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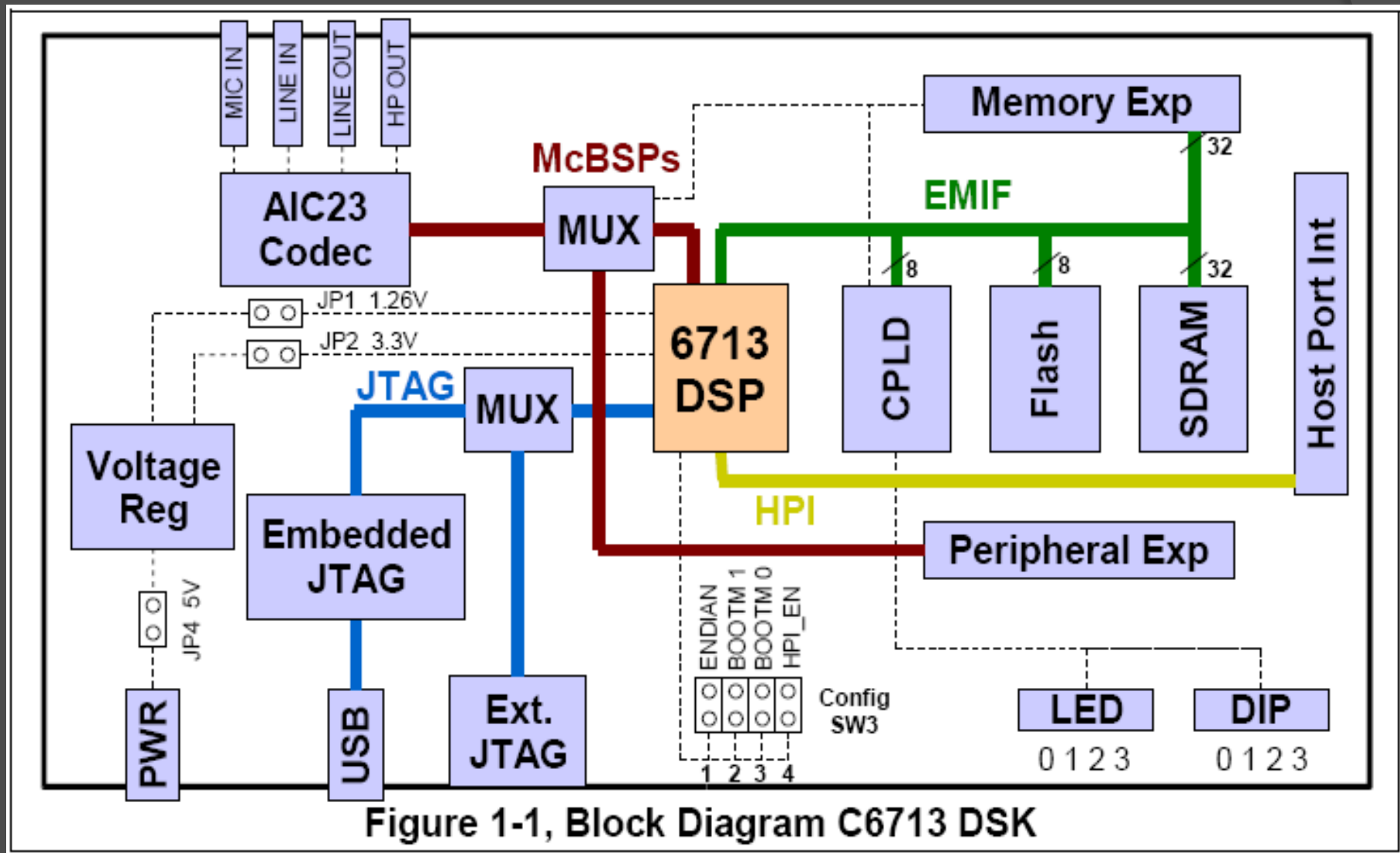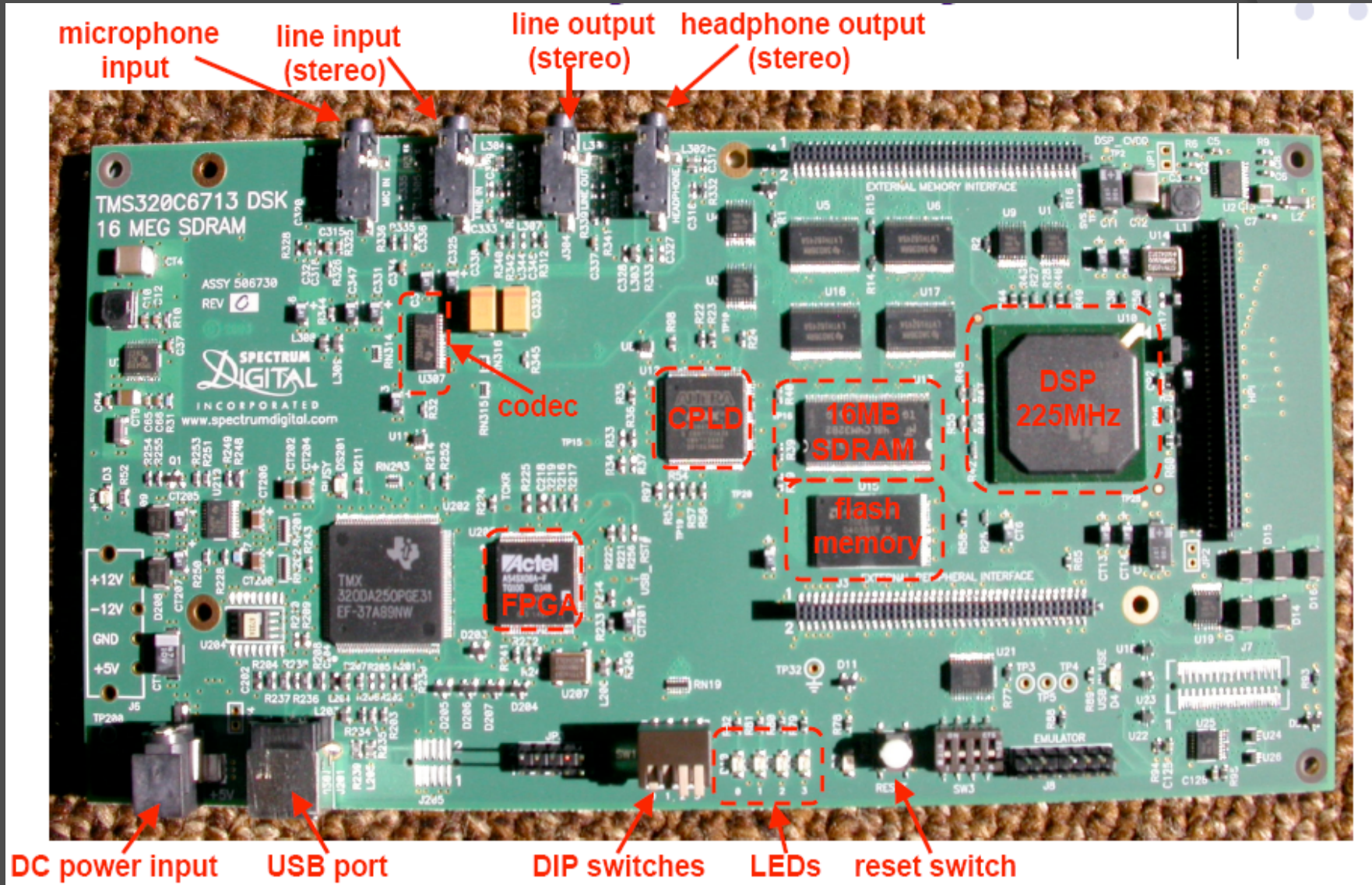
ECE4703 REAL-TIME DSP LABORATORY ORIENTATION

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

Figure 1-1, Block Diagram C6713 DSK

C6713 DSK Physical Layout

microphone input — line input (stereo) — line output (stereo) — headphone output (stereo)

