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ECE4703 REAL-TIME DSP LABORATORY ORIENTATION

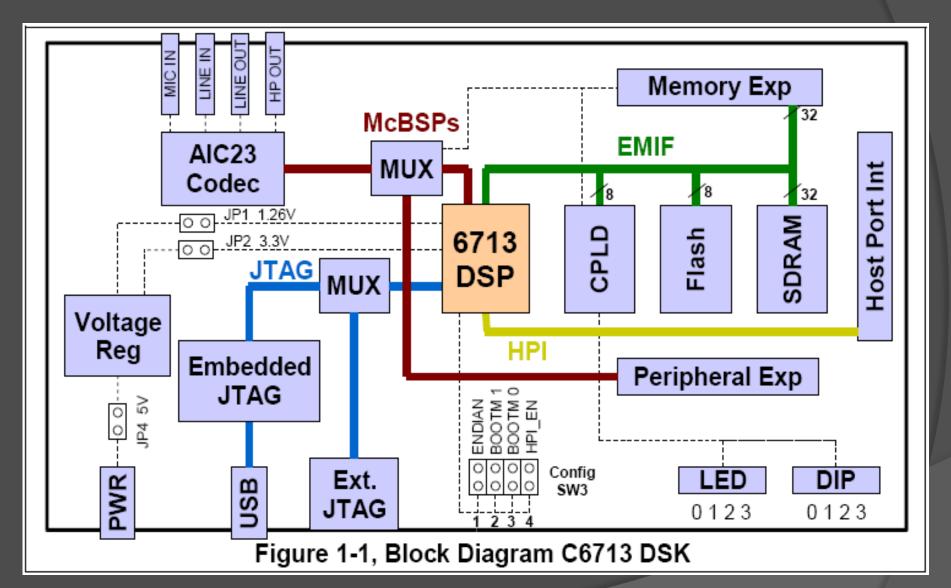


C6713 DSK Overview

- Texas Instruments TMS320C6713 floating point DSP running at 225 MHz
- AIC23 stereo codec (ADC and DAC)
 - Ideal for audio applications
 - 8-96 kHz sample rates
 - Line in/out (we use these most of the time)
 - Microphone in
 - Headphone out
- Memory
 - 16 MB dynamic RAM
 - 512 kB nonvolatile FLASH memory
- General purpose I/O
 - 4 LEDs
 - 4 DIP switches
- USB interface to PC

