ThinkIO™ - Duo

Premium DIN Rail PC

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Programming Assistance Guide

-

Windows XP Embedded

kontron

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Kontron Modular Computers GmbH may be contacted via the following:

MAILING ADDRESS

Kontron Modular Computers GmbH

Sudetenstraße 7

D - 87600 Kaufbeuren Germany

TELEPHONE AND E-MAIL

+49 (0) 800-SALESKONTRON

sales@kontron.com

For further information about other Kontron Modular Computers products, please visit our Internet web site: www.kontron.com

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Kontron Modular Computers makes no representations or warranties with respect to this Windows XP Embedded package, and specifically disclaims any express or implied warranties of merchantability or fitness for any particular purpose.

2. Introduction

The ThinkIO-Duo Windows XP Embedded Board Support Package (BSP) is intended for use with the Microsoft® Windows XP Embedded Studio.

It is not a complete Windows XP Embedded target image of the ThinkIO-Duo and only contains ThinkIO-Duo specific components.

This Programming Assistance Guide is designed to provide information about the basic steps required to design a custom Windows XP Embedded target image for the ThinkIO-Duo. It begins with general information about the Windows XP Embedded Studio and ends with specific suggestions for using the ThinkIO-Duo Windows XP Embedded BSP.

This guide is designed to be read sequentially, however, experienced Windows XP Embedded Studio users may choose to proceed with section 4.

2.1 Presumptions

The use of this guide requires the availability of the Windows XP Embedded Studio and basic knowledge of how to use it.

2.2 List of Terms

BSP Board Support Package

Component A single object in the in the SLD file or the Component Database such as the non-volatile memory (SRAM/MRAM) driver, the VGA driver, or a macro component which contains references to several other components

CRT Cathode Ray Tube: an analog monitor

DVI Digital Visual Interface: used for connecting digital monitors

FBA First Boot Agent: a program which installs a Windows XP Embedded image on a target computer. The FBA runs only once.

INF File An ".inf" file (information file) contains instructions and settings required for the installation of a driver by the Windows Hardware Manager.

GUID Globally Unique Identifier: a unique random number.

Repository A folder or directory which contains all files referenced by one or more components of the Component Database. The files referenced by components used in the target design will be copied during the build phase of the target image.

SLD File System Level Definition: a component definition file which contains all information about a component

3. Windows XP Embedded Studio

This is only a short introduction into the Windows XP Embedded Studio and not intended as a complete user guide. For in-depth information refer to Microsoft® MSDN Library and the Help-Files of the Studio itself.

3.1 General

The Windows XP Embedded Studio consists of a database and three main programs:

- Component Database
- Component Database Manager
- Component Designer
- Target Designer

The programs run independent of each other, except the Component Database Manager, whose functionality is restricted if one of the other programs is open.

The heart of the Studio is the Component Database**.** This database can be edited by the Component Database Manager only. The Target Designer and Component Designer are based on the contents of the Component Database. This means, components not in the Components Database cannot be added to a target design project.

3.2 The Component Database

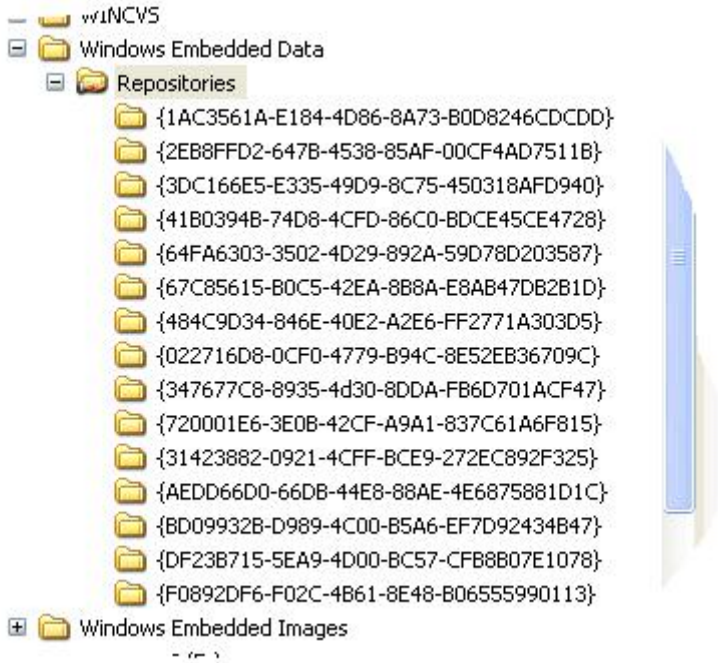
The Component Database contains:

- repositories
- components
- packages and groups

The repositories contain the physical driver, application, and program files which may be used on a target device.

A repository is a folder which has a GUID as name. There are already several basic repository folders which contain all necessary files needed by the more than 10,000 components which are already in the database.

The screenshot on the following page illustrates the composition of the root repository with its basic repository folders.



WARNING!

Except for folders created by importing OEM ".sld" files such as the ThinkIOD.sld into the database, do not delete folders in the repository. Refer also to section 5.3 for further information.

A new component added to the database will add a new folder containing all files required by that component.

3.3 The Component Database Manager

The Component Database Manager is used:

- for importing new component files (".sld" files)
- to set or change the location of the root repository
- to provide an overview of and for the deletion of component packages
- to provide an overview of and for the deletion of components
- to filter the component overview
- for repository manipulation (root, location, deletion)
- to provide an overview of and for the deletion of component groups

3.4 The Component Designer

The components contain descriptions of their composition (drivers, applications, other components), to what repository they are associated, and information about where to copy files, what registry settings to set, etc. Components can be assigned to groups and packages.

The Component Designer is used to create and modify custom components and any associated repositories, packages, dependency groups, and repository sets. These objects are saved in component definition files (".sld" files), imported into the component database, and used in configurations.

For further information regarding the Component Designer refer to the Help menu and the following WEB link:

http://msdn2.microsoft.com/en-us/library/ms950428.aspx

There are several methods available for creating an ".sld" file:

Manual creation (File/New) – (see Help Manual of the Component Designer)

- importing an existing INF file (*.inf)
- importing a Target Analyser file (*.pmq) (created by ta.exe/tap.exe)
- importing a Registry file (*.reg)
- importing a Windows NT Embedded KDF file (*.kdf)or
- opening of an existing ".sld" file and modifying it.

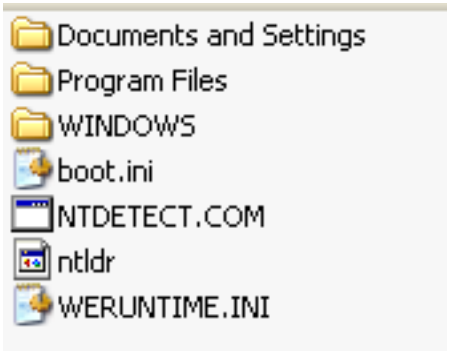
Use of the above methods requires exact knowledge about the hardware, including required registry settings and drivers. Therefore, whenever possible, an existing file of the type mentioned above should be imported.

3.5 The Target Designer

The Target Designer is used to create and modify a configuration and build it into a runtime image. With the Target Designer it is possible: to add components and resources to a configuration; modify various properties of the components and resources added; modify properties of the configuration itself; check component dependencies to ensure that necessary components are included in the configuration; estimate the footprint of a runtime image before building it; and much more.

New components such as the ThinkIO-Duo BSP are available after being imported into the Component Database.

After all required components have been added to the configuration and the dependency check has been run without errors, the runtime image must be built. It can be created in a freely selectable directory. The following screenshot illustrates this.



Note...

An error free dependency check and an error free build does not guarantee that the FBA has been executed without problems or that the runtime image will work as expected on the target machine.

