Author: Addison Elliott

Date Created: 8/23/2017

Last Updated by: Addison Elliott

Last Updated: 11/01/2017

Setting up DSP Starter Kit (DSK)

- Begin by downloading the latest Code Composer Studio (CCS) software from the following link: <u>http://processors.wiki.ti.com/index.php/Download_CCS</u>
 - a. CCS v3.1 is available on the CD with the product but this does **NOT** support Windows Vista and higher operating systems. You must use a later version of CCS for these OSes.

	X G Imsi2Deb000 code com: X 🕂 pruJ01c.pdf X 🔶 Download CCS - Texas In: X	(Addition	- 1	3					
C O process	Hs.wikit.com/index.php/Download_CCS	\$ 0		• ®					
Apps M Inbox - addis	nzelico 🚦 Bliott, Addison - Oui 👔 Facebook 🧧 Addison's Website 🚳 Boctrical Engineering 🚇 NavTube 👂 Pendora Internet Ra: 🖑 Blectrical Engineering 🖳 Amazon.com Online 🥛 Things to Buy 🔏 Rockkuto Parts Catali 👭 BOMicro Electronics 🜑	CHASE Bank - C	redit						
	Download CCS								
Aan Page U pages (L categories Recent changes Random page (Help) Mitterport Create a book Dominoda as PDP Printable version Ootbor What links here Related changes Special pages	Centents (hide) 1 Cloud Tools 2 Downlasd the latent CCS 2.1 Free License for dater venions 2.2 Degreaction notices 3 CCS Incommant Update Policy 4 Code Composer Studio Venisin 7 Downloads 5 Code Composer Studio Venisin 8 Downloads 7 Code Composer Studio Venisin 8 Downloads 7.1 Image Descriptions 7.2 CCSV4 Relatese Archives 8 Code Composer Studio Venisin 8 Downloads								
age information	Code Comparer Studio Version 2 Downloads Cloud Tools								
	Ibrarles, CCS Cloud is a cloud-based IDE and PinMux enables you to select your perpherals and generate the pin configuration. Download the latest CCS								
	D Westers								
	Version 7.2.0.0013 Linux Installation Instructions System Hardware Requirements Training Material @								
	Licensing: CCSv7 is now Technology Software Publicly Available (TSPA) compliant. This means that it does not require a paid license.								
	Update Status: This release will be available as an update								
		Mac Users Please note that only microcontroller and connectivity devices are supported on Mac. Processors devices are not support. See MacOS Host Support CCSv7 for more information. Also if you do not have administrative rights on your Mac then you will need to run the installer with a command that looks like this: xathd com apple quantatine cos_ebut_7.1.0.0016 app (replace the filename with the version you are using). If you do not do that then MacOS will copy the executable to another folder and run it from there, as a result the installer will not be able to the officient Bear will runs as well runs as the folder.							
	Mac Users Please note that only microcontroller and connectively devices are supported on Mac. Processors devices are not support. See MacCB Host Support CCSV? for more information. Also if you do not have administrative rights on your run the installer with a command that looks like this .xath - 4 com apple quantatine ccs_setur_7.10.00016 app (replace the filename with the version you are using). If you do not do that them MacOS will copy the executable to another folder result the installer will not be also the dot the total filename with una a version site.	and run it from	there, as	а					
	Mac Users Please note that only mercontroller and connectivity devices are supported to Mac. Processor services are not support CCSV for more intermation. Also F you do not have administrative rights on your in the installer will not be able to find the offline files and will run as a web installer. Linux Users Please note that there is an issue with certain version of the linux kernel/# that if installed will prevent CCS from starting and RTSC based projects from building. A fix is available in the latest kernel updates. If you are running into you have the distaller will not be able to find the offline files and will run as a web installer.	and run it from	there, as	a sure					
	Mac Users Please note that only microcontroller and connectivity devices are supported on Mac. Procession services are not support 2CSV? for more information. Also Fyou do not have administrative rights on you run the installer will no command that looks like this: staft -4 corn apple quarantine cos_setup_7 10.00016 app (replace the flename with the version you are using). If you do not have administrative rights on you run the installer will not be able to find the offline files and will run as we bistaller. Linux Users Please note that there is an issue with certain version of the linux kernelip that if installed will prevent CCS from starting and RTSC based projects from building. A fix is available in the latest kernel updates. If you are running into you have the tate's updates update is an assue with certain version of the linux kernelip that if installed will prevent CCS from starting and RTSC based projects from building. A fix is available in the latest kernel updates. If you are running into you have the tate's updates update support.	r and run it from	there, as	a					

