

OMAP™

*Public Version*

# Pad Configuration Tool User Manual version 1.0

Texas Instruments OMAP4430 Multimedia Device™ Family of Products

## Technical Reference Manual



Literature Number: PCT

December-2010

PRELIMINARY

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# Chapter 1. Pad Configuration Tool History

## 1.1. PCT Version History



### Note

Submit feedback at [http://www.go-dsp.com/forms/techdoc/doc\\_feedback.htm](http://www.go-dsp.com/forms/techdoc/doc_feedback.htm)

**Table 1.1. PCT Release Notes**

Version	Release Date	Notes
v1.0.0.0b	December, 2010	<ul style="list-style-type: none"> <li>Initial OMAP 4430 PCT beta release version</li> </ul>
v1.0.0.0	February, 2011	<ul style="list-style-type: none"> <li>NDA to Public migration</li> <li>GEL and CMM script files included</li> <li>Pads added: B26, T27,U27,V27, H2, H3, D2, E1-E4, F1, F3, F4, G3, G4</li> </ul>
v1.0.0.1	May, 2011	<ul style="list-style-type: none"> <li>Registers aligned with OMAP4430_ES2.x_PUBLIC_TRM_vT</li> <li>Register extraction fix</li> <li>I2C1_SDA and MCSPI4_SOMI pads associated registers fix in model file</li> <li>GPIO_WK81 renamed to GPIO_81; GPIO_82 renamed to GPIO_82; GPIO_WK2 pad added; GPIO_98 signal added to the associated pad.</li> <li>Updated descriptions for Control Bits for I/Os with Combined Mode vs Load Setting</li> </ul>
v1.0.0.2	September, 2011	<ul style="list-style-type: none"> <li>Registers aligned with OMAP4430_ES2.x_PUBLIC_TRM_vX</li> <li>gpio_65 and gpio_66 added</li> <li>export to C header XLoader format support added</li> </ul>
v1.0.0.3	November, 2011	<ul style="list-style-type: none"> <li>Registers aligned with OMAP4430_ES2.x_PUBLIC_TRM_vZ</li> <li>export to C header XLoader format updates</li> </ul>

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# Chapter 2. Pad Configuration Tool and JGraph Library Installation

## 2.1. PCT Installation



### Caution

Java™ Runtime Environment, Standard Edition (v 1.6.0 build 17-b04 or higher) **must** be installed before Pad Configuration Tool is installed.

The Pad Configuration Tool (PCT) installation procedure is composed of following steps.

