TMS

series

SIGNUM SYSTEMS CORPORATION

JTAGjet Driver for Code Composer Studio 3.1, 3.2 and 3.3

Installation
Instructions

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Installing JTAGjet CCStudio Drivers

CCStudio Version Support

The Signum JTAGjet driver package for Code Composer Studio supports the CCStudio ver. 3.1, 3.2 and 3.3. The components installed for each version differ slightly. The package is expected to be forward compatible with future versions of CCStudio. For these versions, the program will install the CCStudio 3.3 compatible components.

Processor and TMS320 DSP Support

All devices supported by CCStudio version 3.1 or newer are fully supported by the JTAGjet emulators. This includes the latest C64x+, OMAP2, OMAP3 DaVinci/DM, and TMS570 Cortex-based processors. However, the JTAG-C2000 model only supports the C2000 family (28x, 24xx, 24x).

A separate PDF file with installation guidelines for the DaVinci processors is available after the drivers have been installed.

JTAGjet USB Device Driver

Note: To get the best performance from your JTAGjet with the high-speed (480 MHz) USB 2.0 interface, make sure that your PC has at least one USB 2.0 port.

Working with USB 1.1 will be by an order of magnitude slower and may feel uncomfortable during debugging. If your computer has only USB 1.1 port, a USB 2.0 PCI or PCMCIA card is an inexpensive and strongly recommended upgrade option.

Your JTAGjet emulator has a USB 2.0 interface. The CCStudio driver package includes the latest system-level JTAGjet USB drivers for Window XP and Windows Vista (32 and 64-bit versions). At the end of the installation process, you may be prompted to install or update the system-level USB driver

(SigUSB.sys file). The JTAGjet USB driver installs in a standard way by detecting the JTAGjet automatically when the emulator is plugged-in for the first time.

In case of difficulties, please refer to the *USB 2.0 Driver for JTAGjet and ADM-51 Installation Instructions* document that describes the USB driver installation process in detail. The document is available at www.signum.com/tecdoc.htm and on the installation CD.

JTAGjet CCStudio Driver

1. Before installing the new drivers, please close all Code Composer Studio debug sessions.

2. Insert the *Signum Systems Development Tools for MS Windows* CD disk into the drive. Expand the *JTAGjet Drivers for Third-Party Debuggers* entry in the installation tree, and double-click the *CCStudio 3.1, 3.2 and 3.3 drivers* option.
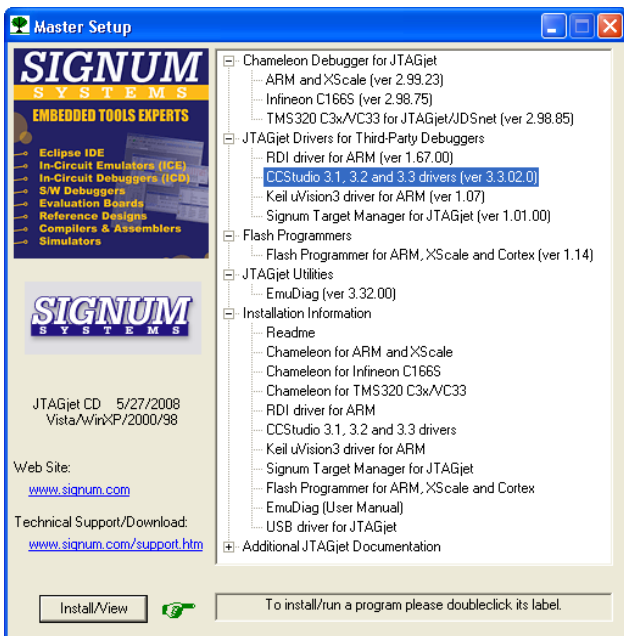
3. If you downloaded the driver, run the ccsjet.exe setup executable.

4. If you have multiple CCStudio versions (3.1 or newer) installed on your computer, the Setup program will display the existing CCStudio installations:
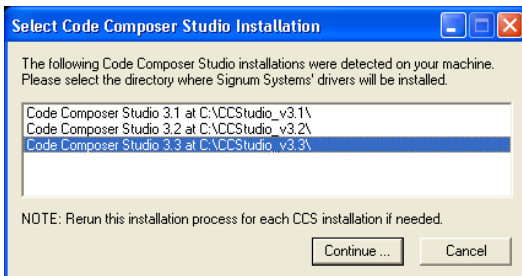
Select the proper Code Composer Studio version and click Continue. The JTAGjet drivers for all platforms supported by the selected instance of CCStudio will be installed at once. When installing drivers for multiple CCStudio versions, it is necessary to repeat the installation process for each individual version. Drivers installed for different versions of CCStudio do not share any components. Consequently, you may have different versions of the JTAGjet drivers associated with individual versions of CCStudio.

> **Note:** Some CCStudio v3.3 Service Releases (SR) available as separate download or through the update advisor may require different JTAGjet drivers. In general, older drivers will continue to work with the updated CCStudio version. However, certain features provided by specific SR, such as additional reset capabilities, may not be accessible. You should then re-install JTAGjet drivers after updating CCStudio. Therefore, it is advisable to update CCStudio before installing JTAGjet drivers.

5. Follow the on-screen instructions to complete the installation process. If an older version of the JTAGjet CCStudio drivers exists, you will be prompted to overwrite it. Accept the replacement.

> **Note:** If new drivers will not work as expected, you may need to uninstall the new drivers.

