KINGSTAR 3.1.1

ETHERCAT RUNTIME INSTALLATION GUIDE

KS-DOC-x64-0005-R12

KINGSTAR IntervalZero

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KINGSTAR EtherCAT

KINGSTAR EtherCAT provides two installations: a Runtime and a Software Development Kit (SDK). Runtime supplies KINGSTAR EtherCAT Subsystem that will be deployed as part of your application, while SDK supplies headers and libraries for you to develop your own KINGSTAR applications.

KINGSTAR also provides Runtime Merge Modules components for you to incorporate Runtime into your installer.

KINGSTAR EtherCAT Runtime contains:

- The KINGSTAR EtherCAT Subsystem.
- An Analysis Console to debug the system.
- An ESI Import Tool to add support for custom hardware profiles into the KINGSTAR Subsystem.
- A sample application that show the capabilities of KINGSTAR EtherCAT.

Merge Modules contains:

- Merge Modules that allows for inclusion of the KINGSTAR EtherCAT Runtime into your product installation.

Product editions and requirements

The difference between product editions and the hardware, software requirements for KINGSTAR are listed below.

Product editions

KINGSTAR EtherCAT provides the following Runtime editions.

Edition	Supports
ENTRY	• 1-millisecond timer, and 1 core dedicated to real-time I/O. • EtherCAT capabilities.
PRO	• 50-microsecond timer, and up to 3 cores dedicated to real-time I/O. • EtherCAT capabilities with 3rd party EtherCAT master support.

Hardware requirements

This section lists hardware requirements for KINGSTAR and the considerations about processors.

Drives and I/O

KINGSTAR supports a number of servo drives, stepper drives, EtherCAT I/O modules and EtherCAT couplers. For the up-to date list, see the KINGSTAR Supported Hardware PDF file at kingstar.com.

Network interface card (NIC)

KINGSTAR requires a dedicated NIC. The NIC is configured when the Install Wizard is run. For the up-to-date list, see the KINGSTAR Supported NIC PDF file at kingstar.com.

EtherCAT

KINGSTAR uses EtherCAT technology for communication. Do the following to set up the EtherCAT network:

1. Make sure your computer and devices have the network interface cards (NICs) or chips that support the EtherCAT protocol. The EtherCAT protocol allows up to 65,535 devices to be connected. To know whether the hardware supports EtherCAT:

    - Computers: In Windows, go to **Device Manager** and find the NIC under **Network adapters**. Make a note of the model number of the NIC. Go to kingstar.com and go to **Support** > **Documentation** > **Support Documentation** > **Supported Network Interface Cards**. If your NIC is listed in the document, it supports EtherCAT.

    - Devices: See the manual of your device, or contact the device manufacturer.

2. Prepare the Ethernet cables that are CAT-5 (Category 5) or higher. The transmission rate needs to be at least 100 Mbps.

3. Connect your computer and devices using the Ethernet cables.

Hardware considerations

KINGSTAR requires a multiprocessor platform that supports 64-bit Windows 10 Version 1607, Windows 8.1 with Update or Microsoft Windows 7 with Service Pack 1. Uniprocessor systems are not supported. At minimum, two cores are required; one core must be dedicated to Windows and another core must be dedicated to the KINGSTAR Subsystem. Systems with up to 64 cores are supported.

NOTE: If your system is hyper-threaded, you should assign an even number of processors between Windows and KINGSTAR real-time components. The Windows logical processor and real-time logical processor must not share the same physical processor.

Some hardware configurations are not supported by the KINGSTAR Runtime installations. Although KINGSTAR runs on most x64 platforms, unique attributes of some processors require special consideration before using them in your system.

- For a comprehensive list of approved and supported hardware, see the Windows hardware certification web page:

https://msdn.microsoft.com/en-us/windows/hardware/gg463010

- For a comprehensive list of system requirements for Windows 8.1, see the Windows 8.1 System Requirements web page:

  https://support.microsoft.com/en-us/help/12660/windows-8-system-requirements

- For a comprehensive list of system requirements for Windows 10, see the Windows 10 System Requirements web page:

  https://www.microsoft.com/en-us/windows/windows-10-specifications

Software requirements

This section lists software requirements for KINGSTAR and things to know before you install the software.

Operating system requirements

KINGSTAR are supported on 64-bit multiprocessor configurations for the following operating systems:

- Windows 10 Version 1607 Professional and Enterprise editions
- Microsoft Windows 8 with Update
- Windows Embedded 8.1 (must support MSI installation to allow RTX64 to be installed)
- Microsoft Windows 7 with SP1
- Windows Embedded Standard 7 with SP1 (must support MSI installation to allow RTX64 to be installed)

Microsoft Visual Studio

Microsoft Visual Studio 2012, 2013 or 2015 with at least Update 1, must be installed in your system if you want to develop KINGSTAR applications.

Microsoft .NET Framework

Microsoft .NET Framework 4.5.1 is required. It the client is not detected, the Install Wizard installs the client for you.

Real-Time Subsystem

KINGSTAR requires, at minimum, RTX64 3.1 Runtime. If it is not already installed in your system, the product installer installs and configures the RTX64 real-time Subsystem for you.

Real-Time Software Development Kit

RTX64 SDK is required for KINGSTAR application development. If it is not already installed in your system, the Install Wizard will install and configure the SDK for you.

Administrator privileges

Administrator privileges are required for installing and uninstalling the RTX64, which provides local Windows Groups to control user access to RTX64 features. By default, all users can access the RTX64 features. You should modify groups to limit the access to specific users.

Request a free trial

For access to evaluation kits, go to http://kingstar.com/download-trial/. In the form that appears, select KINGSTAR from the product choices, fill out the contact information, and then click **Start Trial**.

Install KINGSTAR EtherCAT Runtime

After purchasing KINGSTAR EtherCAT Runtime, you will receive an email confirmation that includes the activation key and a link to the KINGSTAR EtherCAT download page. After downloading the file, complete the steps that follow to install KINGSTAR EtherCAT Runtime.

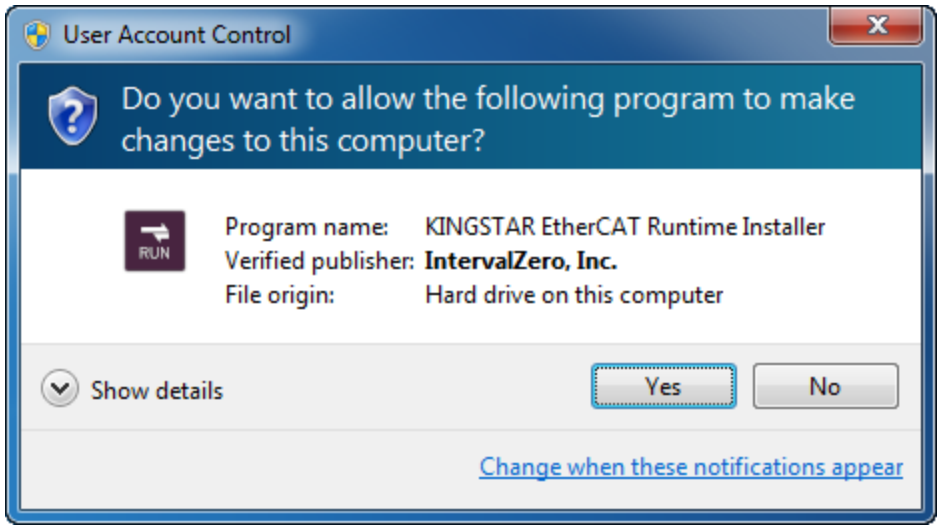
1. Go to **Control Panel** > **Programs and Features**. Select the previous version of KINGSTAR EtherCAT Runtime and RTX64 Runtime from the list and uninstall them.

   IMPORTANT: Because KINGSTAR EtherCAT Runtime 3.1.1 and the included RTX64 Runtime are incompatible with their previous versions, you need to uninstall previous KINGSTAR EtherCAT and RTX64 Runtime versions before you install v3.1.1.

   IMPORTANT: KINGSTAR EtherCAT Runtime and KINGSTAR Soft Motion Runtime cannot exist on the same computer. Uninstall either of them if you want to install the other.

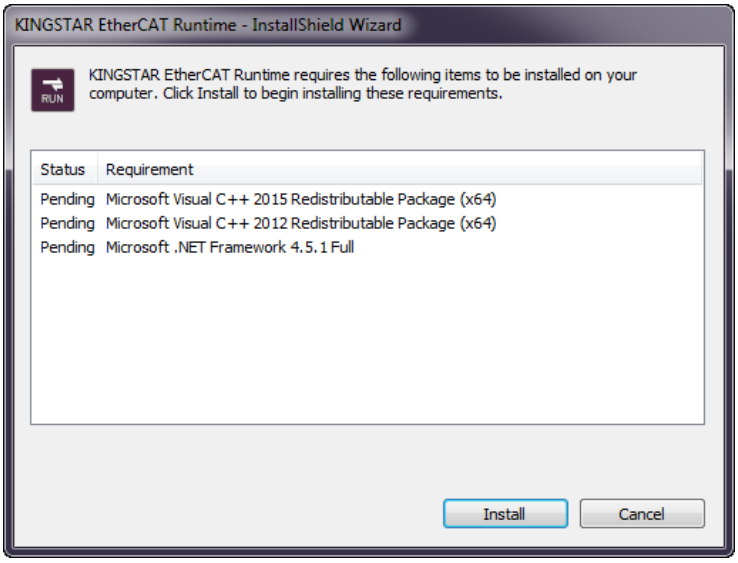
2. Double-click `KINGSTAREtherCATRuntimeInstaller.exe`.

   NOTE: You must have administrator permission to install KINGSTAR EtherCAT Runtime. Before the installation begins, the **User Account Control** dialog box may ask if you want the installer to make changes to your computer. Click **Yes** to continue the installation.

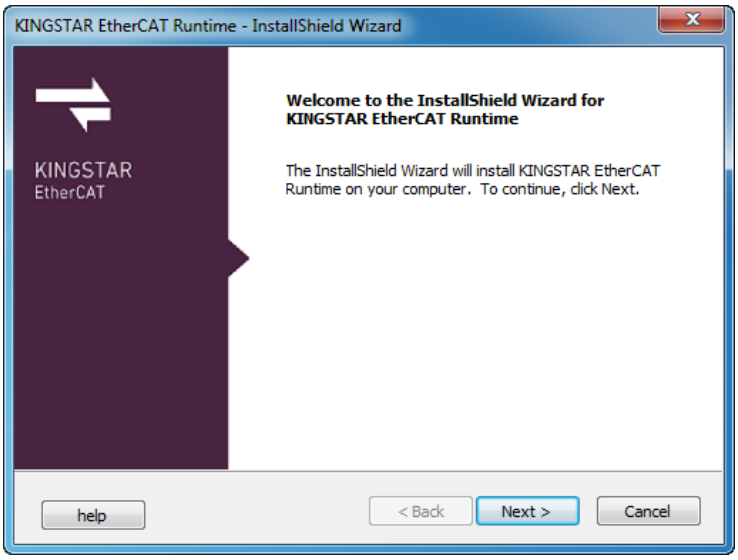


3. The prerequisites for KINGSTAR EtherCAT Runtime are Microsoft Visual C++ 2015 and 2012 Redistributable Package (x64) and Microsoft .NET Framework 4.5.1 Full. If you don't have the prerequisites installed on your computer, click **Install** and KINGSTAR will install them for you.

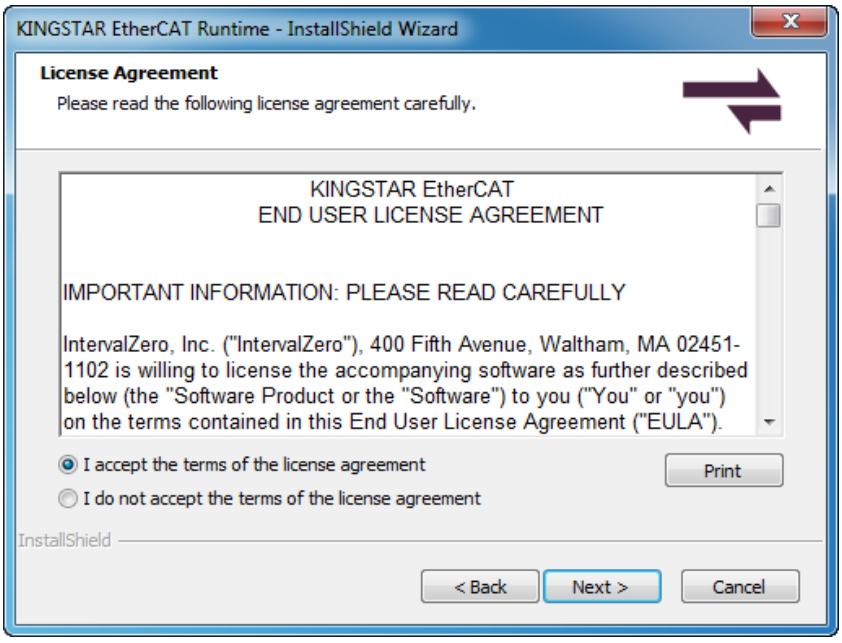
   NOTE: If you've already installed the prerequisites or their newer version, you won't see this screen.



