

Trizeps4 and ConXS

Quick-Start-Guide

Version 1.1

This document guides you through the first steps of using the Trizeps4 running on the ConXS-Evaluation-Board.

1.0 Introduction

Thank you for purchasing the Trizeps4&ConXS-Evaluation-Kit.

The Trizeps4 is a small and complete SODIMM-size computer. Everything for a fully working module, like Flash-Storage, RAM etc. is already included and only a power-supply of 3.3V is needed to run it.

The ConXS-board is designed as motherboard for our SODIMM200-Trizeps-Modules. It contains several interfaces, and is a good starting point for your own product-design. A lighth-version of the ConXS-Board is available for use in your products.

Technical documentation can be found on the CD coming with this Evaluation-Board and on our FTP-Server [see chapter 4.6]. Sign the Non-Disclosure-Agreement [CD:\Board_Doc\DesignKits\ConXS\nda-conxs-englisch.pdf] to get additional information, like schematics and VHDL-code.

Support:

Hardware: hardware@keith-koep.com

Software: software@keith-koep.com

Sales: sales@keith-koep.com

2.0 Getting Started

2.1 Evaluation-Kit Contents

1. Trizeps4-Module
2. ConXS-Board with display
3. Power-Supply
4. Serial Null-Modem-Cable, USB-Cable
5. CD containing WinCE-Board-Support-Package, Tools and documentation.

2.2 Using the board

Normally the ConXS-Evaluation-Board should be assembled and ready to use. All you must do, is to connect the power-supply to the ConXS-Board and wait till the pre-installed WinCE-image boots up.

If the SODIMM is not fitted with a Trizeps module when you receive your board, follow the next instructions:

1. Slide the Trizeps into the socket taking account of the polarity mark. Do not touch the gold contacts. You can see that there is a polarization mark cut in the Trizeps ; this ensures that the module is adjusted correctly. Put the Trizeps module carefully at an angle of about 30 degrees into the socket.
2. Support the underside of the board and push the Trizeps down into the socket. It should click into its place.

2.3 Using the bootloader

The bootloader is the „BIOS“ of the Trizeps-module. It decides what to boot and may assist you in testing your hardware.

To enter the bootloader-command-interpretter:

1. Connect the ConXS-board with a serial null-modem-cable to your pc.
2. Open Hyperterminal with 38,4kBaud, 8 data-bits, no parity, 1 stop bit, no flow control.
3. Press ESC and hold it pressed while turning on the Evaluation-Board.
4. Take a look at the supported bootloader-functions: „?“.

TABLE 1.

Often used Bootloader-Commands

Command	Description
?	print supported functions.
tftp	load file from TFTP-server.
ereg	erase permanent registry (recommended, before loading a new WinCE-image).
eflasb0	erase everything from flash, except the bootloader.
epsm	erase persistant-storage (Flashdisk-folder in WinCE).
mount mmc or mount pcmcia	mount storage card. This must be called, before you can use the card.
cd, dir	navigate through the directory structure of a mounted storage card.
boot mmc <file> or boot pcmcia <file>	load a file from a storage card.
fb	flash boot. Boots image stored in flash.
contr, backlight	adjust contrast or brightness of a connected display.

2.3.1 Loading files

Files loaded from the bootloader must contain a bootheader (,view [CD::\MT6N_BSP_CD_2.10_05\Bootloader\KuK\Doc\bootloader2_02.pdf] for details.). The bootheader describes what to do with the data appended to it. Typically the bootheader describes where to store the data (program code) and if to jump to a specified address in RAM or FLASH to execute this code.

Examples for loadable files:

- WinCE-Images:
[CD::\wince500\Images\CONXS\TRIZEPS-IV\lm8v31]
- Boot-Bitmaps (Bitmap shown on boot):
[CD::\MT6N_BSP_CD_2.10_05\Bootloader\KuK\bootblock\BitmapBoot]

The bootloader can load files from various locations:

- Ethernet using a BootP/TFTP-Server running on your PC.
- SD/MMC-Cards (formatted as FAT12/16/32).
- CompactFlash/PCMCIA-Cards (formatted as FAT12/16/32).
- Using additional programs, like EBoot.