6. At the end of the installation process, you may be asked to either install or update the system-level JTAGjet USB driver on your computer. If one of the following messages appears, follow the instructions and install (or update) the driver.
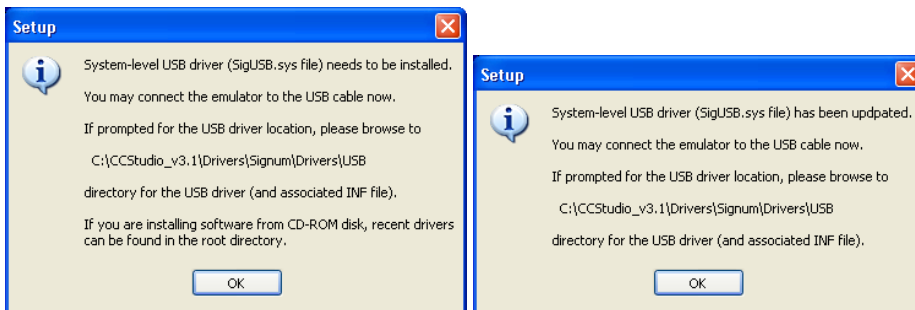
7. Once the drivers are installed, the SignumCCS configuration program, the EmuDiag utility, and the documentation files are available through the All Programs list in the Windows Start menu.
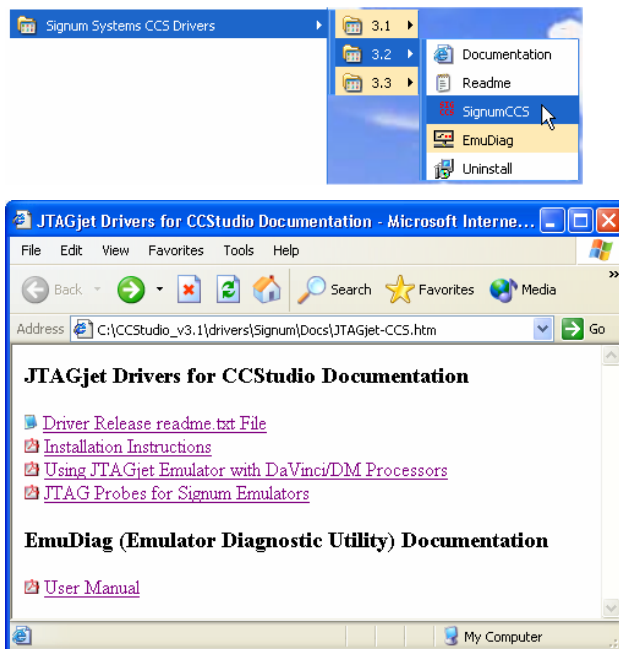
It is imperative to familiarize yourself with the provided DaVinci documentation before you attempt to connect to a DaVinci board or processor. The documentation contains a discussion of important DaVinci related issues.

8. At the end of the installation process, a link to SignumCCS appears on the desktop:
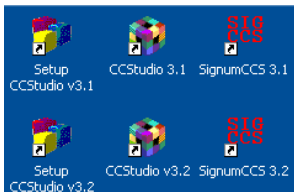
Connecting JTAGjet to Target

The standard TI-14 pin JTAG probe shipped with your emulator is appropriate for the majority of the TMS320 DSP boards. Some new types of boards, such as the DaVinci DVEVM, require the CTI-20 probe, however.

Detailed descriptions, pinout and images of all JTAGjet probes can be found in the *"JTAGjet Probes for Signum Emulators"* document. A PDF version of this document is available after the drivers have been installed.

Please be aware that some probes are designed for a low-voltage range (1.2-4.5V) only. Do not use such a probe for any of the older, 5V boards.

For motor control DSP boards—many of which utilize the F24x or F28x processor—and wherever high voltage or high current is used, the optically isolated probe ADA-ISO-TI14 is recommended.

When connecting the JTAGjet to the target board, always observe this cautionary rule:

> **Caution:** Never connect an unpowered JTAGjet emulator to a powered target board!

When performed in the order indicated, the following startup procedure enforces this requirement.

- Connect the JTAGjet to a USB port on your computer.

- Connect the JTAG probe to an **unpowered** target.

- Power up the target, preferably by turning on the switch on the board.

If you are working with the same board for longer periods, you may safely shut your computer down and then power it up again without disconnecting the JTAG probe from the target. However, always remember to power-down the target before you shut down your computer. When returning to the project, reverse the sequence: start your computer first — this will also power up the JTAGjet via the USB cable. Power up the board just before starting CCStudio.

Configuring CCStudio for JTAGjet

Code Composer Studio must be configured for the Signum JTAGjet emulator through the CCStudio Setup program. This can be accomplished in several ways:

- Use the built-in JTAGjet Factory Board files—a user-friendly drag-and-drop method.

- Create JTAGjet CCStudio configurations manually—a more complex method.

- Utilize the TI XDS510 emulator drivers with the JTAGjet—a rarely used approach.

If you have used the JTAGjet emulator with CCStudio before and exported the configuration files as CCS files, you can import them, using the CCStudio Setup program. Do not import CCS files created with a CCStudio that is newer than the version you are using. Even if imported without errors, they are likely to create problems with the CCStudio debugger.

When connecting to the DaVinci processor, please follow the instructions in the *"Using JTAGjet Emulator with DaVinci/DM Processors"* PDF file accessible through the Documentation shortcut, as described earlier in the text.

Using Built-in JTAGjet Factory Board Files

The JTAGjet driver package includes definitions of many Factory Boards for the most popular DSPs and processors. To use a predefined configuration for your processor, follow these steps:

1. Select JTAGjet Emulator as Platform (see the figure below) to limit the number of board choices. You can narrow these choices further by selecting the Family option. Drag and drop the corresponding Available Factory Board entry from the first column in the middle pane to the System Configuration pane on the left. The figure below illustrates this, assuming the TMS320F2808 board as the target.
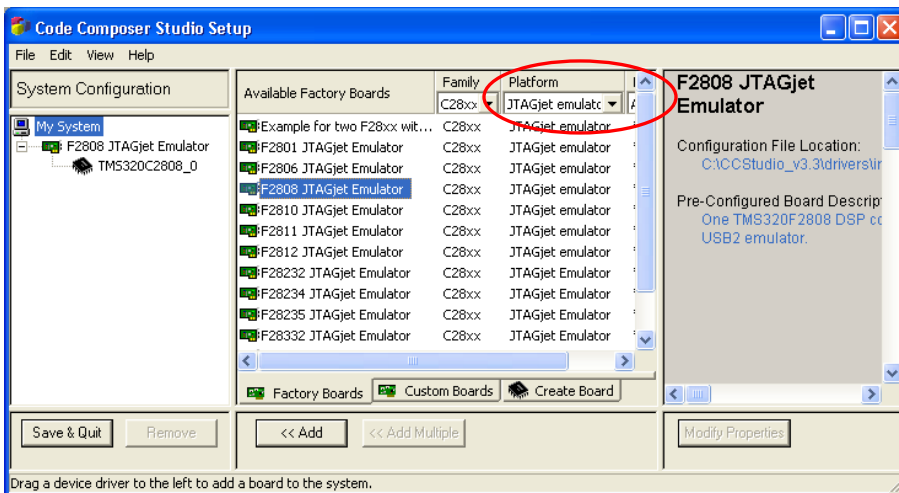
- Inspect and, if necessary, adjust Connection Properties.
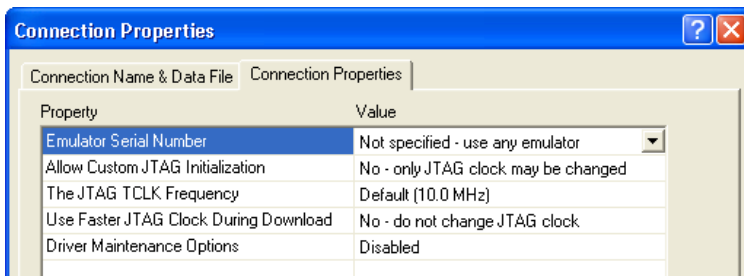
Under normal circumstances, it is not necessary to modify these settings. Most of the predefined configurations use the default values, as shown in the illustration above.