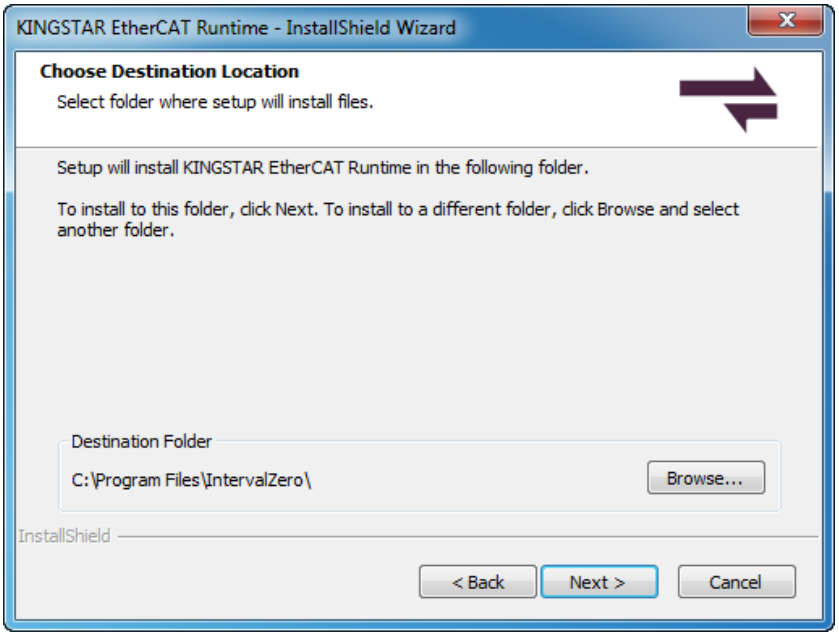
4. In the **KINGSTAR EtherCAT Runtime - InstallShield Wizard** dialog box, click **Next** to begin the installation.



5. Read the End User License Agreement, select **I accept the terms of the license agreement** and click **Next**.

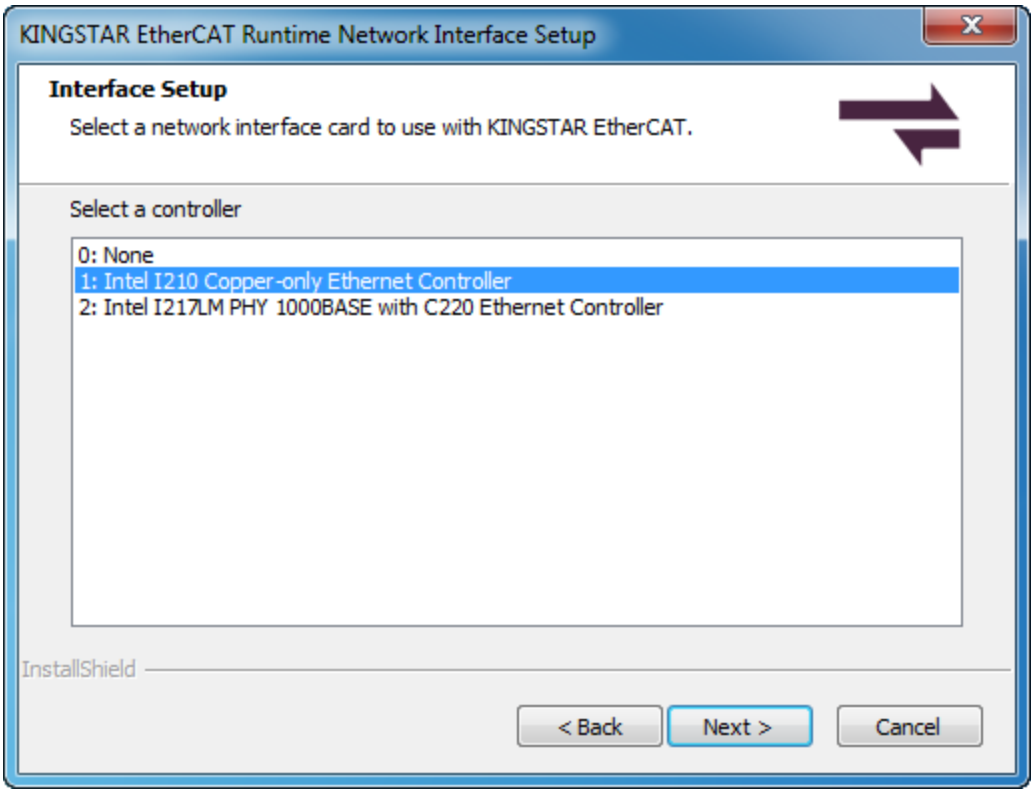


6. Choose the location you want to install KINGSTAR EtherCAT Runtime. You can accept the default installation path, or click **Browse** to choose a different location. When you finished, click **Next**.

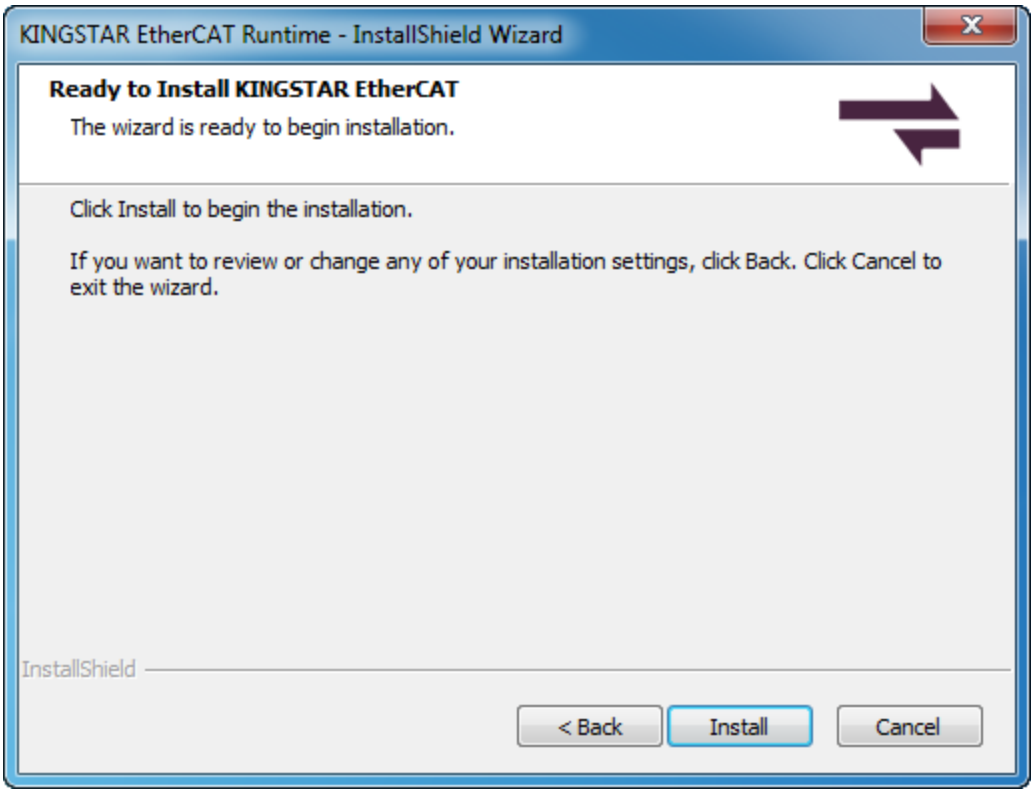


7. In the **KINGSTAR EtherCAT Runtime Network Interface Setup** dialog box, select a network interface card (NIC) for KINGSTAR to use, and then click **Next**:
   - **None** – Do not associate a NIC with KINGSTAR EtherCAT Runtime now. You need to manually configure a controller and interface before you can use KINGSTAR EtherCAT Runtime.
   - **<NIC>** – Select a NIC to associate with KINGSTAR EtherCAT Runtime, and configure an interface to use this device for KINGSTAR EtherCAT network communication.

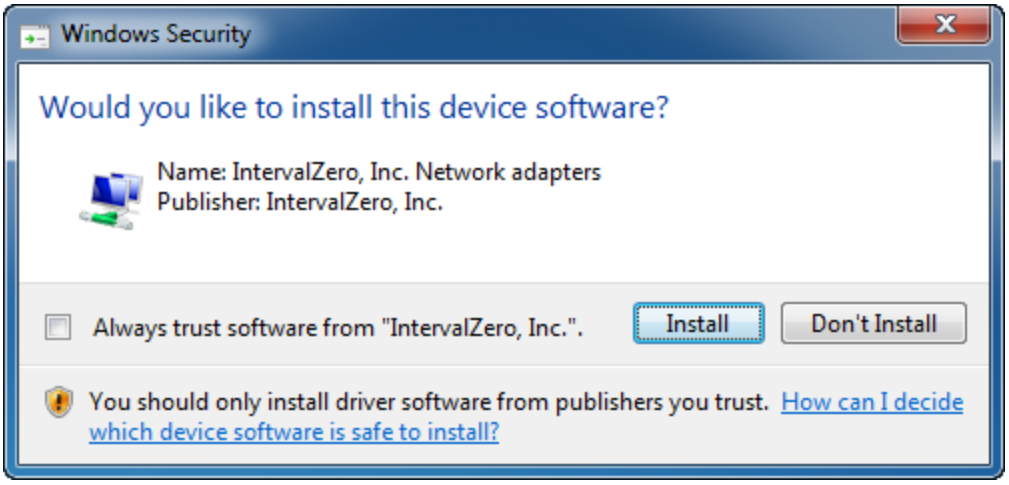
   We suggest you select a NIC. KINGSTAR EtherCAT will automatically associate and configure the card so you don't need to manually configure it later.



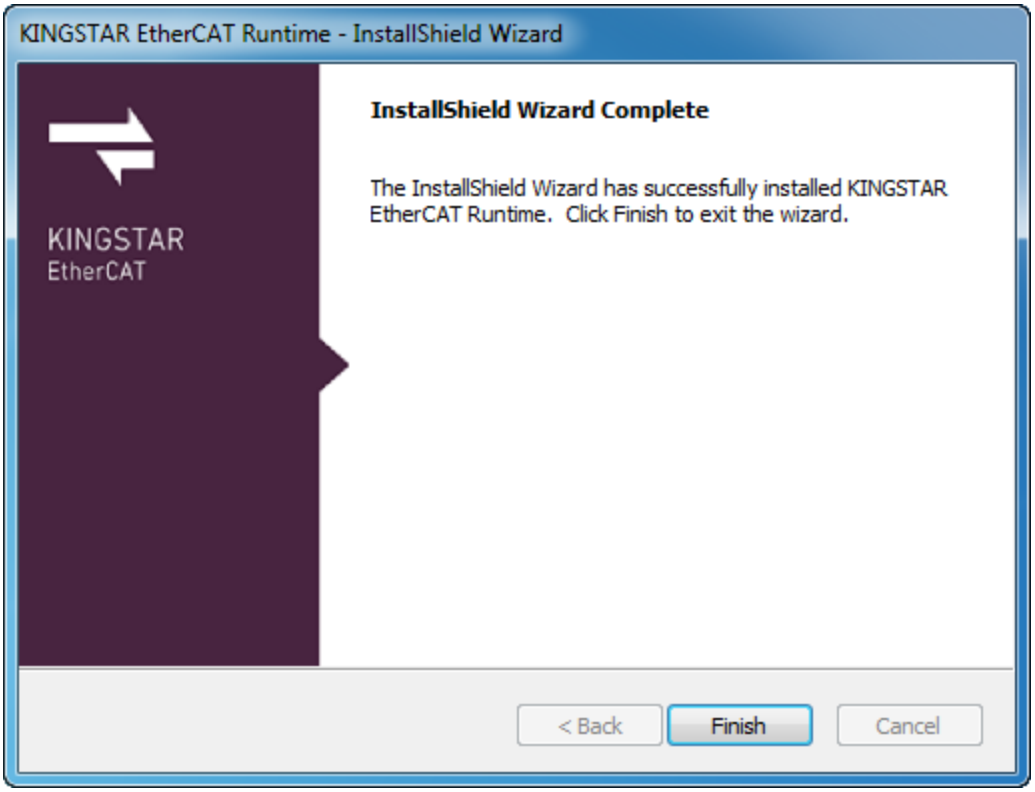
8. In the **KINGSTAR EtherCAT Runtime - InstallShield Wizard** dialog box, click **Install**.



NOTE: During the installation, **Windows Security** may prompt you to choose to install IntervalZero software. Click **Install** to continue the installation.



9. After completing the installation, click **Finish** to close the wizard. For more information about activating your KINGSTAR EtherCAT components, see Activate and Configure KINGSTAR.



Activate and configure KINGSTAR

You must activate your KINGSTAR software and configure the system's boot configuration before you can run any KINGSTAR applications.

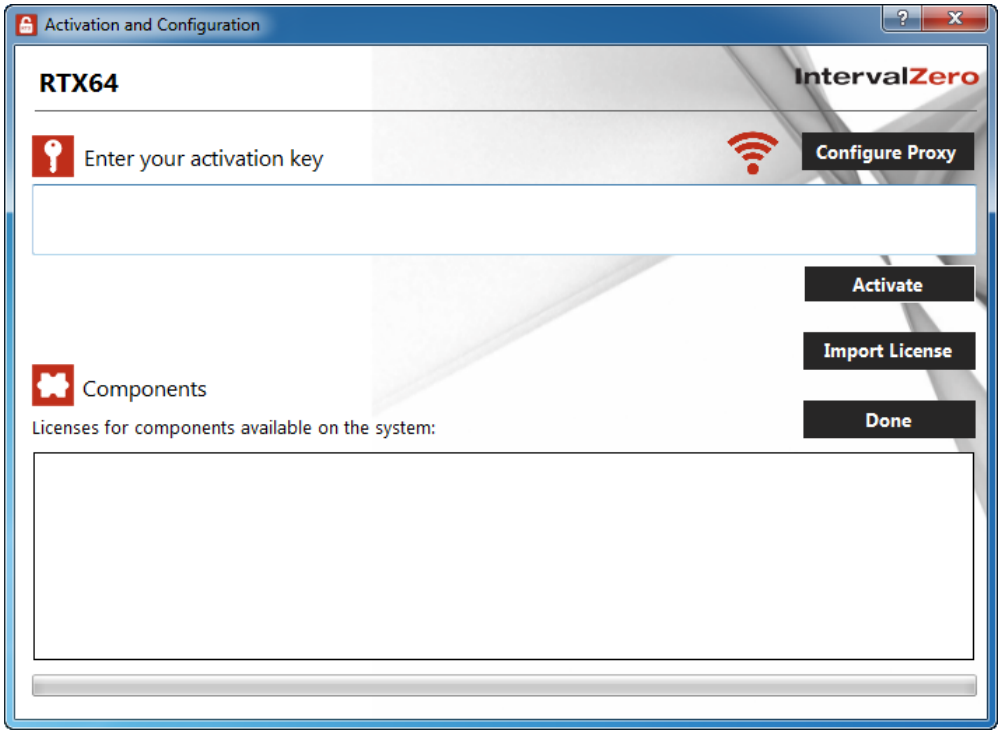
You should have received an activation key through an email. If you didn't receive the key, contact the salesperson from whom you purchased KINGSTAR.