TMS320C6713 DSK
16 MEG SDRAM

codec — CPLD — 16MB SDRAM — DSP 225MHz — flash memory — FPGA

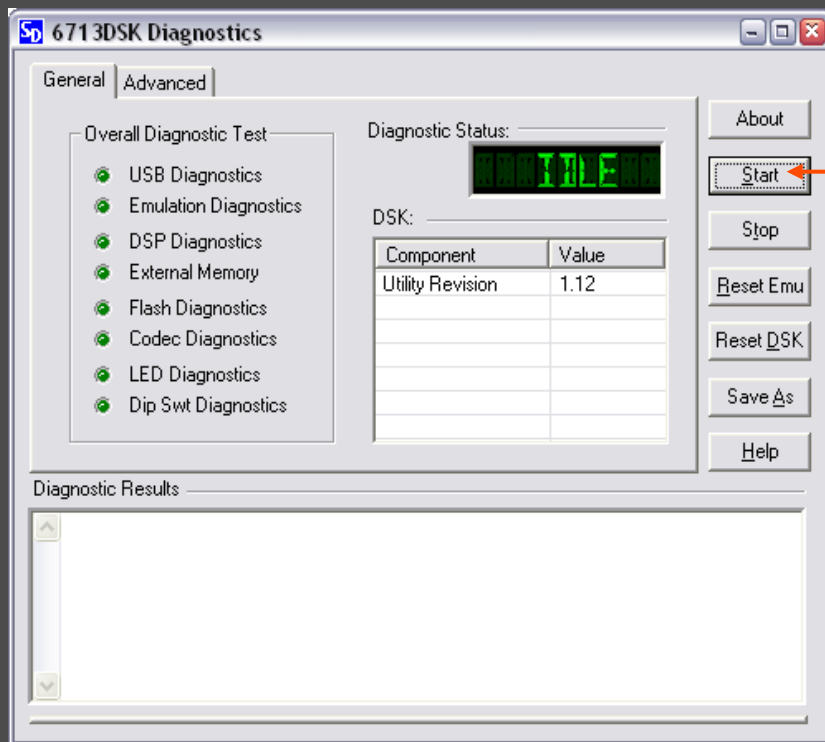DC power input — USB port — DIP switches — LEDs — reset switch

Is my DSK working?
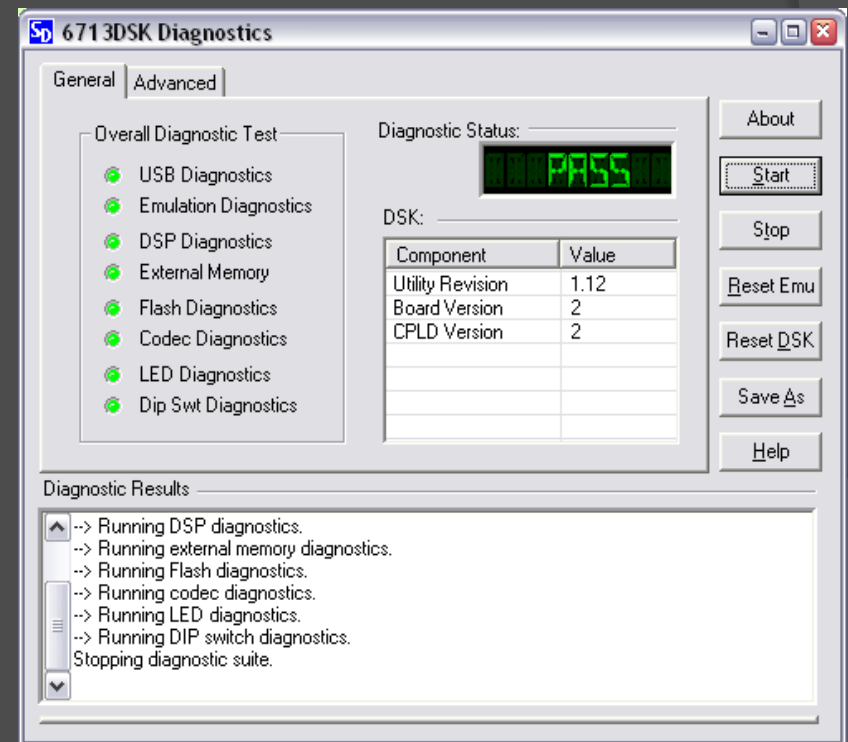# DSK Power On Self Test

- 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
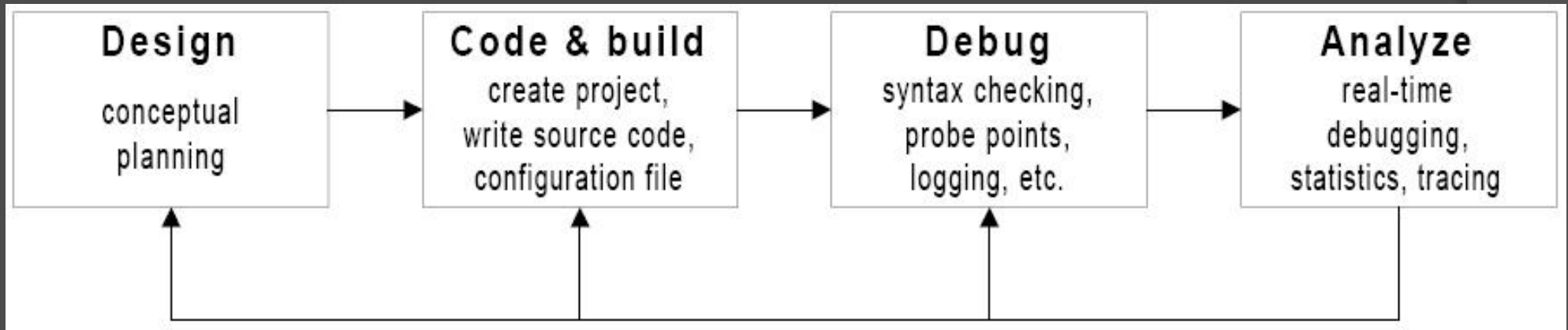
Is my DSK working?
DSK Diagnostic Utility

Code Composer Studio IDE

Design — conceptual planning → **Code & build** — create project, write source code, configuration file → **Debug** — syntax checking, probe points, logging, etc. → **Analyze** — real-time debugging, statistics, tracing

Useful TI documentation (available online or on your hard drive):
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 →

