MCBTMS570
Quick Start Guide

KEIL™ Tools by ARM

Getting Started

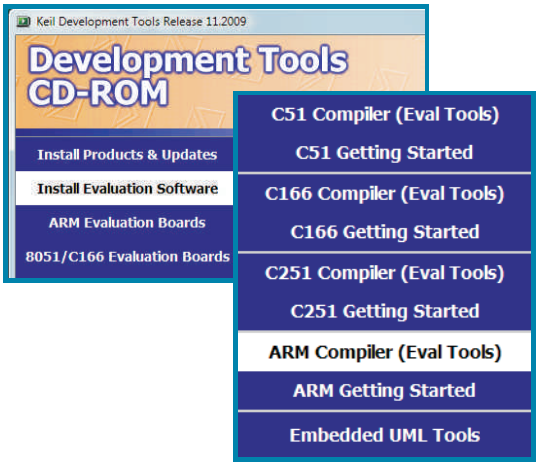
This **Quick Start Guide** introduces the Keil development tools for the TMS570 family of Cortex-R4 devices from Texas Instruments. It shows how to install the Keil development tools for ARM-based devices, set up the hardware, and begin application development.

Installing the Software

To install the evaluation version of the Keil Microcontroller Development Kit (MDK-ARM):

- Insert the CD-ROM into your PC
- Follow the setup program instructions

The SETUP program installs the Keil MDK-ARM that includes µVision4 IDE/Debugger and the ARM Compilation Tools.



You may download the latest MDK evaluation software from the Keil website: www.keil.com/demo.

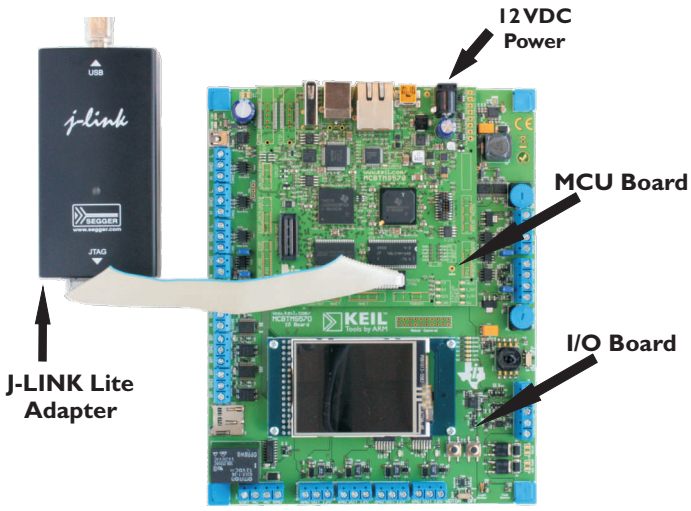
Installing the Hardware

The MCBTMS570 Evaluation Board set is made up of:

- **MCU Board** which features the TMS570 microcontroller, along with the USB interfaces, power connector and debug interfaces.
- **I/O Board** which features a color LCD touch screen and provides interfaces for the on-chip peripherals. The I/O board provides connectors for CAN, LIN, Ethernet, solenoid, and MicroSD card. It includes light and temperature sensors and a speaker.

To use the TMS570 Evaluation board set:

- Ensure that the MCU Board is mounted to the I/O Board
- Connect the J-LINK Lite adapter to the JTAG connector of the MCBTMS570 board
- Connect the J-LINK Lite adapter to the PC via a USB cable
- Connect the supplied 12VDC power adapter to the coaxial connector on the MCU board



Exploring the Example Projects

MDK-ARM includes example programs configured for the TMS570 evaluation board. Each example is stored in a separate folder at:

C:\Keil\ARM\Boards\Keil\MCBTMS570

The examples range from a simple Blinky project which verifies that programs build and quickly gets you started; to complex examples which exercise the communications interfaces and use the Keil RTX Real-Time Kernel.

Each project folder has the same structure, and include:

- Application source files for the example
- **StartupTMS570.s** startup code for the microcontroller
- **SystemTMS570.c** initialization file for the microcontroller
- **Abstract.txt** file that explains how the example works and which peripherals and interfaces are exercised

Blinky Example

This example demonstrates the ease-of-use and ensures that MDK-ARM is correctly installed. It can be found at:

C:\Keil\ARM\Boards\Keil\MCBTMS570\Blinky

To use this example:

Double-click on the Keil uVision4 icon to start µVision. Open the Blinky project file with **Project - Open**

Compile and link the Blinky application with **Project - Build**

Program the application with **Flash - Download**

The LEDs on the MCU board start toggling which is the primary function of the Blinky application.