2. After the executable is finished downloading, double-click it to run. A window will open up and check the status of your system. If there is any errors or warnings in the textbox, it is recommended you resolve those issues before continuing

👽 Code Composer Studio v7 Setup —	[\times
CCS Installation		S	
The Code Composer studio installer is checking for any preinstall dependencies. This may take some time.		Ŭ,	Ŭ.
Please read the information carefully to determine if you need to take any action prior to continuing.			
Starting dependency checks Operating System Check: Windows 10 -> OK Unicode character Check -> OK			
Anti-Virus Check -> We have detected you are running anti-virus software on this computer. To ensure no problems occur during t is highly recommended that real-time file scanning be turned off before proceeding with the installation. Pending reboot Check -> OK	he in:	stallatio	on, it
Checking Windows Updates Done			
Texas Instruments		Contin	iue

- 3. Accept the terms and conditions and continue
- 4. Select the desired installation folder for CCS and continue
 - a. If unsure, leave the default folder and continue

👽 Code Composer Studio v7 Setup				×
Choose Installation Location Where should Code Composer Studio v7 be installed?				
To change the main installation folder click the Browse button.				
CCS Install Folder				
c:\ti ~				Browse
Texas Instruments				
	< Back	Next >	Finish	Cancel

5. Select the Product Families to be installed. For this DSP Starter Kit, the processor is **C6000 Power-Optimized DSP**. Press "Next" to continue

👽 Code Composer Studio v7 Setup			×
Processor Support Select Product Families to be installed.			X
Image: Simple State St		Description The C6000 DSP category includes a number of DSP families: C66x, C674 and C64x	x
Select All		Install Size: 958.92 MB. Download Size: 319.64 MB.	
Texas Instruments	< Back	Next > Finish Can	cel

- 6. Select the **Spectrum Digital Debug Probes and Boards** option and click Finish
 - a. This option installs the drivers required to program to the board

😳 Code Composer Studio v7 Setup				\times
Select Debug Probes Select the debug probes you want installed and deselect the debug probes you wa	ant to leave out.			
 ☐ TI XDS Debug Probe Support ☐ Blackhawk Debug Probes ☑ Spectrum Digital Debug Probes and Boards 		Descriptio	nd support files fo AG debug probes nent boards.	r Spectrum and
Select All		Install Size Download	: 1169.97 MB. Size: 389.99 MB.	
Texas Instruments				
	< Back	Next >	Finish	Cancel

7. CCS will now be downloaded and installed. When finished, you will see a window like the following. Click Finish and CCS is successfully installed!



8. Start CCS. Upon first startup, a dialog will appear asking where your workspace directory should be located. The default location is fine but check **Use this as the default and do not ask again** and press OK.

0400	F F			
10.00	ECI	ipse l	launc	her
-10 P				

Select a directory as workspace

Code Composer Studio uses the workspace directory to store its preferences and development artifacts.

