A Getting Started to

Free TriCore™ Entry Tool Chain

AURIX family and AUDO Future, AUDO MAX

Integrated Development Environment for 32-bit TriCore derivatives

This manual contains 40 pages.

Contact us at:

EMail: tctcsupport@pls-mc.com

HighTec EDV Systeme GmbH
Europaallee 19
D - 66113 Saarbrücken
Germany
Phone: +49 681 92613 - 0
Fax: +49 681 92613 - 26

PLS Programmierbare Logik & Systeme GmbH
Technologiepark Lauta
D - 02991 Lauta
Germany
Phone: + 49 35722 384 - 0
Fax: + 49 35722 384 - 69

PLS Development Tools
1250 Oakmead Parkway, Suite#210
Sunnyvale CA, 94085
U.S.A.
+ 1 408 451 - 8408
+ 1 408 501 - 8808
Toll Free: + 1 877 - 77DEBUG

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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 Free TriCore 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 **Free TriCore™ 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 sale's office. Contact information is available on Infineon web site: **www.infineon.com**.

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

Note: "Starter Kit Evaluation Board", "Evaluation Board", "TriBoard" and "Target" terminology are used to denote Evaluation Boards as shown in Figure 17 to Figure 29.

Installing the Free TriCore 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® 7, Windows® 8.1, Windows® 10 (32-bit/64-bit)
- **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
- Free TriCore Entry Tool Chain installation package
- USB cable.

System Requirements

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

- 2,5 GHz or faster 32-bit (x86) or 64-bit (x64) processor
- 4 GByte RAM (32-bit) or 8 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® 10 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. **Free TriCore Entry Tool Chain** dialog appears (Figure 1)

Figure 1 Free TriCore 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 installed only for your profile or for all users of the computer (Figure 3)

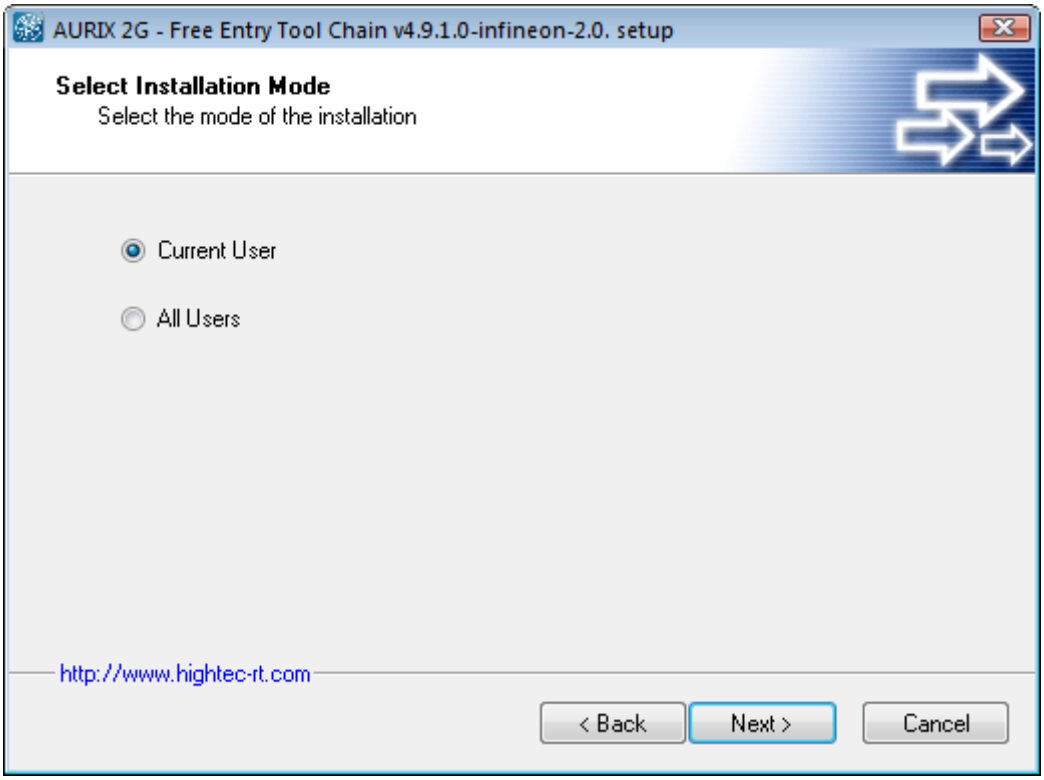


Figure 3 Free TriCore Entry Tool Chain Setup dialog

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

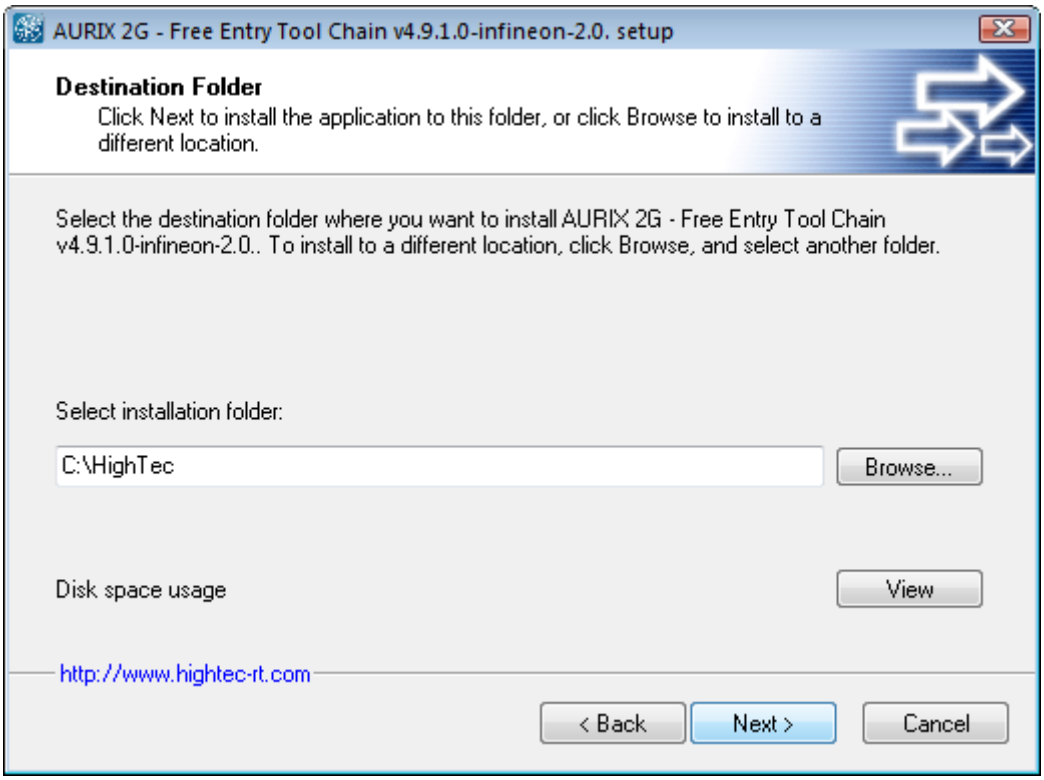
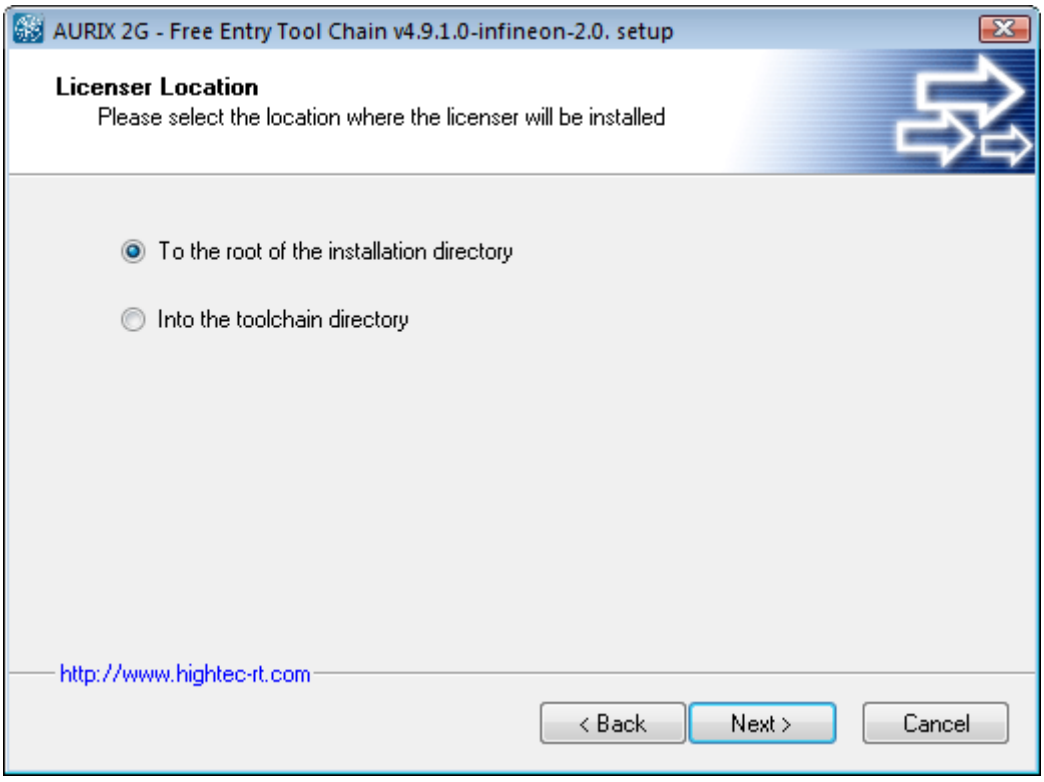


Figure 4 Free TriCore Entry Tool Chain Setup folder dialog

5. Click **Next** button. Select the destination of the installation.



6. Click **Next**. Now the Product Selection dialog with the predefined product key appears (Figure 5). No user action is needed.

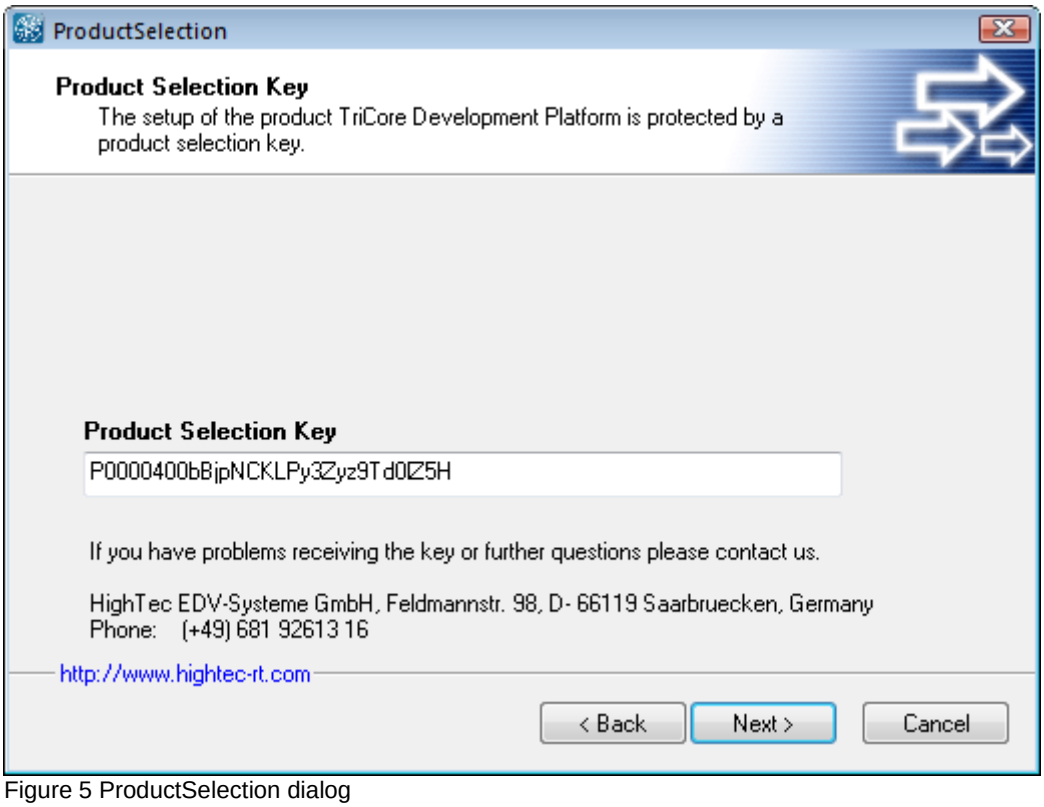


Figure 5 ProductSelection dialog

7. Click **Next**. Further dialogs inform you about the progress of installation.

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

The **Free TriCore Entry 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 **Free TriCore Entry Tool Chain** together with a **professional version UDE 4.10**.