  6713 DSK
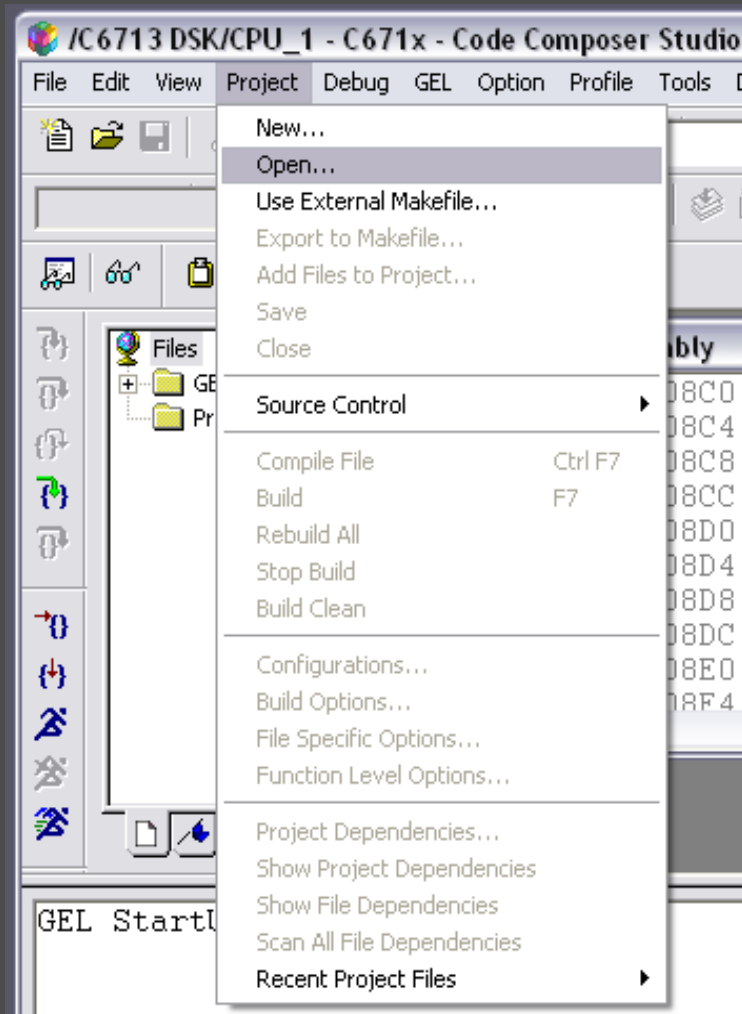 CCStudio v3.1
- CCS will load and wait for your input
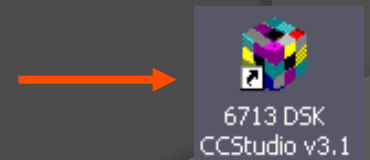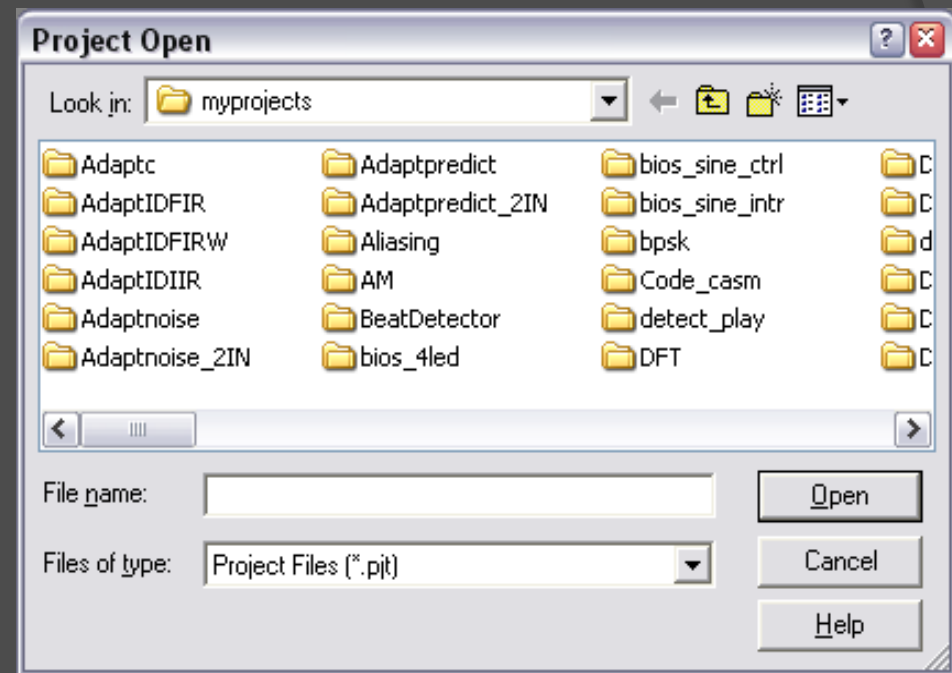
Code Composer Studio IDE
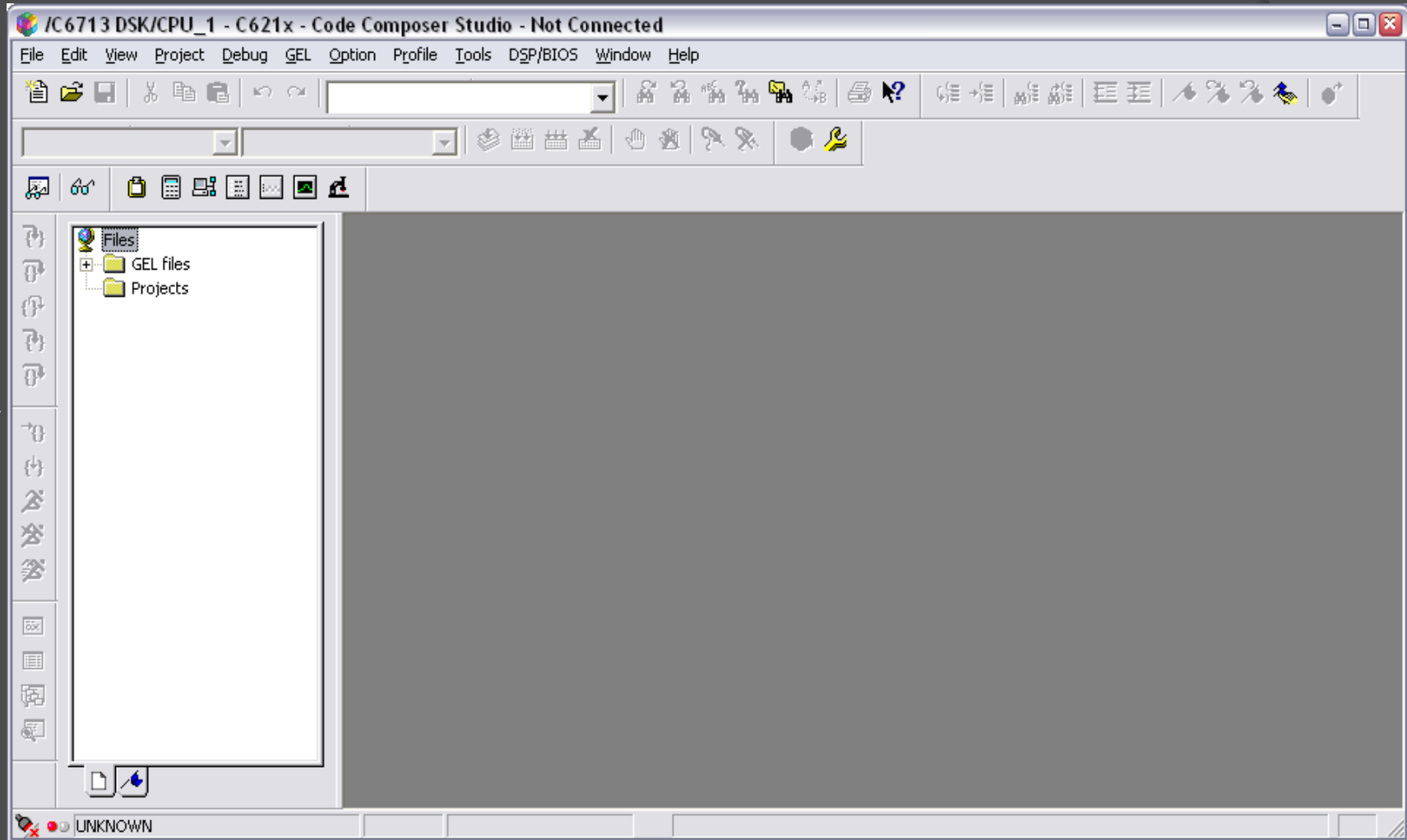
Connecting to the C6713 DSK
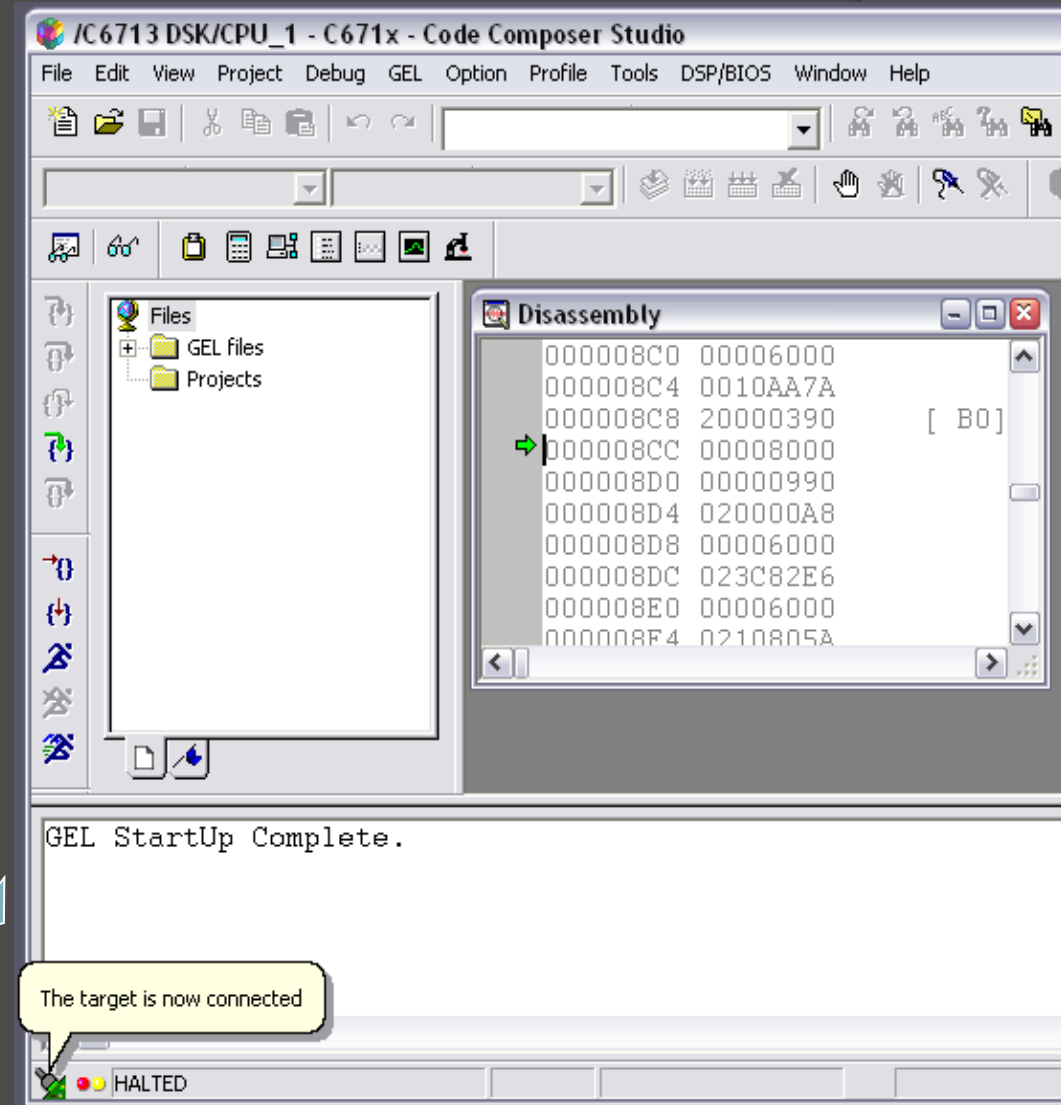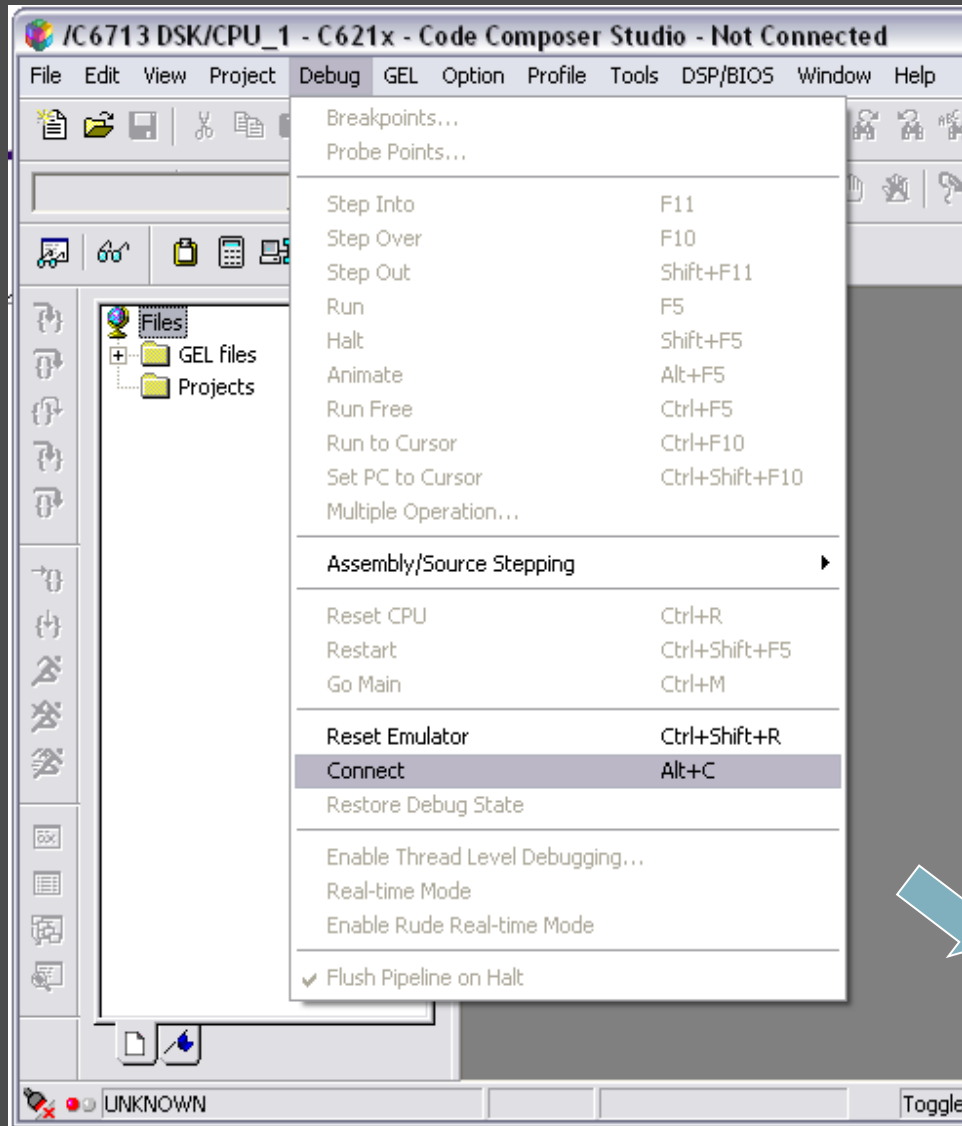
Opening an Existing Project
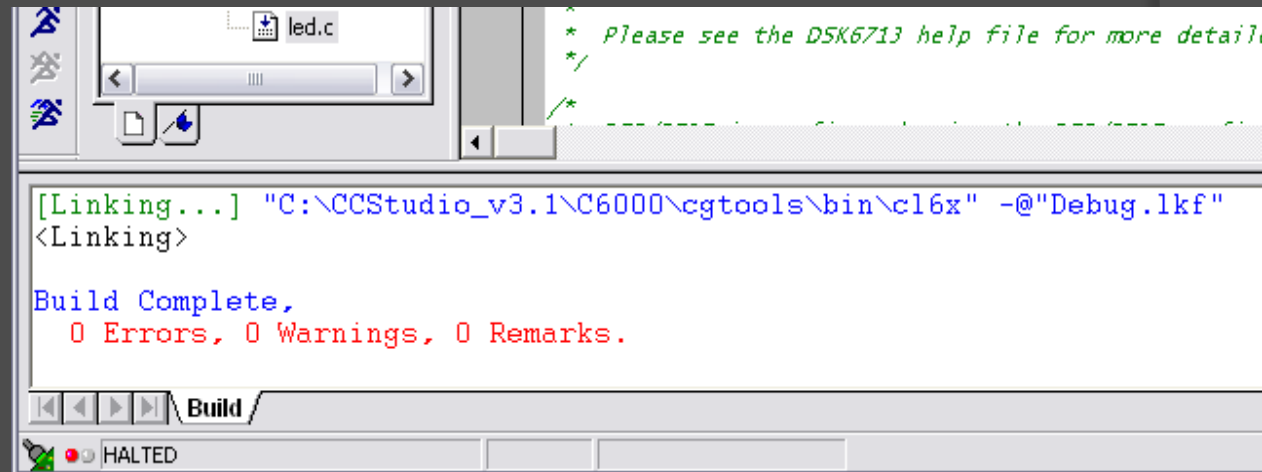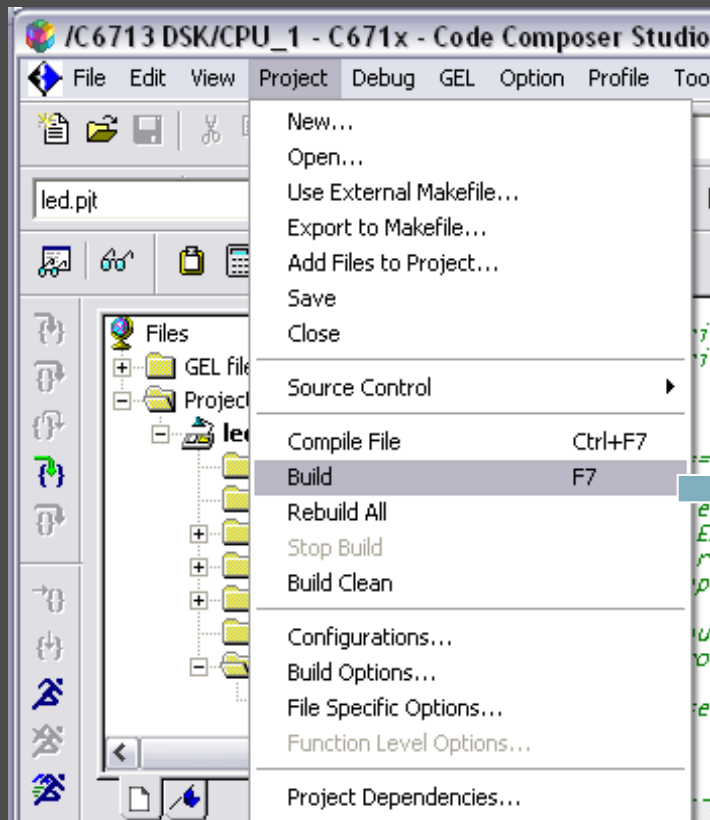
Project->Open