Activate over the internet

Follow the steps below if you can access the IntervalZero license server. If you do not have the internet access, see the section Activate by the file.

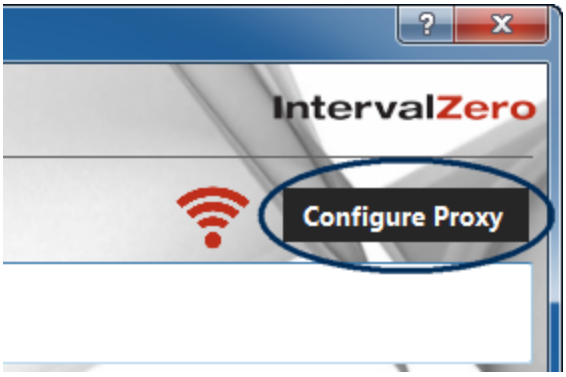
1. On the taskbar, click **Start** > **All Programs** > **RTX64 3.1 Runtime** > **Activation and Configuration**. The **Activation and Configuration** dialog box appears.

   NOTE: You must have administrative permissions to launch this utility. Before the utility starts, the **User Account Control** dialog box may ask if you want the installer to make changes to your computer. Click **Yes** to continue the installation.



2. Make sure your machine is connected to the internet with access to the IntervalZero license server. If a connection is available, you will see in the upper-right corner of the dialog box. If the connection is not available, make sure all network cables are plugged in and click the signal image to refresh. If the connection is still not available, you may need to configure a proxy server. To configure a proxy server:

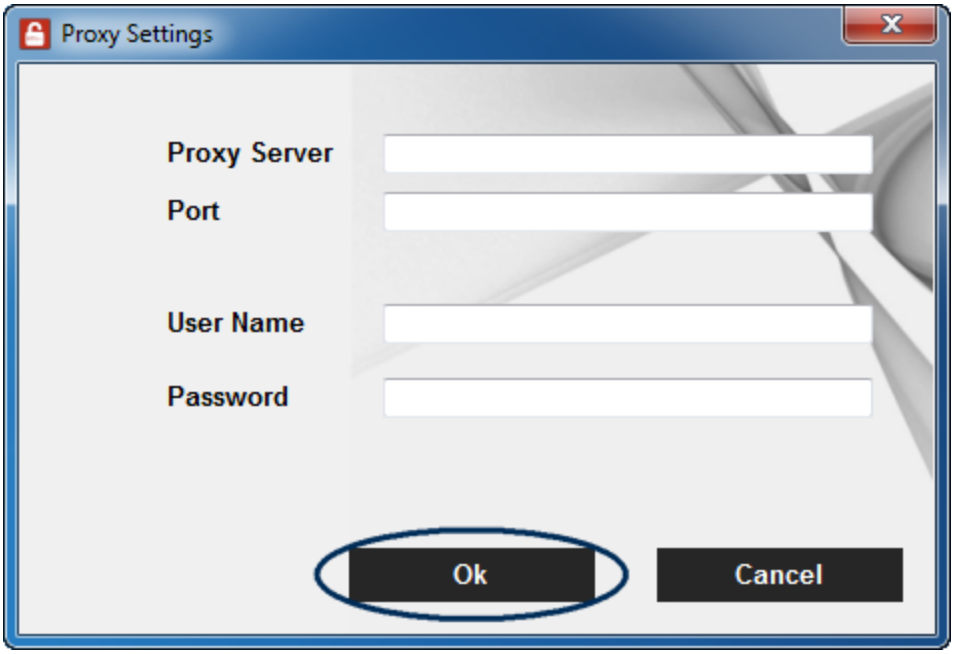
   a. Click **Configure Proxy**.



   b. Enter the information in the empty boxes and click **Ok**. The information should be available from your IT department.

      NOTE: The proxy server must be able to process HTTP connections. SOCKS proxies are not supported.

      NOTE: If no network connection can be established, see the section Activate by the file.



3. Back in the **Activation and Configuration** dialog box, in the **Enter your activation key** box, enter your activation key and then click **Activate**.

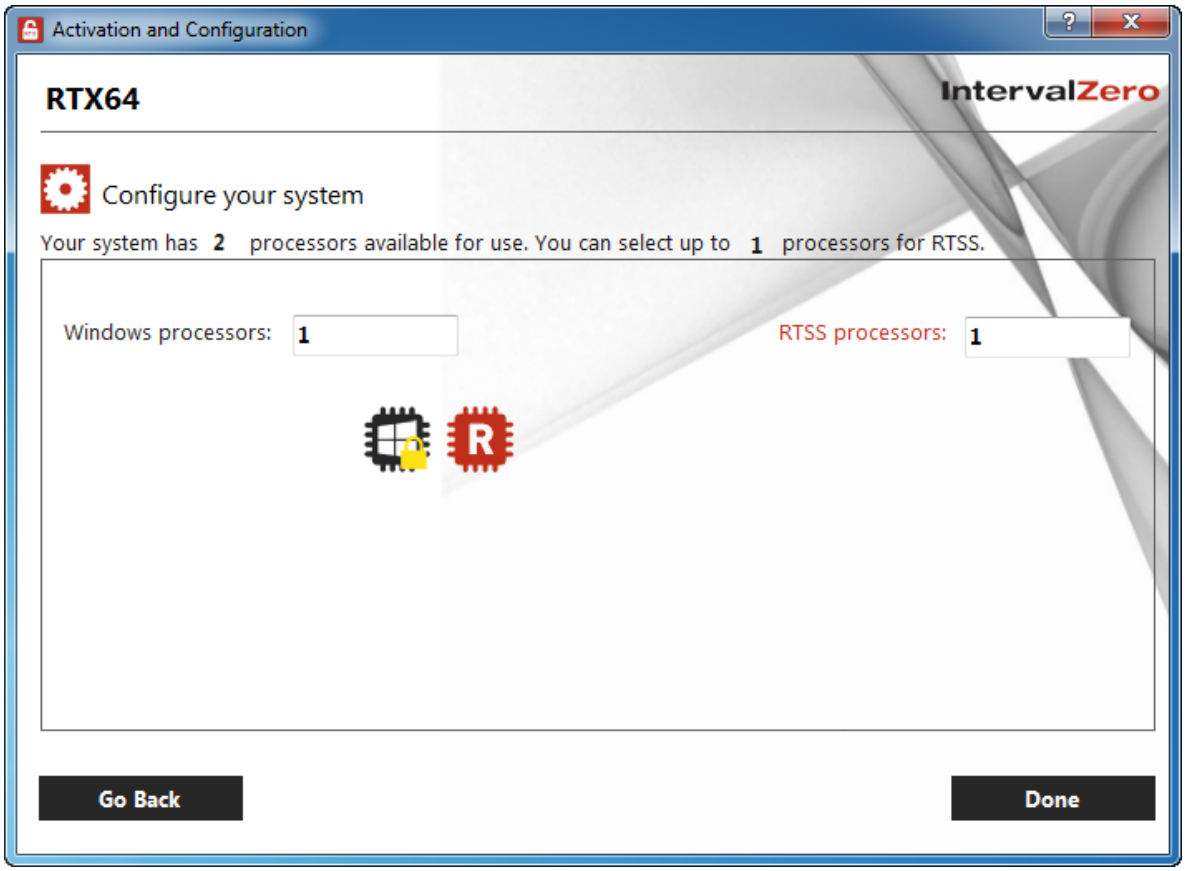
   The product components activated by your key are listed in the **Components** box. You should see the following components:

   - KINGSTAR Soft Motion Runtime
   - KINGSTAR EtherCAT Runtime
   - RT-TCP/IP Stack
   - RTX64 Subsystem (this component will show up with a warning image until you configure the system)
   - ISaGRAF64
   - KINGSTAR SDK (this component is dimmed if you didn't install it)

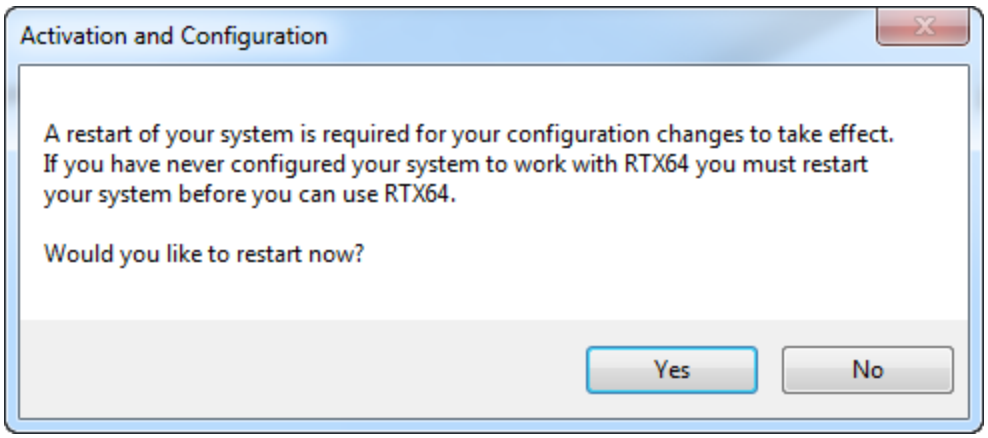
   NOTE: If you want to activate part of the product, copy part of the activation key to the **Enter your activation key** box and click **Activate**. For example, if you want to activate ISaGRAF64 (KINGSTAR Soft PLC Runtime), copy the ISaGRAF64 key to the activation box and activate it:

4. Click **Configure** to assign processors between Windows and RTX64. There must be at least one processor for Windows (indicated by the lock). You must configure this setting before you can use KINGSTAR. Click **Done** after you complete the configuration.

    - If you have purchased the ENTRY edition, you can assign 1 processor for RTX64.
    - If you have purchased the PRO edition, you can assign up to 3 processors for RTX64.



5. When you are prompted to restart your computer, click **Yes**.



6. Choose the RTX64 boot configuration at system startup:

   - Windows 10: Windows 10 - RTX64
   - Windows 8: Windows 8 - RTX64
   - Windows 7: Windows 7 - RTX64

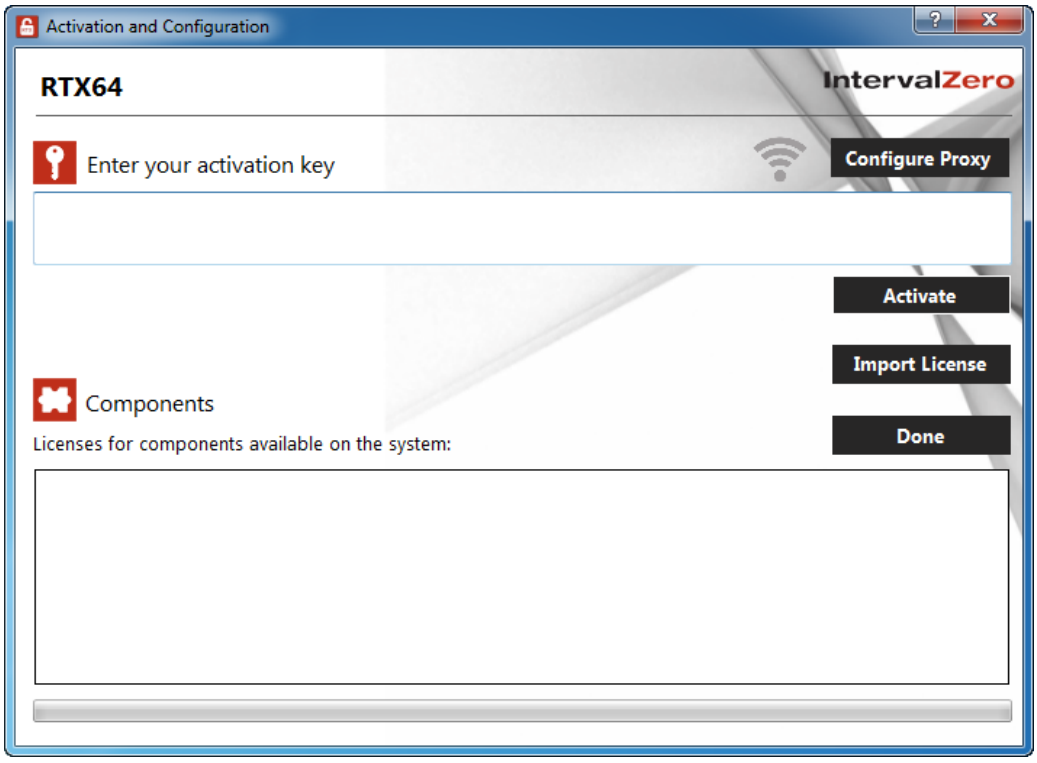
   NOTE: If you start your system with a configuration other than RTX64, KINGSTAR won't work properly.

Activate by the file

Follow the steps below if you cannot access the IntervalZero license server.

Step I. Create a fingerprint file

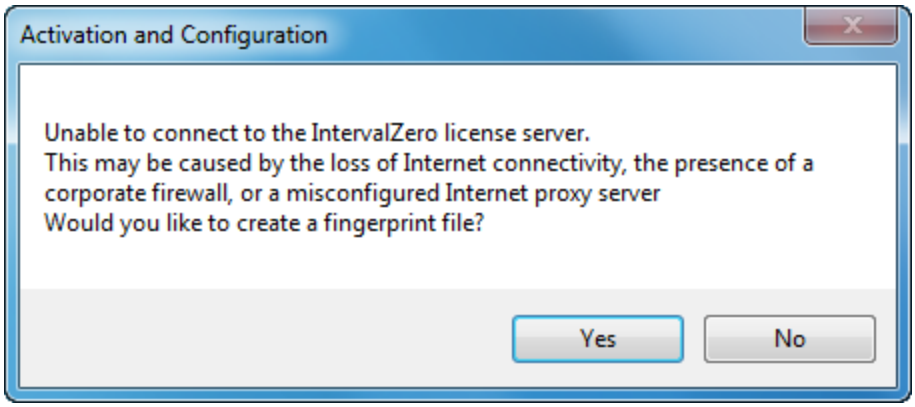
1. On the taskbar, click **Start** > **All Programs** > **RTX64 3.1 Runtime** > **Activation and Configuration**. The **Activation and Configuration** dialog box appears.



