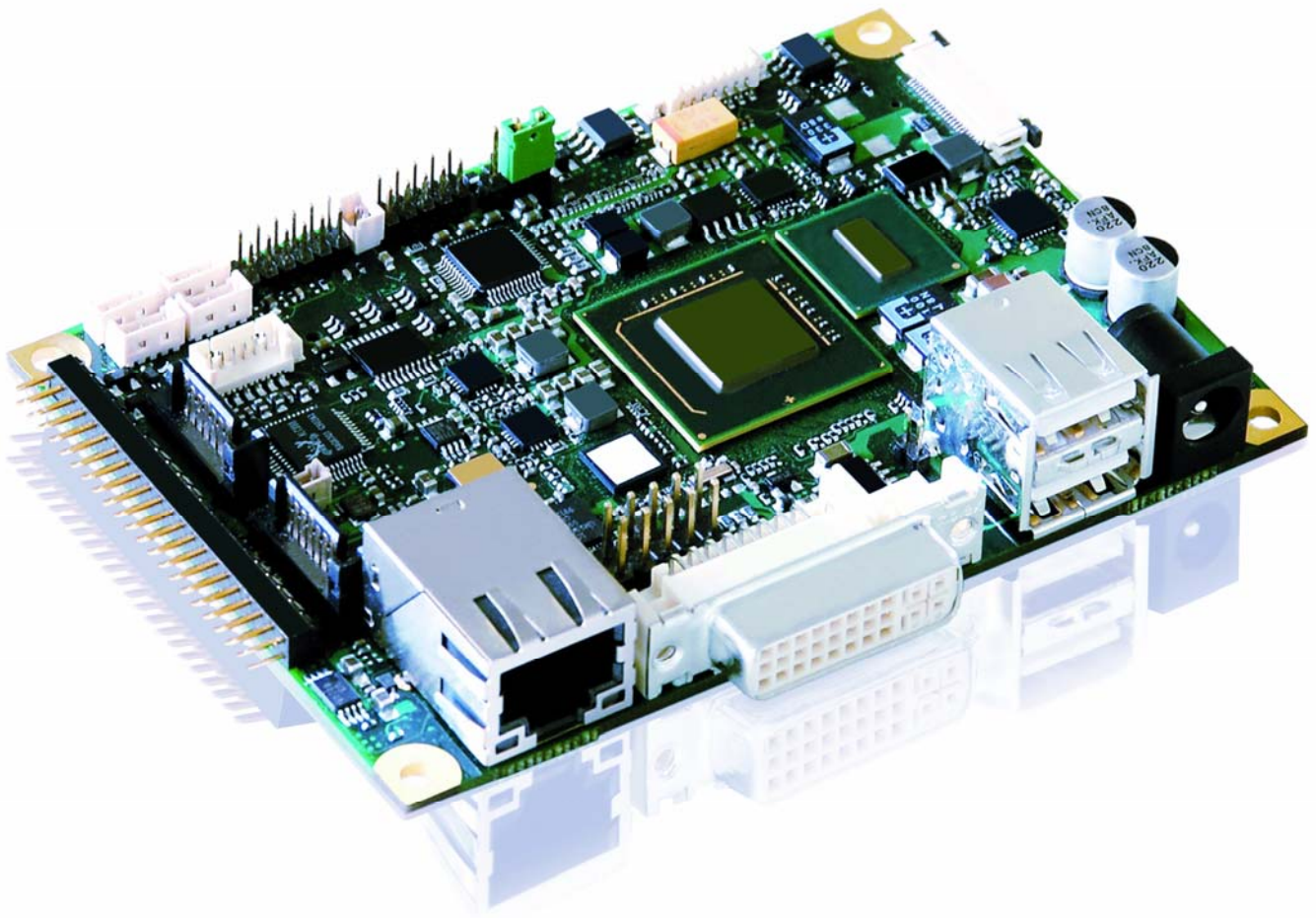


» WIN CE Guide «



pITX-SP
KTD-S0010-A

 **Pico**[™]

» Table of Contents «

1	User Information	1
1.1	About This Document.....	1
1.2	Copyright Notice	1
1.3	Trademarks	1
1.4	Standards.....	1
1.5	Warranty	1
1.6	Life Support Policy	2
1.7	Technical Support	2
2	Introduction	3
3	BSP Installation	4
3.1	Removing SDIO Driver	7
3.2	General Settings	7
3.3	Start Run-Time Image	7
4	Graphic Driver	8
4.1	Common Settings.....	8
4.2	DVI Interface Settings.....	8
4.3	LVDS Interface Settings.....	9
5	LAN Driver	9
6	Audio Driver.....	10
7	P-ATA Driver.....	10
8	S-ATA Driver.....	10
9	USB Driver	10
10	SDIO Driver	11
11	Boot without DOS.....	11
12	Development Hints.....	12
13	Run-Time Image Debugging	13
Appendix A: Reference Documents		14
Appendix B: Document Revision History		15

1 User Information

1.1 About This Document

This document provides information about products from KONTRON Technology A/S and/or its subsidiaries. No warranty of suitability, purpose or fitness is implied. While every attempt has been made to ensure that the information in this document is accurate the information contained within is supplied “as-is” - no liability is taken for any inaccuracies. Manual is subject to change without prior notice.

KONTRON assumes no responsibility for the circuits, descriptions and tables indicated as far as patents or other rights of third parties are concerned.

1.2 Copyright Notice

Copyright © 2010, KONTRON Technology A/S, ALL RIGHTS RESERVED.

No part of this document may be reproduced or transmitted in any form or by any means, electronically or mechanically, for any purpose without the express written permission of KONTRON Technology A/S.

1.3 Trademarks

Brand and product names are trademarks or registered trademarks of their respective owners.

1.4 Standards

KONTRON Technology A/S is certified to ISO 9000 standards.

1.5 Warranty

This product is warranted against defects in material and workmanship for the warranty period from the date of shipment. During the warranty period KONTRON Technology A/S will at its discretion decide to repair or replace defective products.

Within the warranty period the repair of products is free of charge as long as warranty conditions are observed.

