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SIGNUM SYSTEMS CORPORATION

JTAGjet Driver for Code Composer Studio 2.x/3.0

Installation Instructions

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Purpose *This document describes the JTAGjet driver installation procedure for the Texas Instruments Code Composer Studio (CCStudio) 2.x and 3.0. Procedures for single- and multi-device systems are both described here. For information on installing and configuring the JTAGjet driver for CCStudio 3.1, please refer to the document titled “JTAGjet Driver for Code Composer Studio 3.1: Installation Instructions.”*

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Installing the Drivers

The USB Device Driver

If your JTAGjet emulator has a USB interface, it is necessary to install a USB driver before proceeding. Skip this section if you successfully installed the JTAGjet on your computer earlier.

Connect your USB emulator to the computer now.

Note: To get the best performance from your JTAGjet with USB 2.0 interface, make sure that your PC has at least one USB 2.0 port.

Working with USB 1.1 will be an order of magnitude slower and may feel uncomfortable during debugging. USB 2.0 PCI card or USB 2.0 PCMCIA card are strongly recommended as inexpensive upgrade options if your PC or laptop has only USB 1.1.

You will be asked for the location of the device drivers. If the Signum CD-ROM is in the drive, simply accept the default settings. Otherwise—as for instance, when installing from a downloaded ZIP file—point to the “Signum\Drivers\USB CCS drivers” folder and select the SigUSB.inf file. For example, assuming that C:\TI\OMAP is the CCStudio main folder, the Signum driver information file is located in the C:\TI\OMAP\drivers\SignumDrivers\USB subfolder.

The USB driver installation process is detailed in the *USB 2.0 Driver for JTAGjet and ADM-51 Installation Instructions* available at www.signum.com/tecdoc.htm.

The CCStudio Driver

1. Insert the *Development Tools for Microsoft Windows* disk into the CD-ROM drive. From the Master Setup screen, double-click the driver for the Code Composer Studio Driver for JTAGjet to begin the installation process.

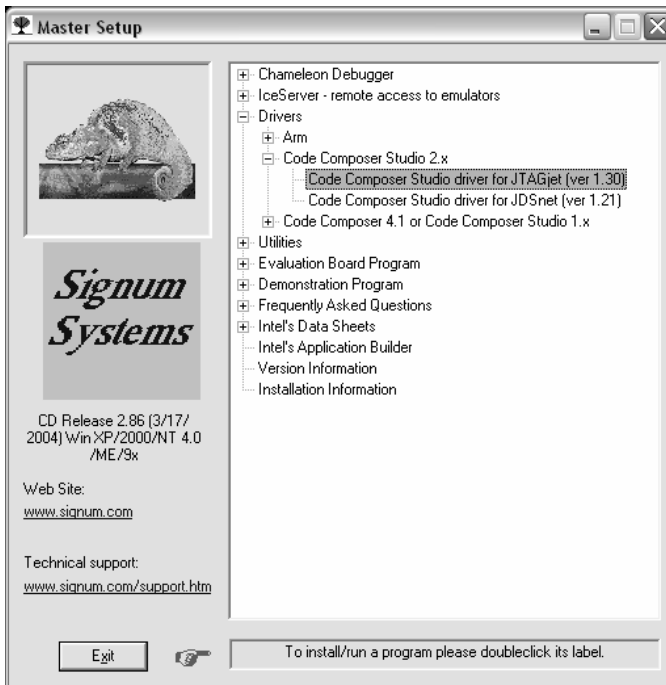


FIGURE 1 Master Setup dialog box.

2. If there are multiple CCStudio installations (2.0 or newer) on your computer, the Setup program will prompt you to select the Code Composer for which the drivers are to be installed (Figure 2).



FIGURE 2 Selecting the CCStudio instance for Signum driver installation.

Select the proper Code Composer Studio you want to add the JTAGjet drivers to and click Continue.

To install the drivers for other CCStudio installations, the entire setup must be repeated each time selecting the desired instance of the CCStudio.

3. The CCStudio drivers and all supporting files will be copied to the “drivers” folder of the selected CCStudio installation (Figure 3). Click Install and then Continue to finish the installation process.

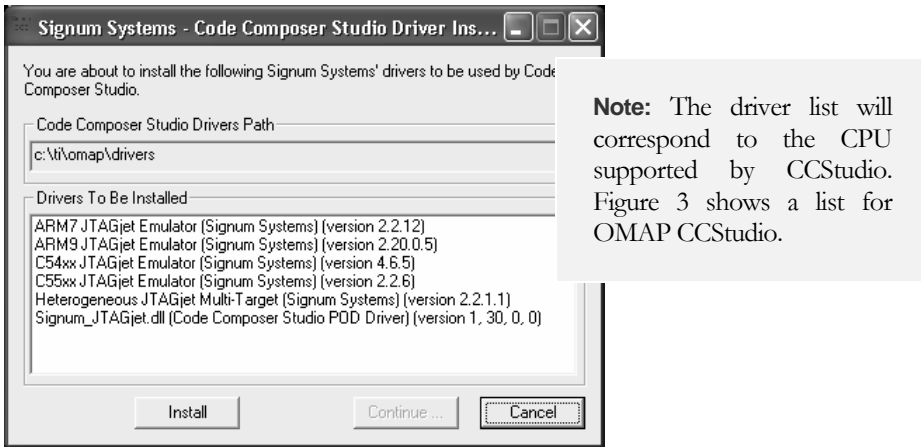


FIGURE 3 Confirming the installation of the drivers.

Configuration

Configuring CCStudio for JTAGjet

Code Composer may be configured for the JTAGjet emulator by running the standard Setup CCS 2 program (cc_setup.exe) provided by TI and selecting the Signum JTAGjet specific drivers instead of the TI XDS510 or XDS560 drivers. However, this process is prone to error, because there are dozens of boards and drivers with similar names to choose from. Signum’s JTAG diagnostic and auto-configuration utility, SignumCCS, simplifies this process.

To run SignumCCS, open the Windows Start menu, click Programs, select Signum Systems CCStudio Drivers and click on SignumCCS. The program will guide you through the board, device and driver selection processes (Figure 4).

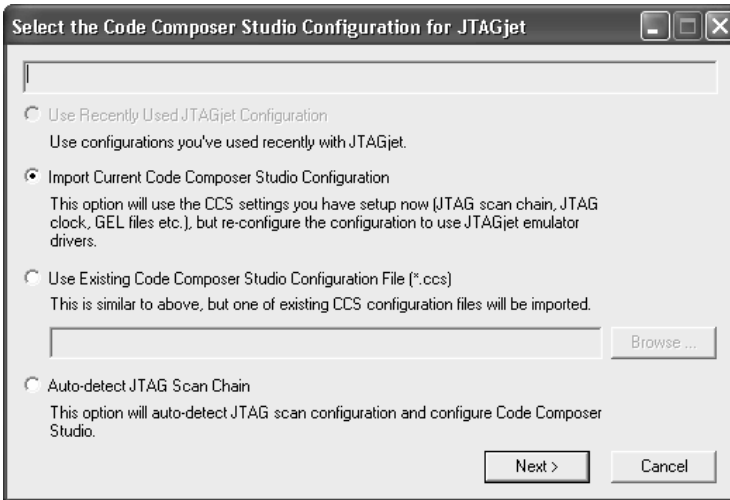


FIGURE 4 Configuring CC Studio for the JTAGjet.