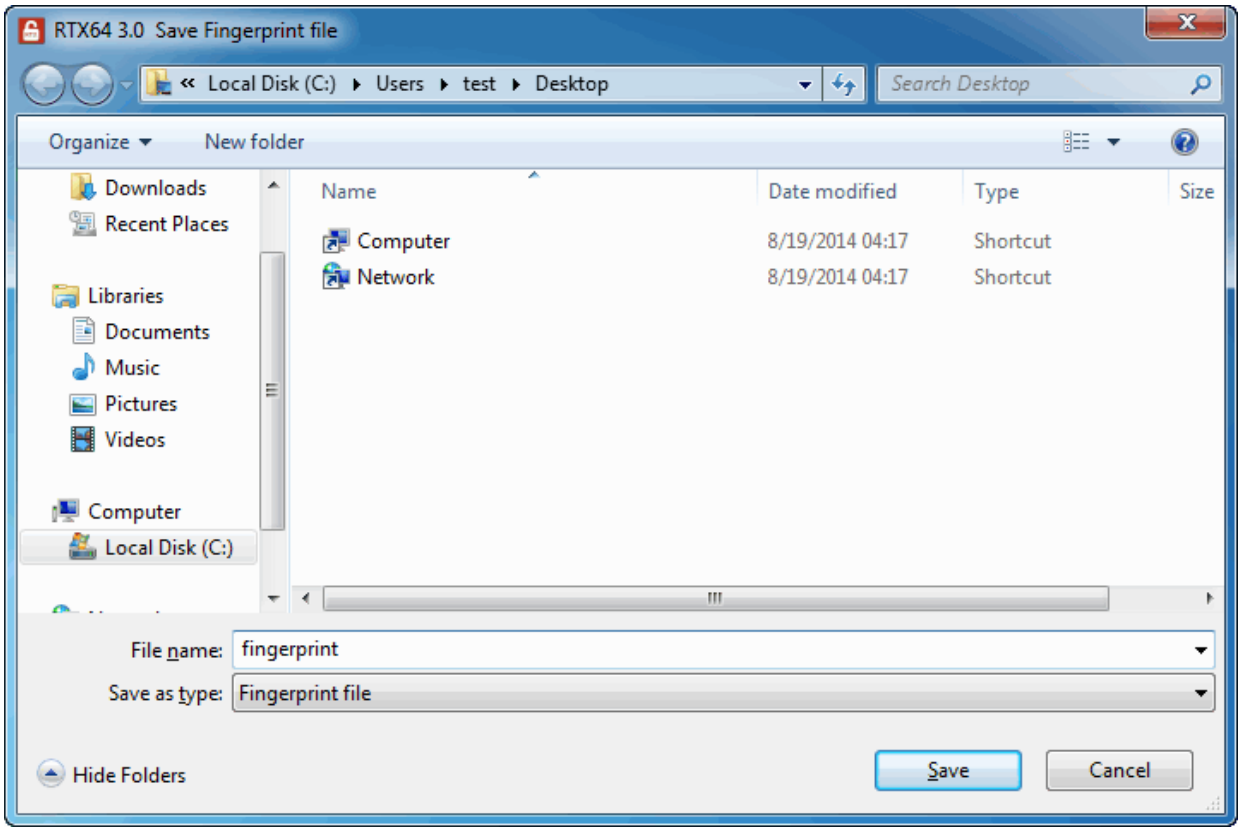
2. Check the internet connection of your machine. If it doesn't connect to the IntervalZero license server, you'll see in the upper-right corner of the dialog box. If the connection is available , see the section Activate over the internet.

3. In the **Enter your activation key** box, enter your activation key, and then click **Activate**.

4. You'll be prompted to create a fingerprint file. Click **Yes** to create it.



5. In the **Save Fingerprint file** dialog box, name the file `fingerprint.rfp`, and then click **Save**. By default, the file is saved to the desktop.

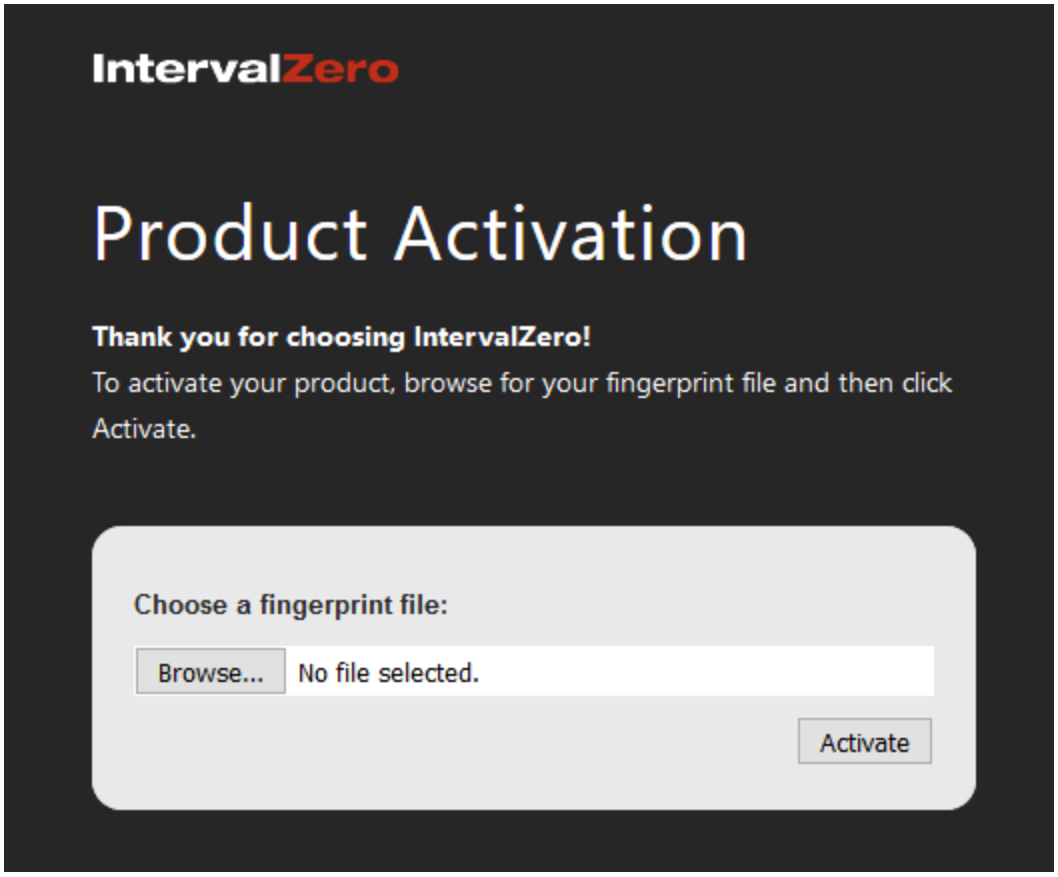


6. Navigate to the desktop, and then copy the `fingerprint.rfp` file to your USB flash drive.

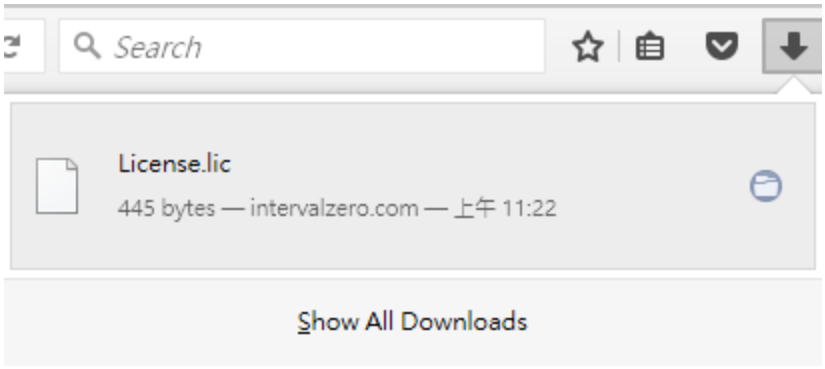
7. Plug the flash drive into a machine with internet connectivity.

Step II. Create the license file and activate the product

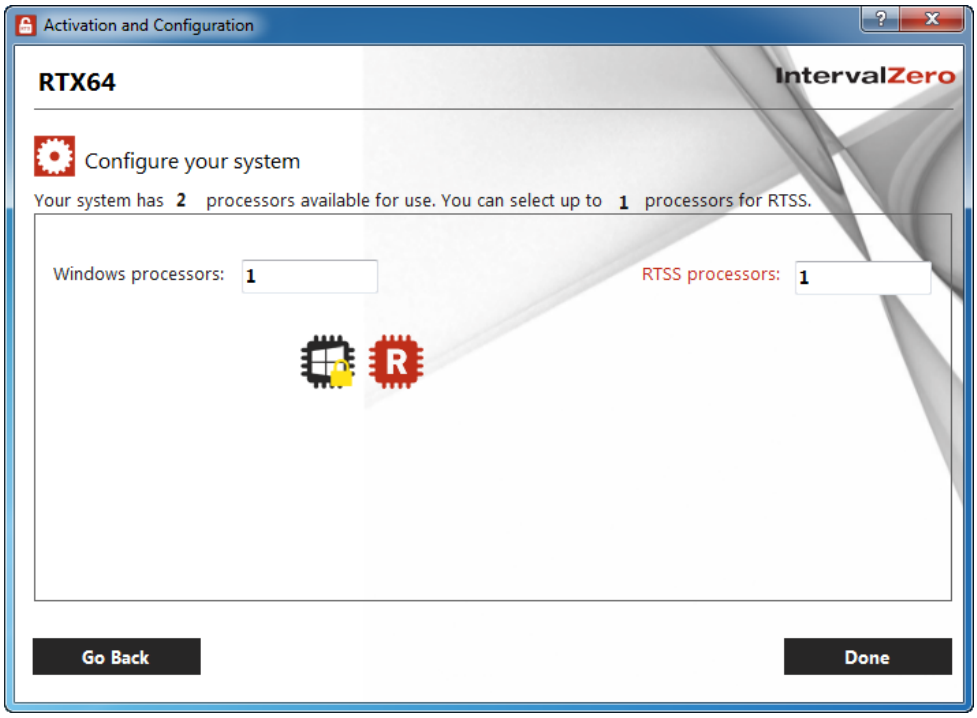
1. Launch a web browser, and go to http://activation.intervalzero.com.



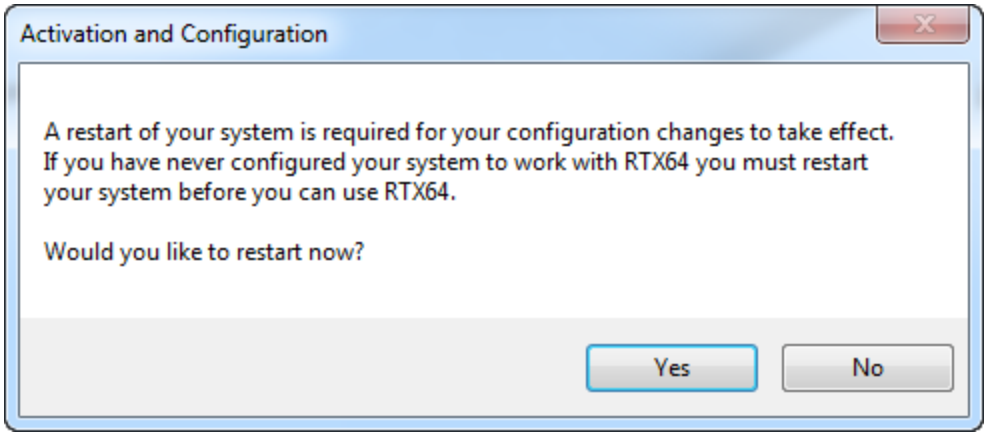
2. Click **Browse**, browse to and open the file `fingerprint.rfp`.
3. Click **Activate** to generate a license (.lic) file.
4. Download the `License.lic`. Depending on your browser, you may be prompted to save the file.



5. Copy the file `License.lic` to your USB flash drive, and use it to transfer the license file to the machine on which RTX64 is installed.
6. In the **Activation and Configuration** dialog box, click **Import License**.
7. Browse for, and then open `License.lic`. The product components activated by your key are listed in the **Components** box. You should see the following components:
    - KINGSTAR Soft Motion Runtime
    - KINGSTAR EtherCAT Runtime
    - RT-TCP/IP Stack
    - RTX64 Subsystem (this component will show up with a warning image until you configure the system)
    - ISaGRAF64
    - KINGSTAR SDK (this component is dimmed if you didn't install it)
8. Click **Configure** to assign processors between Windows and RTX64. There must be at least one processor for Windows (indicated by the lock). You must configure this setting before you can use KINGSTAR. Click **Done** after you complete the configuration.
    - If you have purchased the ENTRY edition, you can assign 1 processor for RTX64.
    - If you have purchased the PRO edition, you can assign up to 3 processors for RTX64.



9. When you are prompted to restart your computer, click **Yes**.



10. Choose the RTX64 boot configuration at system startup:

    - Windows 10: Windows 10 - RTX64
    - Windows 8: Windows 8 - RTX64
    - Windows 7: Windows 7 - RTX64

NOTE: If you start your system with a configuration other than RTX64, KINGSTAR won't work properly.

Activate by the dongle

A dongle is a USB flash drive specifically designed for containing KINGSTAR license. It is convenient for people who need to take the license with them. When you purchase the KINGSTAR license, it's optional to purchase a dongle.

