Application Note

TKScope Emulator for DSP User Manual

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Table of Contents

1. TKScope Emulator Introduction

1.1 Introdution

TKScope embedded intelligent emulator designed by Guangzhou Zhiyuan Electronics Co., Ltd. in 2008, which is a high-performance general-purpose integrated emulator and supports DSP / ARM / AVR core etc. At the same time, TKScope built-in 32-way professional logic analyzer.

TKScope DK Series Emulator built-in DSP and ARM dual simulation models, dual JTAG port can also complete the TI DSP and ARM core simulation debugging, the unique technology leads a new model to DSP and ARM development tools.

Figure 1.1 TKScope DK9

TKScope DK Series can support DSP and ARM simulation: DK5 / DK8 / DK9 / DK10.

Support the DSP chips: TI C2000 / C5000 / C6000 / OMAP / DaVinci etc.

Support the ARM core: ARM7 / ARM9 / Cortex-M0 / Cortex-M1 / Cortex-M3 / XSCALE / ARM11 etc.

Support all the mainstream IDE, such as CCS / TKStudio / Keil / ADS / IAR / RealView / SDT and so on.

1.2 TKScope DK Performance

TKScope DK Series built-in DSP and ARM dual simulation models, dual JTAG port can also complete the TI DSP and ARM core simulation debugging, the unique technology leads a new model to DSP and ARM development tools. At the same time, TKScope built-in 32-way professional logic analyzer.

TKScope emulator features for DSP simulation:

- Support IDE: CCS3.1 / CCS3.2 and the latest CCS3.3.
- Support full of TI DSP chips simulation: such as C2000 / C5000 / C6000 / OMAP / DaVinci and so on.

- USB2.0 (High Speed), high-speed communication interface.
- High-speed code download function which exceeds 600KB/s, especially on the DEBUG mode, download the code for speed optimization.
- Support high-speed RTDX data link which exceeds 2MB/s.
- Real-time event triggers, to support real-time breakpoint.
- Target board IO voltage adaptation, support for JTAG IO voltage range of 1.6V~3.6V.
- Built-in PLL clock generator which can distinguish automatically, adjust to JTAG clock, support user-defined simulation clock 500K~35MHz.
- DSP simulation, ARM simulation and Logic Analyzer can work together at the same time.

TKScope emulator features for ARM simulation:

- Support the full range of ARM core simulation, such as ARM7 / ARM9 / Cortex-M0 / Cortex-M1 / Cortex-M3 / XSCLAE / ARM11 and so on, including Thumb mode;
- Support the Cortex-M0 / Cortex-M1 / Cortex-M3 core serial debug (SWD) mode;
- Support all the mainstream IDE,such as TKStudio / Keil / ADS / IAR / RealView / SDT and so on;
- Support the on-chip Flash in-circuit programming / debugging, providing each chip corresponding Flash programming algorithm file;
- Support the off-chip Flash in-circuit programming / debugging, providing hundreds of commonly used Flash device programming algorithm file;
- Support multiple interface types of external Flash programming / debugging,such as NOR / NAND / SPI Flash and so on;
- Allowing users to add their own Flash programming algorithm file;
- Provide a separate programming-Flash independent software to increase productivity;
- Support for unlimited RAM breakpoint debugging;
- Support for unlimited Flash breakpoint debugging, breaking limit the number of hardware breakpoints;
- Synchronous Flash technology, fast refresh Flash breakpoints, the speed as fast as RAM debugging;
- Support dynamic breakpoints can set / cancel any breakpoint in running;
- Support program breakpoints and data breakpoints, user-friendly and accurately track complex programs to run;
- Rapid single-step, the fastest 150 steps / sec;
- Ensure the fastest and most stable frequency changes in the target system to debug;
- Built-in special debugging algorithms, reliable debugging of the ARM core in an irregular situation;
- Support for daisy-chain connection of multi-device simulation;
- Chip-based design concepts for the hundreds of kinds of chips to provide a sound initialization file.
- Built-in comprehensive interpretation of the actuator initialization files, can be flexible system settings before and after reset / run around / Flash download around, including register settings / ARM initialization / clock Settings / delay / information and so on.

