Data Translation GmbH • Im Weilerlen 10 • 74321 Bietigheim-Bissingen

DT 9812
Waveform-Generator

Operating Manual

Version 2.0

May 2011

Data Translation GmbH • Im Weilerlen 10 • 74321 Bietigheim-Bissingen

Table of Contents

1 Components

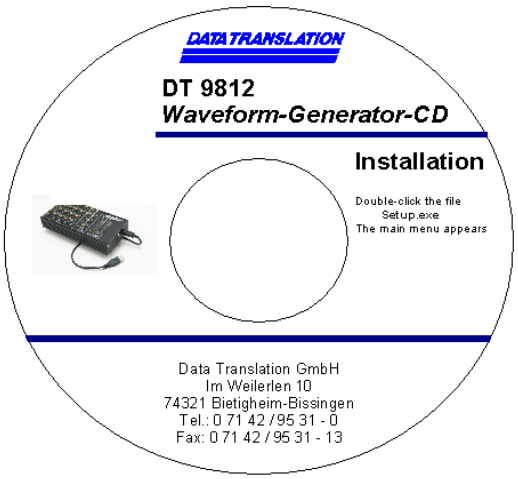
The DT 9812 Waveform-Generator includes the following components:

1.1 USB DAQ module DT 9812-10V integrated into a metal box with BNC

The detailed technical specifications can be found within the User's Manual (DT9812_13_14UM.pdf) in the root directory of the DT 9812 Waveform-Generator-CD.

1.2 DT 9812 Waveform-Generator-CD

This CD contains the driver software for the USB DAQ module DT 9812 and the Medical Waveform Generator Application (MWG). With this control software you can define single waveforms/stimuli being available at the BNC output connector (WAVEFORM OUT DAC 0). Using the integrated oscilloscope function two analog input signals can be monitored.



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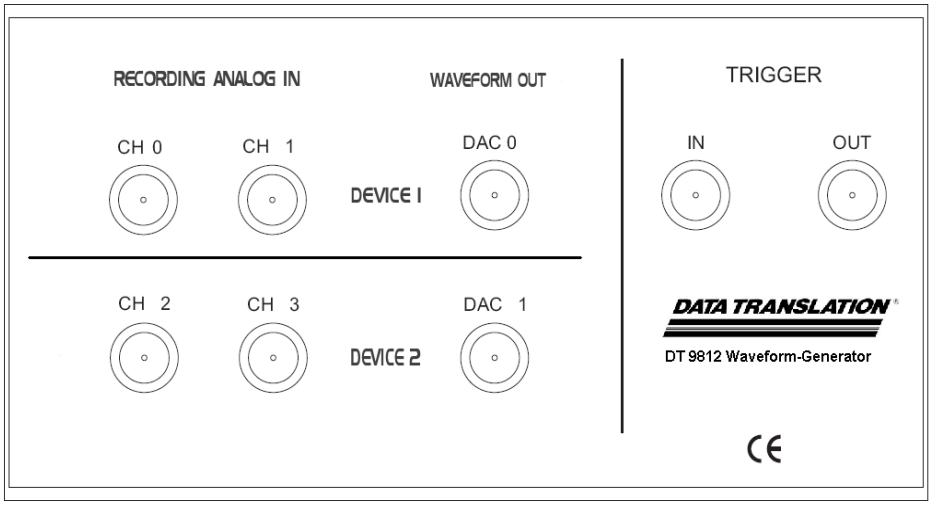
2 Installation and connecting the components

2.1 Device driver installation for the USB DAQ module DT 9812-10V

First the Waveform Generator Application software must be installed before connecting your DT 9812 Waveform Generator to the PC. Please run the Setup.exe in the root directory of the CD.
The device driver for the USB DAQ module will automatically installed within this process. You must have administrator rights to do so.

2.2 DT 9812 Waveform-Generator front panel connectors

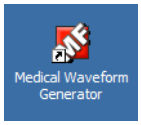


Front panel of the DT 9812 Waveform-Generator

Connector	Description	DT 9812-10V assignments
Analog Inputs		
Recording Analog IN CH 0	Analog Input max. ±10V	Analog Input CH 0
Recording Analog IN CH 1	Analog Input max. ±10V	Analog Input CH 1
Recording Analog IN CH 2	Analog Input max. ±10V	Analog Input CH 2
Recording Analog IN CH 3	Analog Input max. ±10V	Analog Input CH 3
Analog Outputs		
Waveform OUT DAC 0	Analog Output max. ±10V	DAC 0
Waveform OUT DAC 1*	Analog Output max. ±10V	DAC 1
Trigger		
Trigger IN	Digital Input TTL	Digital Input 0
Trigger OUT	Digital Output TTL	Digital Output 0

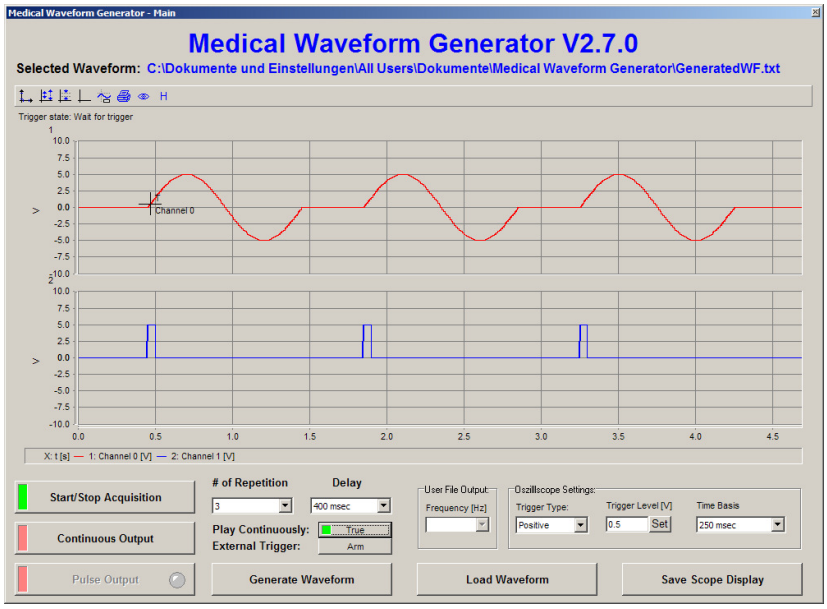
***** The analog output channel WAVEFORM OUT DAC 1 can be used as an output trigger. When using the Medical Waveform Generator Application, a 5V pulse will be generated with each waveform (See also the screenshot on the next page).