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:
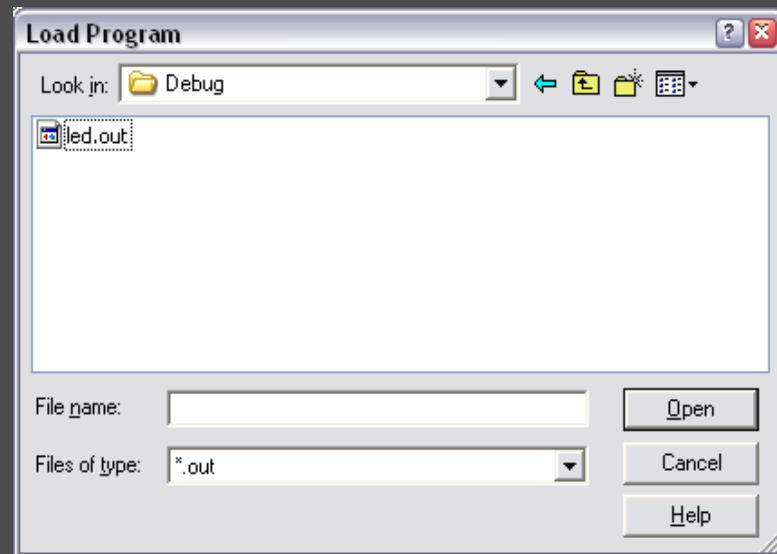c:\CCStudio_v3.1\myprojects\
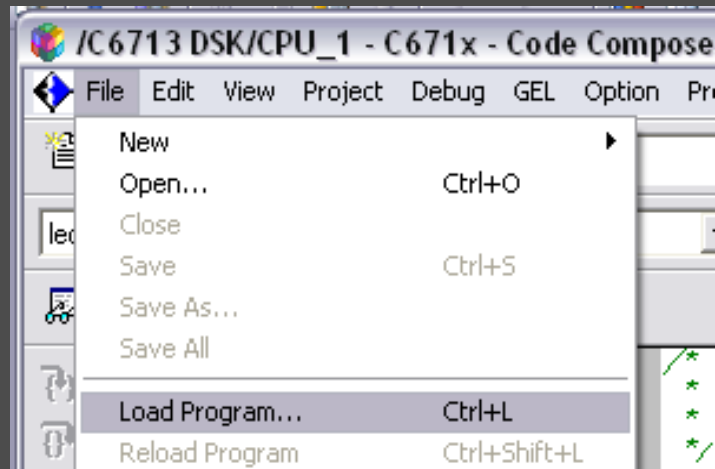c:\CCStudio_v3.1\examples\dsk6713