The Use Recently Used JTAGjet Configuration option will be disabled if you have not used the JTAGjet with CCStudio before. Table 1 provides guidelines for using the other configuration options.

| IF | SELECT |
|--|--|
| You previously used CCStudio with your target board and any XDS emulator | Import Current Code Composer Studio Configuration |
| Your target board is brand new with a ready to use Board Configuration files | Use Existing Code Composer Studio Configuration File (*.ccs) |
| Your target board is brand new without a ready to use Board Configuration files | Auto-detect JTAG Scan Chain |

TABLE 1

Choose the right selection and click Next to configure the connection between the debugger and the emulator. Connect to Emulator Automatically is the recommended choice if you have only one JTAGjet on your PC (Figure 5). If more than one JTAGjet is used, you can manage the communication details by selecting the Specify Connection Port and

Parameters option, which will allow selecting the proper JTAGjet to be used with your CCStudio environment.

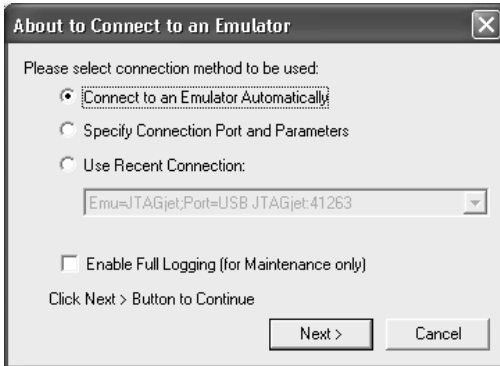


FIGURE 5 Connecting the emulator with the target board.

Click Next to configure the JTAG header and the clock.

Configuring the JTAG Header and Clock

The dialog box that appears in the next Figure allows you to define the type of the JTAG header used by the target board and the JTAG clock (TCK) frequency to be used for that board.

It is recommended that the default 10 MHz setting not be changed for C6000, C5000 or C2000 DSPs and that OMAP161x and OMAP171x devices be set to the Adaptive Clock setting.

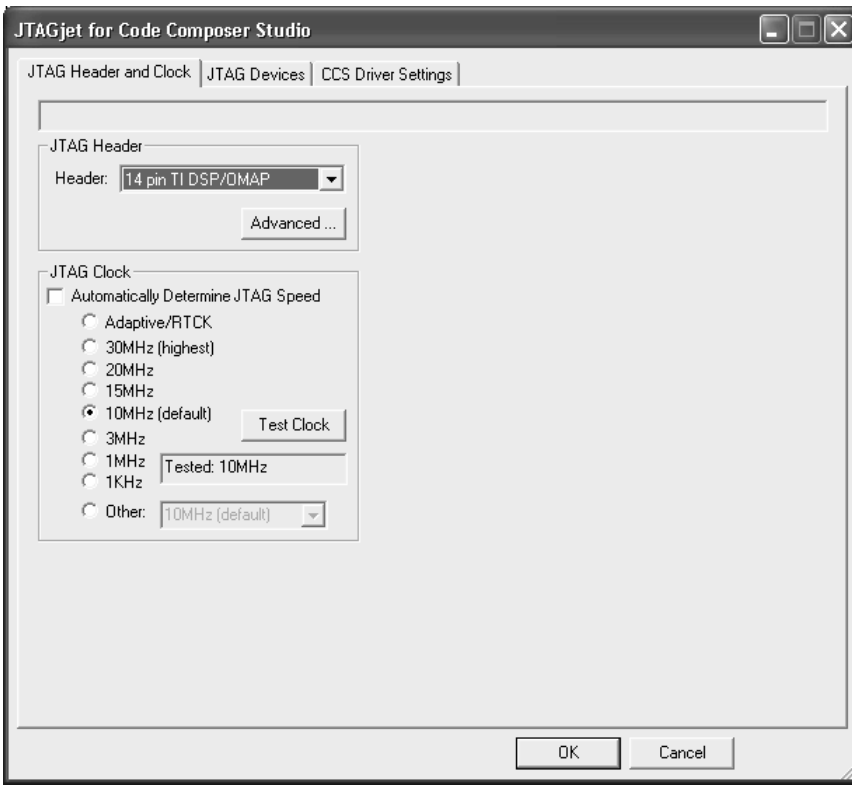


FIGURE 6 Configuring the JTAG header and setting the clock speed.

The settings must match the JTAG connector in use. The default is a 14 pin TI DSP/OMAP connector available on all of the target boards manufactured by TI and Spectrum Digital.

The JTAG Clock section of the dialog box allows you to modify the JTAG clock (TCK) speed setting. The default is 10 MHz, however some DSP devices may need to have this changed to a lower setting. Use the explanations below to set the proper JTAG clock for your board:

- Select the fastest JTAG clock possible for your board but not to exceed 10 MHz. The rule of thumb is that the JTAG clock must not be faster

than 1/3 of the CPU clock. The board may not support selections higher than 10 MHz. The higher clock frequencies may be used successfully only when the Code Composer Studio is running without any problems at the lower settings. The SignumCCS.exe utility may be used to change the JTAG clock even while the CCS is running.

- The Adaptive/RTCK option is reserved only for ARM and OMAP devices that synchronize the JTAG clock with the CPU clock and return the RTCK clock signal back to the emulator. This is true for any ARM core with an -S suffix in its name, such as ARM 926EJ-S found in the OMAP16xx, OMAP17xx and other ARM devices. The Adaptive/RTCK option makes the JTAG channel functional at a broad range of CPU speeds that may be varied at will by the running application.

Caution: Do not use this setting for plain DSP devices.

- The Automatically Determine JTAG Speed selection is reserved for ARM cores only. The software will try to determine the correct clock setting. However, please verify that the setting matches your board capabilities before continuing.

It is recommended to test the selected JTAG clock speed setting by clicking the Test Clock button. The program will communicate with the target board at the new clock frequency and report errors, if any. Passing this test does not mean the entire board will work at that speed, as some memories may not be fast enough above the 10 MHz default setting.

The Advanced button allows you to customize the pins on the JTAG cable, which should not be modified for most of the boards. See *Appendix* for more details.

When done configuring the JTAG clock, press the JTAG Devices tab. A graphical representation of the JTAG chain will appear (Figure 7).

Device List on the JTAG Chain

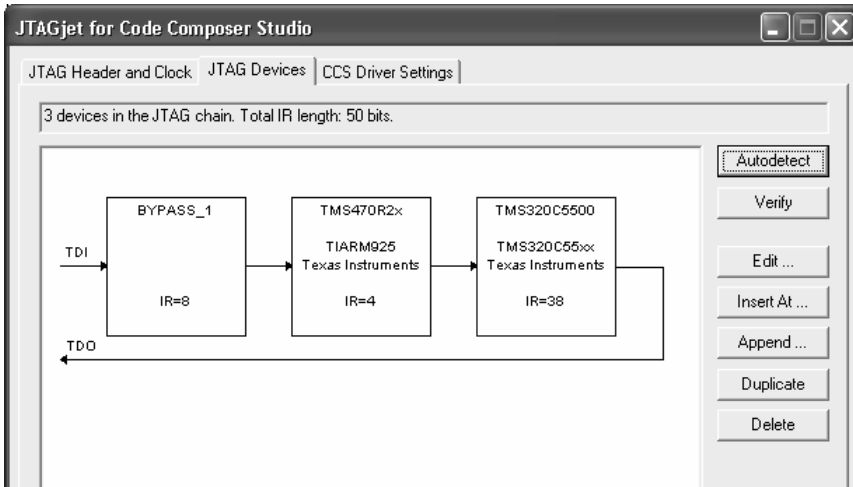


FIGURE 7. JTAG chain diagram. Depending on your particular system, you may see a different number of JTAG devices. Single-device systems will have only one link.