Workspace: C:\Users\adellio\workspace_v7	∽ Browse
☑ Use this as the default and do not ask again	OK Cancel

×

- 9. Next, we need to install any necessary updates. Go to Help->Check for Updates
- 10. Install any necessary updates. Typically, the C6000 device support will need to be updated

💱 Available Updates						\times
Available Updates					Ó	
Check the updates that you wish to install.					C	
Name	Version	ld				
C6000 device support	1.1.4	com.ti.ccstudi	o.c6000.devicesup	port.win		
TI Emulators	7.0.48.0	com.ti.emulati	on.pack.win32.fe	ature.gro		
Select All						
Details						
						ŝ
?		< <u>B</u> ack	<u>N</u> ext >	<u>F</u> inish	Can	cel

- 11. Next, we must install the C6000 compile. Select View->CCS App Center
- 12. In the section "Code Composer Studio Add-ons", select **C6000 Compiler (v7)** and then select **Install Software** at the top of the page
 - a. The C6000 Compiler v8 and above does **NOT** support this board anymore since it is so old. You must use v7 of the compiler!



- 13. Accept the terms of agreement, and follow the prompt to finish the installation. Restart CCS to have the changes take effect
- 14. The software side of things is complete for installation. Now we move on to the hardware. Plug in the +5V power supply to the DSK board. When power is applied to the board the Power On Self Test (POST) will run. LEDs 0-3 will flash. When the POST is complete all LEDs blink on and off then stay on. At this point your DSK is functional.



- 15. At this point, your DSK is functional and you can connect it to your PC with the included USB cord.
 - a. You should hear the familiar "beep" noise when plugging in the USB. If not, this may be an issue.
- 16. You are finished setting up your DSK board. The next steps are to create a project and compile and run it on the board.

Creating Project in CCS

- 1. To begin creating a new project in CCS, start by selecting File->New->CCS Project
 - a. You can also select **File->New->Project** and then select **CCS Project** but this is an extra step
- 2. A new project dialog box will appear. Fill in the following settings:
 - a. **Target:** TMS320C6713
 - b. Connection: Spectrum Digital DSK-EVM-eZdsp onboard USB Emulator
 - c. Project Name: Your desired project name
 - d. Compiler Version: TI V7.4.23 (version downloaded from CCS App Center)

😵 New CCS	Project								×
CCS Project .									
Target: Connection:	<selec< td=""><td>t or type filter te um Digital DSK-E</td><td>xt> VM-eZdsp onboa</td><td>~ ard USE</td><td>TMS320C Emulator</td><td>6713</td><td>~</td><td>Verify.</td><td>~</td></selec<>	t or type filter te um Digital DSK-E	xt> VM-eZdsp onboa	~ ard USE	TMS320C Emulator	6713	~	Verify.	~
管 C67XX [C6000]								
Project name: SimpleExample									
🗹 Use def	ault loca	ation					_		- 1
Location: C:\Users\adellio\workspace_v7				Simple	Example		E	rowse	
Compiler version: TI v7.4.23						~		More	
 Advance Project to 	d setting emplate	gs s and examples							
 Project templates and examples type filter text Empty Projects Empty Project (with main.c) Empty Assembly-only Project Empty RTSC Project Basic Examples Hello World 			Creat the s an er	es an empt elected dev npty 'main.	y project fully ir ice. The project c' source-file.	nitialize will co	ed for ontain	~	
Open <u>Resourc</u>	ce Explo	r <u>er</u> to browse a v	vide selection of e	exampl	e projects				
?			< Back	N	ext >	Finish		Cance	I

- 3. Select "Finish" to create the project. A new window will appear where you will spend most of your time programming. Make sure you have the "Project Explorer" panel on the left hand side. If not, you can show it by selecting **View->Project Explorer**
- This next step is a one-time thing. If this has already been completed, then you may move on to the next step. Extract the provided folders include and lib folders to
 C:\ti\ccsv7\tools\compiler\c6000_7.4.23. There should already be existing include and lib

folders in this directory

- a. These files are used to communicate with the board. They are specific to the board with functions such as read from Audio Codec, read state of switch, or change the state of the LEDs
- b. The provided directory will depend on where you installed your CCS installation. Please adjust accordingly