Logic Analyzer Performance

- 32 channels, 100M sampling speed, 512KB memory depth.
- Advanced triggering: edge / level / bus etc.
- Multi-document structure allows to measure and compare the other data at the same time.
- Powerful data export function to support secondary analysis of the measurement sigal.
- Flexible frequency setting breaks through traditional 1 / 2 / 5 Hex, makes measurements more precise.
- Algorithm for dynamic upgrades of hardware to make your measurements with the times.

1.3 Selection Guide

At present, there are mainly four types of TKScope DK Series: DK5 / DK8 / DK9 / DK10, as show in Table 1.1.

Table 1.1 Selaction guide table

Emulator Type	DK5	DK8	DK9	DK10
Simulation Type	DSP	DSP	DSP，ARM，AVR	DSP，ARM，AVR
K-Flash in-circuit programming On-chip/out-chip Flash			ARM，AVR	DSP，ARM，AVR
Communication	USB2.0	USB2.0	USB2.0	USB2.0
Logic Analyzer		√	√	√
Logic Analyzer Performance		32-way/512KB/100MHz	32-way/512KB/100MHz	32-way/512KB/100MHz
Support IDE	CCS	CCS，Zlglogic	CCS，TKStudio，Keil，ADS，IAR，RealView，Zlglogic	CCS，TKStudio，Keil，ADS，IAR，RealView，Zlglogic

This article explains how to use the TKScope DK9 for DSP simulation, including the installation of driver, the using steps and precautions in the CCS3.3 IDE.

2. Use TKScope Emulator

2.1 Install Driver

TKScope DK Series simulation of DSP chips, supports for TI CCS3.1 / CCS3.2 and the lastest CCS3.3 IDE. In this paper, we will take CCS3.3 for expamle, explain TKScope DK9 simulation process and methods of DSP chips in detail.

TKScope DK9 uses in CCS3.3 IDE, you must install CCS3.3 IDE interface driver (Setup TKScopeDK9ccs_v303.EXE).

1. Double-click SetupTKScopeDK9ccs_v303.EXE, the system will pop-up dialog box as shown in Figure 2.1.

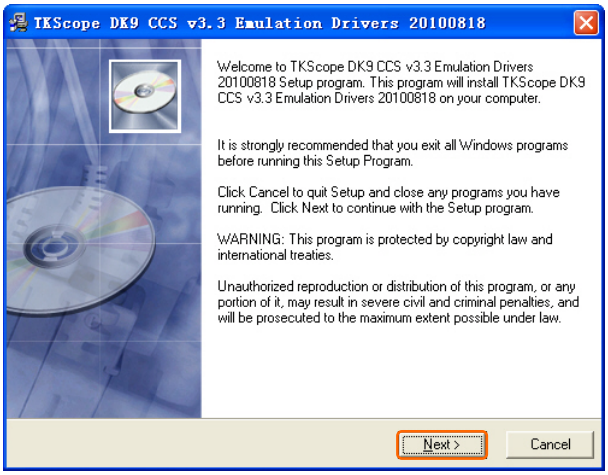

Figure 2.1 Install TKScope driver

2. In Figure 2.1, click [Next] to continue, the system will pop-up dialog box as shown in Figure 2.2, prompt the user to select the driver installation path.

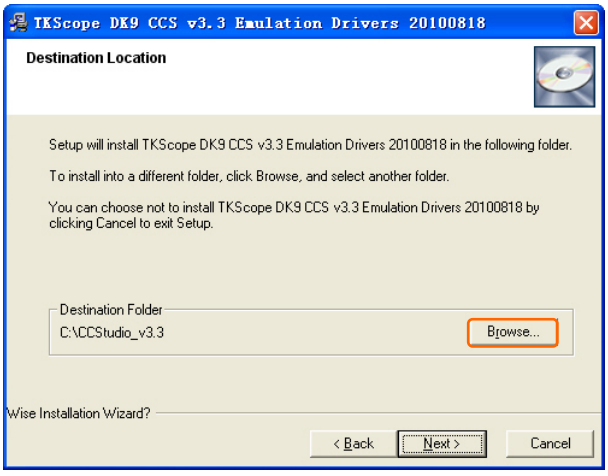

Figure 2.2 Driver installation path

3. In Figure 2.2, click [Browse], the system will pop-up dialog box as shown in Figure 2.3. Drivers must be installed to the CCS3.3 IDE directory.

