

TriCore Free Entry Tool Chain

AURIX family and AUDO Future, AUDO MAX

Integrated Development Environment for 32-bit TriCore derivatives



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This manual contains 36 pages.

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Introduction

This **Getting Started** document will help you to install and configure the Hardware and Software tools necessary to operate the TriCore Free Entry Tool Chain. At the end of the instructions described in this document, you will have a running environment that could be used as a starting point for further development or evaluation work.

This tutorial goes step-by-step through the necessary procedures in order to:

- Install the **TriCore Free Entry Tool Chain**
- Set up a project
- Configure the Evaluation Board and connect it to the PC
- Debug your application

If you need more information, please contact your nearest Infineon sales office. Contact information is available on Infineon web site: **www.infineon.com**.

We wish you a lot of success with the TriCore Free Entry Tool Chain!

Note: "Starter Kit Evaluation Board", "Evaluation Board", "TriBoard" and "Target" terminology are used to denote Evaluation Boards as shown in Figure 14 to 21.

Installing the TriCore Free Entry Tool Chain

Before you start

To execute this **Getting Started**, it is necessary to have a

- Microsoft Windows® compatible PC equipped with USB port
- Operating System Windows® Vista, Windows® 7, Windows® 8(.1), Windows 10 (32/64 bit versions)
- **Power user's or administrator rights** are mandatory to install the required programs
- **During installation a connection to the internet is required for license activation**

All the items below are included in the Starter Kit.

- Power Supply (AC/DC converter) (5.5V – 60V) for the Starter Kit Board (optional)
- TriCore Family Starter Kit Evaluation Board
- TriCore Free Entry Tool Chain installation package
- USB cable.

System Requirements

Before installing, make sure the following minimum system requirements are met:

- 1 GHz or faster 32-bit (x86) or 64-bit (x64) processor
- 1 GByte RAM (32-bit) or 2 GByte RAM (64-bit)
- 3 GByte available hard disk space
- Microsoft .NET™ Framework 3.5 SP1
- Microsoft Windows® Scripting Host V5.6
- Microsoft Internet Explorer® 9.0 or higher
- Java Runtime Environment v8 (32-bit version)
- Adobe® Acrobat Reader 10.0 or higher.

Installation

1. From the installation package run the installer setup.exe. **TriCore Free Entry Tool Chain** dialog appears (Figure 1)



Figure 1 TriCore Free Entry Tool Chain Setup dialog

2. Select **Next** button. The License Agreement dialog appears. Please read carefully and agree or cancel the installation with Cancel button (Figure 2)

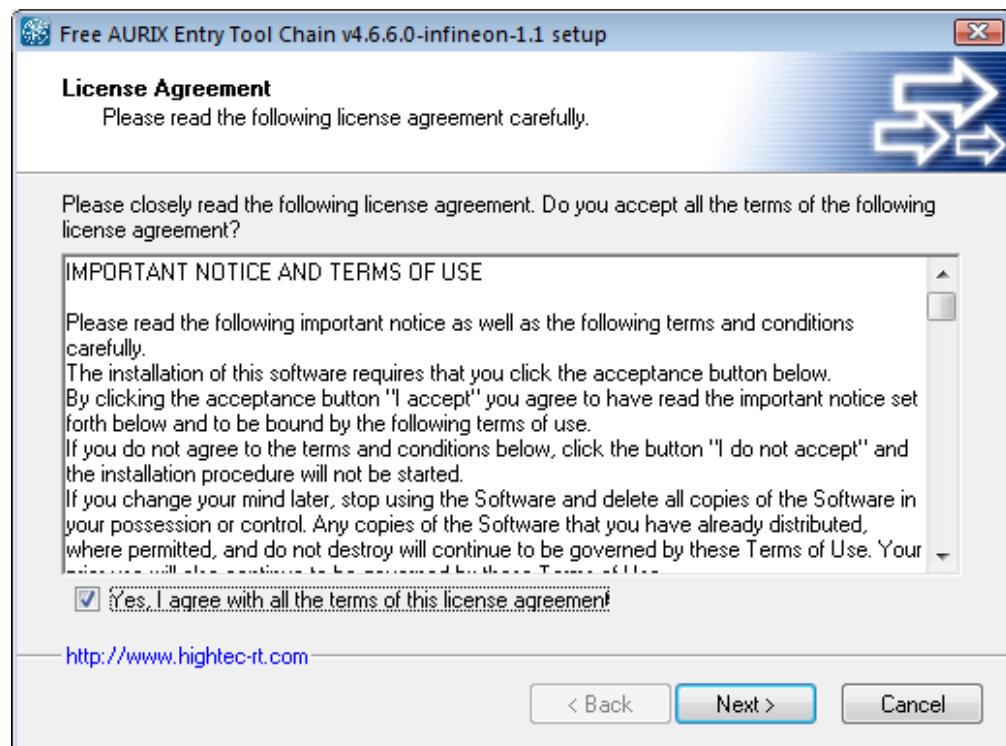


Figure 2 License Agreement dialog

3. Select **Next** button. In the next dialog you can decide if the tool chain will be installed only for your profile or for all users of the computer (Figure 3)

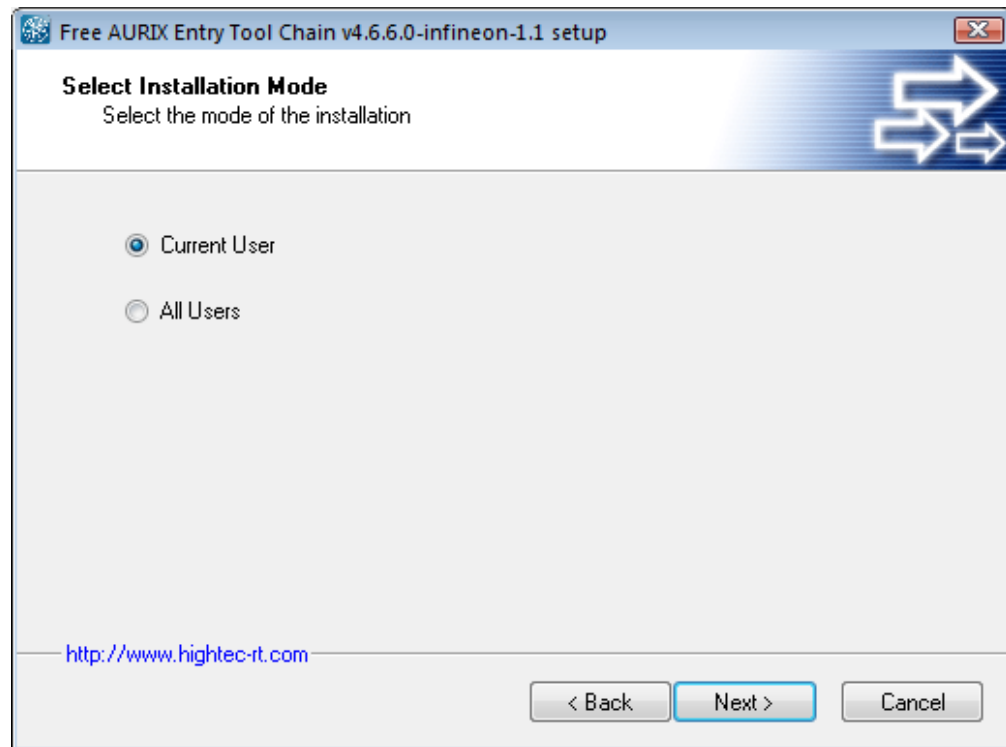


Figure 3 TriCore Free Entry Tool Chain Setup dialog

4. Click **Next** button. The dialog for selecting the installation directory appears (Figure 4). Use the default or select another installation directory.

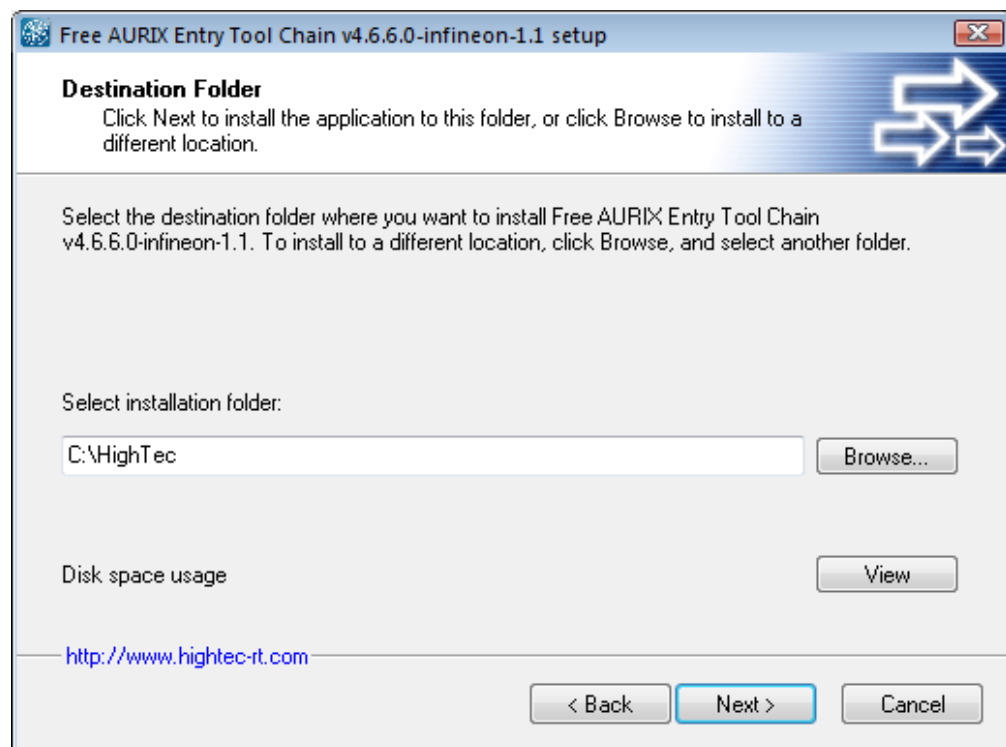


Figure 4 TriCore Free Entry Tool Chain Setup folder dialog

5. Please select mode and click **Next**. Now the ProductSelection dialog with the predefined product key appears (Figure 5). No user action is needed.