3 The Medical Waveform Generator Application

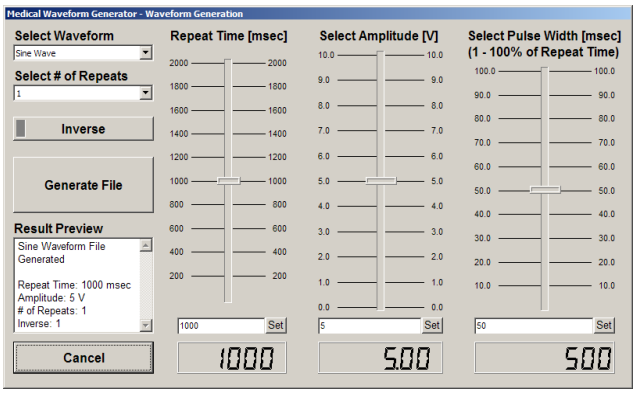
The Medical Waveform Generator Application can either be started by clicking on the Icon on the Desktop 

or using the Windows start menu (Start => Programs => Medical Waveform Generator => Medical Waveform Generator*)*.

The application contains of two windows: The Main window to control the input/output with an integrated oscilloscope function and a second window (Waveform Generation) to generate new waveforms/stimuli.



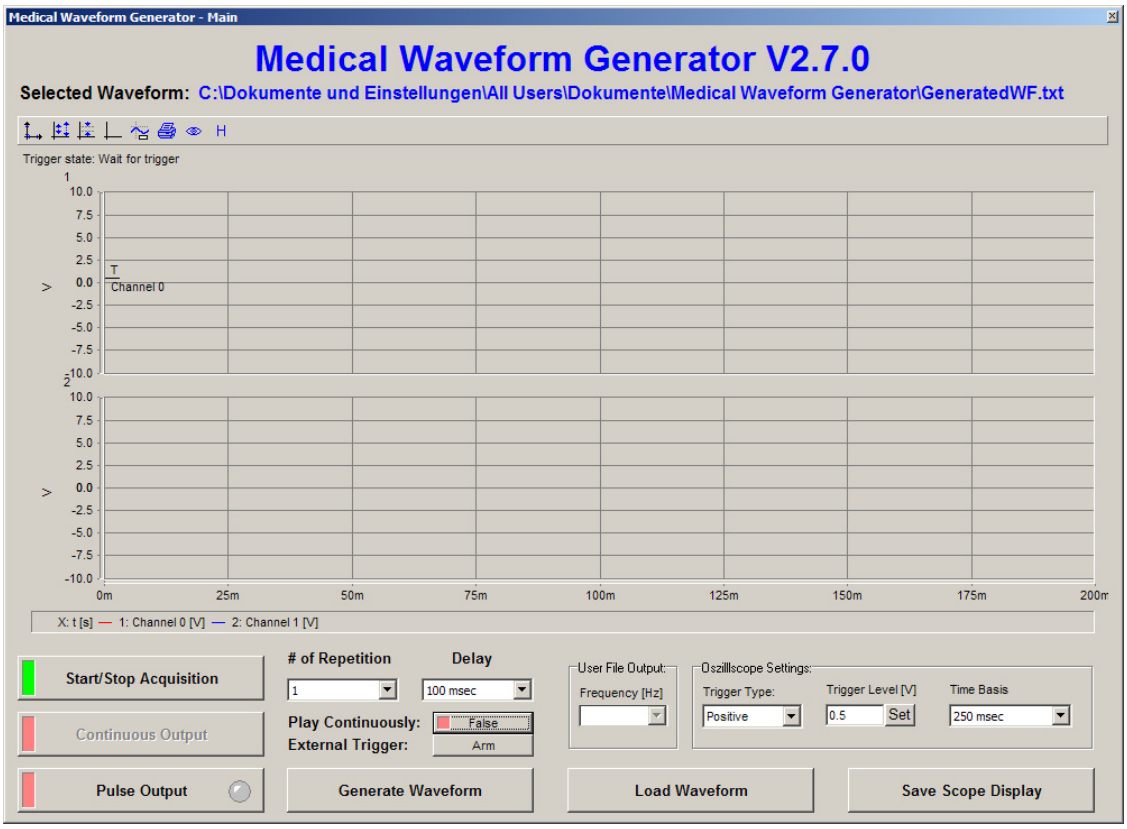
Medical Waveform Generator – Main



Medical Waveform Generator – Waveform Generation

3.1 The Window "Main"

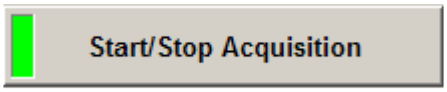
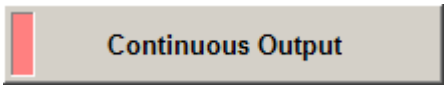
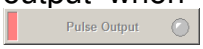
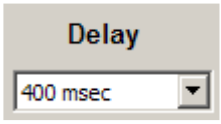
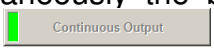
After starting the software, the window "**Main**" of the **Medical Waveform Generator Application** is shown.



Medical Waveform Generator window "Main"

Using this window you can control and set the waveform output and display the applied data from the two analog input channels (Recording Analog IN CH 0 and CH 1, oscilloscope mode).

3.1.1 Description of the individual button and switch functions

	Starts/Stops the acquisition of the analog input channels **Recording Analog IN CH 0** and **CH 1**
	Starts the output of the loaded/generated waveform at the analog output channel **DAC Ch0.** The round LED indicator turns red when the output starts.
	Starts the continuous output of the loaded/generated waveform at the analog output channel **DAC Ch0**. To activate this function the parameter **Play Continuously** must be set before to **True**: 
	The number of Repetitions for the waveform can be set to the values 1 to 10 or Infinite. With every output, the round LED indicator on the button Pulse Output  briefly turns red. To stop the output when Infinite is selected, press Pulse Output  again.
	The Delay between the repetitions of the output can be set between 50ms and 10000ms.
	The output of the waveform can also be started via an external trigger. To initiate the button *Arm* must be pressed. Its caption will change to *Armed*. Simultaneously the button Continuous Output turns green  and the round LED indicator on the button Pulse Output shows permanently red:  The output starts, when a rising edge is detected at the trigger input **Trigger IN**.

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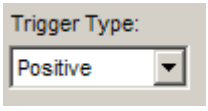
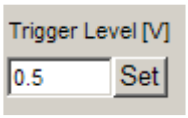
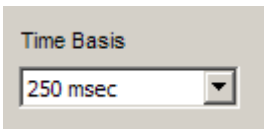
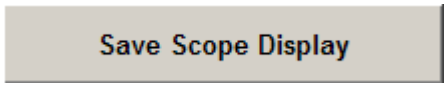
	By clicking this button the window **Waveform Generation** will be opened to generate new waveforms/stimuli.
	Software-Trigger for the oscilloscope: **Off:** no trigger, free running **Negative:** trigger on a negative Edge **Positive:** trigger on a positive Edge The trigger channel is always **Recording Analog IN CH 0**.
	Voltage level where the Software-Trigger happens. The trigger channel is always **Recording Analog IN CH 0**.
	The Time Basis of the oscilloscope which can be set from 50ms to 2s.
	To load a previously generated or saved waveform template (ASCII file), this button must be pressed. A file open dialog will appear and you can select the desired file.
	Saves the actual displayed data in the oscilloscope into an ASCII file (.txt).