For example，CCS3.3 development environment installed on the C drive，therefore，TKScope emulator driver installation path to C: \ CCStudio_v3.3, as shown in Figure 2.3.

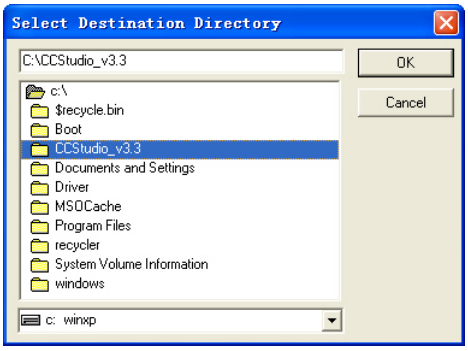

Figure 2.3　Select destination directory

4. After the installation path, Click [Next] to continue until the installation is completed, as shown in Figure 2.4. Click [Finish], the installation is completed.

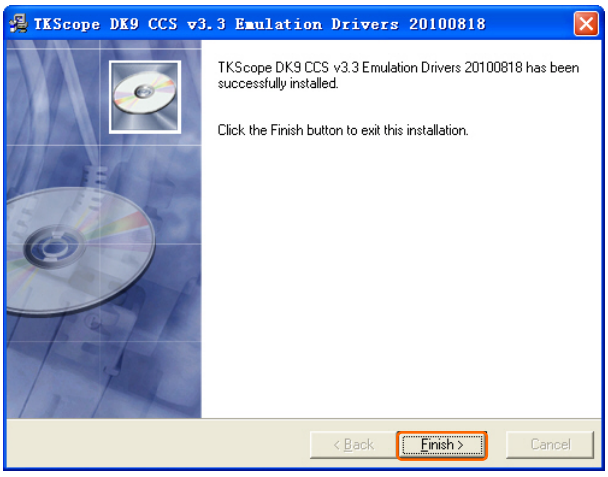

Figure 2.4　Driver installation is complete

2.2　Hardware Connection

1. For the first time，TKScope emulator power use, the system will pop-up dialog box shown in Figure 2.5. Need to specify the exact location of USB device driver.

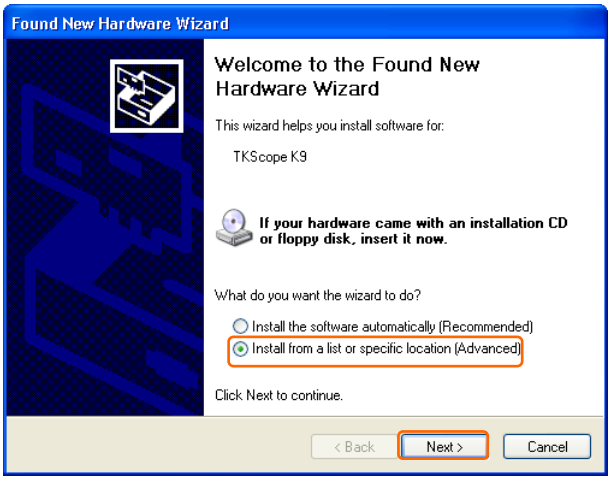

Figure 2.5 Found new hardware wizard

2. Select [Install from a list or specific location(Advanced)] option in Figure 2.5, click [Next]，the system will pop-up dialog box as shown in Figure 2.6.

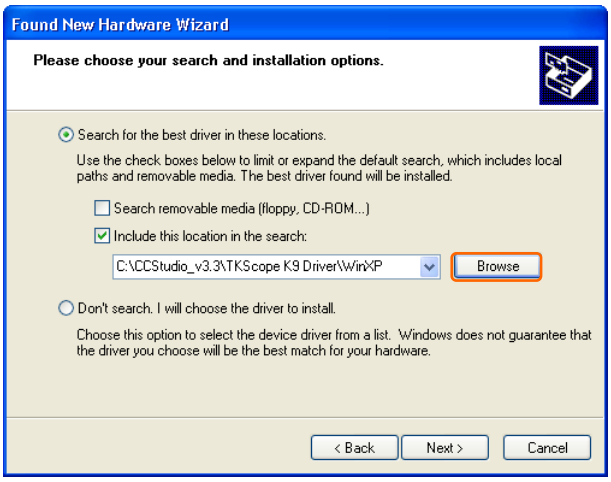

Figure 2.6 Select driver box

3. In Figure 2.6, click [Browse]，open the dialog box as shown in Figure 2.7. Find the driver files in TKScope emulator installation directory, click [OK].

