

ReRa Tracer3

USER MANUAL

© 2019 ReRa Solutions
ReRa Solutions

RERA SOLUTIONS
SOLAR MEASUREMENT

1.	Installation	3
1.1	Computer Requirements	3
1.2	Software Prerequisites	4
1.3	Installing the software	5
1.4	Installing Hardware	13
1.4.1	Installing Drivers	13
1.4.2	Installing optional drivers / installers	25
1.5	License Activation	34
1.5.1	Automatic Activation	36
1.5.2	Manual Activation	39
1.5.3	Transfer the license to another computer	42
1.6	Setting up the system	44
1.6.1	Tracer Configurator	44
1.6.2	Cell and Module mode	49

1 Installation

This part will focus on the computer requirements and how to install Tracer3.

1.1 Computer Requirements

Processor, memory and hard-drive

The minimum requirements for a computer to run Tracer3 are:

1. 32-bit (x86) or 64-bit (x64) processor, Pentium, Core i3, i5 or i7, Xeon
2. 4 GB of system memory
3. 128 GB hard drive with at least 20 GB of available space

More system memory (8GB total) and a powerful processor (Core i3, i5, i7, Xeon) is recommended.

Operating System

Tracer3 is developed for the Microsoft Windows platform. Linux and MacOS are not supported.

The supported versions of Windows are:

- Microsoft Windows 7 and higher (Windows 10)

Not supported: Windows RT and all windows versions before Windows Vista, note that Windows XP is **NOT** supported in any way.



Tracer3 will run on Windows 7 Starter, but most of the drivers for instruments fail to work on this version of Windows.

Hardware interfacing

Depending on the hardware used to measure the cells, different requirements on the interfaces may be there. In general 3x USB 2.0 and a free Ethernet port are sufficient.

1.2 Software Prerequisites

Elevated User Rights

To install Tracer3 it is required to have elevated user rights (also known as Administrative rights).

Minimum (also Tracer3 Analyser)

To run Tracer3 without any hardware support or to use as a Tracer3 Analyser the minimum requirements are:

1. Microsoft .NET 4.5 Framework (file: 'dotnetfx45_full_x86_x64.exe', [download link](#))

Full installation including hardware

To fully use Tracer3 the following applications/drivers need to be installed additionally. These files can be found in the ' Required installers' folder.

1. National Instruments VISA (file: 'NIVISA1800runtime')
2. National Instruments NI-DAQmx (file: 'NIDAQ1860f2Config')



Note 1: all files can be found in the Tracer installer folder.



Note 2: you will need to restart your computer before starting Tracer3!

1.3 Installing the software

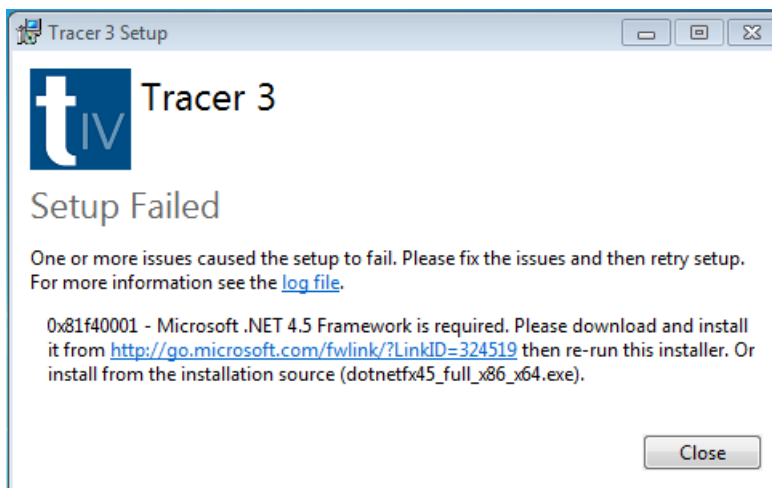
Before installing Tracer3 or any driver/ application associated with the software, it is important to have Microsoft .NET 4.5 Framework installed on the computer.

Microsoft .NET 4.5 Framework (file: 'dotnetfx45_full_x86_x64.exe', [download link](#))

The Basic Installation

To install Tracer3, execute 'Tracer3Installer.exe' from the installation folder.

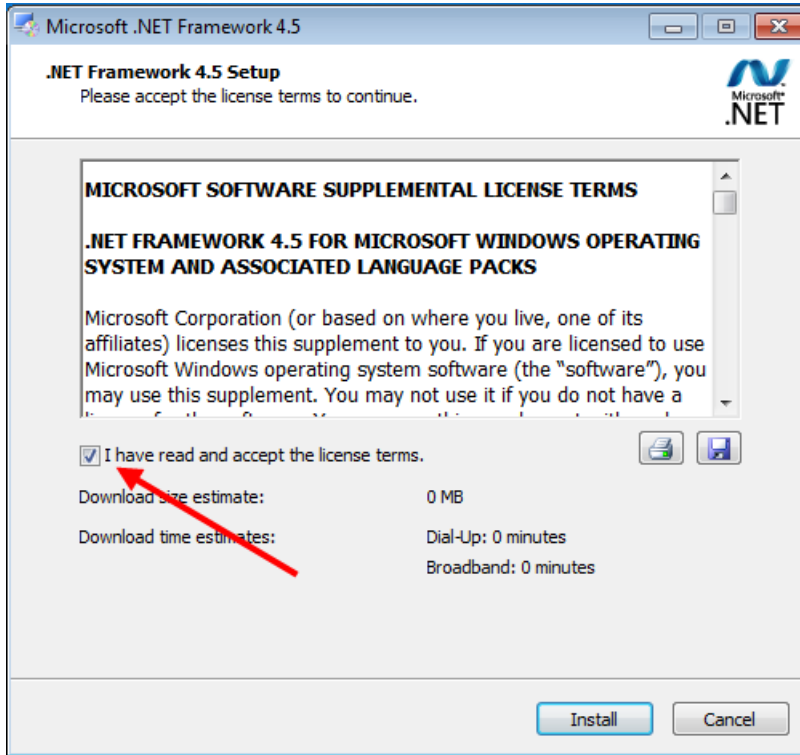
If the Microsoft .NET 4.5 Framework is not yet installed on your computer, you will see the following message:



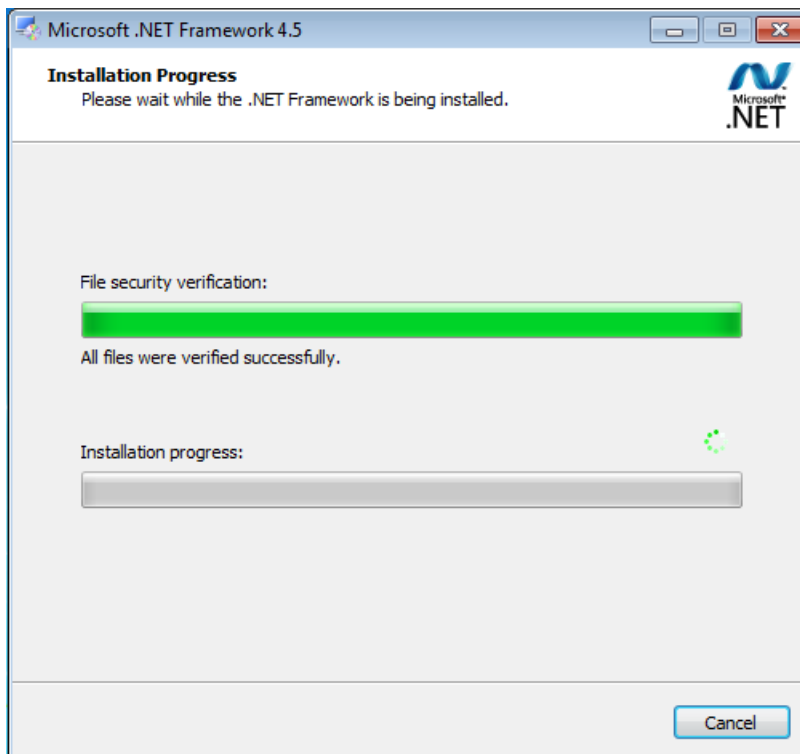
If you press the link you will be taken to the Microsoft download site where you can get the Microsoft .NET 4.5 Framework installer. If you have no internet connection you can also find the installer on the Tracer3 installation disk ((file: 'dotnetfx45_full_x86_x64.exe').

How to install Microsoft .NET 4.5 Framework

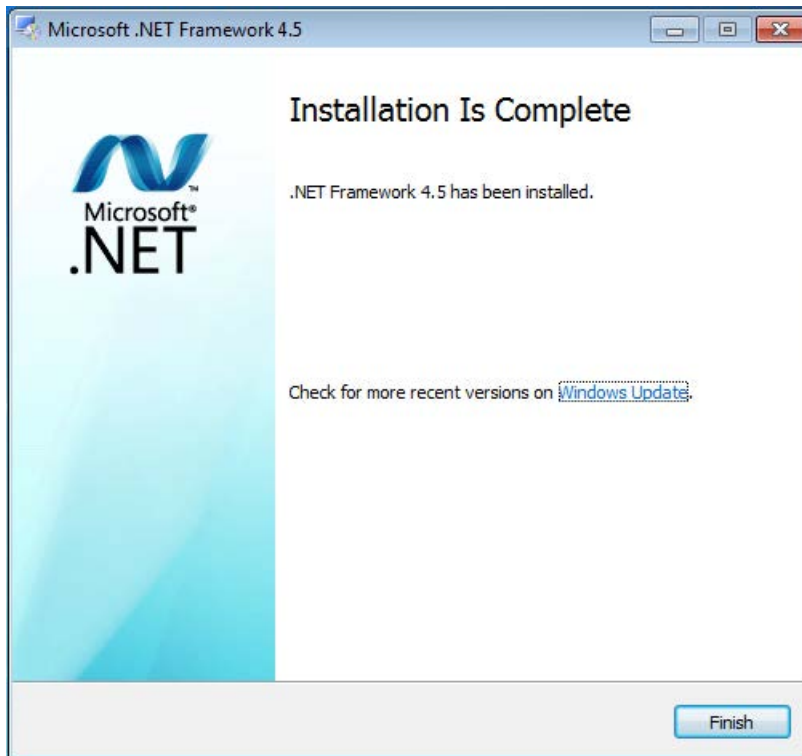
Run the installer from the web or from the file on the installation disk.



Accept the license terms and press Install.



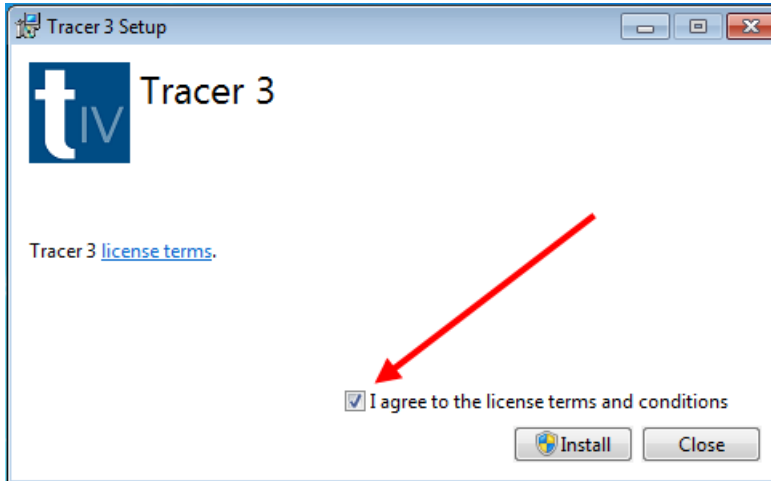
Wait for the installer to end and press Finish.



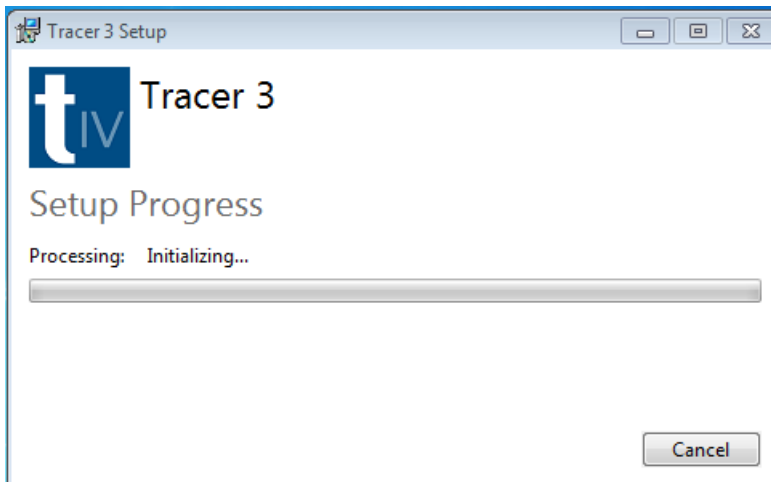
You might be asked to restart the computer. Please do this before you continue the Tracer3 installation.

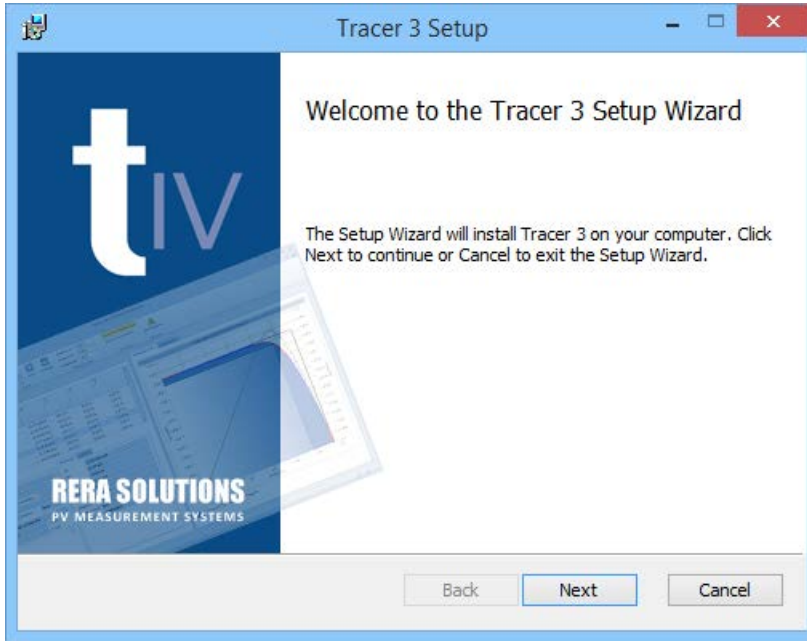
How to install TRACER

To install Tracer3, execute 'Tracer3Installer.exe' from the installation folder.

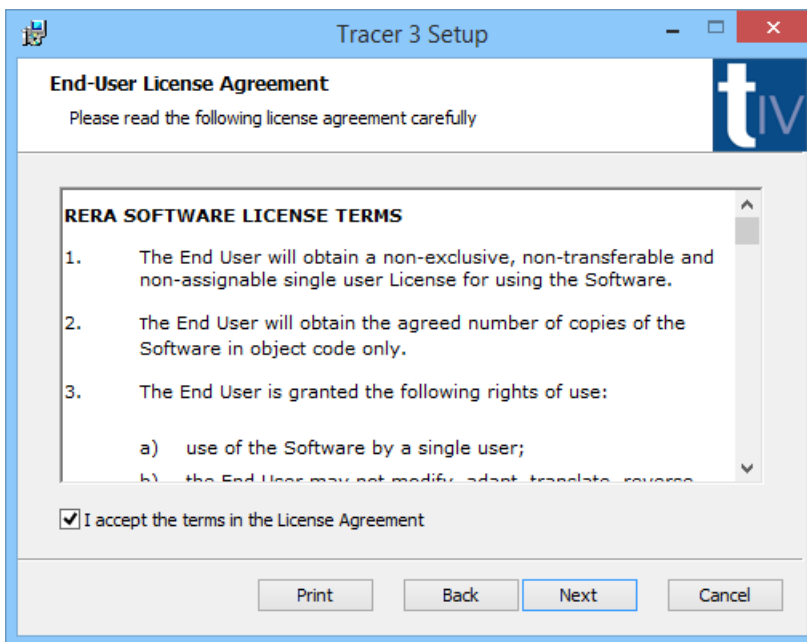


Accept to agree to the license terms and conditions and press Install.

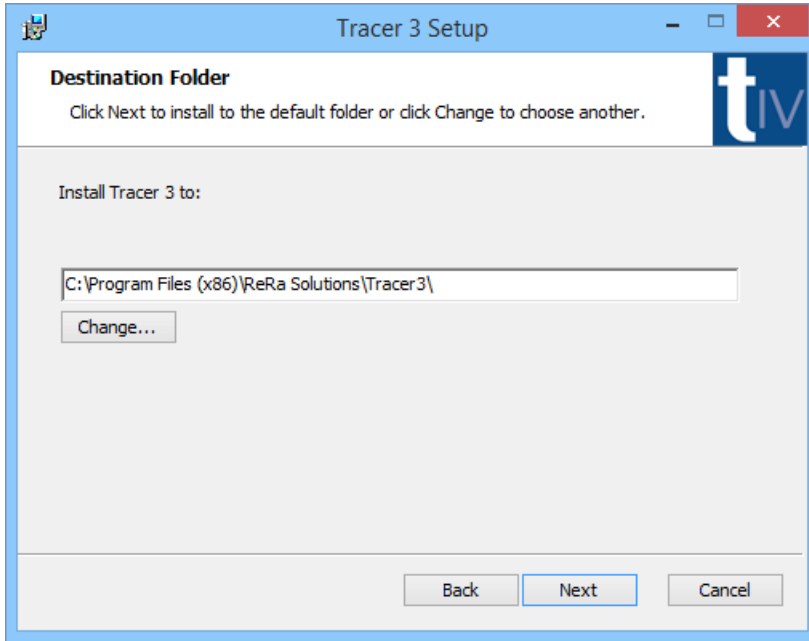




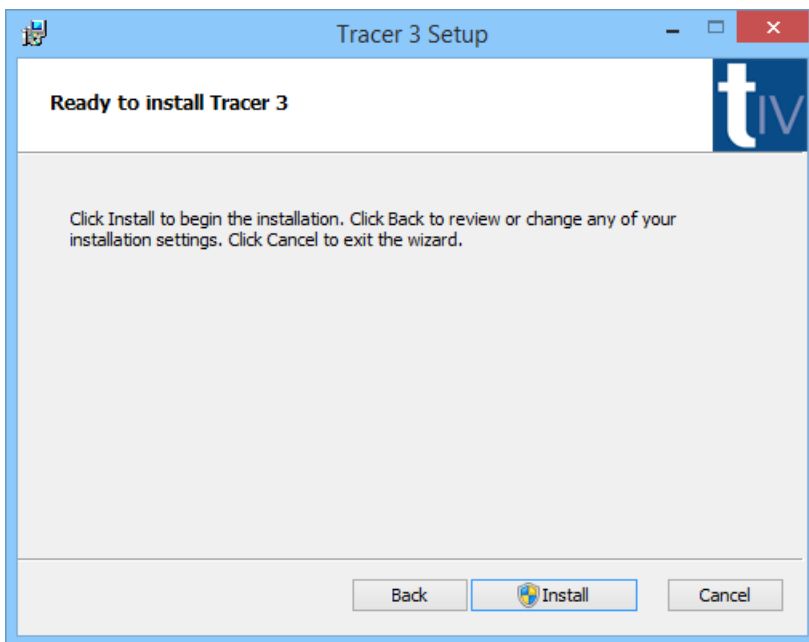
Press Next to start the installation process



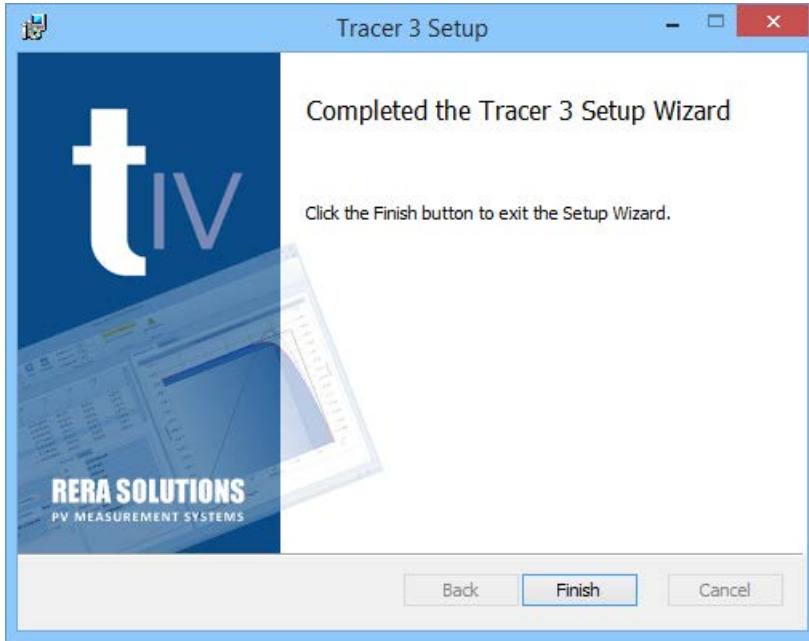
Read the license terms and if you agree to them select the acceptance check box and press Next.