The list of the JTAG devices on the chain is either detected automatically or imported from the last used CCStudio configuration, depending on what you have selected in first step of the installation.

Press the Verify button to make sure that the scan chain is correctly defined and works with the target currently connected to the JTAGjet.

Use the available buttons to Autodetect, Add, Remove or Edit the devices on the chain to eliminate any errors reported by the Verify button due to incompatibility of the configuration file with the currently connected target hardware.

Next, click the CCS Driver Settings tab to display the remaining set of configuration options (Figure 8).

Code Composer Studio Driver Settings

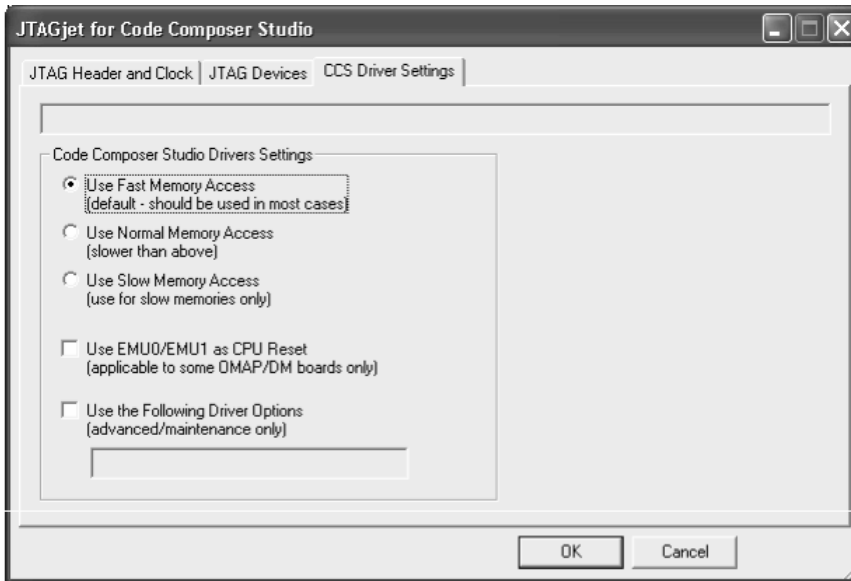


FIGURE 8. Selecting CCStudio driver settings.

The CCS Driver Settings tab controls non-JTAG aspects of the Signum Code Composer drivers, such as memory access speed or the CPU Reset option. For now, click OK to accept the default settings.

Since it is not possible to automatically set or change the existing Code Composer Studio configuration, we will need the information displayed in the next box to set up CCStudio properly, so please do not click OK - you will need this information during the next stages of the installation.

Important: Do not press the OK button in the dialog box in Figure 9 *below* yet.



FIGURE 9. The SignumCCS dialog box. Keep it open during the setup process.

Single Device Configuration in CCS 2.x/3.0

The Setup user interface of the Code Composer versions 2.4 and higher differs from the user interface in older versions of the Setup program. The differences are detailed in section Device Configuration in CCS 2.4 on p. 24.

To illustrate the process of configuring Code Composer Studio for a single target device, we will use the TMS320C6416 device running on the TMS320C6416 DSK board.

For OMAP and other multi-core device example, please refer to the section titled *Multi-Core Configuration* on p. 17.

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If you are installing any other single-device configuration (C62xx, 67xx, C2000 or C5000), please follow this C6416 example, carefully selecting the proper drivers when indicated.

Start the TI CCStudio Setup program for your device family (C6000, C5000 or C2000) and follow these steps below. You will need the information from the previous step shown in (Figure 9).

1. Make sure that the System Configuration pane in the CCStudio Setup dialog box is empty. Choose the Emulator corresponding to your target from Table 1. Locate the same entry in the Available Board/Simulator Types pane of the dialog box and drag it to the System Configuration pane. In our example, we drag the C64xx Rev. 1.1 JTAGjet Emulator (Signum Systems) entry, as shown in Figure 10.

| DSP FAMILY | DEVICE | DRIVER ENTRY TO DRAG |
|--------------|-----------|---|
| C6000 | C62xx | C62xx, C67xx JTAGjet Emulator (Signum Systems) |
| | C64xx | C64xx Rev 1.1 JTAGjet Emulator (Signum Systems) |
| | C67xx | C62xx, C67xx JTAGjet Emulator (Signum Systems) |
| C5000 | C55xx | C55xx JTAGjet Emulator (Signum Systems) |
| | C54xx | C54xx JTAGjet Emulator (Signum Systems) |
| C2000 | C24xx | F24xx XDS510 Emulator |
| | C27xx | C27xx XDS510 Emulator |
| | C28xx | F28xx XDS510 Emulator |
| | All other | XDS510 Emulator |

TABLE 2 Selecting the Emulator drivers for various single-device families. 3

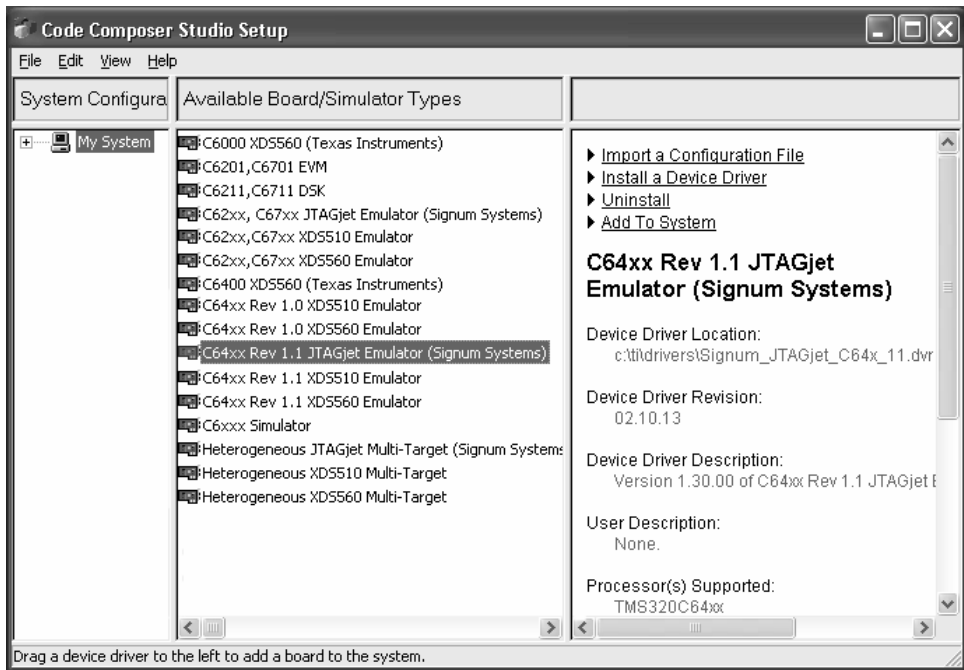


FIGURE 10 Code Composer Studio Setup dialog box.

The TI XDS510 Emulator drivers are fully compatible with JTAGjet and may be used for any DSP device. However, they are slower than the corresponding JTAGjet Emulator drivers, but for the C2000 family the XDS510 Emulator drivers are the only choice.

The Heterogeneous JTAGjet Multi-Target (Signum Systems) driver should only be used for targets that contain cores with mixed CPU architectures, like OMAP (ARM with C5000) or targets with C5000 and C6000 DSPs on the same JTAG chain.

2. After the Emulator is selected, the Board Properties dialog box will appear (Figure 11). Select the Board Name & Data File tab and verify that the correct board type is displayed in the Board Name text box.. Next, choose the Auto-generate board data file with extra configuration file

option from the drop-down list. To select the driver configuration file, press the Browse button and navigate to the Signum_JTAGet.cfg file found in the drivers subfolder of CCStudio's installation directory.