- If you purchase the KINGSTAR licenses with the same number of dongles, we'll put the license files in the dongles and activate them in advance. When you get the dongles, just plug them into the computers that have the corresponding KINGSTAR products and the activation is done. After assigning the processors to Windows and RTX64, you can start to use KINGSTAR.
- If you purchase the KINGSTAR licenses with the different number of dongles, we'll give you empty dongles so you can decide which dongle you want to put the license in and activate it. Once you activate a dongle, just plug it into a computer that has the corresponding KINGSTAR product and the activation is done. After assigning the processors to Windows and RTX64, you can start to use KINGSTAR. For more information about activating a dongle, visit the IntervalZero website (www.intervalzero.com), go to **Downloads** > **Tools & Utilities** and download **Dongle Activation Utility**. It includes the file and manual.

Manually configure system settings

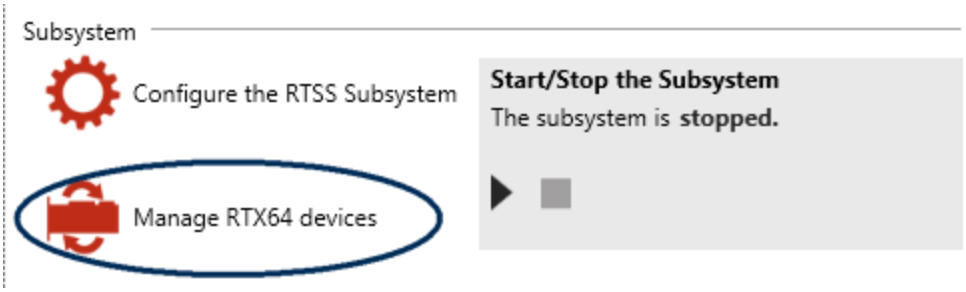
The KINGSTAR installer installs and configures the RTX64 for you. If you didn't select a network interface card (NIC) when you install KINGSTAR Runtime, you must configure RTX64 manually. Complete the procedures that follow.

NOTE: The following procedures are only necessary if your NIC doesn't associate with KINGSTAR.

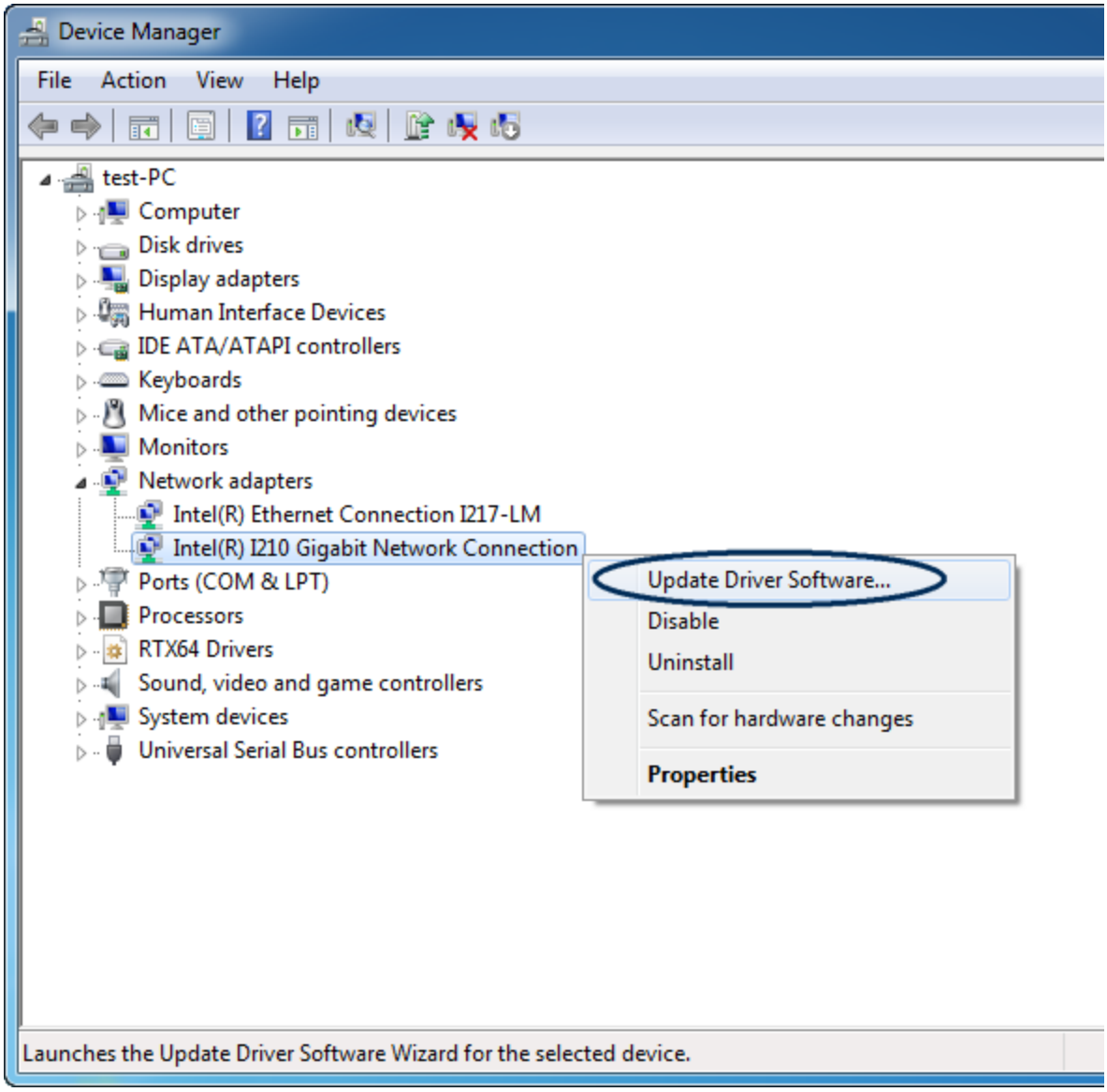
Manually associate a NIC

To manually dedicate a network interface card (NIC) for use with KINGSTAR, complete the steps that follow:

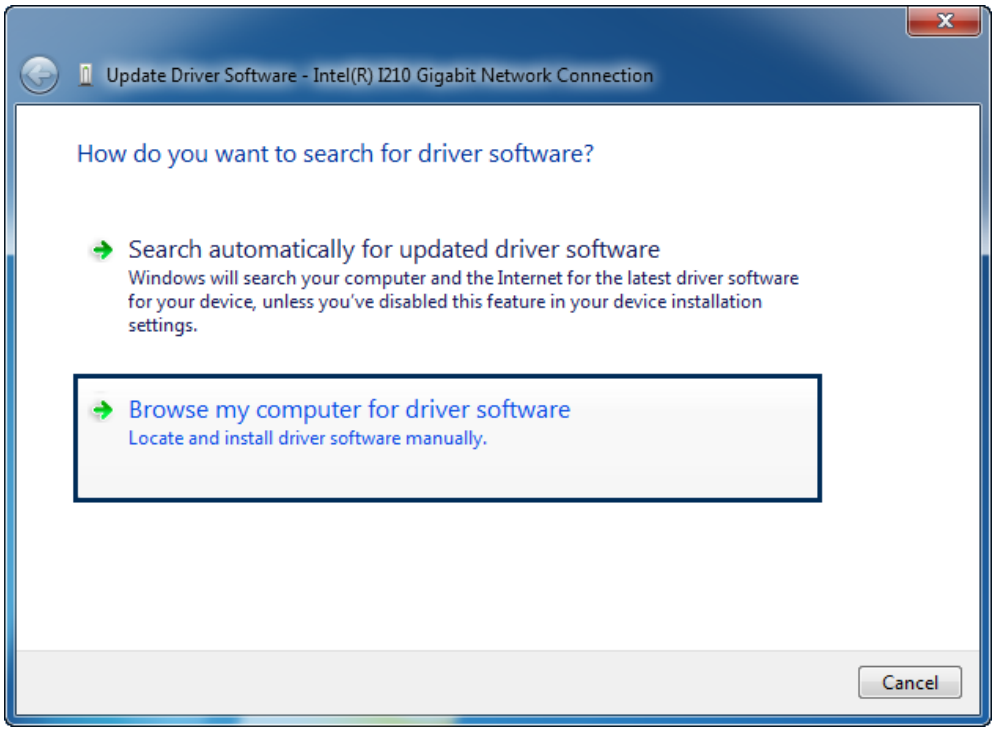
1. On the taskbar, click **Start** > **All Programs** > **RTX64 3.1 Runtime** > **Control Panel**.
2. In **RTX64 Control Panel**, click **Manage RTX64 devices** to launch Windows **Device Manager**.



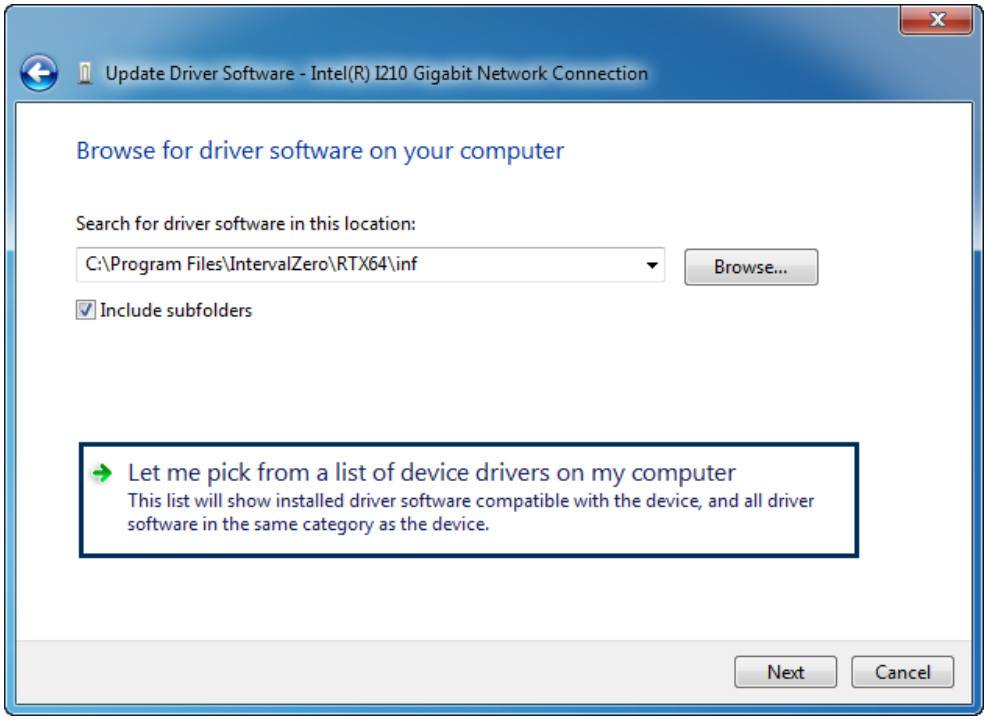
3. In the **Device Manager** dialog box, expand **Network adapters**, right-click on the network adapter to associate with KINGSTAR, and then click **Update Driver Software**. The adapter must be supported by both RTX64 and KINGSTAR.



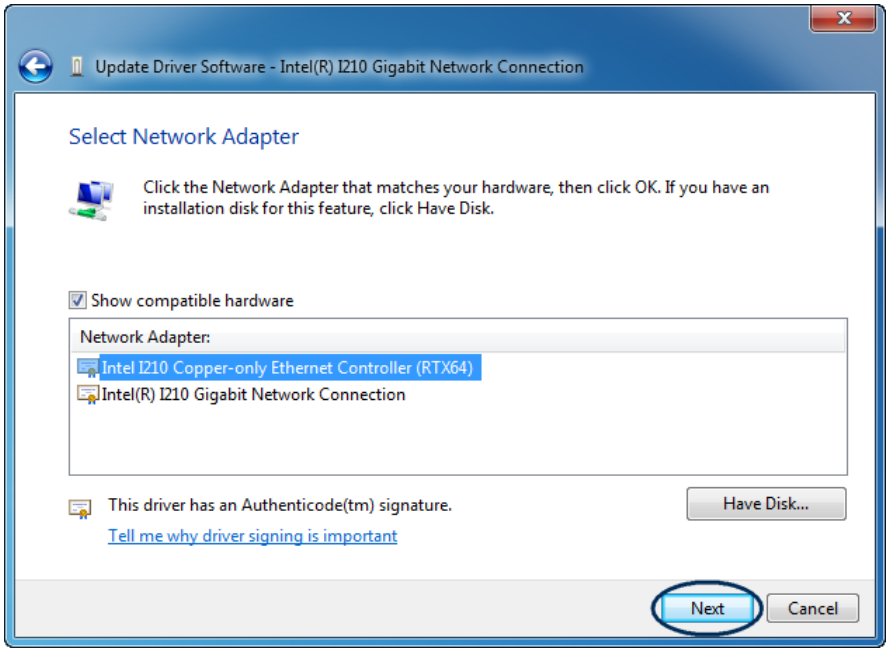
4. In the **Update Driver Software** dialog box, click **Browse my computer for driver software**.



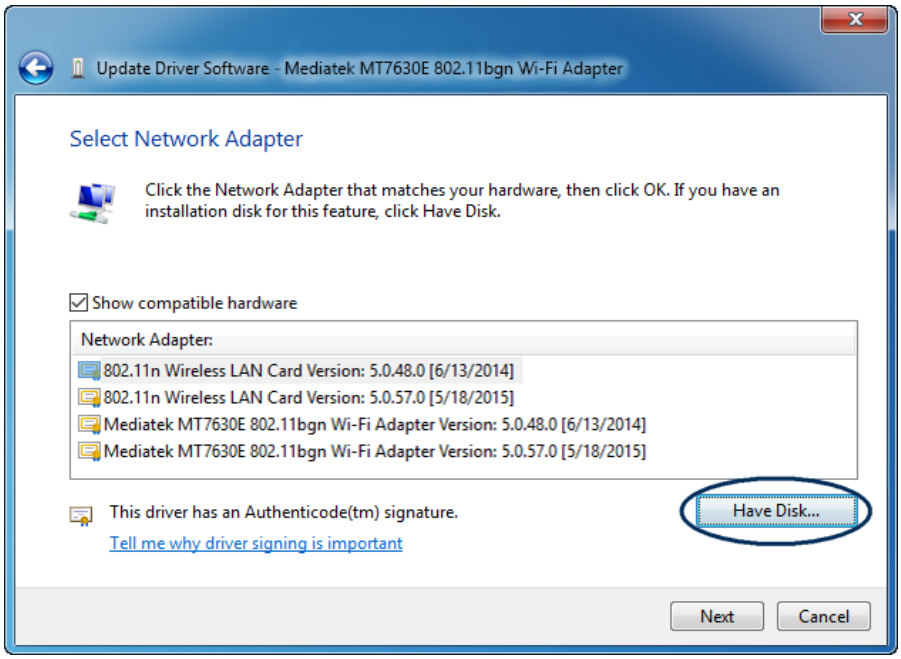
5. Click **Let me pick from a list of device drivers on my computer**.