4. Components of the ThinkIO-Duo Win XPe BSP

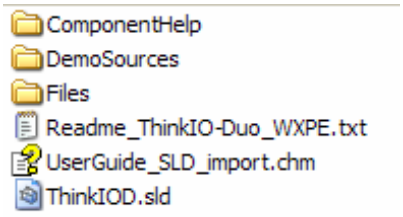
The ThinkIO-Duo Windows XP Embedded BSP contains the following:

ThinkIOD.sld	the ".sld" file to be imported into Component Data Base
UserGuide_SLD_import.chm	shows how to import an ".sld" file into the Component Database (refer to section 5.2)
Files Folder	Contains all drivers, files, etc. for every component in the ".sld" file
DemoSources Folder	Contains demo source code for application programmers who want to develop applications using KBus, non-volatile memory (SRAM/MRAM), and KOMisc drivers The demo sources are not part of the ".sld" file as they are intended to be a reference only for developers.
Component Help Folder	Contains HTM help files used by the Component Database Manager for inserting component help into the Component Database

5. ThinkIO-Duo BSP Installation Procedures

5.1 Preparation

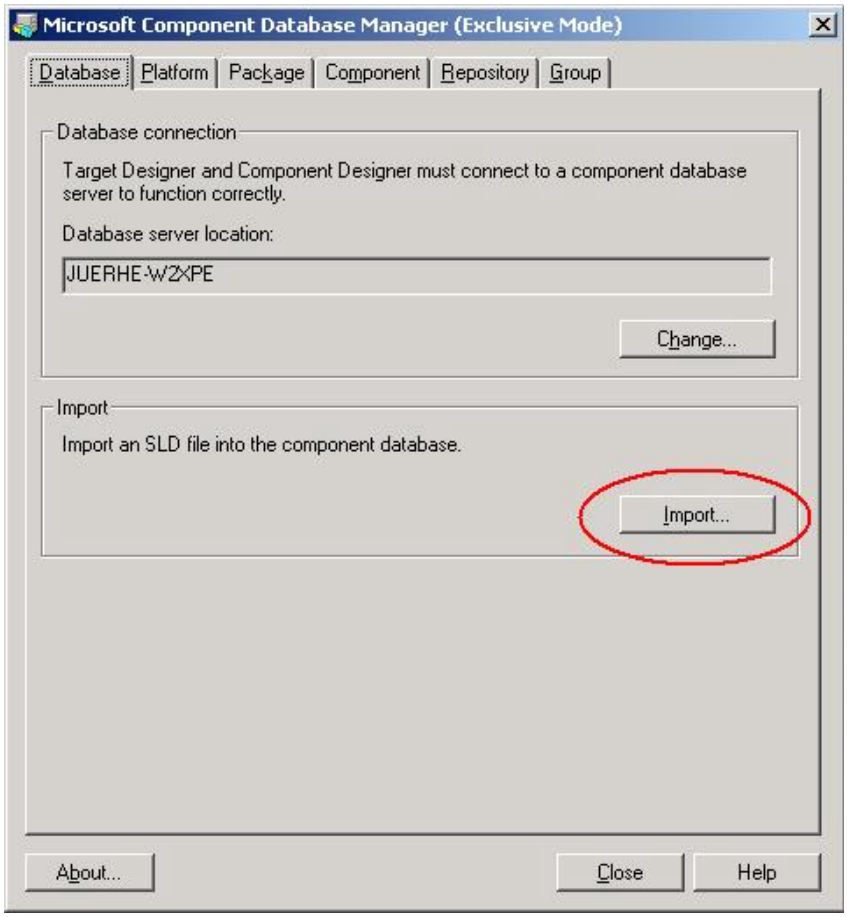
Create an empty directory folder and unpack the Kontron delivered ".zip" file in this directory. Afterwards the file and folder list should be as illustrated in the screenshot below:



5.2 Import of Components

To import components perform the following:

- Open the Component Database Manager
- Select "Import"



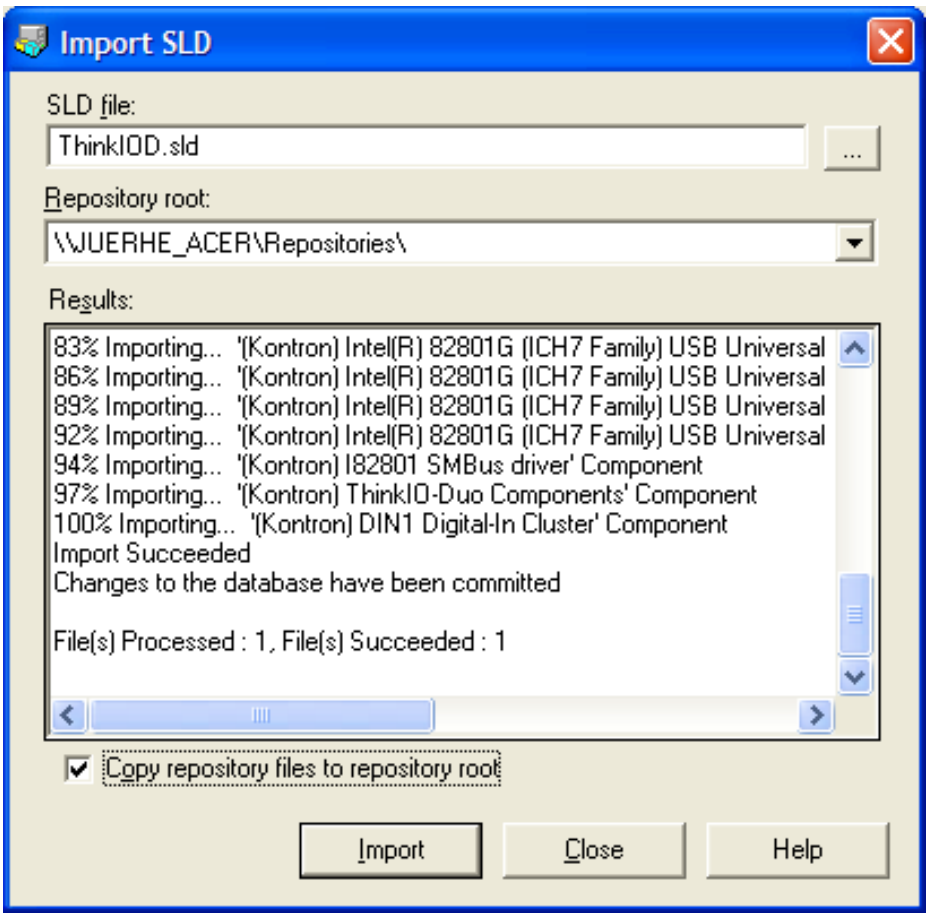
- To search for the component file to import, browse to the folder where the "ThinkIOP.sld" file is located and select it
- Check mark "Copy repository files to repository root" of the Component Database Manager. This ensures that the associated files are found and included in the target image when using the component later on in the Target Designer.

- Select "Import"

Note...

If the source files cannot be found during the import process, this copy function fails silently, and the first time an error will appear is during the runtime image build process in the Target Designer.

After a successful import the following information should be displayed.