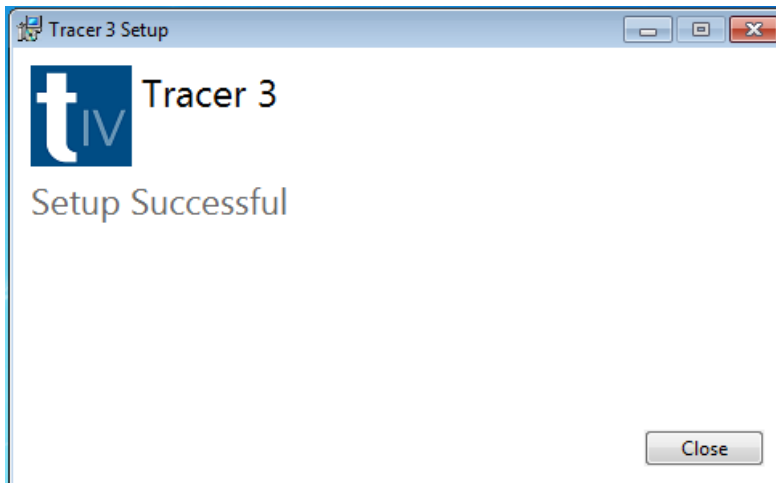
Use the default install folder and press Next.



Tracer3 is now ready to be installed, press Install and the software will be installed on the computer.



Press Finish.



Press Close and Tracer is installed.

After the installation you will find the following in the application start menu:

- Tracer3
 - Demo Project
 - Documentation
 - Release Notes
 - Tracer 3
 - Tracer Configurator

Demo Project	Tracer3 is installed with a Demo Project file. You can open this and play with the options in the software.
Documentation	Opens the current documentation and help.
Release Notes	The release notes
Tracer 3	Start the Tracer3 software
Tracer Configurator	Start the Tracer Configurator

To use the full control capabilities of Tracer3 you will need to [install instrument drivers](#).

1.4 Installing Hardware

In order to use Tracer3 together with different instruments it is required to install the drivers that come with these instruments.

Please follow the [Installing required drivers](#) section to install the **mandatory** drivers. For other instruments the drivers are given in the [Installing optional drivers](#) section.

1.4.1 Installing Drivers

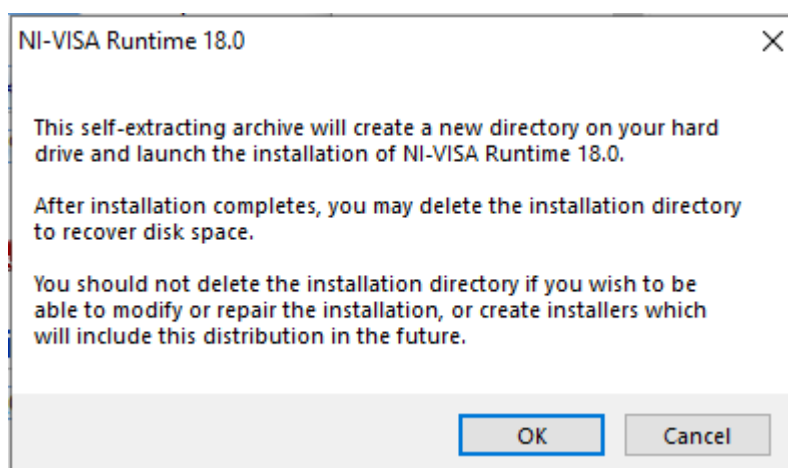
To fully use Tracer3 the following applications/drivers need to be installed additionally. You can find these files in the subdirectory 'required installers'.

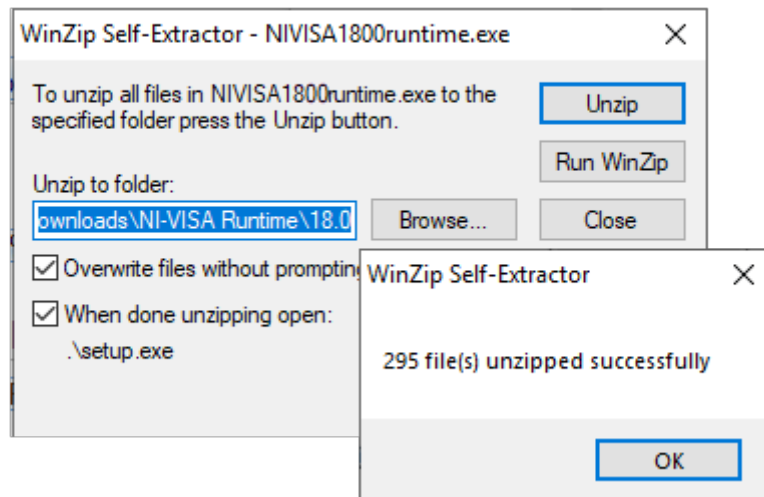
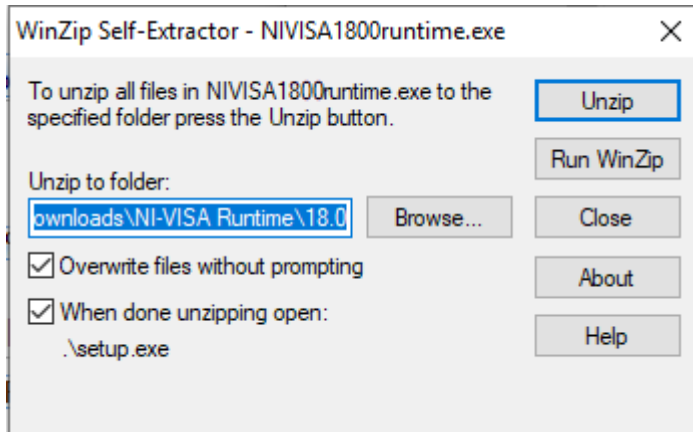
National Instruments VISA (NI-VISA) **(required)**

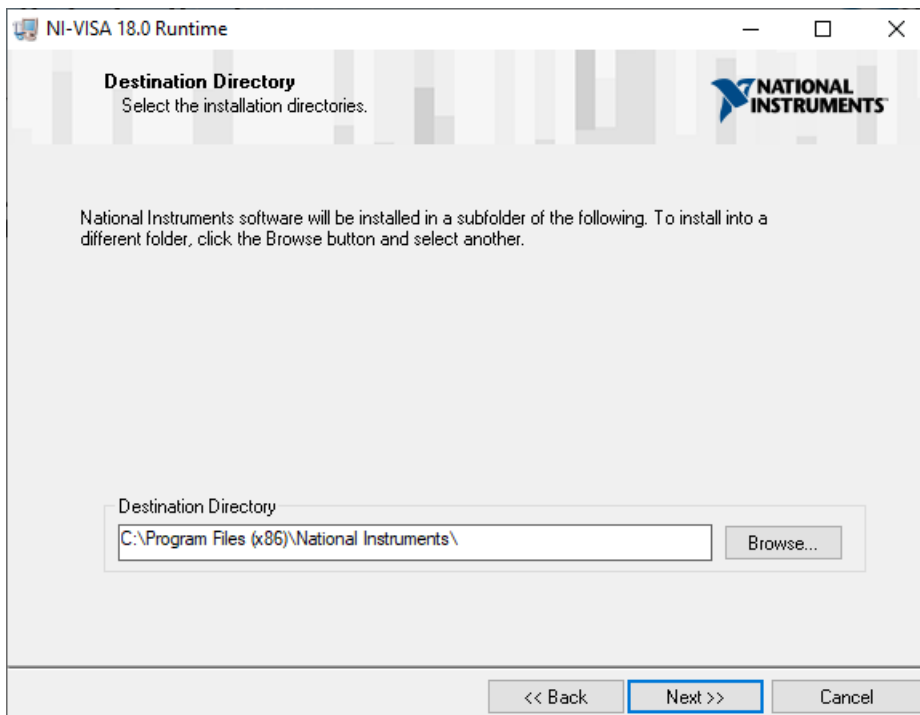
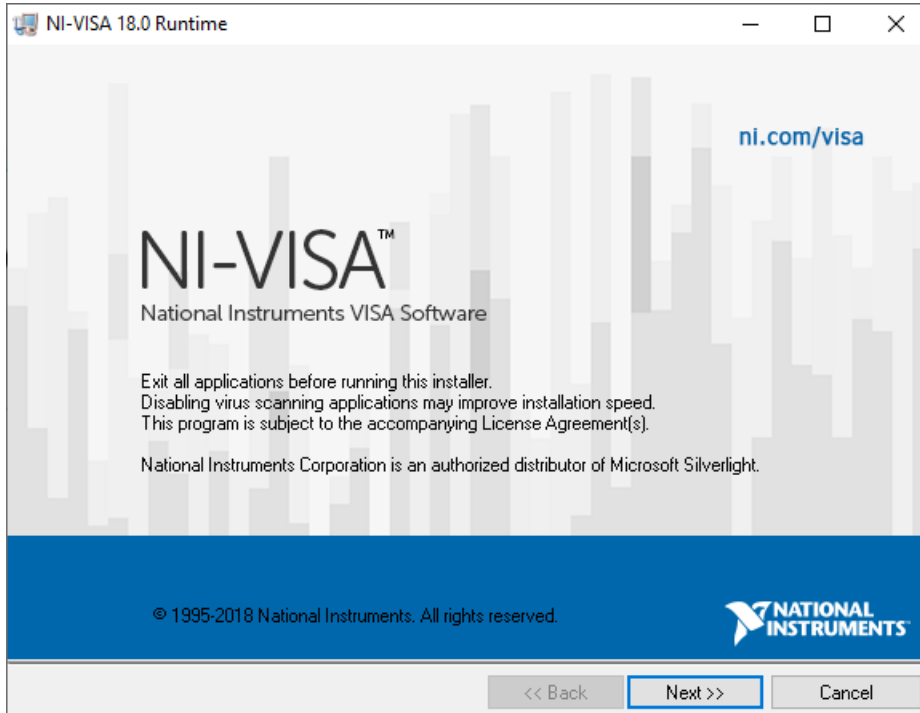
The Virtual Instrument Software Architecture (VISA) is a standard for configuring, programming, and troubleshooting instrumentation systems comprising GPIB, VXI, PXI, Serial, Ethernet, and/or USB interfaces. NI-VISA is the National Instruments implementation of the VISA I/O standard. NI-VISA includes software libraries, interactive utilities such as NI I/O Trace and the VISA Interactive Control, and configuration programs through Measurement & Automation Explorer. Tracer3 uses NI-VISA extensively for communications with the different instruments. All Ethernet, LXI, GPIB, USB and Serial communications are controlled over NI-VISA. It is therefore mandatory to install NI-VISA on your computer in order for Tracer3 to work properly.

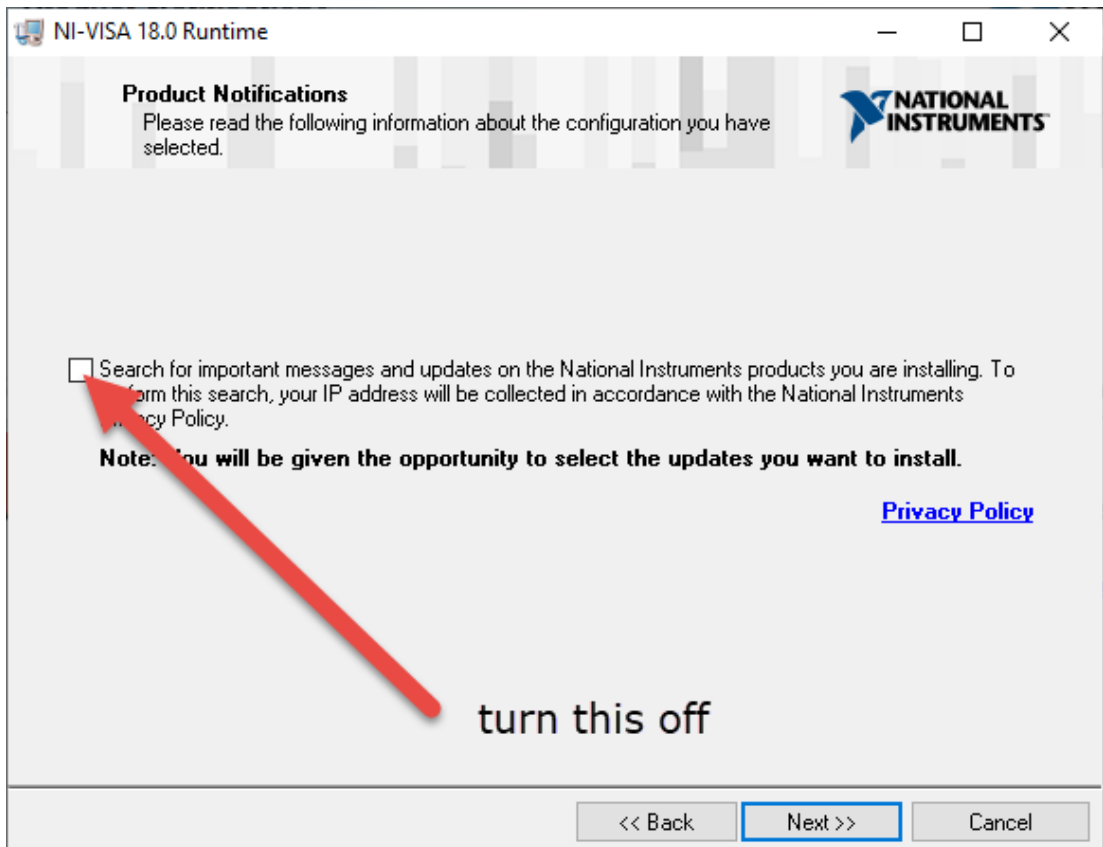
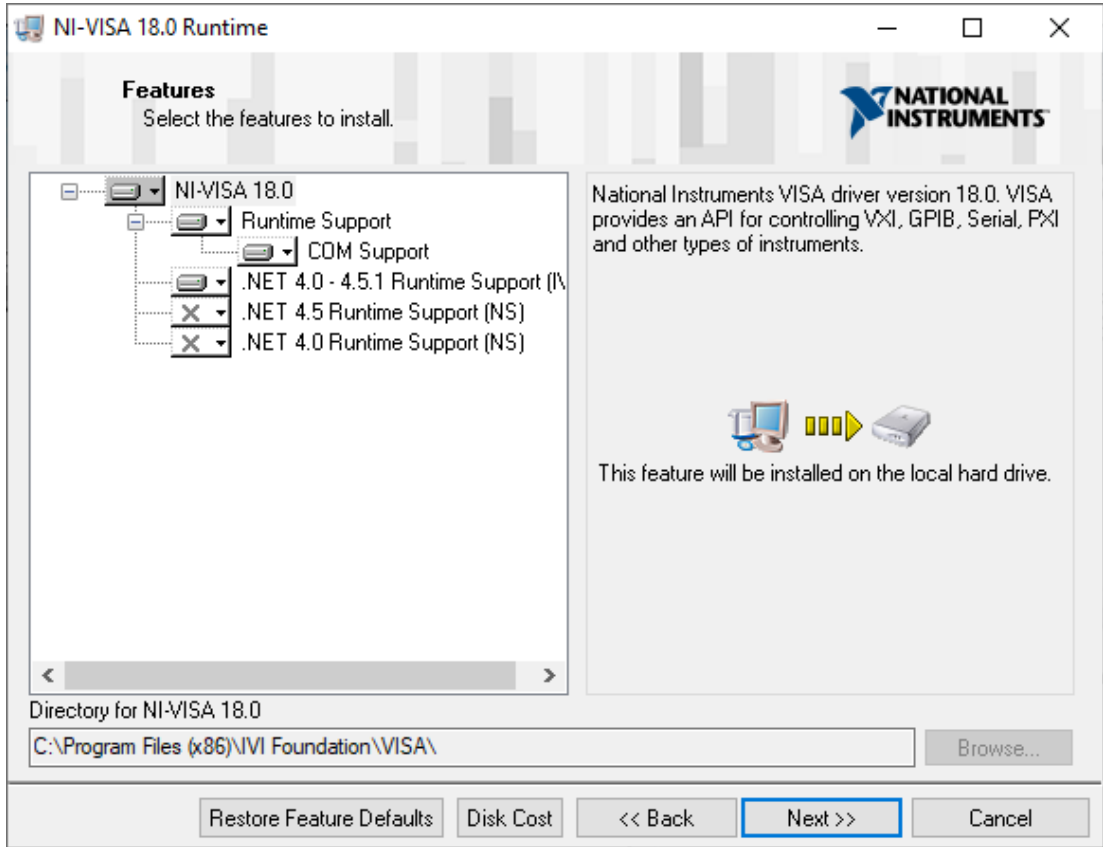
National Instruments VISA (file: Tracer3Full\Required installers\NIVISA1800runtime)