The warranty does not apply to defects resulting from improper or inadequate maintenance or handling by the buyer, unauthorized modification or misuse, operation outside of the product's environmental specifications or improper installation or maintenance.

KONTRON Technology A/S will not be responsible for any defects or damages to third party products that are caused by a faulty KONTRON Technology A/S product.

1.6 Life Support Policy

KONTRON Technology's products are not for use as critical components in life support devices or systems without express written approval of the general manager of KONTRON Technology A/S.

As used herein:

Life support devices or systems are devices or systems which

- a) are intended for surgical implant into body or
- b) support or sustain life and whose failure to perform, when properly used in accordance with instructions for use provided in the labelling, can be reasonably expected to result in significant injury to the user.

A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system or to affect its safety or effectiveness.

1.7 Technical Support

Please consult our web site at <http://www.kontron.com/support> for the latest product documentation, utilities, drivers and support contacts. In any case you can always contact your board supplier for technical support.

Before contacting support please be prepared to provide as much information as possible:

Board identification:

- ☐ Type
- ☐ Part number (find PN on label)
- ☐ Serial number (find SN on label)

Board configuration:

- ☐ DRAM type and size
- ☐ BIOS revision (find in the BIOS Setup)
- ☐ BIOS settings different than default settings (refer to the BIOS Setup section)

System environment:

- ☐ O/S type and version
- ☐ Driver origin and version
- ☐ Attached hardware (drives, USB devices, LCD panels ...)

2 Introduction

This document explains in detail how to install the Kontron **B**oard **S**upport **P**ackage (BSP) and how to perform a build process for

Microsoft® Windows® CE 6.0

The BSP cannot be used for former versions of Windows® CE (i.e. 4.x or 5.0). The following table gives an overview about the software conditions:

Driver	Condition	Sourcecode available
Graphic	Windows® CE 6.0	
LAN	Windows® CE 6.0	
USB	Windows® CE 6.0	✓ ¹⁾
S-ATA	Windows® CE 6.0	
P-ATA / CF-Card	Windows® CE 6.0	
Audio	Windows® CE 6.0	
SDIO (microSD)	Windows® CE 6.0 R2	✓ ¹⁾

Note: 1) see the directory WINCE600\PLATFORM\pITX-SP_R100\SRC\DRIVERS.