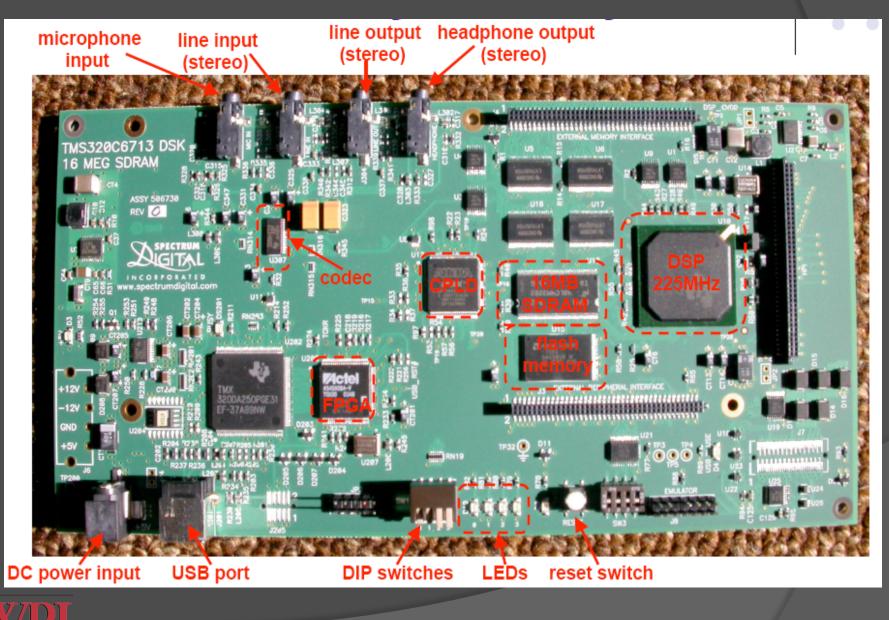


C6713 DSK Functional Block Diagram





C6713 DSK Physical Layout



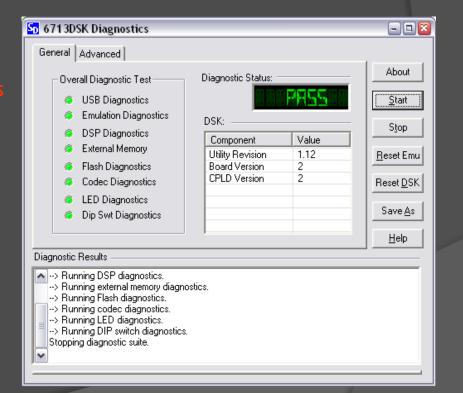
Is my DSK working? DSK Power On Self Test

- Power up DSK and watch LEDs
- Power On Self Test (POST) program stored in FLASH memory automatically executes
- POST takes 10-15 seconds to complete
- All DSK subsystems are automatically tested
- During POST, a 1kHz sinusoid is output from the AIC23 codec for 1 second
 - Listen with headphones or watch on oscilloscope
- If POST is successful, all four LEDs blink 3 times and then remain on



Is my DSK working? DSK Diagnostic Utility

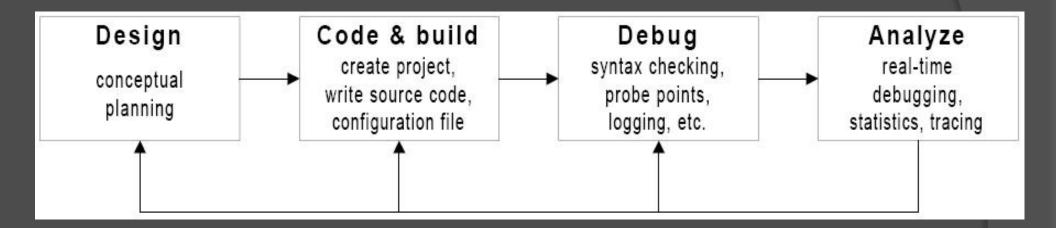






Code Composer Studio IDE





<u>Useful TI documentation (available online or on your hard drive)</u>: SPRU509F.PDF CCS v3.1 IDE Getting Started Guide C6713DSK.HLP C6713 DSK specific help material

Note that we will be using CCS v3.1.



Code Composer Studio IDE

- Connect power supply to DSK
- Wait for POST to complete
- Connect USB cable from PC to DSK
 - If this is the first time connecting the DSK, you may be asked to install a driver. The driver is on the Code Composer Studio CD and will automatically be found by Windows if the CD is in the drive.
- Launch Code Composer Studio C6713 DSK
- CCS will load and wait for your input





Code Composer Studio IDE

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Connecting to the C6713 DSK

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Opening an Existing Project

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	Files of type: Project	Files (*.pjt)	•	Cancel
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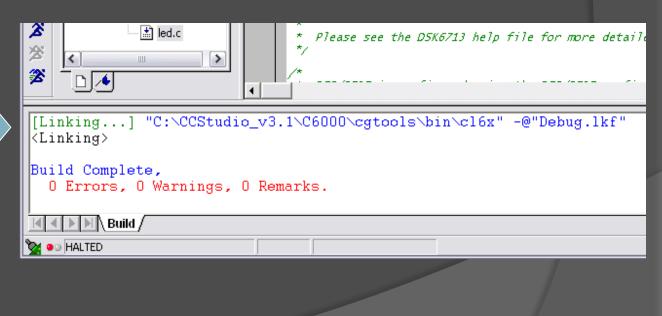
Select a .PJT file and press "Open". You have several example projects on the CD included in your Kehtarnavaz textbook. There are also lots of example projects in these locations: c:\CCStudio_v3.1\myprojects\ c:\CCStudio_v3.1\examples\dsk6713



Compiling/Building a Project

Project->Build (F7)

😻 /C6713 DSK/CPU_1 - C671x - Code Composer Studio								
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Loading and Running a Project on the C6713 DSK

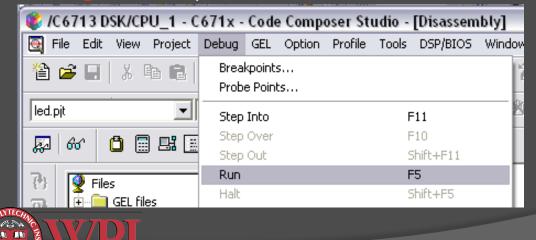
File-> Load Program (ctrl+L)

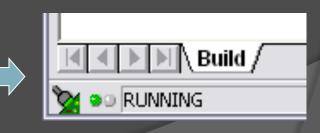
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ed.out	
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Files of type: *.out	✓ Cancel

Select the .out file in the project\Debug directory. Program is sent to DSK.

