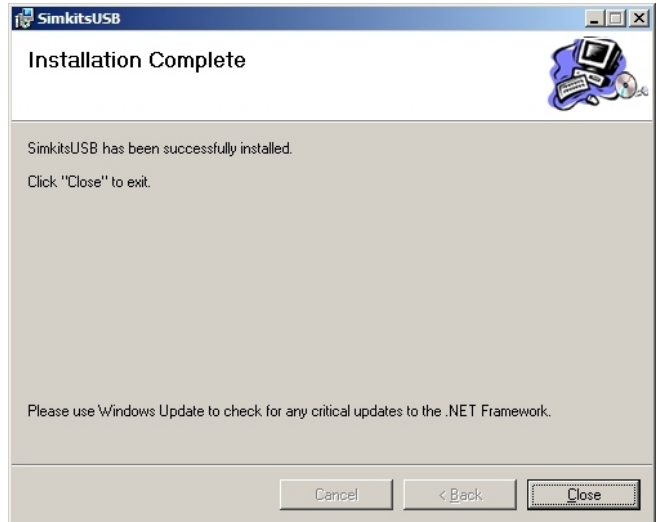
14.

Screen **15** shows the progress during installation of the Simkits USB Aircraft Gauge calibration and control software.

15.

When all software is installed, screen **16** shows. You are now ready to start using the Simkits USB Aircraft Gauge software.

16.

To start any of the Simkits USB Aircraft Gauge software, go to "Start"on your PC, choose "All Programs" and Look for the installed software "Simkits USB". There are 5 sub-menus. Each menu let you choose for one of the Simkits USB Aircraft Gauge programs:

USBFSUIPCLink
The software to run (in combination with FSUIPC 3.x) with Microsoft Flightsimulator 2002/2004.

USBFSUIPCLink (autostart)
The software to run (in combination with FSUIPC 3.x) with Microsoft Flightsimulator 2002/2004. Can be used when you want to use automatic starting for all software.

USBFSXLink
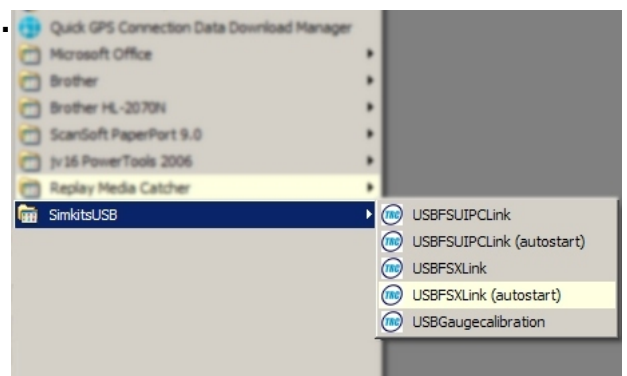The software to run with Microsoft Flightsimulator X.

USBFSXLink (autostart)
The software to run with Microsoft Flightsimulator X. Can be used when you want to use automatic starting for all software.

USBGaugecalibration
The software to calibrate a newly assembled gauge. This is the first software to use, prior to any other software!

17.

Calibrating the Attitude Indicator

Start the program **"trc_attitude_calibration.exe"** and connect the Attitude Indicator to a free USB connector on your PC.

Use the pull down window to select the Attitude Indicator you want to calibrate. Usually this is TRC GAUGE 60 (or 61).

Now click "Next" to proceed.

First the bank indicator has to be calibrated.

Turn the ring to the position as shown on the picture on the left by moving the slider. You can move quickly by pointing the mouse on the slider and "hold and move" to the left or the right.
Fine tuning can be done by clicking on the arrow buttons on the left and right of the slider button.

Warning: in case the middle scale moves up or down when you move the slider, the servos are connected wrongly and you should change them servo wiring prior to proceeding.
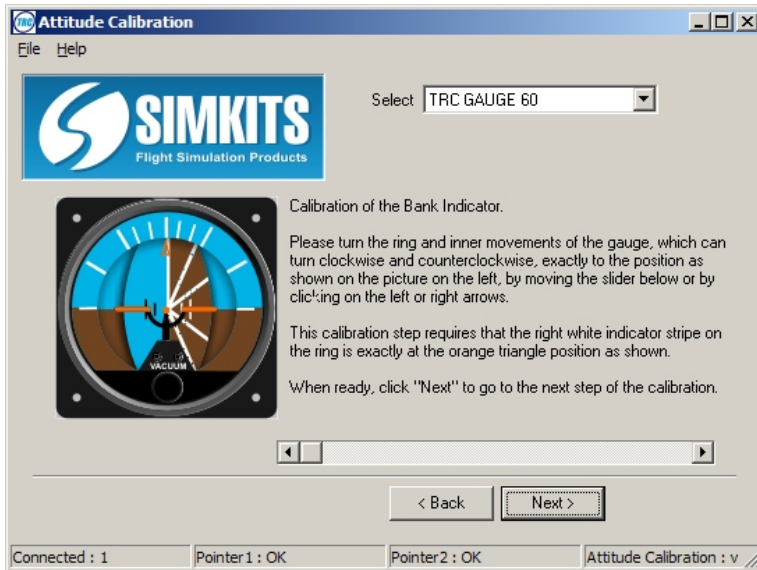
When the ring is in the position as shown in the picture, then click "Next".