Emulator Serial Number — Forces driver to connect to emulator with specified serial number. See below for more details.

Allow Custom JTAG Initialization — Allows the specification of a nonstandard JTAG initialization (displayed in separate dialog box). Only selected DaVinci and OMAP predefined configurations have this option set. The option is only intended to handle certain non-standard JTAG cases. See below for more details.

The JTAG TCLK Frequency — The frequency of the JTAG TCK signal driven by the emulator. Any frequency between 1.0 kHz and 30.0 MHz or Adaptive/RTCK can be specified. Adaptive/RTCK clock should be used with DaVinci or OMAP devices that incorporate ARM9 or ARM11 cores.

Use Faster JTAG Clock During Download — Configures the driver to use a faster JTAG clock during code download. See below for more details.

Driver Maintenance Options – Allows the cration of an extra option string to fine-tune the drivers or to generate internal log files. Use this option only at the request of and under supervision of the Signum Technical Support staff.

Save the created configuration and start the Studio. In the CCStudio window, select Connect from the Debug menu. The JTAGjet CCStudio driver module will automatically connect to the JTAGjet emulator via the USB port.

2. Click OK. CCStudio will start. You may need to use Debug/Connect menu option to connect to the DSP.
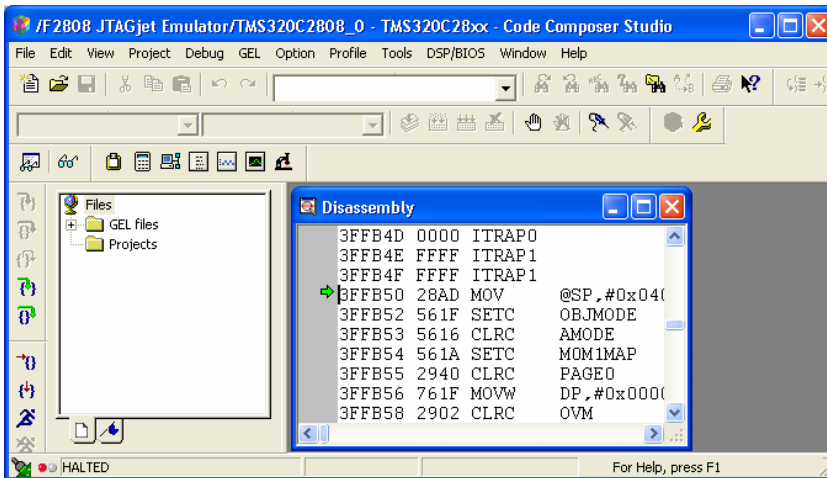
Configuring JTAGjet CCStudio Manually

If a ready to use board configuration is not available for your board or processor, you will need to create a new board configuration manually. This involves the standard CCStudio Setup procedure for creating a new configuration. If you already have a configuration for another emulator, you may use its settings as a template to create the same configuration for the JTAGjet. Below, we describe only the steps that are specific to the JTAGjet emulator.

1. Start with the Create Board tab. Select the Signum JTAGjet Emulator:
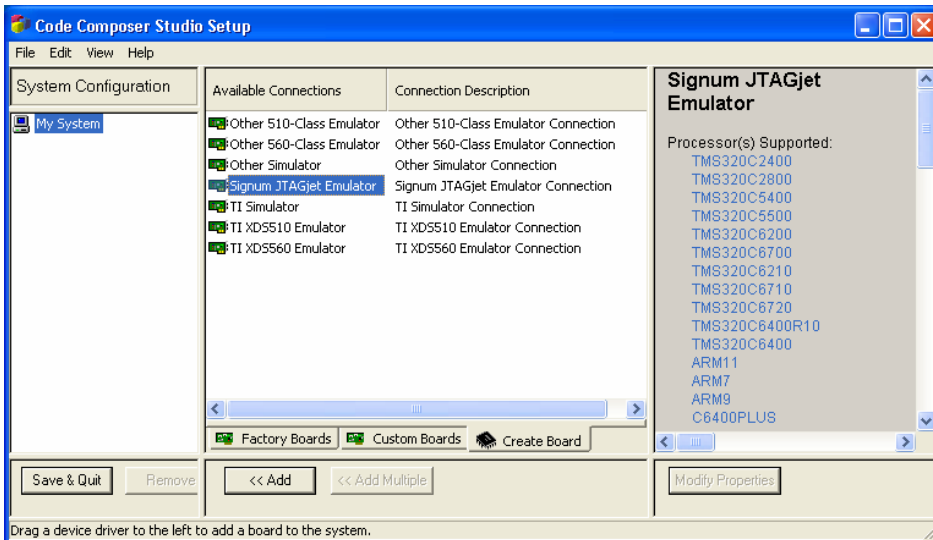
The right-side pane displays a list of the processors supported by the JTAGjet drivers.