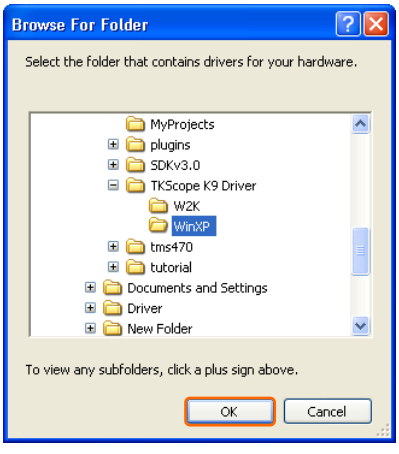

Figure 2.7 Designated driver

4. Driver installed, the system will pop-up dialog box as shown in Figure 2.8, click [Finish] to complete.

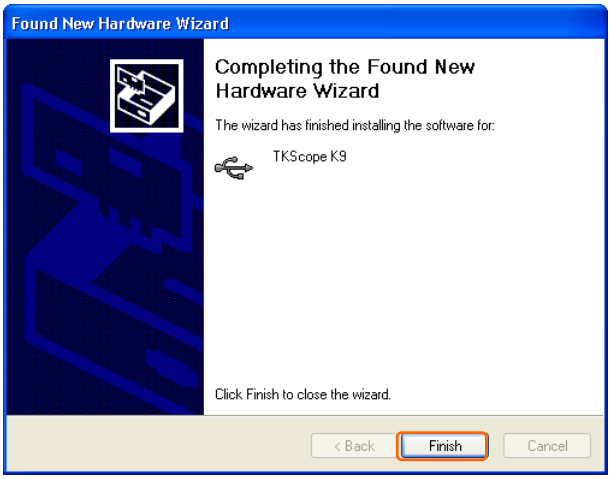

Figure 2.8 New hardware installation has completed

3. Simulation DSP In CCS3.3

3.1 Simulation Environment Setting

CCS3.3 IDE installation is completed, the desktop will see the "Setup CCStudio v3.3" and "CCStudio v3.3" icon of two words.