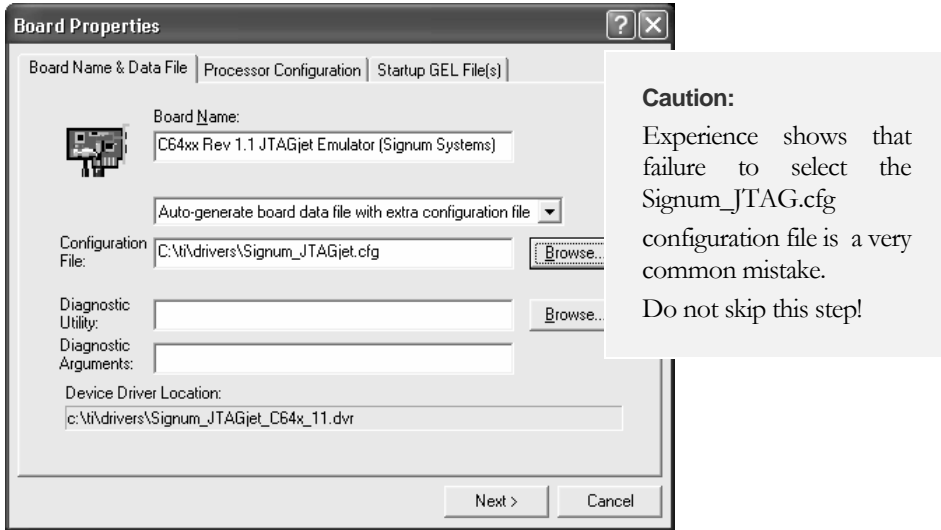


FIGURE 11 Selecting the Signum driver configuration file.

Once the Signum_JTAGjet.cfg file is selected you can leave the Diagnostic Utility and Diagnostic Arguments fields empty and press Next.

3. The Processor Configuration tab will appear next showing available processors and you will be asked to choose the processor to be emulated. Use Table 3 below as a help in selecting your device.

| FAMILY | AVAILABLE PROCESSORS |
|---------------|---------------------------|
| 'C62xx, C67xx | TMS320C6x0x or TMS3206x1x |
| 'C64xx | TMS320C64xx |
| 'C5500 | TMS320C55xx |
| 'C5400 | TMS320C54xx |
| 'C2400 | TMS320C24xx |
| 'C2700 | TMS320C27xx |
| 'C2800 | TMS320C28xx |

TABLE 3 Possible contents of the Available Processors list in Figure 12.

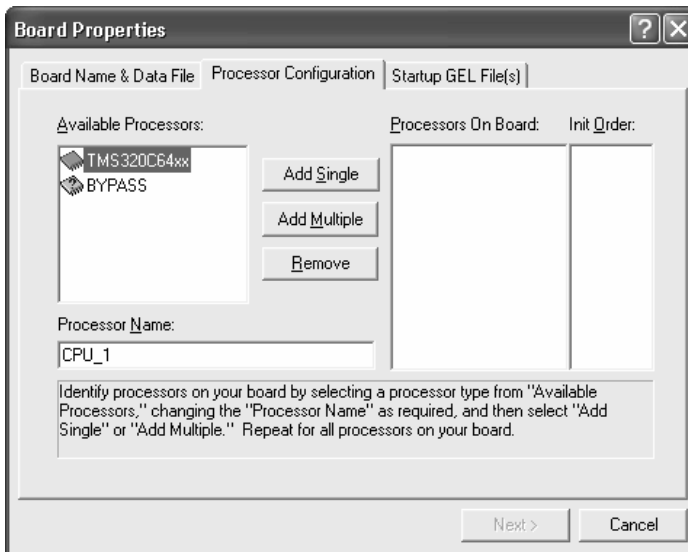



FIGURE 12 Processor Selection tab

In our example, select the TMS320C64xx processor, press the Add Single button, and then click Next to move to select the startup gel file.

In the Startup GEL File(s) tab, press the Browse button  to choose a startup GEL script file that was written for your target board. These files

come with the DSK and EVM boards and are used to initialize the boards to a known, usable state.

For our TMS320C64xx DSK example board, select the dsp641x.gel file located in Code Composer's C:\ti\cc\gel subfolder (Figure 13).



FIGURE 13 GEL file selection

4. The resulting Code Composer Setup window for the 6416 DSK should look like Figure 14.

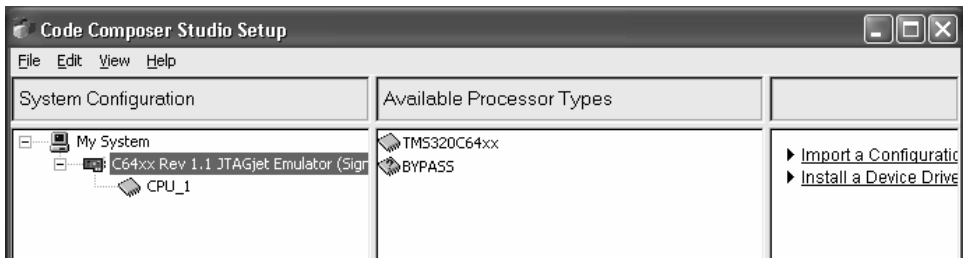


FIGURE 14 Final Code Composer Setup screen for the TMS320C6416 DSK board

Now, Exit from the Code Composer Setup, saving the new configuration, and allow to start Code Composer Studio. After about 30 seconds CCS will appear with a screen similar to Figure 15 below.

JTAGJET DRIVER FOR CODE COMPOSER STUDIO 2.X/3.0 INSTALLATION INSTRUCTIONS

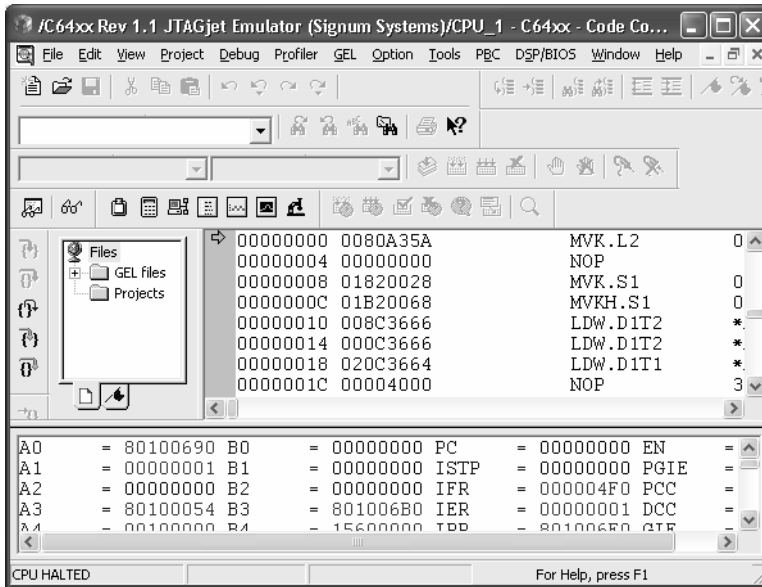


FIGURE 15 Code Composer Studio in action.

Multi-Core Configuration

To illustrate the process of configuring Code Composer Studio for multi-core and multi-target systems, we will use the OMAP 1510 device running on the PSI Innovator 1510 platform.

Open the CCStudio Setup program and set the System Configuration and Board Properties as shown in your SignumCCS dialog box from Figure 9

To setup CCStudio for debugging both ARM and DSP processors, follow these steps:

1. Make sure that the System Configuration pane is empty. Drag the Heterogeneous JTAGjet Multi-Target (Signum Systems) entry from the middle pane to the left pane, as shown in Figure 16.