### 2.1.1. PCT Installation Steps

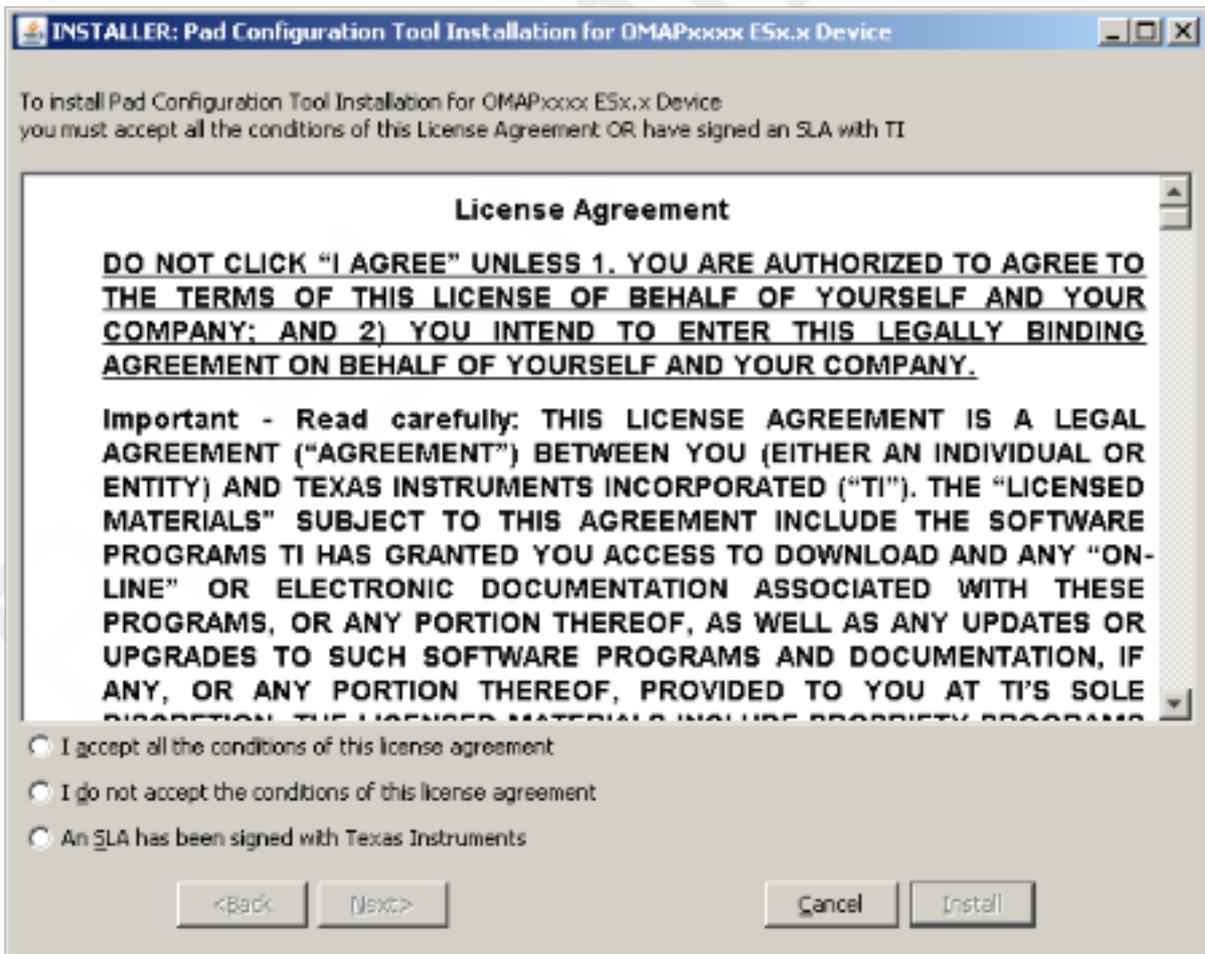
To install the Pad Configuration Tool double click (java -jar in terminal for Linux users) on the "Installer-PCT-OMAPxxxxESx.x-vx.x.x.x" file. The installer will execute and display the License Agreement window shown in [Figure 2.1](#). You must either accept the conditions of the license or have a signed SLA to proceed further. Select an option.

When the conditions of the license agreement are accepted or the SLA option is selected, the "Next" button will become active. In the "Export Control Notice" window, the "Install" button is enabled. Click on the "Install" button to proceed to the "Destination Directory Selection" window

When the installation is complete the "Installation completed" message is displayed. Click on "OK" button to proceed to the last window.

The Pad Configuration Tool is now installed!

**Figure 2.1. PCT Installation License Agreement Window**



## 2.2. PCT running when multiple versions of JRE are installed (Under MSWindows)



### Warning

JRE **version 1.6 Build 17** or higher is required. The default Java™ updater should install version 1.6 Build 17 or higher by default. If not, please refer to the Java™ update web page for downloading the 1.6 Build 17 or higher version. Then verify the installation by checking the version from the command line (type *java -version*).



### Warning

PCT is capable of running with older JRE versions. Although this functionality, PCT performance and behaviour is unexpected if older JRE version is used.

When multiple versions of JRE are installed on the same machine, the default version for the java execution is the latest version.

