C2000™ DIMM100 Experimenter's Kit Overview

The C2000 DIMM100 Experimenter's Kit provides a quick, easy, low-cost way to evaluate the TMS320F28x family of devices (see Figure 1). The kit consists of a docking station and a F28x controlCARD. The docking station is a small baseboard that accepts any of the DIMM100 plug-in controlCARDs and allows the user access to all the key GPIO and ADC signals of the F28x device. Additionally, the docking station also provides two prototyping areas (one on each side of the DIMM100 connector) with an array of 0.1" spaced plated through holes for wire-wrapping and soldering.
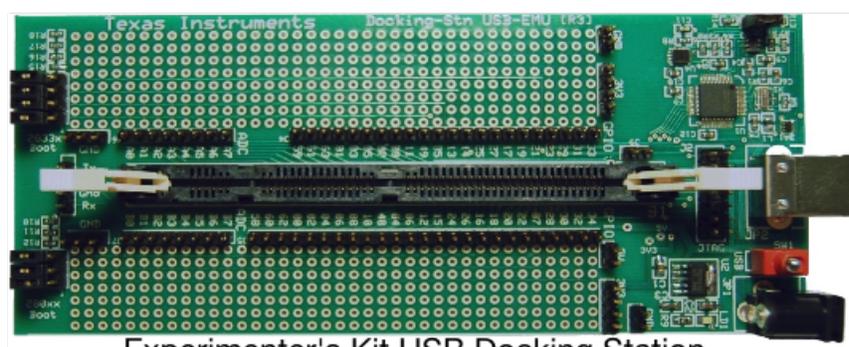

TMDSF28027CNCD

TMDSF28035CNCD

TMDSF28069CNCD

TMDSF28335CNCD

TMDSF2808CNCD

Experimenter's Kit USB Docking Station

Figure 1. C2000 DIMM100 Experimenter's Kit

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Trademarks

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1 Introduction

Other features of the docking station include the following:

- Onboard xds100v1 USB emulator or the ability to use an external JTAG emulator
- Can use either 5-V supply of the USB or an external power supply to power the board
- UART communications through onboard USB-to-UART bridge (once jumper J9 is placed)
- 5.0-V supply for prototyping area
- 3.3-V supply for prototyping area
- All key signals accessible through clearly labeled header pins

DIM100 controlCARDs are small, 100-pin, Dual In Line Memory Module (DIMM) style, vertical, plug-in boards that have all the necessary support circuitry (clock, supply LDO, decoupling, pull-ups, and so on) to provide reliable operation for the C2000 MCU. The board design is robust and meant for operation in noisy electrical environments. TI offers several pin compatible controlCARDs for evaluating the different MCUs available in the C2000 family.

DIM100 controlCARDs include the following features:

- Small size: 90 mm × 25 mm (3.5" × 1")
- All key GPIO, ADC, and other important signals routed to gold edge connector fingers
- Extensive supply pin decoupling with L+C close to pins
- Clamping diode protection at ADC input pins
- Anti-aliasing filter (noise filter) at ADC input pins
- Ground plane

Both the controlCARD and docking station include a Hardware Developer's Package, a set of files that make copying or redeploying this technology very easy (see Section 3).

The Hardware Developer's Package includes the following:

- Schematics (source or .PDF files)
- Bill of materials (BOM)
- Gerber files to freely use or modify
- Pin-out table showing all key signals on the 100-pin connector
- DIMM100 pin / socket mechanical details
- PCB files done in the popular Freeware tool, ExpressPCB, for easy modification (docking station only)

NOTE:

- This EVM includes a crystal component (CSTCR6M00G53Z-R0) that contains > 0.1% of Lead Titanium Zirconium Oxide CAS# 12626-81-2, listed in EU REACH as a Substance of Very High Concern.
- The ceramic crystal component CSTCR6M00G53Z-R0 is RoHS exempt through exemption 7(c)-1.
- The ceramic resistor component CRCW08050000Z0EA is RoHS exempt through exemption 7(c)-1.

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2 Hardware Setup

This guide sets up the board to use onboard USB emulation and uses the 5-V supply of the USB to power the board.

Follow these steps to set up the hardware:

Step 1. Unpack the DIMM style controlCARD.

Step 2. Spread open the winged retaining clips on connector J1.

Step 3. Sit the DIMM card loosely in the connector slot. Ensure to align the two keyed notches and position the card bottom corners inside the retaining clips (see Figure 2).

Step 4. Push down vertically using even pressure from both ends of the card until the clips snap and lock.

NOTE: To remove or eject the card, simply spread open the retaining clips with your thumbs.

Step 5. Place switch 1 (SW1) in the ON position, then connect the USB cable to USB connector JP2.

Step 6. Once you download the TI Software or are ready to run your own project, turn on the board power by putting SW1 in the USB position. This allows the board to use the 5 V of the USB as the supply voltage.