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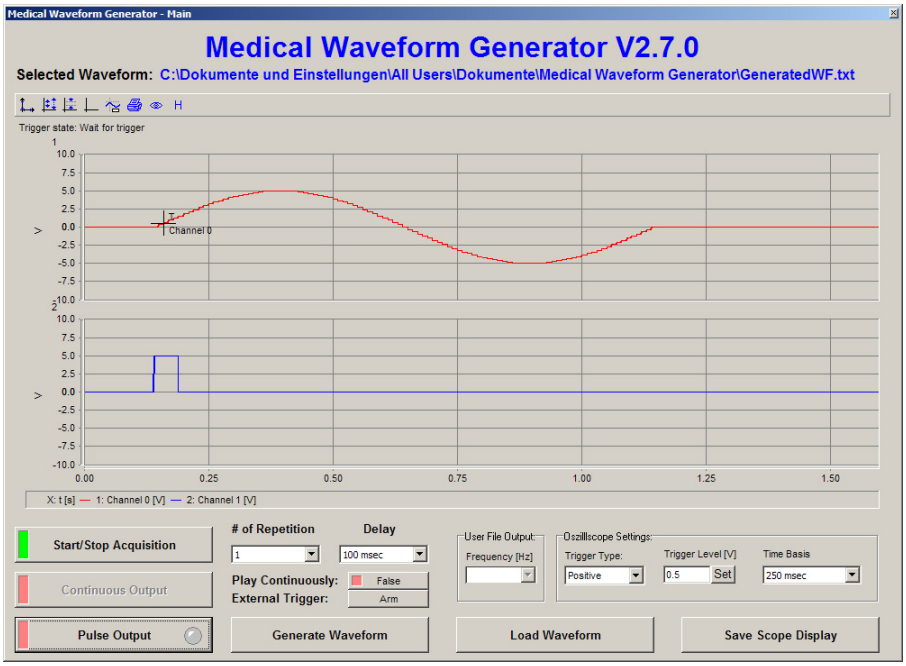
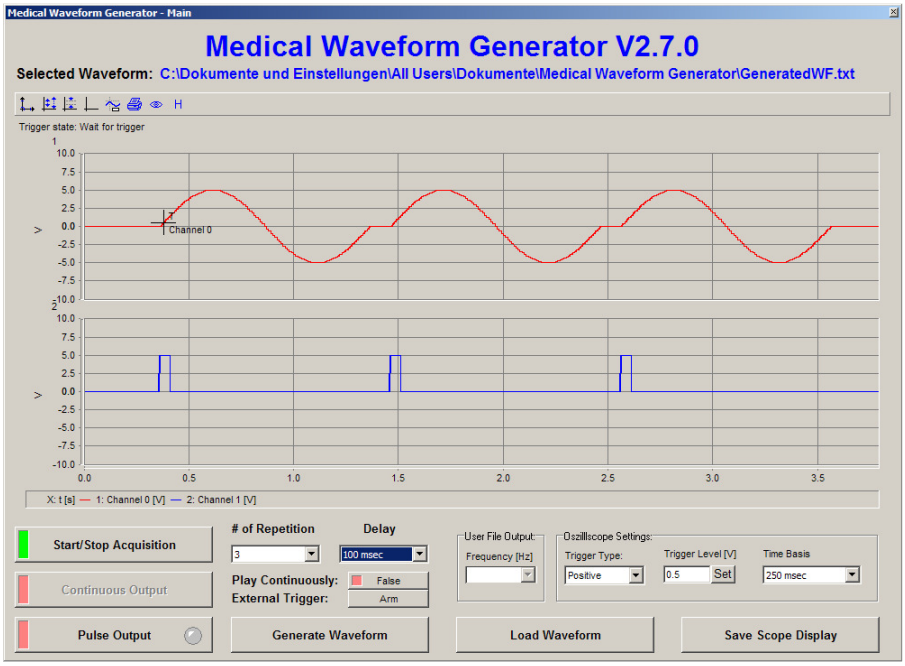
3.1.2 Screenshots with different settings



Medical Waveform Generator – Main
Output of a waveform with one repetition



Medical Waveform Generator – Main
Output of a waveform with three repetitions and a delay of 100ms between the repetitions

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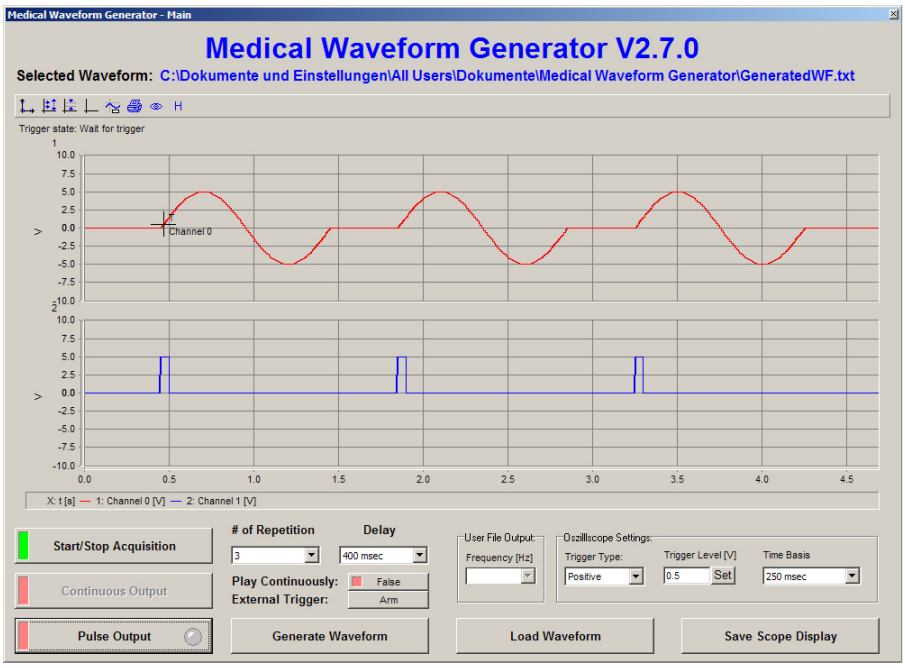
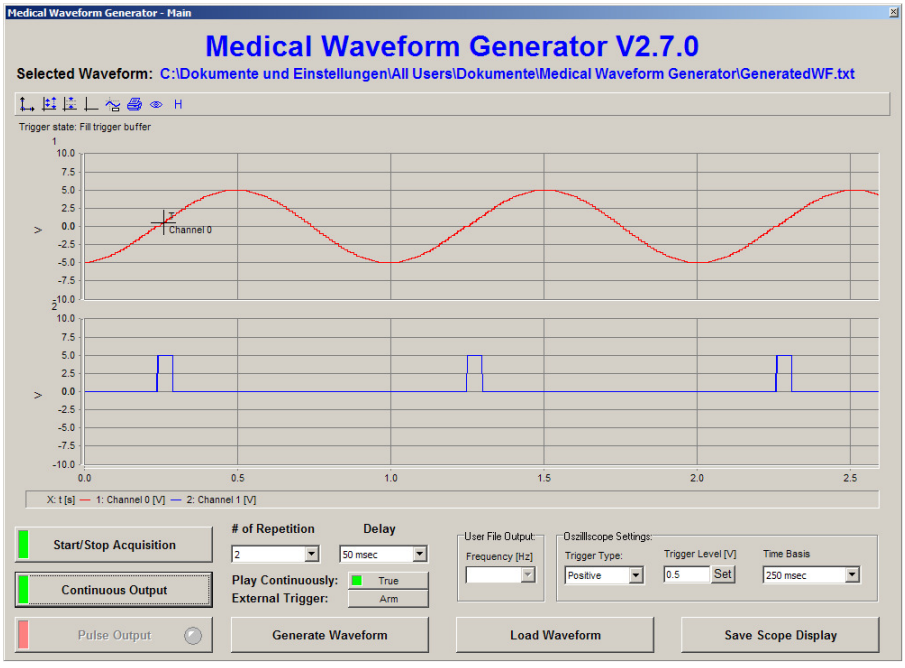