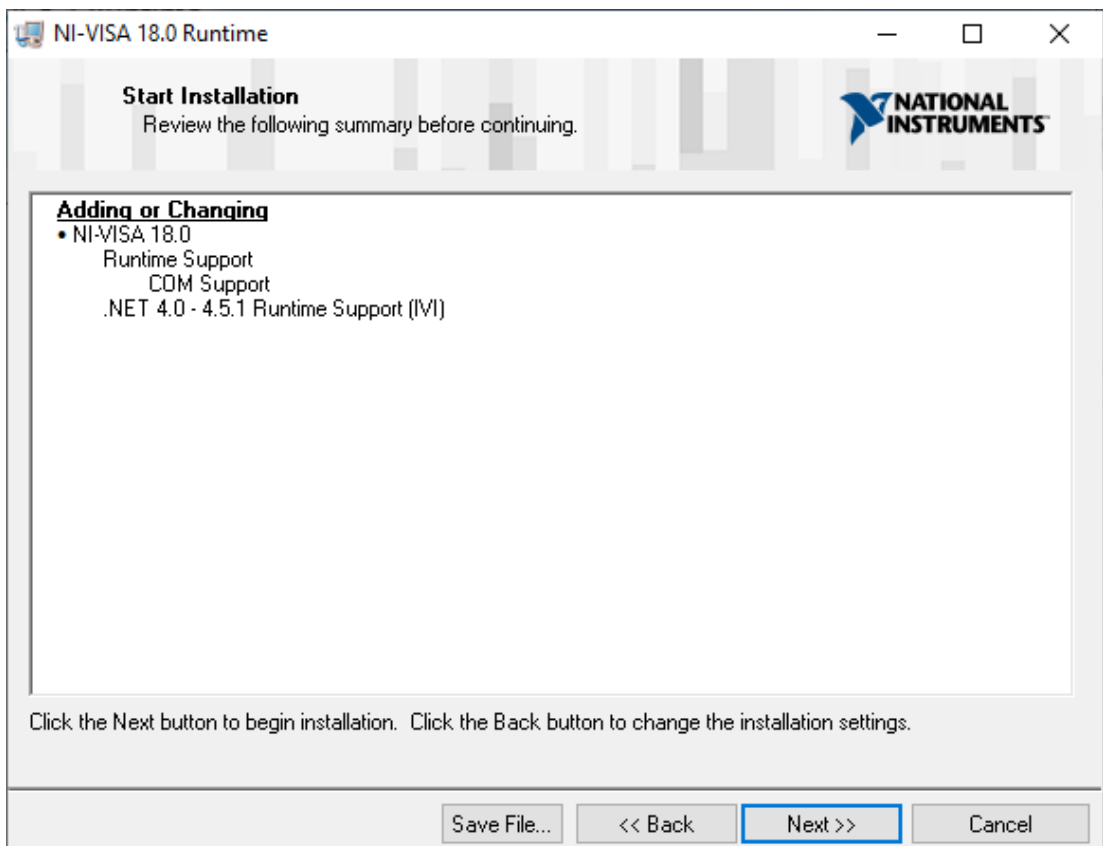
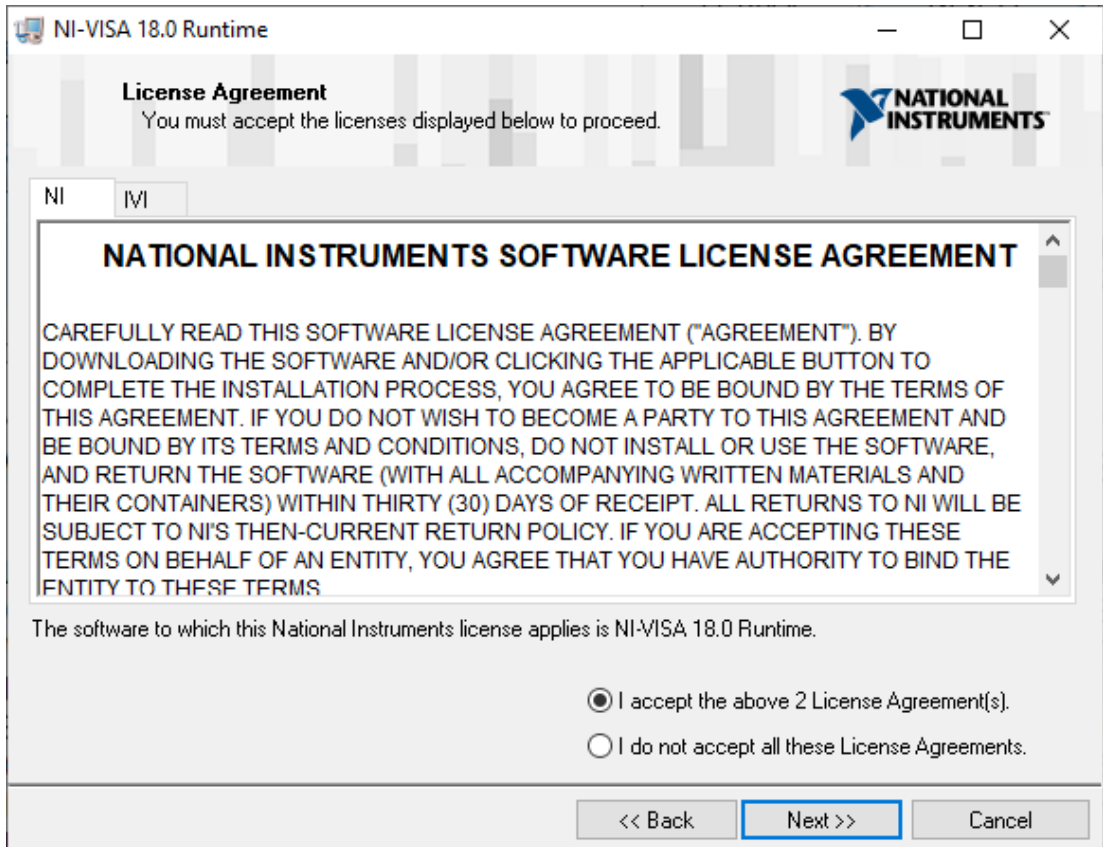
Follow the screens below:

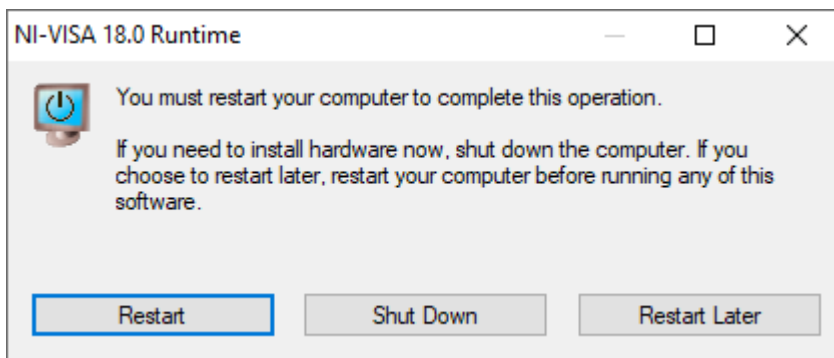
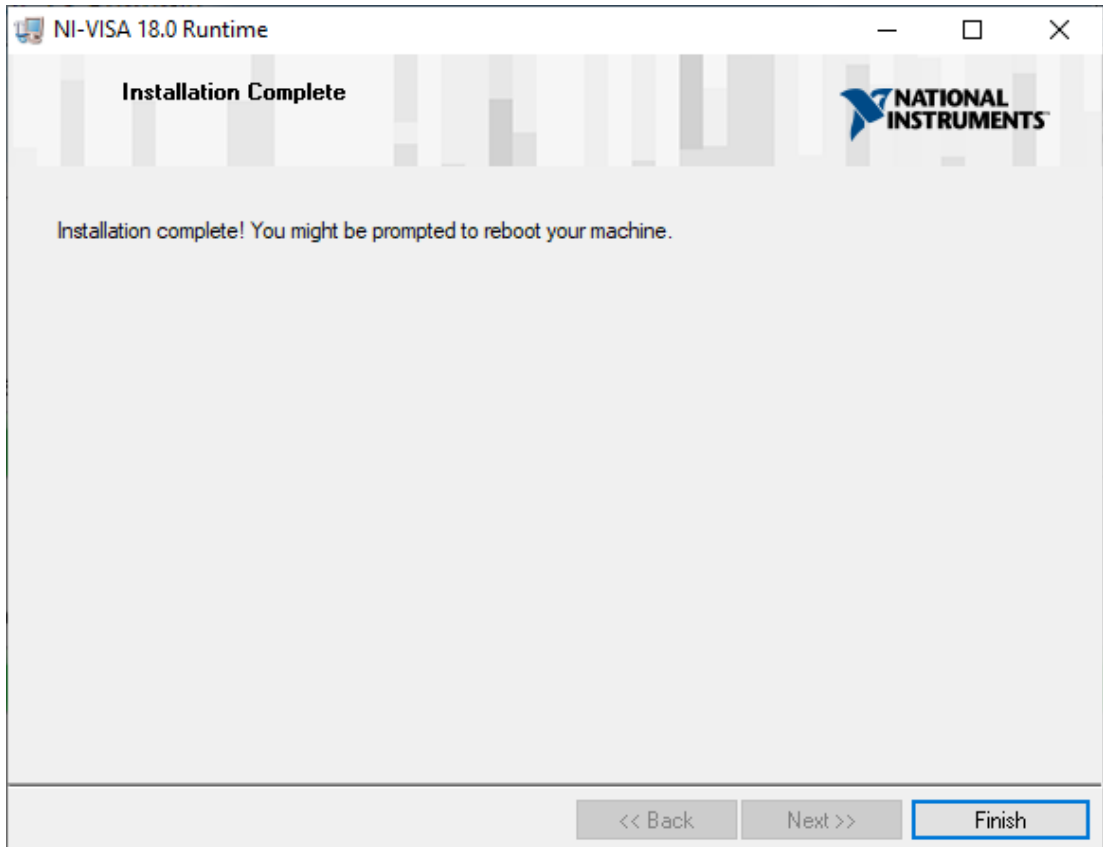










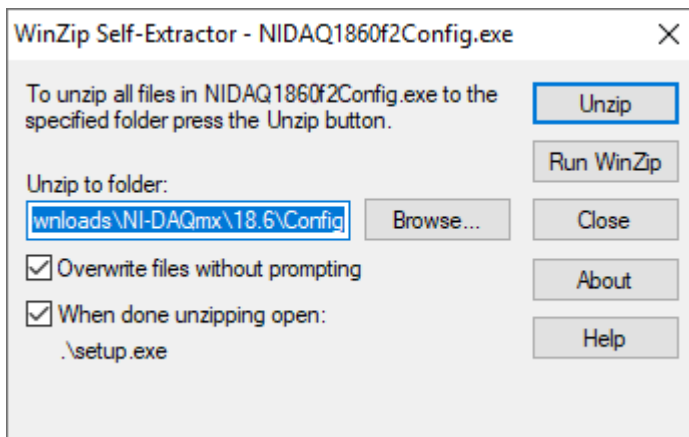
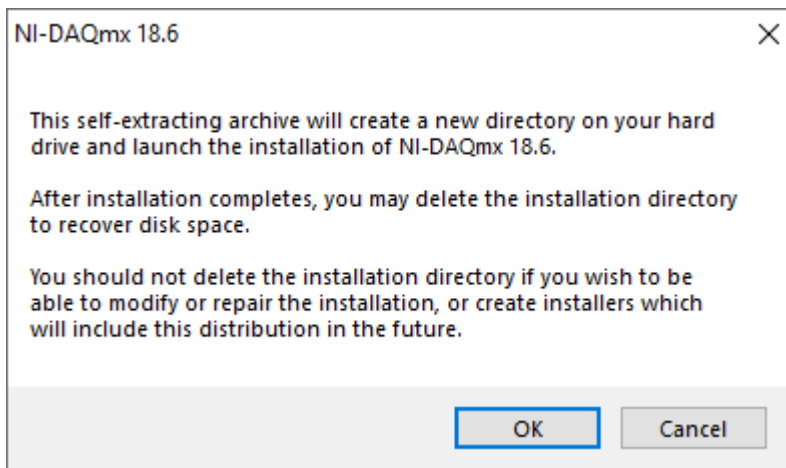


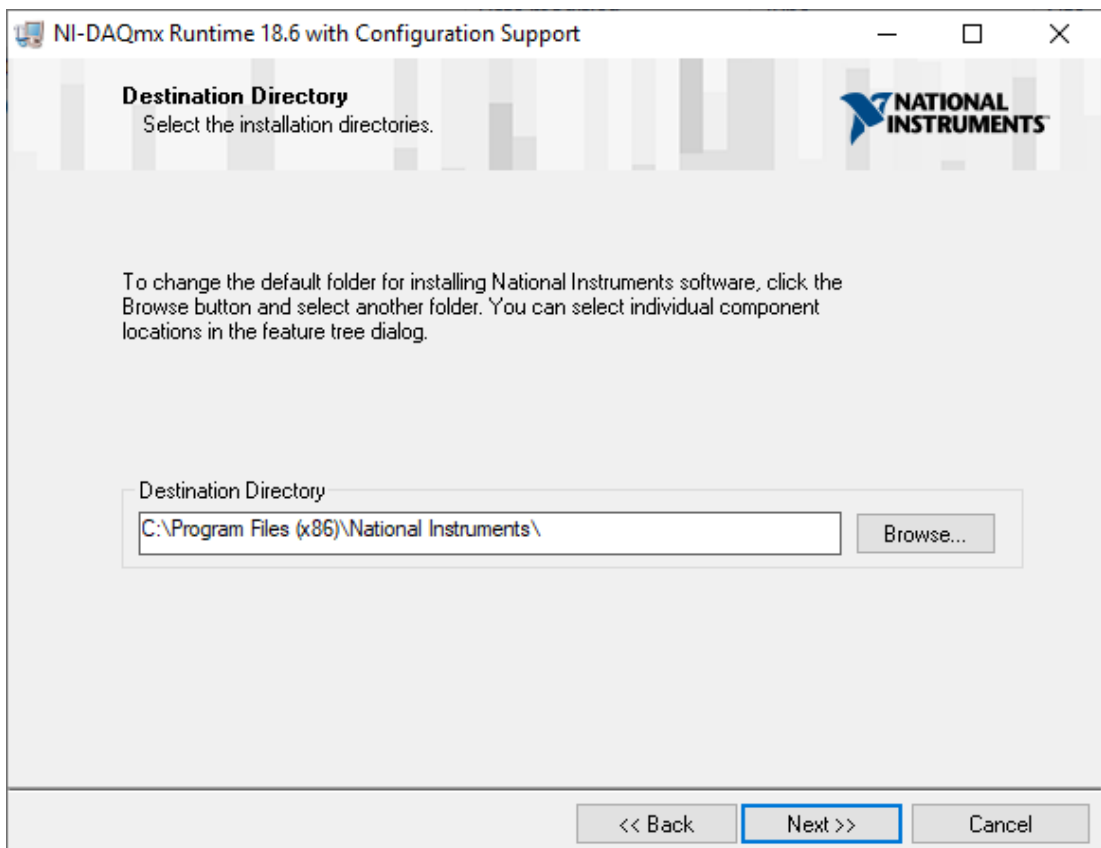
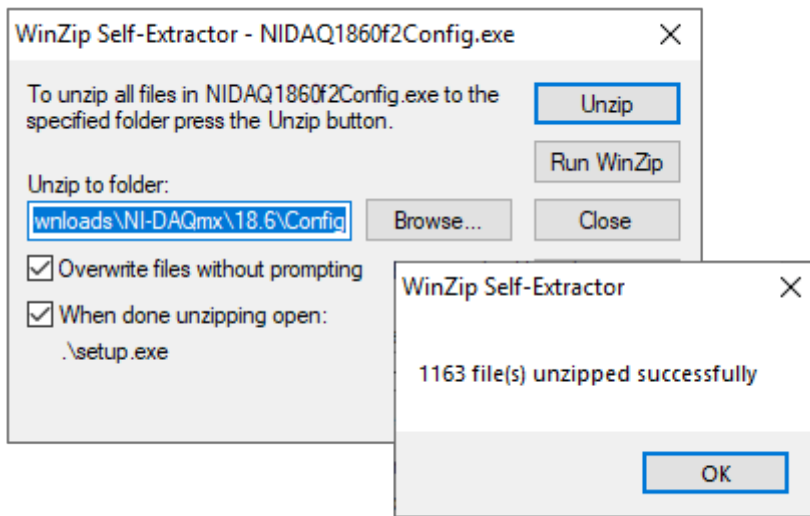
National Instruments Data Acquisition drivers (NI-DAQmx) **(required)**