Step 7. For full details (schematics, pin-out table, and so on) of the hardware see the Hardware Developer's package, DockingStnHWdevPkg.
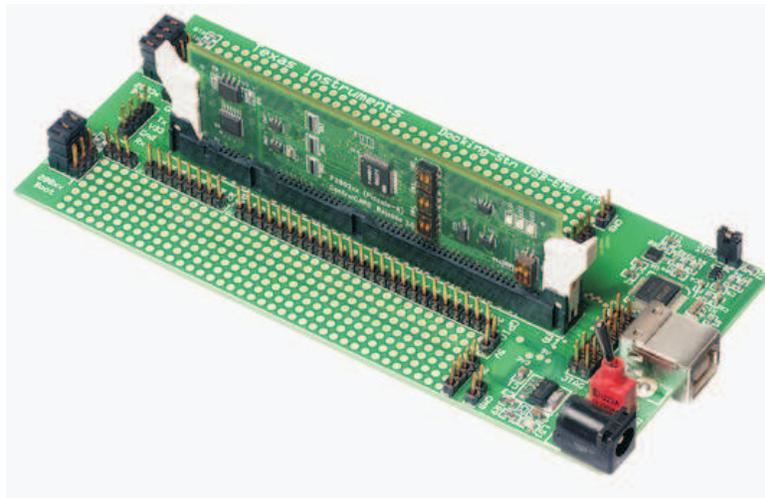
Figure 2. Retaining Clips

3 Software Setup

All of the documentation, software, and hardware files needed to use the experimenter's kit and develop on a C2000 MCU is in the controlSUITE package. The controlSUITE installs the Hardware Developer's package for the experimenter's kit baseboard and for all C2000 controlCARDs. In addition all software and documentation for this and all other kits can also be installed.

To install controlSUITE, do the following:

1. Visit http://www.ti.com/controlsuite and download the controlSUITE installer.
2. Run the installer and after a few clicks select the experimenter's kit checkbox.
3. By default the installer creates a directory called controlSUITE on the C drive inside the TI directory:

   a. The example software for the experimenter's kit is at:
   \controlSUITE\development_kits\TemplateProjects\

   b. The hardware documentation for the experimenter's kits is at:
   \controlSUITE\development_kits\~ExperimentersKits

   c. The controlCARD hardware developer's package is at:
   \controlSUITE\development_kits\~controlCARDs

   d. More examples for your specific device are within the controlSUITE at:
   \controlSUITE\device_support

3.1 Alternate Software Setup for Non -TMS320F2808 Based controlCARDs

For all devices except the TMDSF2808CNCD, the documentation and hardware files are also available in the C2000Ware package. C2000Ware is the most recent FW download package for C2000 MCUs, adding support for the most recent C2000 MCUs as well as providing driver libraries in addition to the bitfields found in controlSUITE.

To install C2000Ware, do the following:

1. Visit http://www.ti.com/tool/C2000WARE and download and run the C2000Ware installer.
2. The installer creates the C2000Ware subdirectory inside the TI directory:
   C:\ti\C2000\C2000Ware_#_##_##_##, where # represents the version of C2000Ware:

   a. The HW files for the specific controlCARD is in the path
   C:\ti\c2000\C2000Ware_#_##_##_##\boards\controlCARDs\

   b. The HW files for the base board can be found in the path
   C:\ti\c2000\C2000Ware_#_##_##_##\boards\ExperimenterKits\DockingStation_DIM_100pin

3. Device specific software examples can be found in the path
   C:\ti\c2000\C2000Ware_#_##_##_##\device_support.

4 Using the Onboard USB JTAG Emulation

The onboard USB JTAG emulation is based on xds100v1 emulation technology from TI and provides an easy way to connect to the board and begin Code Composer Studio™ development.

To set up the onboard USB JTAG emulation, follow these steps:

1. Download and install Code Composer Studio (CCS).
2. Connect the USB docking station to an available USB port.
3. If prompted, do not allow Windows to go online to search for drivers, but allow Windows to search your computer for drivers.
4. Once Windows has finished installing the drivers, the onboard USB JTAG emulator should be ready for use.
5. Open CCS and create a new target configuration, Target → New Target Configuration…
6. Choose the title of your new configuration to be xds100v1-f28X (where X is the part number of the C2000 MCU that is being worked with, for example F28035. Use the shared location.
7. Choose the device that goes with your kit. In CCS, the onboard emulator is called the Texas Instruments XDS100v1 USB Emulator.

8. Choose the connection as Texas Instruments xds100v1 USB Debug Probe (or Emulator). In the Board or Device field, select the C2000 device that is on your controlCARD.

9. Open up the project for the kit by clicking Project → Import Existing CCS/CCE Eclipse Project. Once the dialog box appears, browse to find the applicable project.

For troubleshooting on Windows machines, the status of the driver can be checked by using the Device Manager. With a docking station plugged in, TI XDS100 Channel A and TI XDS100 Channel B should be seen. If they are not seen, refer to this E2E thread.

5 Running Your First Program

The FlashingLeds project, included as a template within the controlSUITE download, allows users to quickly get started with a C2000 MCU. The documentation for this project is at:

\controlSUITE\development_kits\TemplateProjects\~Docs\SystemFrameworkOverview.pdf

This project can be imported into CCS. When importing, ensure that the option to import the project into your workspace is unchecked.

6 Other Types of controlCARDs

This document specifically describes a certain subset of controlCARDs in the DIM100 format – such as the TMDSDOCK28335, TMDSDOCK28035, and so on. These controlCARDs do not contain emulation circuitry on the controlCARD and therefore require that the baseboard contain emulation circuitry. controlCARDs such as the TMDSCNCD28069MISO contain an ISOlated debug probe, and in those controlCARDs the oncard emulator must be used for CCS to connect to the device.

For newer devices, such as the F28379D, a different controlCARD connector standard was used, referred to as HSEC180. It is possible for newer controlCARDs to interface to DIM100 baseboards using the TMDSADAP180TO100. However, at this time there is no provision to bring a DIM100 controlCARD into a baseboard containing an HSEC180 controlCARD connector.

7 References

- controlSUITE
- Code Composer Studio User's Guide
- C2000 Forum on TI E2E
- C2000 XDS100 Wiki
- C2000 Tools Page

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from H Revision (October 2017) to I Revision	Page
• The Abstract was updated. …………………………………………………………………………………………	1
• Added new Section 3.1. …………………………………………………………………………………………	5

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