For example, if the installed versions are:

- JRE version 1.4
- JRE version 1.5
- JRE version 1.6 (Default)

The current default version of JRE can be found by typing the following command on the command line:

```
java -version
```

The Pad Configuration Tool requires JRE version 1.6 Build 17 for best performance. If you try to run the Pad Configuration tool (by double clicking on the PCTOMAP[full name].jar ) it should function properly if the required JRE version is installed.

PCT can also run with older JRE versions although it is not recommended. In order to run the Pad Configuration Tool with the JRE version 1.5 following command line can be used from the directory containing the PCT jar file:

```
[full path to the JRE version 1.5 bin directory]\java -jar PCT-OMAP[full name].jar
```

For example:

```
C:\Program Files\Java\jre1.5.0_15\bin\java -jar PCT-OMAP4430ES2.x-v1.7.0.0b.jar
```



### Note

The "Quotes" in the path name are used when there are spaces in the path name.

Rather than typing this command every time to execute the Pad Configuration Tool, a better option is to build a simple batch file. See below the example of a simple "PCT.bat" batch file:

```
@echo off  
[full path to the JRE version 1.5 bin directory]\java -jar PCT-OMAP[full name].jar
```

Add this batch file to the directory containing the PCT jar file. Double clicking on the batch file will execute the PCT with correct JRE version 1.5.



### Warning

Running PCT with older JRE versions is not recommended.

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# Chapter 3. Pad Configuration Tool

## 3.1. PCT Overview

The Pad Configuration Tool (PCT) is a Java™ based stand-alone application. It is an interactive pad configuration software for the device. It allows the user to:

- visualize the device pad multiplexing and additional functionalities
- interact with the pad elements and view the effect on the Control Module registers
- interact with the Control Module registers and view the effect on the device pad configuration
- view a trace of all the device registers affected by the user interaction with pad configuration
- extract padconf register C header and register dumps for Code Composer Studio and Lauterbach.

The advantage of the tool is that the user can visualize the device pad configuration state on power-on reset and then customize the configuration of the pads for the specific use-case and identify the device register settings associated to that configuration.

Being an interactive visual tool, the PCT gives the user a global view of the device pad architecture and allows determining the exact register settings to obtain the specific configuration.

## 3.2. PCT System Requirements

- Requires Java™ JRE 1.6.0 or higher (Can be downloaded from <http://java.sun.com>).
- Has been tested for Microsoft WindowsXP(c)
- The ideal screen resolution is 1280x1024 or higher.

## 3.3. PCT Running Requirements

1. Unzip the project zipped folder. (NOTE: Do not change the name of the unzipped folder, e.g., PCT-OMAPXXXX)
2. Double-click on the PCT-[version].jar file.

## 3.4. PCT Start-up and View Refresh Timing



### Note

The performance data given below is for the test machine used with AMD™ Athlon™ 64 X2 Dual Core processor at 3.8GHz+ with 2 GB of RAM.

The start-up sequence of the PCT consists of reading an entire pad associated description database files. This would normally take about 10 seconds.

Similarly, the View Refresh function that updates the main view, covers all software functional pad of the device and takes as well about 10 seconds.



### Note

In some cases, due to OS platform dependency, the PCT may not display correctly. In this case, a simple "View>Refresh Main view" command will fix the coordinations of the main view window.