\leftarrow \rightarrow \checkmark \uparrow \square \rightarrow Thi	is PC \rightarrow OSDisk (C:) \rightarrow ti \rightarrow ccsv7 \rightarrow tools \rightarrow c	ompiler > c6000_7.4.2	3
.ssh ^	Name	Date modified	τ
🗾 IndependentStu	🔄 bin	8/25/2017 10:16 AM	F
InstallingCodeC	🔒 doc	8/25/2017 10:16 AM	F
b Music	📙 include	8/25/2017 10:57 AM	F
2 0 0: (0 :	lib	8/25/2017 10:58 AM	F
Chebrive for Busil	nan 📊	8/25/2017 10:16 AM	F
5 SharePoint		8/25/2017 10:16 AM	F
This DC	C6000_7.4.x_CodeGenerationTools_Manif	8/18/2017 4:34 PM	C
	Closed_defects.html	8/18/2017 4:34 PM	C
A360 Drive	LICENSE.txt	8/18/2017 4:35 PM	Т
E Desktop	i misra.txt	8/18/2017 4:34 PM	Т
Documents	📀 Open_defects.html	8/18/2017 4:34 PM	C
🕂 Downloads	README.txt	8/18/2017 4:34 PM	Т

- 5. Now we need to link the library files that contain the actual source code for the support library functions. In the Project Explorer, right-click your project name and select **Show Build Settings**
- A new dialog will appear. Select CCS Build->C6000 Linker->File Search Path in the list on the left hand side. Under the first textbox, select the paper icon with the green plus to add a new library. Type in dsk6713bsl.lib and select OK

ype filter text	File Search Path	← ▼ ⇒ ▼
General General C6000 Compiler Processor Options Optimization Debug Options Include Options Performance Advisor Advanced Options C6000 Linker Basic Options File Search Path Advanced Options C6000 Hex Utility [Disabled]	File Search Path Configuration: Debug [Active] Include library file or command file as input (lib) "libc.a" dsk6713bsl.lib Add file path File: Add <dir> to library sea "S{CG_TOOL_ROOT}/lib"</dir>	
	Search libraries in priority order (priority, -prior Reread libraries; resolve backward references (1 Disable automatic RTS selection (disable, auto)	rity) reread_libs, -x) rts)

7. Repeat Step 7 to add another library named csl6713.lib

- a. Repeat Step 7 and Step 8 for the Release configuration by selecting the combo box at the top and changing it from Debug to Release
- Press OK again to exit the build settings and open the file TMS320C6713.ccxml (it may also be located in the directory targetConfigs). Select the Advanced tab at the bottom of the page. Select TMS320671X in the connections tree view. Finally, set the initialization script under Cpu Properties to the GEL script (DSK6713.gel) provided.
 - a. The GEL script contains to flush the cache, reset the board, and other things that are not absolutely required to build your project. However, one issue that arises without the GEL script is running your project on the board requires you to power cycle the board each time.

workspace_v7 - CCS Edit - HelloWorld/targetConfigs/ File Edit View Navigate Project Run Scripts Wi	TMS320C6713.ccxml - Code Compose ndow Help	er Studio				-	٥	×
📑 • 🔜 🐚 🗳 🍕 • 🖉 🏘 • 🔗 🗊	Þ• ⇔ •					Quick Acce	ss 🖻 😰	5
Project Explorer ≅ ♥ #leloWorld [Active - Debug] ♥ Binares > ♥ Binares > Debug ▶ Release ♥ targetConfigs Image: Release > @ config: Config	B % ♥ ■ C Gett Targ	tting Started @ main.c tet Configuration Connectors % Spectrum Digital DSK-FVM- MINS20C6713 TMS320C671X Advanced Source	2 +TMS320C6713.ccml №	Jmport_ New_ Add_ Delete Up Down Test Connection Save	Cpu Properties C671x CPU Set the properties of the selected cpu. Bypass initialization scriptDesktop\DSK6713.gel Slave Processor		Brow	Se
	Con:	nsole 🛛			Problems 🛛		9	- 0
	No con	nsoles to display at this time.			0 errors, 3 warnings, 0 others			