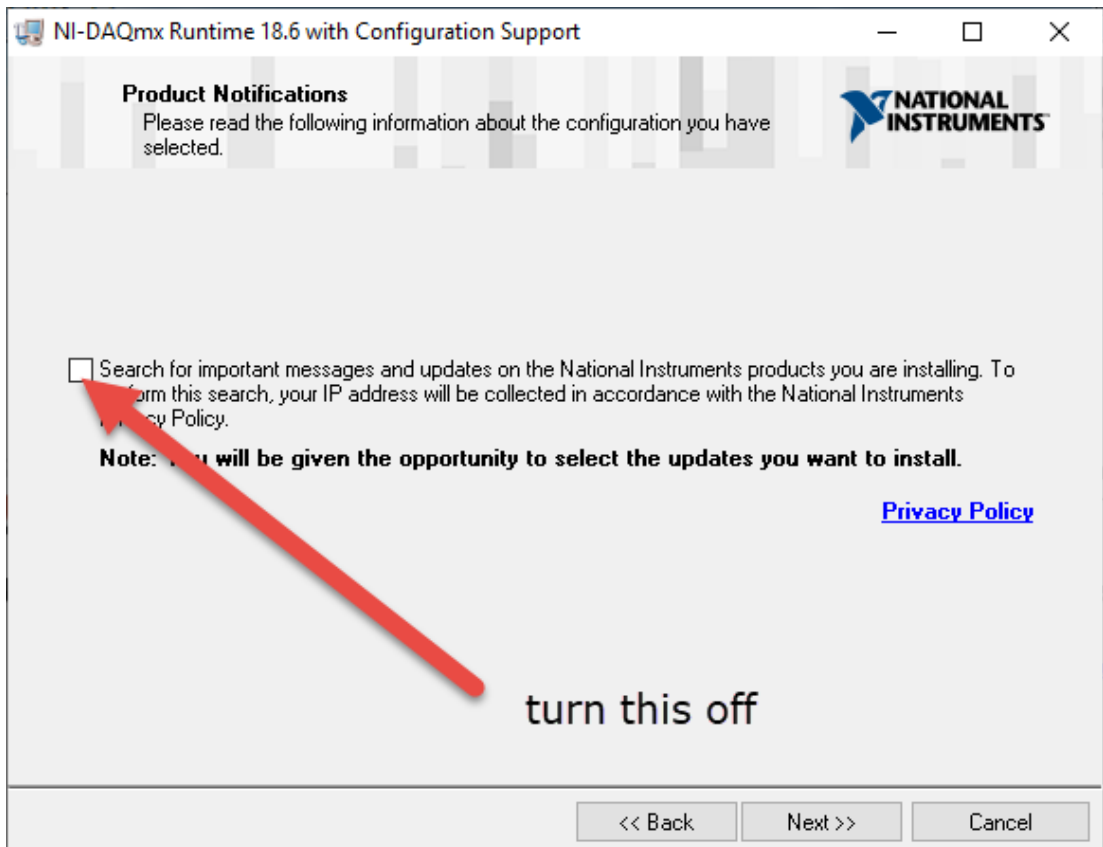
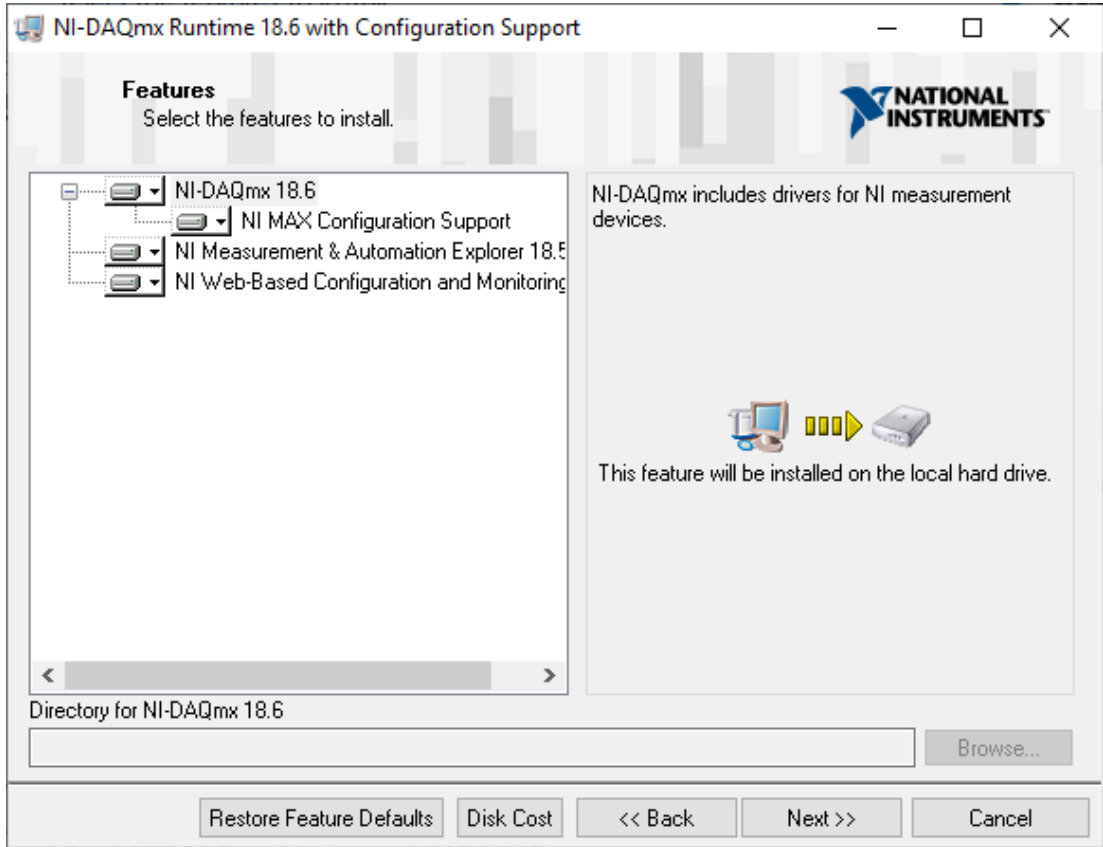
The NI-DAQmx driver software supports all National Instruments related devices and is required for some of the Tracer3 supported instruments. You will need to install NI-DAQmx on your computer for Tracer3 to work as expected.

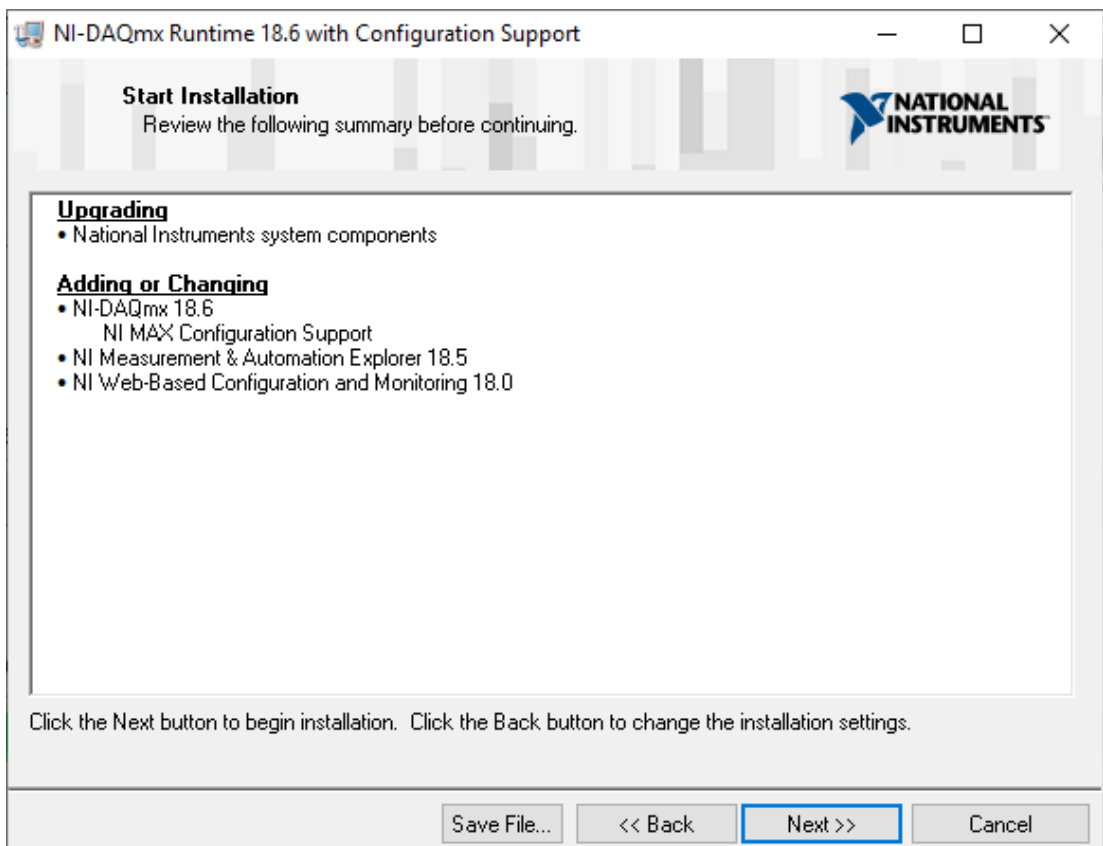
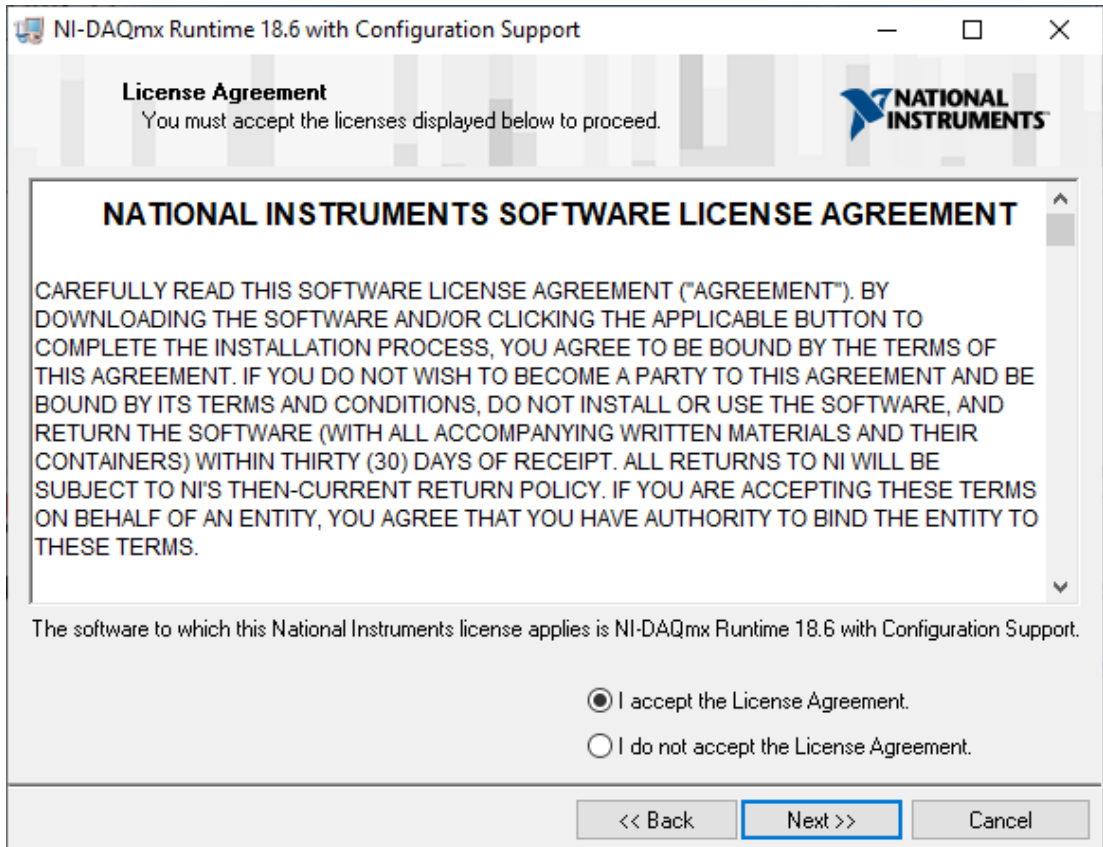
National Instruments NI-DAQmx Run-Time Engine (file: Tracer3Full\Required installers\NIDAQ1860f2Config)

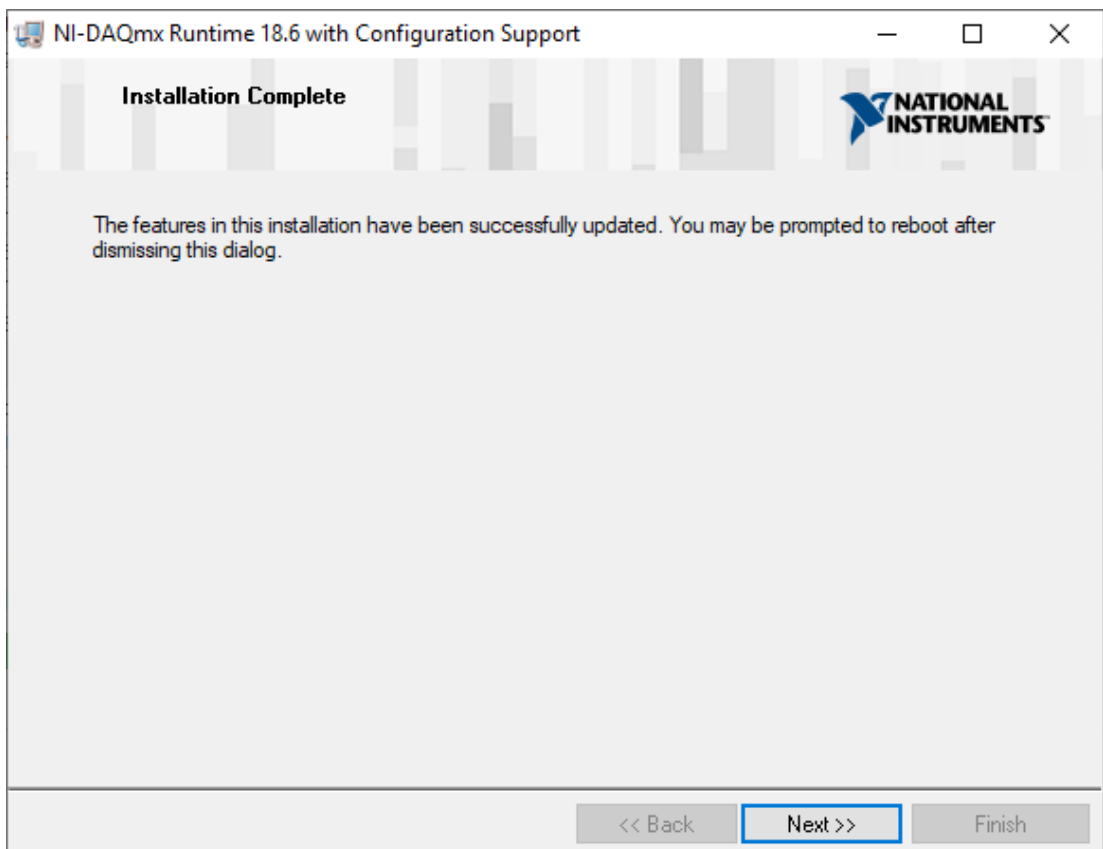
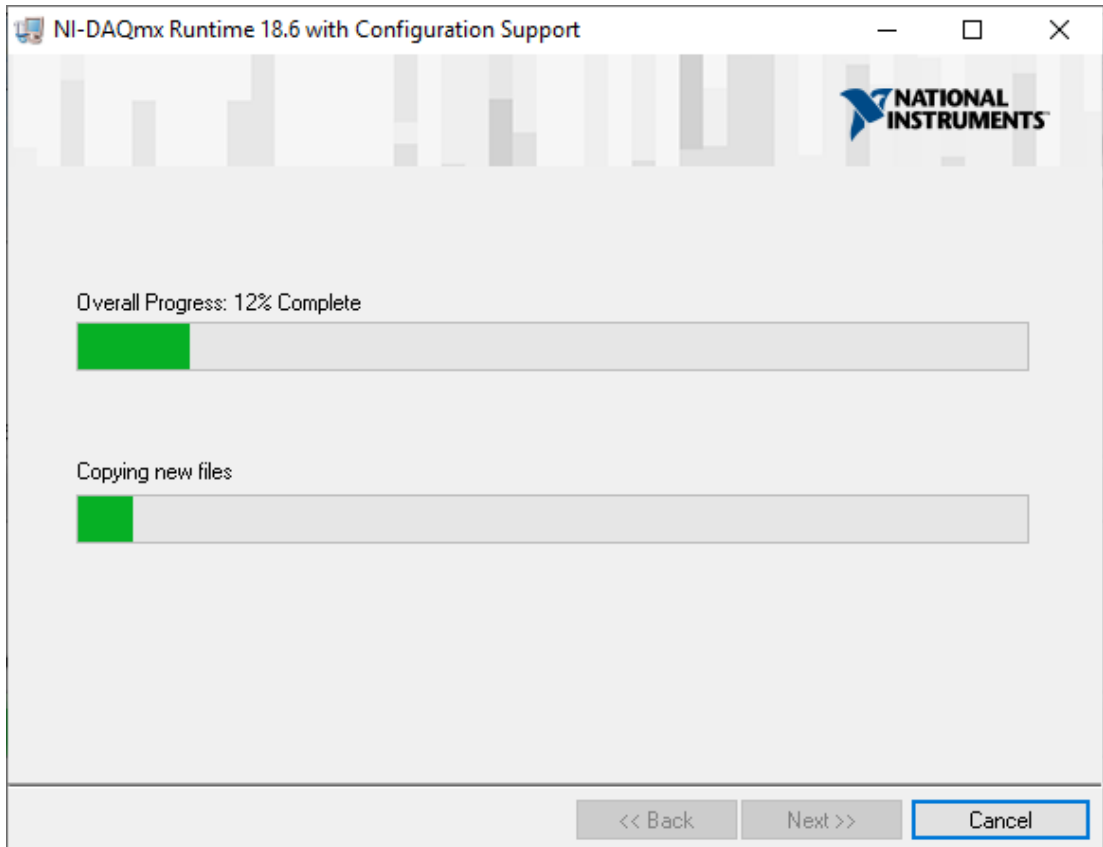
Follow the screens below:

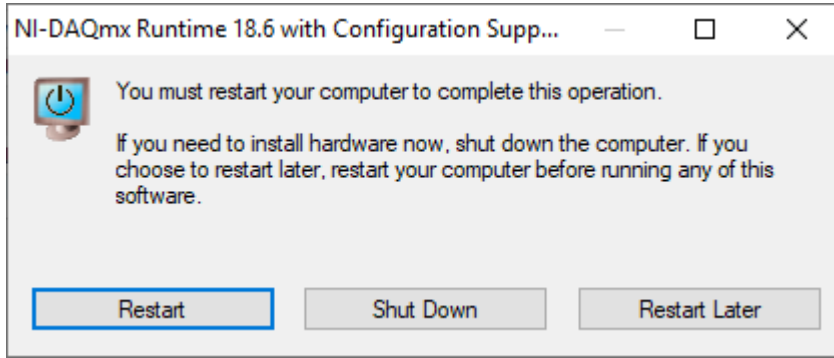












1.4.2 Installing optional drivers / installers

Some applications/drivers need to be installed additionally. You can find these files in the subdirectory 'Instrument Drivers'.