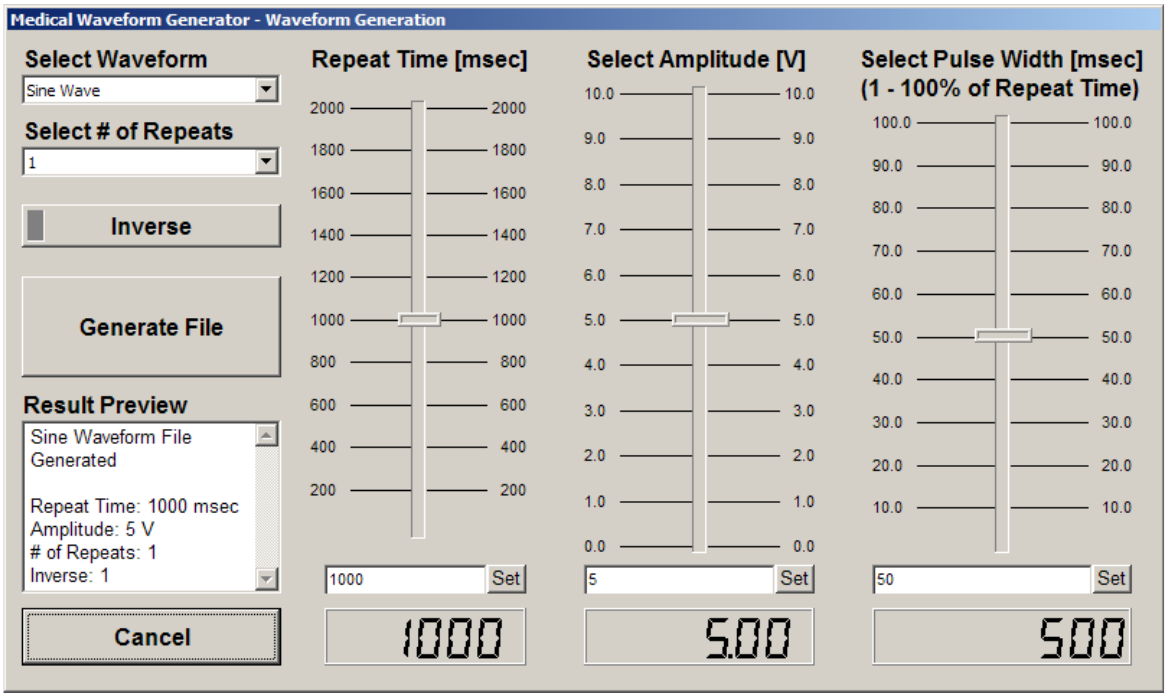
Medical Waveform Generator – Main
Output of a waveform with three repetitions and a delay of 400ms between the repetitions



Medical Waveform Generator – Main
Continuous output of a waveform

3.2 The window "Waveform-Generation" to generate a waveform

Within this window you can generate new waveforms which can be a square wave, a sine wave or a ramp. The waveform can also be inverted.



Medical Waveform Generator – Waveform Generation

A new generated waveform will always be saved in the folder

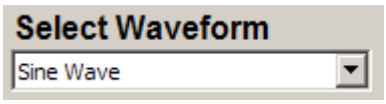
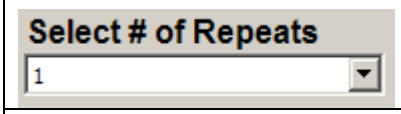
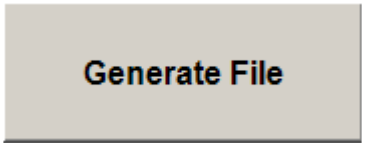
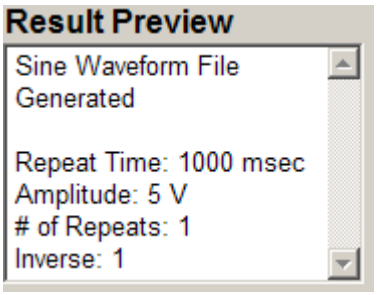
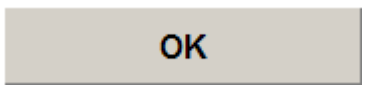
C:\Documents and Settings\All Users\Documents\Medical Waveform Generator

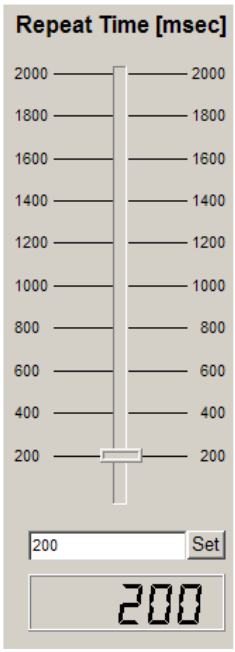
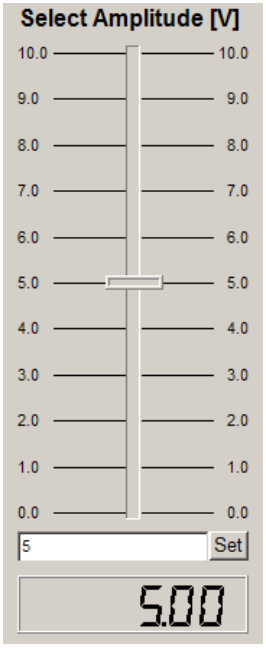
using the file name

GeneratedWF.txt

This file can be copied and re-named and then loaded into the application at a later time.