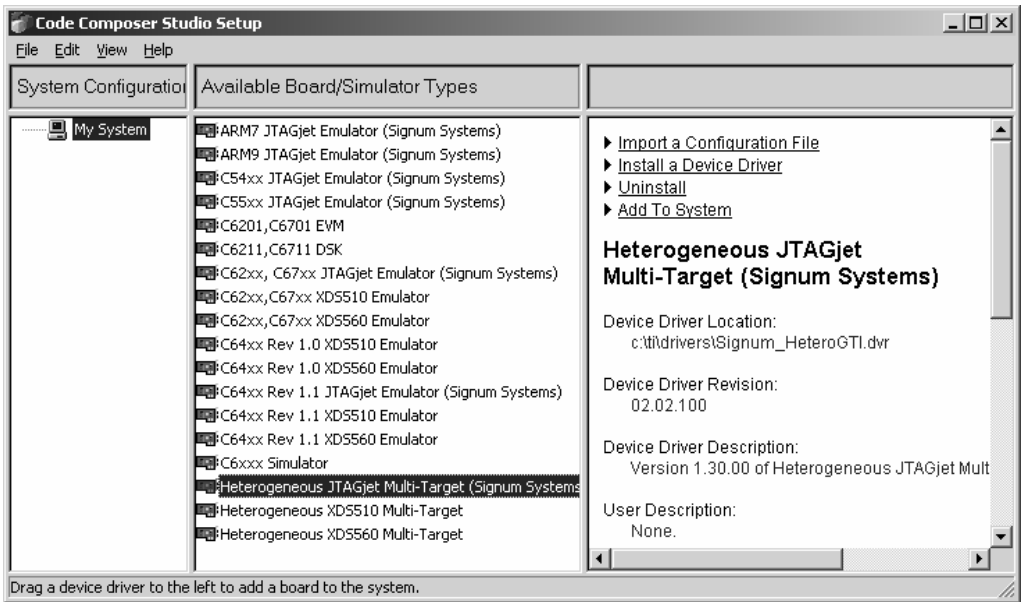


FIGURE 16 Code Composer Studio Setup dialog box.

2. The Board Properties dialog box will appear next. Select the Board Name & Data File tab and verify that the entry from previous step is displayed in the Board Name text box..

Choose the Auto-generate board data file with extra configuration file option from the drop-down list. Press the Browse button and navigate to the Signum_JTAGet.cfg file found in the drivers subfolder of Code Composer's installation folder (Figure 17).

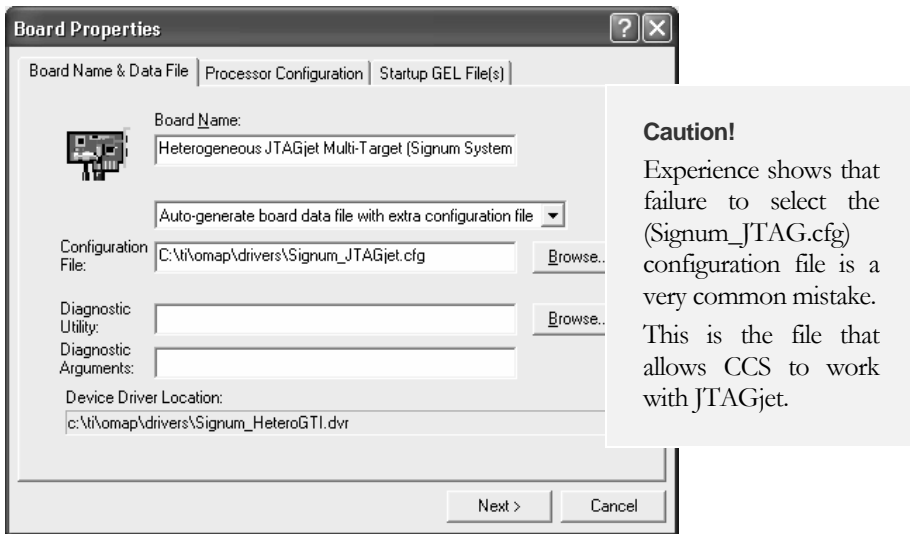


FIGURE 17 Selecting the JTAGjet driver configuration file.

3. Leave the Diagnostic Utility and Arguments fields empty and click Next to begin the processor selection process. The dialog box shown in Figure 18 will appear.

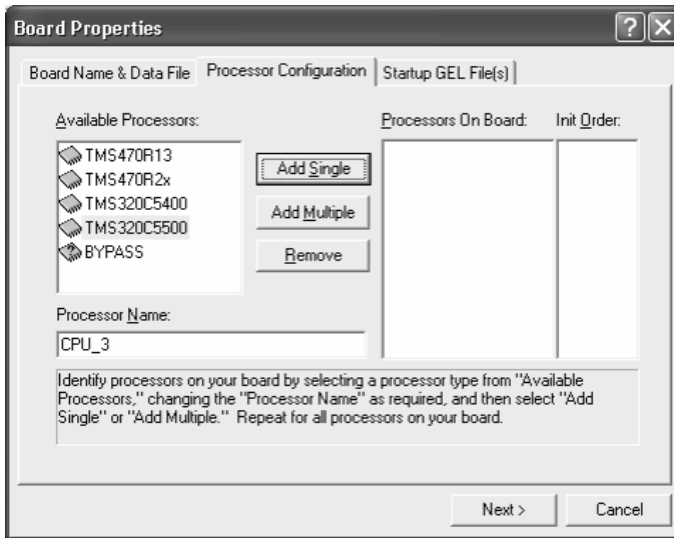


FIGURE 18

Assuming that we are configuring CCStudio for the JTAG chain shown in Figure 7, select BYPASS and click the Add Single button. Make sure that the number of bits in the instruction register is set to 8 (Figure 19).

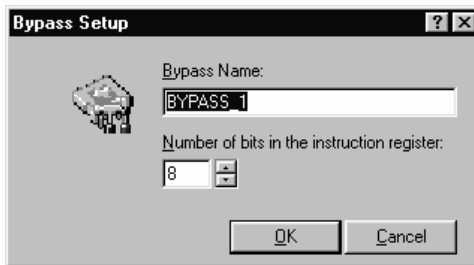


FIGURE 19

Click OK and select the TMS470R2x from the Available Processors list, change the processor name to ARM and click Add Single button to add the ARM processor.

Next, choose the TMS320C5500 processor, change the name to C5500 and click Add Single again. The dialog box should look like Figure 20.

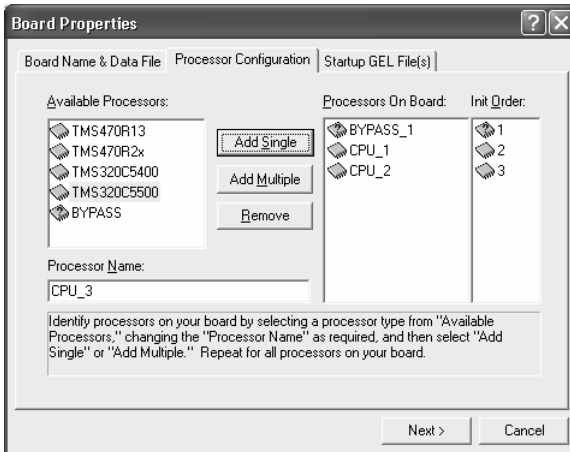


FIGURE 20 Configuring CCStudio for the OMAP.

Note: The Init Order column and the number of bits in the BYPASS_1 registers are important. The ARM processor must be initialized first as it is configured as a master.