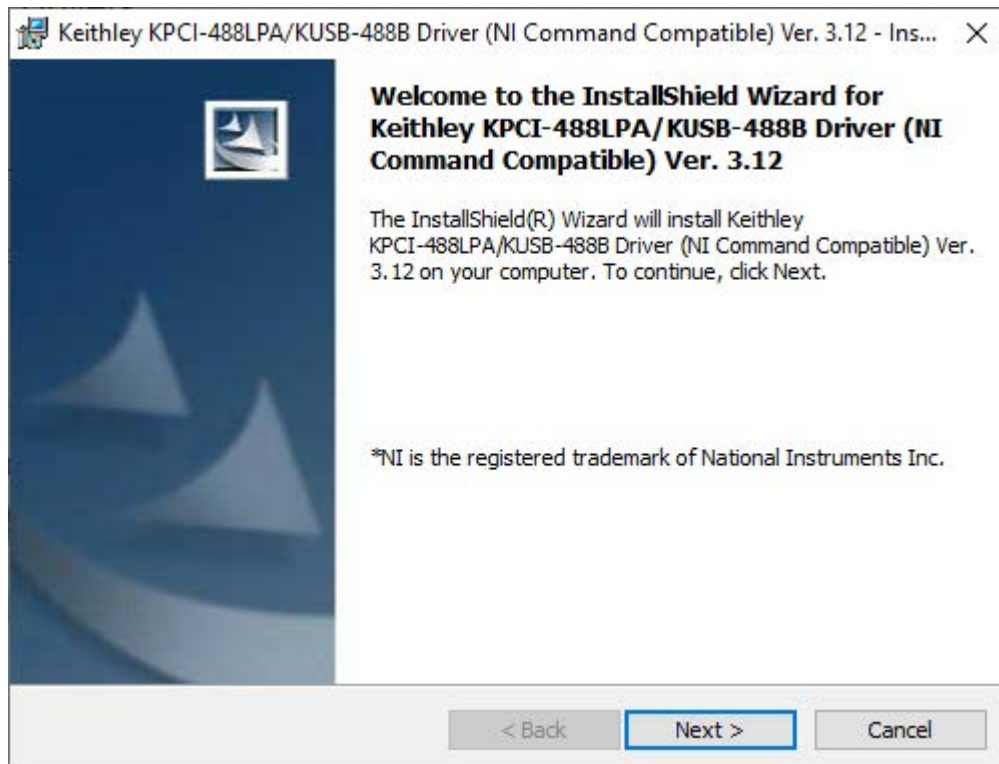
GPIB Instruments **(Optional)**

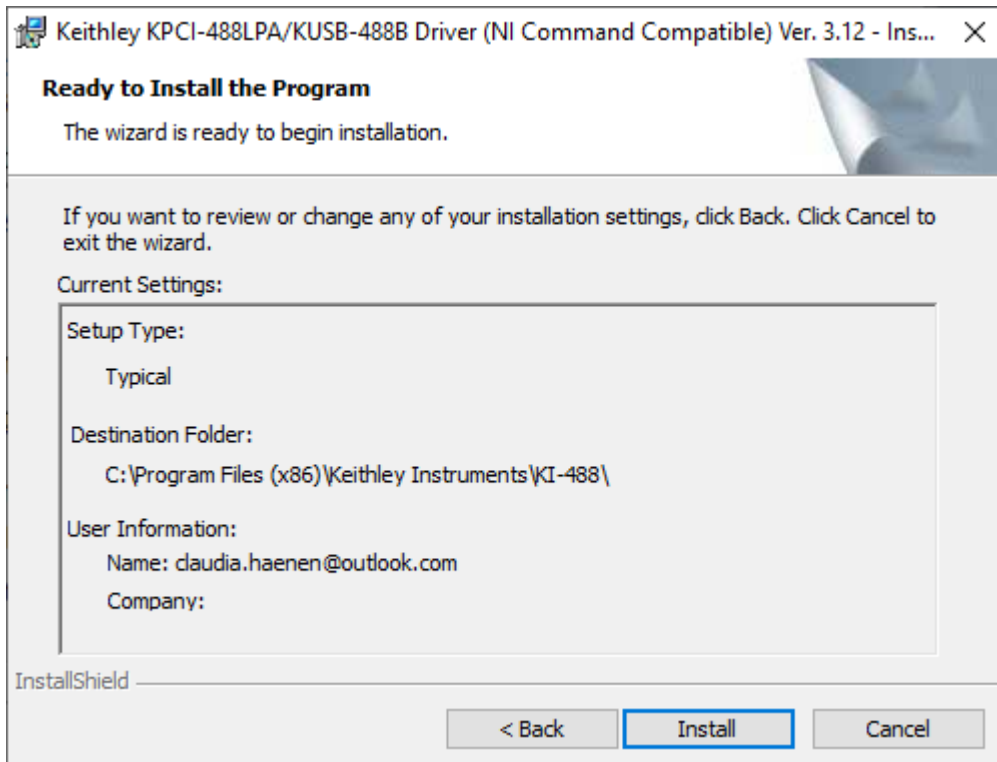
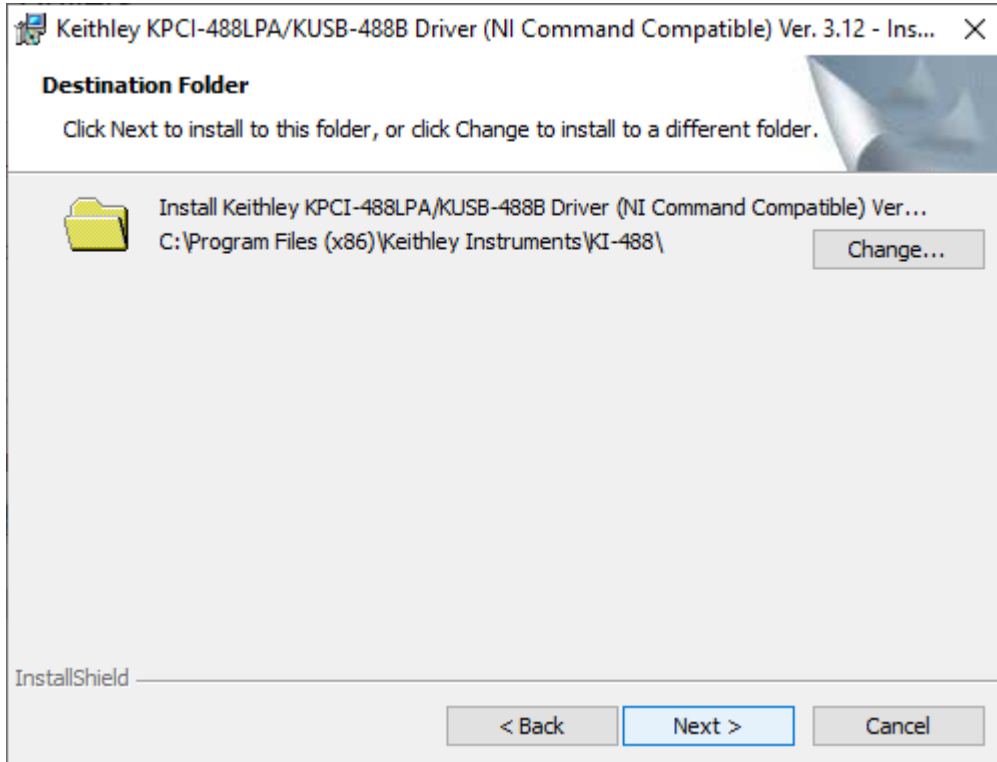
For some instruments, for example the Keithley 2400 series Source Meters a GPIB interface is the preferred method of communications. There are several GPIB interfaces on the market of which two brands are supported: National Instruments and Keithley.

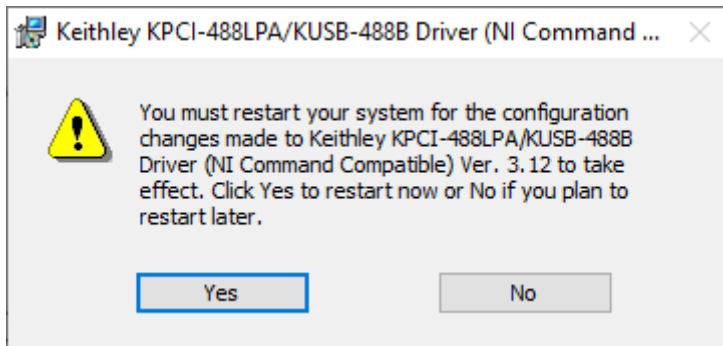
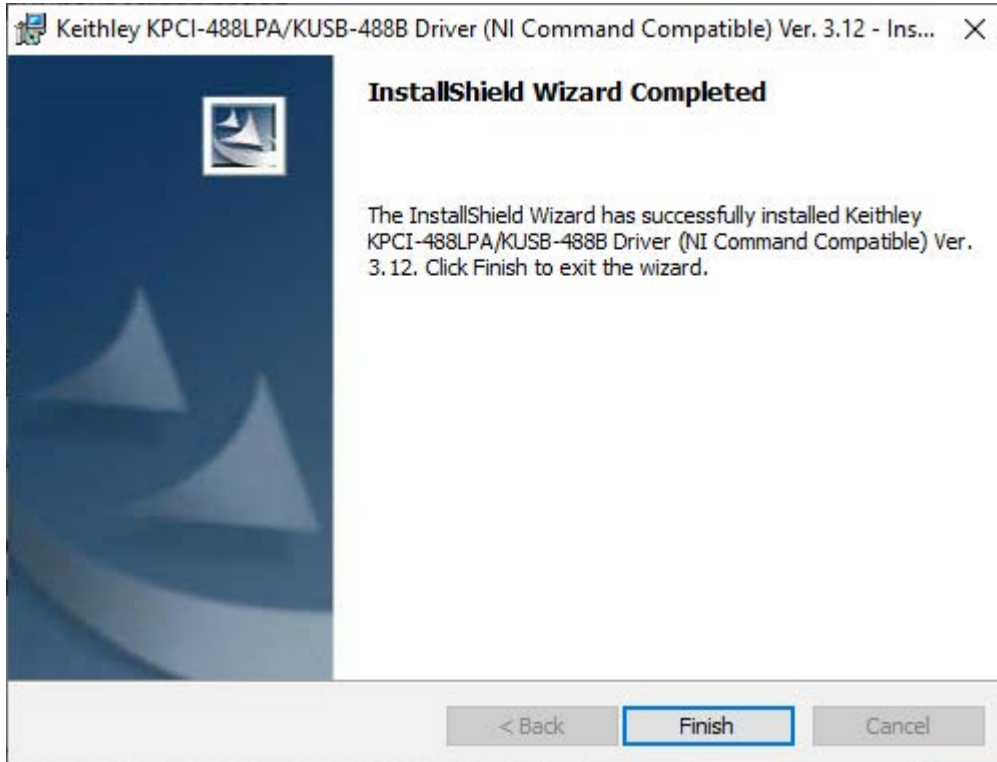
Keithley GPIB interfaces

Keithley GPIB-USB Driver (file: Tracer3Full\Instrument Drivers\GPIB Interfaces\KeithleyNI\Command Compatible Driver)

Follow the screens below:





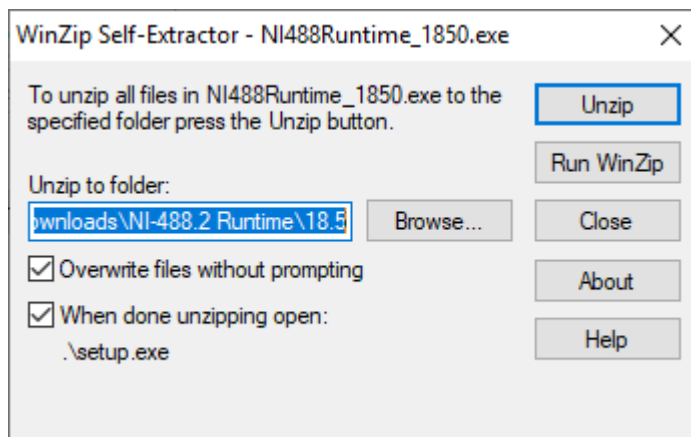
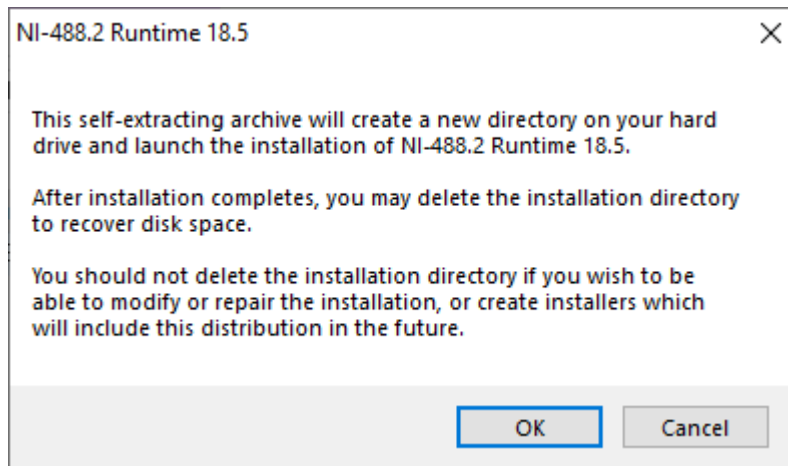


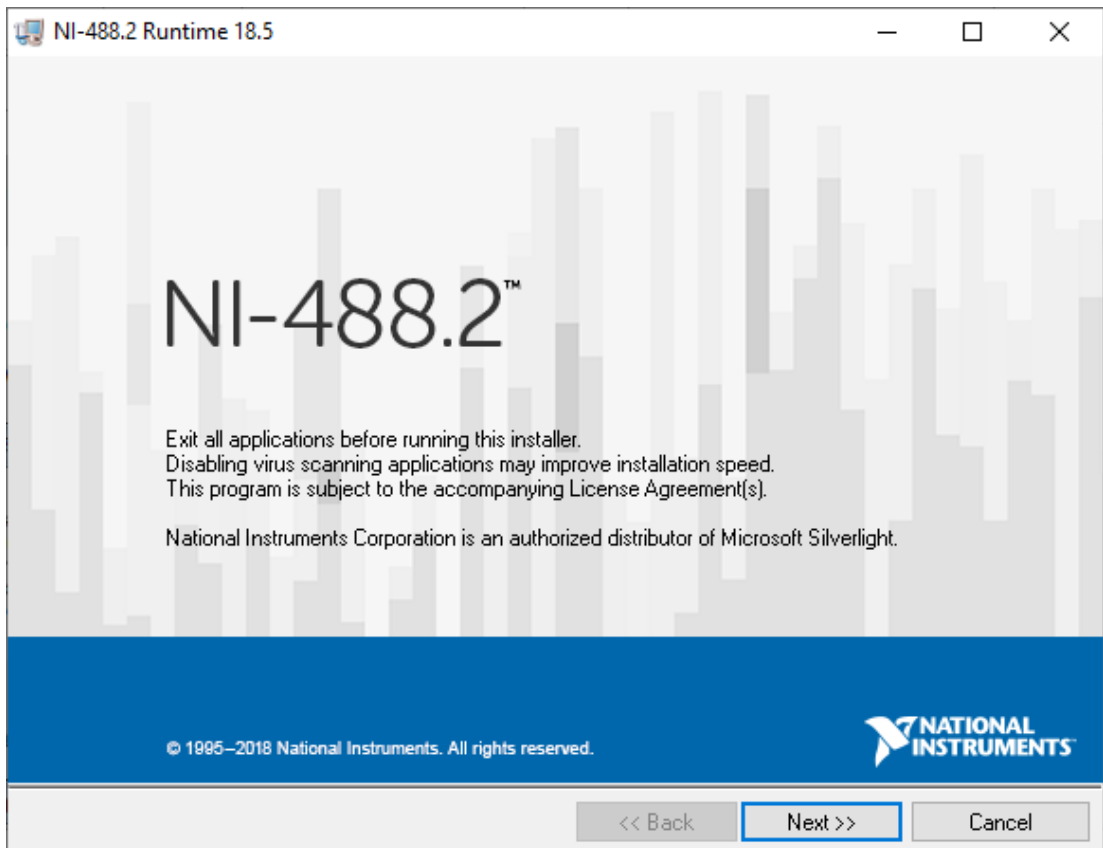
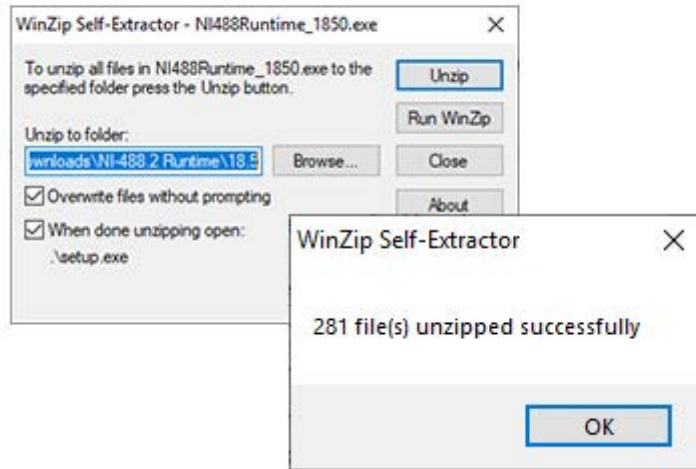
National Instrument GPIB interfaces

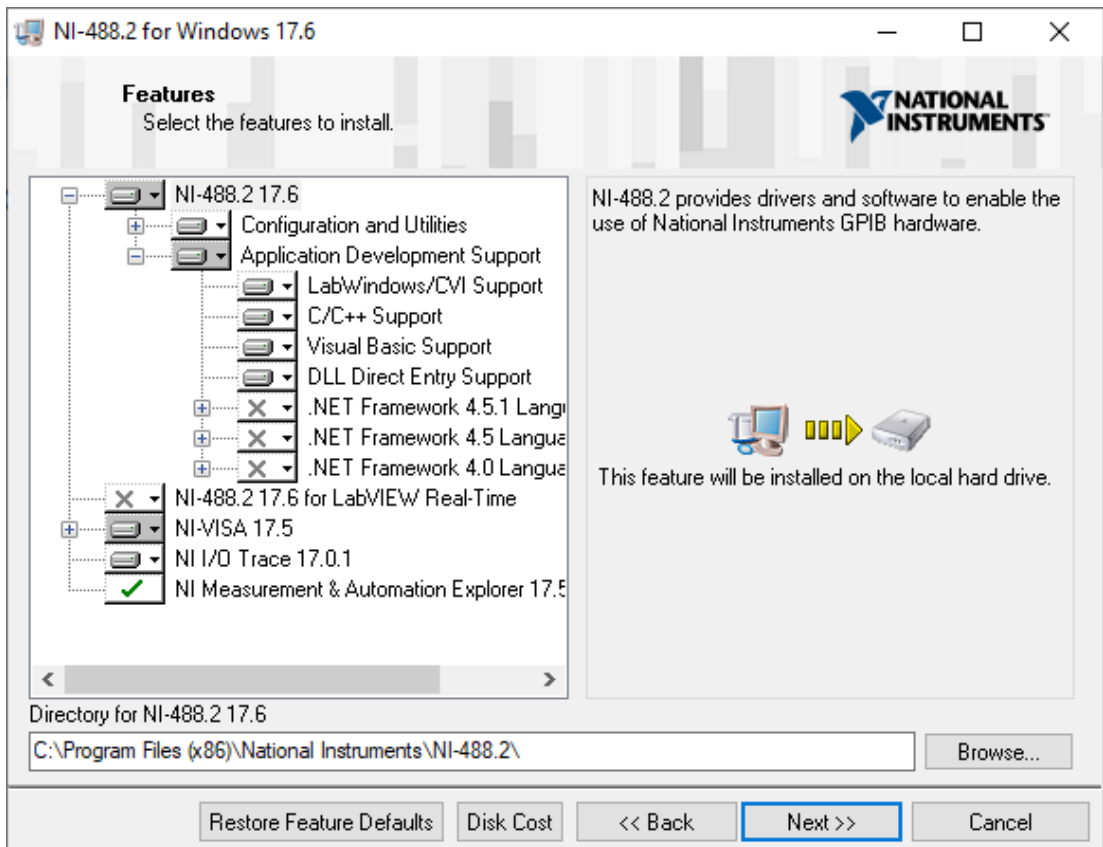
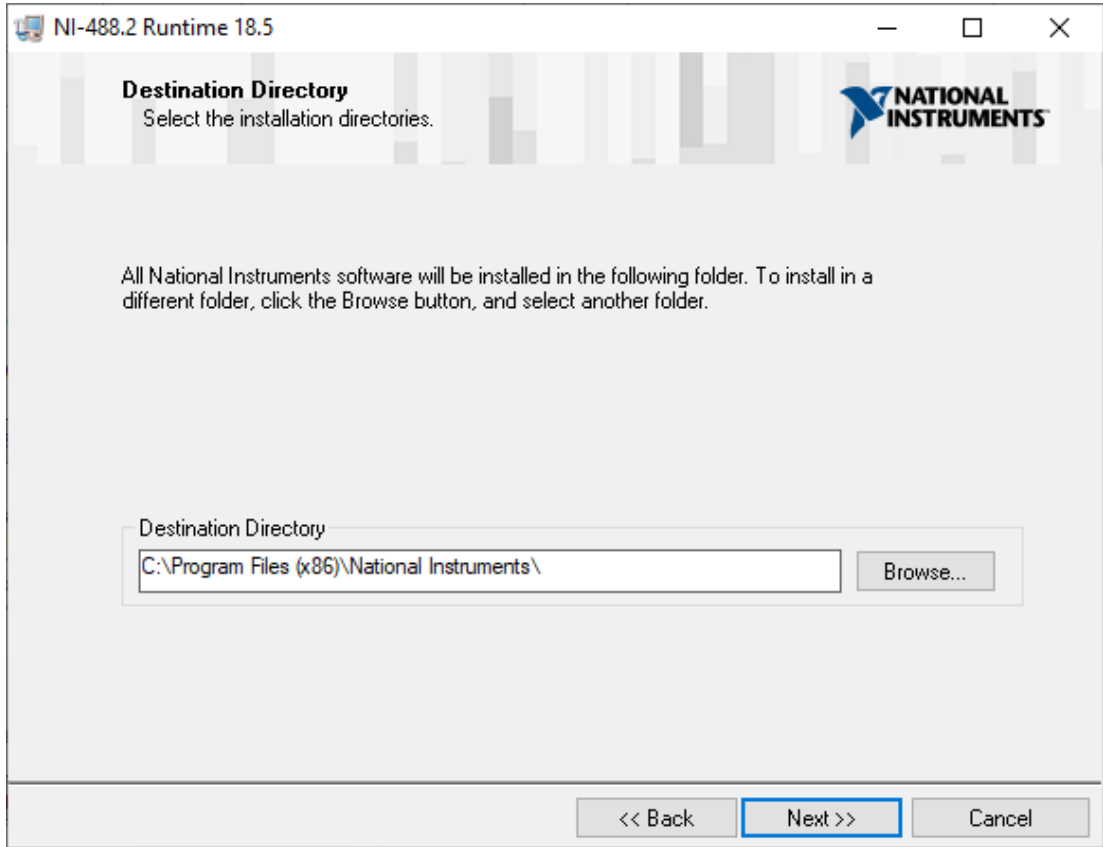