2.3.2 Loading files using Ethernet

To load a file through Ethernet, you must set up a BootP/TFTP-Server:

1. Download bootfft.zip from our FTP-Server [ftp://www.keith-koep.com/pub/bootloader/BootTftpServer_Windows].
2. Unpack and install Cabletron tftp/Bootp-Server.
3. Connect Evaluation-Board with Host-PC (Ethernet and serial connection).
4. Open Hyperterminal and enter the bootloader-command-interpreter.
5. Clear registry: „ereg“. This is extremely recommended for every new image you load. Old registry-settings may result in misbehaviour of the system.
6. Obtain MAC-address of the Ethernet-Controller: „mac“. This will print the current mac-address. If you wish to change this, enter a new one, else press ESC. (All Trizeps4-modules with Ethernet-Controller have a unique MAC-address shown on the label).
7. Start Cabletron TFTP/BOOTP-Server. Choose BootP-Tab and enter Ethernet-Address, a free IP-Address, and the place, where your image-file resides. Push „Update“. **Note:** The MAC-address must use „-“ separators (i.e. 00-50-C2-0E-CD-12). You must have „Broadcast Reply to Bootp Request“ selected.
8. Type „tftp“.
9. Wait till upload finished. If you loaded a RAM-Image (nk_ram.nb0) it will start automatically, else (if ROM-Image (nk_rom.nb0, nk_zip.nb0)) type „fb“ to start image.

2.3.3 Loading files using storage-card-interface

To load a file using a SD/MMC or CompactFlash-Card:

1. Copy the file to a SD/MMC or CompactFlash-Card.
2. Insert it into the ConXS-Evaluation-Board.
3. Type „mount mmc“ or „mount pcmcia“ to mount the card.
4. Type „boot mmc <filename>“ or „boot pcmcia <filename>“.

5. Loading should begin.

or

1. Copy the file to a SD/MMC or CompactFlash-Card:
2. Rename file to autoboot.000.
3. Insert card and switch on power of the Evaluation-board.
4. While booting, the bootloader will check if a file named „autoboot.000“ exists on a connected storage-media and will boot it. After autoboot.000 has been loaded, the bootloader will check if autoboot.001 to .999 exists and boot them in this order.

2.3.4 Loading WinCE-Images using EBoot

EBoot is a common used „Bootloader“ for WinCE-Devices. As we provide our Trizeps-modules with an OS-independant bootloader, our Eboot is just a small program, which is started by the bootloader. The source of this program is located at <WINCEROOT>\Platform\TR4CONXS\SRC\Bootloader\Eboot. After building the platform, you will find two loadable eboot-files in your _FLATRELEASEDIR (Build OS-> Open Release Directory):

- eboot.nb0 (RAM-Version)
- ebootrom.nb0 (ROM-Version)

You can load Eboot through ethernet or the storage-card-interface, as described in the previous chapters.

Example of using Eboot:

1. Copy eboot.nb0 to a SD/MMC-card and rename it to autoboot.000.
2. Insert this card in the ConXS-board.
3. Open your project or the nk.bin (WinCE-Image-File) with Platform-Builder.
4. Target->Connectivity Options:
Select Download = „Ethernet“ and press Settings-button next to this entry.
5. Turn on power and wait till a device name appears in the Settings-box.
6. Choose the appearing name and close „Target Device Connectivity Options“-dialog with „Apply“.
7. Target->Attach Device

Download should now begin.

The WinCE-Image will be copied to RAM, starting at 32MB. This is different to the behaviour of the bootloader. The bootloader will load a WinCE-Image (nk_*.nb0) to the end of memory. This is important, because everything before the WinCE-Image will be mapped as usable RAM. If you have a Trizeps-module with 64MB-RAM and a WinCE-Image with a size of 12MB, than 52MB free RAM will be reported, if you use the bootloader and only 32MB if you use Eboot. To change the starting address, where eboot will put your image, modify EXECUTABLE_PHYSICAL in mt6_io.inc. (You will need to rebuild Eboot).

3.0 Using the WinCE Board-Support-Package (BSP)

The WinCE-BSP helps you in creating your own custom WinCE-images. Prebuild WinCE-Images may be found at [CD::\wince500\Images\CONXS\TRIZEPS-IV\lm8v31] or on our FTP-Server [see chapter 4.6].