Now move the ring with the slider to the middle position as shown in the picture.

When done, click "Next".
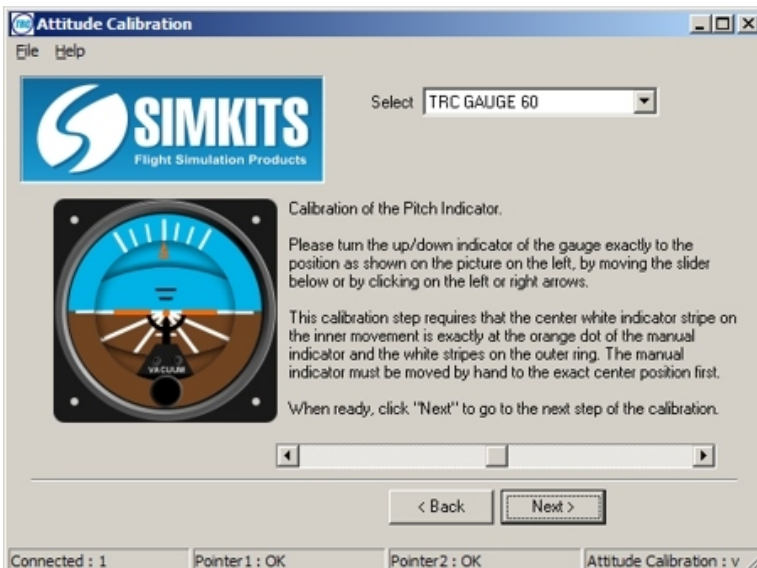
Calibrating the Attitude Indicator

Now move the ring with the slider to the position ton the right as shown in the picture.

When done, click "Next".

Now the lmiddle oval of the attitude indicator has to be calibrated.

Use the sliders and arrow buttons to position the scale exactly as in the picture and click "Next".
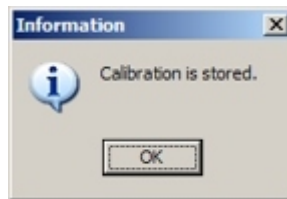

Move the slider again to set the scale in the position as shown and click "Next".

Calibrating the Attitude Indicator

This is the final step to calibrate the Attitude Indicator.

When you have moved the slider to position the scale as shown in the picture on the left, click "Save" to write the calibration values to the harddisk.

You should see the confirmation "Calibration is stored" when done.

Now you can start the program USBFSXLink or USBFSUIPCLink (depending on which flight simulator software you are running).

Connecting gauges to Microsoft Flight Simulator

There are 2 different programs supplied to connect your Attitude Indicator to Microsoft Flight Simulator. Although their "looks and feels" are the same, they are for different versions of Microsoft Flight Simulator. Please only use one program!

USBFSXLink.exe
This is the program to connect the gauges to Microsoft Flight Simulator X (Deluxe version only). FSUIPC is not needed here.

USBFSUIPCLink.exe
This is the program to connect the gauges to Microsoft Flight Simulator 2002 and 2004 and FSUIPC 3.x must be used.