Note: The Free TriCore 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 – AURIX 2G - Free Entry Tool Chain v4.9.1.0-infineon-2.0 – Eclipse** or use the Desktop icon **Eclipse for TriCore**.
2. Now the Workspace Launcher dialog appears (Figure 6).

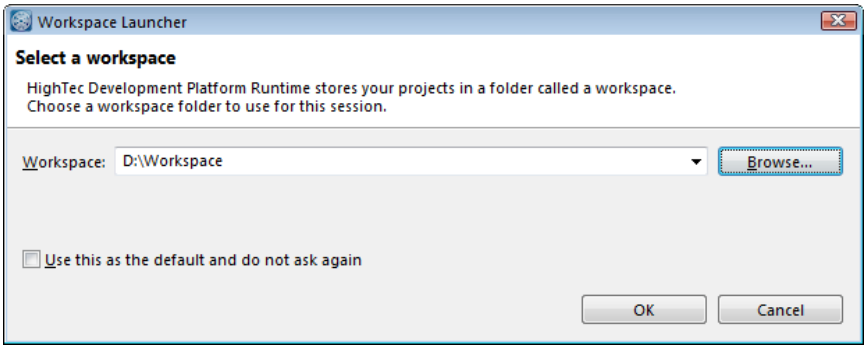


Figure 6 Workspace Launcher

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 7)

Figure 7 HighTec Licensing dialog

Click **Yes** to proceed.

7. To add a license a dialog for Activation and Registration of a license appears (Figure 8).

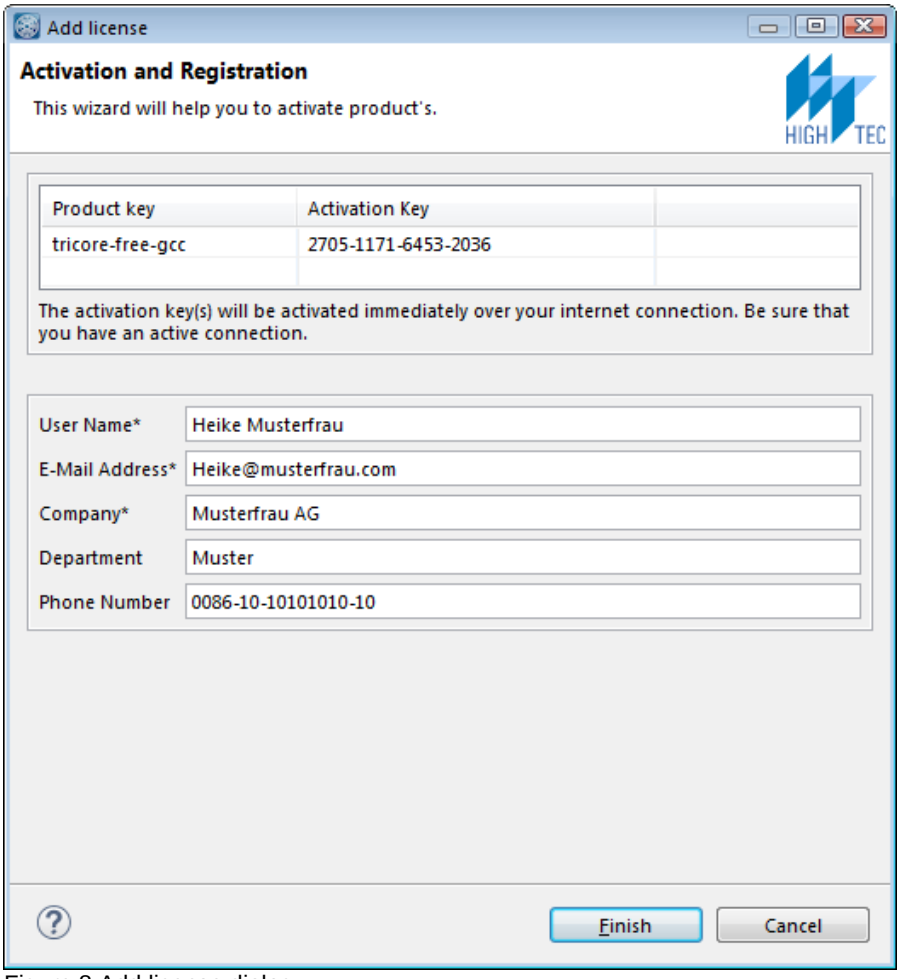


Figure 8 Add license dialog

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 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 9) appears, otherwise last saved workbench layout.

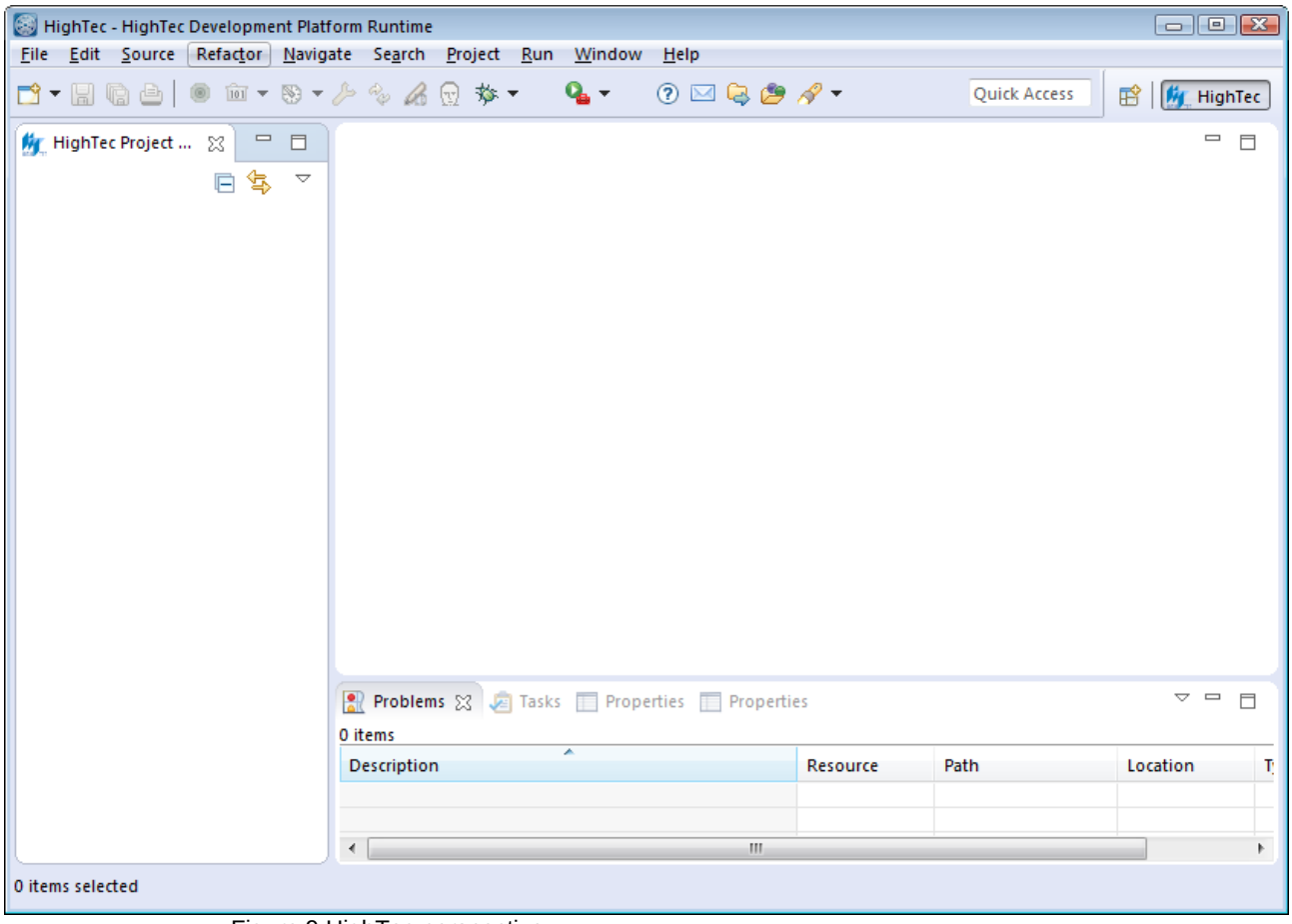


Figure 9 HighTec perspective

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 10). The New Example wizard appears (Figure 11).

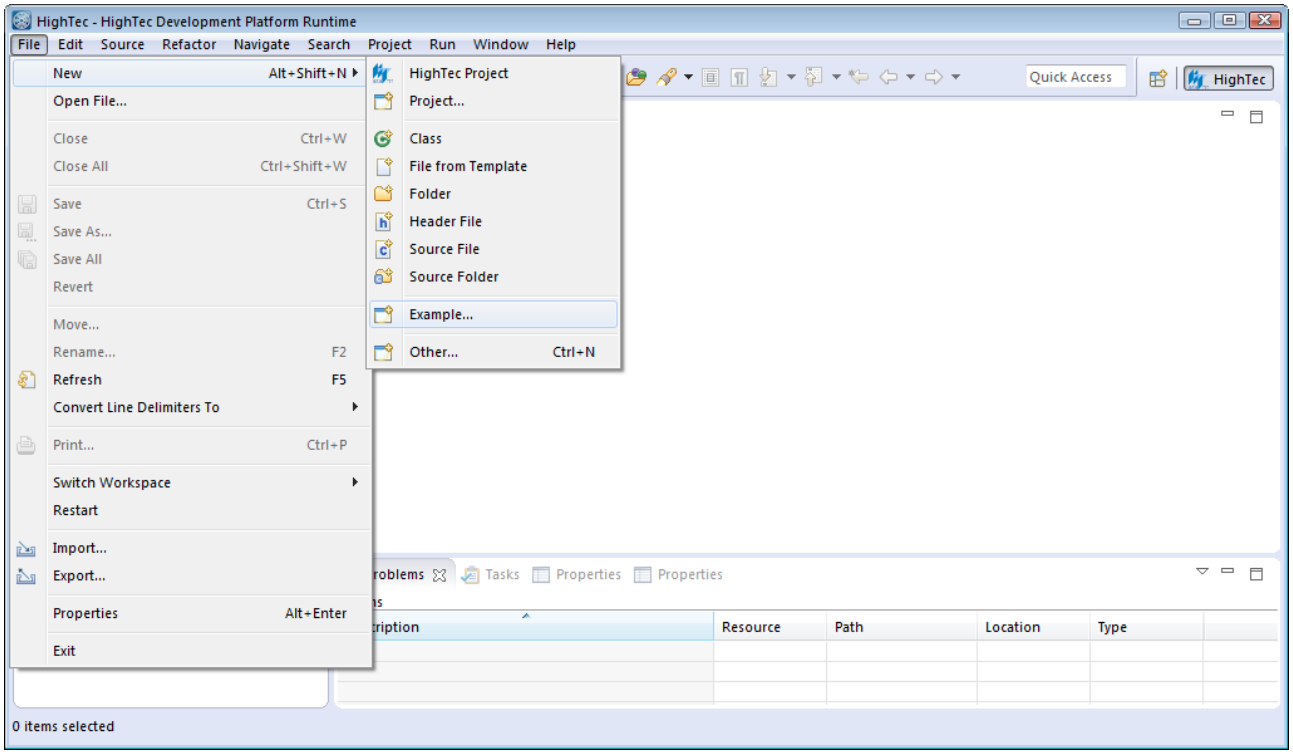


Figure 10 Menu File / New / Example

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

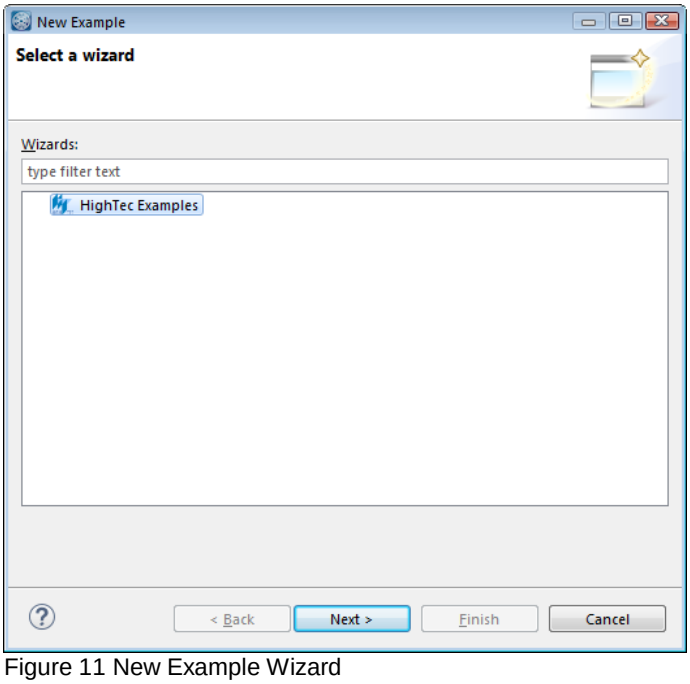


Figure 11 New Example Wizard

3. The next wizard page (Figure 12) shows a selection tree containing the TriCore boards supported by the toolchain. Expand the sample node e.g. **TimeDemo** and select **TriBoard TC26x A-Step**. Press Next.