The version Windows® CE 6.0 R2 needs additional software packages (the SDIO driver can be masked out without a problem).

- ☐ Visual Studio™ 2005 SP1
- ☐ Windows® CE 6.0 SP1
- ☐ Windows® CE 6.0 R2

The Kontron Board Support Package supports the following features:

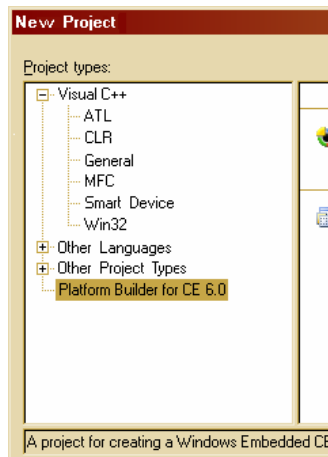
- Graphic: DVI and LVDS interface (18/24 bit color depth)
- LAN: operation at 10/100/1000 Mbps
- USB: all six ports with USB 1.1 and USB 2.0 devices
- S-ATA: both ports only with native mode
- P-ATA: one port including CF card support
- Audio: analog interface with 16 bit / 48 kHz
- SDIO: only the microSD interface with SDHC feature (capacity > 2 GB)

3 BSP Installation

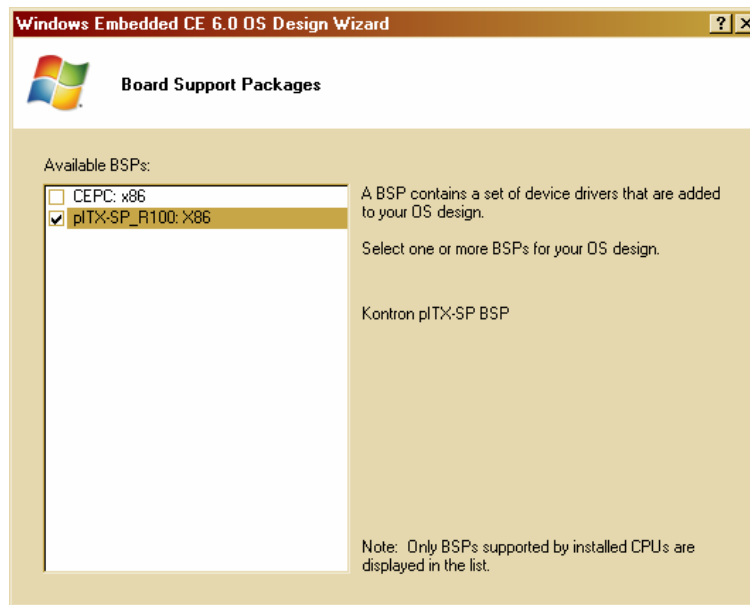
Unzip the BSP archive to the platform directory (normally WINCE600\PLATFORM). The BSP is only detected automatically by the Platform Builder when it is placed in this path. After extraction the directory tree must look like this

```
WINCE600\  
PLATFORM\  
  CEPC  
  COMMON  
  pITX-SP_R100
```

After invoking the menu item **File/New/Project** the following message box appears.