### 3.5. PCT GUI (Graphical User Interface) Description

#### 3.5.1. PCT Views Description

Figure 3.1. PCT Views



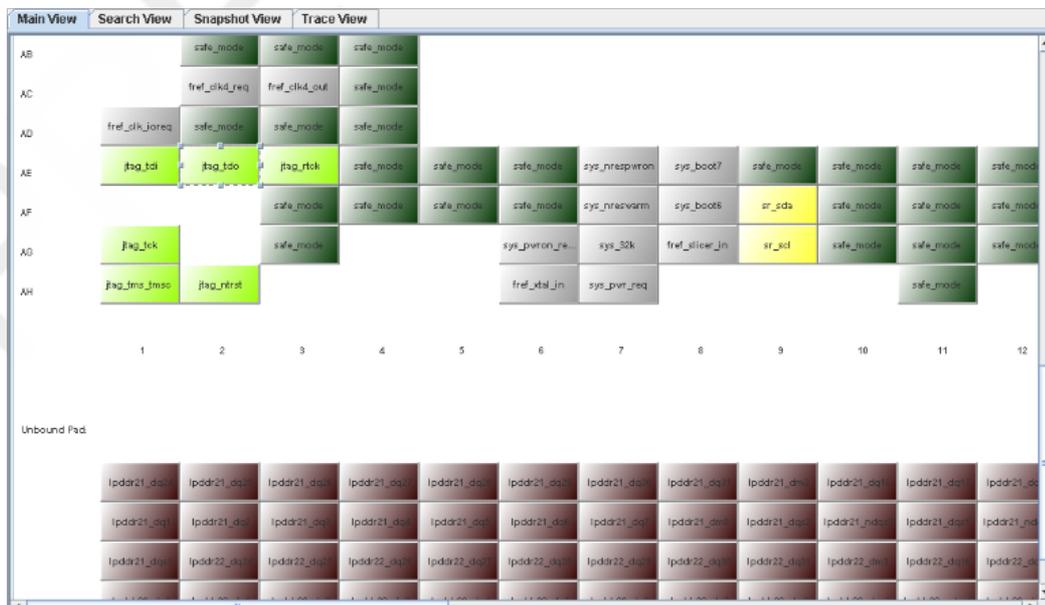
The PCT GUI is composed of 8 sub-views:

- Main View
- Search View
- Snapshot View
- Trace View
- Zoom Control
- Thumbnail View
- Controller View
- Registers View

##### 3.5.1.1. PCT Main View

The Main View presents a focused view of a section of the device pad configuration.

Figure 3.2. PCT Main View



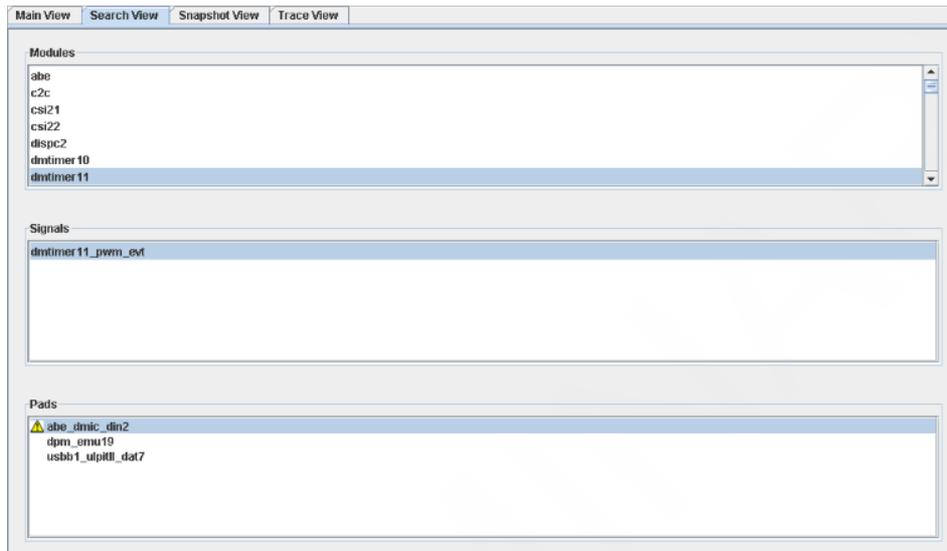
The device pad configuration is represented as an XY coordinate system of pads (i.e., the rectangular elements).

The user can use the slide bars on the right side and the bottom of the view to move up/down and left/right in the Main View, respectively. The view highlights the state of the blocks and their current configuration visually. For example, the mux mode of the pads is color coded. User will notice that for all pads that are set in muxmode 7 (safe mode) the colors stay the same.