3.1 Installing the Trizeps4 Board-Support-Package

You will need Platform-Builder 5.00 from Microsoft (free Eval-Versions are available) and our BSP [CD::\wince500\BSP\BSP_TR4CONXS_yyyyQx_z.msi].

First install Microsofts Platform-Builder, than run the BSP-install-file.

View the release-note to the BSP found after install at [c:\wince500\platform\tr4conxs\docs\]

3.2 Creating an image with existing project CoreMax

The CoreMax-project is a good starting point for an own custom-project. It includes almost all needed components and may still be licensed under Microsofts WinCE-Core-License.

1. Copy and unzip
[CD::\wince500\PRJ\PRJ_COREMAX_TR4CONXS_yyyyQx.zip] to
[c:\wince500\pbworkspaces\]
2. Open the CoreMax-project through:
File-> Open Workspace...
3. Choose to build a release-build:
Build OS-> Set Active Configuration...
4. Build a WinCE-image (this will take 20 minutes to up an hour) :
Build OS-> Build and Sysgen...
5. The build process should finish with no errors and some warnings.

Note:

If no errors occurred, the build process runs makeimg.exe. which will create a nk.bin file in your _FLATRELEASEDIR (Build OS-> Open Release Directory). This file is not the binary image. After nk.bin is created, PostMakeImg.bat will run. This batch will create 3 binaries, patched with a bootheader (see [CD::\MT6N_BSP_CD_2.10_05\Bootloader\KuK\Doc\bootloader2_02.pdf] for further details).

- nk_ram.nb0 Image will be loaded to RAM and execute.
- nk_rom.nb0 Image will be stored to flash (uncompressed).
- nk_zip.nb0 Image will be stored to flash (compressed).

The maximum size for a WinCE-image build with this Board-Support-Package is 32MB.

3.3 Creating an image from scratch

1. Choose File-> New Platform.
2. Push Next.
3. Choose TR4ConXS and press Next.
4. Select a configuration (i.e. Industrial Controller).
5. Push Finish.
6. Choose Build OS-> Build and Sysgen...
7. Wait till build finishes.

Note:

(View notes from 3.2).

If a component added is excluded from build (red-cross in the right corner of the icon), you get the reason by pressing the right-mouse-button on that icon and choosing „Show why item is Excluded from image...“. RightClick on the catalog, choose „Find“ and search for the missing item. If the reason is a PLAT_XXX-variable, you have to remove or set it in the [%_WINCEROOT%\TR4CONXS\CUSTOM\TR4CONXS.bat].

Sometimes drivers need additional components from the Microsoft Platform-Builder to function as expected!

- To use Compact-Flash storage cards, include the ATADISK and the FAT-Filesystem component.
- To use a SD/MMC storage card, you have to include the FAT-Filesystem component.
- To use Active-Sync, you have to include ActiveSync and the Network User interface (SYSGEN_CONNMC):

SD/MMC: add „SD Memory“ SYSGEN_SD_MEMORY

USB-Slave: add one of the USB-Function clients (RNDIS, Serial(ActivSync), Mass Storage) (i.e. Serial: SYSGEN_USBFN_SERIAL).

Wave driver: add „Waveform Audio“ SYSGEN_AUDIO.

Known Issues:

If you want to use the UCB-Touch driver, always include the Wave driver. Otherwise the system may hang after suspend/resume!

3.4 Debugging with Platform-Builder

Platform-Builder may connect to your device with the „KITL“-interface (Kernel Independent Transport Layer). KITL uses Ethernet and can be activated dynamically on retail-builds, by passing „kitl“ to the commandline of the bootloader (;must be newer than 27.02.2006): „fb kitl“, „tftp kitl“, „boot mmc eboot.nb0 kitl“ or is activated automatically when using debug-builds.

For a KITL-connection, you must open Target->Connectivity Options and select „Ethernet“ as transport. Press the Settings-Button next to the listbox. Start your WinCE-Image and wait for the device-name to appear. Select it and close the dia-

log. Press Target->Attach device. The device attaches and you should see some output in the debug-window (View->Output).

There are many things you can do with KITL and even more that you can do with a debug-build using KITL. View Platform-Builder Help on details.

4.0 Things you can do with WinCE

With WinCE you can do almost everything, that you can do with a „big“ computer. Although a full OS can be squeezed into images with less than 32MB (the Core-Max-image has a size of 16MB), many interfaces from the bigger Desktop-Windows can be used. Simple Applications written for Windows would also recompile for WinCE with no major changes.