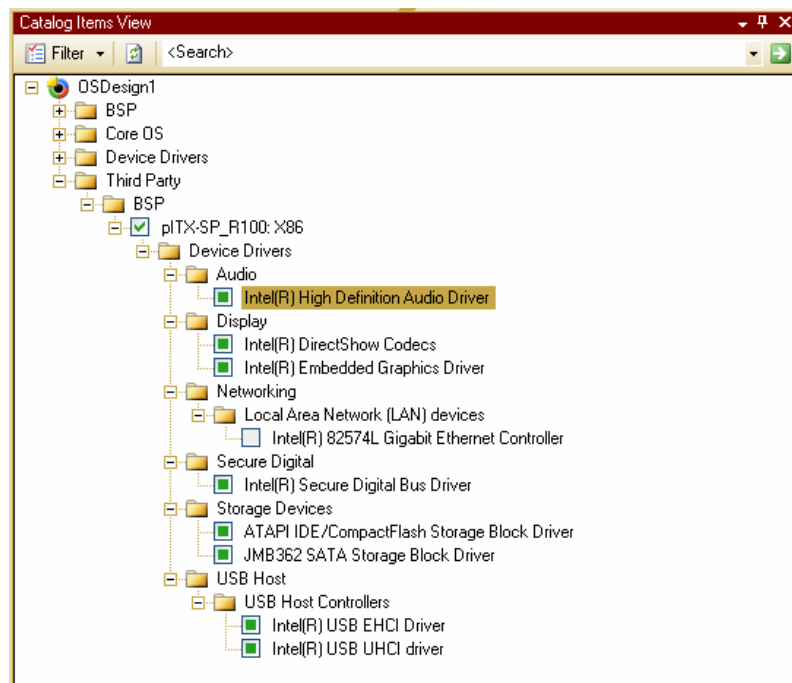


Press twice **Enter** and now the next interesting dialog box appears.

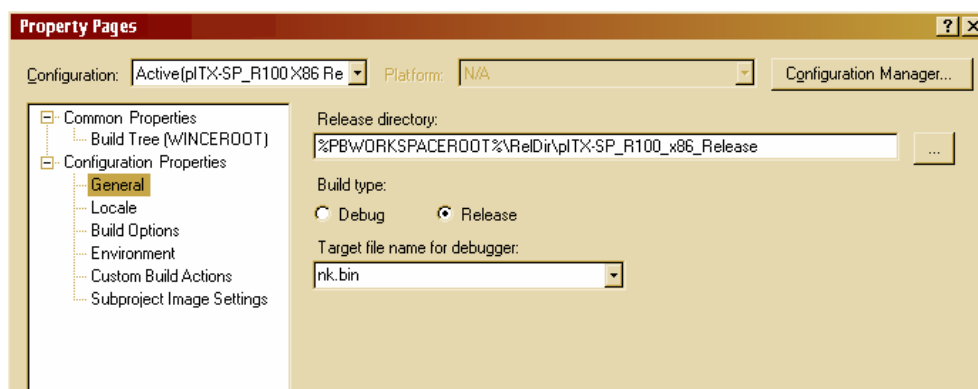


Only the entry **pITX-SP_R100: X86** may be selected. When **CEPC: x86** is selected as well this can lead to critical errors and it is also absolutely needless.

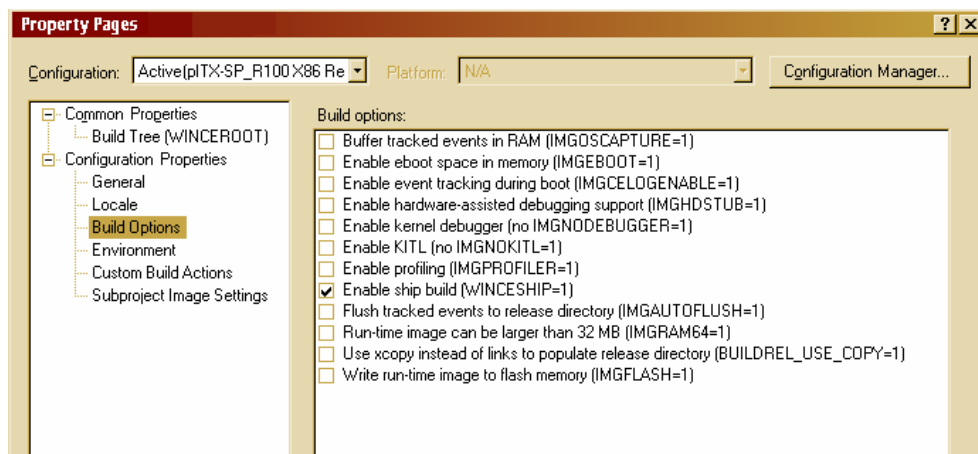
The **Design Templates** offer for instance the choice between **Consumer Media Device** and **Custom Device**. As all further settings depend on the project these cannot be described in detail. After all entries have been done the Catalog Item Viewer should look as you can see below.