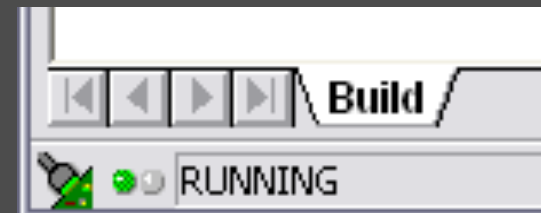# Compiling/Building a Project

Project->Build (F7)

Loading and Running a Project on the C6713 DSK

File-> Load Program (ctrl+L)

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

Debug->Run (F5 or the Run button 🏃)
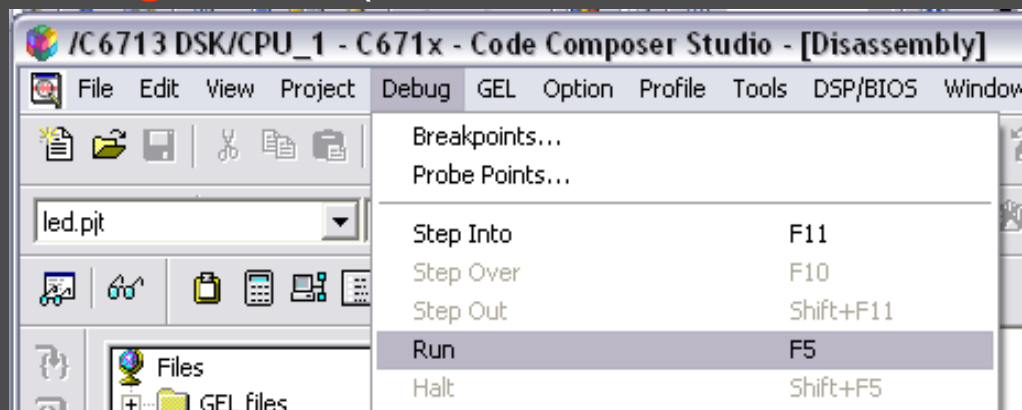
Halting a Running Program on the C6713 DSK