- 9. Press OK again to exit the build settings and open the file **main.c** from the Project Explorer. This should be familiar to you since this is where the C code will be at. As an initial test, copy/paste the code below into the file
 - a. The CHIP_6713 macro is required for **EVERY** project to let the library know what board this is for.
 - b. The three include files are also necessary to import the functions dsk6713_XXX
 - c. In future projects, **don't** forget to call dsk6713_init() and supplementary init's or the program will not work correctly
 - d. In this example, LED 2 (they are labelled on the board) will toggle on/off at a rate of 1Hz

```
/*
 * main.c
 */
#define CHIP_6713
#include "dsk6713.h"
#include "dsk6713_led.h"
#include "dsk6713_flash.h"
void main(void)
{
    DSK6713_init();
    DSK6713_LED_init();
    while (1)
    {
        DSK6713_LED_toggle(2);
        DSK6713_waitusec(1000000);
    }
}
```

- Press the hammer icon to build the source code into a binary with extension .out. You will know it built correctly if the two panels at the bottom **Console** and **Problems** show that no errors occurred
 - a. If you get an "undefined reference..." error, that means you made a mistake with linking the .lib file
 - b. If you get an "cannot find some include .h file" error, that means you may have forgotten to copy the include files into the correct directory



- 11. Finally, we will upload the binary to the board and run the code. Select Run->Debug or press F11
 - a. CCS will change from edit mode to run mode.
 - In the **Debug** panel, you should see the emulator name with the following in parenthesis: (Suspended – SW Breakpoint). This means the binary was successfully uploaded and it is waiting to run.



- 12. Click the **Resume** button at the top or press **F8.** Your code should now be running and the Debug panel should say (Running).
- 13. Now, doing this every time you want to test some code can be a major pain. Instead, it is easier to press the **Suspend** button or **Alt+F8**.
- 14. You can now make changes to your code as you see fit. Finally, press the **Build** button. Select Yes to reloading the program automatically. It will be in the same state as step 11. Click **Resume** and you are editing code again.

File Edit View Project Tools Run Scripts Window Help | 🗂 🕶 🔚 🐚 | 🖳 🕪 🗉 🔳 🎿 👁 📭 🔠 🖳 🇞 🚇 🕶 🕅 🖉 🌰 🗸 🍼 🛝 🗸 🍼 🐔 🕶 🖏 🖉 👘 🖉 8 🏇 Debug 🖾 SimpleExample [Code Composer Studio - Device Debugging] P Spectrum Digital DSK-EVM-eZdsp onboard USB Emulator/TMS320C671X (Suspended - SW Breakpoint) main() at main.c:11 0x00000D20 c_int00() at boot.c:87 0x00000CF8 (the entry point was reached) 🖻 main.c 🔀 🚺 hello.c R TMS320C6713.ccxml C DSK6713_wait(unsigned int) at dsk6713.c:189 0x3b4 1/* 2 * main.c 3 */ 4 #define CHIP 6713 6 **#include** "dsk6713.h" 7 **#include** "dsk6713_led.h" 8 **#include** "dsk6713_flash.h" a 10 void main(void) 11 { DSK6713_init(); 12 13 DSK6713_LED_init(); 14 15 while (1) 16 { DSK6713_LED_toggle(1); 17 18 DSK6713 waitusec(1000000); 19 3 20 }

Frequently Asked Questions

- Where can I find necessary schematics, technical reference manuals, and other documentation for the DSK?
 - Everything can be found here: <u>http://c6000.spectrumdigital.com/dsk6713/revc/</u>

Additionally, some of these documents are contained in the **docs** directory of the ZIP file provided with the project.

• How can I see what functions are available to use?