2. In the Connect Properties column, choose "Auto-generate board file with extra configuration file" and browse for the Signum_JTAGjet.cfg configuration file:
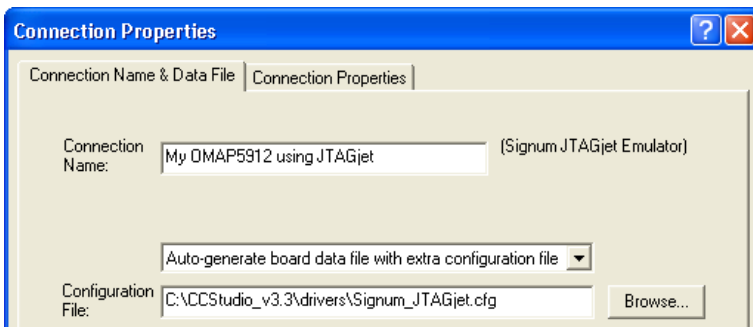
The Signum_JTAGjet.cfg file is located in the CCStudio driver subdirectory. If you have installed more than one CCStudio version installed, make sure to select the correct configuration file. A configuration file taken from a wrong folder will generate errors when connecting to the CPU.

3. Use the Adaptive/RTCK JTAG clock, since the processor includes the ARM926EJ-S core:
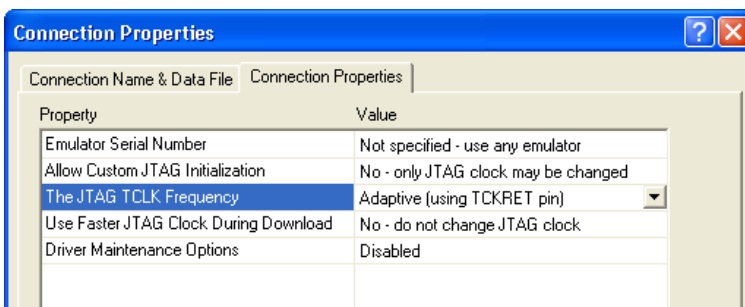
4. Continue the setup process as usual — drag and drop the processors or use the Add button. Make sure that the GEL files you are using are appropriate for your board. These files often are found on the board's installation CD.
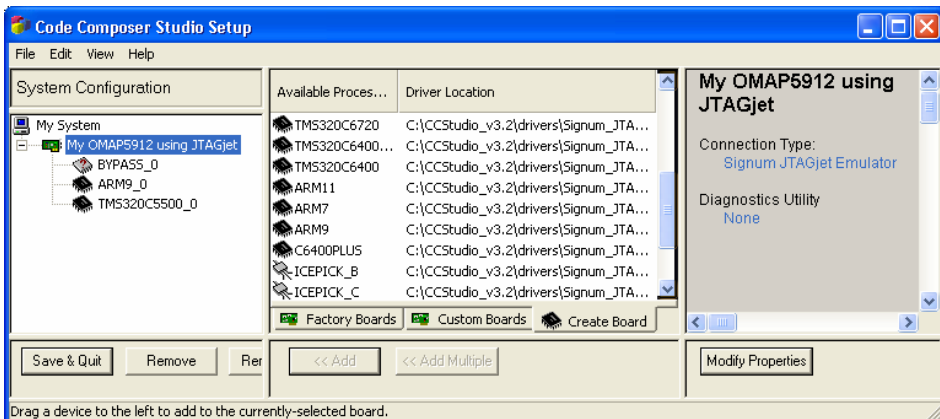
The settings I the illustration above show manual configuration for a custom board with the OMAP5912 processor on it. It includes a BYPASS (8-bit), the ARM9 core and the C55x DSP.

5. Close CCStudio Setup and start the Code Composer Studio program. Since CCStudio configuration includes more than one CPU, the parallel debug manager will start. Connect to the ARM device first.

6. After connecting to the ARM side, make sure that the DSP has been released from reset by the GEL file, as indicated by the message "DSP Released" (illustration below). Only then connect to the DSP. The illustration below shows

two CCStudio sessions for both the ARM and the DSP. The Parallel Debug Manager controlling the two processors appears in the background:
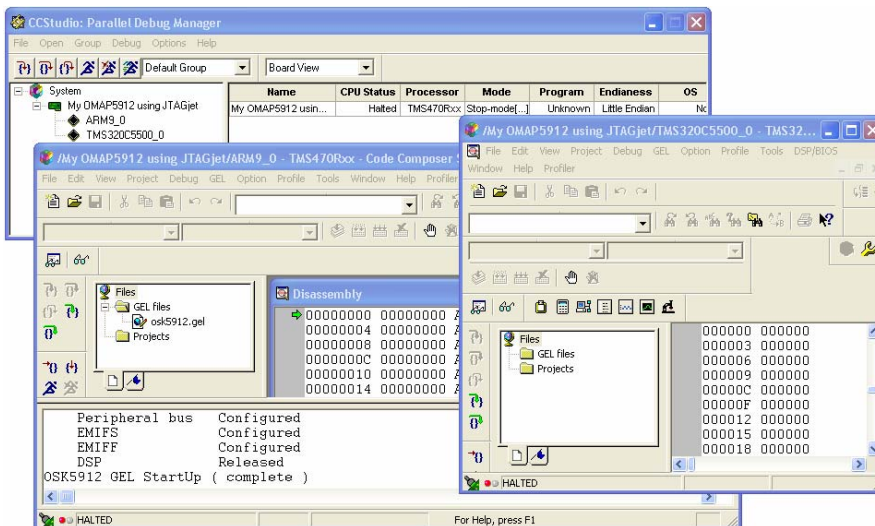
Using TI XDS510 Drivers with JTAGjet

In some instances, the TI DSP/CPU may require a device driver obtained directly from Texas Instruments or downloaded using the CCStudio Update Advisor. In such a case, the JTAGjet CCStudio driver, even if released before the new silicon was available, may support the device., provided the specifications do not deviate significantly from those of the older devices. This compatibility is by no means guaranteed, particularly if the revision of the XDS510 driver is higher than the revision of the corresponding JTAGjet driver. If this is the case, try using the XDS510 driver on top of the low-level JTAGjet controller. In the CCStudio terminology, the latter is referred to as "POD driver."