### 3.5.1.2. PCT Search View

The Search view allows the user to navigate to the needed pad and pad controller. Simply by selecting the desired module associated to the pad.

Figure 3.3. PCT Search View



### 3.5.1.3. PCT Snapshot View

The Snapshot view allows the user to see a clear list of all device pads, their padconf register address, value, selected mux-mode, and safe mode availability. This view is dynamically refreshed and all changed done in other views are also present here.

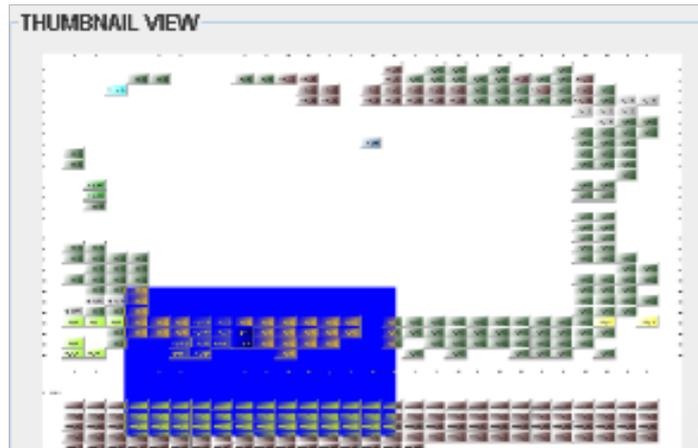
Figure 3.4. PCT Snapshot View

PAD	ADDRESS	VALUE	SELECTED MODE	SAFE_MODE AVAILABLE
gpmc_a00	0x4A100040	0x118	gpmc_a00	<input type="checkbox"/>
gpmc_a01	0x4A100042	0x118	gpmc_a01	<input type="checkbox"/>
gpmc_a02	0x4A100044	0x118	gpmc_a02	<input type="checkbox"/>
gpmc_a03	0x4A100046	0x118	gpmc_a03	<input type="checkbox"/>
gpmc_a04	0x4A100048	0x118	gpmc_a04	<input type="checkbox"/>
gpmc_a05	0x4A10004A	0x118	gpmc_a05	<input type="checkbox"/>
gpmc_a06	0x4A10004C	0x118	gpmc_a06	<input type="checkbox"/>
gpmc_a07	0x4A10004E	0x118	gpmc_a07	<input type="checkbox"/>
gpmc_a08	0x4A100050	0x118	gpmc_a08	<input type="checkbox"/>
gpmc_a09	0x4A100052	0x118	gpmc_a09	<input type="checkbox"/>
gpmc_a010	0x4A100054	0x118	gpmc_a010	<input type="checkbox"/>
gpmc_a011	0x4A100056	0x118	gpmc_a011	<input type="checkbox"/>
gpmc_a012	0x4A100058	0x108	gpmc_a012	<input type="checkbox"/>
gpmc_a013	0x4A10005A	0x108	gpmc_a013	<input type="checkbox"/>
gpmc_a014	0x4A10005C	0x108	gpmc_a014	<input type="checkbox"/>
gpmc_a015	0x4A10005E	0x108	gpmc_a015	<input type="checkbox"/>
gpmc_a16	0x4A100060	0x10F	safe_mode	<input checked="" type="checkbox"/>
gpmc_a17	0x4A100062	0x10F	safe_mode	<input checked="" type="checkbox"/>
gpmc_a18	0x4A100064	0x10F	safe_mode	<input checked="" type="checkbox"/>
gpmc_a19	0x4A100066	0x10F	safe_mode	<input checked="" type="checkbox"/>
gpmc_a20	0x4A100068	0x10F	safe_mode	<input checked="" type="checkbox"/>
gpmc_a21	0x4A10006A	0x10F	safe_mode	<input checked="" type="checkbox"/>
gpmc_a22	0x4A10006C	0x10F	safe_mode	<input checked="" type="checkbox"/>
gpmc_a23	0x4A10006E	0x10F	safe_mode	<input checked="" type="checkbox"/>
gpmc_a24	0x4A100070	0x10F	safe_mode	<input checked="" type="checkbox"/>
gpmc_a25	0x4A100072	0x10F	safe_mode	<input checked="" type="checkbox"/>
gpmc_ncs0	0x4A100074	0x118	gpmc_ncs0	<input type="checkbox"/>
gpmc_ncs1	0x4A100076	0x11F	safe_mode	<input checked="" type="checkbox"/>
gpmc_ncs2	0x4A100078	0x11F	safe_mode	<input checked="" type="checkbox"/>
gpmc_ncs3	0x4A10007A	0x11F	safe_mode	<input checked="" type="checkbox"/>
gpmc_nwp	0x4A10007C	0x108	gpmc_nwp	<input type="checkbox"/>
gpmc_clk	0x4A10007E	0x108	gpmc_clk	<input type="checkbox"/>
gpmc_nash_ale	0x4A100080	0x108	gpmc_nash_ale	<input type="checkbox"/>