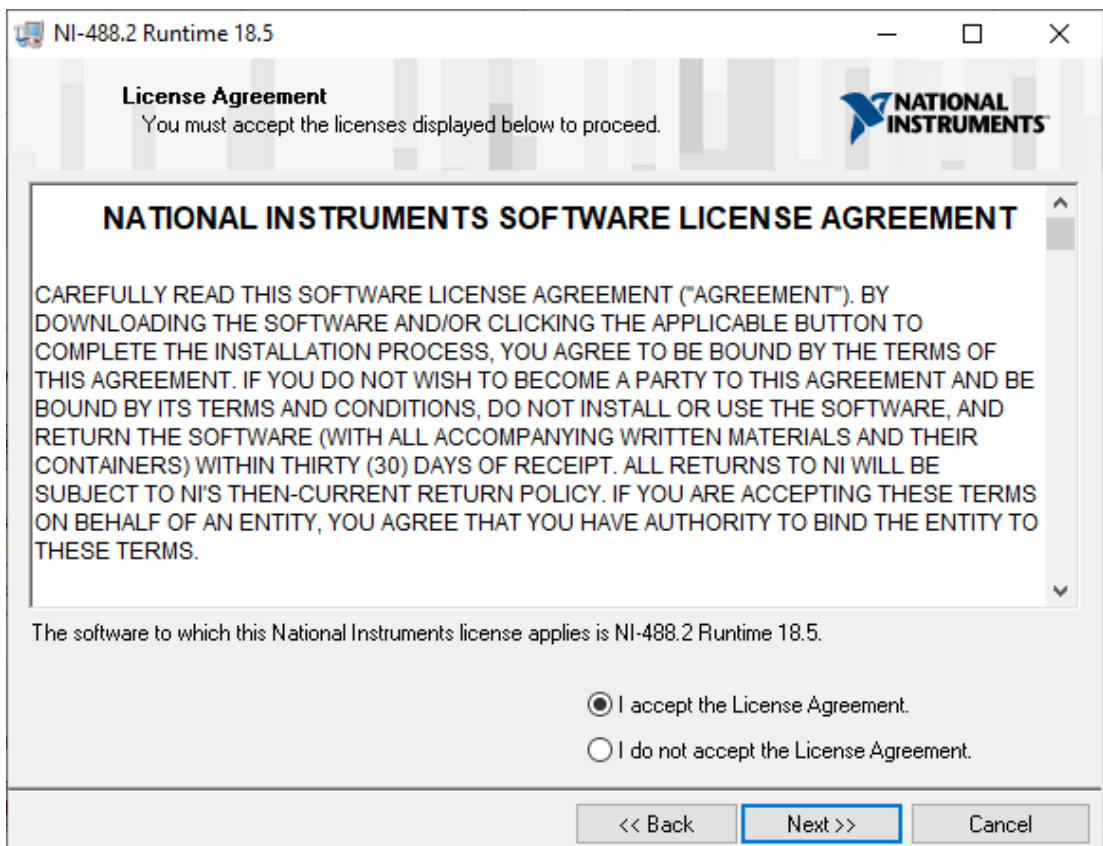
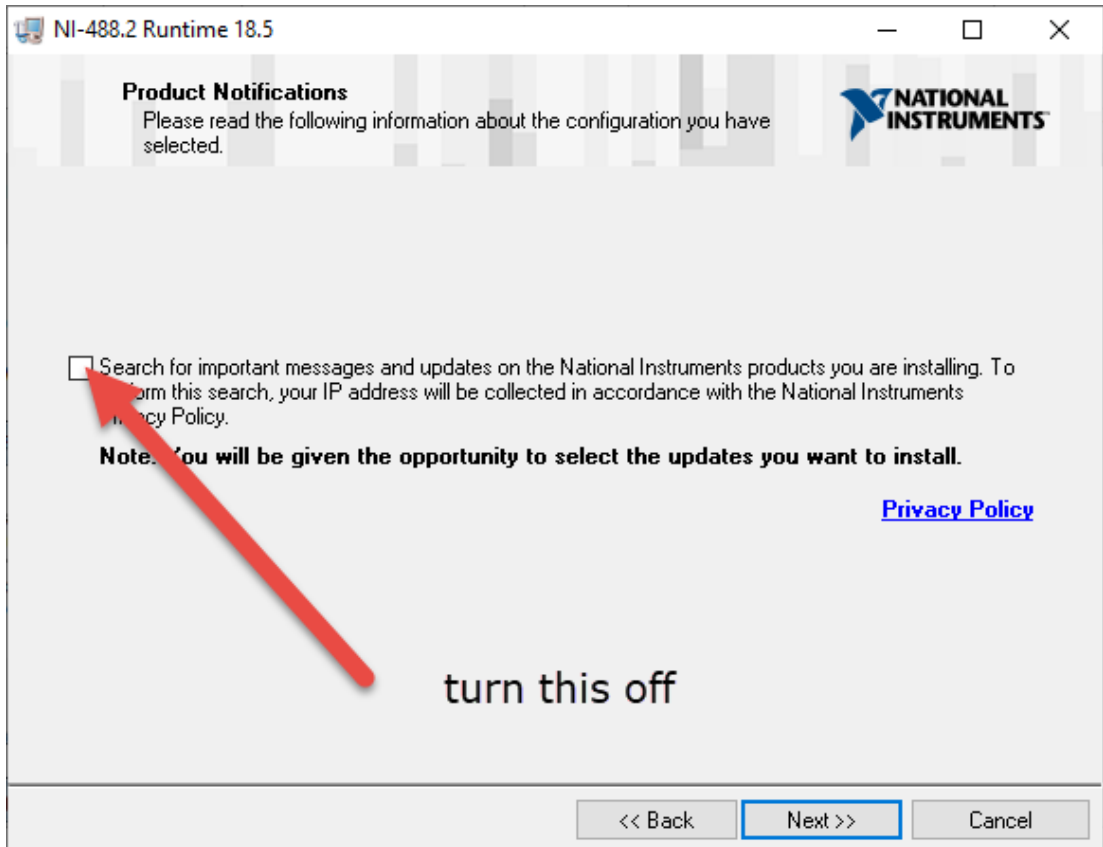
National Instruments GPIB-USB Driver (file: Tracer3Full\Instrument Drivers\GPIB Interfaces\National Instruments\NI488Runtime_1850)

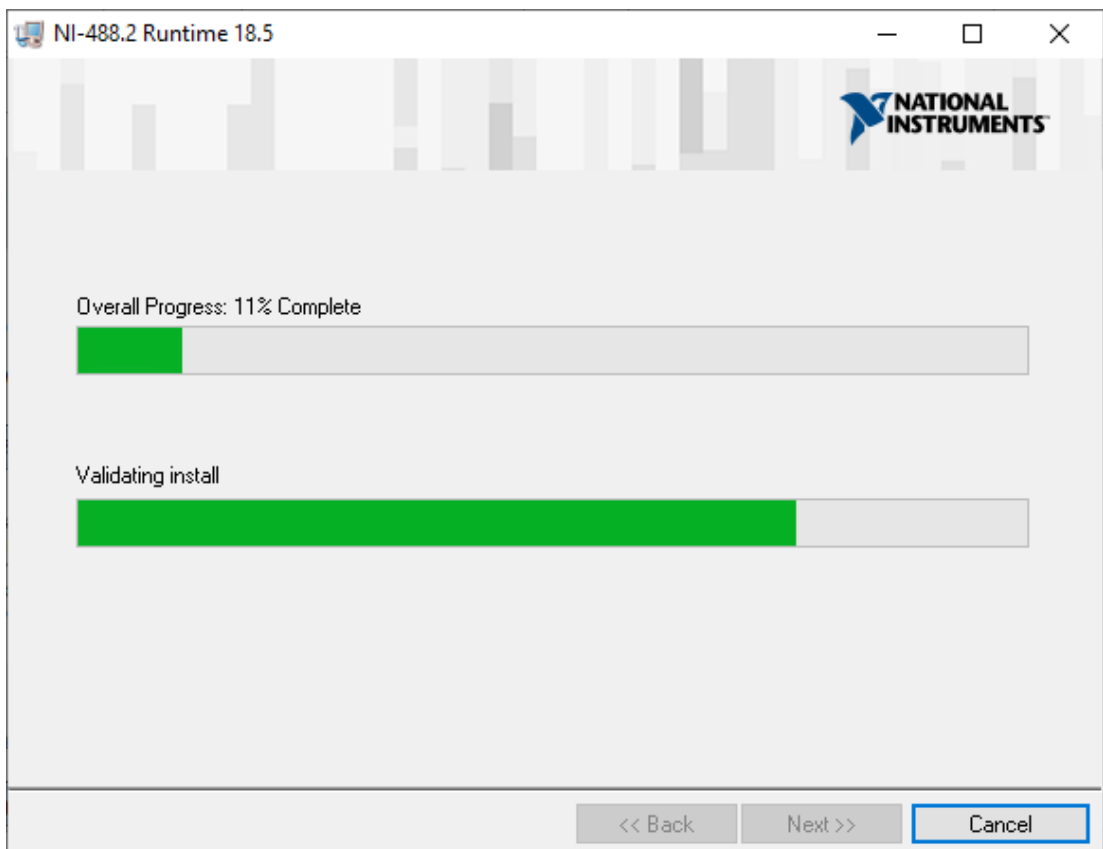
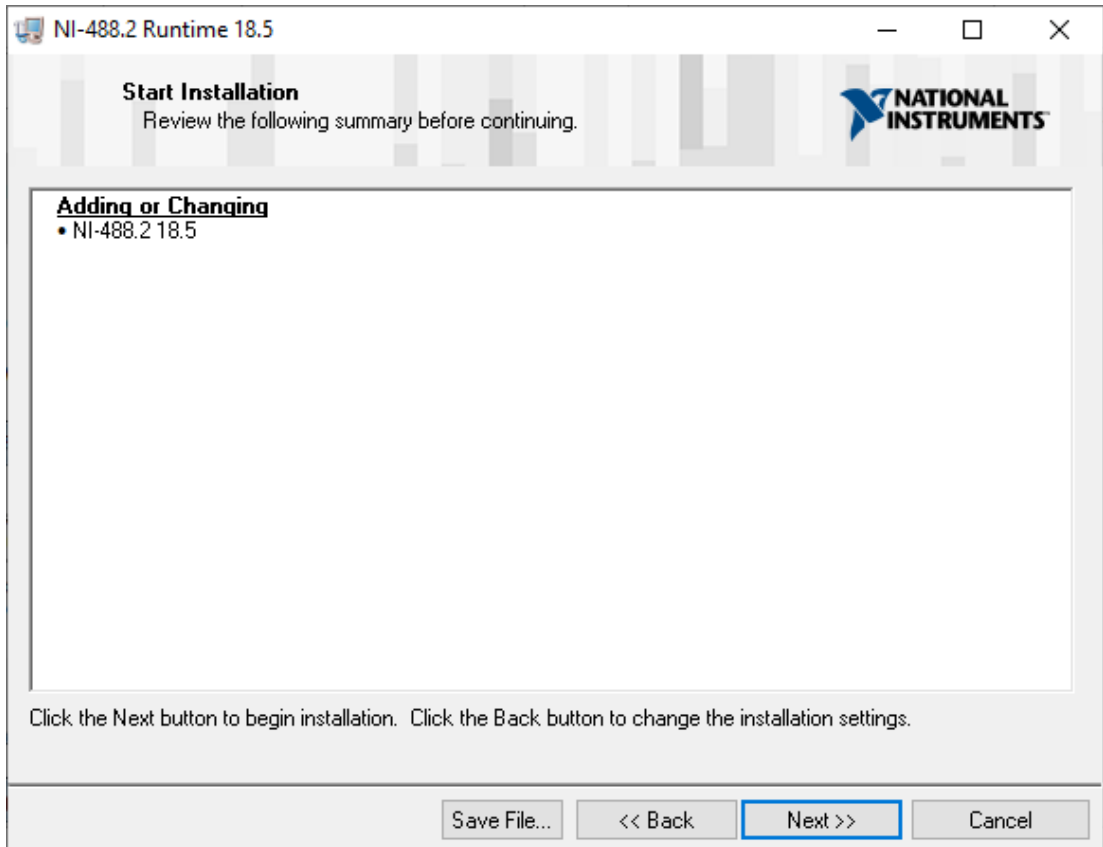
Follow the screens below:

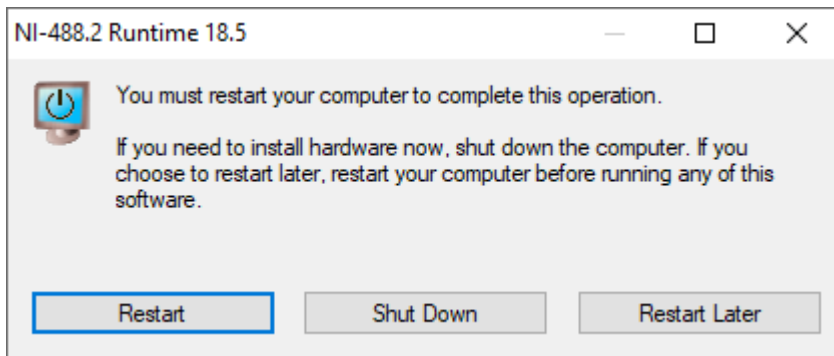
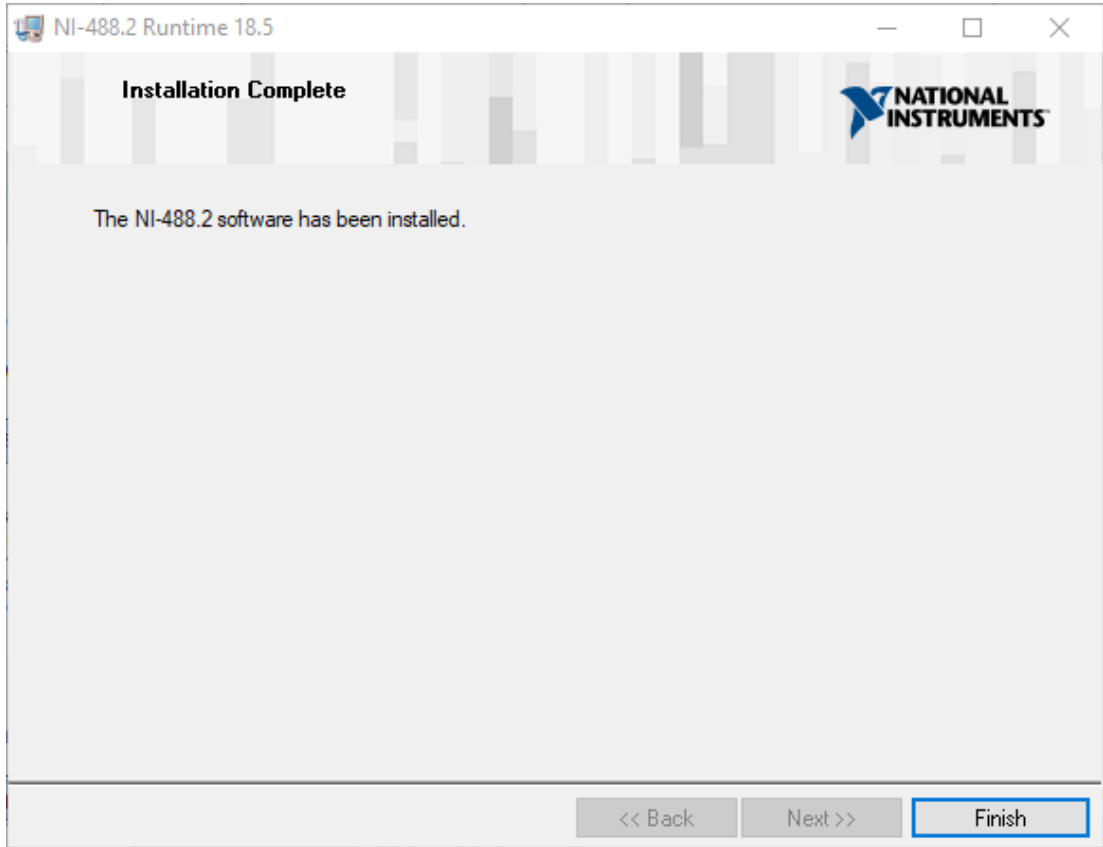












1.5 License Activation

Unlike the earlier versions of Tracer, it is not possible to use hardware dongles. The application needs to be activated by a license code on a specific computer.