Debug->Halt (shift+F5 or the Halt button).
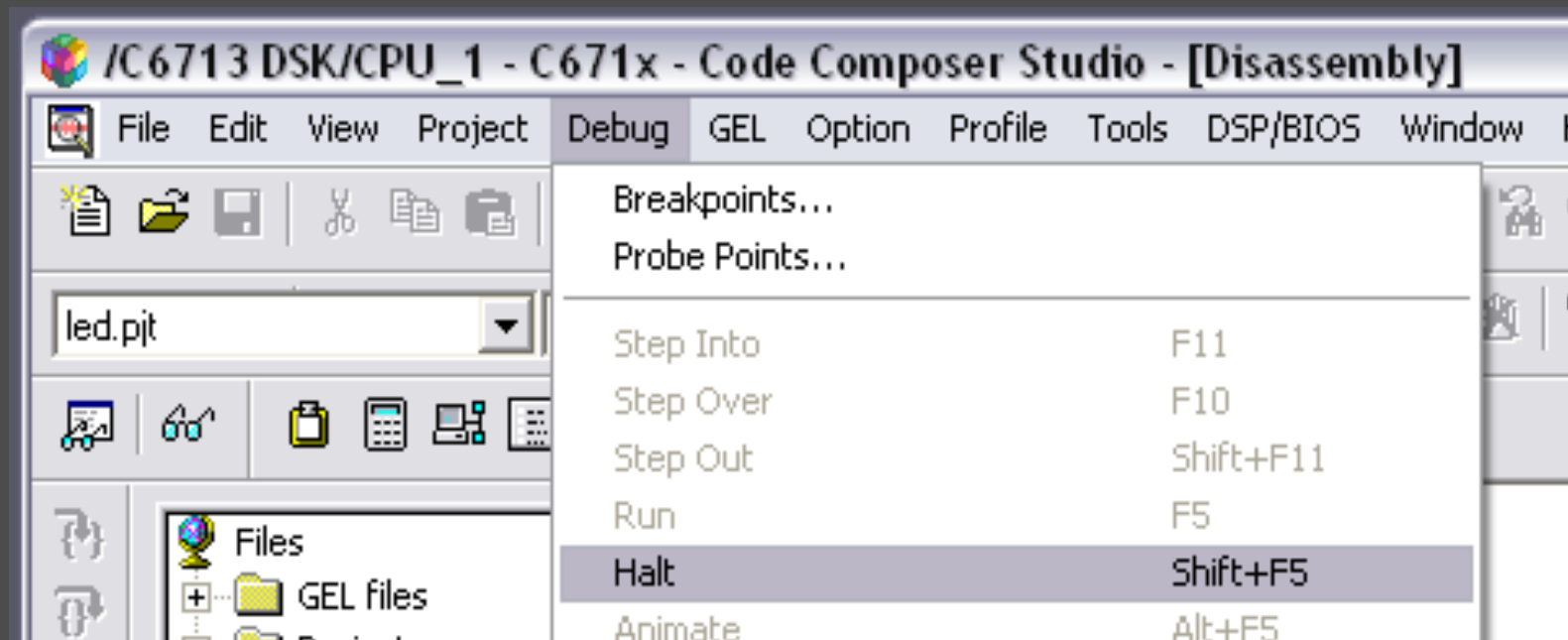
Fixing Some Problems with Example Projects

- During compilation, the compiler can't find some header (.h) files?
  - Fix: Add an item to the CCS search path.
- During compilation, the linker can't find some libraries?
  - Fix: Remove hard links to libraries and add libraries manually to the project.
- During 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 category]

Tip: Removing Hard Links to Libraries

```
[Loop_store.c] "C:\CCStudio_v3.1\C6000\cgtools\bin\cl6x" -g -q -fr"C:/
[Linking...] "C:\CCStudio_v3.1\C6000\cgtools\bin\cl6x" -@"Debug.lkf"
<Linking>
>> C:\DOCUME~1\drb\LOCALS~1\Temp\TI5643, line 21:    er
             can't find input file 'DSK6713bsl.lib'

>> Compilation failure

Build Complete.
```
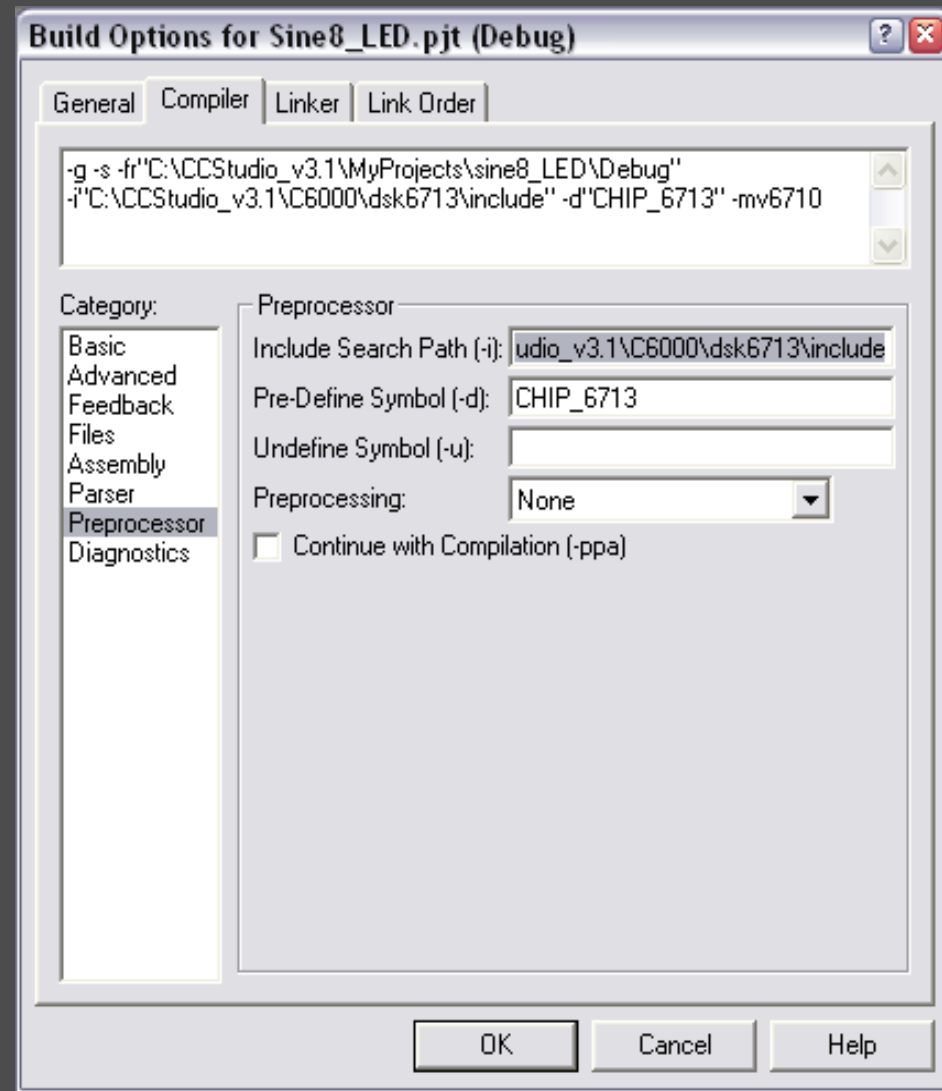
Build Options for Loop_store.pjt (Debug)

General | Compiler | **Linker** | Link Order

```
-q -c -m".\Debug\Loop_store.map" -o".\Debug\Loop_store.out" -x
-l"rts6700.lib" -l"DSK6713bsl.lib" -l"csl6713.lib"
```

Category:
- **Basic**
- Advanced

Basic
- ☑ Suppress Banner (-q)
- ☑ Exhaustively Read Libraries (-x)

Output Module: [▼]
Output Filename (-o): [.\Debug\Loop_store.out]
Map Filename (-m): [.\Debug\Loop_store.map]
Autoinit Model: [Run-Time Autoinitialization (-c) ▼]
Heap Size (-heap): [   ]
Stack Size (-stack): [   ]
Fill Value (-f): [   ]
Code Entry Point (-e): [   ]
Library Search Path (-i): [   ]
Include Libraries (-l): [rts6700.lib;DSK6713bsl.lib;csl6713.lib]

Remove these →

[OK] [Cancel] [Help]

Problem is caused by a bad path for the include libraries in the linker options (Project -> Build Options -> Linker tab)

A fix for this is to remove rts6700.lib, DSK6713bsl.lib, and csl6713.lib from the linker options and add these files manually (Project -> Add files to Project…)

C:\CCStudio_v3.1\c6000\cgtools\lib\rts6700.lib
C:\CCStudio_v3.1\c6000\csl\lib\csl6713.lib
C:\CCStudio_v3.1\c6000\dsk6713\lib\dsk6713bsl.lib

Or you can add the appropriate directories to the library search path.