1. Double-click "Setup CCStudio v3.3", open the CCS3.3 setting interface, as show in Figure 3.1.

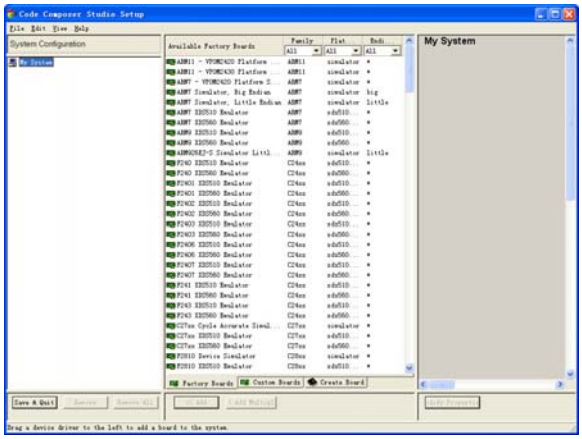

Figure 3.1 CCS3.3 setting interface

2. In Figure 3.1, Click [File] option, the drop-down menu, select [Import], as show in Figure 3.2.

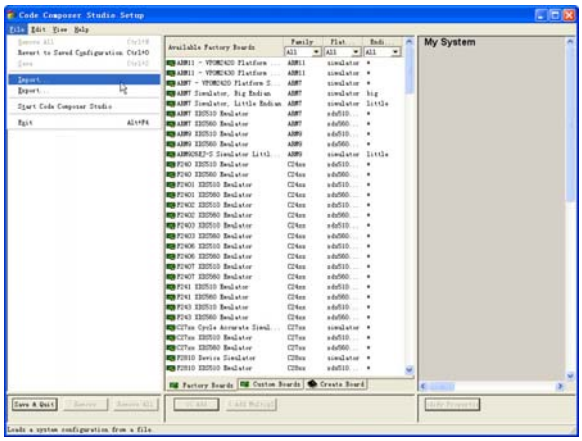

Figure 3.2 Import option

3. The system will pop-up dialog box as shown in Figure 3.3, click [Browse] option.

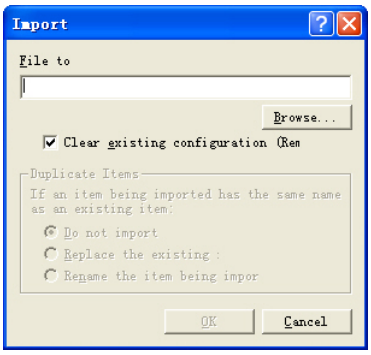

Figure 3.3 Import option dialog box

4. System will automatically open the CCS3.3 installation directory "import" folder, users choose appropriate option based on their use. (This example uses TKScope DK9 simulation of TMS320LF2407 chip, as show in Figure 3.4).

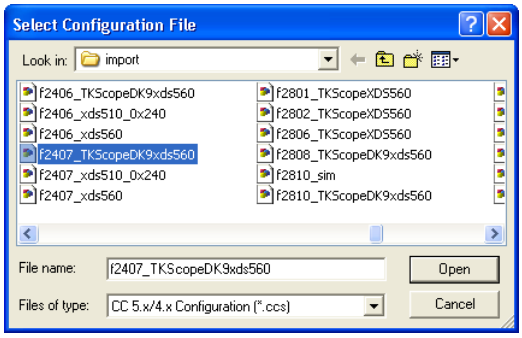

Figure 3.4 Select configuration file

5. After the right to import, CCS3.3 setup interface show in Figure 3.5. At this time, need to set the Emulator information and CPU type.