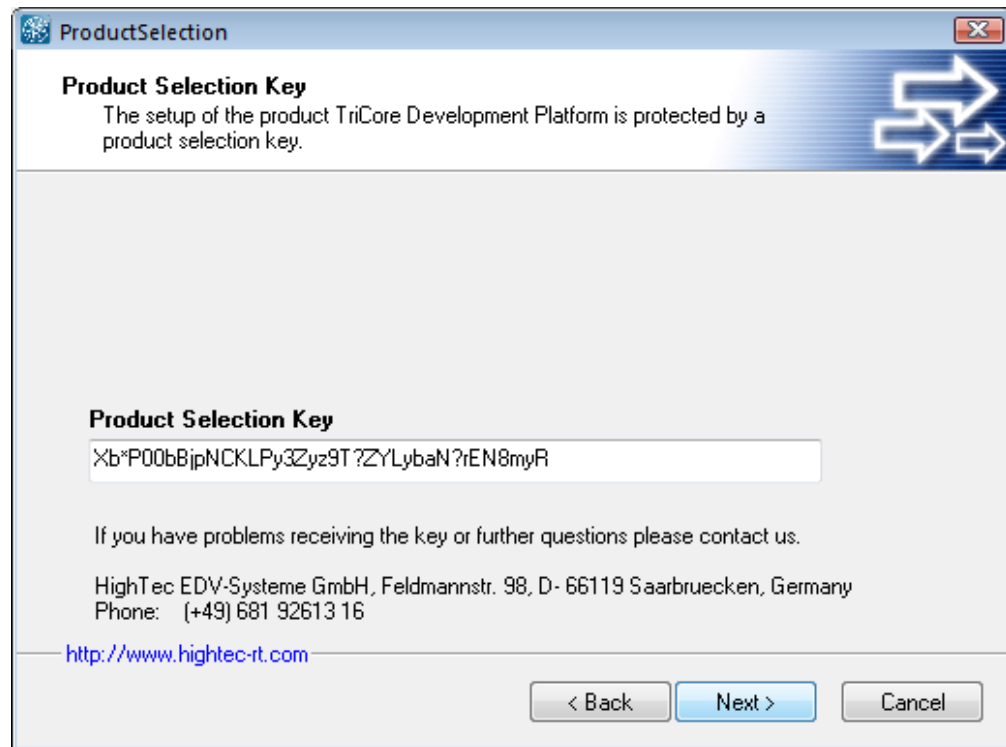


Figure 5 ProductSelection dialog

6. Click **Next**. Different dialogs inform you about the progress of installation.

Please note: For commercial development you need the **full version of TriCore Development Platform**.

The **TriCore Free Entry Level Tool Chain** cannot be used together with professional versions of the containing products because they are incompatible. That's why, it is not possible to use a parallel installation of the **TriCore Free Entry Level Tool Chain** together with a **professional version UDE 4.4**.

To avoid destroying of an installation of a professional version of UDE, please cancel the UDE 4.4 installation dialog (Figure 6) which only appears if an UDE 4.4 installation is already on the computer.

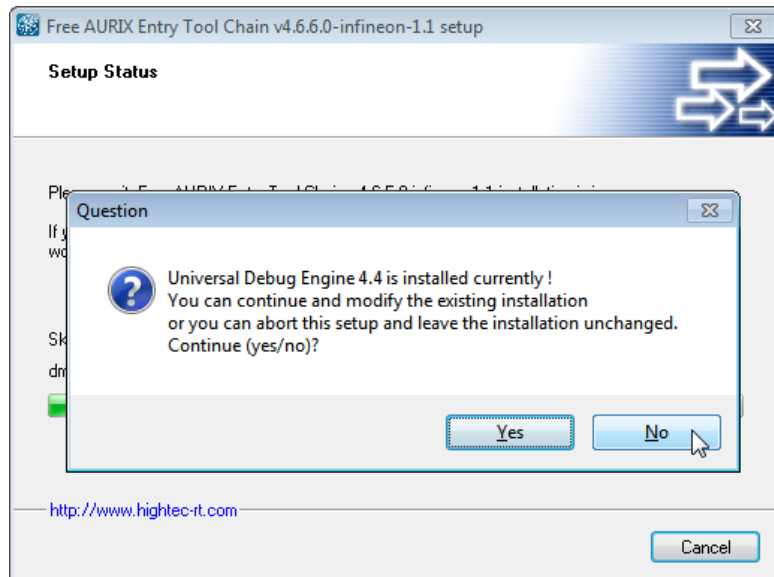


Figure 6 UDE 4.4 installation warning

Note: The TriCore Free Entry Tool Chain license is valid for at least one year. There are following restrictions in comparison to the professional version:

Useable for TriCore evaluation boards with on-board wiggler only, PCP assembler only, Debugger: No visualization functions at runtime, no MCDS support, no Script support.

Please contact **tctcsupport@pls-mc.com** for extending the license.

First Starting of Eclipse

Starting Eclipse

1. From the Windows' **Start** menu, select **All Programs - Free AURIX Entry Tool Chain v4.6.6.0-infineon-1.1 - Eclipse** or use the Desktop icon **Eclipse for TriCore**.
2. Now the Workspace Launcher dialog appears (Figure 7).

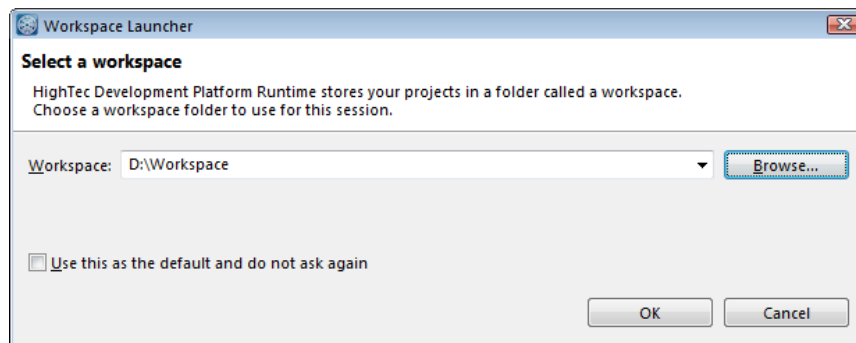


Figure 7 Workspace Launcher

3. Enter the path to the workspace directory e.g. `D:\Workspace`. If the directory doesn't exist, new directory will be created; otherwise existing directory will be used as eclipse workspace. New created projects will be saved in the selected workspace directory.
4. You can enable the option **Use this as the default** and do not ask again. By next start last used workspace will be used, skipping the **Workspace Launcher** dialog. If you want to use other or new workspace. Select from the **File** menu **Switch Workspace**.
5. Click **OK** to proceed.
6. The HighTec Licensing dialog appears (Figure 8)

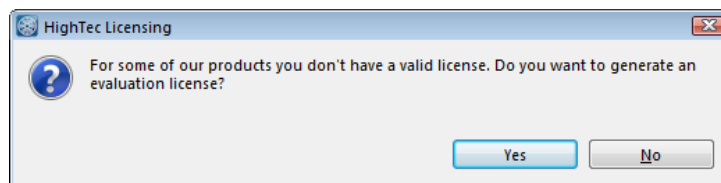


Figure 8 HighTec Licensing dialog

Click **Yes** to proceed.

7. To add a license a dialog for Activation and Registration of a license appears (Figure 9).

Add license

Activation and Registration
This wizard will help you to activate product's.

Product key: tricore-free-gcc Activation Key: 8189-1009-9503-4678

The activation key(s) will be activated immediately over your internet connection. Be sure that you have an active connection.

User Name*: Heike Musterfrau
E-Mail Address*: Heike@musterfrau.com
Company*: Musterfrau AG
Department: Muster
Phone Number: 0086-10-10101010-10

Finish Cancel

Figure 9 Add license dialog

It shows the products for the license activation. Further some data are requested. User name, e-mail address and company are needed and department and phone number are optional.

8. After pressing **Finish** the license will generated. The license file is located in the directory where the environment variable `HTC_LICENSES` points to and is also visible in the license manager page of eclipse plug-in from HighTec.

Note: License activation fails if the Avira Security Suite is used. The error message is: "Bad return data from webserver (no status)(-134)". Please deactivate the browser protection for a short time to allow license activation.

The Welcome view (**Fehler! Verweisquelle konnte nicht gefunden werden.**) appears.

Note: Step 2 to 4 are needed only at the first time start.

Initially, Eclipse opens with a workbench displaying the C/C++ perspective with only the Welcome view visible. This view provides some general information and alternative ways to access the online documentation.

Eclipse opens with the perspective which was last used before closing, except when starting up for the very first time showing the Welcome view.

9. Click the **Workbench** on the right side of the view to go to the workbench. Assuming first start of eclipse, **HighTec perspective** (Figure 10) appears, otherwise last saved workbench layout.

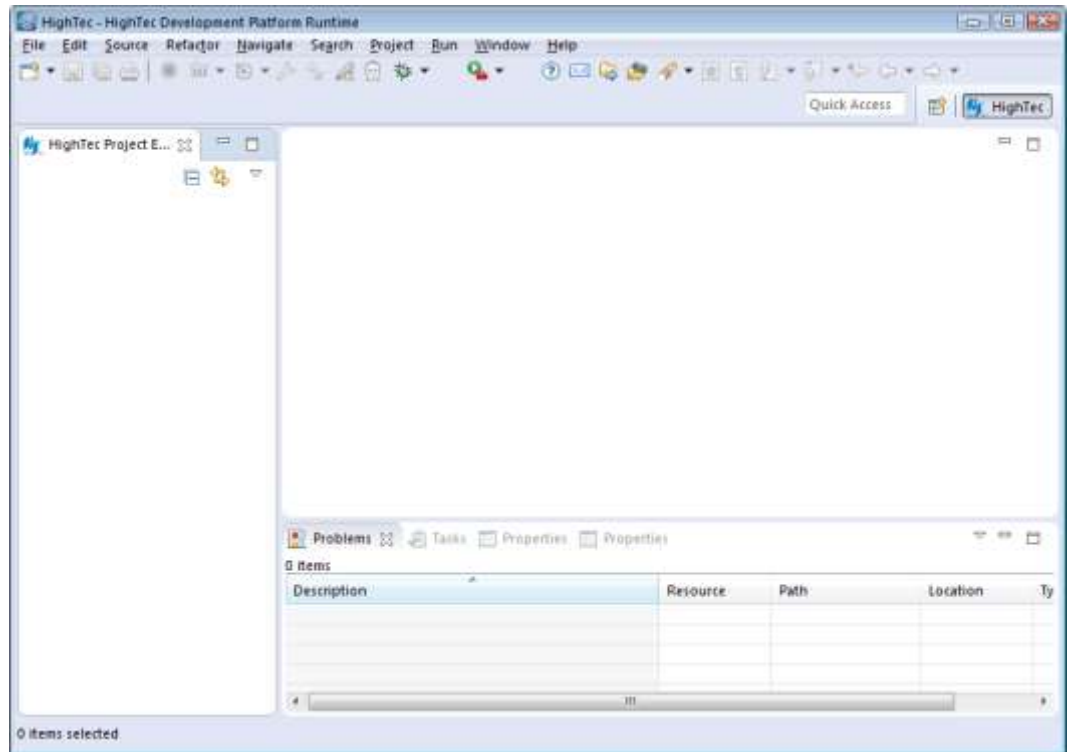


Figure 10 HighTec perspective

Create an AURIX Project

C/C++ Project wizard

This tutorial shows how to create an embedded software project with the TriCore toolset. It lets you create your own project with an example of an analogue clock on the display of the AURIX application kit.