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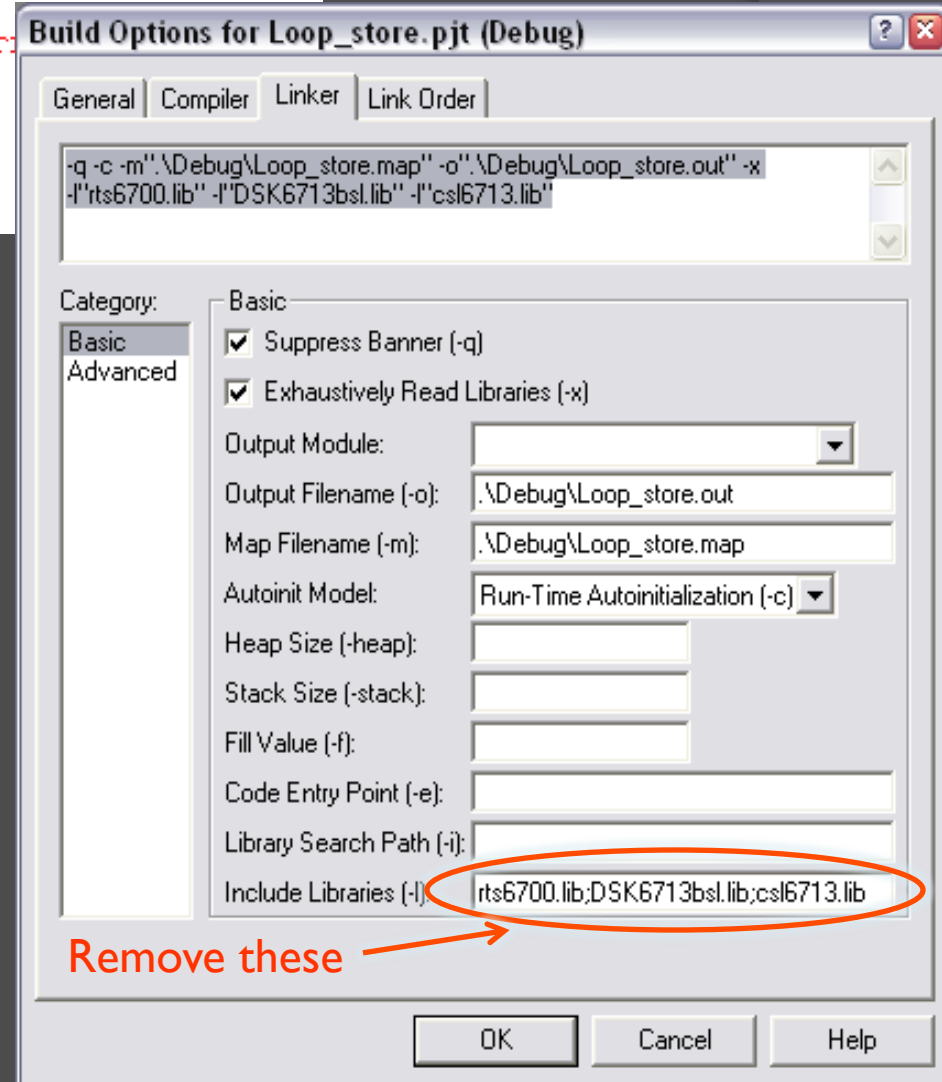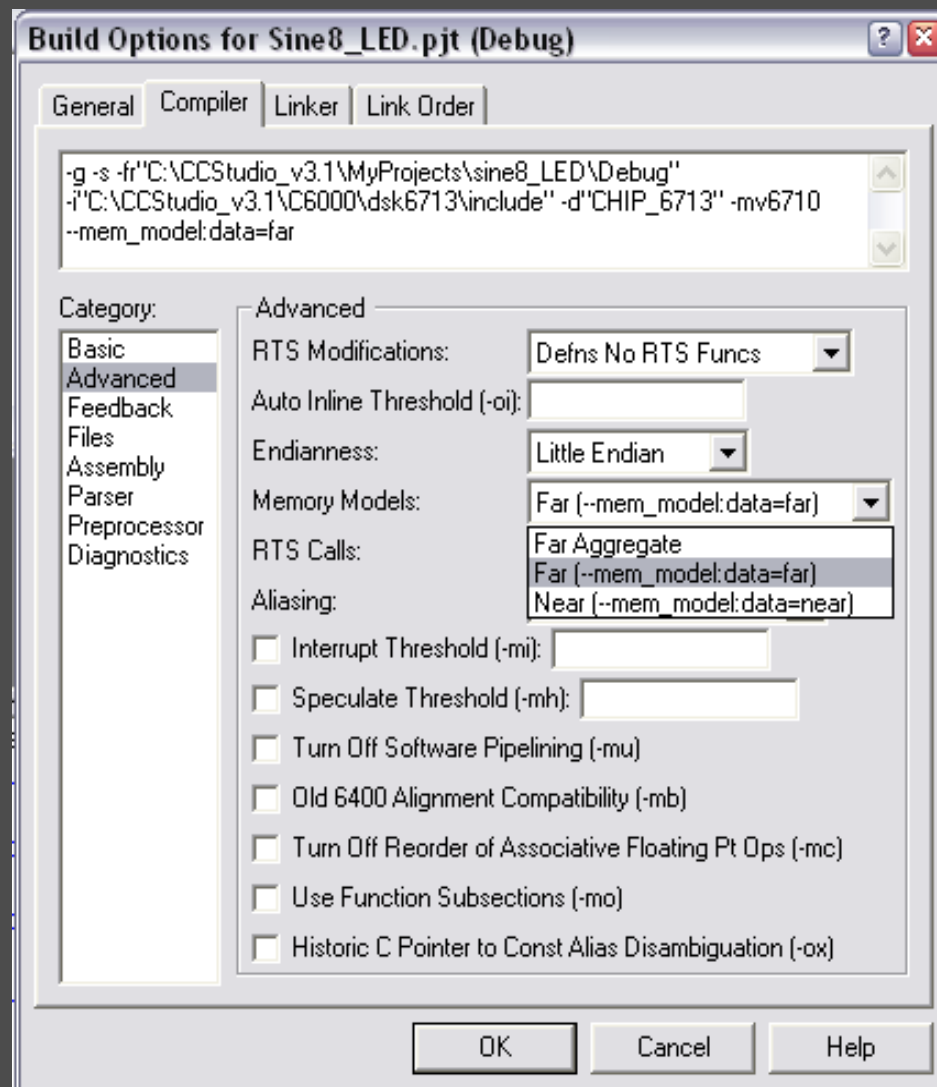
Tip: Fixing the memory model

Change the memory model to "data=far"

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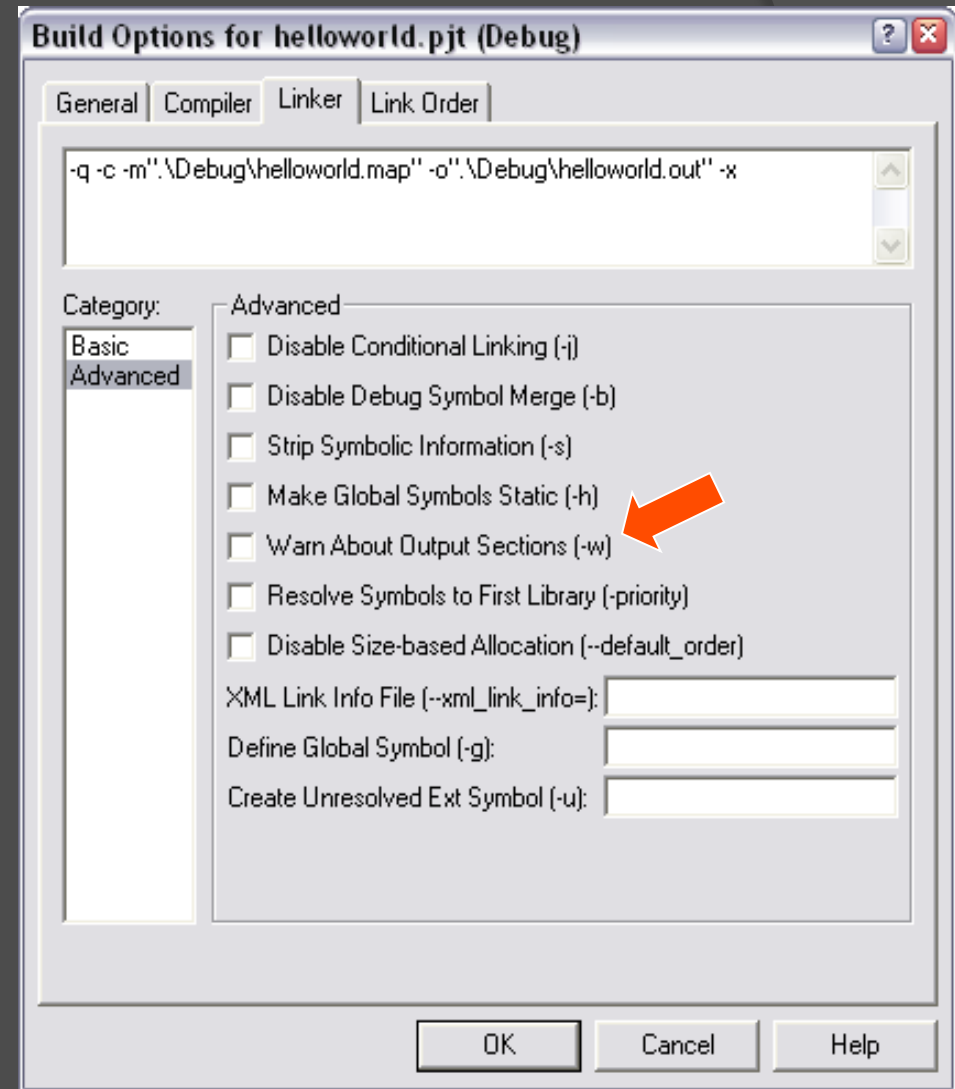[Compiler tab] ->
[Advanced category]