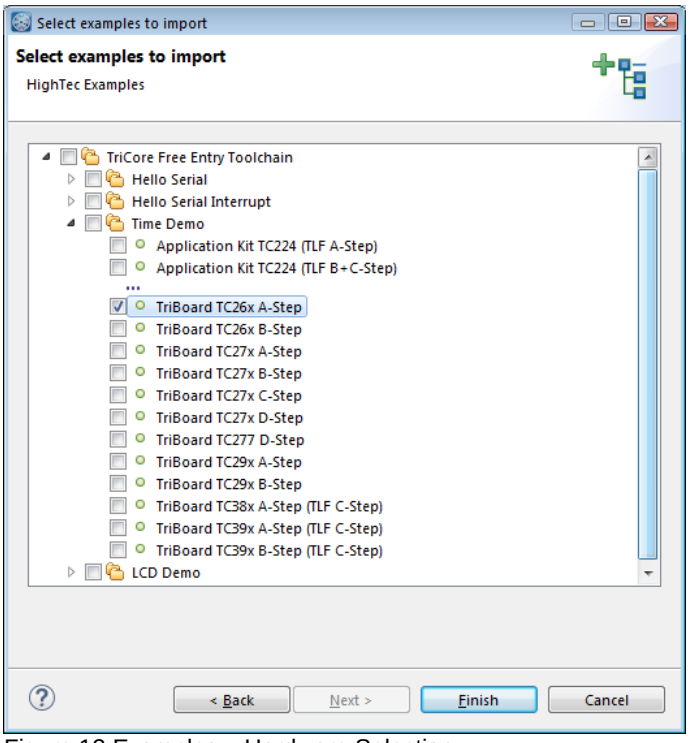


Figure 12 Examples – Hardware Selection

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

Figure 13 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.

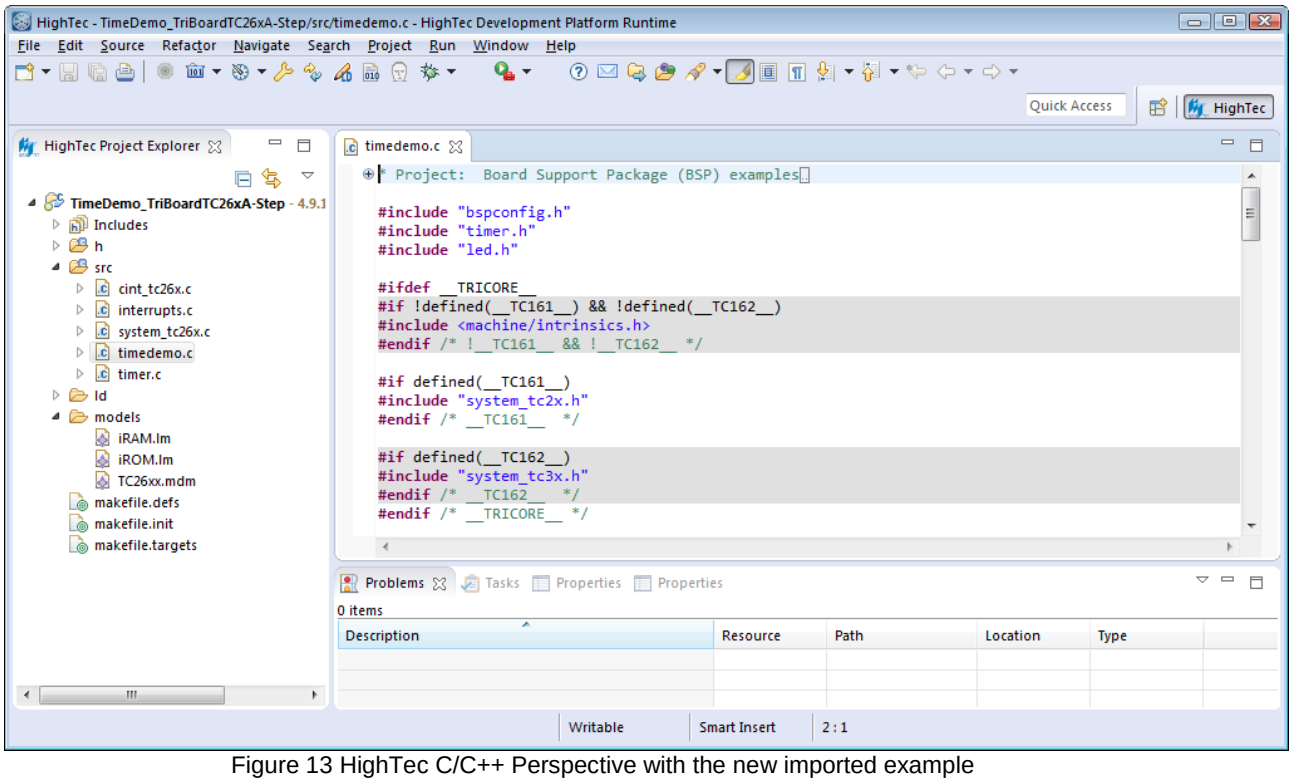


Figure 13 HighTec C/C++ Perspective with the new imported example

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 14). The build process should terminate without giving any errors or warnings.

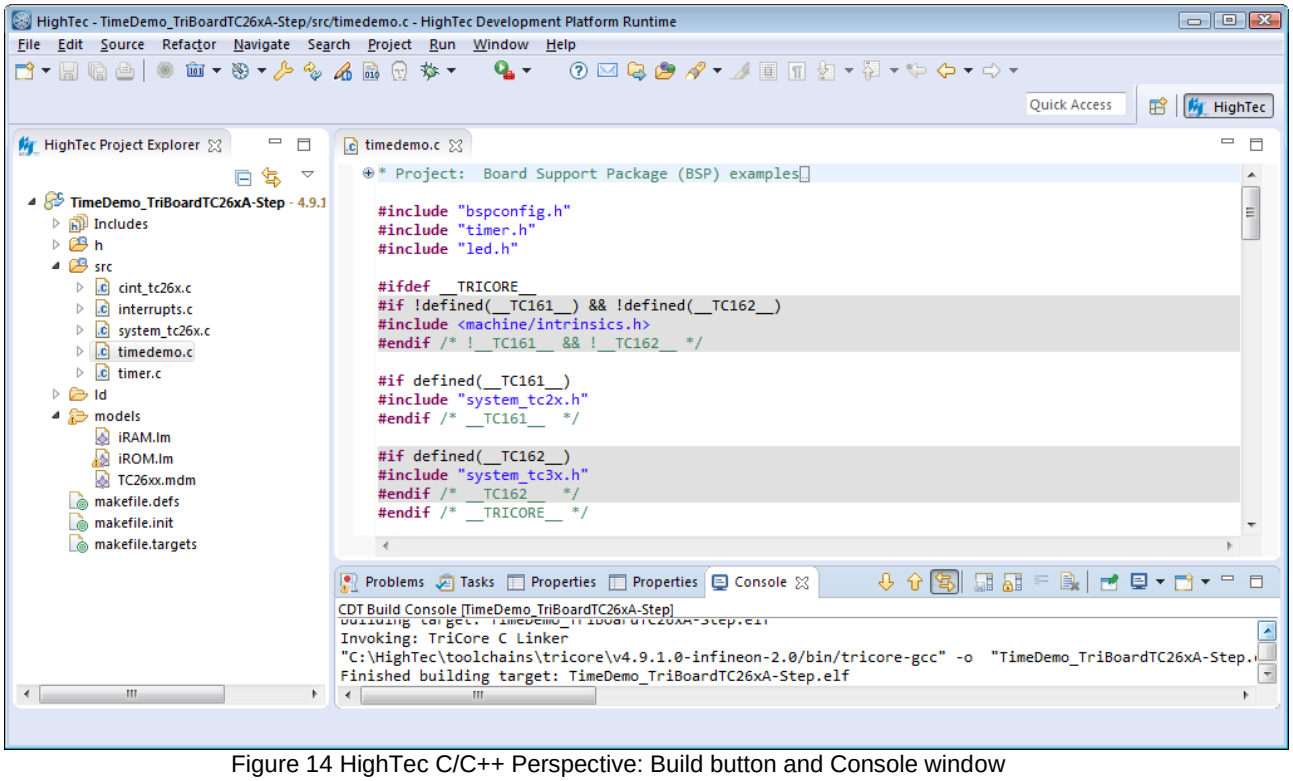


Figure 14 HighTec C/C++ Perspective: Build button and Console window

Connecting the Target

TriBoard with mounted TC38xA, TC39xA, TC39xB 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)

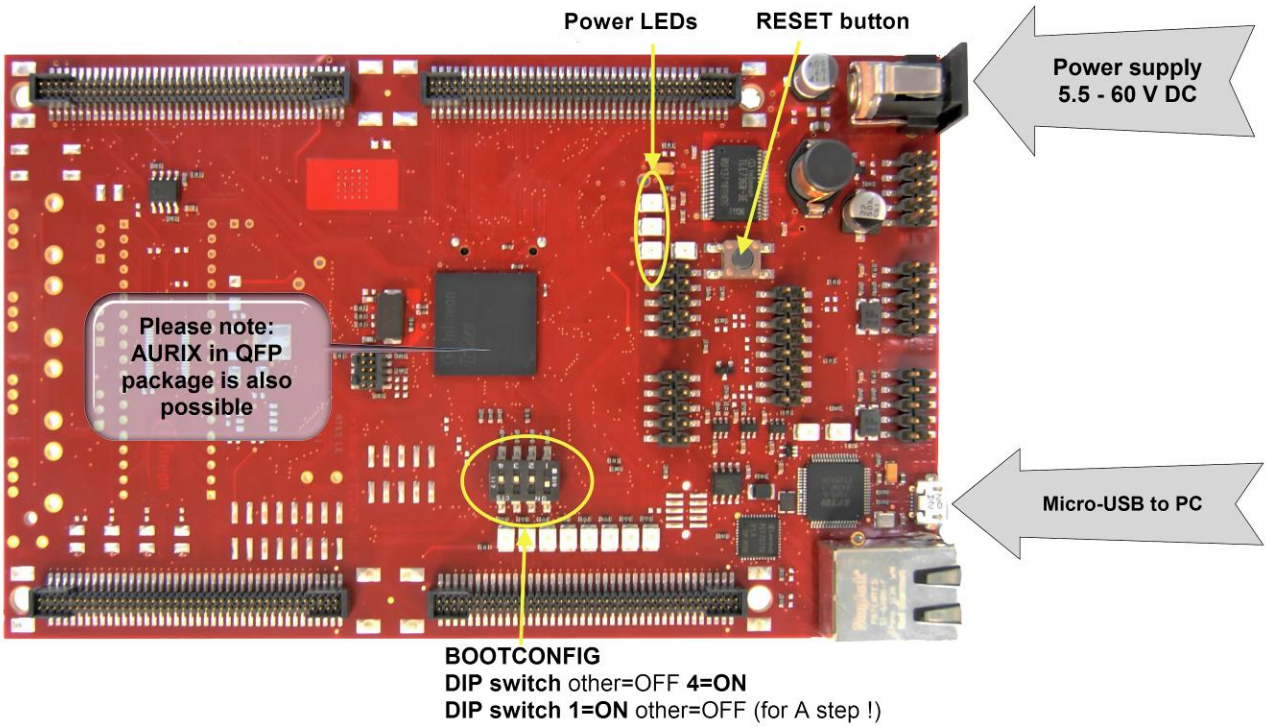
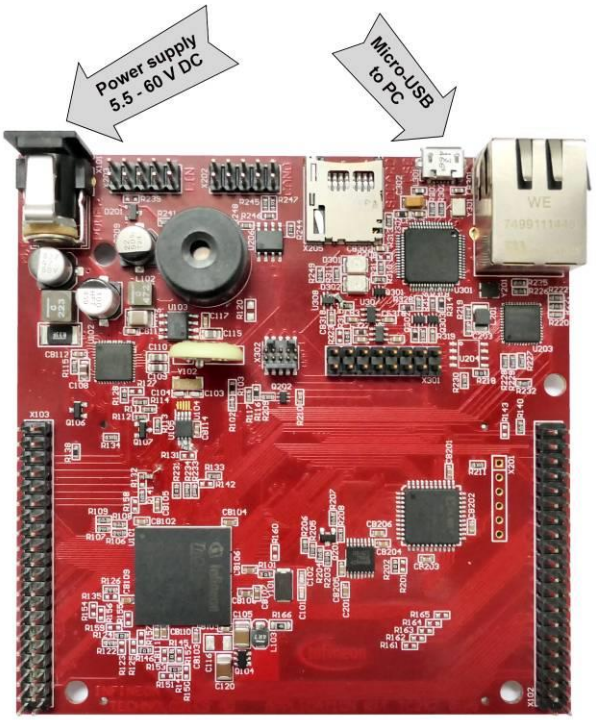