4.1 Embedded Visual C++ and Trizeps500-SDK

To write WinCE-Applications, you may use the development tool „Microsoft eMbedded Visual C++“ (available for free download from Microsoft). If you decide to use this program, you should install the Trizeps500-SDK (Software-Development-Kit) [CD:\wince500\SDK\SDK_Trizep500_yyyyQx.msi].

A SDK helps programmers to develop programs for a specified project/platform. Unlike Windows, where you may assume that all given interfaces are available, WinCE only contains a subset of functionality, which changes with the items you include/exclude from an image. The Trizeps500-SDK contains functions from a quite fully featured WinCE-image, but not all is included, neither can you assume, that your WinCE-image supports all functions from this SDK.

If you build your own images using the Platform-Builder, you may create your own specific SDK:

1. Choose Platform->SDK->New SDK...
2. Configure SDK...
3. and finally Build SDK...

When you download your application to your platform using ActiveSync, you may get a message „The targeted platform Trizeps500_2005Q2_1 does not match the connected platform. Continue?“. This happens, when the platform-GUID (a unique id-string) stored in the registry at [HKEY_LOCAL_MACHINE\Windows CE Tools\Platform] does not match the platform-GUID stored for the SDK ([c:\wince500\programs\Windows CE Tools\wce500\Trizeps500_2005Q2_1\Properties.xml] search for the property named „ID“). You may ignore this warning or change the GUID value in the registry or in the SDK.

4.2 ActiveSync Tools

ActiveSync is a tool, that helps you connect the Trizeps4-Evaluation-Board to your development workstation. Besides the functionality you know from PDA's or other devices, that use ActiveSync to synchronise your phone-book or download programs, you may also use ActiveSync to debug your program or use some of the remote tools (i.e. Remote Registry Editor). If not already installed, you can get ActiveSync from Microsoft for download.

To use ActiveSync, just connect the EvaluationBoard through an USB-cable. ActiveSync will connect automatically. If not, open Microsoft ActiveSync and choose „File->Connection Settings...“ and validate that „Allow USB connections“ is selected.

If connected with ActiveSync, start Embedded Visual C++. You may now choose between the remote tools „Tools->...“. To start debugging with ActiveSync, open your project-workspace, verify that „Build->Set Active Platform...“ „Trizeps500_yyyyQx“ is selected and start a debug-session.

Note: On Trizeps4, USB-Host port 2 is disabled during an USB-Slave-connection.

4.3 KuK-Tools, drvlib_app.dll and the persistant registry

drvlib_app.dll is a DLL which contains many useful functions to do device-specific things like reset, storing and erasing the registry and i2c-communication. For a documentation of these function view [%_WINCEROOT%\platform\TR4ConXS\docs\DrvLib_App.chm]

KuK-Tools is a simple program that uses drvlib_app.dll. The main feature of the KuK-Tools is, that you can store and erase the persistant registry. If you don't store the registry, changed values are lost on the next cold-boot.

4.4 RotateScreen

There exist a little tool named RotateScreen, which is shown in the taskbar:



- Tap it once to rotate the screen.
- Tap it twice to open a control-panel, which lets you set the rotation-angles.

4.5 FTP, HTTP, VNC-Server

Most images include an FTP and HTTP-server. To attach to these servers, obtain the IP-address of the connected ethernet-card (,double-tap the network-symbol in the task-bar) and open your browser with:

- ftp://wince:secret@<IP-Address (i.e. 195.8.230.20)>
View [HKEY_LOCAL_MACHINE\COMMFTP] registry keys.
The ftp-server is configured to use the „\temp“-directory.
- http://<IP-Address (i.e. 195.8.230.20)>/ADMIN
View [HKEY_LOCAL_MACHINE\COMMHTTP] registry keys.
- Execute VncViewer.exe contained in [%_WINCEROOT%\PLATFORM\Tr4conxs\Vnc_4_customers\vnc.zip]. You must have included the VNC-server item to your image!

4.6 Application-Notes, Samples and Updates

You will find application-notes, samples and updates in the private part of our ftp-server at:

ftp://ce500:ce500@www.keith-koep.com