Set the HighTec C/C++ perspective

Before creating a TriCore project, it is necessary to have the **HighTec C/C++** perspective on the workbench (Figure 11). By default, this should be the case when you start Eclipse, but if it is not, do the following.

To open the **HighTec C/C++** perspective

1. From the **Window** menu select **Open Perspective - Other... - HighTec**. The name of the perspective is displayed in the title bar of the workbench window

Import a sample Project

1. From the **File** menu select **New - Example** (Figure 11). The New Example wizard appears (Figure 12).

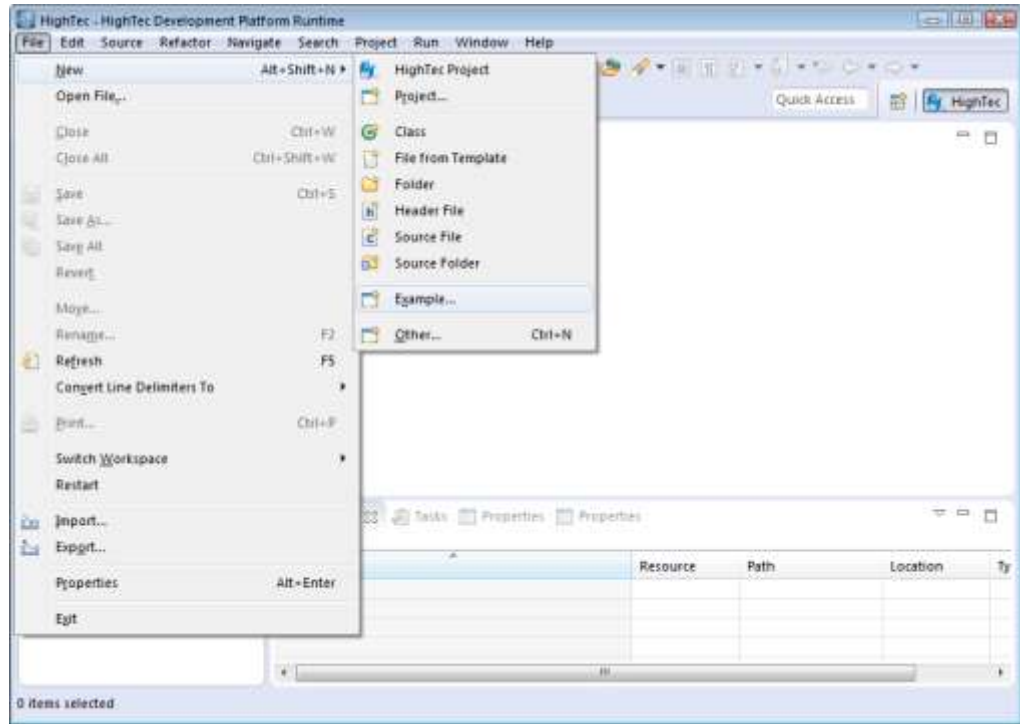


Figure 11 Menu File / New / Example

2. Select **HighTec Examples** and press **Next**.

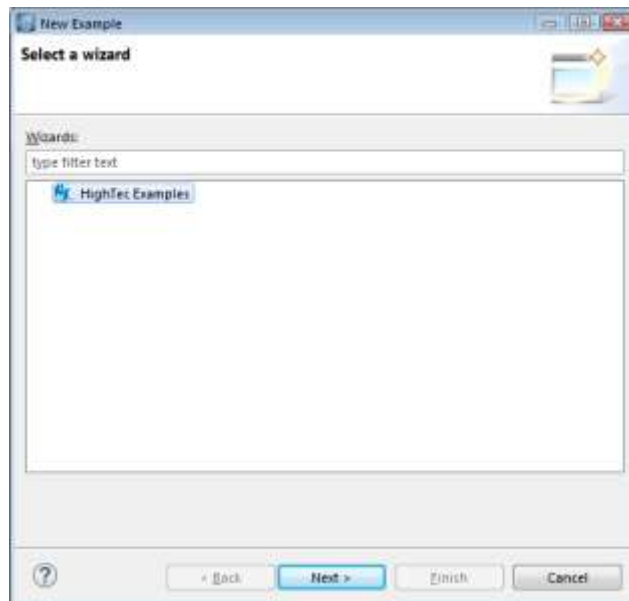


Figure 12 New Example Wizard

3. The next wizard page (Figure 13) shows a selection tree containing the TriCore boards supported by the toolchain. Expand the sample node e.g. **TimeDemo** and select **AppKit-TC224TFT**. Press Next.

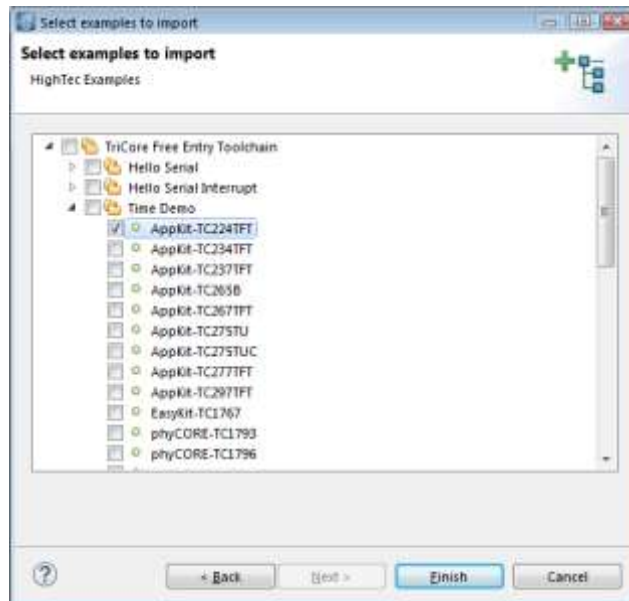


Figure 13 Examples – Hardware Selection

4. Click **Finish** to finish the wizard and to import the example.

Figure 14 shows HighTec perspective with the new created project. To see the generated project files you may need to expand the hello project structure on the left pane. To open one generated file double-click the file in the **src folder** of the project structure.

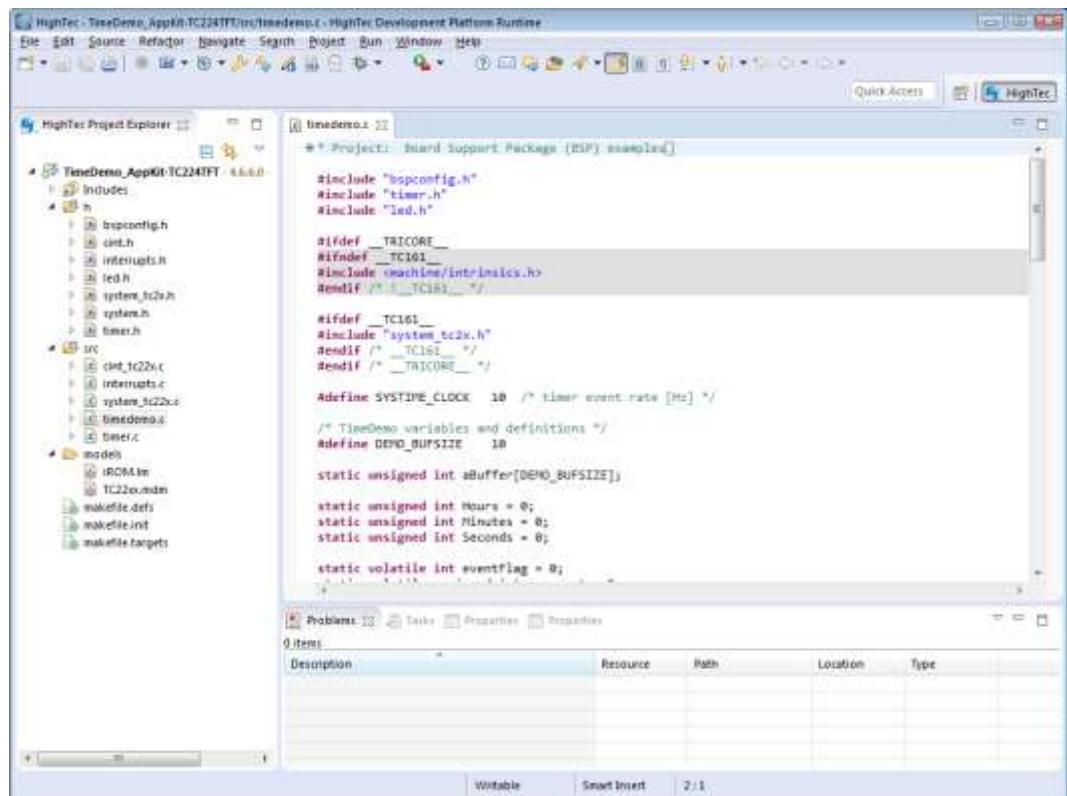




Figure 14 HighTec C/C++ Perspective with the new imported example

Start with an empty Project

To start from an empty project following the steps from the previous section Import a sample project and simply remove all header files from the `h` folder and the file `timer.c` from the `src` folder and delete the content of the file `timedemo.c` except an empty `main()` function.

Build the Project

When you build an AURIX C/C++ project in Eclipse, the HighTec TriCore compiler, assembler and linker are used to compile and link all the source code and the libraries associated with the project.

The wizard generates different build targets like **iROM** (default). You can choose a build configuration by clicking the arrow of the build icon  and build a target by clicking the build icon .

Meaning of build targets

- **iROM** Code will be located in the internal flash (default)

During the build process the sources belonging to the project will be compiled and linked. The messages occurring during the build process are displayed in the **Console window** (Figure 15). The build process should terminate without giving any errors or warnings.