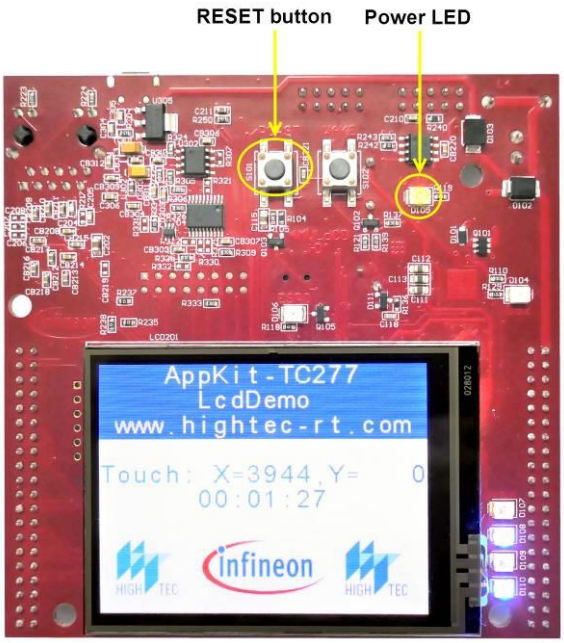
Figure 15 AURIX – TriBoard

Application Kit AURIX TC397 TFT with TC397A, TC397A (ADAS)

1. Connect a DC power supply (5.5V – 60V) to the Application Kit.
2. Connect the Application Kit TC397 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 16 AURIX Application Kit TC397 TFT

TriBoard with mounted TC2D5T, TC21xA, TC22xA, TC23xA, TC26xA, TC26xB, TC27xA, TC27xB, TC27xC, TC27xD, TC29xA, TC29xB 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)

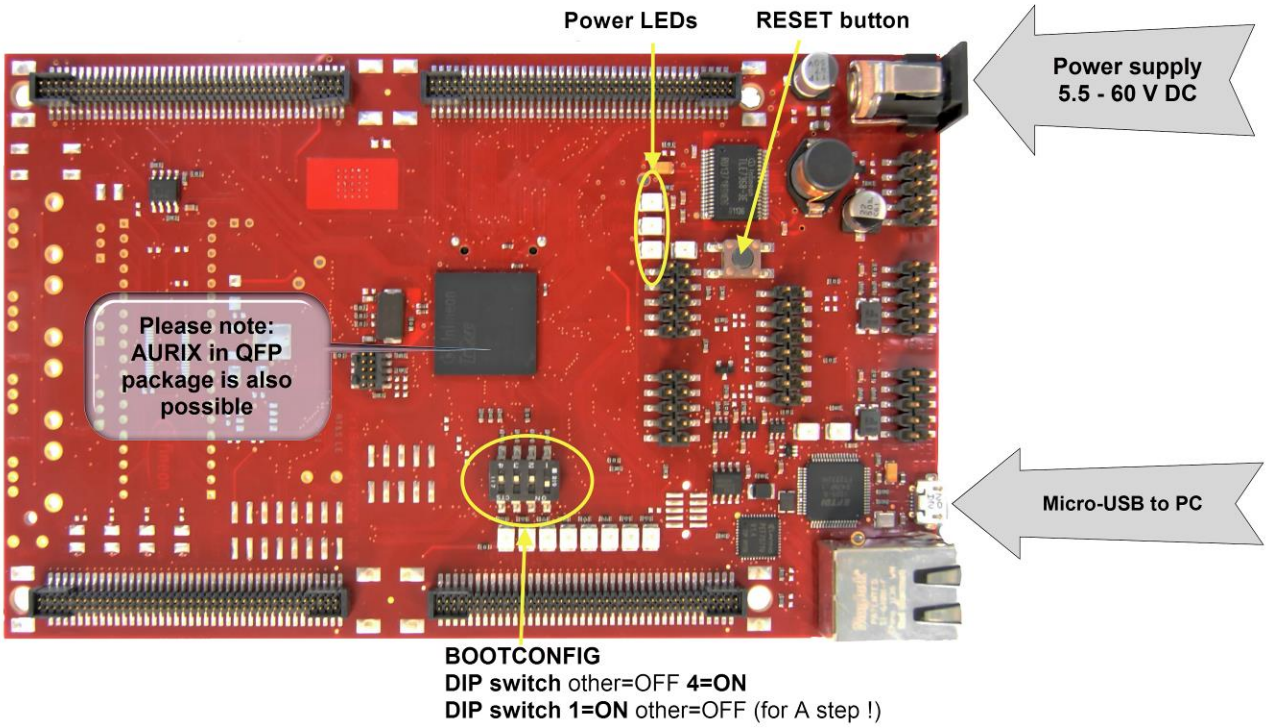
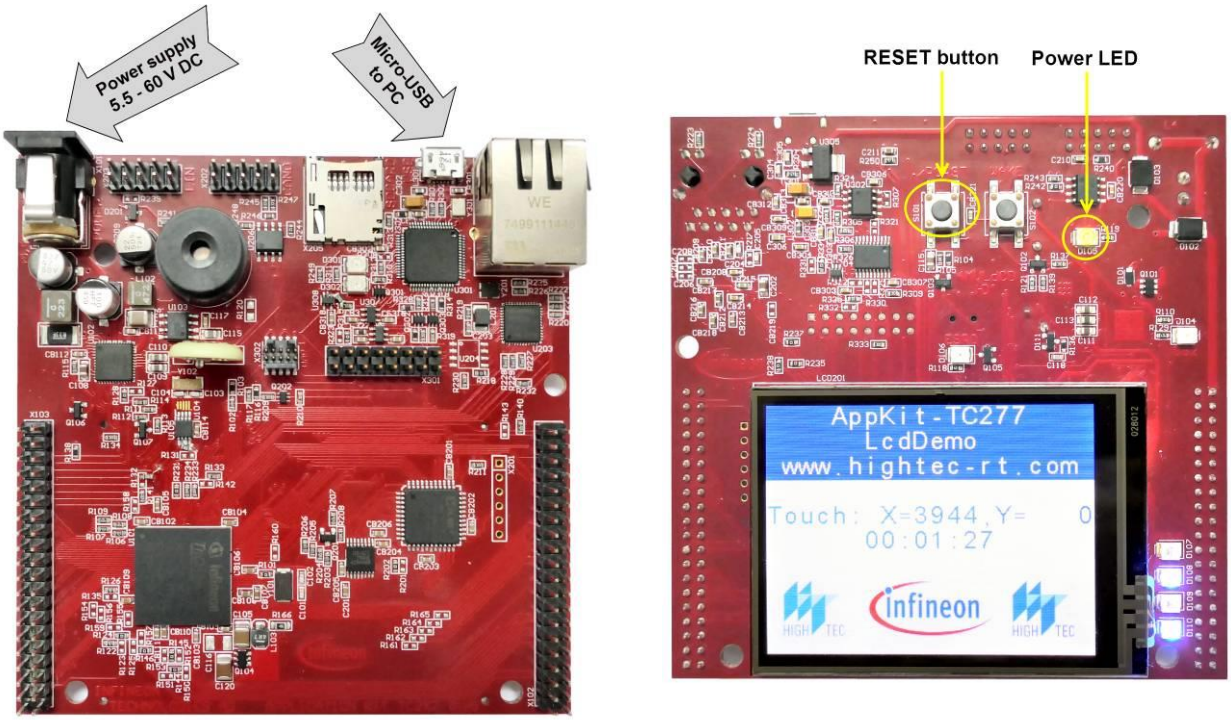


Figure 17 AURIX – TriBoard

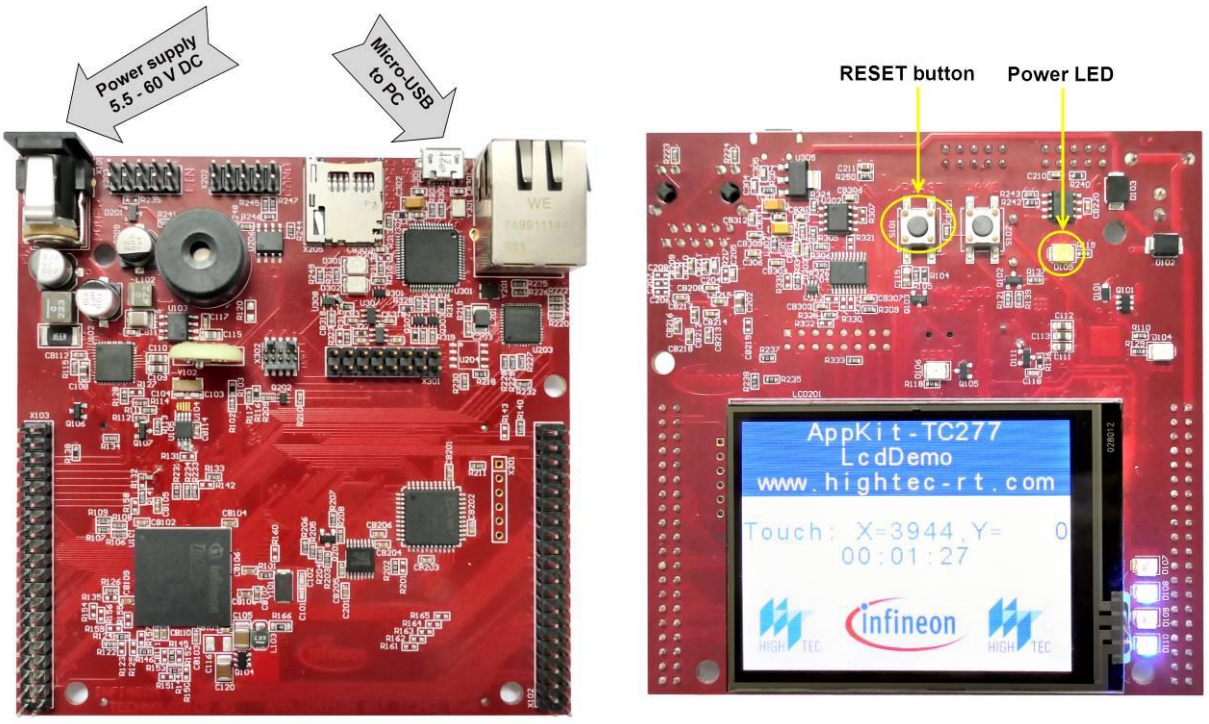
5. Connect a DC power supply (5.5V – 60V) to the Application Kit.
6. Connect the Application Kit TC2X4 to the PC via a USB cable (a cable is supplied with the Starter Kit).
7. The Power Supply LED should be on.
8. Press the **Reset button** (see picture below)



Back side Top side

Figure 18 AURIX Application Kit TC2X4 TFT

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)