Click Next. The dialog box shown in Figure 21 will appear.

4. Press the Browse button  to browse for the startup GEL macrofiles for both ARM and C5500 processors:

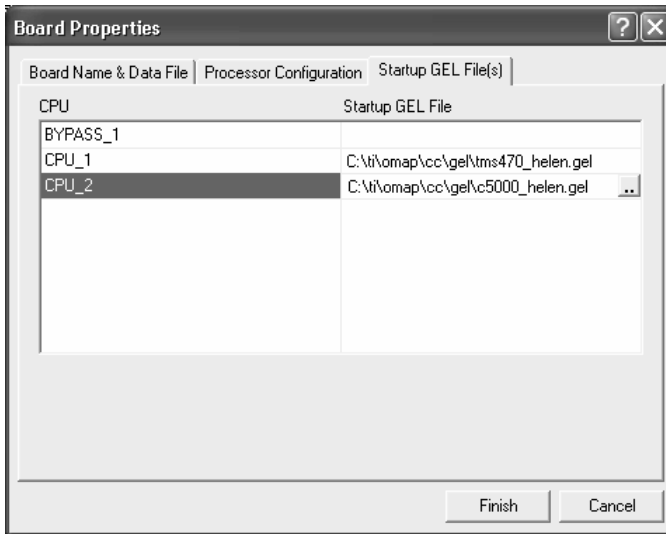


FIGURE 21

For the Innovator target, the ARM and DSP processors should have the tms470_helen.gel and C5000_helen.gel files assigned to them, respectively. These files are located in Code Composer’s gel subfolder. Click Finish when both gel files are selected.

5. The resulting CCS Setup window should look like Figure 22.

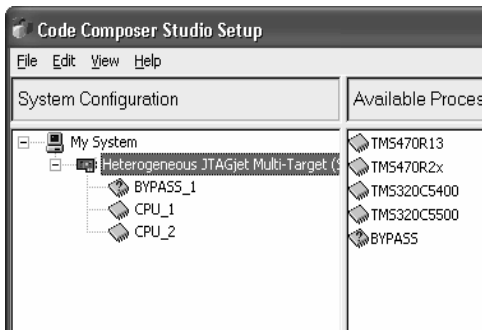


FIGURE 22

Close CCS Setup, saving the new configuration, and start Code Composer Studio.

- The CCS Parallel Debug Manager toolbar should now appear (Figure 23).



FIGURE 23

Use the Open menu to start a CC Studio debugging session. A sample Code Composer Studio window for the ARM processor is shown in Figure 24.

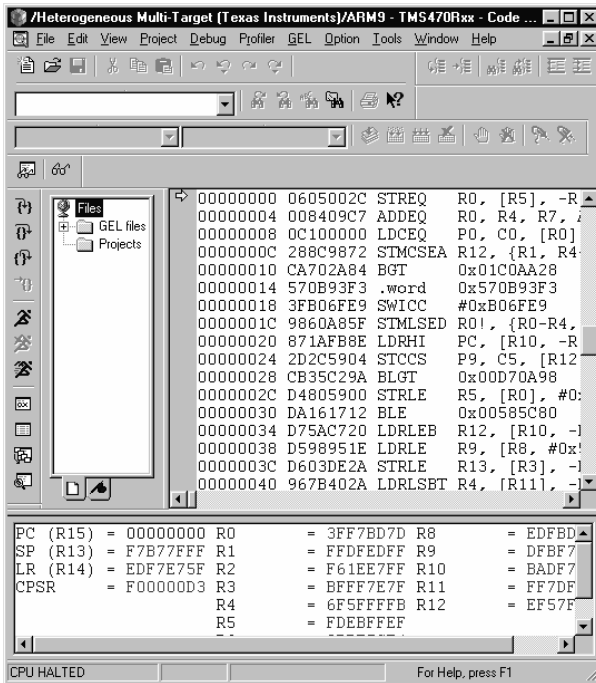


FIGURE 24 Code Composer Studio in action.

Device Configuration in CCS 2.4

*This section describes the configuration steps required by Code Composer Studio versions 2.4 that differ from the steps in older versions of the Studio. The remaining details of the device configuration process are described in sections *Single Device Configuration* (p. 11) and *Multi-Core Configuration* (p. 17). For information on installing and configuring the Signum Systems driver for CCStudio 3.1, please refer to the document titled “JTAGjet Driver for Code Composer Studio 3.1: Installation Instructions.”*

1. In the Code Composer Studio Setup program, Choose Custom Board from the Available Connections list box (Figure 25).

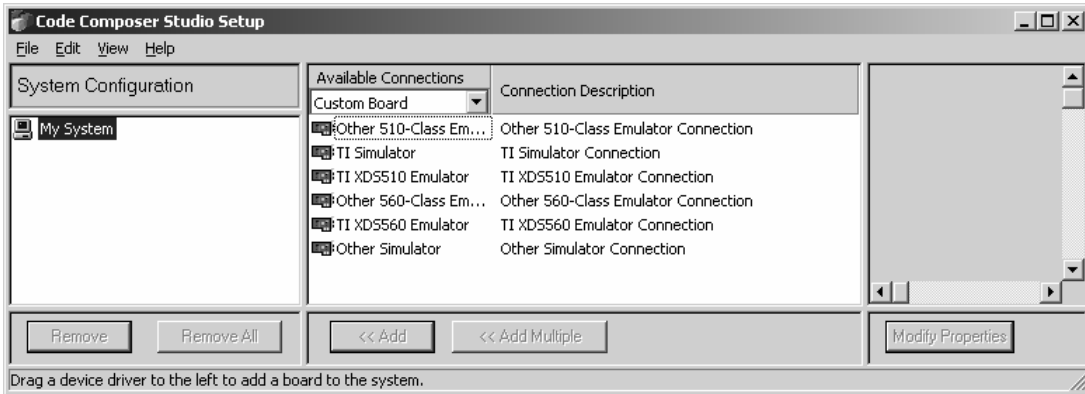


FIGURE 25 Configuring devices in Code Composer Studio 2.4.

2. From the list shown in the middle pane chose Other 510-Class Emulator by double-clicking on the text or drag it to the left pane. In the Connection Properties dialog box that appears (Figure 26):
 - 2.1 Write an arbitrary Connection Name, such as “My Target with JTAGjet.”

2.2 From the drop-down list, choose “Auto-generate board file with extra configuration file” and browse for the file C:\ti\CCStudio_2_40\drivers\Signum_JTAGjet.cfg.

2.3 Press Next.

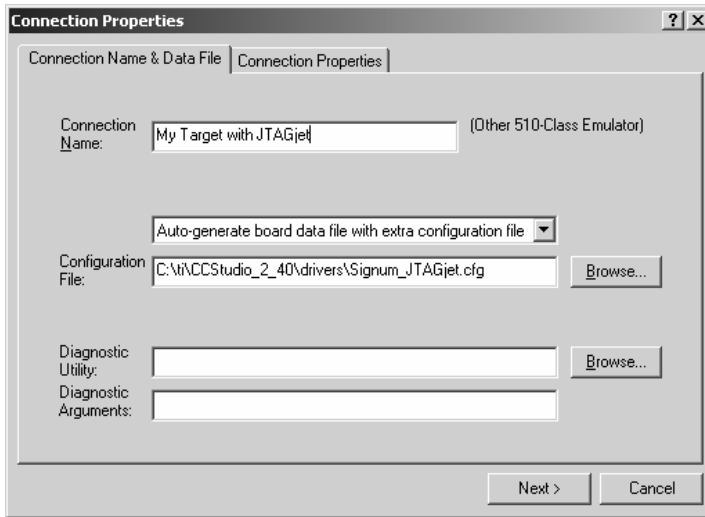


FIGURE 26 Configuring devices in Code Composer Studio 2.4.