When you have purchased Tracer3 you will receive an Activation Code. You will need this code to activate the license on a specific computer. This can be done [automatically](#) over the internet or [manually](#) by our email support service.

[Automatic online activation of the software](#)

[Manual activation of the software](#)

[Transferring the license to another computer](#)

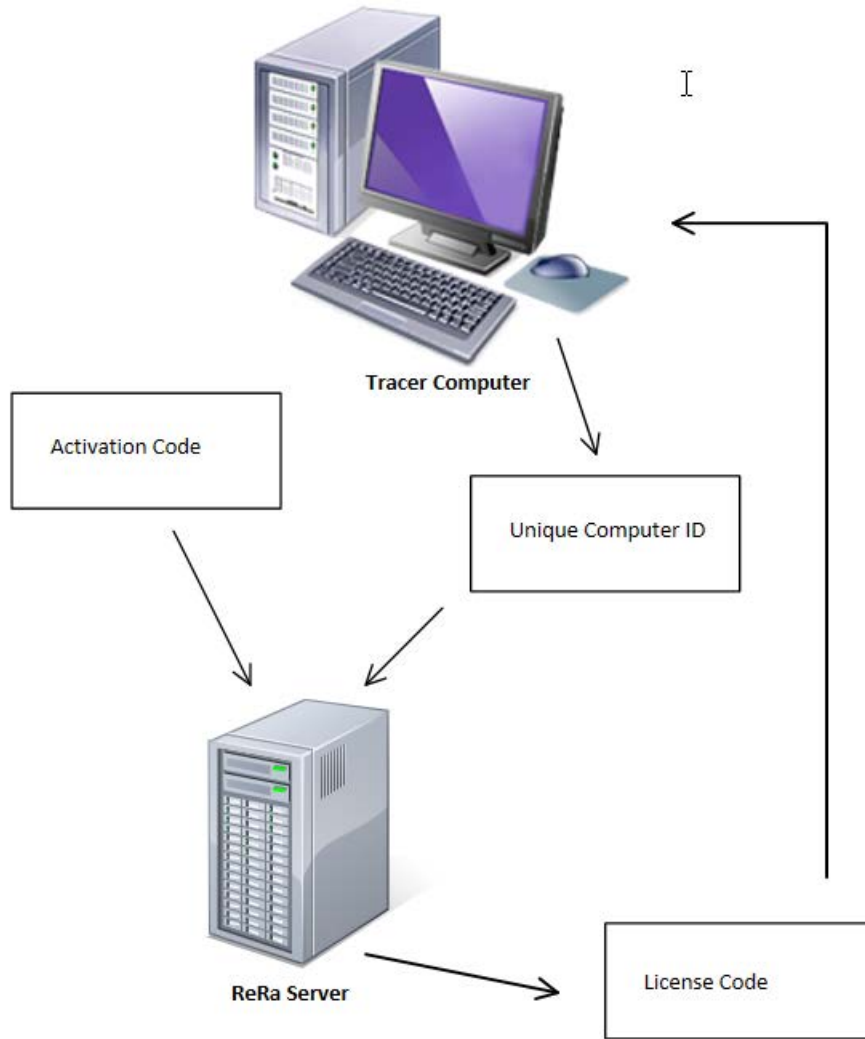
How does the licensing work


Short:

- The licensing of Tracer3 is based on a License Code.
- A certain license code will only work on one unique computer.
- Each computer has a unique identifier.
- The license code is created by the ReRa license server
- The ReRa license server needs the unique computer identifier to create the license code.

To create a license code it is required to send the unique computer identifier and the activation code to the ReRa license server. After creating a license code, the activation code cannot be used on another computer.

The schematic representation of the licensing process is given below.



 Part of the unique computer identifier is the computer name. If you change the name of the computer after the installation, you will not be able to run the software. Contact our support to solve problems you might encounter.

1.5.1 Automatic Activation

Automatic activation of Tracer3

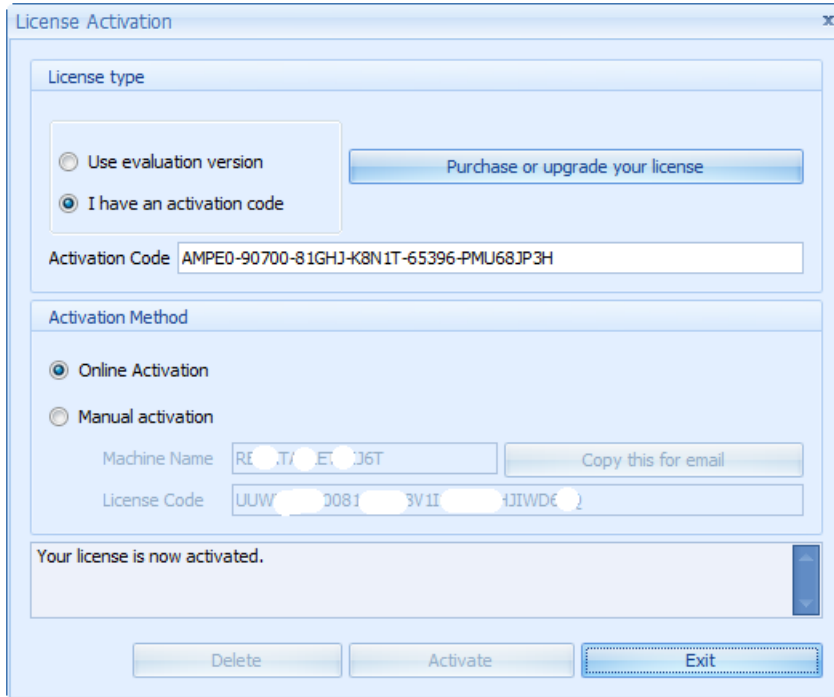
If the computer is connected to internet and when it is not hidden by firewalls or other protective measures, you can activate the software online.

Start Tracer3 and you will see the following dialog.



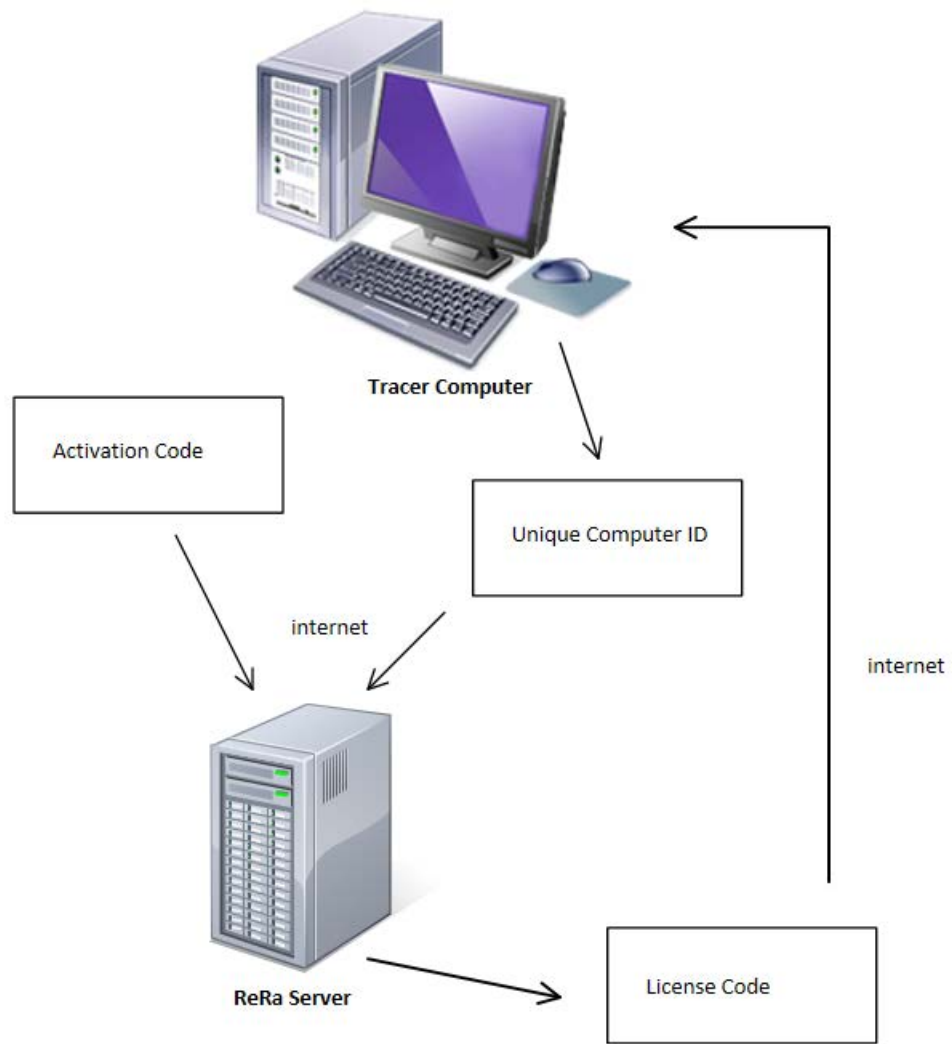
If you already use the software in evaluation mode, you can access this dialog from the **Home - About/Register - Register...**

Select the "I have an activation code" - check box. Fill in your activation code in the designated text box. Then press Activate. Tracer3 will now contact the license server and request a license code.



When the activation is successful you will see the message as shown above and the License Code appears.

In the schematic representation it is shown how the process works. The Activation Code will be sent together with the Unique Computer Identifier to the ReRa License Server over the internet. The server sends the created license code back to the computer where it is used to activate the software.



1.5.2 Manual Activation

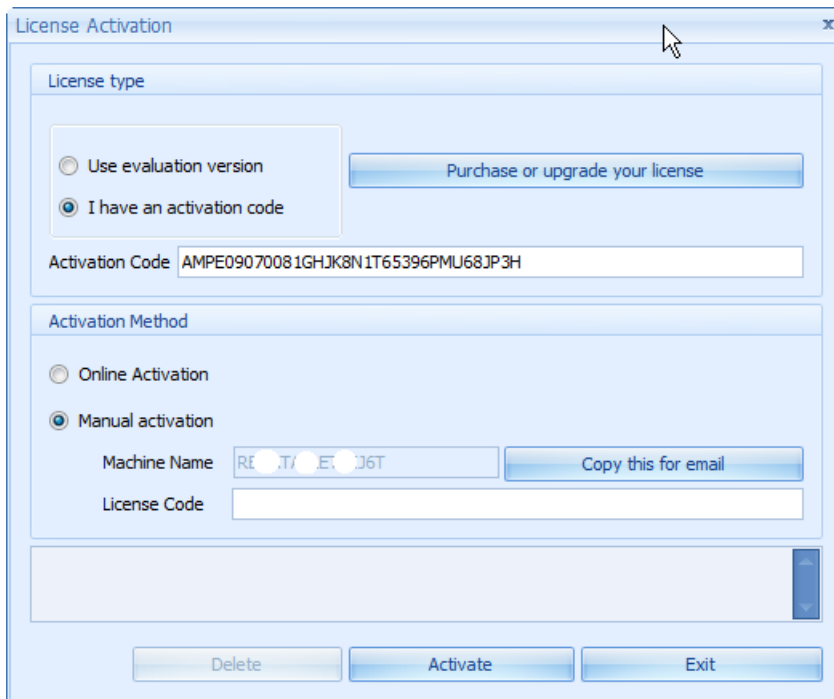
Not every computer is connected to the internet, therefore we support offline activation of the software as well. It might also be the case that the computer is hidden behind a firewall or that your IT department just does not allow for online traffic.

Manual activation of Tracer3

To manually activate Tracer3 start Tracer3 and you will see the following dialog.



If you already use the software in evaluation mode, you can access this dialog from the **Home - About/Register - Register...**

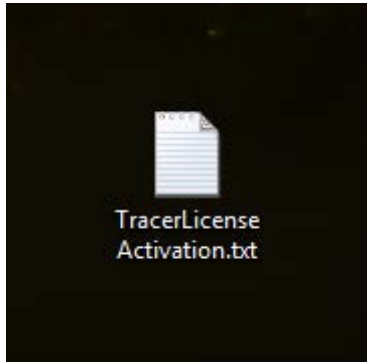


Select the 'I have an activation code' check box. Fill in your activation code in the designated text box and select the 'Manual Activation' check box.

Press the 'Copy this for email' button and the following message will appear:



As described in the message look for the 'TracerLicenseActivation.txt' and send this (or its contents) to license@rerasolutions.com.

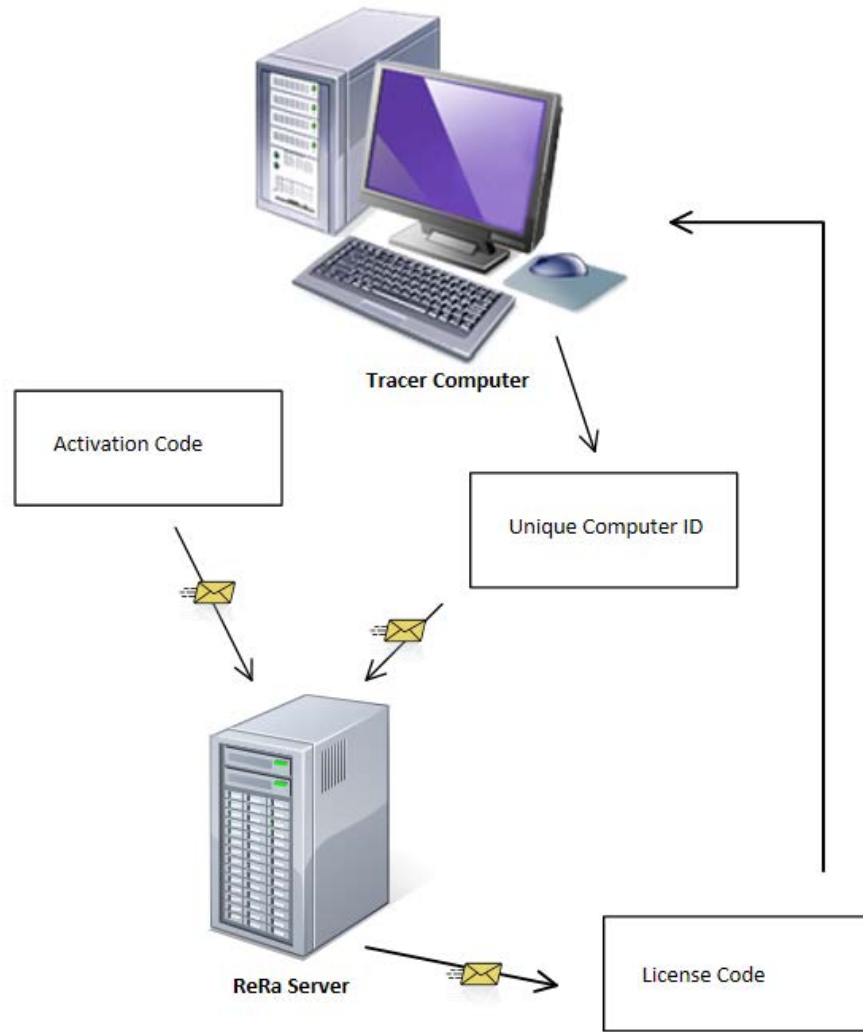


The file can be found on the desktop.

Our license support people will contact you with a valid license code within 24 hours by email.

When you receive the license code repeat the steps exactly as shown above, but instead of pressing the 'Copy this for email' button, you have to insert the license code into the license code text box and press activate.

In the schematic representation it is shown how the process works. The Activation Code will be sent together with the Unique Computer Identifier to the ReRa License Server by e-mail. You will receive the created license code back back by e-mail so it can be used to activate the software.



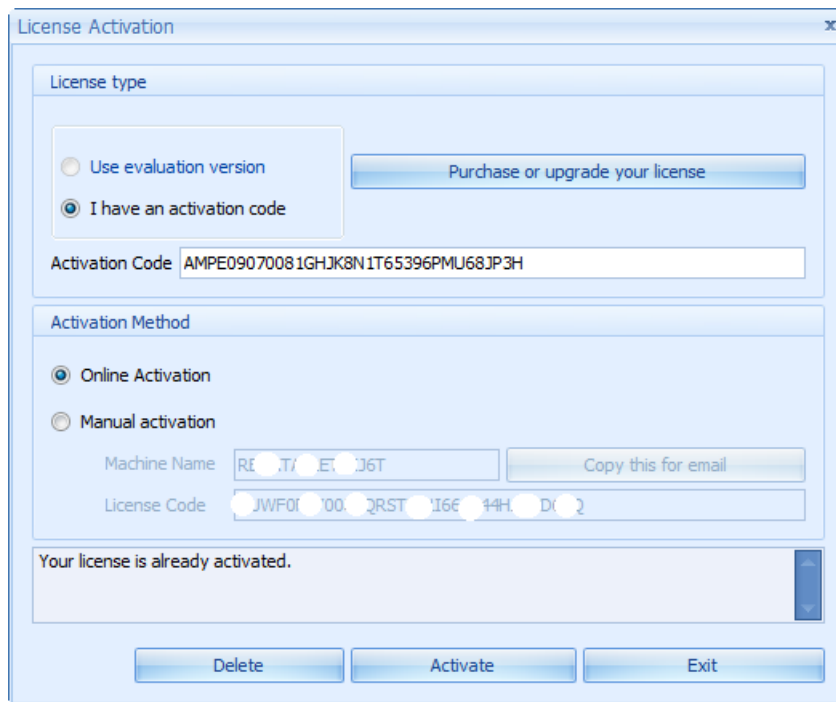
1.5.3 Transfer the license to another computer

In the occasion that the license needs to be installed on another computer, the following procedure has to be used.

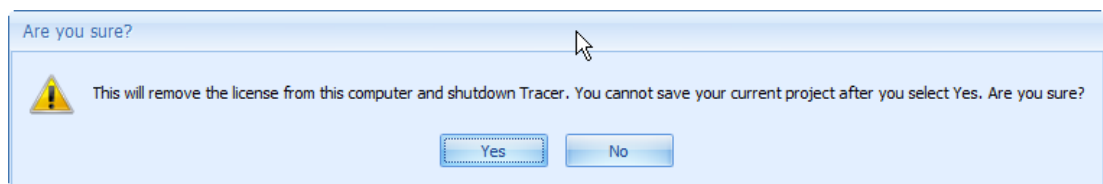
- Remove the license from the current computer
- Send proof of removal to ReRa license support
- You will obtain a new activation code to use on another computer

Steps to transfer the license

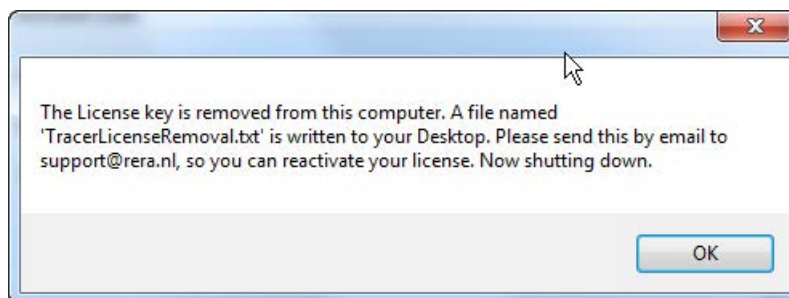
First open the license dialog from Home - About/Register - Register...