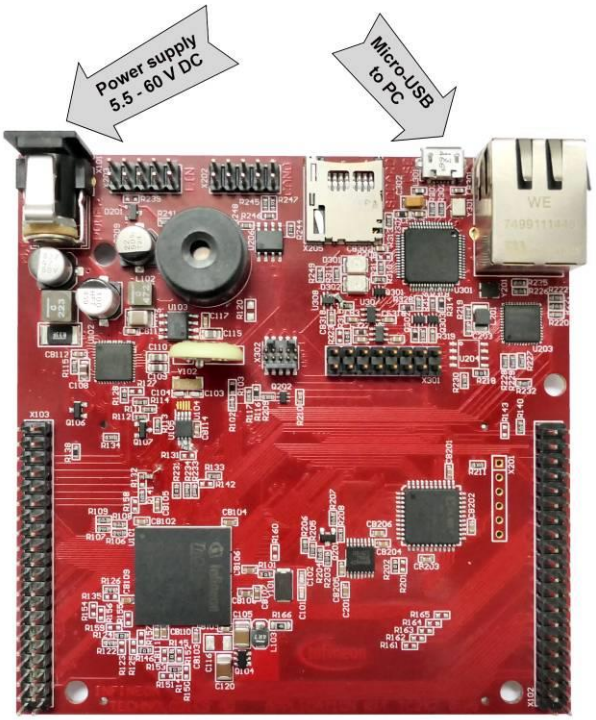
Back side

Top side

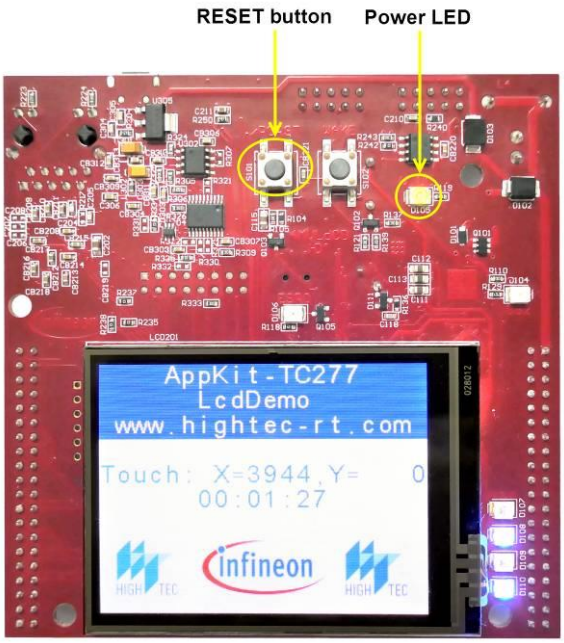
Figure 19 AURIX Application Kit TC2X5

Application Kit AURIX TC2X7 TFT with TC237, TC267B, TC277C, TC277D, TC297B

1. Connect a DC power supply (5.5V – 60V) to the Application Kit.
2. Connect the Application Kit TC2X7 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 20 AURIX Application Kit TC2X7

1. Configure the Power Supply Jumper to VUSB.
2. Connect the ShieldBuddy to the PC via a USB cable (a cable is supplied with the Starter Kit).
3. Three Power Supply LEDs should be on.
4. Press the **Reset button** (see picture below).

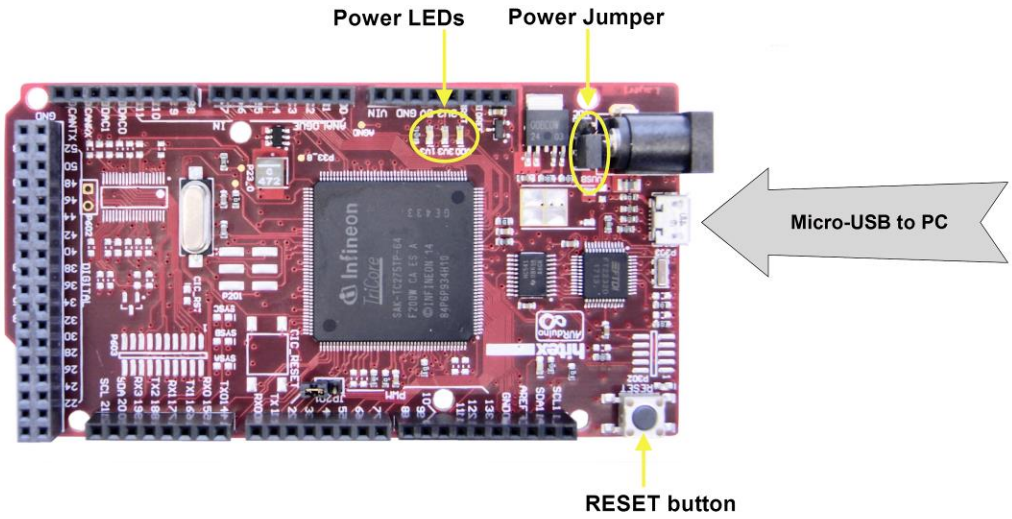


Figure 21 ShieldBuddyTC275

TriBoard with mounted TC1767 processor

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

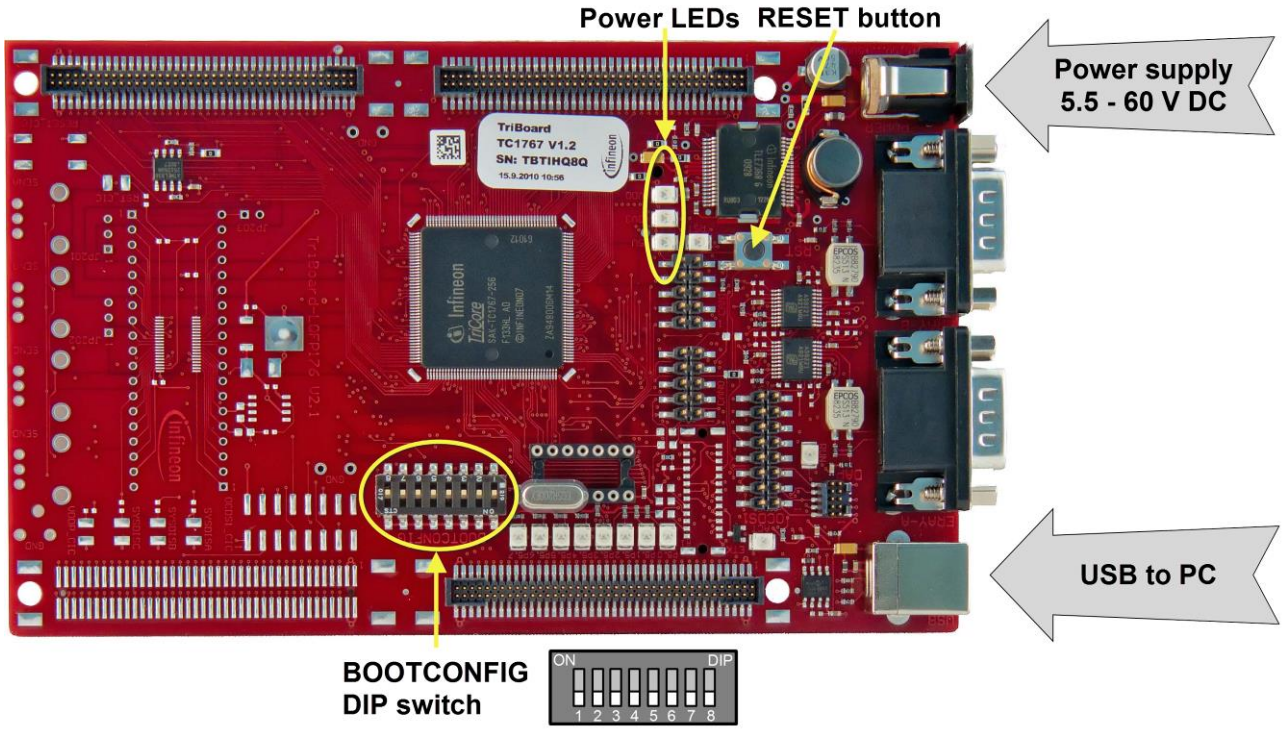


Figure 22 TC1767 - TriBoard

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).

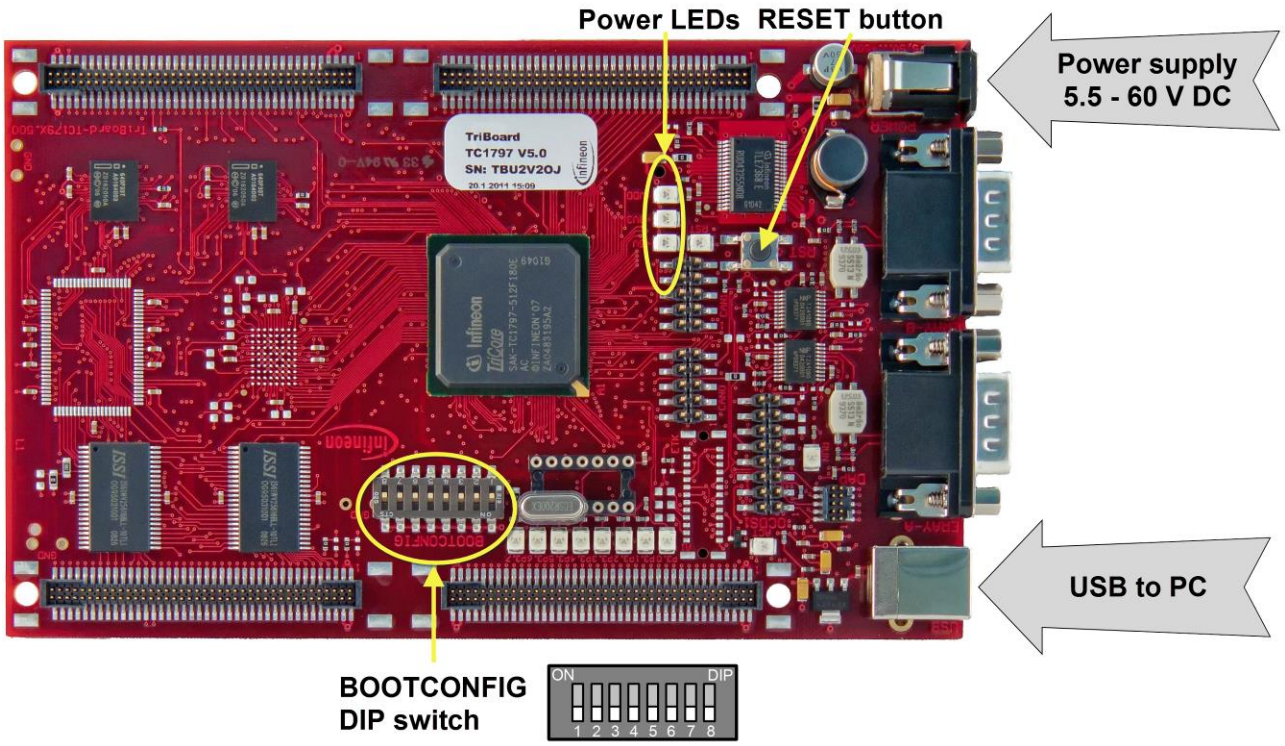


Figure 23 TC1797 - TriBoard

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).

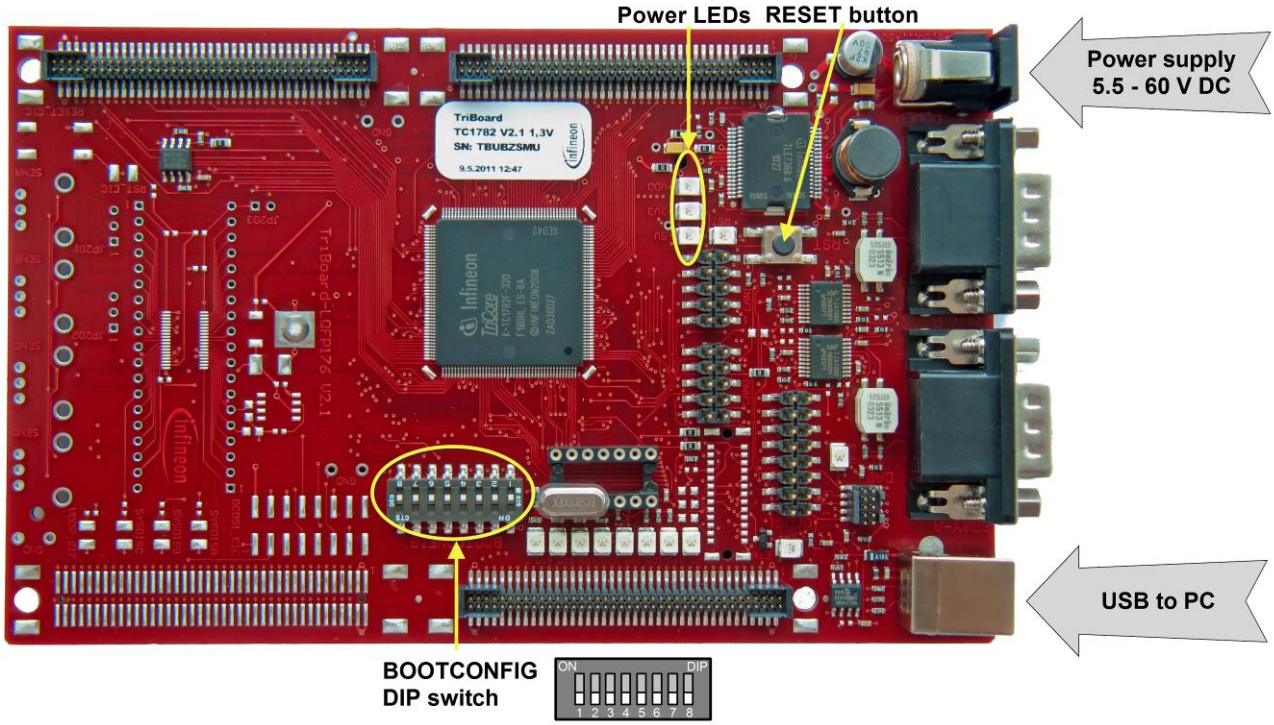


Figure 24 TC1782 - TriBoard

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).