💱 workspace_v7 - CCS Debug - SimpleExample/main.c - Code Composer Studio

• Well, many of the traditional functions in the C language are available such as *malloc*, *free*, *printf*, etc.

However, there are some special functions from the Board Support Library (BSL) that was included. The API reference can be seen in the help file **C6713DSK.chm** located inside the **docs** folder in the ZIP file provided with the project. Double-click the CHM file and a menu will open.

This documentation is 10+ years older when CCS was at version 3.1 and thus some of the information may not be applicable. However, the following sections contain information regarding the BSL API:

- **BSL API Index**
- **BSL Board Setup API**
- BSL Codec API
- **BSL DIP Switch API**
- BSL Flash API
- BSL LED API
- **Codec BSL Functions**

🛃 Help		- 0	\times
Hide Back Print Options			
Type in the key <u>w</u> ord to find:	BSL API Index		\sim
Board Support Library, BSL API Index	DSK6713 init()	Initialize the 6713 DSK	
6713 DSK	DSK6713 rget()	Read an 8-bit value from a CPLD register	
Block Diagram Board Description	DSK6713_rset()	Write an 8-bit value to a CPLD register	
Board Support Library	DSK6713 version()	Get the DSK version	
Board Support Library	DSK6713 weit()	Spin in a software delay lean	
BSL API Index BSL Board Setup API	DSK(712 iv 0		
BSL Codec API	DSK6713 waitusec()	Spin in a software delay loop (microseconds)	
BSL DIF Switch AFI BSL Flash API BSL LED API	DSK6713 AIC23 openCodec()	Allocate an identifying handle for an instance of a codec	
BSL Overview	DSK6713 AIC23 closeCodec()	Release a codec handle	
Codec BSL Functions	DSK6713 AIC23 config()	Set parameters on codec registers	
Codec Overview Codec Registers	DSK6713 AIC23 read()	Read 32 bits from the codec data stream	
Configuration Switches CPLD	DSK6713 AIC23 write()	Write 32 bit value to the codec data stream	
CPLD Overview	DSK6713 AIC23 rset()	Set the value of a codec control register	
Diagnostic Utility	DSK6713 AIC23 rget()	Return the value of a codec register	
Advanced lests Codec Test	DSK6713 AIC23 outGain()	Set the codec output gain	
Diagnostic Overview	DSK6713 AIC23 loopback()	Enable/disable the codec loopback mode	
General Tests	DSK6713 AIC23 mute()	Enable/disable the codec mute mode	
LED/Switch Test Memory Diagnostic	DSK6713 AIC23 nowerDown()	Enable/disable the codes powerdown modes	
DIP Switches	DSK6712 AIC22 artErs =0	Set the sedes security into	
DIP Switch Overview	DSK6713 AIC23 setFreq()	Set the codec sample fate	
DSK Specific Files Error Messages	DSK6/13 DIP mtt()	Initialize the DIP switches	
Examples	DSK6713 DIP get()	Read the DIP switches	
DSK_App Example	DSK6713 LED init()	Initialize the LED's	
Examples Overview	DSK6713 LED off()	Turn specified LED off	
LEDPRD example	DSK6713 LED on()	Turn specified LED on	
Features	DSK6713 LED toggle()	Toggle the specified LED	
Flash Elash BSL Functions	DSK6713 FLASH checksum()	Calculate checksum for a range of memory	
Flash Description	DSK6713 FLASH erase()	Erase a range of Flash memory	
LEDs	DSK6713 FLASH read()	Read from a range of Flash memory	
LED BSL Functions	DSK6713 FLASH write()	Write to a range of Flash memory	
Managing CDB Files v			
<u>D</u> isplay			\sim

- I received error message "function _acos in file acos.c: invalid instruction schedule generated ..."
 - This is an odd message that happens the **first** time you build a project with CCS. If you simple clean the project and try to rebuild it, the error message should disappear.