### 3.5.1.4. PCT Thumbnail View

The Thumbnail View highlights a global view of the device pad configuration. It also highlights the region of the tool visible in the Main View by a bounding rectangle. As the slide bars of the Main View are displaced the bounding rectangle in the Thumbnail View also moves accordingly.

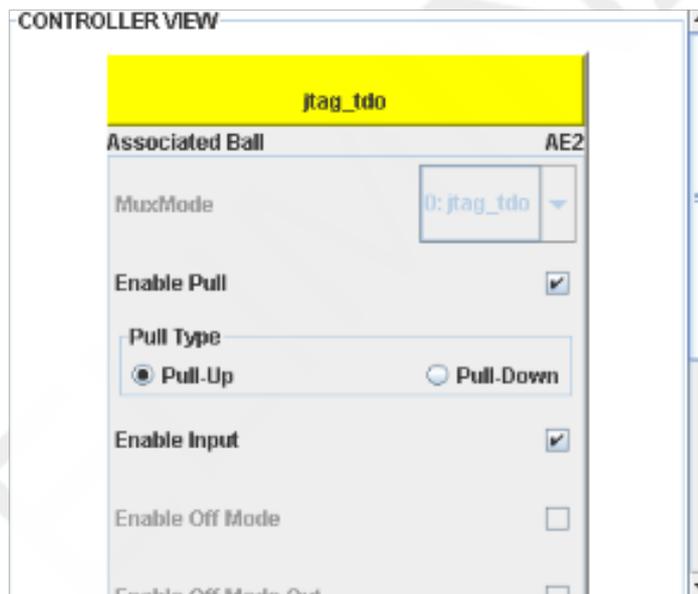
**Figure 3.5. PCT Thumbnail View**



### 3.5.1.5. PCT Controller View

The Controller View highlights a signal or a block of the pad. The user selects (i.e., clicks on) the block in the Main View and it is highlighted in the Controller View.

**Figure 3.6. PCT Controller View**



### 3.5.1.6. PCT Registers View

The Registers View is composed of a Register Selector list box, on the left hand side. The name of the currently selected register is highlighted in this box.

On the upper right hand side of the Register View is the Register Address/Value indicator. It presents the address and the current hexadecimal value of the register.

Below these two is a Register Bits view. The register bits view lists all the bits of the selected register (e.g., 0 to 31 bits for a 32 bits register of the Control Module). Each bit is identified by the bit number (0 for the LSB). Below the bit number is the current value of the bit (1/0).

A toggle button below the bit number of the user configurable (i.e. read/write) bits allows the user to toggle the bit value. Pressing the button sets the bit value to 1 and in the released state the bit value is 0.

There is no button associated to the RESERVED bits of the register (i.e., the user cannot modify the states of these bits).