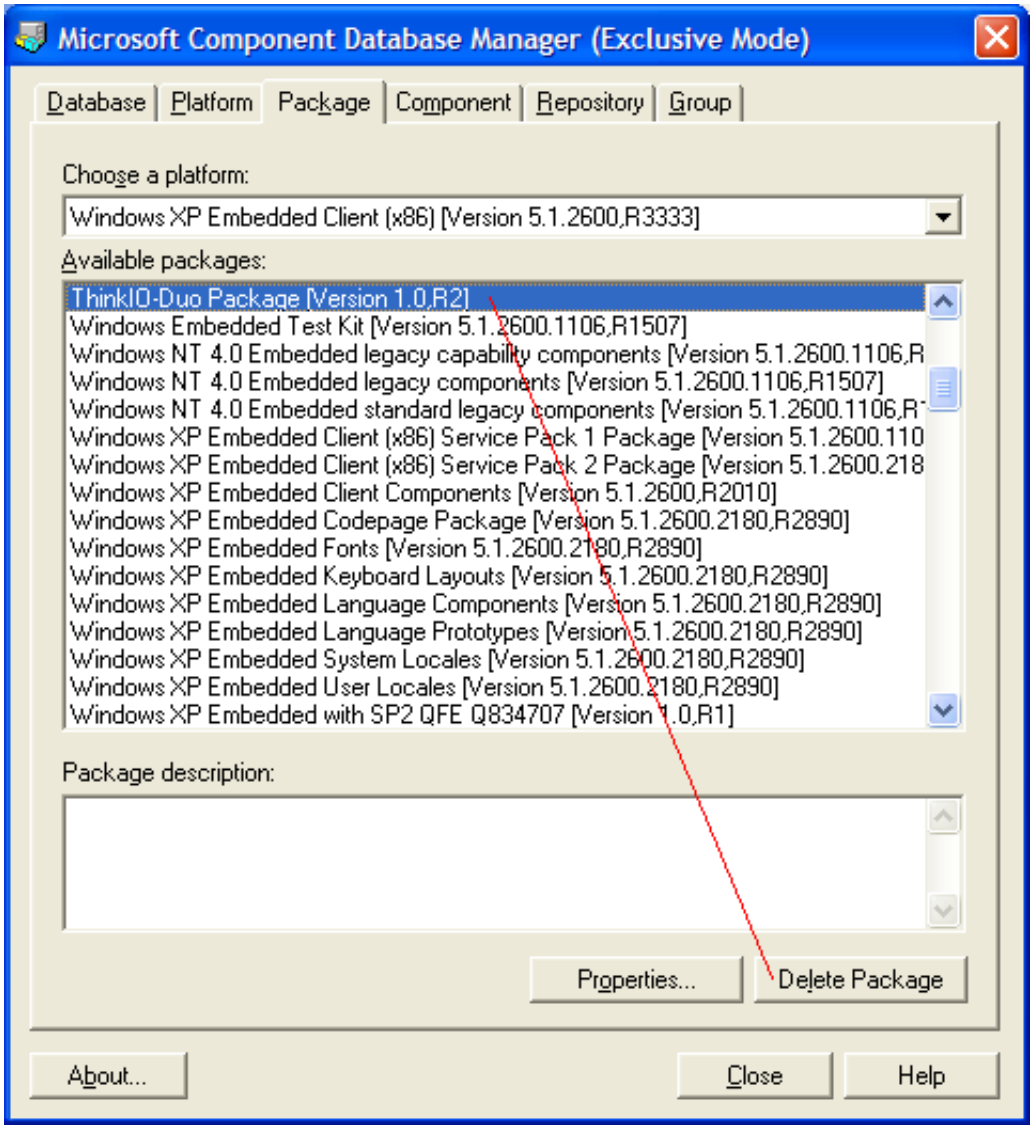
- Close the Component Database Manager

  The components are now available in the Target Designer.

5.3 Removing ThinkIO-Duo Components from the Database

The easiest method to remove the ThinkIO-Duo components from the Component Database is to remove the ThinkIO-Duo package. This ensures that all components and the ThinkIO-Duo repository are removed from the database.

- Select the package to be removed from the database
- Select "Delete Package"



Note...