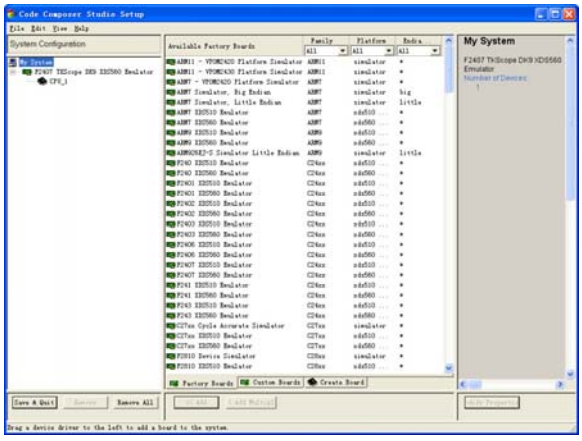

Figure 3.5 Completing settings interface

6. Users can open the properties dialog box emulator, set according to actual needs, as show in Figure 3.6.

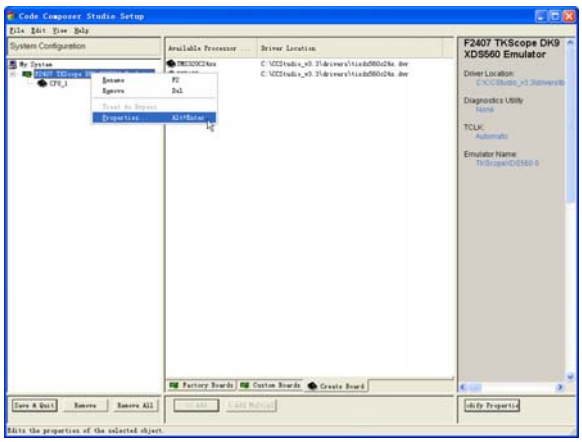

Figure 3.6 Set emulator properties

7. Emulator properties dialog box show in Figure 3.7, the user can set TCLK mode. In general, choose [Automatic].

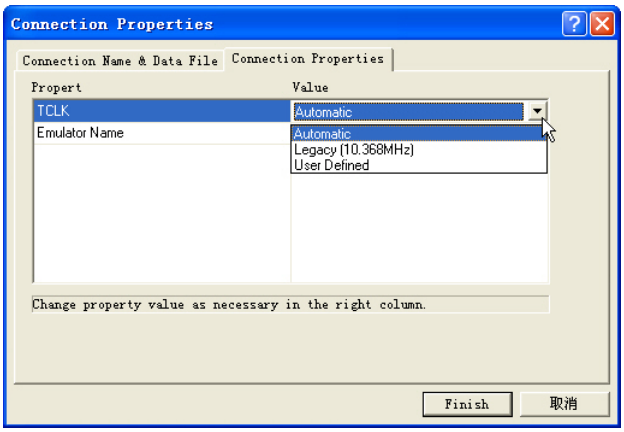

Figure 3.7 emulator properties dialog box

8. Users can also open the CPU properties dialog box, set according to actual needs, as show in Figure 3.8.

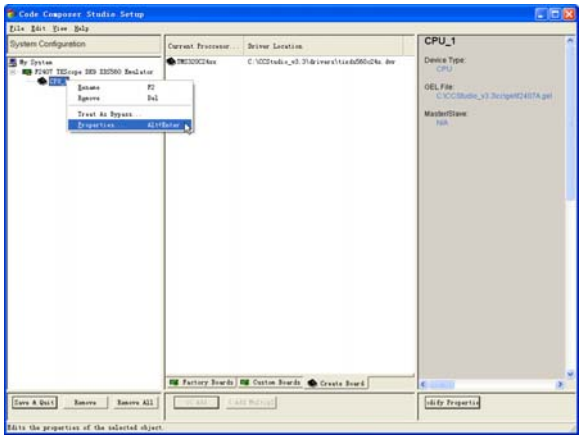

Figure 3.8 Set CPU properties

9. CPU properties dialog box show in Figure 3.9, users can modify the CPU property. In

general, CPU properties without having to modify.

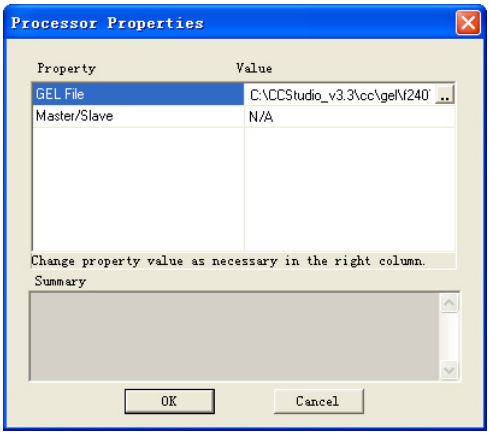

Figure 3.9 CPU properties dialog box

10. When settings are completed, click [Save & Quit] option in Figure 3.1, save and close CCS3.3 setting interface. At this time, system will pop-up dialog box as shown in Figure 3.10. Click [Yes], the system will open CCS3.3 operating environment; Click [No], need to the user open it.

Figure 3.10 Choose dialog box

3.2 Debugging method

Users can debug after the completion of the emulator settings.

3.2.1 Device Connection

Double-click “CCStudio v3.3”, open the CCS3.3 IDE interface, as show in Figure 3.11. At this moment, system prompts “No target connected”.

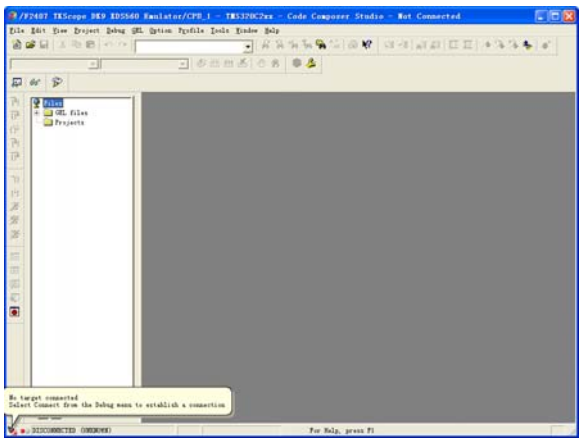

Figure 3.11 No target connected interface

Click [Debug] menu, select [Connect] option, connect the target board, as show in Figure 3.12.