The USBxxLink screen for connecting gauges to Microsoft Flight Simulator is very easy to use. At startup the software "looks" which Simkits USB devices are connected to your PC and displays the number d function (you must have calibrated the gauges prior to use, otherwise an error will occur).
Pressing the button "Connect to Flight Simulator" will connect the gauges to FS2002/4 or FSX. Flight Simulator must be running prior to pressing this button! When - after starting the Flight Simulator software you cannot "see" this program, press and hold the ALT key, while pressing the TAB key untill this program appears again.
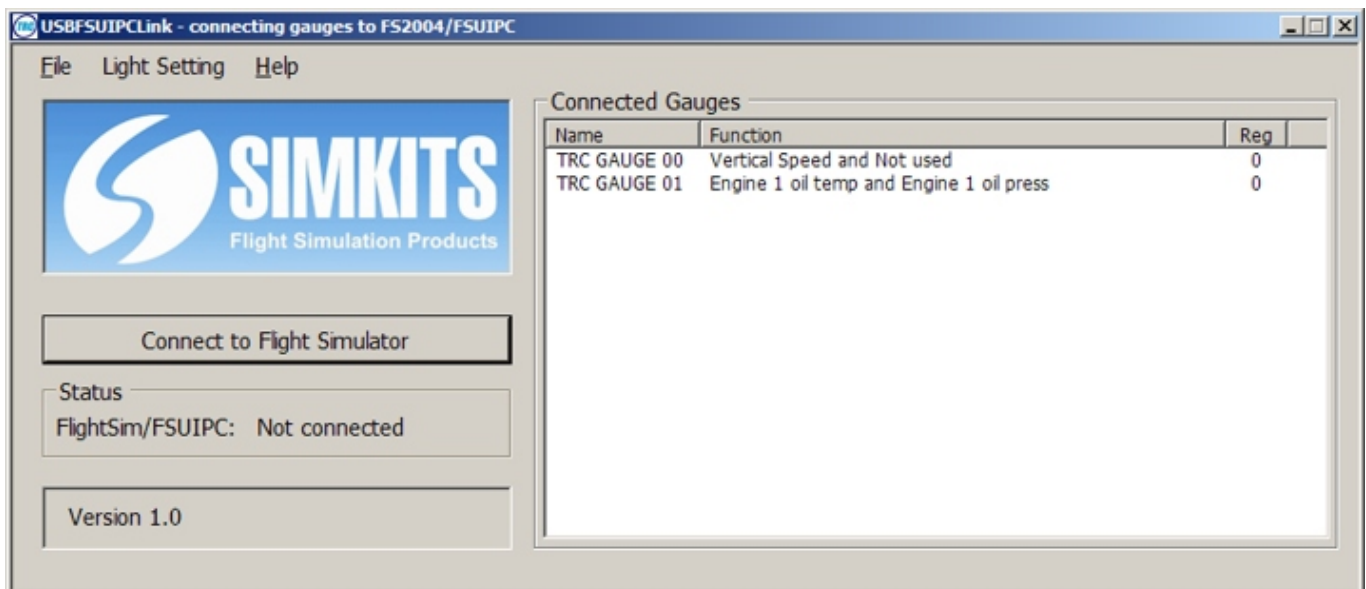

(the above "Connected Gauges" text is just for information. Your screen may show differently)

The window named "Connected Gauges" shows 3 columns. The first column is the gauge name/number as recognized by Windows. The second column shows the function(s) of the gauge and the 3rd column shows which light regulation will control the lighting of the specific gauge.

The USB Light Control (separately available) let you control the lighting of gauges very easily "on the fly". A maximum of 4 USB Light Controls can exist within a single PC/Flightsim setup. You can assign each gauge to a certain USB Light Control enabling 4 groups of different lighting.

The XXLink software reads out the setting of the USB Light Control and sets the lighting of the gauge accordingly.
When you don't have a USB Light Control, you can set the light manually in the XXLink software via the pull down menu "Light Setting", which also gives acces to the light assigment when using USB Light Control(s).
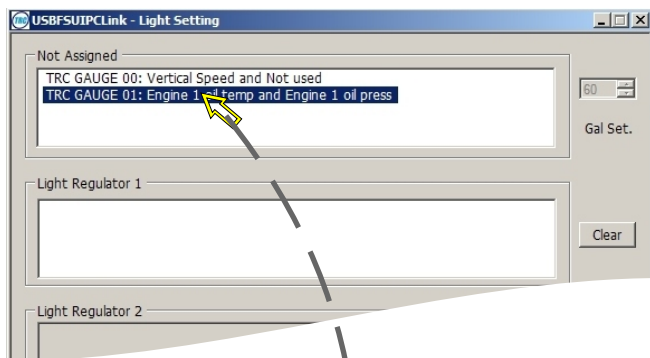
Assigning gauges to a USB Light Controller
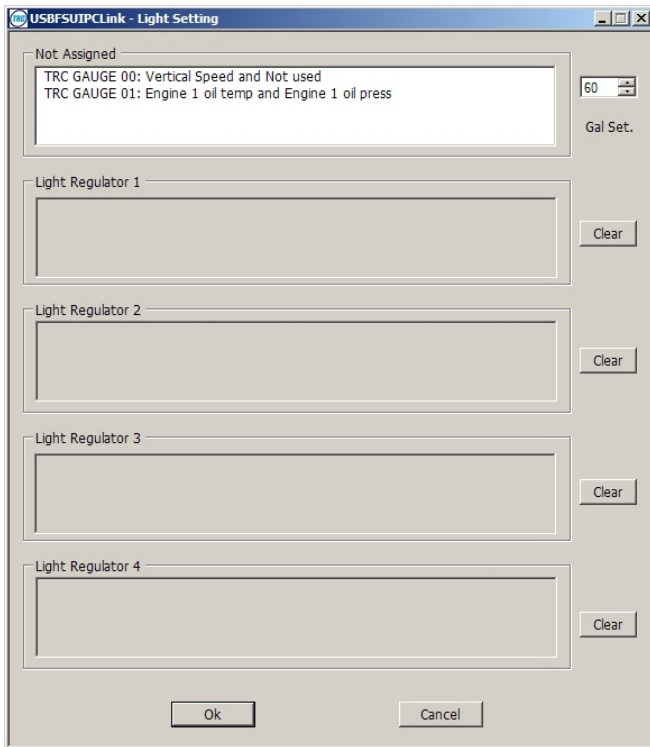
The **Light Setting** window shows the possible lighting assignments for the gauges.