3.2.1 Description of the individual button and switch functions

	You can choose between three different waveforms: **- Sine Wave** **- Half Square** **- Ramp**
	The number of repetitions for the waveform can be set from 1 to 50.
	To invert the polarity of the waveform press this button, this will then turn green.
	This button generates the waveform and saves the waveform into the file *GeneratedWF.txt* within the folder *C:\Documents and Settings\All Users\documents\Medical Waveform Generator*
	The **Result Preview** only shows the parameter of the generated waveform currently being used.
 	As long as no new waveform has been generated (the button **Generate File** has not been pressed), this button shows the caption Cancel. By clicking on this button, you can close this window and the previous waveform remains. If a new waveform has been generated (the button **Generate File** has been pressed), this button shows the caption OK. By clicking on this button, you can close this window.

	The **Repeat Time** equals the period of the waveform which can be set between 1 and 2000 milliseconds. Instead of using the slider, the value for this parameter can also be typed into the edit field below the slider and then be acknowledged by clicking the **Set** button. The selected value will be displayed in the display below the edit field.
	The **Amplitude** can be set between 0.1 and 10 Volts. Instead of using the slider, the value for this parameter can also be typed into the edit field below the slider and then be acknowledged by clicking the **Set** button. The selected value will be displayed in the display below the edit field.

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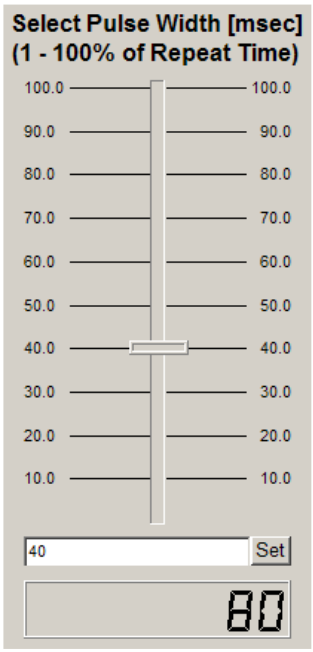
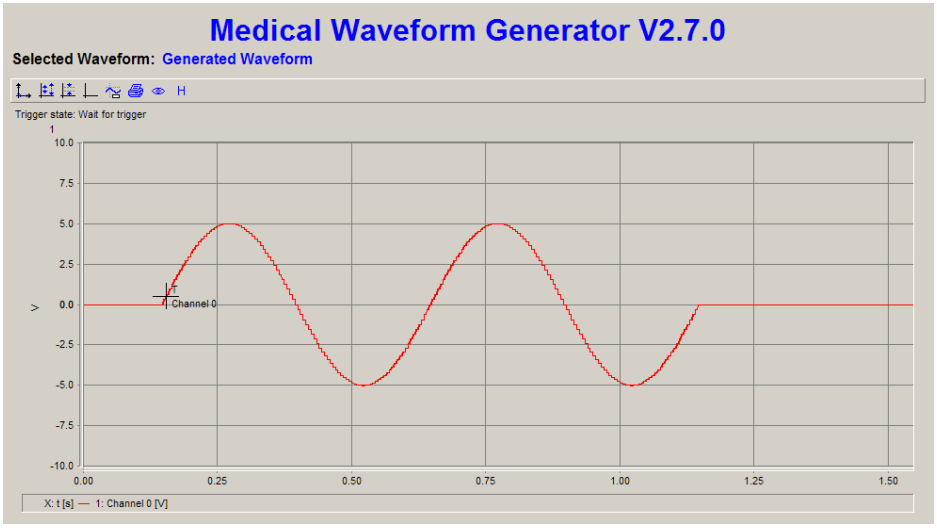
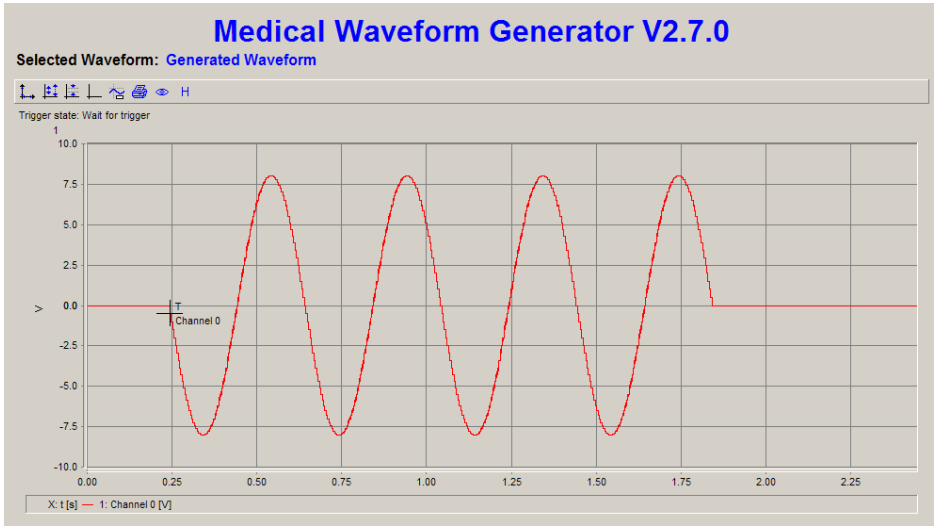
	The **Pulse Width** will be entered in percent. This parameter is only relevant when using the waveform types **Half Square** and **Ramp**. It represents the ratio in percent between pulse duration and pulse inactive of the whole pulse (Repeat Time). Instead of using the slider, the value for this parameter can also be typed into the edit field below the slider and then be acknowledged by clicking the **Set** button. The display below the edit field does not display the value in percent. The pulse duration in milliseconds will be displayed. **Example:** Using a Repeat Time (Period) of 200ms and a Pulse Width of 40% equals a Pulse Width of 80ms.