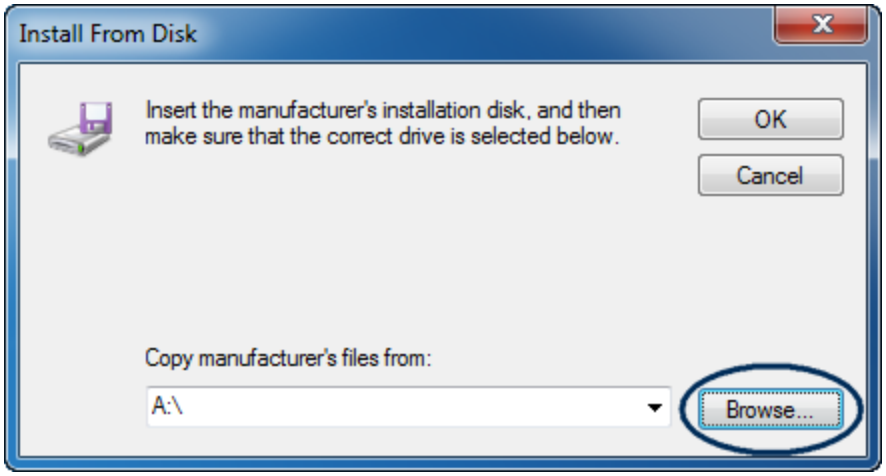
6. In the list of adapters, do one of the following:
    - If your network adapter shows in the list, select the adapter that includes RTX64 in the name, and then click **Next**.



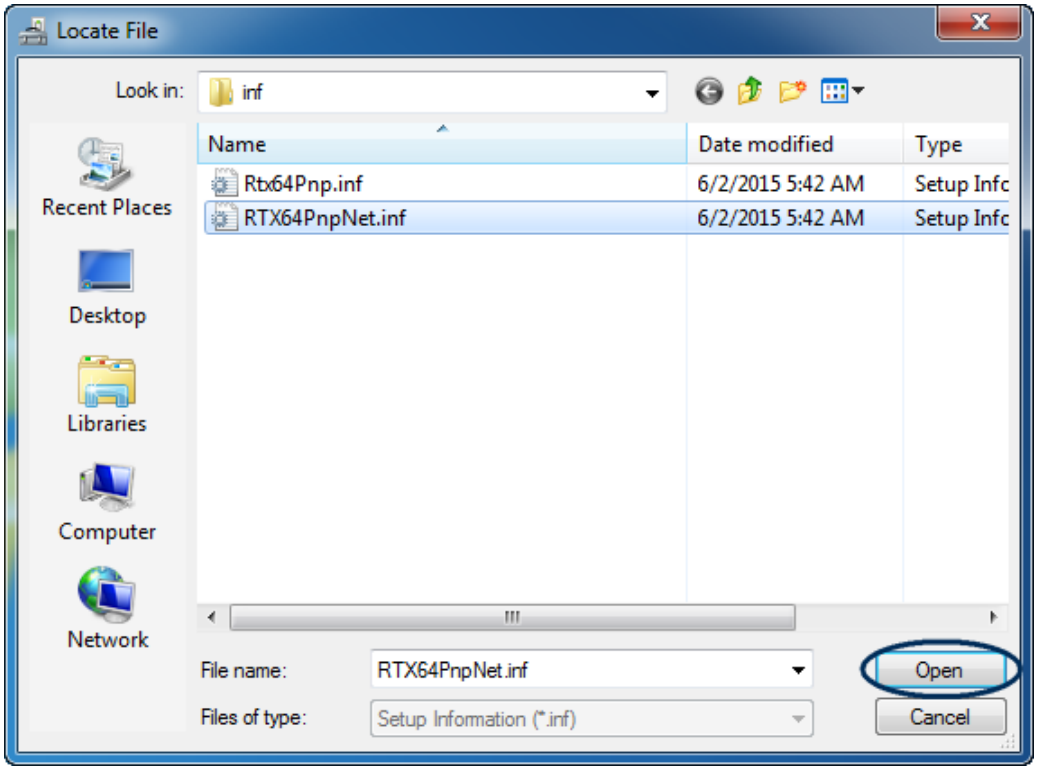
    - If your network adapter does not show up in the list, click **Have Disk**.



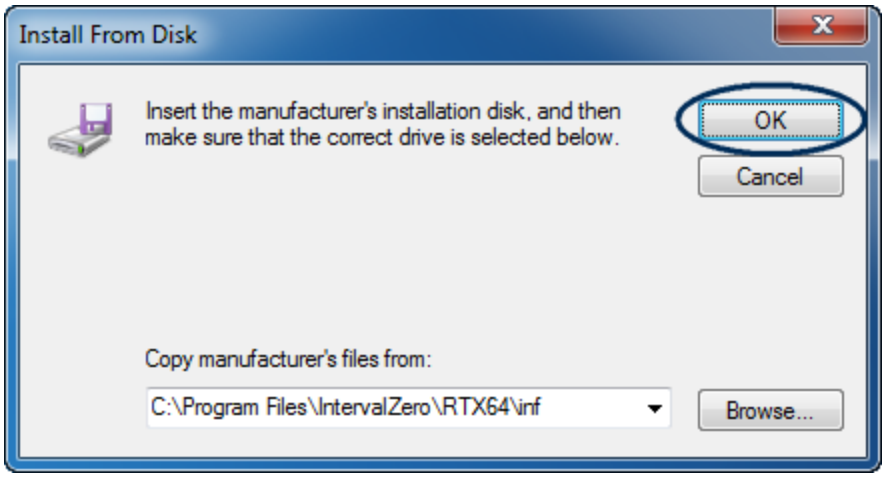
a. In the **Install From Disk** dialog box, click **Browse** and navigate to the RTX64 inf location `C:\program files\IntervalZero\RTX64\inf` if you installed RTX64 in the default location.



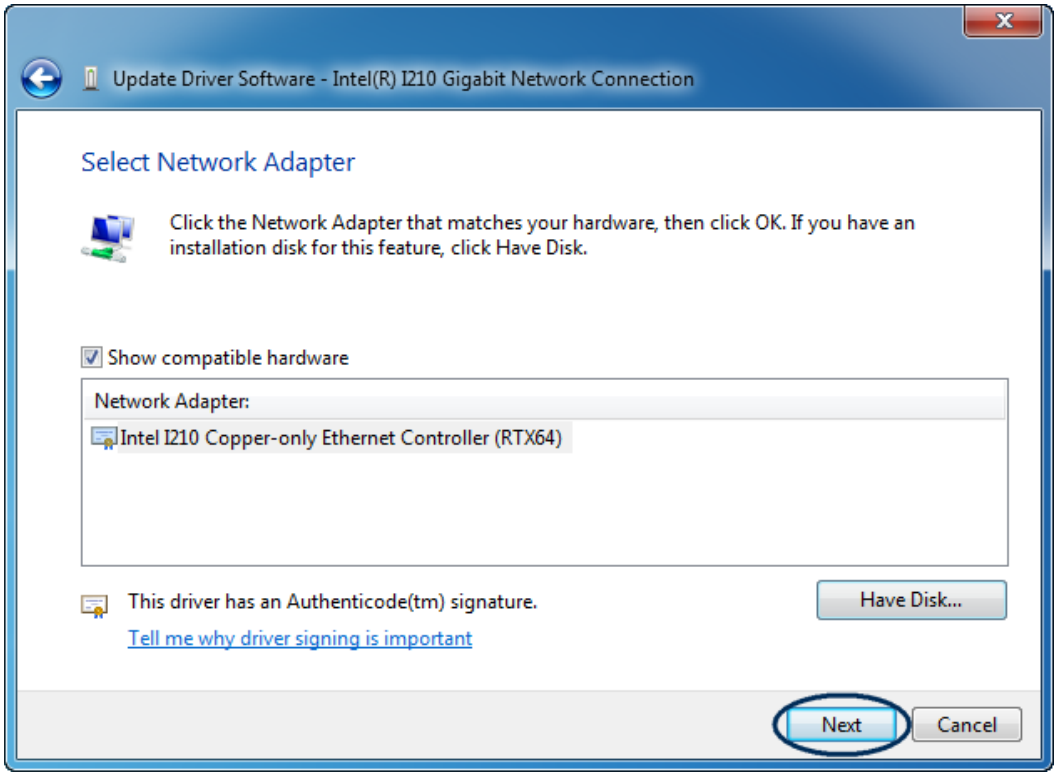
b. In the **Locate File** dialog box, select `RTX64PnpNet.inf` and click **Open**.



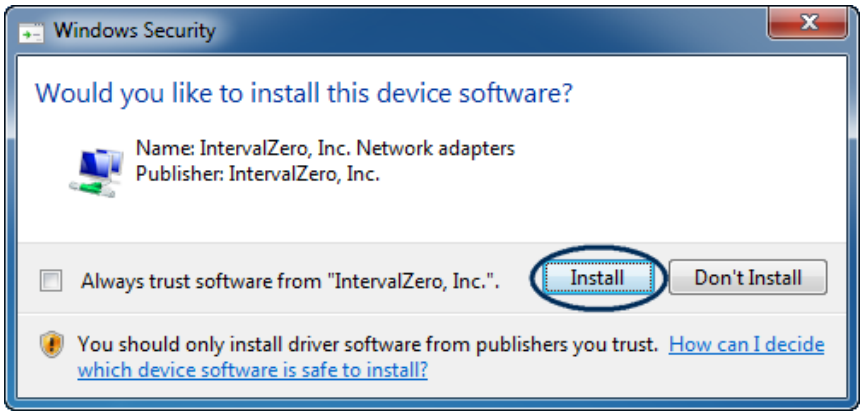
c. In the **Install From Disk** dialog box, click **OK**.



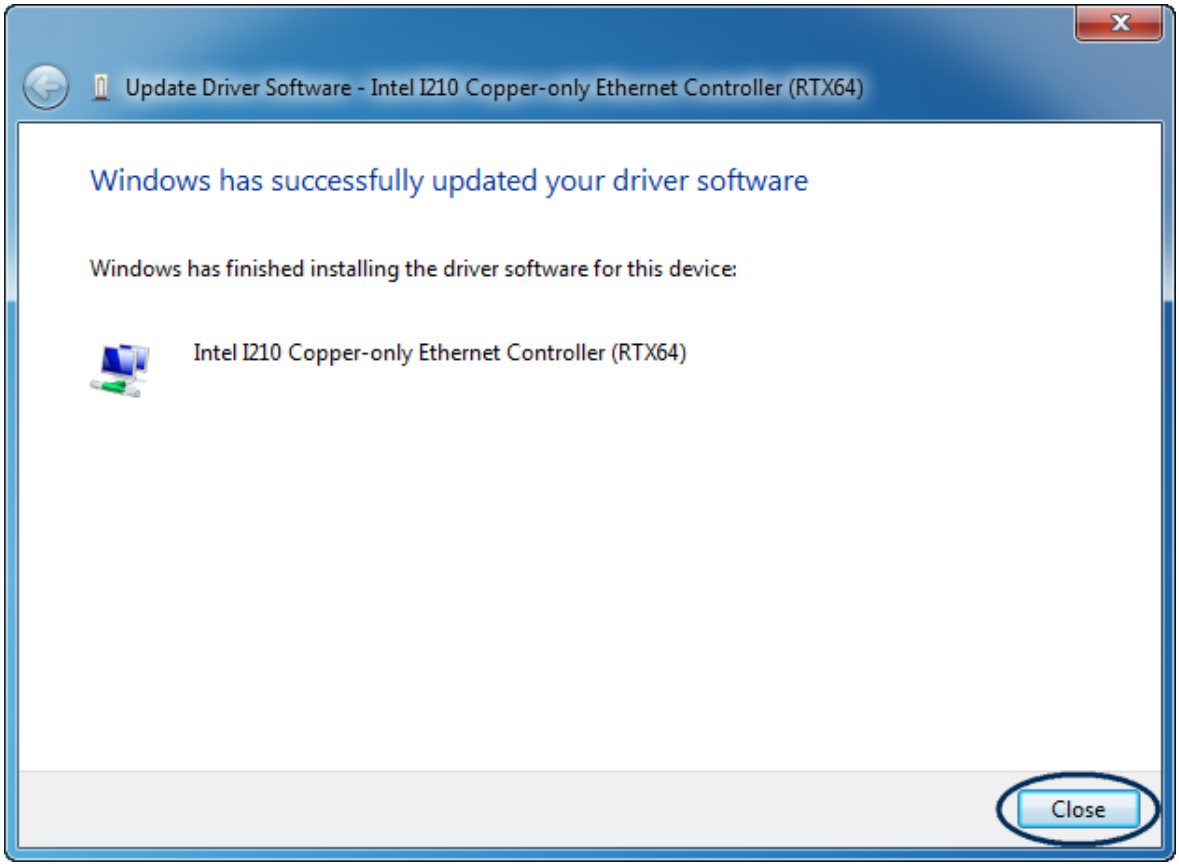
7. In the **Update Driver Software** dialog box, select the network adapter that includes RTX64 in the name, and then click **Next**.