Optional: Suppress Linker Warnings
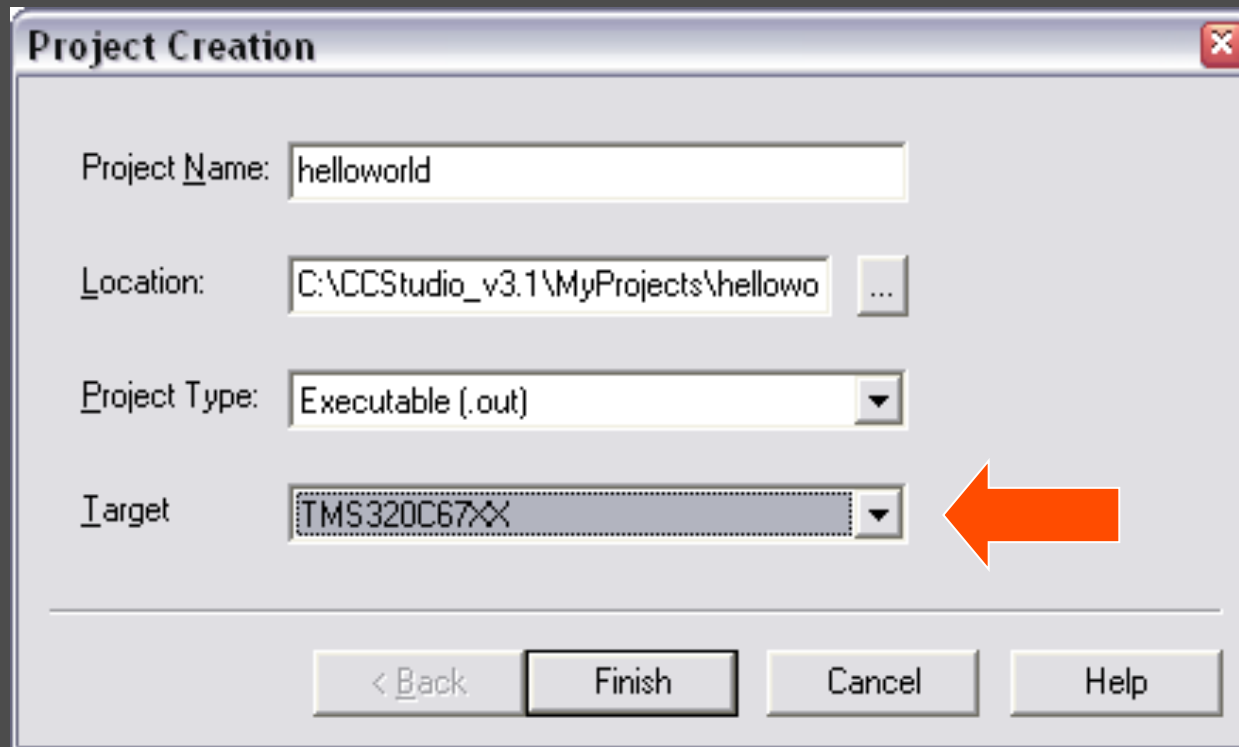
Project->Build Options
[linker tab]

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

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

Creating a New Project (1 of 5)

1. Create new project
   Project->New

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
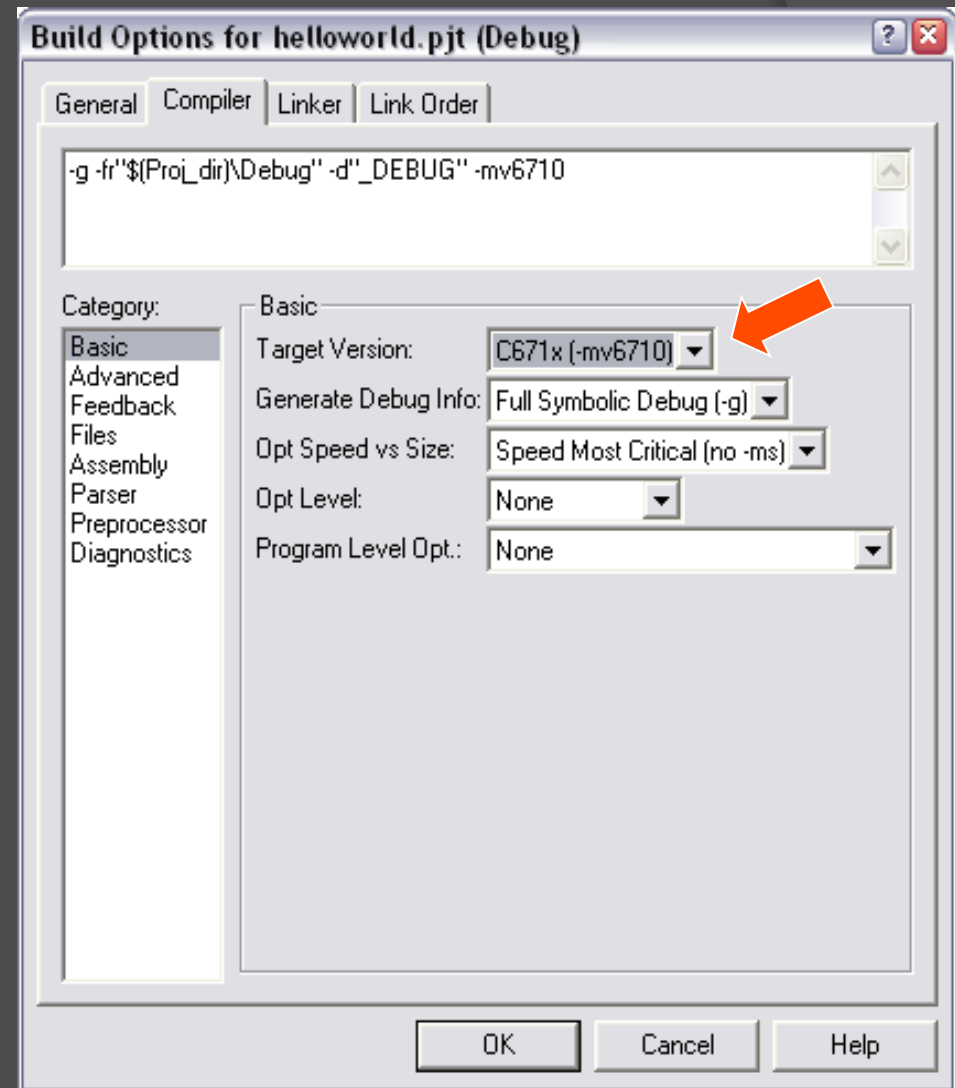
Creating a New Project (5 of 5)

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

10. If successful, load the .out file to the DSK:
File -> Load Program
Select the Debug directory. Select the .out file.

11. Run it:
Debug -> Run or F5 or the run button.

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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