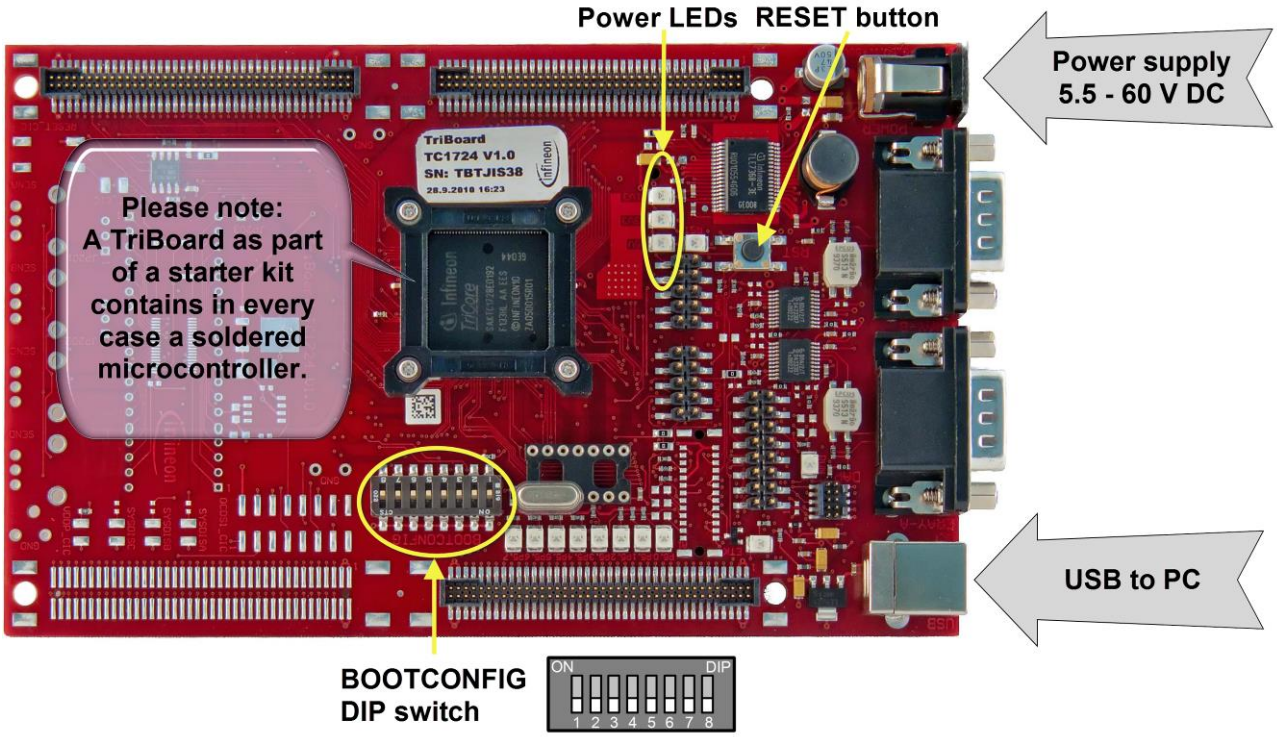


Figure 25 TC1724 - TriBoard

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).

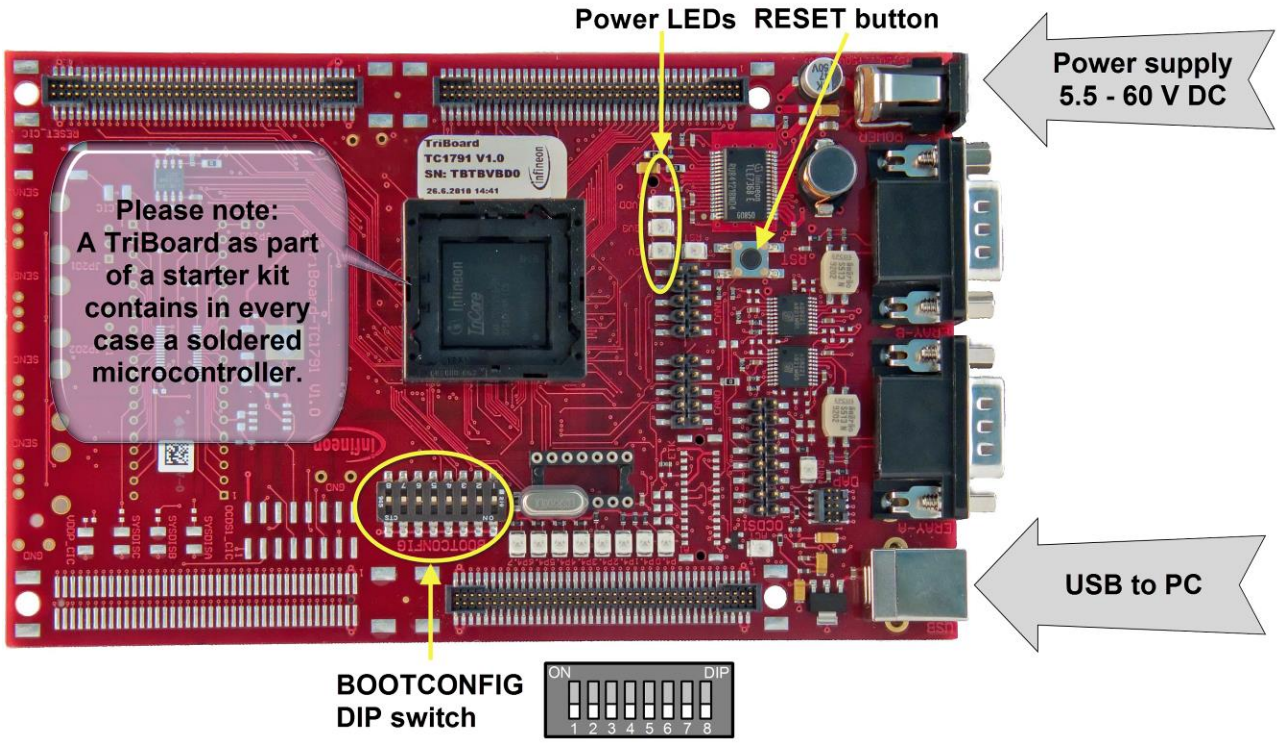


Figure 26 TC1791 - TriBoard

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).

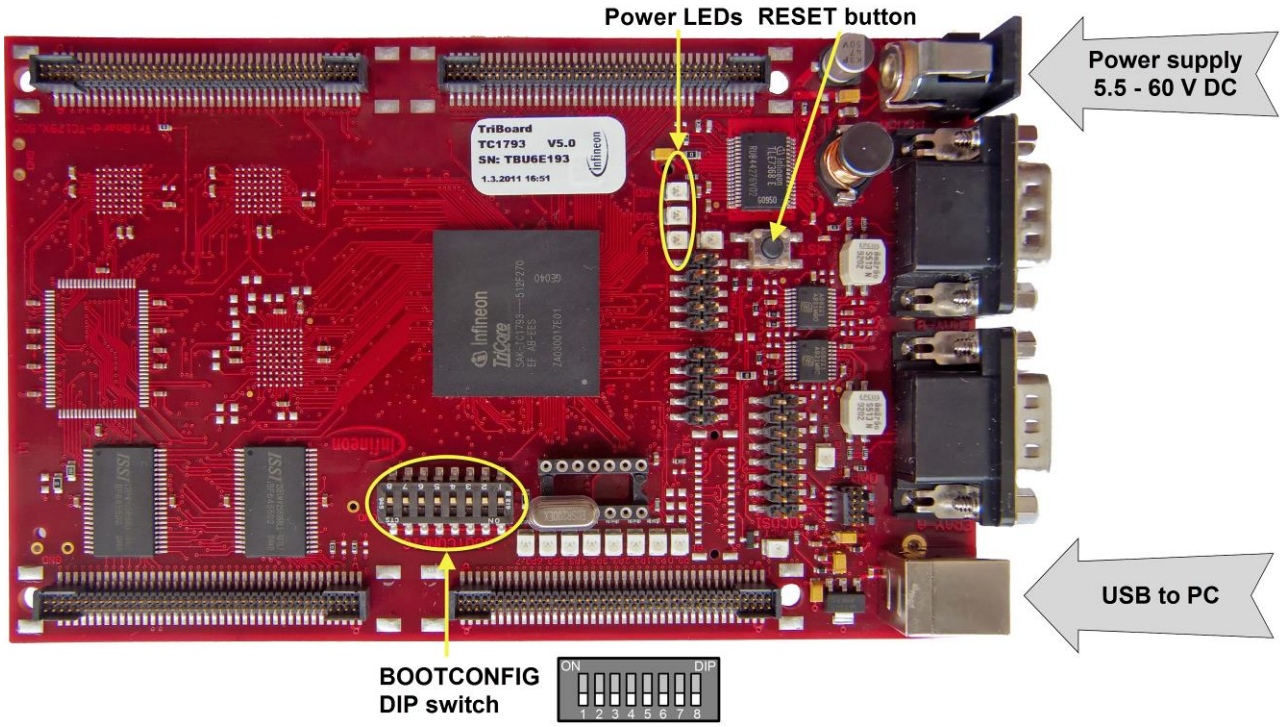


Figure 27 TC1793 - TriBoard

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).

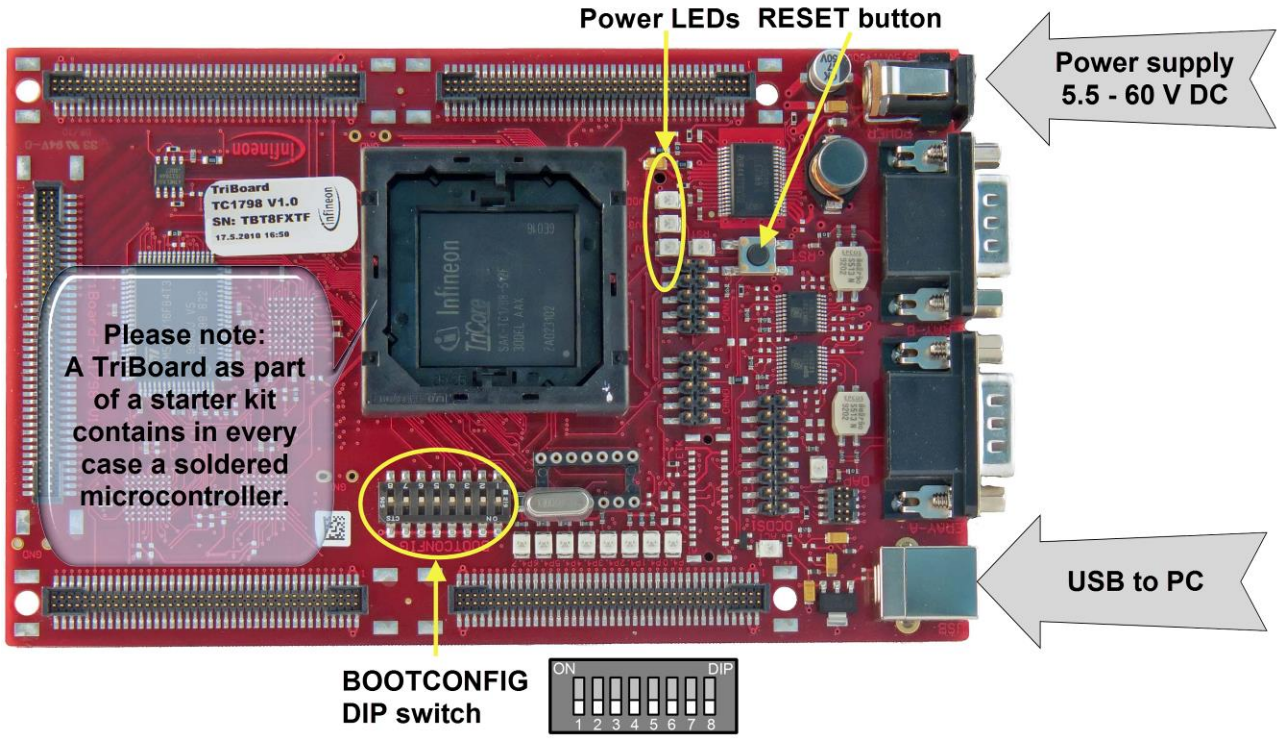


Figure 28 TC1798 - TriBoard

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).