1. Import the XDS510-specific CCS file or create a new XDS510 configuration.

2. In the Connection Properties dialog, specify Auto-Command Board Data File with Extra Configuration. Browse for the Signum_JTAGjet.cfg file and select it as the extra Configuration File, as shown in the illustration.
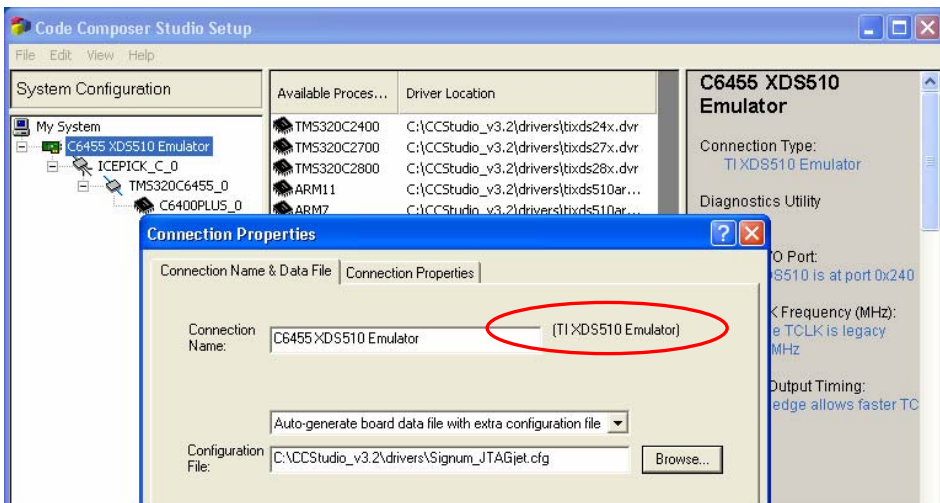
If multiple versions of CCStudio are installed, make sure that the correct CCStudio installation directory is used. A failure to do so may result in an error when trying to connect to the CPU. The JTAGjet will be unable to work with the XDS510USB or XDS510PP drivers. The TI XDS510 Emulator drivers must be used, as marked in the illustration.

3. All the XDS510-specific settings in the Connection Properties tab are irrelevant for the JTAGjet emulator and are ignored.
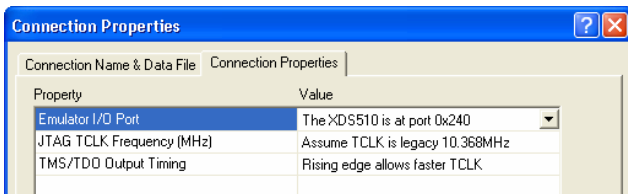
You can modify the JTAG clock and other parameters when prompted before the drivers connect to the CPU. You can also use the SignumCCS utility, as described in the next chapter.

Advanced JTAGjet Options

Allow Custom JTAG Initialization Option

If the **Allow Custom JTAG Initialization** option is selected in CCStudio Setup, the driver offers an opportunity to customize the advanced JTAGjet parameters and test the JTAG connectivity before the CCStudio connects to the processor.

> **Note:** To simplify the connection process in the newer versions of the driver, the Custom JTAG Initialization dialog box is no longer displayed by default.

1. Press Yes in either of the dialog boxes that may appear:
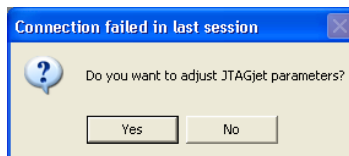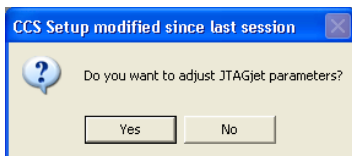
- In the JTAG configuration dialog box, select 14-Pin TI DSP as the JTAG Header. Choose the JTAG TCK clock frequency to be used. (The default, 10MHz, is appropriate for most DSP boards.) If your processor has an ARM9 or ARM11 core in it (OMAP or DaVinci), use the Adaptive/RTCK clock. Press the Test button. A typical response from the system for single, regular DSP looks like this:
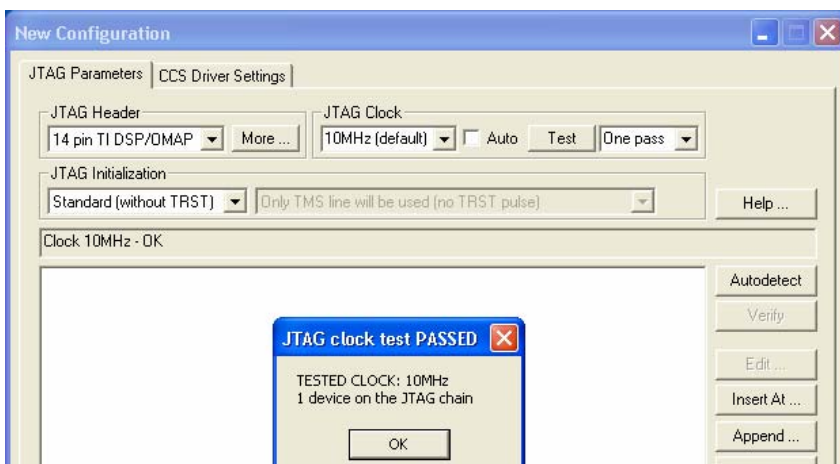
If the 10MHz JTAG clock is not working, click Auto to determine the highest safe frequency. For more details about configuring the JTAGjet, click the Help button and open the EmuDiag User Manual PDF file. The document is also available via the Documentation shortcut in the All Programs list. Click the Autodetect button. The resulting window may look like this.
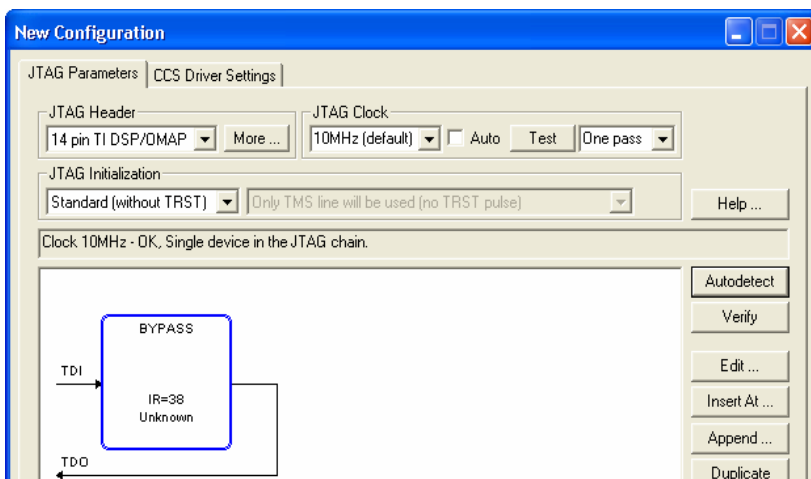
Note the BYPASS device detected in the JTAG was chain. This is to be expected, since for the majority of the Texas Instruments DSPs, it is impossible to determine the type of the device physically connected to the JTAG.