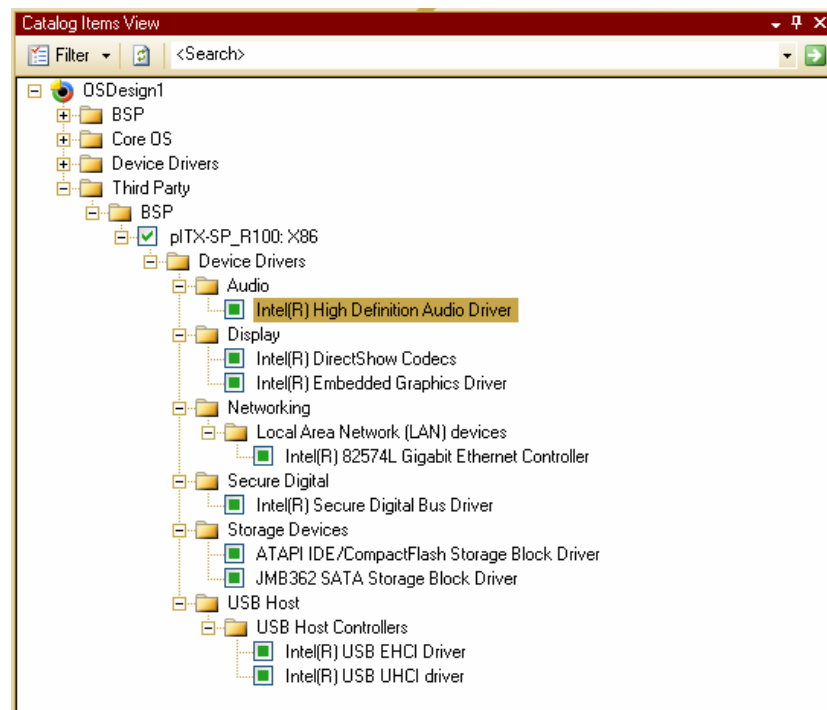
As the **Kernel Independent Transport Layer (KITL)** is activated by default in the debug mode the LAN controller is blocked. By changing to release mode the LAN controller can be used freely. The Configuration Manager must be started through the menu item **Build/Configuration Manager** and set to **pITX-SP_R100 X86 Release**.



The Build Options allow several settings. Subsequent you can find an example.



After this change the Catalog Item Viewer displays the corrected settings.



3.1 Removing SDIO Driver

To mask out the SDIO driver two files must be modified. First the file **WINCE600\PLATFORM\pITX-SP_R100\cebasecesysgen.bat** must be changed as follows. Below the comment line **@REM Include SDIO support** there are the following entries:

```
set SYSGEN_SDBUS=1
set IMGSDBUS2=1
set SYSGEN_SDHC_STANDARD=1
set SYSGEN_SD_MEMORY=1
```

These must be changed to:

```
set SYSGEN_SDBUS=
set IMGSDBUS2=
set SYSGEN_SDHC_STANDARD=
set SYSGEN_SD_MEMORY=
```

The second file is **WINCE600\PLATFORM\pITX-SP_R100\SRC\DRIVERS\dirs.**

```
DIRS=\
    usb\
    e1000dbg\
    pm\
    sdcard
```

The last line must be deleted.

```
DIRS=\
    usb\
    e1000dbg\
    pm\
```

3.2 General Settings

The general BSP settings are located in the files **WINCE600\PLATFORM\pITX-SP_R100\pITX-SP_R100.bat** and **WINCE600\PLATFORM\pITX-SP_R100\cebasecesysgen.bat**. You can add or disable/delete entries.

3.3 Start Run-Time Image

The general way is to boot a DOS version and use the CE-Loader LOADCEPC. This program needs HIMEM.SYS to have access to the extended memory. It is mandatory to activate the Gate A20 within the BIOS Setup at **Advanced/CPU Configuration/Fast Gate A20** (possible since BIOS release R113 and CPLD version 0x0E).

The following table gives an overview about the tested DOS versions.

Operating System	Version	Possible	Comment
MS-DOS	6.22	✓	
MS-DOS	WIN 98 (7.10)	✓	
MS-DOS	WIN ME (8.0)	✓	Boot from floppy disk. HIMEM not necessary
DR-DOS	7.03	✓	

4 Graphic Driver

The **I**ntel **E**mbedded **G**raphics **D**river (IEGD) supports either DVI or LVDS output. This can be switched through registry settings. The corresponding REG-file is located at **WINCE600\PLATFORM\pITX-SP_R100\BIN\Drivers\IEGD\iegd.reg**.