8. A **Windows Security** dialog box may display asking if you would like to install the driver. Click **Install**.



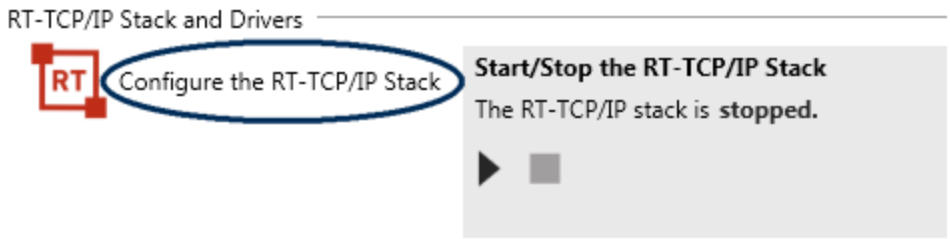
9. The RTX64 driver installs for the network adapter. Click **Close** after the installation is completed. The network adapter is now available for use with KINGSTAR.



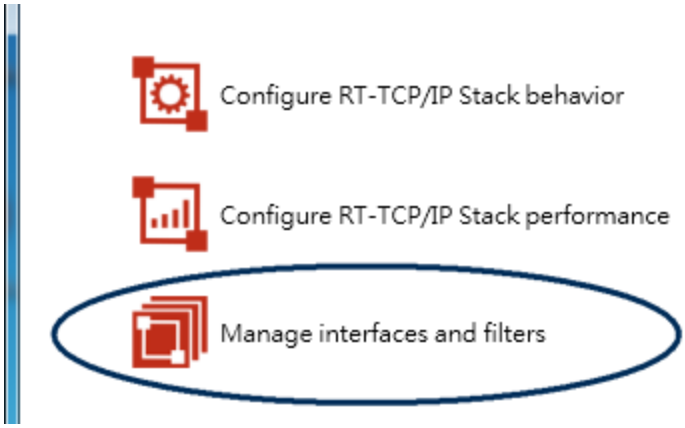
Manually configure the RT-TCP/IP stack

To manually set up the RTX64 RT-TCP/IP stack to use the dedicated NIC for KINGSTAR, complete the following steps.

1. On the taskbar, click **Start** > **All Programs** > **RTX64 3.1 Runtime** > **Control Panel**.
2. Click **Configure the RT-TCP/IP Stack**.

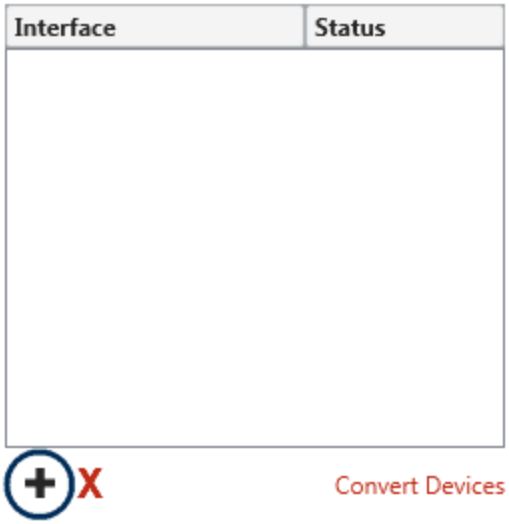


3. Click **Manage interfaces and filters**.

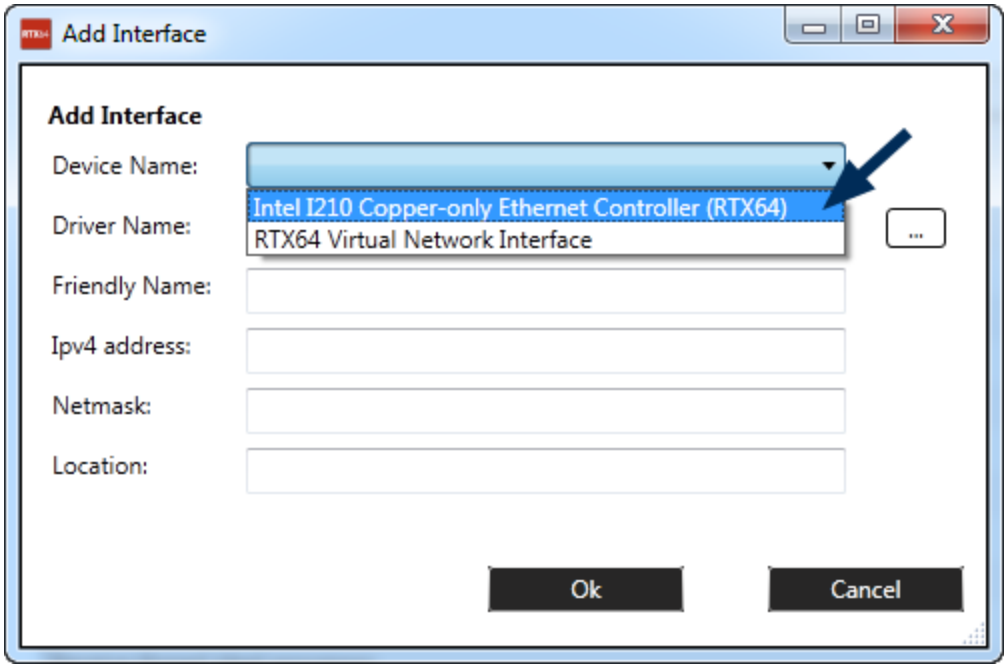


4. On the left pane, click ✚ to add a new interface.

   NOTE: If **RtVirtualNic** is displayed in the pane, disable or delete it.

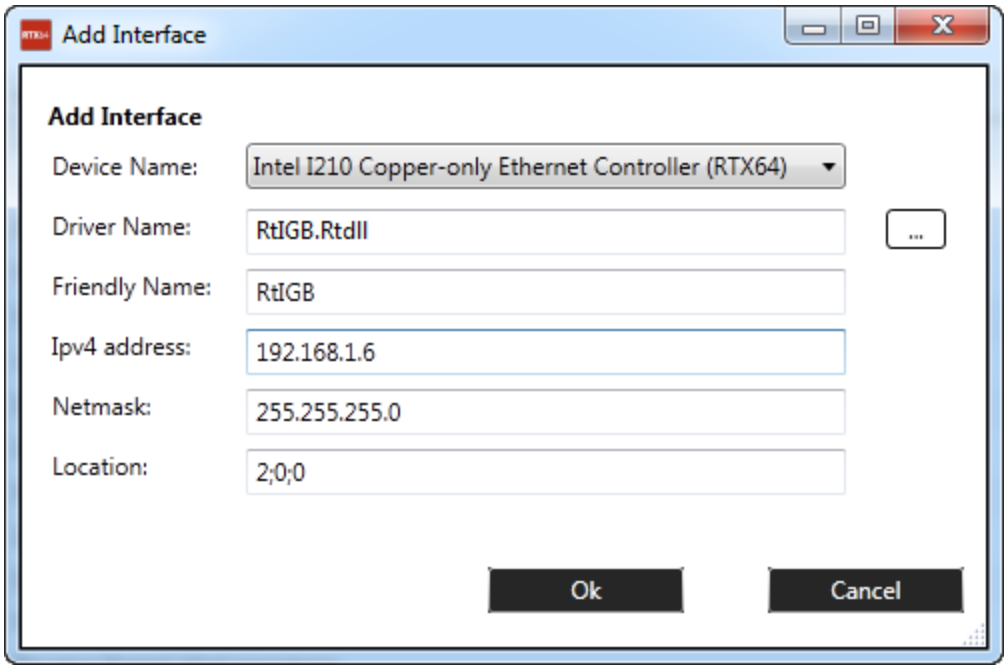


5. In the **Add Interface** dialog box, in the **Device Name** list, select a NIC that has RTX64 in its name. If the name of the NIC doesn't have RTX64, it means your NIC is not associated with RTX64. See Manually associate a NIC to configure your NIC.

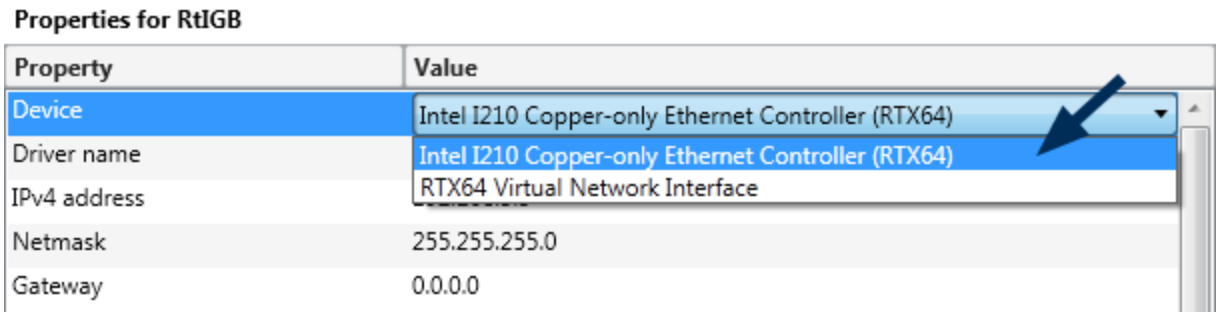


6. In the **IPv4 address** and **Netmask** box, enter the information to use with the selected NIC, and then click **OK**. For example, you can enter 192.168.1.6 for **IPv4 address** and 255.255.255.0 for **Netmask**. If you have more than two NICs installed on the same computer, make sure the IPv4 address of the selected NIC doesn't conflict with that of other NICs.

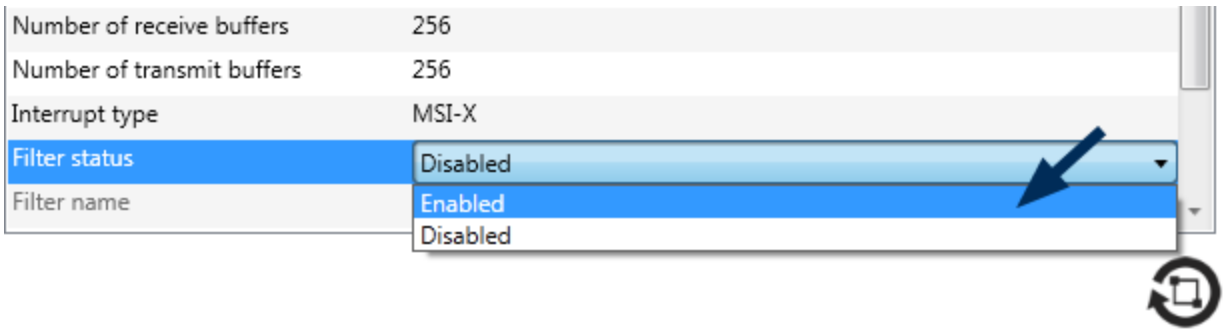
   NOTE: To ensure the IPv4 address doesn't conflict with your NIC, go to **Start Menu** > **Accessories** > **Command Prompt**. Enter `ipconfig` and you'll see the IPv4 address your NIC is using.



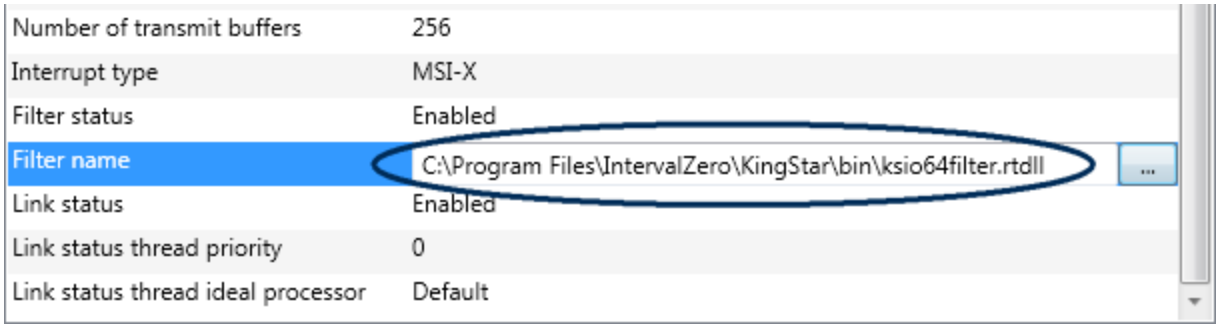
7. In the **Properties for RtIGB** list, in the **Device** list, the NIC added on the left pane should be displayed. If it doesn't, select the NIC you added on the left pane.



8. In the **Filter status** list, choose **Enabled**.



9. In the **Filter name** box, browse to the file `ksio64filter.rtdll`, which is in the `<KSMDir>\bin` (`<KSMDir>` is the location where KINGSTAR was installed). This will associate the KINGSTAR filter with the interface.