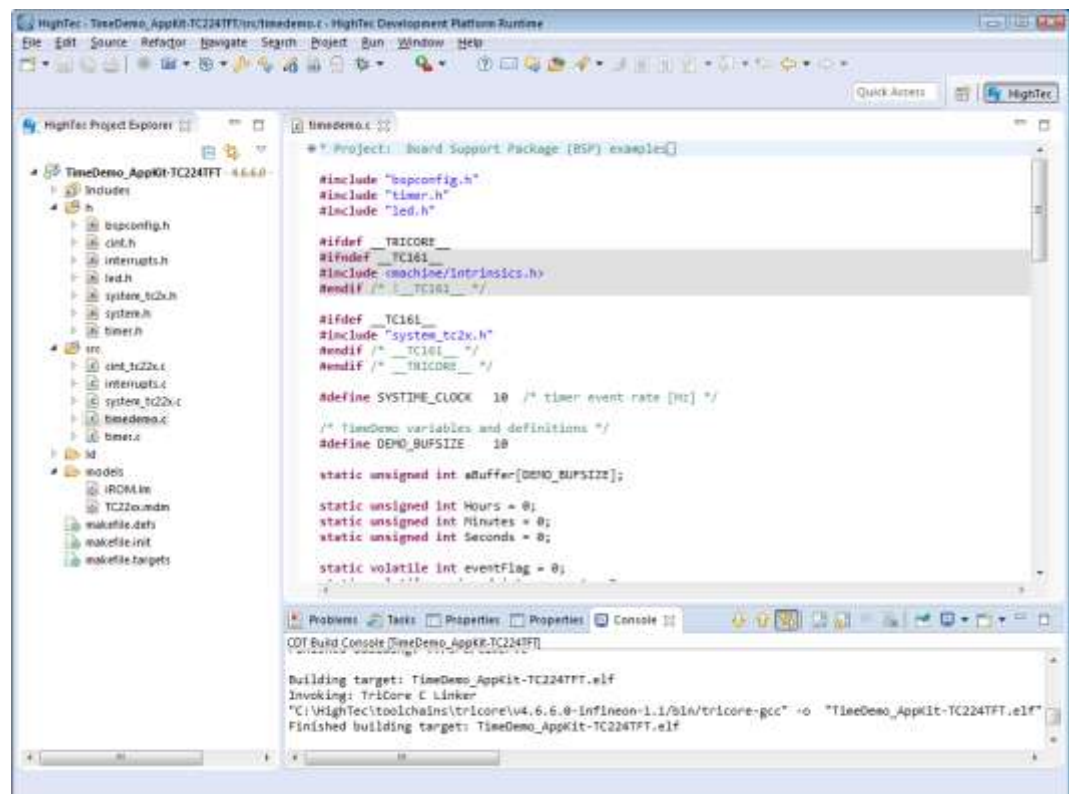


Figure 15 HighTec C/C++ Perspective: Build button and Console window

Connecting the Target

TriBoard with mounted TC2D5T, TC2xxA, TC2xxB, TC2xxC processor

1. Configure the DIP switches (1,2,3=OFF 4=ON but for A step (!) 1=ON 2,3,4=OFF)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **Reset button** (see picture below)

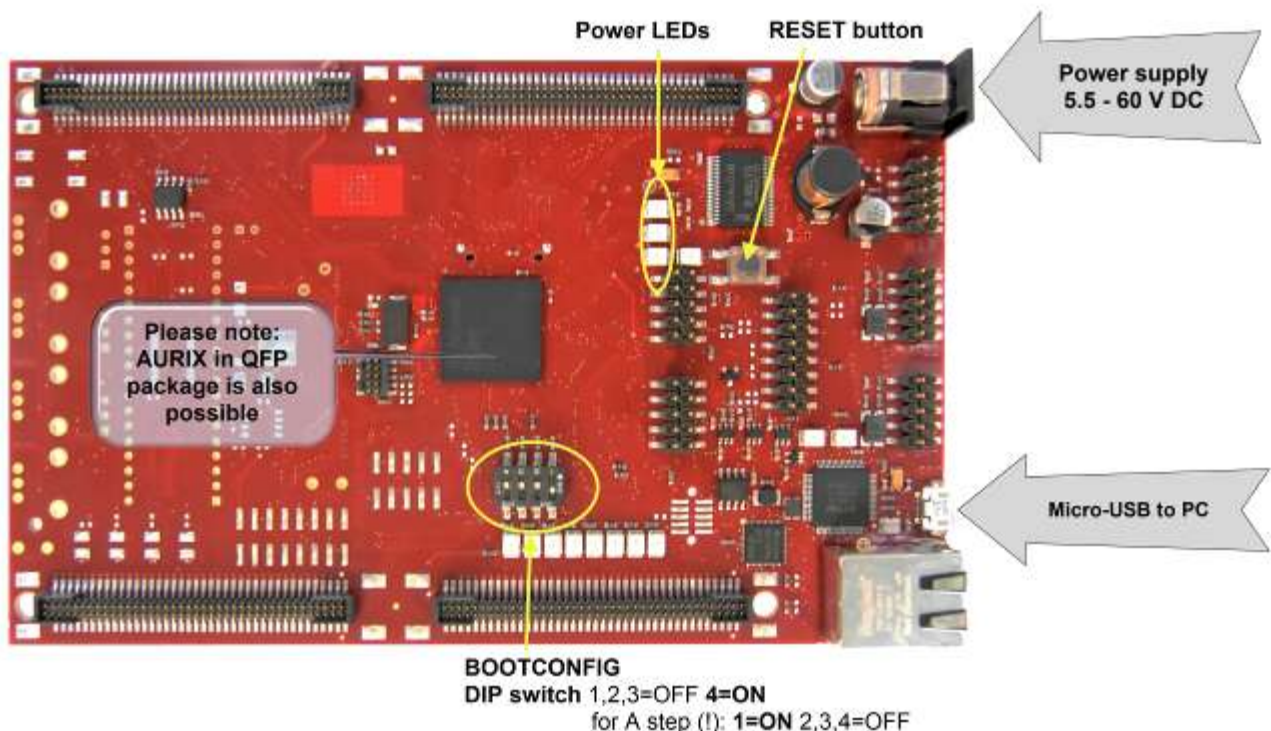


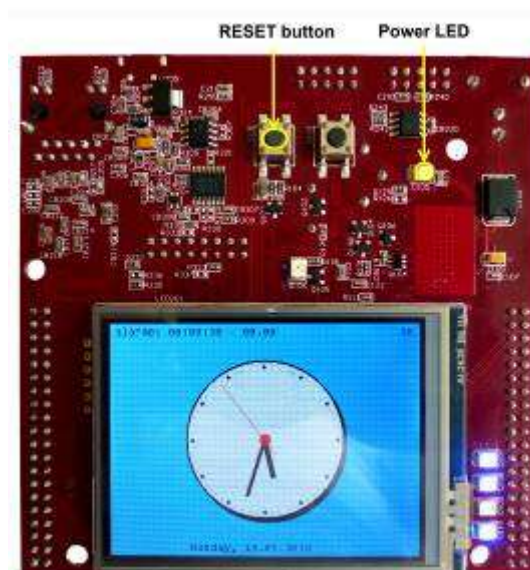
Figure 16 AURIX – TriBoard

Application Kit AURIX TC2X4 TFT with TC224, TC234

1. Connect a DC power supply (5.5V – 60V) to the Application Kit.
2. Connect the Application Kit TC2X5 to the PC via a USB cable (a cable is supplied with the Starter Kit).
3. The Power Supply LED should be on.
4. Press the **Reset button** (see picture below)



Back side



Top side

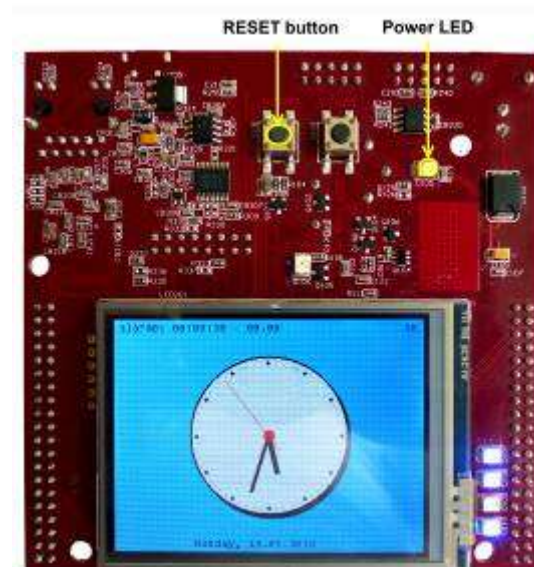
Figure 17 AURIX Application Kit TC2X4 TFT

Application Kit AURIX TC2X5 TFT with TC265

1. Connect a DC power supply (5.5V – 60V) to the Application Kit.
2. Connect the Application Kit TC2X5 to the PC via a USB cable (a cable is supplied with the Starter Kit).
3. The Power Supply LED should be on.
4. Press the **Reset button** (see picture below)



Back side



Top side

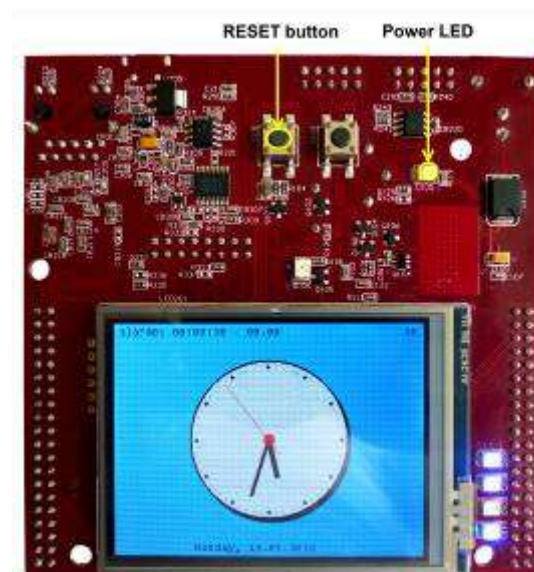
Figure 18 AURIX Application Kit TC2X5

Application Kit AURIX TC2X7 TFT with TC297, TC277, TC267, TC237

1. Connect a DC power supply (5.5V – 60V) to the Application Kit.
2. Connect the Application Kit TC2X5 to the PC via a USB cable (a cable is supplied with the Starter Kit).
3. The Power Supply LED should be on.
4. Press the **Reset button** (see picture below)



Back side



Top side

Figure 19 AURIX Application Kit TC2X7

TriBoard with mounted TC1767 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **Reset button** (see picture below)