3. Leave the Connection Properties tab unchanged. Press Finish.
4. In the System Configuration pane of the Code Composer Studio Setup dialog box, click “My Target with JTAGjet” (Figure 27). Configure your target device list by adding processor or bypass devices from the middle pane.

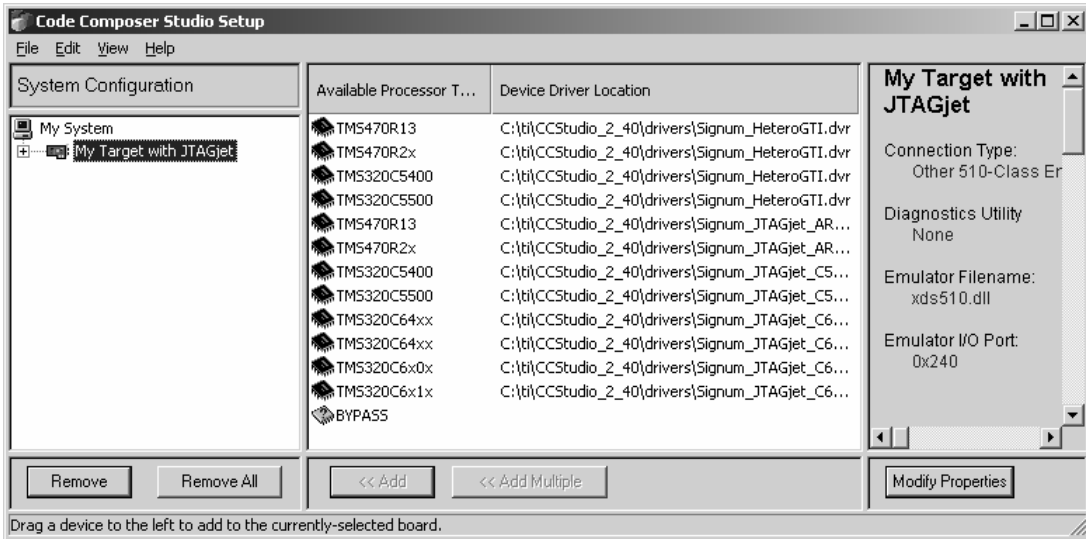


FIGURE 27 Adding processors and bypass devices to configure a target for use with the JTAGjet emulator.

For each device you add to the target, the Device Properties dialog appears. In it, you may specify the GEL startup file and select the Master/Slave mode as well as other device specific parameters. For bypass devices, you can modify the bypass name and bit number.

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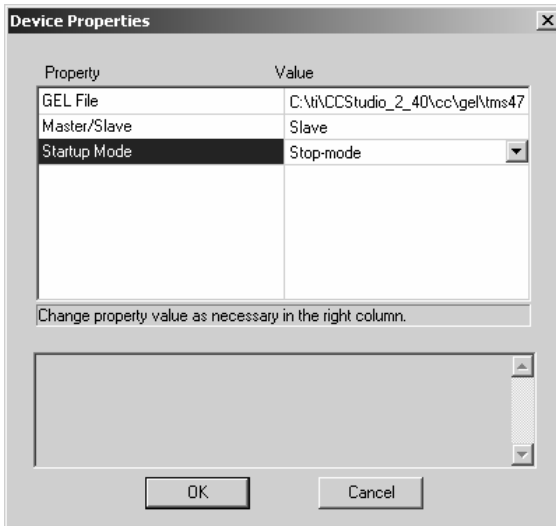


FIGURE 28 The Device Properties dialog box.

5. Figure 29 shows a configuration example for OMAP 1510. Save the configuration and start Code Composer Studio.

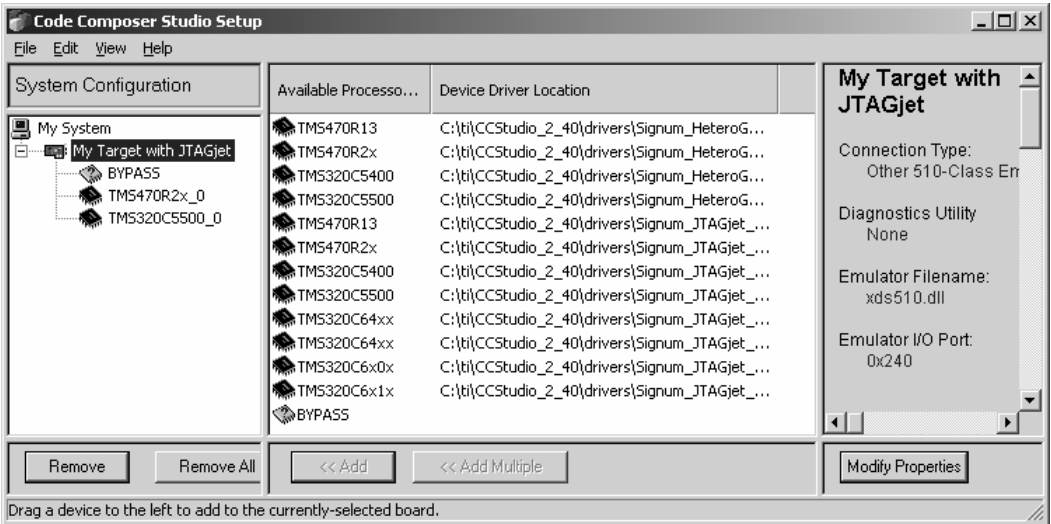


FIGURE 29 OMAP 1510 configured for the JTAGjet emulator.

Miscellanea

Driver Revisions

The Signum Systems driver revision scheme is compatible with the revisions assigned by Texas Instruments to XDS510 class emulation drivers.

JTAGJET DRIVER FOR CODE COMPOSER STUDIO 2.X/3.0 INSTALLATION INSTRUCTIONS

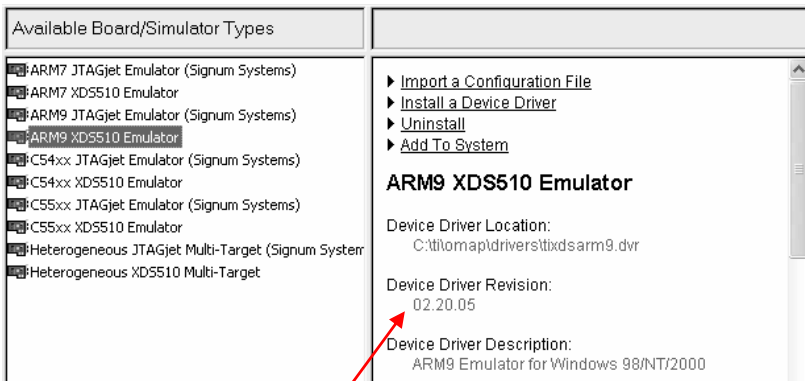


FIGURE 30 Texas Instruments device driver revision

The Signum driver has the same revision number (in our example, 02.20.05) as its TI counterpart (compare Figure 30 and Figure 31).