Nonetheless, CCStudio will use the driver of the type you selected in the CCStudio Setup program.

The number of devices and the total number of IR bits should be detected correctly and correspond to the devices set in CCStudio Setup. In our example, the value IR=38 is the IR length of a single F2808 DSP. Typical IR values for the TMS320 DSP devices are these: 8 for the C24x, C54x, C6x0x processors; 46 for C6x1x, C6x2x; and 38 for C28x, C55x, C64x and C64x+. Click Help for more information about IR lengths associated with other processors.

2. If you are more complex CPU (DM644x with ARM926EJ-S core), you need to select Adaptive/RTCK as JTAG clock.

All the JTAGjet-related configuration options appear only during the first connection after any change made in the CCStudio setup. Subsequent CCStudio sessions for the same board will start automatically. To customize these parameters, use the SignumCCS utility at any time. The new settings will take effect in the next CCStudio session.

Use the Faster JTAG Clock During Download Option

> **Caution:** This feature relies on the assumption that the CPU clock is fast enough when downloading code. Use this option ONLY when (1) the code to download is large, (2) the connection to the CPU is stable, and (3) you repeat the download operation often. Do not use it when connecting to the target for the first time, or when your memory or CPU clock configuration settings (in GEL or in code) are not finalized. None of the predefined configurations supplied with the driver has this option set.

For such target boards as OMAP, DaVinci or C6000, the code to be downloaded can be quite large, reaching Megabytes. In general, the faster JTAG clock, the faster code download. However, your target may be running with a slow clock, or even while in the sleep mode. In such cases, it may be impossible to connect to the CPU using fast JTAG clock. The GEL files provided with most boards initialize the CPU before downloading the code. The process includes the setup of the PLL (to make the CPU run faster) and the initialization

of SDRAM (to accelerate access to RAM). After the PLL is set up and CPU runs using a fast clock, it may be possible to use a faster JTAG clock.

If the Use Faster JTAG Clock During Download option is set to 10, 15, 20 or 30MHz, the driver internally switches to the specified faster JTAG clock before performing large memory transfers, such as code downloads or massive memory uploads. At the end of the transfer, the option switches back to the original clock (usually Adaptive/RTCK). This approach ensures that the CPU initialization and all accesses to the registers use the original—slower or Adaptive—JTAG clock frequency.

Typically, this option results in doubling the download speed.

Emulator Serial Number Option

The Connection Properties option allows you to specify the serial number of the emulator to be connected to. The default settings do not include the emulator serial number.
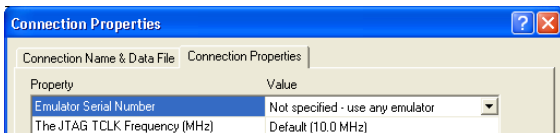
The above (default) settings are usually satisfactory for a single emulator connected to one PC. These settings are also appropriate when a development group shares several emulators, one (and only one) of which is connected to your machine.

However, it possible to supply the serial number of a specific emulator:
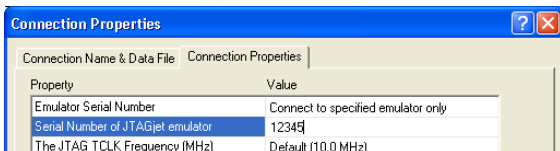
This is useful (and necessary) when there are multiple emulators attached to your PC. The option allows you to tell which emulator is used in a CCStudio debug session, or connect to multiple target boards with multiple emulators simultaneously.

The JTAGjet CCStudio drivers installation includes examples of configurations for two F28xx processors connected to two different JTAGjet emulators. 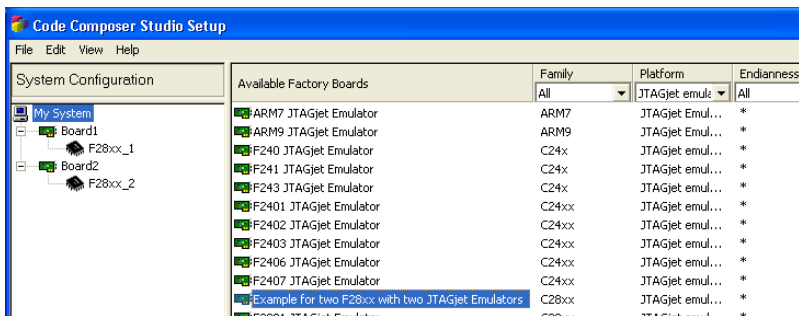The following procedure outlines the process of connecting two F28xx boards. Use it as a template for your own multi-board and multi-emulator configurations.

1. Start the CCS Setup program and select the "Example for two F28xx with two JTAGjet Emulators" configuration:

2. This configuration uses emulator serial numbers 50001 and 50002 as an example. To match the serial numbers of your emulators, make the necessary modifications. Select properties for each board and modify the JTAGjet serial number like this:
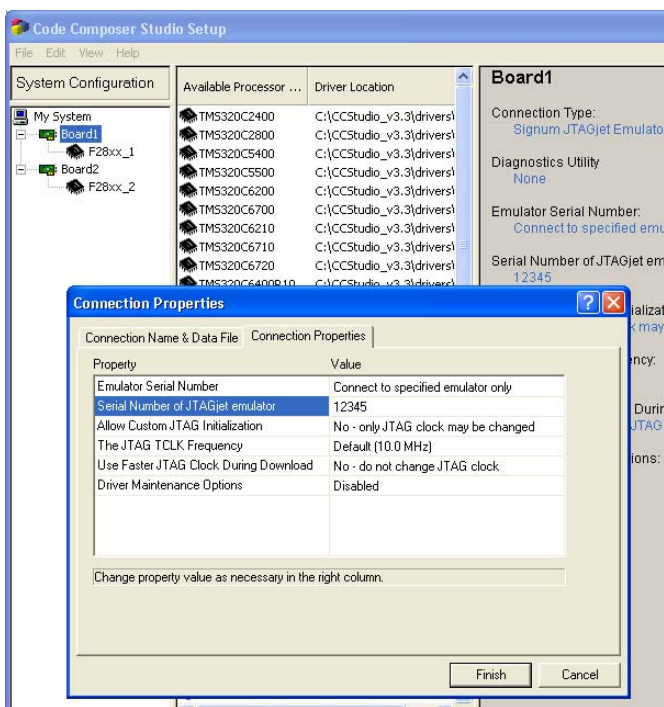
3. You may need to specify the GEL files for each processor as well. Make sure that you selected the correct GEL file for each processor. Note that the processors may not be identical, since you are connecting to two different boards at once.