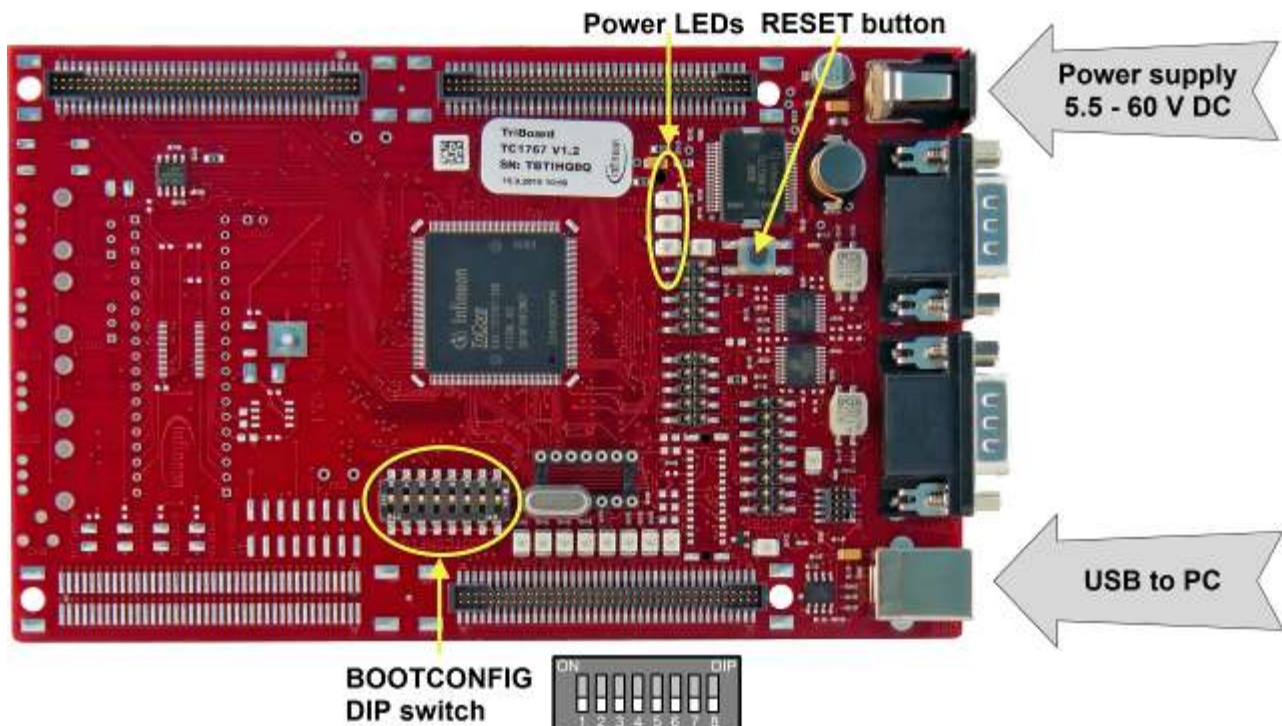


Figure 20 TC1767 - TriBoard

TriBoard with mounted TC1797 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **Reset button** (see picture below)

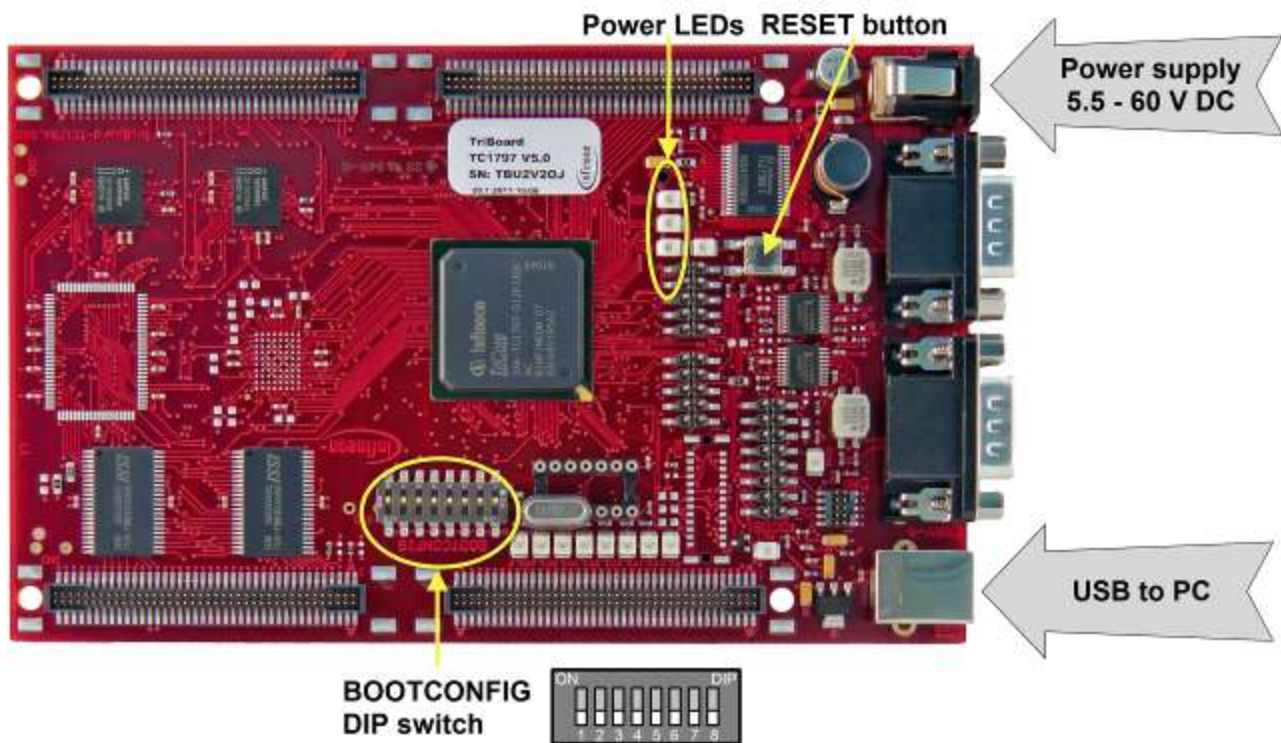


Figure 21 TC1797 - TriBoard

TriBoard with mounted TC1782 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **Reset button** (see picture below)

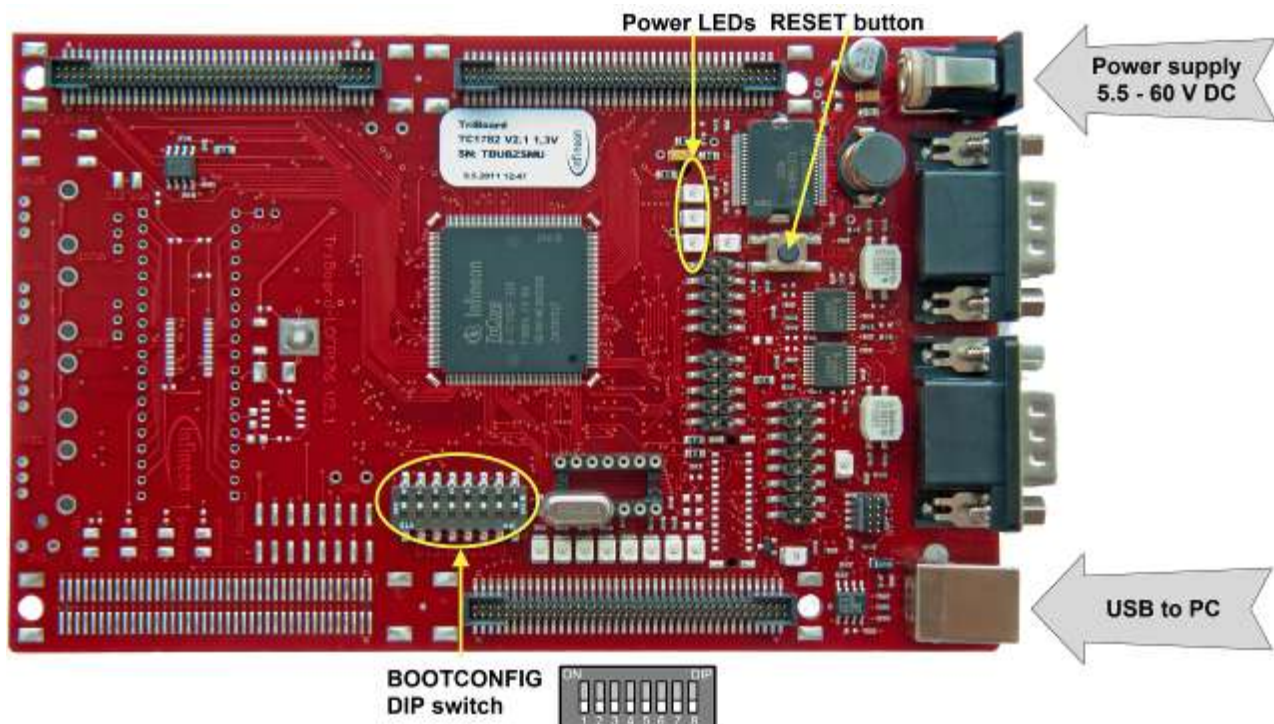


Figure 22 TC1782 - TriBoard

TriBoard with mounted TC1724 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **Reset button** (see picture below)

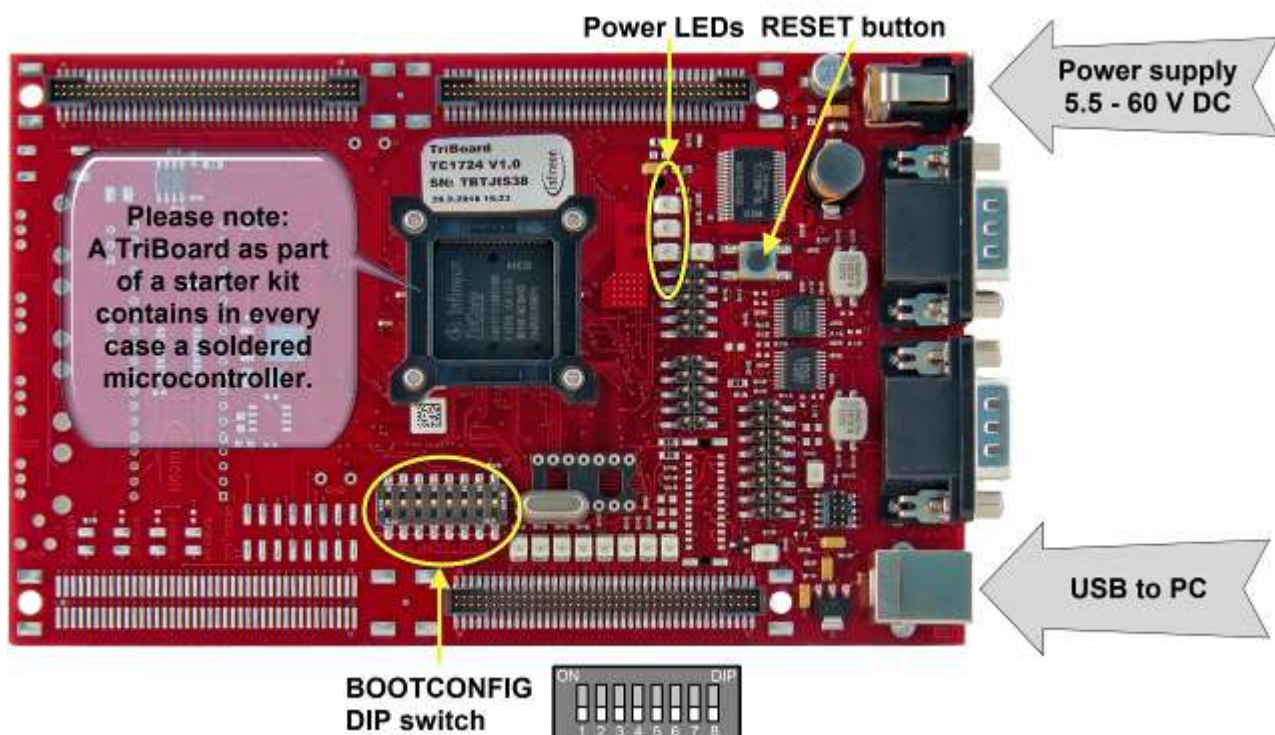


Figure 23 TC1724 - TriBoard

TriBoard with mounted TC1791 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **Reset button** (see picture below)