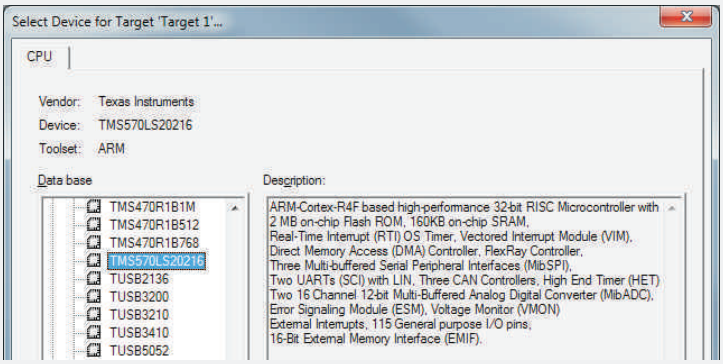
You may start the µVision Debugger to inspect the code

Using the MCBTMS570 Evaluation Board

Creating a New Project

MDK makes it easy to create new programs for the TMS570 by providing the Device Database, Startup Code, and Configuration Wizard that help you select your target, and configure the tools.

- To start a new project use **Project - New µVision Project**. Assign a project file name and save to your preferred location.
- µVision opens the Device Database that allows you to select the targeted device. Select vendor **Texas Instruments** and the **TMS570LS20216** microcontroller.



After selecting the microcontroller, µVision gives you the option to copy its startup code to the project workspace. You should accept this option so that you do not need to create this file yourself.

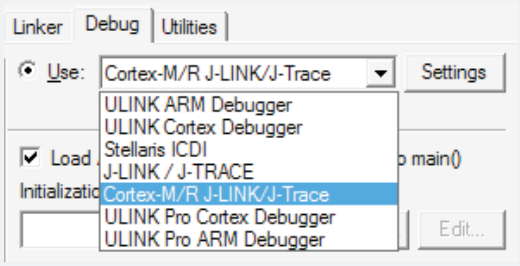
To add files to your new project expand the folder **Target 1** in the **Project** window and right click on **Source Group 1** to open the context menu. Then use **Add Files to Group** to add existing source files to the project.

New source files for this project may be created with **File - New.**

Compile and debug your application using the steps shown with the **Blinky** example.

Download and debugging works via the JLINK adapter. To select and configure the J-Link adapter click on the **Options for Target** icon.

- Under the **Debug** tab, select Cortex-M/R J-LINK/JTRACE and click on **Settings** to configure the unit



- Do the same under the **Utilities** tab

For further information see the MCBTMS570 User's Guide available at: www.keil.com/support/man/docs/mcbtms570. Configuration details are in the chapter **Writing Programs**.

Confidence Test Application

The Confidence Test Application allows to verify most functions of the CPU and I/O board. It can be found at:

C:\Keil\ARM\Boards\Keil\MCBTMS570\ConfTest

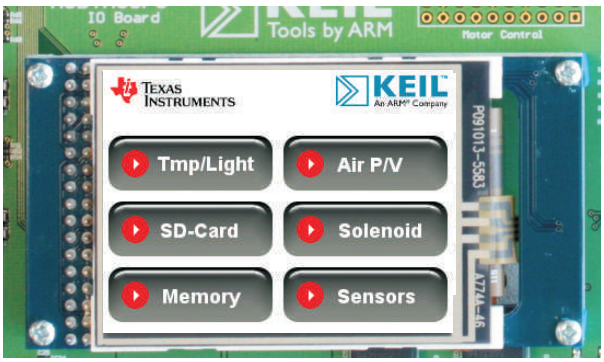
This application is provided in source code and shows the usage of most peripherals. Two project targets are provided:

- **Eval Version**: pre-compiled for Flash download with an evaluation version of MDK-ARM
- **Full Version**: to be build with a licensed version of MDK-ARM

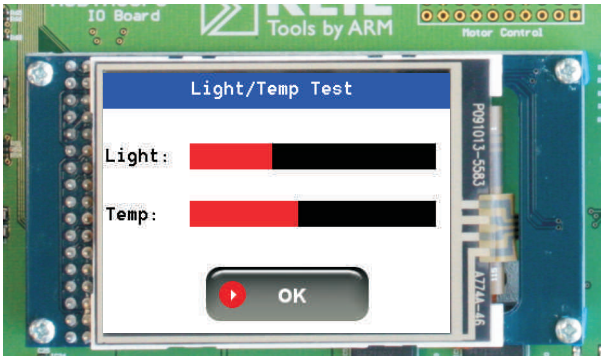
The Confidence Test Application is programmed using **Flash - Download** and can be controlled from the LCD screen. It verifies the following components:

- Temperature and light sensor provided on the I/O board
- SD-Card interface lists card size and card ID
- 512KB RAM provided on the CPU board and FRAM, EEPROM provided on the I/O board
- Sensor inputs by displaying the input voltage
- Signal outputs for air pump and valve
- Four solenoid outputs that can be switched

Tested are also the LEDs, loudspeaker, push buttons, and the LCD touch screen. In addition the board provides interfaces for Ethernet, CAN, Flexray, USB device, USB host, MIPI, RS485/LIN, USB/COM bridge, Pulse oximeter, and pressure sensor.



The Confidence Test Application is controlled from the LCD touch screen.



Light and Temperature sensors are provided on the I/O board and their level is shown on the LCD screen.