## Developing Software Project Using Keil MDK-ARM Version 5

All the programs in the book were developed under Keil MDK-ARM v4.71. Since then, Keil has released v5. A major change in Keil v5 is the creation of device family support software packs.

If this is the first time you start a project for Tiva C Series microcontroller and you have not install the Device Family Pack yet, click the Pack Installer button to launch the installer. You only have do this once.



After the Pack Intaller is launched, it takes a short time to fill the list of devices. On the right panel, select **Devices** tab then scroll down and expand Texas Instruments then click select **Tiva C Series**. The **Keil::TM4C\_DFP** will be added to the left panel under **Packs** tab. Click the **Install** button to the right of TM4C\_DFP in **Action** column and the installation will start. It may take several minutes to install the pack. When the pack is installed the **Action** button turns green.

۵	Pack Installer – 🗖							
<u>File Packs Window He</u>	elp ments - Tiva C	Series						
Packs Examples	5	4	Image: Operation of the second seco			₽		
Pack	Action	Description	Search:	• ×				
ARM::CMSIS	Up to d.	CMSIS (Cortex Microcontroller S	Device /	Summary				
Keil::MDK-Middlewa	Up to d.	Keil MDK-ARM Professional Mic	🗉 🔮 Renesas	2 Devices		-		
🗉 Keil::TM4C_DFP 🤇	Install	Te as Instruments Tiva C Series	🗉 📍 Silicon Labs	40 Devices				
lwIP::lwIP	♥ Install	IwIP is a light-weight implemen	🗉 🔮 SONiX	40 Devices				
wolfSSL::CyaSSL	Install	Light weight SSL/TLS and Crypt	🗉 🔮 Spansion	307 Devices				
			■ STMicroelectronics	459 Devices				
			🗉 📍 Texas Instruments	340 Devices				
			🗉 🍄 LM3S Series	219 Devices				
			🗉 🍄 LM4F Series	50 Devices				
			E Tiva C Series	71 Devices				
			🗉 📍 Toshiba	67 Devices				
•		Þ				-		
Completed reading Pack des	criptions		[ <u></u>		ONLIN	E		

If it asks you whether you want to add the new device family pack to the project or not. Click Yes.

When you start a new project in Keil v5, after selecting the target device a window will pop up for you to manage the run-time environment. For all the sample programs of the book, you need to select **CMSIS->CORE** and **Device->Starup** as seen in the figure below.

Software Component	S	Variant	Version	Description
🖻 🔶 CMSIS				Cortex Microcontroller Software Interface Components
CORE			3.40.0	CMSIS-CORE for Cortex-M, SC000, and SC300
DSP			1.4.2	CMSIS-DSP Library for Cortex-M, SC000, and SC300
🗉 💠 Rtos (API)			1.0	CMSIS-RTOS API for Cortex-M, SC000, and SC300
CMSIS Driver				Unified Device Drivers compliant to CMSIS-Driver Specifications
Device				Startup, System Setup
Startup			1.0.0	System Startup for Texas Instruments Tiva C Series
🗉 💠 File System		MDK-Pro	6.2.0	File Access on various storage devices
Graphics		MDK-Pro	5.26.1	User Interface on graphical LCD displays
Network		MDK-Pro	6.2.0	IP Networking using Ethernet or Serial protocols
USB		MDK-Pro	6.2.0	USB Communication with various device classes
/alidation Output			Description	

The projects in Keil v5 are created with an additional startup file named system\_TM4C123.c.

This startup file system\_TM4C123.c contains the function SystemInit() which is in conflict with the function of the same name in the sample programs of the book. The conflict can be easily resolved by deleting the SystemInit() function in all the sample programs.

The other issue with the SystemInit() function in the new system\_TM4C123.c is that it configures the clock generation and results in a different system clock rate than the default 16 MHz. All the sample programs in the book assume the default 16 MHz system clock. Some of these sample programs will have timing issues with Keil v5. You may retain the default system clock rate in Keil v5, by the following steps:

- 1. Expand the Project->Device to show system\_TM4C123.c (startup)
- 2. Double click to open the file in editor window
- 3. Find the line "#define CLOCK\_SETUP 1" as the figure below
- 4. Comment out the line
- 5. Rebuild the project

Project 📮 🛽	syst	tem_TM4C123.c
Project: p11_2	29	// <i> Uncheck this box to skip the clock configuration.</i>
🖮 😂 Target 1	30	//
🖃 🗁 Source Group 1	31	// The following controls whether the system clock is configured in the
p11.2 c	32	// SystemInit() function. If it is defined to be 1 then the system clock
	33	// will be configured according to the macros in the rest of this file.
CIVISIS	34	// If it is defined to be 0, then the system clock configuration is bypassed.
Device	35	
startup_TM4C123.s (Startup)	36	#define CLOCK_SETUP 1
system TM4C123.c (Startup)	37	
-,(	38	//************************************
	39	//
	40	// <b> Bun-Mode Clock Configuration (PCC)</b>