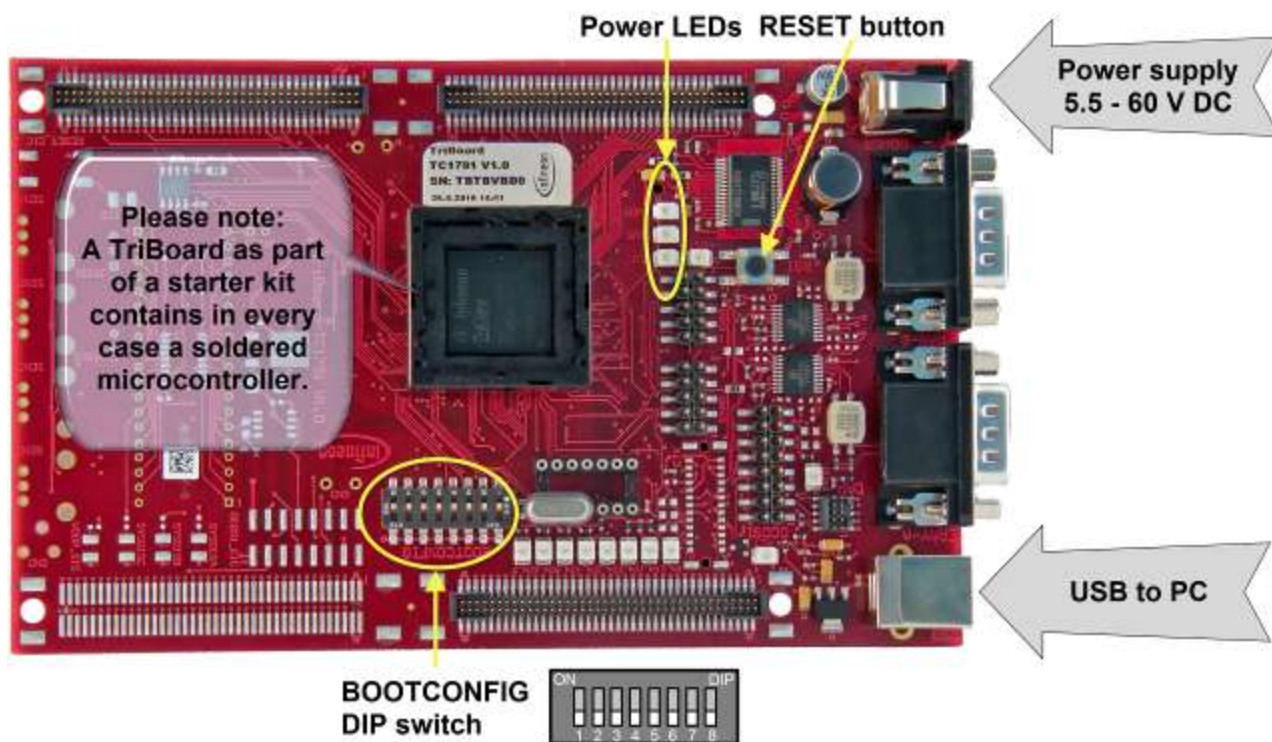


Figure 24 TC1791 - TriBoard

TriBoard with mounted TC1793 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **Reset button** (see picture below)

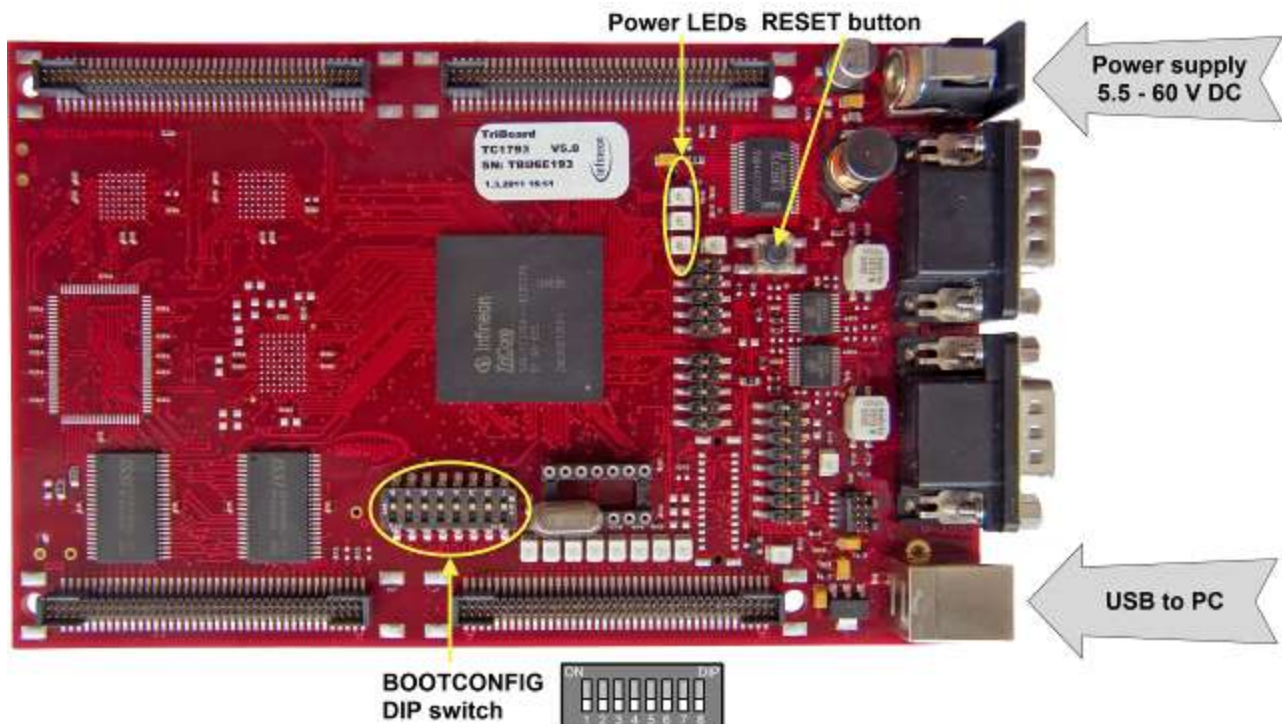


Figure 25 TC1793 - TriBoard

TriBoard with mounted TC1798 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **Reset button** (see picture below)

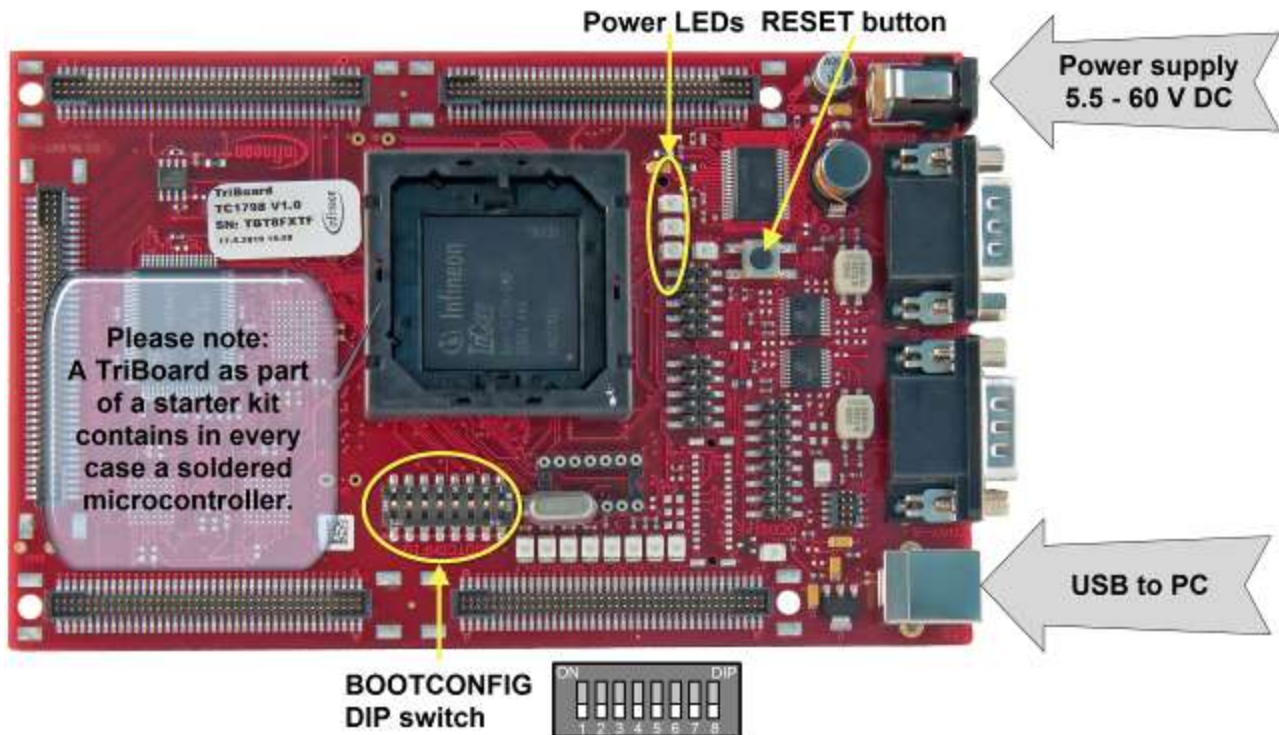


Figure 26 TC1798 - TriBoard

phyCORE-TC1793 with baseboard

1. Connect a DC power supply (5.5V – 60V) to the baseboard
2. Connect the baseboard to the PC via a USB cable (a cable is supplied with the Starter Kit).
3. The Power Supply LED should be on.
4. Press the **Reset button** (see picture below)