Debug->Run (F5 or the Run button 👔





Halting a Running Program on the C6713 DSK

Debug->Halt (shift+F5 or the Halt button 🗾).

😻 /C6713 DSK/CPU_1 - C671x - Code Composer Studio - [Disassembly]									
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GEL files	Anim	ate			- A	Alt+F5			



Fixing Some Problems with Example Projects

- Ouring compilation, the compiler can't find some header (.h) files?
 - Fix: Add an item to the CCS search path.
- Ouring compilation, the linker can't find some libraries?
 - Fix: Remove hard links to libraries and add libraries manually to the project.
- Ouring compilation, you get warnings about "far calls" to data?
 - Fix: Set the memory model to "data=far"



Tip: Fixing the search path

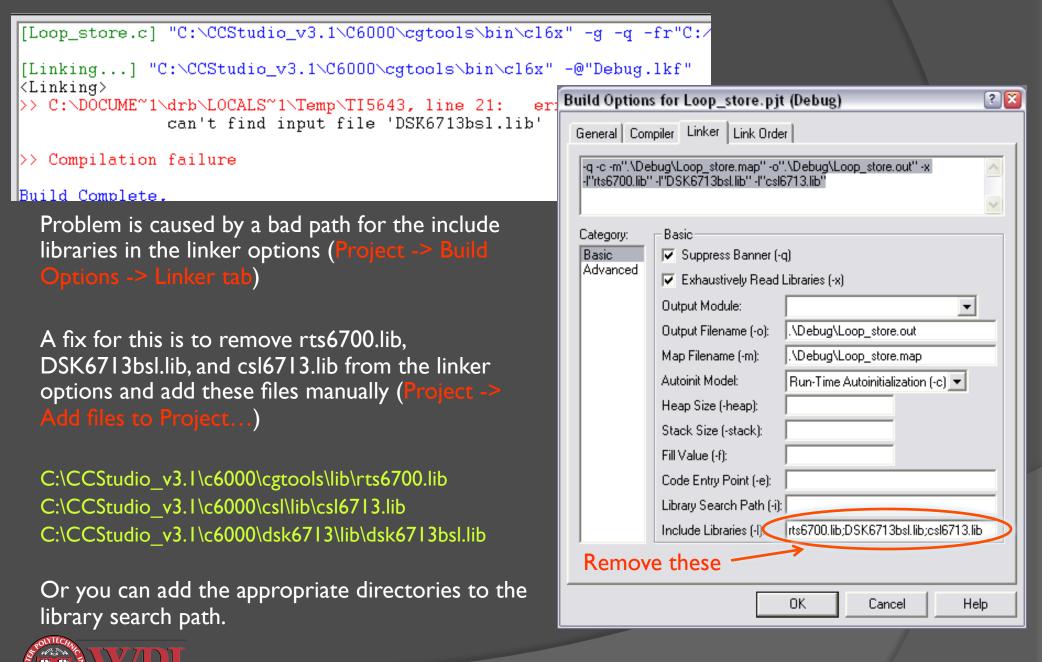
Add C:\CCStudio_v3.1\C6000\dsk6713\include to the search path

Project -> Build Options -> [Compiler tab] -> [Preprocessor catego

Build Options f	or Sine8_LED.pjt (Debug)	? 🗙
General Compile	er Linker Link Order	
-g -s -fr''C:\CCSt	Linker Link order udio_v3.1\MyProjects\sine8_LED\Debug" v3.1\C6000\dsk6713\include" -d"CHIP_6713" -mv6710 Preprocessor Include Search Path (-i): udio_v3.1\C6000\dsk6713\incl Pre-Define Symbol (-d): CHIP_6713 Undefine Symbol (-u): Preprocessing: None Continue with Compilation (-ppa)	ude
	OK Cancel H	elp



Tip: Removing Hard Links to Libraries



Tip: Fixing the memory model Change the memory model to "data=far"