3.2.2 Screenshots with different Settings



Generated waveform with the following parameters:

Waveform:	Sine Wave
# of Repeats:	2
Inverse:	No
Repeat Time:	500ms
Amplitude:	5V



Generated waveform with the following parameters:

Waveform:	Sine Wave
# of Repeats:	4
Inverse:	Yes
Repeat Time:	400ms
Amplitude:	8V

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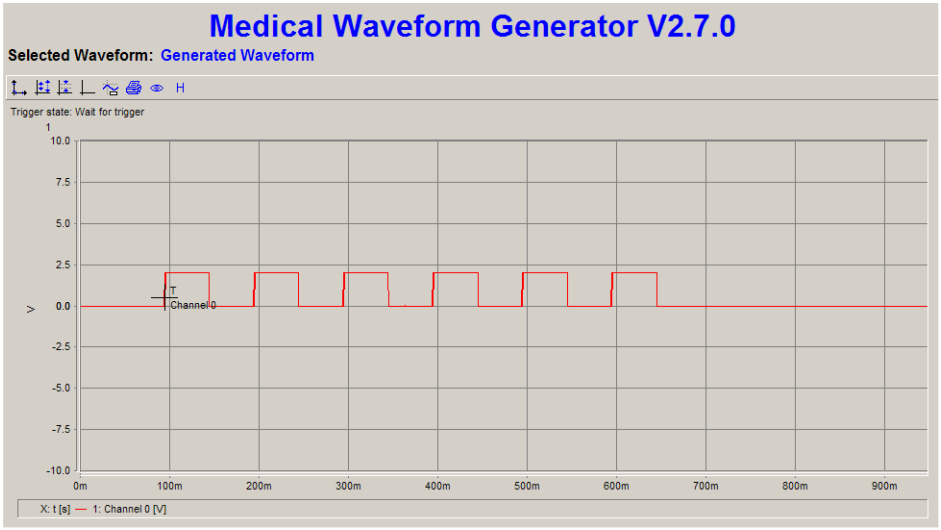
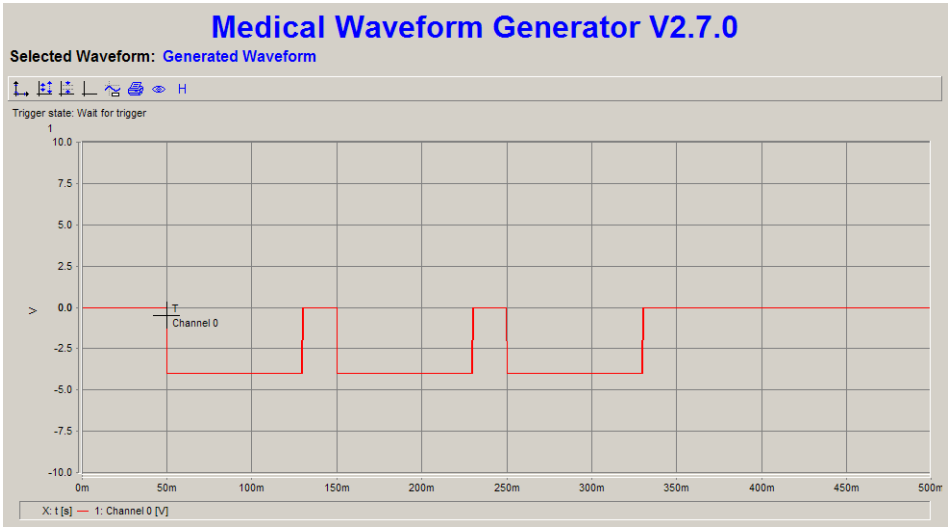


Generated waveform with the following parameters:

Waveform:	Half Square
# of Repeats:	6
Inverse:	No
Repeat Time:	100ms
Amplitude:	2V
Pulse Width:	50%



Generated waveform with the following parameters:

Waveform:	Half Square
# of Repeats:	3
Inverse:	Yes
Repeat Time:	100ms
Amplitude:	4V
Pulse Width:	80%

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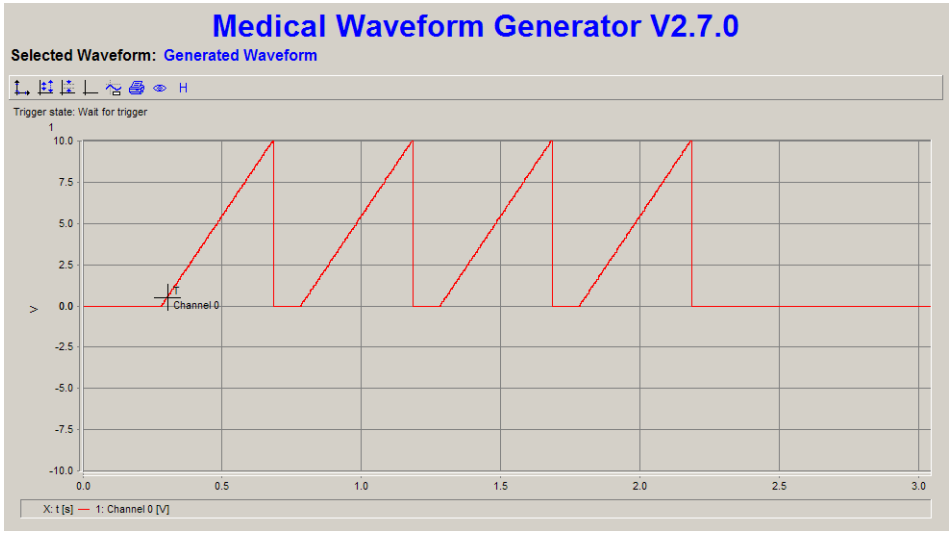
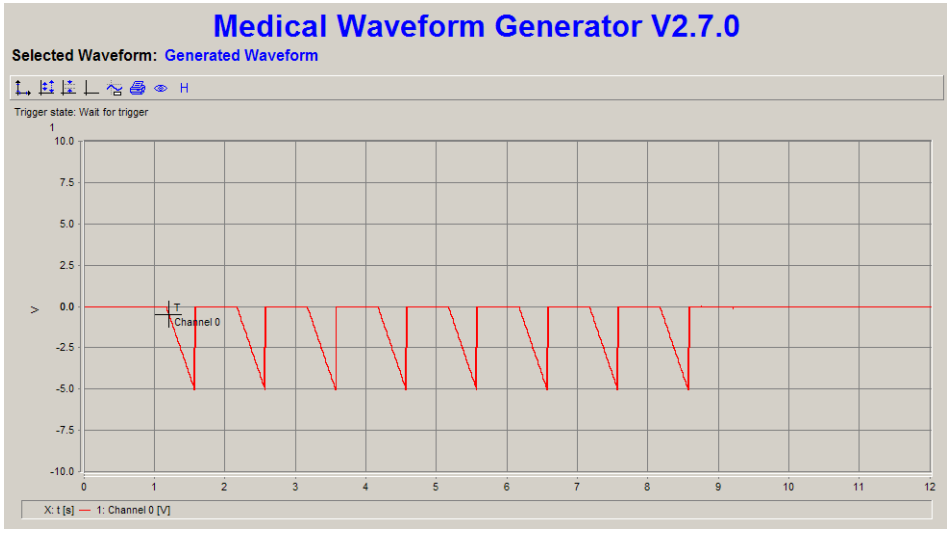