4. Close CCStudio Setup, make sure, that you have specified emulators connected to USB cable and target board and start CCStudio.

5. In Parallel Debug Manager, connect to the first processor by choosing Connect Device from the processor specific right-click menu:
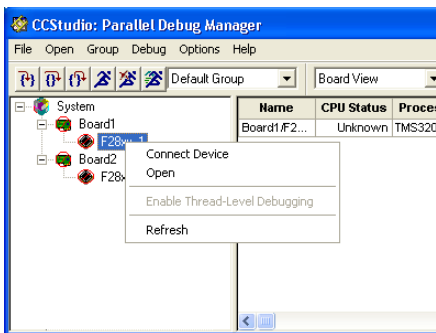
6. Repeat for the second processor and open both instances of CCStudio using Open from the processor specific menu. The CCStudio windows will look like this:
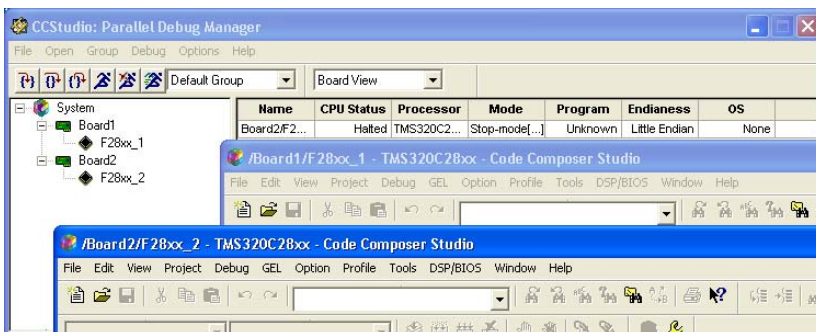
Running SignumCCS Separately

The SignumCCS utility can be used to configure the JTAG clock speed and other JTAG parameters for use during CCStudio session. The program can be run before Code Composer Studio starts or concurrently with it.

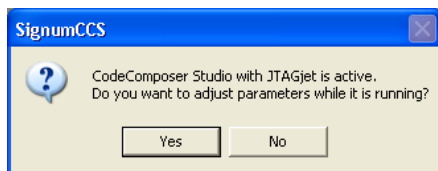However, executing the two programs in parallel limits the functionality of SignumCCS to JTAG clock control only.

After connecting to the emulator, SignumCCS displays the same JTAGjet configuration as the one used when starting the CCStudio session for the first time. All the modifications will be saved and used in the next CCStudio debug session.

JTAG Clock Considerations

The JTAGjet configuration module used in the CCStudio drivers is also used by EmuDiag, the Signum Emulator Diagnostics Utility. For added convenience, EmuDiag is installed together with the JTAGjet CCStudio drivers.

The following chapters in the EmuDiag User Manual provide a comprehensive description of the JTAGjet settings and related issues:

* Configuring and Testing JTAG

* Advanced JTAG Topics

* Basic JTAG Debugging Guidelines

The general guidelines for setting the JTAG clock for your board are as follows:

* Select the fastest JTAG clock supported by your board or set it to 10 MHz, whichever is lower. 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. Higher clock frequencies may be used successfully only when Code Composer Studio is running without any problems at lower settings. Remember that SignumCCS can change the JTAG clock speed while CCStudio is running.

* The Adaptive/RTCK option should be used for the OMAP and DaVinci devices that include ARM9 or ARM11 cores. These cores synchronize the JTAG clock with the CPU clock and return the RTCK clock signal back to the emulator. 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:** The Adaptive/RTCK option will work for plain DSP devices, since the TCK and TCKRET signals on the JTAG connector are connected together. However, the option may be slower than using a fixed 10MHz clock.

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

Miscellaneous CCStudio Drivers Topics

Limited CCStudio Versions

The Code Composer Studio kit shipped with your target board may be limited to the use of the board's built-in emulation connection, such as a parallel port or USB port. This is often the case with less expensive TMS320C2000 DSP boards. These limited versions of CCStudio cannot be used with the JTAG emulator, because it would allow such a copy of CCStudio work with other boards or CPUs.

The following error message at the beginning of a debug session will advise you of the need to upgrade CCStudio to a full version to be able to use the JTAGjet:
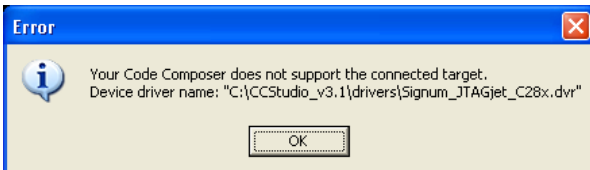
An upgrade can be acquired using Update Advisor after obtaining a proper activation key from Texas Instruments.