Project -> Build Options -> [Compiler tab] -> [Advanced category

Build Options for Sine8_LED.pjt (Debug) 🔹 👔 👔								
General Compile	er Linker Link Order		1					
		e8_LED\Debug" ude" -d"CHIP_6713" -mv6710	~					
Category: Basic Advanced Feedback Files Assembly Parser Preprocessor Diagnostics		Little Endian Far (mem_model:data=far) Far Aggregate Far (mem_model:data=far) Near (mem_model:data=ne -mi): d (-mh): pelining (-mu) Compatibility (-mb) Associative Floating Pt Ops (-mo						
	 Use Function Subsections (-mo) Historic C Pointer to Const Alias Disambiguation (-ox) 							
,		Cancel	Help					



Optional: Suppress Linker Warnings

Project->Build Options [linker tab]

In the Advanced category, uncheck "warn about output sections".

Alternatively, put values for stack and heap in the Basic category.

Build Options	; for helloworld.pjt (Debug)	? 🗙
General Com	piler Linker Link Order	
-q -c -m''.\Det	bug\helloworld.map'' -o''.\Debug\helloworld.out'' -x	~
Category: Basic Advanced	Advanced Disable Conditional Linking (-j) Disable Debug Symbol Merge (-b) Strip Symbolic Information (-s) Make Global Symbols Static (-h) Warn About Output Sections (-w) Resolve Symbols to First Library (-priority) Disable Size-based Allocation (default_order) XML Link Info File (xml_link_info=): Define Global Symbol (-g): Create Unresolved Ext Symbol (-u):	
	OK Cancel H	lelp



Creating a New Project (1 of 5)

I. Create new project Project->New

Project Creation 🛛 🛛 🛛						
Project <u>N</u> ame:	helloworld					
Location:	C:\CCStudio_v3.1\MyProjects\hellowo					
<u>P</u> roject Type:	Executable (.out)					
<u>T</u> arget	TMS320C67XX					
	< Back Finish Cancel Help					



Creating a New Project (2 of 5)

- 2. Write your C code: File->New->Source File
- 3. Save it in your project directory (make sure it has a .c extension):
 File->Save
- 4. Add your C code to the project: Project->Add Files to Project



Creating a new project (3 of 5)

- 5. Add required support files to project Project->Add Files to Project
 - a) myprojects\support\c6713dsk.cmd [linker command file – this or another cmd file is required]
 - b) c6000\cgtools\lib\rts6700.lib [run-time support library functions - required]
- 6. Add optional support files to project, e.g. Project->Add Files to Project
 - a) myprojects\support\vectors_poll.asm or vectors_intr.asm [used to set up interrupt vectors]
 - b) c6000\dsk6713\lib\dsk6713bsl.lib [DSK board support library functions – useful for interfacing to the codec, DIP switches, and LEDs]
 - c) c6000\csl\lib\csl6713.lib [chip support library functions]



Creating a New Project (4 of 5)

- 7. Set up the build options for C6713: Project -> Build Options (compiler tab)
 - Make sure target version is C671x
 - Also make sure Opt(imization)
 Level is "none" this will help with debugging

Build Options for helloworld.pjt (Debug)							
General Compiler Linker Link Order							
	I Linker Link Order Debug" -d"_DEBUG" -r Basic Target Version: Generate Debug Info: Opt Speed vs Size: Opt Level: Program Level Opt.:	nv6710 C671x (-mv671	ebug (-g) 🔻				
		<u></u>	Cancel	Help			



Creating a New Project (5 of 5)

- 8. Scan all file dependencies to automatically bring all header files and includes into the project: Project -> Scan all file dependencies
- 9. Build the project:Project -> Build
- If successful, load the .out file to the DSK:
 File -> Load Program
 Select the Debug directory. Select the .out file.
- II. Run it:

Debug -> Run or F5 or the run button.



Useful Reference Material

- Kehtarnavaz Chapter 4
- Kehtarnavaz CD with example projects
- Other example projects installed with CCS
- CCS Help system
- SPRU509F.PDFCCS v3.1 IDE Getting Started Guide
- C6713DSK.HLPC6713 DSK specific help material
- Spectrum Digital TMS320C6713 DSK reference

Latest TI documentation available at http://www.ti.com/sc/docs/psheets/man_dsp.htm