Generated waveform with the following parameters:

Waveform:	Ramp
# of Repeats:	4
Inverse:	No
Repeat Time:	500ms
Amplitude:	10V
Pulse Width:	80%



Generated waveform with the following parameters:

Waveform:	Ramp
# of Repeats:	8
Inverse:	Yes
Repeat Time:	1000ms
Amplitude:	5V
Pulse Width:	40%

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4 Specifications

4.1 Analog Inputs

Number of channels	4 (Single-ended)
Resolution	12 Bits
Sample rate	50kSamples/s divided by the channels used
Input ranges	±10V, ±5V, ±2.5V, ±1.25V programmable
Maximum input voltage	±20V (Power off) / ±35V (Power on)

4.2 Analog Outputs

Number of channels	2
Resolution	12 Bit
Sampling rate	max. 50kSamples/s per channel
Output range	±10 V

4.3 Trigger IN (Digital Input)

Number of channels	1
Input logic load	LVTTL
Input type	Level sensitive
High input voltage	2.4V min.
Low input voltage	0.8V

4.4 Trigger OUT (Digital Output)

Number of channels	1
Input logic load	LVTTL
High Output voltage	2.8V min.
Low Output voltage	0.6V max.
High Output current (source)	2mA
Low Output current (sink)	10mA

4.5 Power, physical and environment specifications

Power, +5V	via USB
Dimensions (LxWxH)	180mm x 106mm x 72mm
Weight	approx. 1000g
Operating temperature range	0°C to 55°C
Storage temperature range	-40°C to 85°C
Relative humidity	To 95%, non condensing

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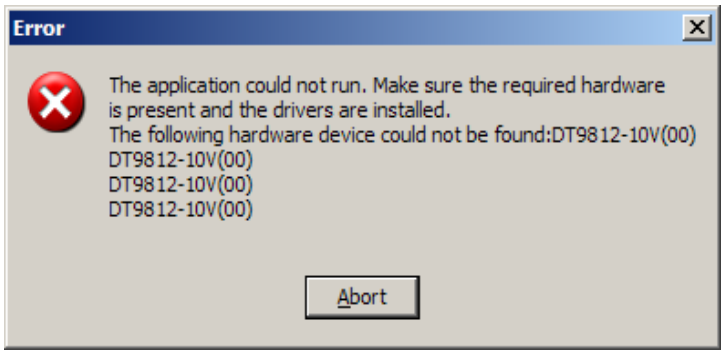
5 Trouble-shooting

5.1 USB DAQ module not connected

If the USB DAQ module is not connected to the PC, the following error message appears:

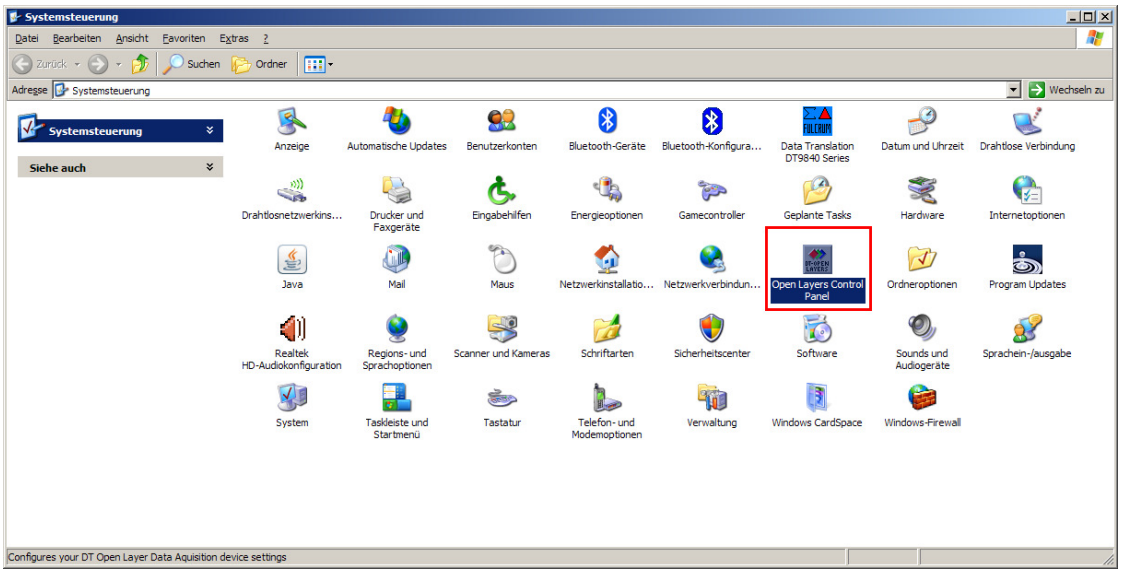


Please click on **Abort**, connect the hardware to the PC and restart the application.

5.2 USB DAQ module connected, but the application does not start

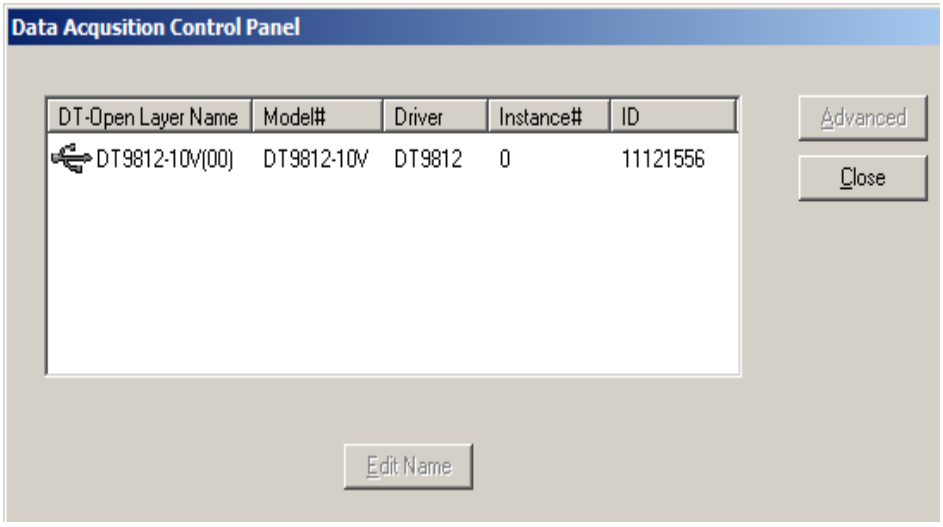
If the USB DAQ module is connected properly to the PC and you get the same error message as in **5.1**, you need to check the name settings for the hardware within the **Open Layers Control Panel**.