4.1 Common Settings

The most important settings can be found in the path **[HKEY_LOCAL_MACHINE\Drivers\Display\Intel\ALL\1\General]**. The following keys are belong to

- "Width"
- "Height"
- "Depth"
- "Refresh"
- "PortOrder"

The key "PortOrder" defines if the DVI or the LVDS interface is active. This key overwrites the BIOS Setup setting. This means you can boot for example with a DVI monitor and switch to the LVDS interface when Windows® CE starts. The keys "Width" and "Height" define the resolution of the DVI or LVDS interface. It is important to note that the maximum resolution for the LVDS interface is 1366x768 Pixel.

4.2 DVI Interface Settings

The specific DVI settings can be found in the path **[HKEY_LOCAL_MACHINE\Drivers\Display\Intel\ALL\1\Port\2\...]**. The following keys are belong to

- "Rotation"
- "Width"
- "Height"
- "18"

The key "Rotation" allows the rotation of the picture in 90° steps. The other three keys are only needed for special applications (optional keys).

Example: If you want to work with a smaller resolution (i.e. XGA = 1024x768 pixel) on a SXGA DVI monitor (1280x1024 pixel) you can modify the **General** settings to achieve this. The three keys (**Port\2\FPIInfo** and **Port\2\Attr**) need to be modified if you want Windows® CE to be displayed unscaled (means not stretched) in XGA resolution on a SXGA monitor. In this case the **General** settings must be set to XGA resolution and the DVI (**Port\2\FPIInfo**) settings must be set to the physical resolution of the monitor (SXGA). Likewise the key "18" must be set to 0.

4.3 LVDS Interface Settings

The specific LVDS settings can be found in the path **[HKEY_LOCAL_MACHINE\Drivers\Display\Intel\ALL\1\Port\4\...]**. The following keys are belong to

```
"Rotation"
"Width"
"Height"
"18"
"26"
```

The first four keys have the identical function as the related DVI keys. The additional key "26" defines the color depth of the LVDS interface (18/24 bit).

5 LAN Driver

The most important settings are done within the registry. The corresponding REG-file is located at **WINCE600\PLATFORM\pITX-SP_R100\BIN\Drivers\NIC\e1q51ce6.reg**. Especially the following path **[HKEY_LOCAL_MACHINE\COMM\PCI\E1Q51CE61\PARMS]** defines the connection parameters.

Some keys can be found there (the means of Intels '*' designator is not known):

```
"*FlowControl"
"*TransmitBuffers"
"*ReceiveBuffers"
"*TCPChecksumOffloadIPv4"
"*UDPChecksumOffloadIPv4"
"*IPChecksumOffloadIPv4"
"*SpeedDuplex"
"*JumboPacket"
```

The key **"*SpeedDuplex"** defines the connection speed and the duplex mode. The value Zero (dword:0) activates the auto-negotiation mode. In this mode the controller works with the Gigabit interface if possible. If the adapter cannot establish a link with the link partner using auto-negotiation, you may need to manually configure the adapter and link partner to identical settings. An explicit setting for the Gigabit interface is not intended.

```
"*SpeedDuplex"=dword:1           ;10 Mbps half duplex
"*SpeedDuplex"=dword:2           ;10 Mbps full duplex
"*SpeedDuplex"=dword:3           ;100 Mbps half duplex
"*SpeedDuplex"=dword:4           ;100 Mbps full duplex
```

All other parameters should only be modified by an expert.

6 Audio Driver

The implemented driver is a **H**igh **D**efinition **A**udio (HDA) driver (supports theoretical up to 24bit@192 kHz). Windows® CE limits the output of WAV-files with the media player to 16 bit resolution with a sampling rate of 48 kHz. Hints for this issue can be found on the internet.

7 P-ATA Driver

Standard hard drives and also CF-cards (not configured as a hard drive) are fully supported by the driver. The detection of CD/DVD drives might cause problems.

Attention: Windows® CE does not support access to NTFS partitions. Only FAT, FAT32 and exFAT partitions are possible.