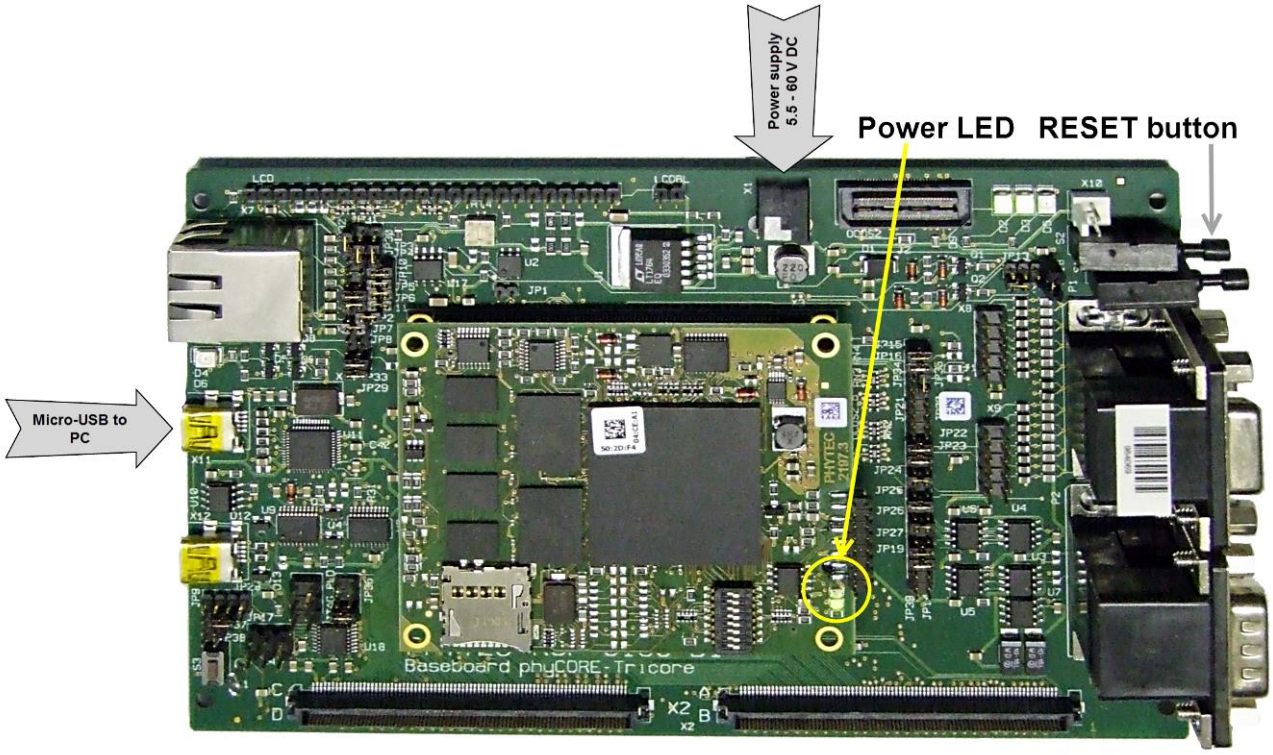


Figure 29 phyCORE - TC1793 with baseboard

Debugging your Application

Start a Debug Session

1. Click at the debug button and select **Debug Configurations ...** (Figure 30).

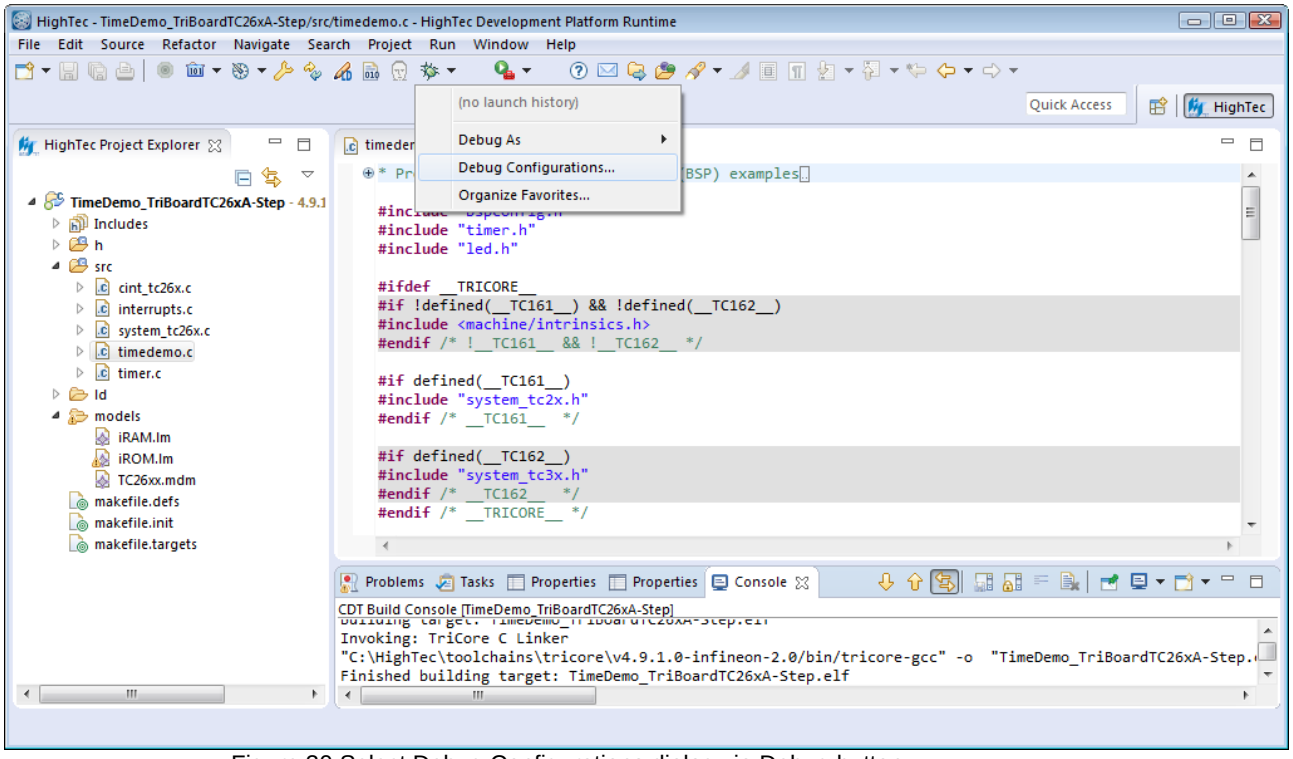


Figure 30 Select Debug Configurations dialog via Debug button

2. The **Debug Configurations** dialog appears. Select **Universal Debug Engine** as debug type (Figure 31).

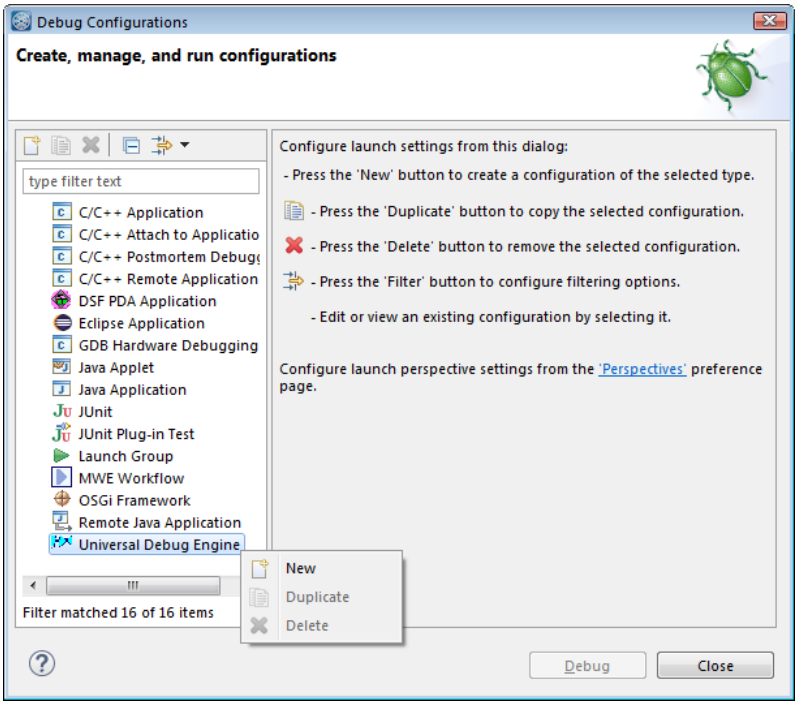


Figure 31 Debug Configurations dialog

3. Press the **New launch configuration** button to create a new debug launch configuration for Universal Debug Engine (Figure 32).

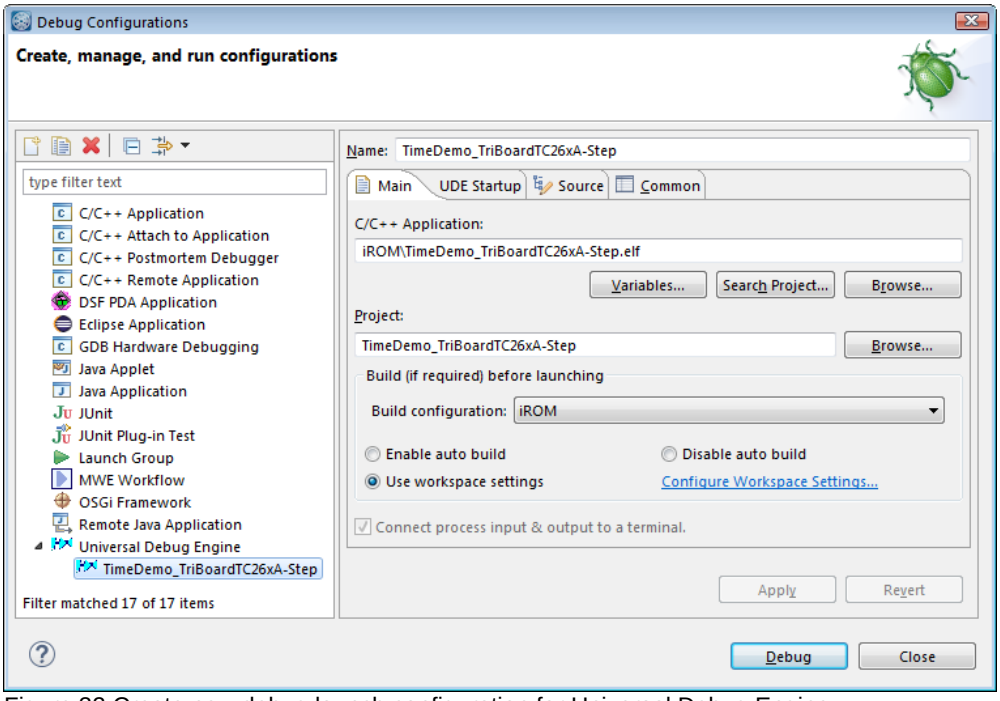


Figure 32 Create new debug launch configuration for Universal Debug Engine

4. A new debug configuration **TimeDemo_TriBoard-TC275A** is created. All input fields are pre-filled with appropriate values (Figure 33).

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 33).