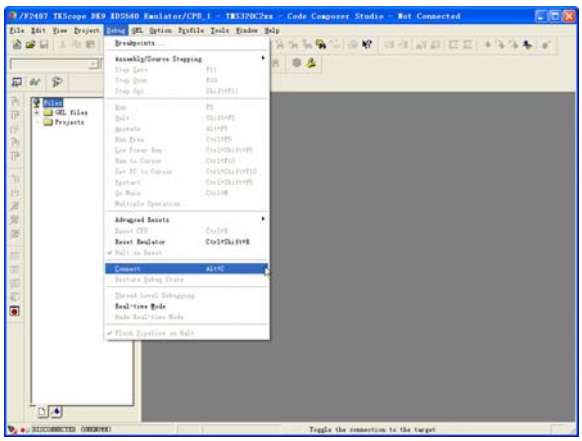

Figure 3.12 Connect the target board operation

If the emulator connets with the target board correctly, the system will prompt the target board is connected, as show in Figure 3.13.

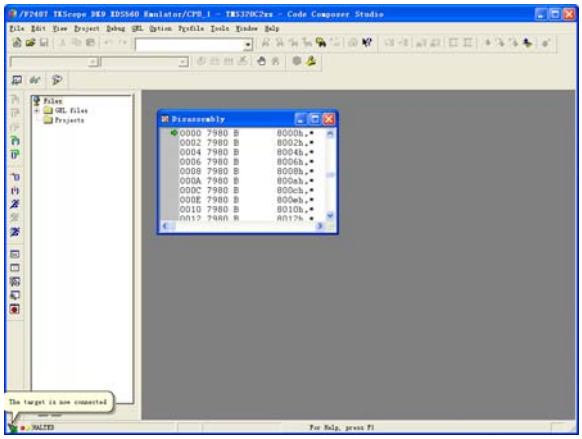

Figure 3.13 Target board is connected interface

If the emulator connets with the target board incorrectly, the system will pop-up dialog box shown in Figure 3.14. This moment, users need to check whether the target board power, or JTAG interface is normal, or CCS3.3 environment settings are correct and so on.

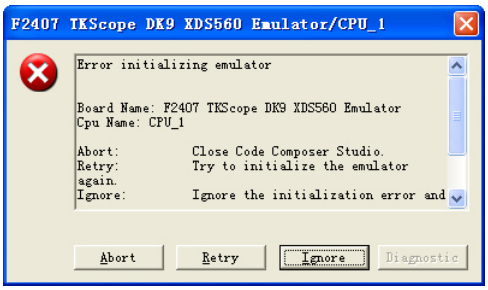

Figure 3.14 Error initializing emulator

If the default of gel documentation systems can not meet user requirements, users can delete the system default file, add your own gel file, show in Figure 3.15.

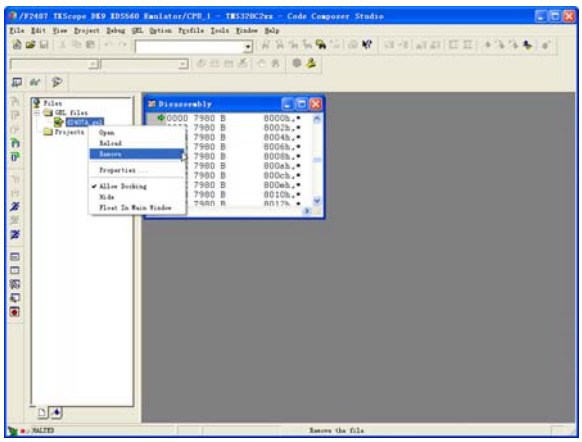

Figure 3.15 Remove gel file operation

3.2.2 Download the project

After emulator connected with target board correctly, the user can load their own project and debug.

Click [project], select [open], load the user's project, as show in Figure 3.16.

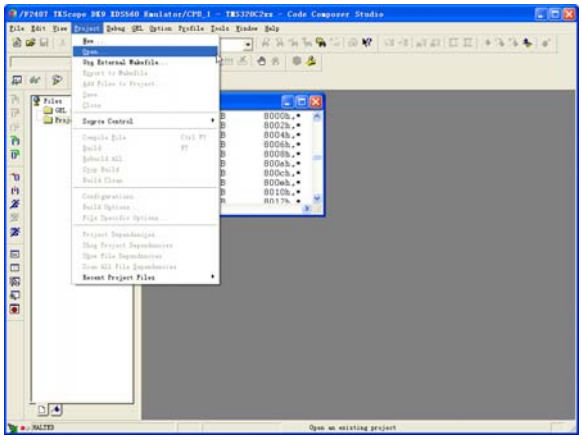

Figure 3.16 Open the project

Load the gel file of the project, as show in Figure 3.17.