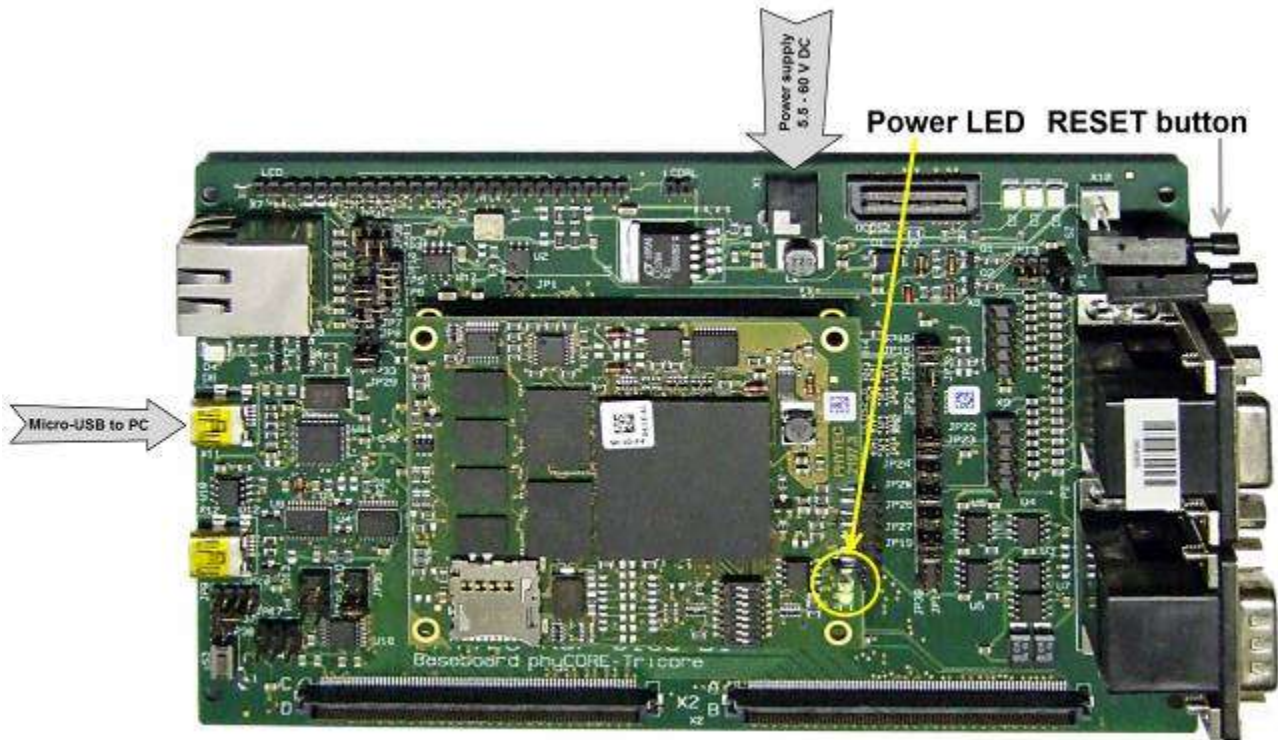


Figure 27 phyCORE - TC1793 with baseboard

Debugging your Application

Start a Debug Session

1. Open the context menu (left mouse click) at the debug button and select **Debug Configurations ...** (Figure 28).

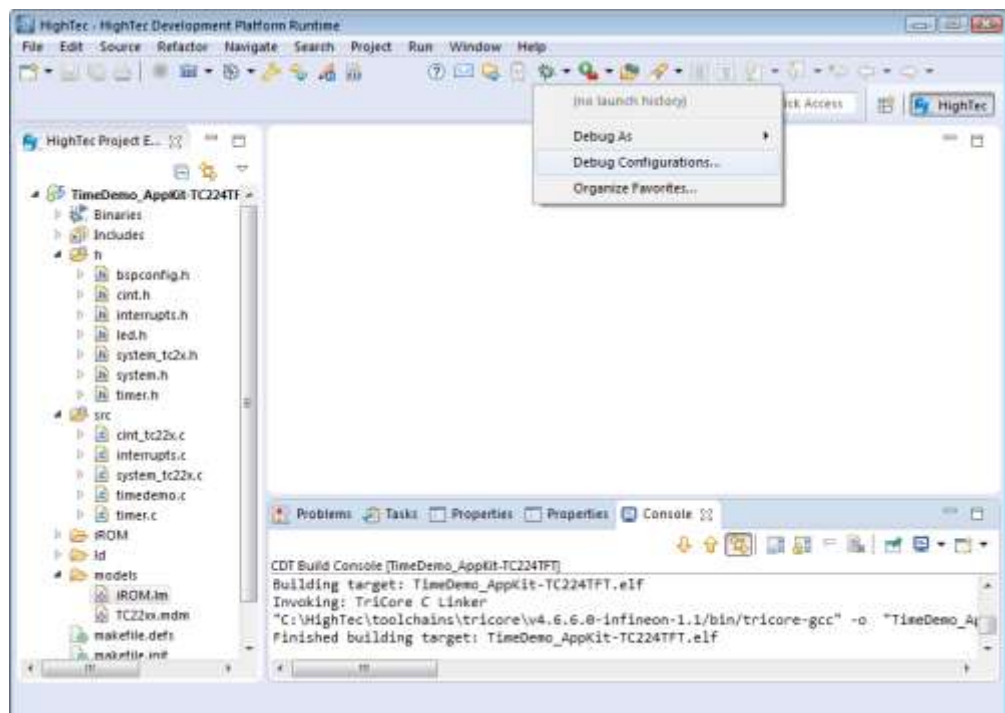


Figure 28 Select Debug Configurations dialog via Debug button

2. The **Debug Configurations** dialog appears. Select **Universal Debug Engine** as debug type (Figure 29).

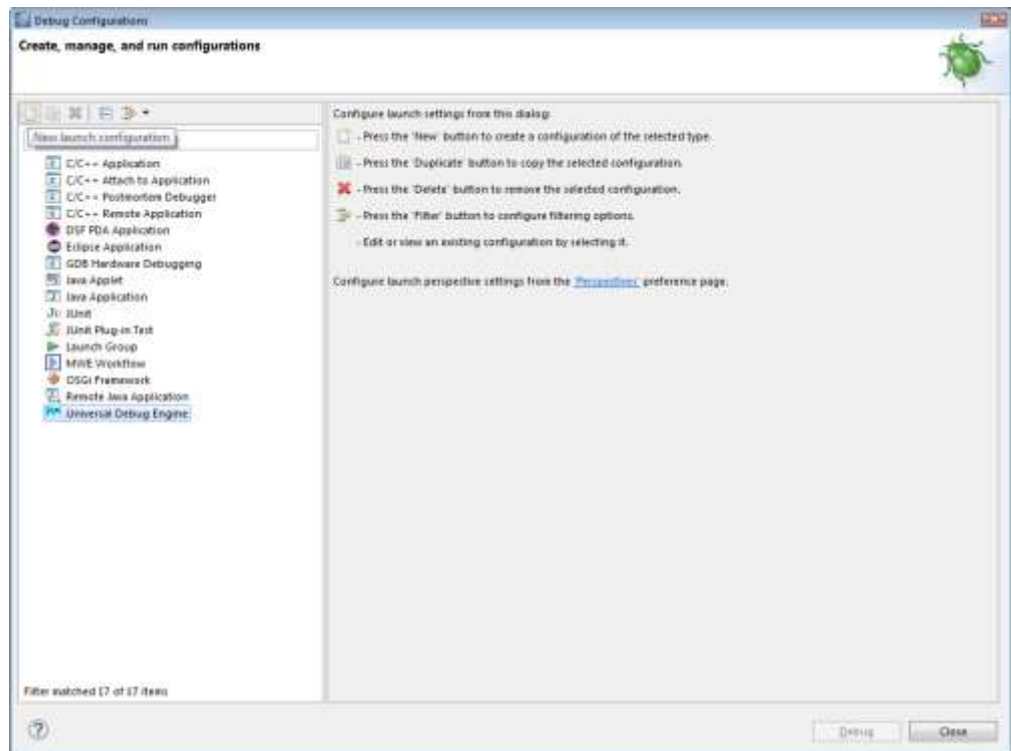


Figure 29 Debug Configurations dialog

3. Press the **New launch configuration** button to create a new debug launch configuration for Universal Debug Engine (Figure 30).

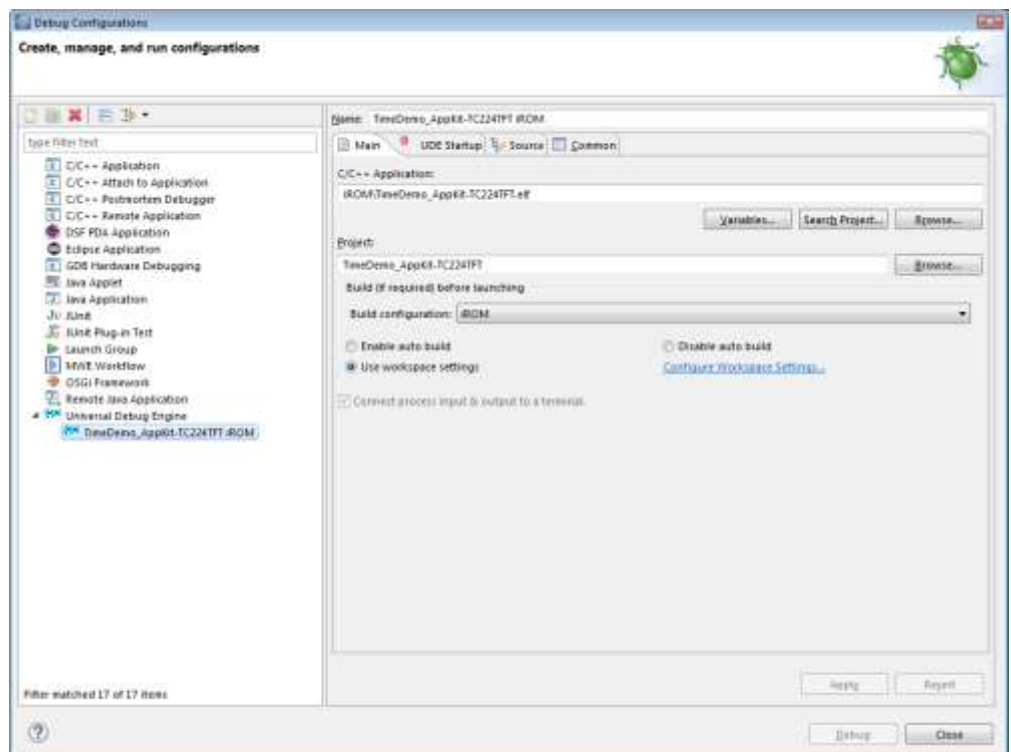



Figure 30 Create new debug launch configuration for Universal Debug Engine

4. A new debug configuration **TimeDemo_AppKit_TC224TFT iROM** is created. All input fields are pre-filled with appropriate values (Figure 31).
5. Push **Debug** to start UDE perspective. Later you can use the Debug icon  from the menu.