8 S-ATA Driver

The driver only supports the native mode. AHCI mode is not allowed. Also bigger hard drives up to 1 TB do not cause problems (the storage manager shows the correct size). Some S-ATA settings can be modified within the registry. The corresponding REG-file is located at **WINCE600\PLATFORM\pITX-SP_R100\SRC\DRIVERS\BLOCK\ATAPI\jmb362.reg**.

The modification of these parameters should only be done by an expert.

Attention: Windows® CE does not support access to NTFS partitions. Only FAT, FAT32 and exFAT partitions are possible.

9 USB Driver

The driver brings full support for all USB 1.1 and USB 2.0 devices (keyboard, mouse, hard drive, key, CD/DVD drive). Some USB settings can be changed within the registry. The corresponding REG-file can be found at **WINCE600\PLATFORM\pITX-SP_R100\SRC\DRIVERS\USB\usb_iceg.reg**.

The modification of these parameters should only be done by an expert.

Attention: Windows® CE does not support access to NTFS partitions. Only FAT, FAT32 and exFAT partitions are possible.

10 SDIO Driver

The pITX-SP board supports two SDIO interfaces (one microSD slot and one SDIO pinheader). Only the microSD slot can be accessed with the driver. The use of the SDIO pinheader can lead to detection problems of microSD cards. In the microSD slot also SDHC devices are supported.

Following steps are necessary to prepare a DOS bootable card.

- ❶ Partitioning and formatting (FAT or FAT32) the microSD card.
- ❷ Use the 'HP USB Disk Storage Format Tool' or an other program and a USB Card Reader with SD/MMC support on a host computer to make the card bootable.

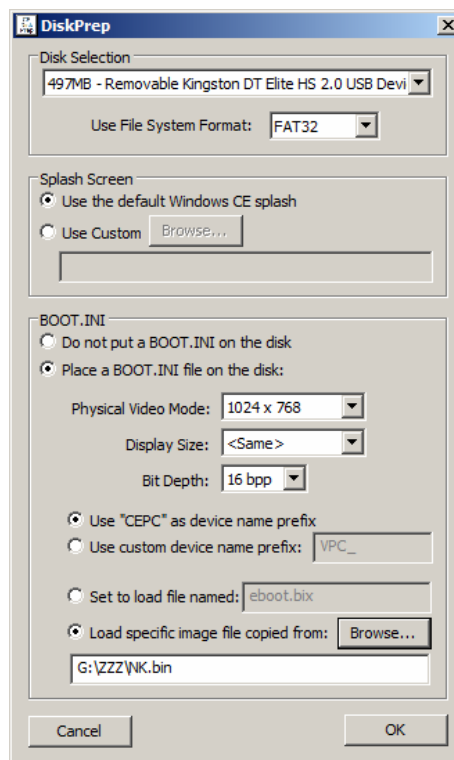
For partitions bigger than 2 GB DOS 8.0 (component of Windows® XP) is a usefull base. HIMEM.SYS is already included and it is only needed to copy LOADCEPC and the Run-Time Image to the partition.

11 Boot without DOS

Booting into DOS and using LOADCEPC is one possible way to start a run-time image. As most DOS versions need to be licensed and are not free of charge the tool **DiskPrep** can be used as an alternative. The program can be downloaded from the following website:

<http://code.msdn.microsoft.com/diskprep>

It is recommended to use this tool on a Windows® 7 operating system. The following picture shows some of the typical settings.



DiskPrep uses the bootloader from Windows® CE (path **WINCE600\PLATFORM\CEPC\SRC\BOOT-LOADER**). However the sourcecode of the bootloader is not really designed optimally and this causes a crash when the bootloader is loaded on the *pITX-SP*. The reason for this can be found within the file **WINCE600\PLATFORM\CEPC\SRC\BOOTLOADER\BIOSLOADER\LOADER\startup.asm**:

```
;
; Set the A20 line if it isn't already
;
LP1:
    in     al, 064h                ; wait not busy
    test  al, 2
    jnz   LP1
    mov   al, 0D1h
    out   064h, al
LP2:
    in     al, 064h                ; wait not busy
    test  al, 2
    jnz   LP2
    mov   al, 0DFh
    out   060h, al
```