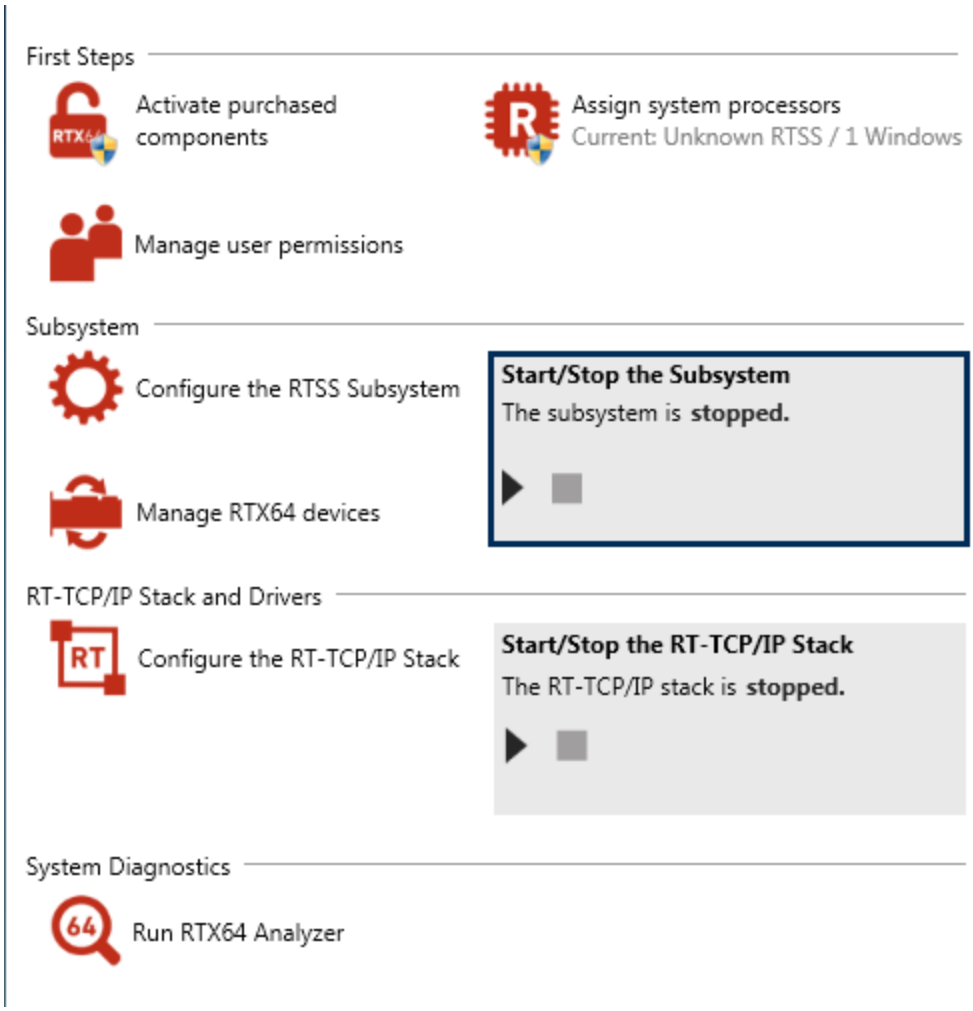


Start the RTX64 subsystem

After the RTX64 subsystem is configured, you can start the Subsystem so it is available for use by KINGSTAR.

1. On the taskbar, click **Start** > **All Programs** > **RTX64 3.1 Runtime** > **Control Panel**.

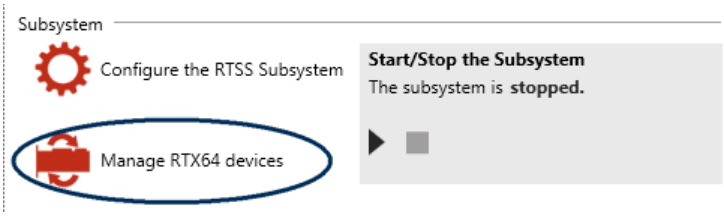
2. In the **Subsystem** area, in the **Start/Stop the Subsystem** group, click ▶ to start the RTX64. It will also start the **RT-TCP/IP Stack**.



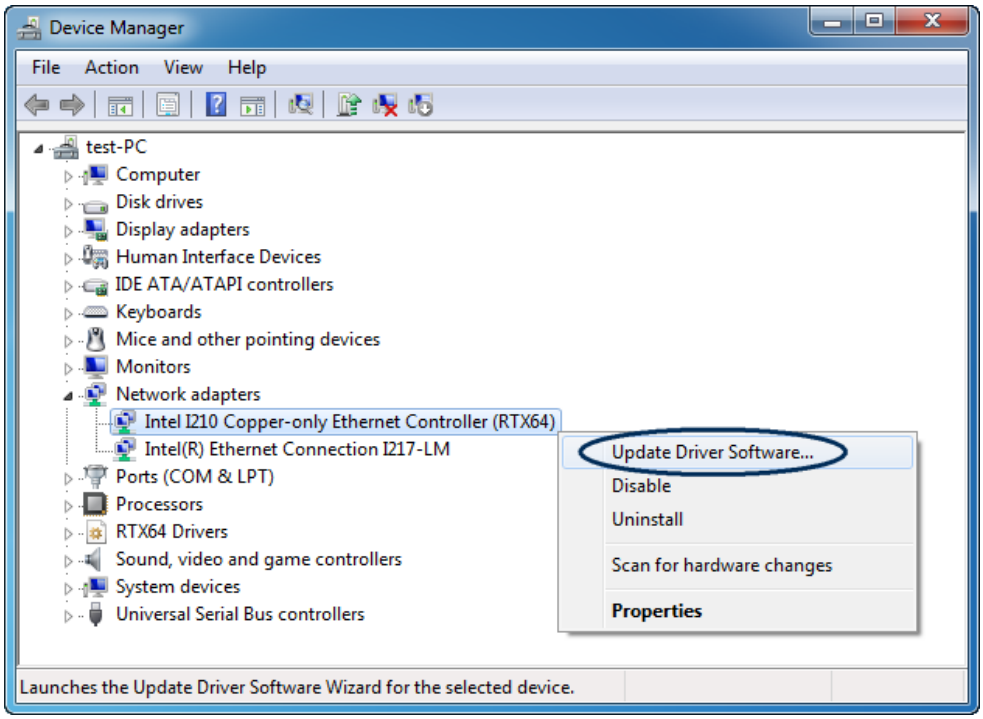
Give the NIC back to Windows

You need to give the network interface card (NIC) back to Windows if you no longer need to use it with KINGSTAR. To give the NIC back, complete the steps that follow:

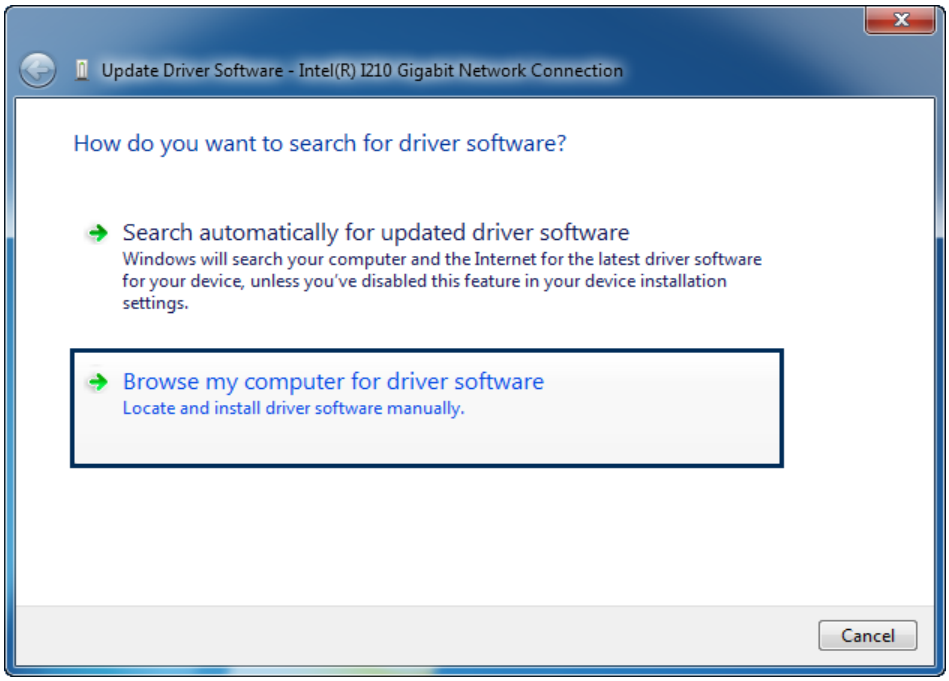
1. On the taskbar, click **Start** > **All Programs** > **RTX64 3.1 Runtime** > **Control Panel**.
2. In **RTX64 Control Panel**, click **Manage RTX64 devices** to launch Windows **Device Manager**.



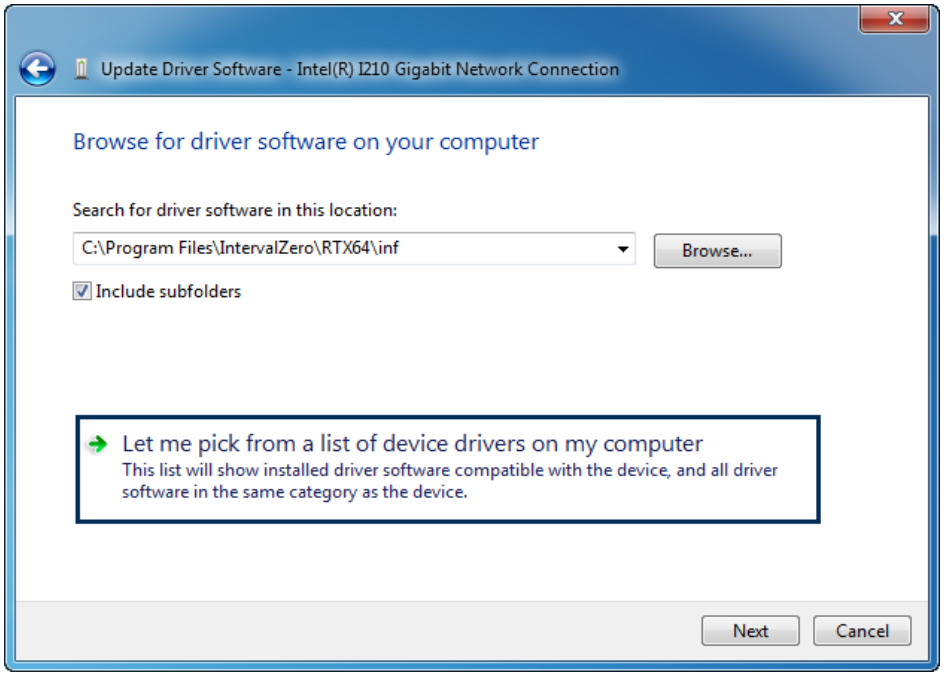
3. In the **Device Manager** dialog box, expand **Network adapters**, right-click on the network adapter that includes RTX64 in its name, and then click **Update Driver Software**.



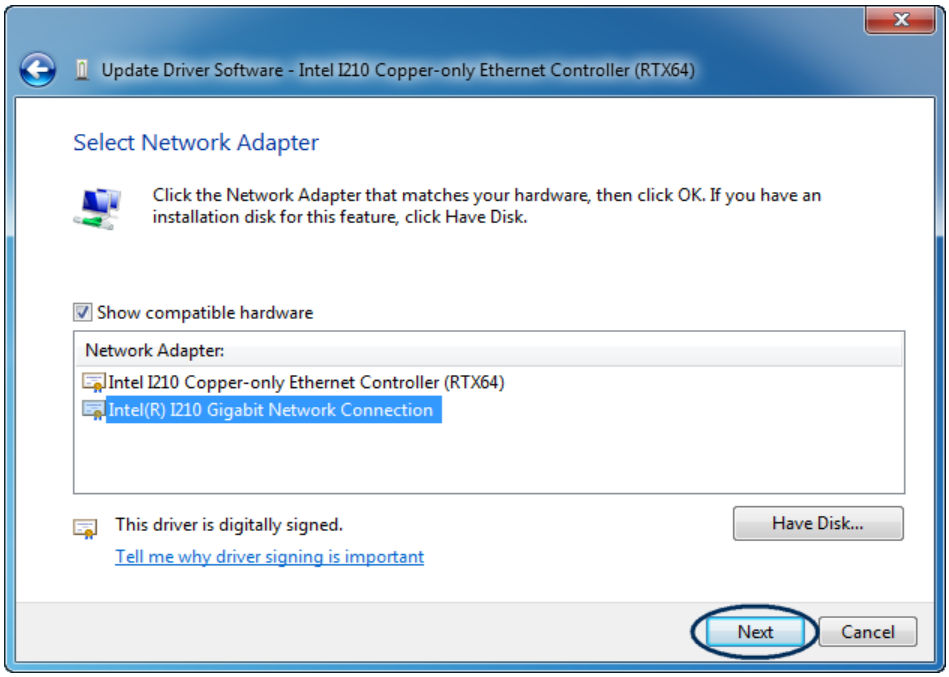
4. In the **Update Driver Software** dialog box, click **Browse my computer for driver software**.



5. Click **Let me pick from a list of device drivers on my computer**.



6. In the list of adapters, choose the adapter that doesn't include RTX64 in its name, and click **Next**.



7. The Windows driver installs for the network adapter. Click **Close** after the installation is completed. The network adapter is now given back to Windows.

Uninstall KINGSTAR

Before uninstalling consider the following:

- When RTX64 Runtime is uninstalled from a system, any devices given to RTX64 will no longer have an associated driver and should be returned to Windows using the Windows **Device Manager**. For more information about how to return the NIC, see Give the NIC back to Windows.
- RTX64 **Control Panel** must be closed.
- KINGSTAR applications must not be running.
- If the RTX64 boot configuration is the only boot configuration present on uninstall, it will be retained so that you can start your system.

To uninstall KINGSTAR, take the following steps:

1. Click the KINGSTAR installer to uninstall, or go to **Control Panel** > **Programs and Features**. Select the KINGSTAR software from the list and uninstall it.
2. After uninstalling KINGSTAR, restart your computer.

Get support

KINGSTAR offers a number of support options for KINGSTAR users, including third-party, online and phone support.

Third-party support

If you are a customer who purchased a KINGSTAR product through a third-party reseller, contact the reseller for support.

Online support

The KINGSTAR Customer Support web page is located at:

http://kingstar.com/support/

The KINGSTAR support web pages provide electronic access to the latest product releases, documentation, and release notes. You can access the online support ticketing system to submit issues or questions.

Before calling technical support

Please have the following information ready before calling KINGSTAR Technical Support:

The version number of your RTX64 and KINGSTAR software

To obtain the RTX64 version number:

1. Click **Start** > **All Programs** > **RTX64 3.1 Runtime** > **Control Panel**.
2. In the **RTX64 3.1 Control Panel**, record **Version** shown in the **Runtime Information** area.

To obtain the KINGSTAR version number:

1. Click **Start** > **All Programs** > **KINGSTAR** > **Runtime**.
2. In **Windows Explorer**, click the `ksm64.rtdll` file, and right-click the same file again.
3. On the shortcut menu, click **Properties**.

4. In the **ksm64.rtdll Properties** window, click the **Details** tab, and record **Product version**.

Phone support

For technical support related to installing and using KINGSTAR, please call technical support at this number:

+886-2-2556-8117

Hours are Monday-Friday from 9:30 to 18:30, UTC+08:00, excluding holidays.