JTAGjet Driver Revisions

The Signum Systems JTAGjet CCStudio drivers are released as a package. The Driver Description section of CCStudio Setup's rightmost pane contains the release number of the package (3.3.00 in the example below). In addition, the Driver Revision section displays the revision number of each JTAGjet driver (33.01.804 in the illustration below). This number can be used to check the compatibility with corresponding Texas Instruments XDS510 driver:
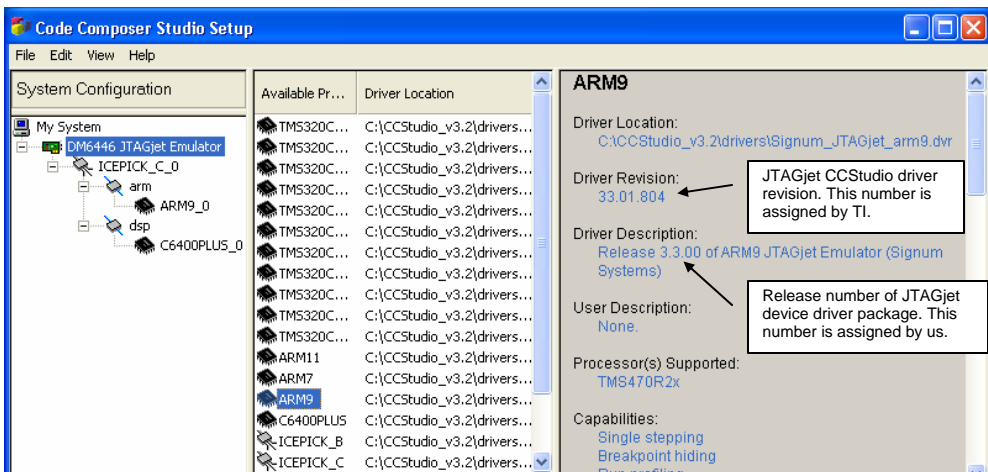

New devices often require the latest drivers. The current package of Signum drivers is available at the www.signum.com/support.htm page. If you already have the latest Signum drivers, but experience problems connecting to your target board, check in CCStudio Setup for a better XDS510 driver—compare the driver revisions of both drivers, as shown in the illustration. If the XDS510 drivers are newer, try using them.

JTAGjet-C2000 Drivers

The JTAGjet- C2000 model includes CCStudio drivers that support only C2000 processors. These drivers are a sub-set of the complete JTAGjet driver package. In general, both the TMS C2000 specific and full JTAGjet drivers can safely be installed over their previous versions.

Uninstalling JTAGjet Drivers

A list of currently installed CCStudio JTAGjet drivers is available through the Control Panel Add or Remove Programs features:
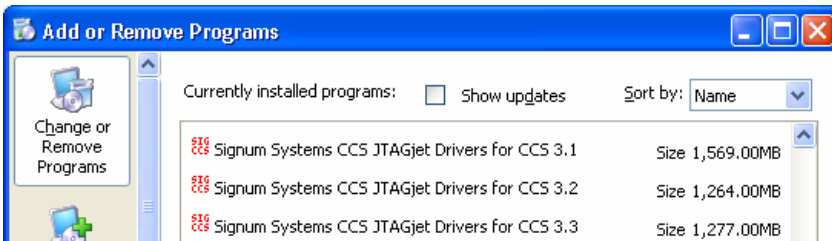
You may remove the JTAGjet Driver from these lists. Alternately, click the driver's Uninstall shortcut in the All Programs menu.
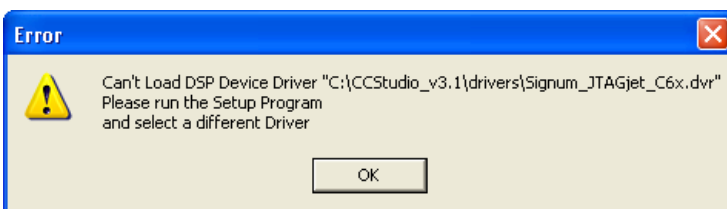
The JTAGjet drivers' sizes reported in Control Panel are the sizes of the entire CCStudio installations, into which they are incorporated. In reality, Signum JTAGjet drivers occupy merely 7.5 MB.

The un-installation process removes all JTAGjet driver components from a particular CCStudio version:
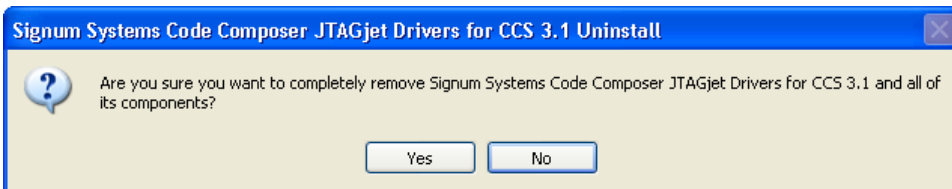
Some temporary files, configuration files and log files created while the drivers were in may remain un-erased. All the installed components, including the drivers, libraries, SignumCCS.exe and configuration files, have file names starting with the word Signum for ease of identification. The bulk of the internal components are installed in the "drivers\Signum" CCStudio subfolder. Both the subfolder and the component files can be removed.

The uninstall process does not erase JTAGjet-specific CCS files created when using Export in CCStudio Setup. If you attempt to run a CCStudio session using such a file, the following message will appear:

Error	✕
⚠	Can't Load DSP Device Driver "C:\CCStudio_v3.1\drivers\Signum_JTAGjet_C6x.dvr" Please run the Setup Program and select a different Driver
	OK

Troubleshooting

1. JTAGjet will not work with limited CCStudio versions. CCStudio will report error about an unsupported driver. See section *Limited CCStudio Versions* for details.

2. For DaVinci related problems, consult DaVinci-specific PDF file available through the Documentation shortcut.

3. Use the SignumCCS program to customize and test the JTAG connection. The Help button provides additional information about JTAG-related issues.

4. The EmuDiag documentation provides list of comprehensive JTAG-related tips and describes the JTAG configuration process in details. It is available via the Documentation shortcut

5. 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.

6. For OMAP and DaVinci devices, which include ARM9/ARM11 cores, use the Adaptive/RTCK clock.

7. Use the fixed clock with TMS320 DSP and TMS470 devices with ARM7 cores.

8. To test your scan chain, use AutoDetect in the SignumCCS program. Compare the results with the device list in the CCStudio Setup. The chain may be incorrect due to modifications, mistakes or different switch and jumper settings on the board.

9. If the devices (or IR sizes) on the JTAG are different than expected, verify the EMU0/EMU1 pin values on your board. Many processors reconfigure the JTAG scan chain depending on the values of these pins, sampled when the CPU is powered up.

10. If you are debugging both ARM and DSP at the same time, as is the case with the OMAP or DaVinci devices, please make sure that the ARM releases the DSP from reset (usually by running GEL file on the ARM side) before trying to connect to the DSP.

11. Make sure that the CPU memory and PLL are properly configured. Do that by selecting the correct board and CCStudio GEL script file during the CCStudio setup process. As an alternative, run an initialization GEL script manually from within CCStudio.

❑

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