When the user selects a register in the Register Selector list box, its contents (i.e., bits and value) are highlighted in the Register Bits view and the Register Value indicator.

When the user changes a parameter of a block in the Controller View, the associated bitfield is updated in the register and the Register View highlights the affected register.

When the value of a bit/ bitfield of a register changes in the register view, the Trace view captures this change also.



### Note

When the user changes a parameter of a block which affects bitfields of more than one register, the Registers View only shows the last register updated. The Trace view shows the complete list of registers affected by this change.

**Figure 3.7. PCT Register View**



When user positions the pointer on the number of a register bit a pop-up displays the name of that bit.

**Figure 3.8. PCT Register View Pop-up**



### 3.5.1.7. PCT Trace View

The Trace View is composed of a multi-column table. The successive changes of the register bitfields as a result of the user interaction with the pad (via the Controller View or the Register View) are recorded in the rows of the Trace View table.

This view allows the user to find a trace of all the register bitfields affected and the values associated to these bitfields, as a result of the current interactions.

**Figure 3.9. PCT Trace View**

EVENT	REGISTER	BITFIELD	VALUE	DESCRIPTION
	CONTROL_CORE_PADD0_GPMC_ADD_PAD1_GPMC_AD1	[19:19] GPMC_AD1_PULLUDENABLE	0x0	pullup/down enable for pad gpmc_ad1
	CONTROL_CORE_PADD0_GPMC_ADD_PAD1_GPMC_AD1	[19:19] GPMC_AD1_PULLUDENABLE	0x1	pullup/down enable for pad gpmc_ad1
	CONTROL_CORE_PADD0_GPIO63_PAD1_GPIO64	[19:19] GPIO64_PULLUDENABLE	0x0	pullup/down enable for pad gpio64
	CONTROL_CORE_PADD0_GPIO63_PAD1_GPIO64	[13:13] GPIO63_OFFMODEPULLTYPESELECT	0x1	OffMode mode pullup/down selection for pad gpio63
	CONTROL_CORE_PADD0_GPIO63_PAD1_GPIO64	[2:0] GPIO63_MUXMODE	0x5	Functional multiplexing selection for pad gpio63
	CONTROL_CORE_PADD0_GPIO63_PAD1_GPIO64	[2:0] GPIO63_MUXMODE	0x1	Functional multiplexing selection for pad gpio63
	CONTROL_CORE_PADD0_SDMMC5_CLK_PAD1_SDMMC5_CMD	[18:18] SDMMC5_CMD_MUXMODE	0x3	Functional multiplexing selection for pad sdmmc5_cmd
	CONTROL_CORE_PADD0_SDMMC5_CLK_PAD1_SDMMC5_CMD	[2:0] SDMMC5_CLK_MUXMODE	0x3	Functional multiplexing selection for pad sdmmc5_clk
	CONTROL_SMART3IO_PADCONF_1	[31:30] SPI2_DR1_MB	0x2	50-Q output buffer mode control for group spi2_dr1. Refer to 50-Q output buffer I/Os with combined M
	CONTROL_SMART3IO_PADCONF_2	[15:15] SPI2_DR1_LB	0x1	50-Q output buffer load control spi2_dr1_lb. Refer to 50-Q output buffer I/Os with combined M

### 3.5.1.8. PCT Zoom Control

The Zoom Control allows the user to change the zoom level of the Main View. By default the zoom level is set to x1. The user can zoom in by shifting the slider to the right hand side (towards x2) and zoom-out by shifting the slider to the left hand side (towards x0.1)

**Figure 3.10. PCT Zoom Control**



### 3.5.2. PCT Menu Commands Description

The PCT menu has following commands:

Figure 3.11. PCT Menu



1. PCT Settings
  1. Power-on Reset
2. View
  1. Reset Trace View
  2. Refresh Main View
3. File Generation
  1. Import Registers
  2. Export Registers
  3. C Header
  4. C Header (XLoader)
  5. Pads Listing
4. Help
  1. About PadConf Tool
  2. User Manual
  3. Licence Agreement
  4. Export Control Notice

### 3.5.2.1. PCT Settings

**1. Power-on Reset** Triggers a power-on reset for all the registers of the Control Module. All the registers are set to their reset values. As a result, the state of the pads is updated and reflects the state after power-on reset. (Note: When the PCT starts, the power-on reset is automatically triggered. Hence, the initial pad state is that of the device after power-on reset).