The **Not Assigned** window shows all gauges which are not assigned or which are controlled by the software setting of the lighting in the small **Gal Set** (General Lighting) window.

When no USB Light Controller is connected, the windows "Light Regulator 1" to "Light Regulator 4" are grey colored and the lighting intensity for all connected gauges can be controlled by changing the setting (from 0 to 100) in the **Gal Set** window.

When the USBFSUIPCLink software or the USBFSXLink software recognizes a USB Light Controller, the corresponding window will open and a gauge can be "dragged" from the **Not Assigned** window to an opened **Light Control** window.

When a USB Light Controller is found by the software, the **Gal Set** (General Lighting) window will turn to grey and is switched off for light control.
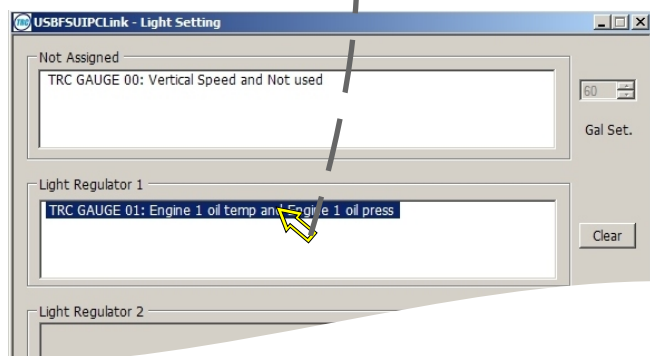
Just move the mouse pointer to a not assigned gauge, click with the left mouse button and hold the button pushed in while dragging the gauge name to an open **Light Control** window.

Now the gauge can be controlled by turning the knob on the assigned USB Light Controller.

(see also the next pages for using the USB Light Controller).

Setting the USB Light Controller number

The USB Light Controller is a stand-alone instrument containing a dedicated microprocessor.

The microprocessor reads out the potentiometer and when the knob is turned, the values of the potentiometer are transmitted over the USB connection to the PC, where the USBFSUIPCLink software or the USBFSXLink software recognizes the USB Light Controller and receives the values to control the lighting of the connected gauges in real time.

The USB Light Controller has a so-called dipswitches (2) which can be set into 4 different combinations. These combinations form the number of the USB Light Controller as it is recognized by windows and by the USBFSUIPCLink software or the USBFSXLink software.
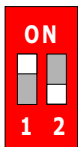
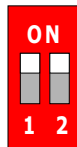**USB Connection**

Dipswitches

Knob
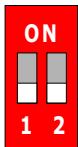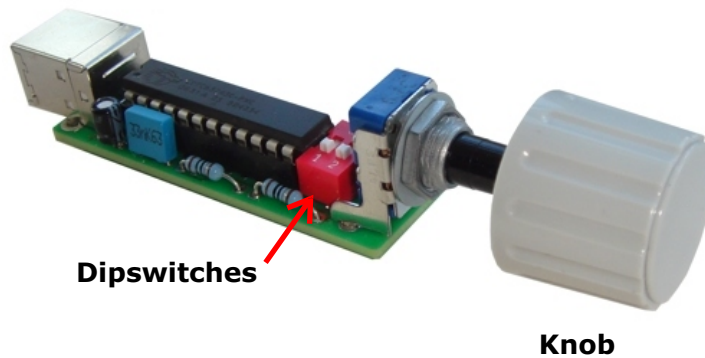
 The Light Controller number is 1
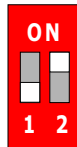
 The Light Controller number is 3

 The Light Controller number is 2

 The Light Controller number is 4