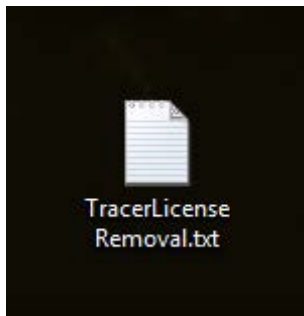
Press the Delete button.



The following message will appear, press Yes.



As described in the message look for the 'TracerLicenseRemoval.txt' and send this (or its contents) to license@rerasolutions.com.



The file can be found on the desktop.

Our license support people will contact you with a valid license code within 24 hours by email. You can then use the normal procedure to install the new license.

1.6 Setting up the system

To setup your measurement system you need to specify both the hardware and software components. This can be done in the 'Tracer Configurator', which is a separate application.



If you only use the Tracer3 Analyser you can skip this part completely.

[Using the Tracer Configurator](#)



[Eternalsun](#) uses Tracer3 as the main control software for their large area continuous solar simulators.

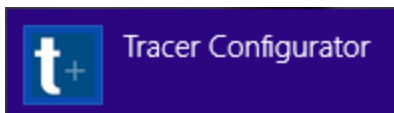
1.6.1 Tracer Configurator

After [installing](#) Tracer3 and getting the [license](#) up and running you have to run the configuration tool named "Tracer Configurator".

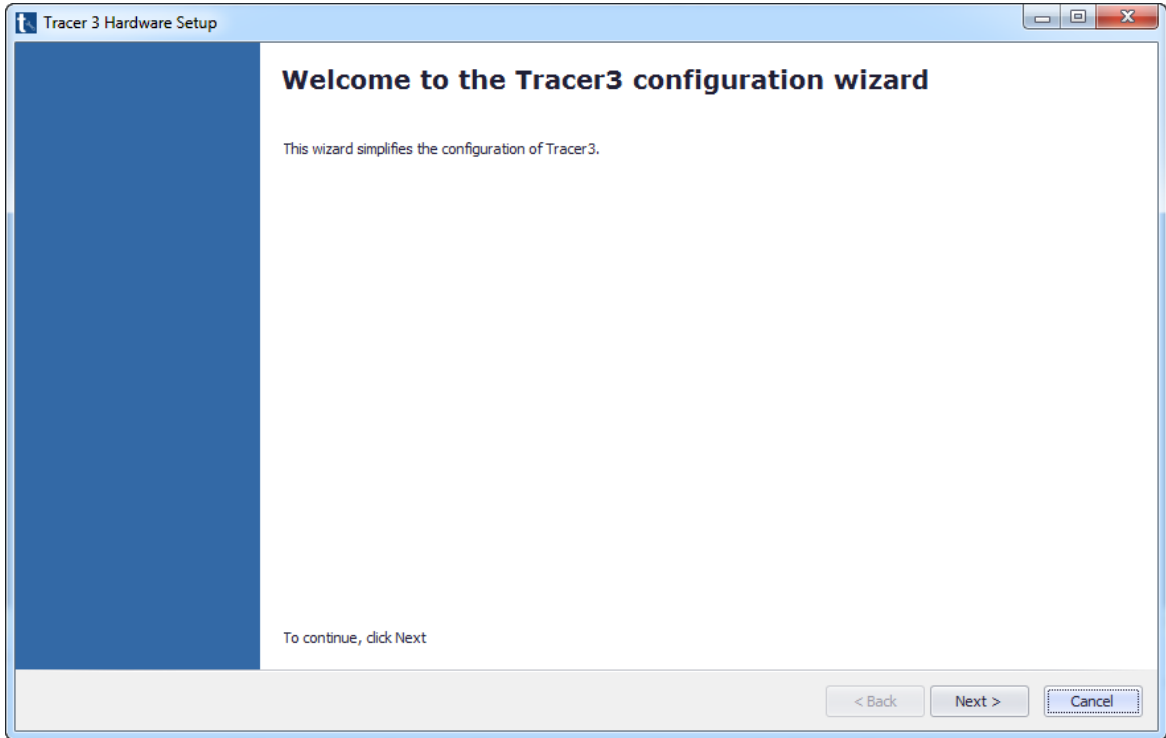


You do not need to use the Tracer Configurator when you use Tracer3 Analyser.

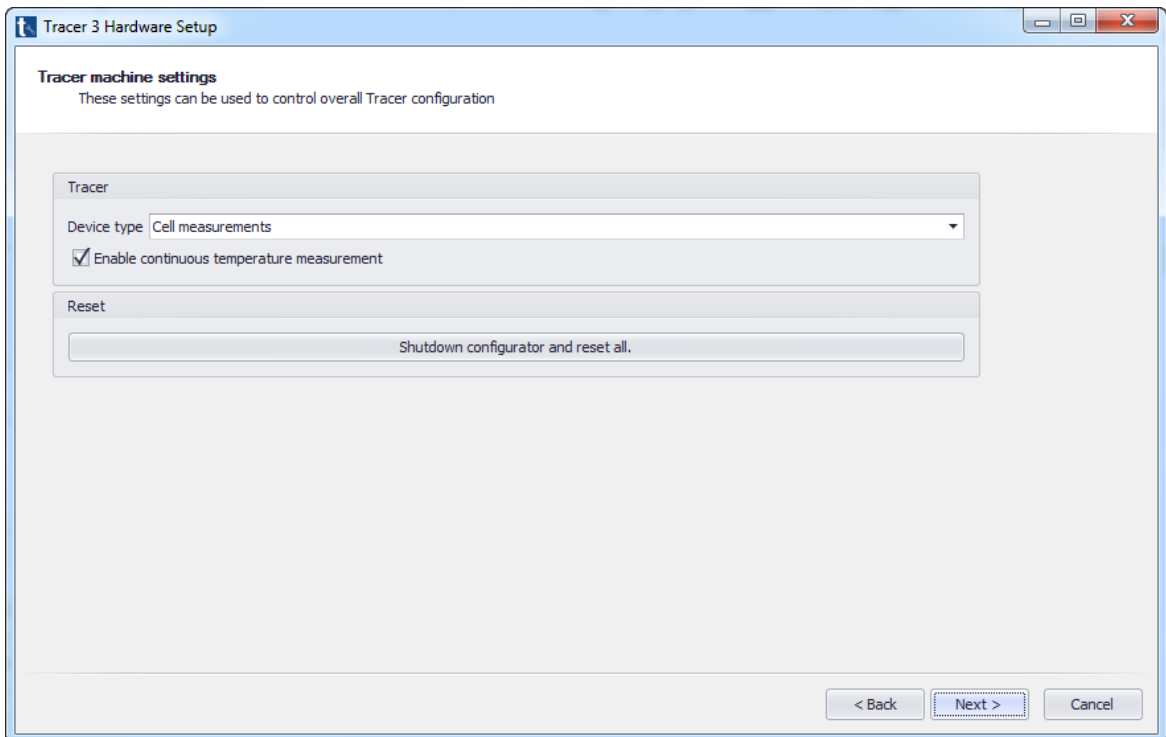
The configurator can be started by clicking the icon/tile:



A wizard will start to help you configure the software.



Press Next.



The first page of the wizard contains 3 sections.

Section Tracer

Device type Tracer3 can run in two modes: "Cell Measurements" or "Modules Measurements". This is very important for the behavior of Tracer3. Here the required mode can be selected.

See also: [Cell and Module mode](#).

Enable continuous temperature measurement When this check-box is selected, the device temperature will be measured continuously when the measurements are inactive. The results are shown in the main screen temperature display.

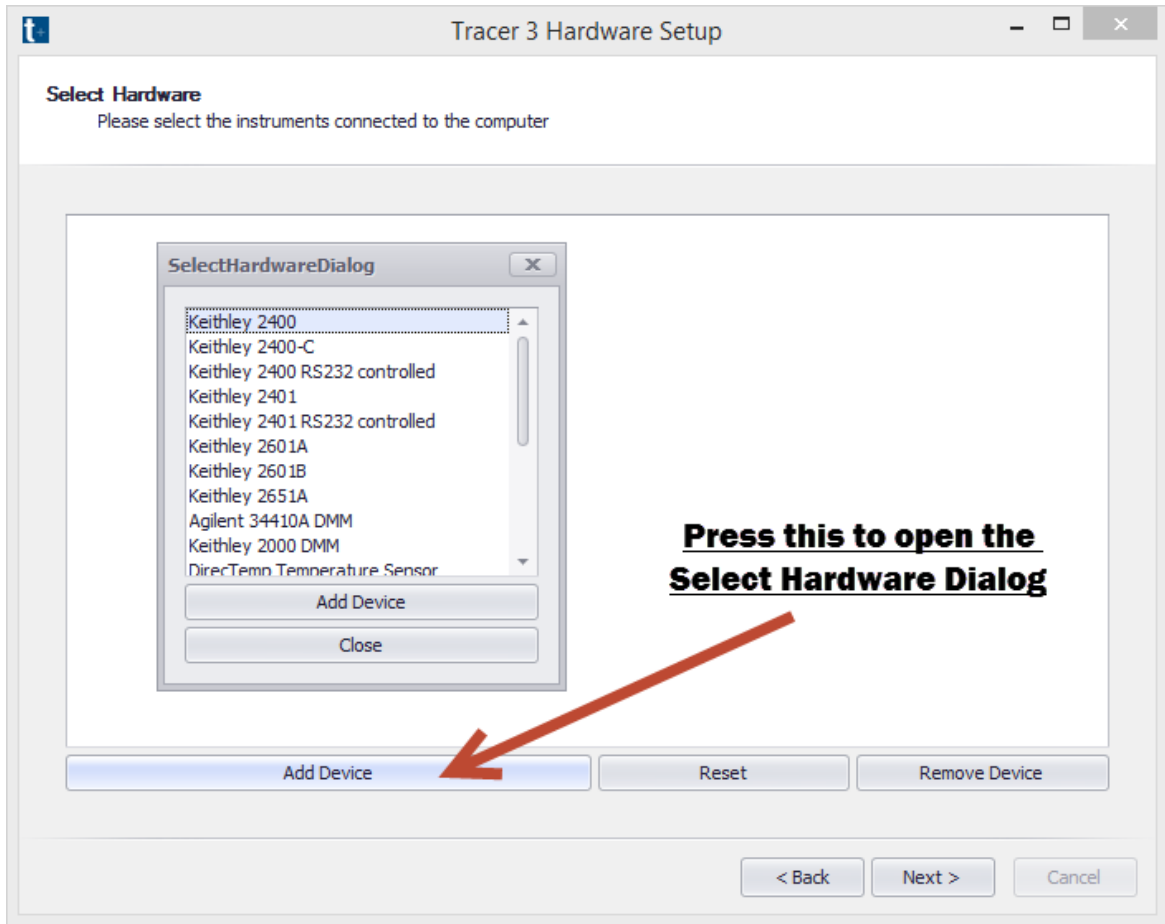
Section Reset

This button resets all configuration settings in Tracer3. Once this is done, **all settings disappear**. For example reference cells, database connection strings and device collections are removed. Only use this to fully reset the application.



Note: more info on the settings and configurations can be found in the Tracer Internals section.

Press Next



In this part of the wizard the system components are defined. Everything you have connected to the computer has to be indicated here. This means Keithleys, Pt100 sensors, DMM's, Relays, etc...

Control buttons

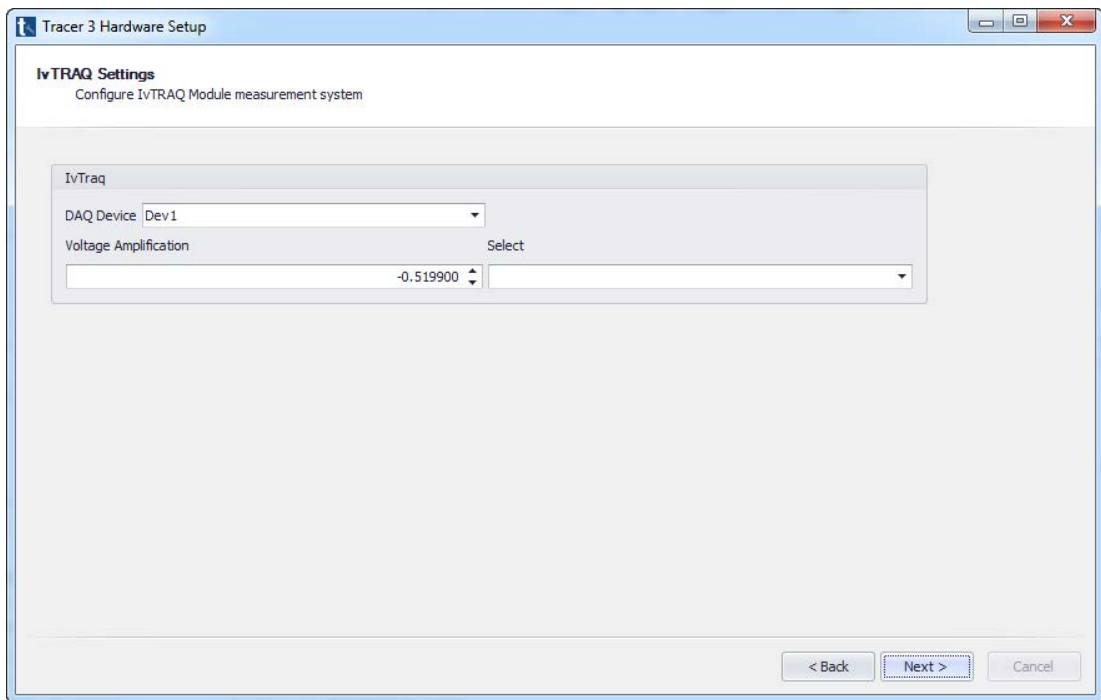
Add Device Pressing this button will open the "Select Hardware" Window. In this window you select all the instruments connected to the computer. It is not important to indicate how many instruments you have of one type. If you want to use 3 agilent 34410A DMM's (1 for temperature, 2 for IV measurement), you have to select only 1 Agilent 34410A.

Reset Pressing this button will remove all instruments from the system.

Remove Device Pressing this button will remove the selected instrument from the system.

Press Next

IvTraq Settings (only appears when IvTraq is selected)



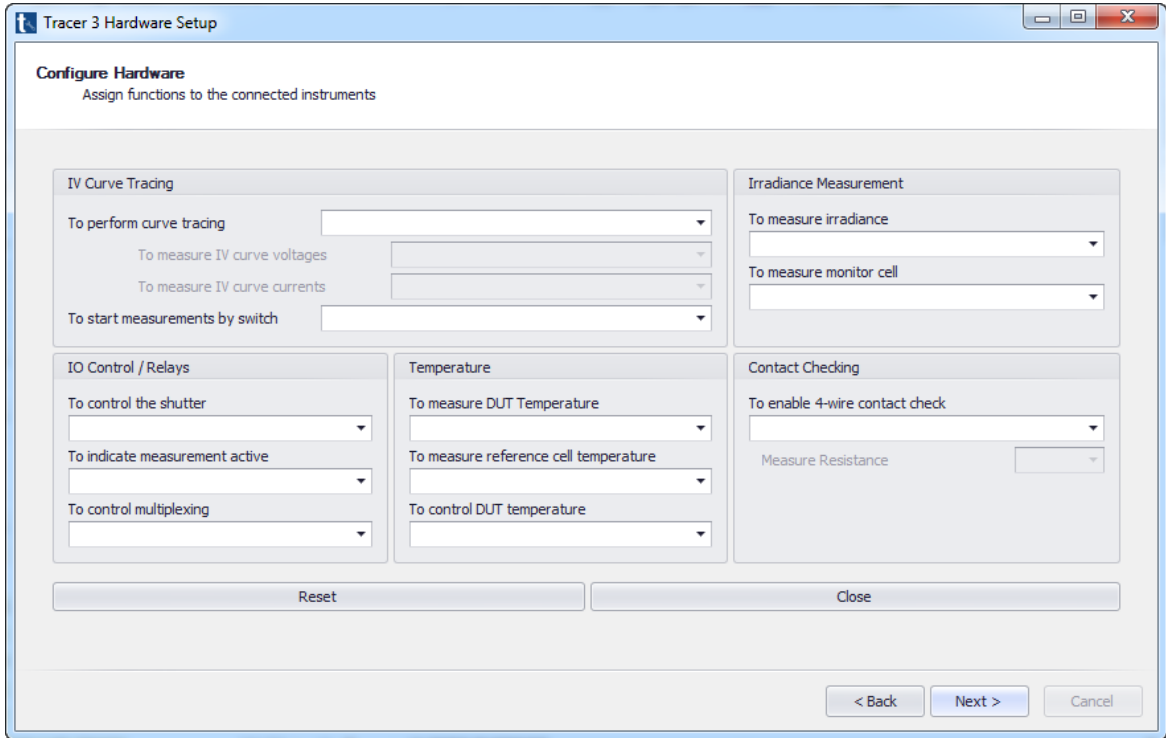
Section IvTraq

These settings are only required when Tracer is used with the Module Measurement system IvTraq, if you do not use an IvTraq system you can skip these settings.

DAQ Device IvTraq requires a National Instruments DAQ Device. Select the DAQ Device ID here.

Voltage Amplification To measure modules, IvTraq sweeps an analog voltage to control the electronic load voltage output. Depending on the load a different voltage amplification is required. For example: one of the ReRa loads has an amplification factor of 0.013333V/V. This means that when the DAQ outputs 1V, the load will apply $(1 / 0.013333 =)$ 75V to the module.

In the dropdown box on the right of the voltage amplification, different pre-defined voltage amplifications can be found.



In this last screen the functionality of the defined instruments is configured. Any device can support one or more functions. For example you can use a Keithley 2400 SourceMeter to measure the IV curve of a solar cell, but it can also be used to control the shutter of a solar simulator. The Keithley 2400 has an IO connector on the back that can provide this functionality.

An overview of the supported functions can be found here.

1.6.2 Cell and Module mode

Tracer3 can be configured in many ways, but there are two main configurations that are changing the overall behavior of the application. The software can be run in Cell mode or Module mode. You will have to indicate this in the [Tracer Configurator](#). If you measure solar cells and small modules the cell mode is recommended. Module mode should only be used if the only devices are PV Modules.

Differences between cell mode and module mode

Topic	Cell mode	Module mode

Topic	Cell mode	Module mode
New Measurement Dialog		Cell area and Cell number not shown
Device Area options	multiple areas can be defined	Only the cell area can be defined
Auto-range current	enabled	disabled
Fitting to diode models	supported	not supported, no model fit overview in parameter area
Main measurement table columns	Time, Type, Code, SubCode, FF, Jsc, Voc, Eta	Time, Type, Code, SubCode, FF, Isc, Pmax, Eta
Dark curve	enabled	disabled
Average two curves	enabled	disabled
Device Manger		The name is changed to Module Manager
IV Curve Graph	Current and Current Density	Only Current

In the About dialog the current Tracer Mode is shown.