### 3.5.2.2. PCT Trace

**1. Reset Trace View** Resets (clears) the Trace View table.

**2. Refresh Main View**

This command refreshes the Main View representation of the pad configuration tool. It is used if the pads representation is not correct and the view needs to be refreshed.

### 3.5.2.3. PCT File Generation

The File Generation menu allows the user to either configure the registers of the control module (used in the PCT) to specific settings given in a file or to write the current values of the registers of the PCT to a file.

**1. Import Registers** This menu allow to read-in the contents of a file, in order to set the values of the register of the PCT. The tool can read two different file formats as given below.

**1.1 Load Format:** ADD DATA. This menu selection allows to read the file in which each line consists of two hex values in following format : ADDRESS\_OF\_REGISTER DATA\_VALUE\_OF\_REGISTER

**1.2 Load Format:** [ADD] DATA. This menu selection allows to read the file in which each line consists of two hex values in following format :[ADDRESS\_OF\_REGISTER] DATA\_VALUE\_OF\_REGISTER



#### Note

The Register Load may be used to read-in the registers dump file generated by the Register Dump script (GEL in Code Composer Studio or CMM in Lauterbach) or by any function respecting the format described below. This allows to read the current state of the pad conf at any break-point in the code and obtain a visual representation of its state in the PCT. A gel and a cmm files can be found in *<PCT-Install-path>/Scripts/*

**2. Export Registers** This menu allow to read-in the contents of a file, in order to set the values of the register of the PCT. The tool can read two different file formats as given below.

**2.1 Dump Format:** ADD DATA. This menu selection allows to write to file in format where each line consists of two hex values as given below : ADDRESS\_OF\_REGISTER DATA\_VALUE\_OF\_REGISTER

**2.2 Dump Format:** [ADD] DATA. This menu selection allows to write to file in format where each line consists of two hex values as given below : [ADDRESS\_OF\_REGISTER] DATA\_VALUE\_OF\_REGISTER



#### Note

The ADD DATA format is saved to / read from file with .rd1 extension.

The [ADD] DATA format is saved to / read from file with .rd2 extension.

- 3. **C Header** This menu allows to export the settings set in the PCT in a C header file. For details of the C header functionality, refer to the comments in an exported C header file from the PCT
- 4. **C Header (XLoader)** This menu allows to export the settings set in the PCT in a C header file XLoader format.
- 5. **Pads Listing**: This menu allows to export the list of pads with the associated padconf registers and settings in a given xml format.

### 3.5.2.4. PCT Help

- 1. **About PadConf Tool**: This option highlights the tool, model and view versions.
- 2. **User Manual**: This option opens the user manual document. (For Linux users, navigate to the "Docs" folder and open document with appropriate application manually.)
- 3. **Licence Agreement**: This option displays the licence agreement window.
- 4. **Export Control Notice**: This option displays the export control notice window.

### 3.6. PCT Pad Block



#### Note

For detail description on Control Module, pads, and I/O cell logical functionality, refer to the device Technical Reference Manual (TRM)



#### Note

For detail description on electrical characteristics and I/O cell performance, refer to the device Data Manual (DM)

The PCT pad block is mainly composed of the associated pad conf register and additional control module registers. In the PCT there are various combinations of registers associated to a pad (pad conf register and additional functionalities). These types of pads are split into classes in the pad conf tool. For detail description of the different functional pad classes refer to device TRM chapter Control Module.

**Figure 3.12. PCT Pad Block**



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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

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