To get there please click within Windows on **Start**, then on **Settings** and then on **Control Panel**:



Within the **Control Panel** please double-click on the icon **Open Layers Control Panel**.

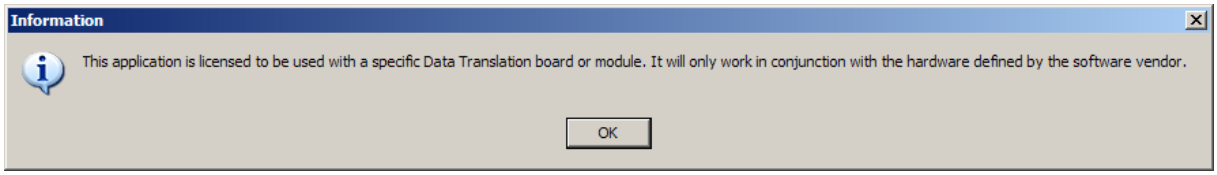
Please check the **DT-Open Layers Name** of your DT 9812 USB DAQ module. It must be **DT9812-10V(00)**



If that's not the case, you need to change this name. Therefore click on the button **Edit** and change the name to **DT9812-10V(00)**. To do this, administrator rights are necessary.

5.3 The application does not start, the hardware is not compatible

The Medical Waveform Application (starting with Version 2.5.6.1) is protected by using a software dongle. The application only runs with the USB DAQ module from the original shipment. If you are using another USB DAQ module, you will get the following error message:



If this message appears, please contact us:

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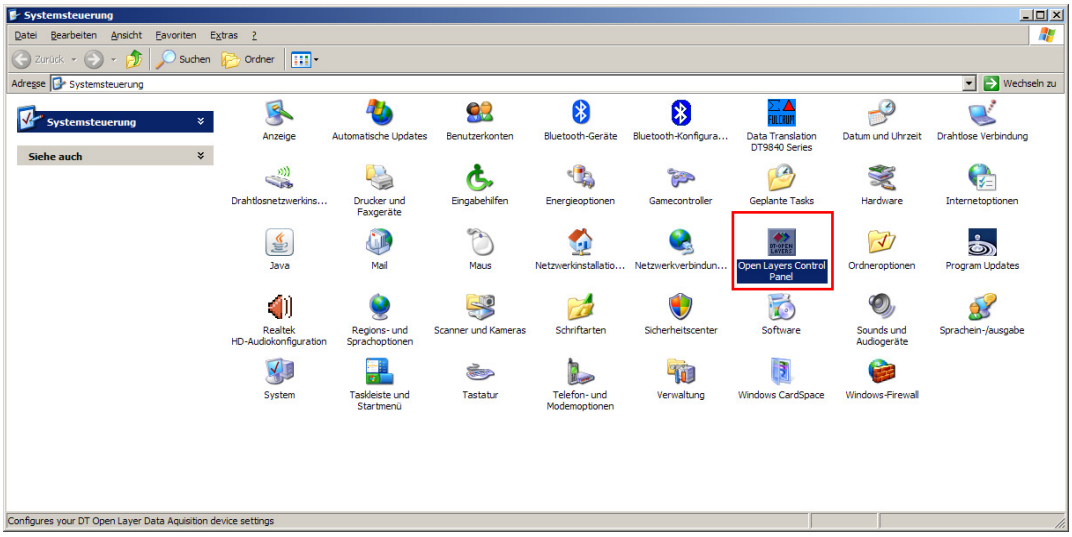
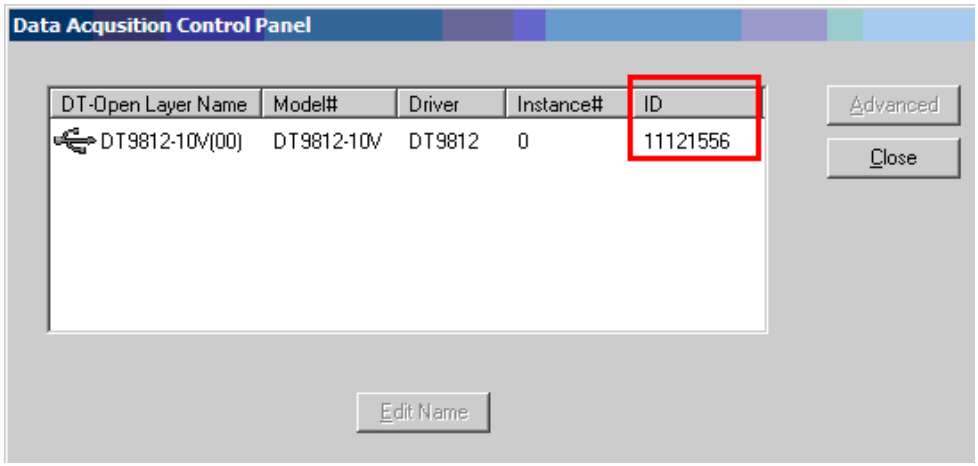
6 Software Update

The new version 2.7.0.1 of the Medical Waveform Generator Application is protected by using a software dongle. As an existing user of the Medical Waveform-Generator you are eligible to receive a free of charge update. Therefore we need the **Hardware ID** of your DT 9812 Waveform Generator.

The Hardware ID can be determined through the **Open Layers Control Panel**. To get to the Open Layers Control Panel please click within Windows on **Start**, then on **Settings** and then on **Control Panel**:



Within the Control Panel please double-click on the icon **Open Layers Control Panel**.



Please send the 8-digit **ID** via e-mail to Mr. Daniel Schmidt (sales@DataTranslation.de). You will receive the new version 2.7.0.1 on CD or via download.

An Introduction to the Theory of Operation of the Digitimer DS5 Bipolar Constant Current Stimulator

Traditional electrical stimulators output a square stimulus pulse which is a set duration in length and a set amplitude in size. These devices are usually triggered by an external trigger pulse (TTL logic), footswitch or front panel push button. The DS5 introduces a new level of versatility as it allows a remote signal generator to completely control both the amplitude and shape of the waveform. In this way, it is possible for you to use signal generating software and a data acquisition interface (with appropriate analogue outputs) to "drive" the DS5. The DS5 has a BNC socket on the rear of the unit which allows it to accept a voltage input of ±1, ±2.5, ±5 or ±10 V (full scale) and convert this into a constant current output of ±10, ±25, ±50 mA (full Scale). This versatility means that the user is no longer restricted to square stimulus pulses, but can now stimulate with arbitrary waveforms, including sine waves and ramps.

Voltage Waveform Input
(±1, ±2.5, ±5 or ±10 V)
Generated by a signal generator such
as a commercial D/A Interface & Software