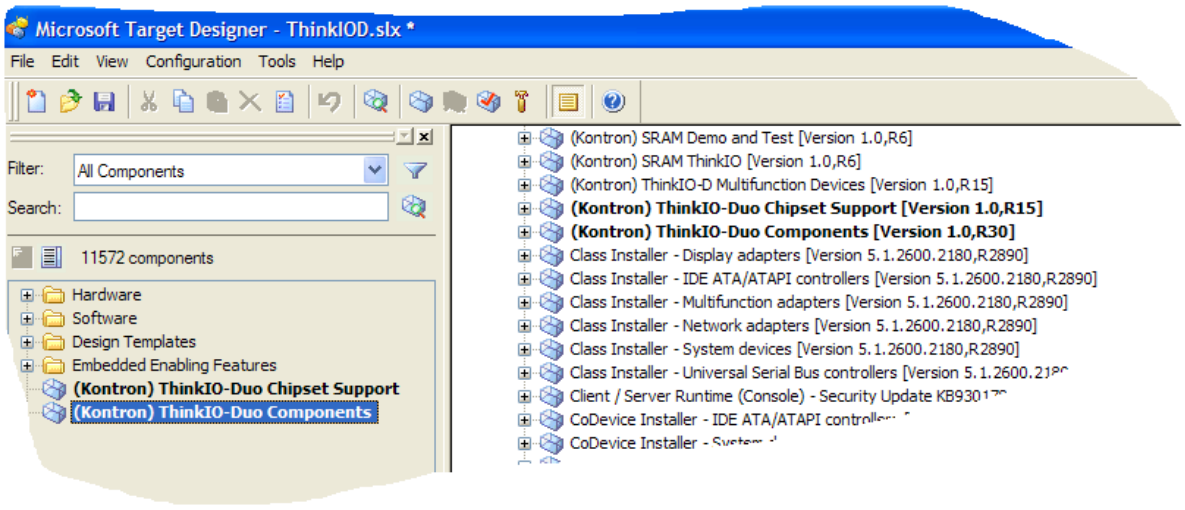
Removing a repository from the database will remove the reference to that repository only. The physical repository itself including all files will not be removed. This must be done manually.

6. Using the Target Designer

After importing the "ThinkIOD.sld" file into the Component Database, open the Target Designer and select: "File"; then select either "New" or "Open an existing SLX file".

The components list on the lefthand side indicates the macro component "(Kontron) ThinkIO-Duo Components".

The macro "(Kontron) ThinkIO-Duo Components" combines several components suitable for the ThinkIO-Duo (see list below). After adding this macro to the target design but before running the dependency check, the single components to be added by the macro can be selected via the settings of the macro (refer to section 6.3, default is all).



6.1 Associated Components

The "(Kontron) ThinkIO-Duo Components" macro is associated with the components listed below.

Some components depend on the existence of other components (see Dependencies column). The dependency check makes sure that components on which already selected components depend on are also included into the target design.