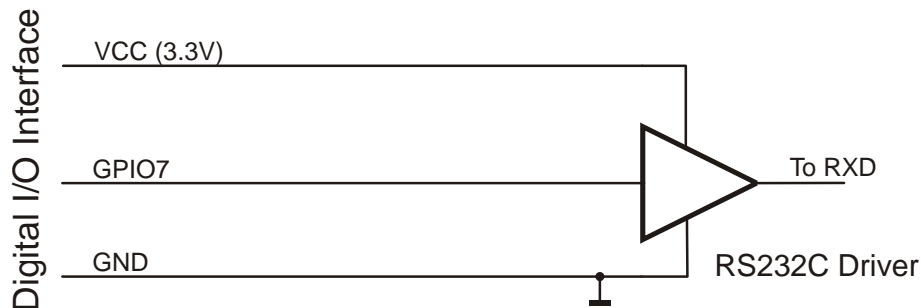
It can be seen that Microsoft® assumes that a keyboard controller is present. As the *pITX-SP* does not have a keyboard controller this leads to a crash. This problem can be fixed with a BIOS setting. The menu entry **Advanced/Onboard Device Configuration/Chipset Configuration/Linux Reboot Fix** (possible since BIOS release R113) solves this problem when set to enabled (busy-flag is active).

12 Development Hints

Changes of the registry files or of the source code of the Board Support Package do only need a complete new creation of the image in special cases. For registry modifications it is sufficient to start **Build/Make Run-Time Image**. For source code changes the menu item **Build/Open Release Directory in Build Window** can be used. Use the command prompt to go to the wanted directory (e.g. **WINCE600\PLATFORM\pITX-SP_R100\SRC\DRIVERS\SDCARD\SDHCBASE**). Then type **BUILD** and press the Enter key. Back in the platform builder surface from Visual Studio™ a new image can very fast be generated by choosing **Build/Make Run-Time Image**.

13 Run-Time Image Debugging

For debugging the tools implemented in Windows® CE can be used except the serial interface. Kontron Technology A/S adds an additional interface (only available since BIOS release R113 and CPLD version 0x11). Port 80h outputs can be send serial to another PC via a GPIO line and show it in a terminal program. The following picture shows the needed hardware.



The parameters for the communication are:

Baud rate: 115200
 Data bits: 8
 Stop bits: 1
 Parity: No
 Data format: Hex

The Port 80h output must be activated after the DOS boot (the feature is only cleared by power off/on). This can be done with the DOS debug tool or with the following small DOS program.

```
#include <conio.h>
#include <stdio.h>
#include <dos.h>

#define CPLD_BASE_ADDR      0xA80
#define GPIO_CONTROL        0x9F

void main (void)
{
    unsigned char reg;

    outp (CPLD_BASE_ADDR, GPIO_CONTROL);
    reg = inp (CPLD_BASE_ADDR+1);
    reg |= 0x20;
    outp (CPLD_BASE_ADDR+1, reg);
}
```

Appendix A: Reference Documents

KONTRON Technology A/S can't guarantee the availability of internet addresses.

Document	Internet Address
Microsoft Windows Embedded CE 6.0 Documentation	http://msdn.microsoft.com/en-us/library/ee504812.aspx
Microsoft Windows Embedded CE Developer Center	http://msdn.microsoft.com/en-us/windowseembedded/ce

Appendix B: Document Revision History

Revision	Date	Author	Changes
S0010-A	07/20/10	M. Hüttmann	Added chapter 'Boot without DOS'
S0010-0	06/24/10	M. Hüttmann	Created preliminary manual

Corporate Offices

Europe, Middle East & Africa

Oskar-von-Miller-Str. 1
85386 Eching/Munich
Germany
Tel.: +49 (0)8165/ 77 777
Fax: +49 (0)8165/ 77 219
info@kontron.com

North America

14118 Stowe Drive
Poway, CA 92064-7147
USA
Tel.: +1 888 294 4558
Fax: +1 858 677 0898
info@us.kontron.com

Asia Pacific

17 Building, Block #1, ABP
188 Southern West 4th Ring Road
Beijing 100070, P.R.China
Tel.: + 86 10 63751188
Fax: + 86 10 83682438
info@kontron.cn