Note: If a **problem occurred** pop-up window appears, click **OK**, check the USB cable connection, reset the board with the reset button, and start again the Debug session

6. If you built an **iROM** version of your application, the **UDE Memory Programming Tool** will appear after launching the **UDE perspective** (Figure 31).

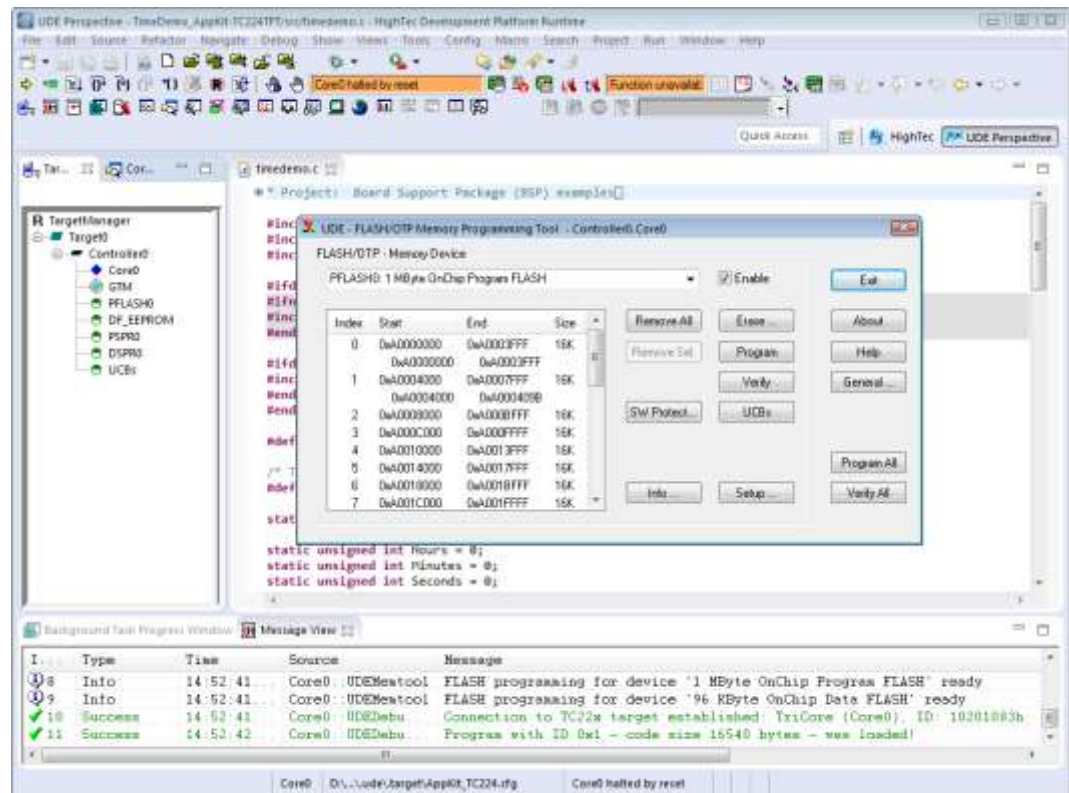


Figure 31 UDE Memory Programming Tool

7. Start flashing with the **Program** button. A progress dialog appears (Figure 32). After successful programming close both dialogs.

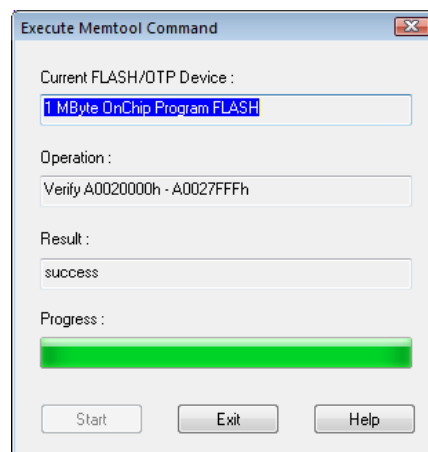



Figure 32 FLASH programming progress dialog

From the **Debug** menu, select **Step over subroutine**, or click on the **Step over** button  in the toolbar. At this moment your application is executing but stopped on the function `main()`. This means the C startup code has been executed completely. The Editor view shows the C source files of your application and a yellow arrow shows the line where the execution has stopped (Figure 33).

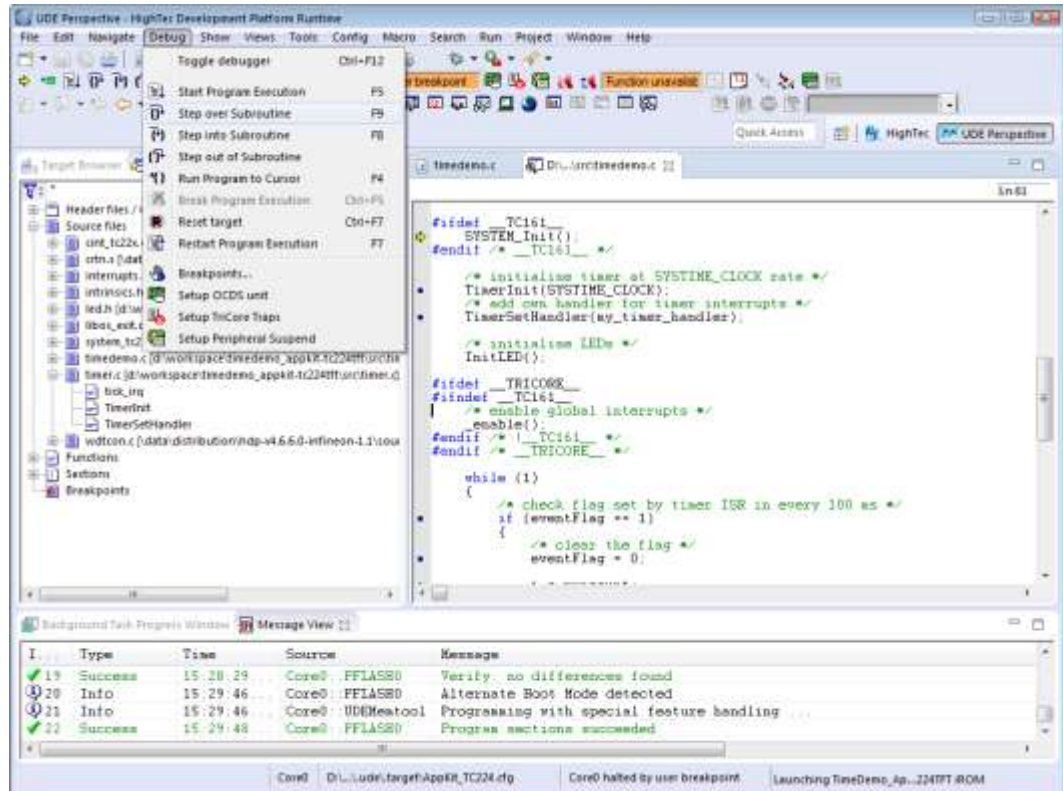





Figure 33 First step to `main()` function

Stepping through the Application

1. From the **Debug** menu select **Step over subroutine** or click on the **Step over** button  in the toolbar. The yellow arrow in the Program view moves to the next statement.
2. To set or clear breakpoints click on the markers in the info margin of program window.
3. To see watch or local variables please open the accordingly window via the **View** menu.
4. To run your application, select **Start Program Execution** from the **Debug** menu or click on the Start Program button  in the toolbar. **Now an analogue clock should be visible on the display of the application kit.**
5. To restart your application, select **Restart Program Execution** from the **Debug** menu, or press **F7** or click on the Restart button  in the toolbar.

Using the UDE debugger

The main() and further features of UDE are described in the UDE Manual, available via **UDE Welcome Page**. Open it via menu **Window - Show View - Other ... - Universal Debug Engine - UDE Welcome Page** and push the **UDE Manual** button.

Figure 34 shows an UDE example configuration with SFR, Call stack, Watch window, and Memory window. All features are described in the **UDE Manual**.

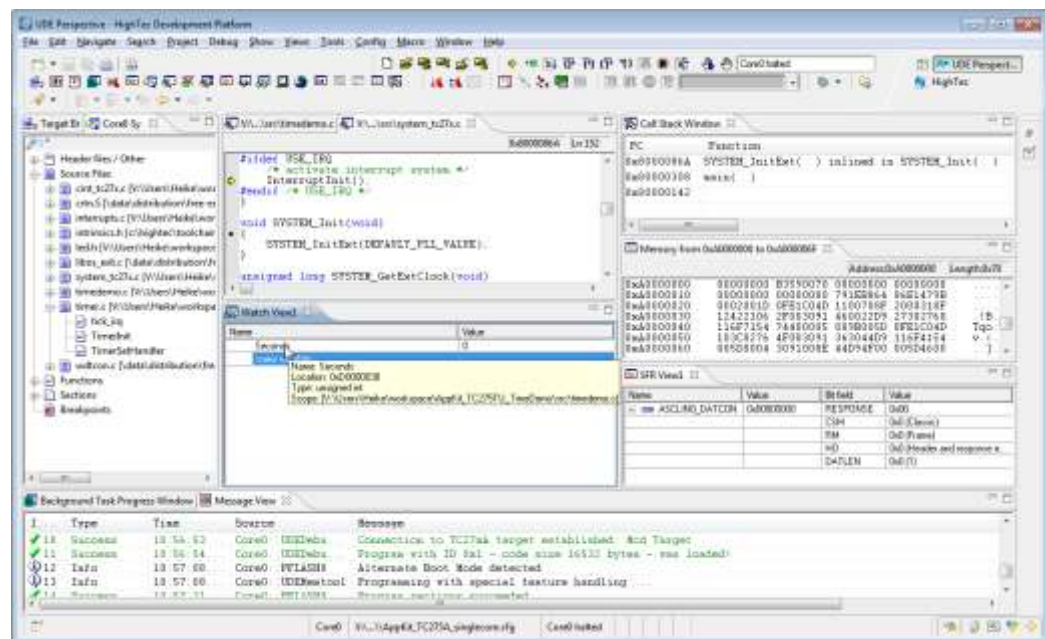



Figure 34 Universal Debug Engine perspective

End the Debug Session

From the **File** menu select **Close Workspace** or click on the Close Workspace  button in the toolbar. The current perspective is switched back to the HighTec C/C++ perspective.

Summary

Having followed the step-by-step instructions the development environment comprising TriCore Free Entry Tool Chain and TriCore Family Evaluation Board will have now been installed. After creating and compiling a simple program, it is successfully executed on the Evaluation Board.

You now have a running environment that could be used for further development or evaluation work.

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