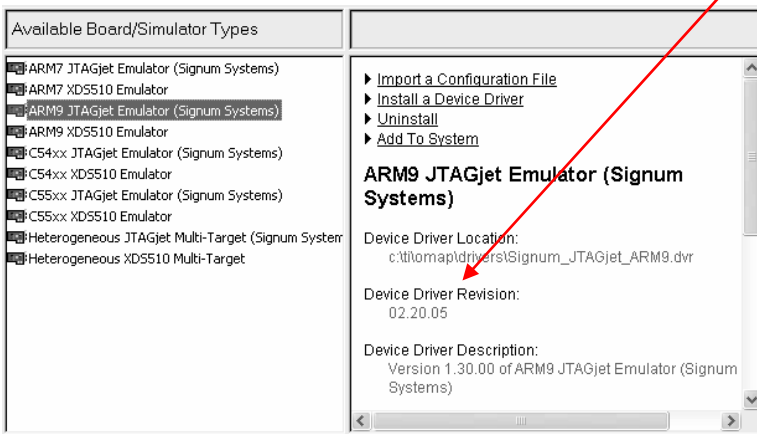


FIGURE 31 Signum Systems device driver revision

The version of a Signum Systems driver package (in our example, 1.30.00) is displayed in under Device Driver Description in the right pane of the CCStudio Setup program window.

New devices often require the latest Texas Instruments CC Studio drivers. Consequently, Signum drivers may need to be updated as well. If you

experience problems connecting to your target board, check in CCStudio Setup if a newer XDS510 driver is available. If so, you will find the latest versions of Signum drivers on the Web at www.signum.com. For further assistance, email Signum Technical Support at support@signum.com.

Using TI XDS510 Drivers with JTAGjet

Your TI DSP/CPU may be so new that it may warrant a customized device driver obtained directly from Texas Instruments. Signum CC Studio drivers released before the new silicon was available will support the device, provided if specifications do not deviate significantly from those of the older devices.

In those rare cases, the JTAGjet emulator can be configured to use the Texas Instruments XDS510 drivers. To do so, in the CCSetup dialog box:

1. Remove the existing setup form the left pane.
2. Select the appropriate family (C64xx, C62xx, etc.) XDS510 Emulator and drag it to the left pane.
3. Specify Auto-Command Board Data File with Extra Configuraton File In the Board Properties dialog box. Browse for the `Signum_JTAGjet.cfg` file and select it as the extra Configuration File (Figure 32).

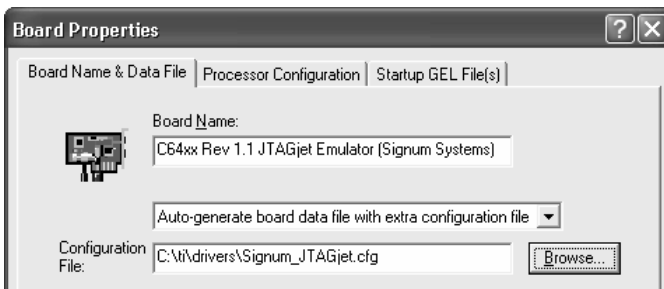


FIGURE 32 Using XDS510 Emulator drivers with JTAGjet.

Click Next and ignore the I/O Port settings. Then continue the configuration process in the same way as with any XDS510 driver.

Uninstalling

All Signum drivers are installed in the drivers sub-folder of the original CC Studio installation folder. All installed components, including drivers, DLLs, SignumCCS.exe and configuration files, have names beginning with the word Signum. The bulk of the internal components are installed in the “drivers\Signum CCS” sub-folder.

The Uninstall utility, found in the Program Files folder, removes all the installed components. Some temporary files, configuration files and log files (with names beginning with *Signum*), created while the drivers were in use, may not be erased. Please remove them manually.

The uninstall process does not remove drivers installed by the CCStudio Setup program. Again, remove them manually from within the CCStudio Setup program if necessary.

Appendix

Advanced JTAG Configuration

As mentioned in section *Configuring the JTAG Header and Clock* (p. 6), the Setup program allows you to customize the JTAG cable pin assignment and characteristics. To make changes in the pinout, in the JTAGjet for code Composer studio dialog box (Figure 6), click the Advanced button to bring up the Advanced JTAG Configuration dialog box shown in Figure 33.

Make pinout modifications only if there are problems connecting to the target board, or if a specific target board requirement must be met.

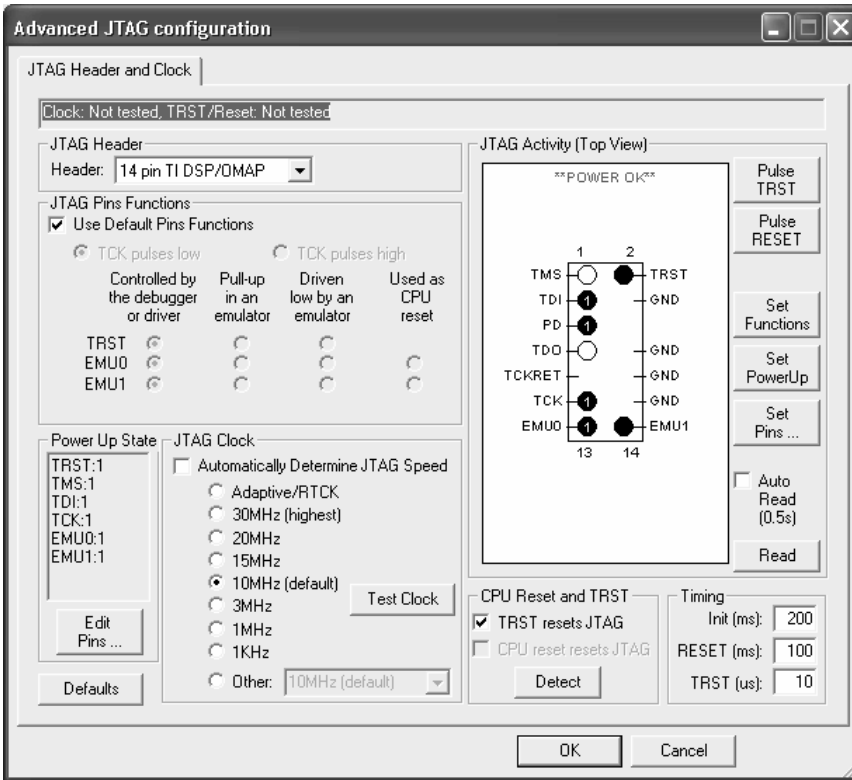


FIGURE 33 Advanced JTAG Configuration dialog box.

The Advanced part of the JTAG Header and Clock tab displays the status of the JTAG header along with controls determining how the JTAG pins are to be terminated or how they should be set during target power-up. The dialog box also allows you to change any JTAG pin, which may be useful when troubleshooting JTAG chains on new boards.

Troubleshooting

1. Make sure that your JTAGjet uses its latest hardware image. Emulator Diagnostic Utility, EmuDiag, enables you to update the JTAGjet firmware using the procedure described in the EmuDiag Help file. EmuDiag can be downloaded over the Internet from www.signum.com/support.htm.

2. Use the SignumCCS.EXE program to customize and test the JTAG connection.
3. Make sure that the JTAG clock is stable, and its speed does not exceed the recommended value. Recall that the JTAG clock should not be faster than 1/3 of the current CPU frequency. As some CPUs start up at a very low CPU clock speed, verify the lowest CPU clock rate and set the JTAG clock to 1/3 of that rate.
4. For ARM cores with the name suffix -S, as well as for the OMAP16xx and OMAP17xx devices, Adaptive/RTCK clock. Otherwise, CCStudio will not communicate with the OMAP1610 and OMAP1710 targets.
5. Use AutoDetect in the SignumCCS program to test your scan chain. The device list in the CCStudio Setup may be incorrect due to modifications or mistakes.
6. Make sure that the CPU memory and PLL are correctly configured. Do that by selecting the correct board, CCStudio GEL script file during the CCStudio setup process, or by running special initialization GEL script manually from within CCStudio.