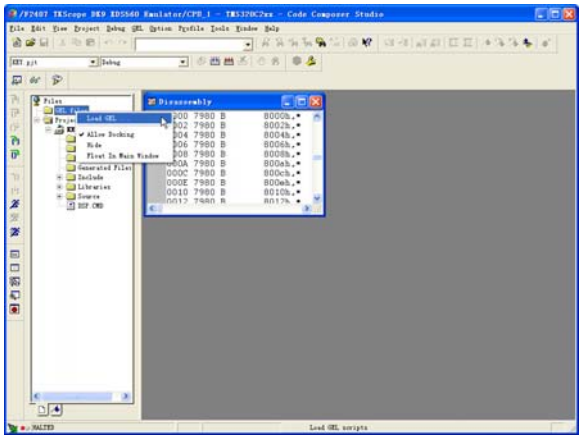

Figure 3.17 Load the gel file operation

Click [File], select [Load Program], as show in Figure 3.18.

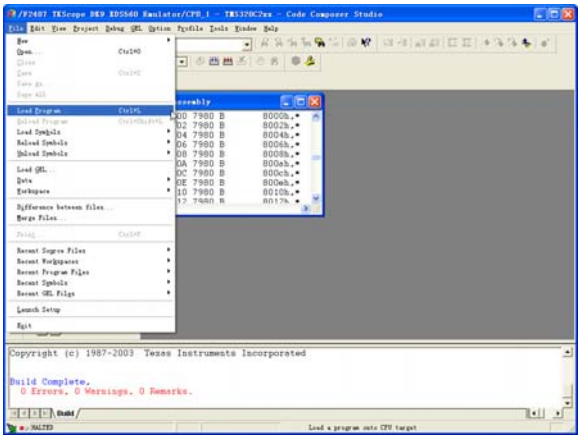

Figure 3.18 Load program operation

After download the .OUT file, you can start debugging, as show in Figure 3.19.

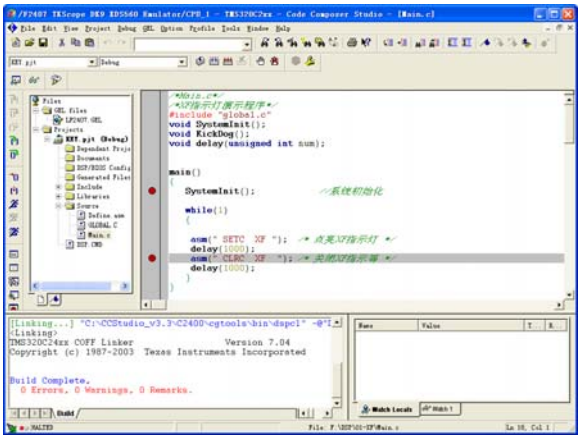

Figure 3.19 Debug interface

3.2.3 Debugging Tools

CCS debugging environment provides the following debugging tools, as shown in Table 3.1.

Table 3.1 Debugging tools

Icon	Description
	Source-Single Step.
	Source-Step Over.
	Step Out.
	Assembly-Single Step.
	Assembly-Step Over.
	Run to Cursor.
	Set PC to Cursor.
	Run.
	Halt.
	Animate.
	Enable/Disable Breakpoint.
	Disable All Breakpoints.

CCS debugging environment provides the following watching tools, as shown in Table 3.2

Table 3.2 Watching tools

Icon	Description
	Open Register Window.
	Open Watch Window.
	Opne Quick Watch.

Technical Supports

Guangzhou ZHIYUAN Electronics Stock Co., Ltd.

Address: Floor 2, Building No.3 Huangzhou Industrial Estate, Chebei Road, Tianhe District, Guangzhou, CHINA, Post code: 510660
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FAX: +86-20 38601859
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MiniARM & ARM Industrial Control
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E-mail: miniarm.support@zlg.cn

ZigBee & Ethernet
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Serial Communication
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