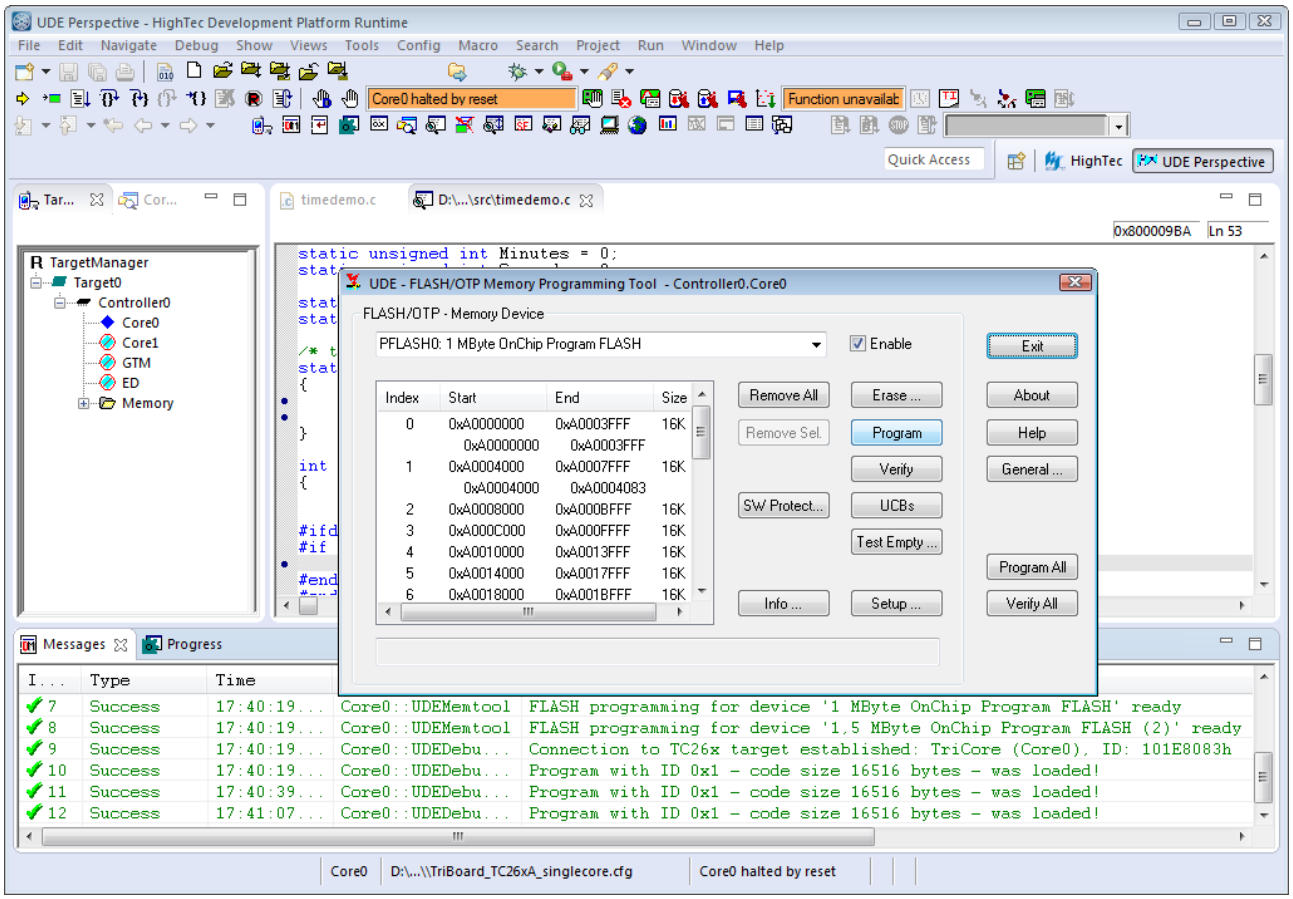


Figure 33 UDE Memory Programming Tool

7. Start flashing with the **Program** button. A progress dialog appears (Figure 34). After successful programming close both dialogs.

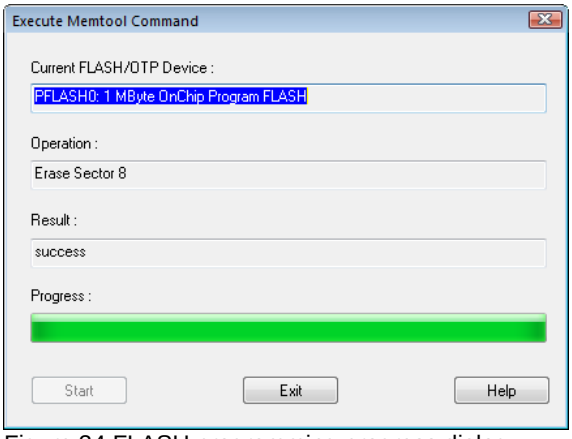


Figure 34 FLASH programming progress dialog

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 35).

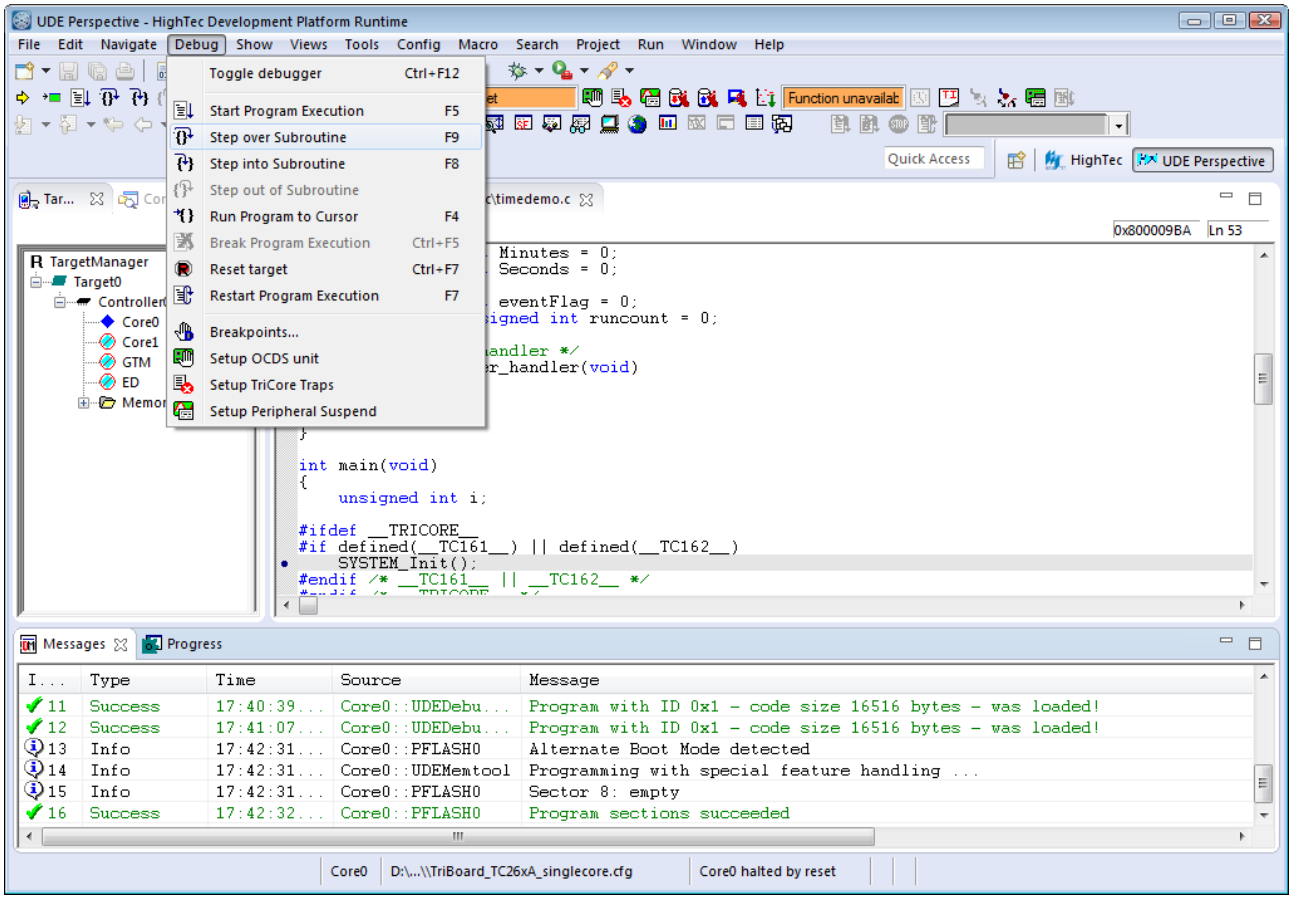


Figure 35 First step to main() function

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 36 shows an UDE example configuration with Peripheral Registers, Call stack, Watch window, and Memory window. All features are described in the **UDE Manual**.

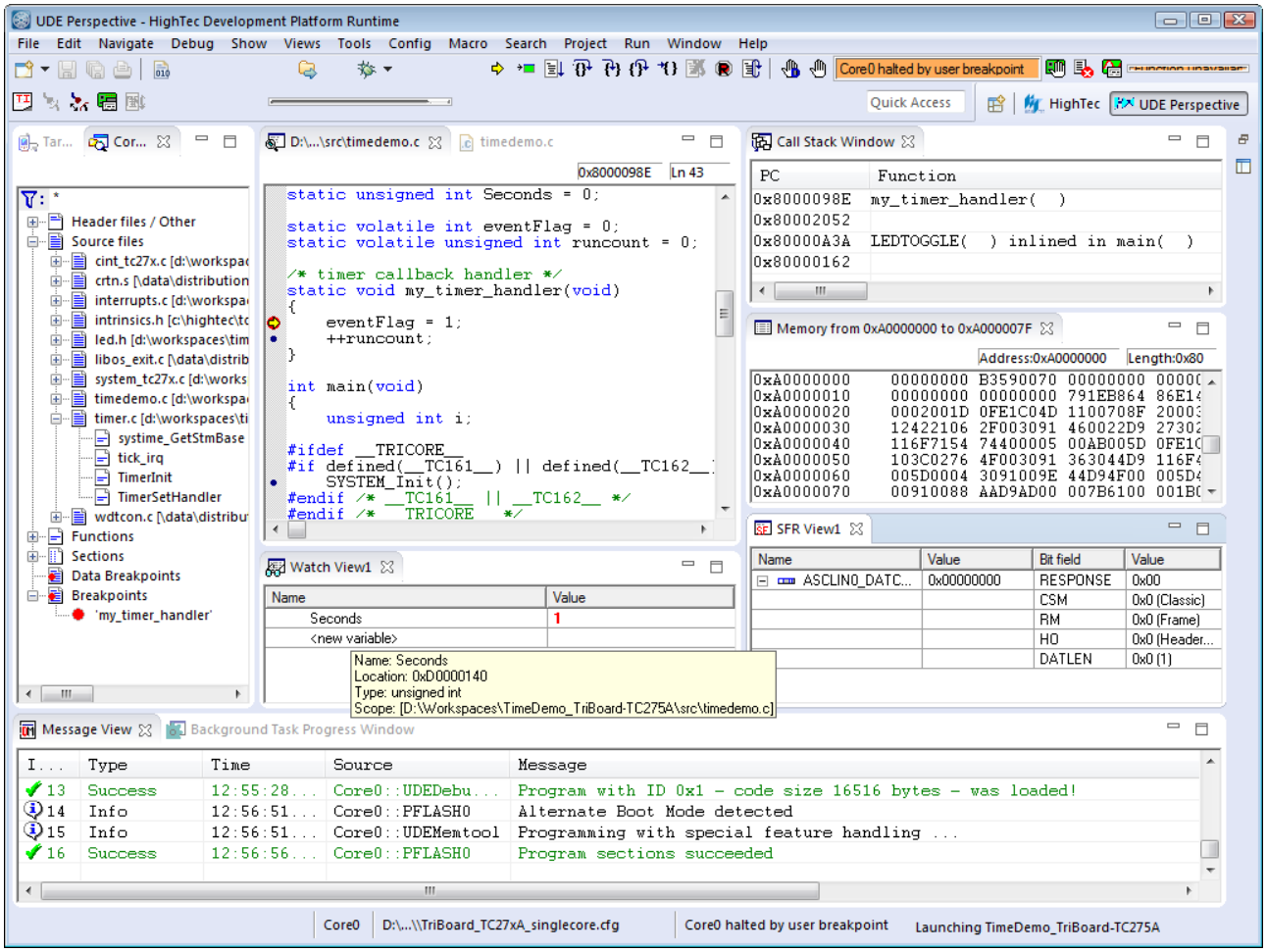


Figure 36 Universal Debug Engine perspective

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 Free TriCore 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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