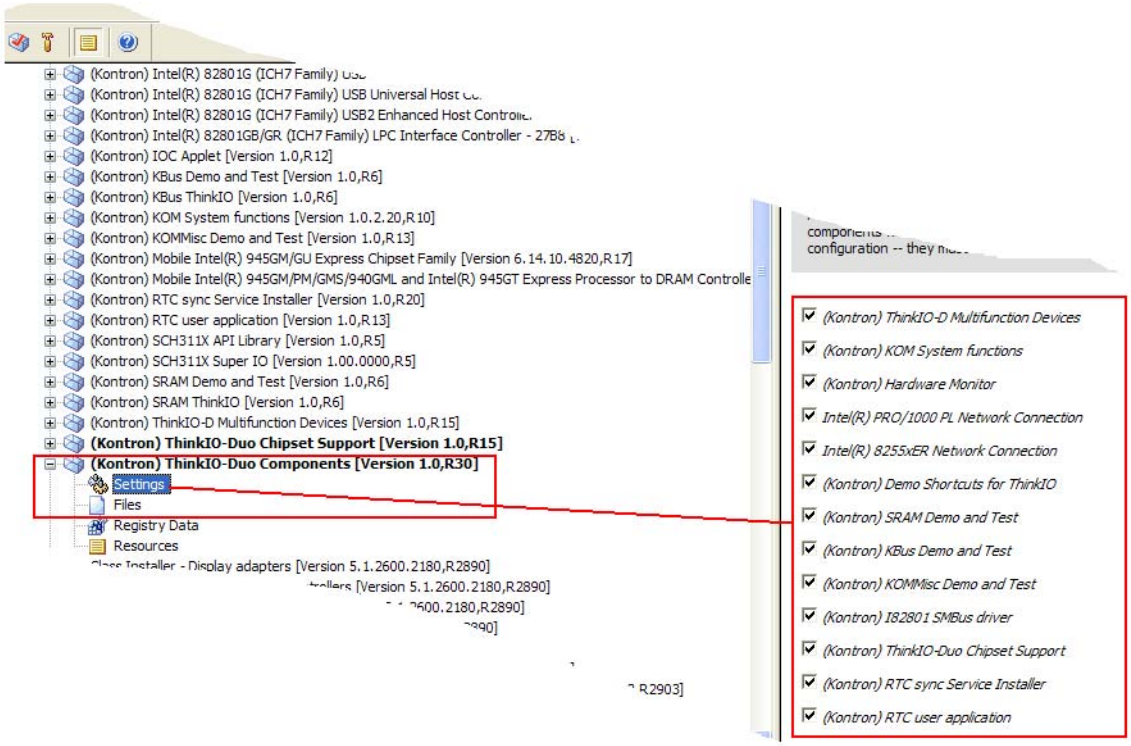
COMPONENT NAME	DEPENDENCIES
(Kontron) KOM System functions	none
(Kontron) KOMMisc Demo and Test	(Kontron) KOM System functions
(Kontron) ThinkIO Multifunction Devices	(Kontron) KBus ThinkIO (Kontron) SRAM ThinkIO (Kontron) DIN1 Digital-In Cluster
(Kontron) KBus Demo and Test	(Kontron) KBus ThinkIO
(Kontron) SRAM Demo and Test	(Kontron) SRAM ThinkIO
(Kontron) SCH311X Super IO	(Kontron) SCH311X API Library
(Kontron) SCH311X API Library	(Kontron) SCH311X Super IO
(Kontron) Hardware Monitor	(Kontron) SCH311X Super IO
Intel(R) PRO/1000 PL Network Connection	none
Intel(R) 8255xER Network Connection	none
(Kontron) KBus ThinkIO	(Kontron) ThinkIO Multifunction Devices
(Kontron) SRAM ThinkIO	(Kontron) ThinkIO Multifunction Devices
(Kontron) DIN1 Digital-In Cluster	(Kontron) ThinkIO Multifunction Devices (Kontron) IOC Applet
VC80 Redistributable Runtime Library	none
(Kontron) IOC Applet	(Kontron) DIN1 Digital-In Cluster

COMPONENT NAME	DEPENDENCIES
(Kontron) ThinkIO-Duo Chipset Support (Macro)	(Kontron) Intel(R) 82801G (ICH7 Family) PCI Express Root Port - 27D0 (Kontron) Intel(R) 82801G (ICH7 Family) PCI Express Root Port - 27D2 (Kontron) Intel(R) 82801G (ICH7 Family) PCI Express Root Port - 27D4 (Kontron) Intel(R) 82801G (ICH7 Family) PCI Express Root Port - 27D6 (Kontron) Intel(R) 82801G (ICH7 Family) Ultra ATA Storage Controllers - 27DF (Kontron) Intel(R) 82801G (ICH7 Family) USB Universal Host Controller - 27C8 (Kontron) Intel(R) 82801G (ICH7 Family) USB Universal Host Controller - 27C9 (Kontron) Intel(R) 82801G (ICH7 Family) USB Universal Host Controller - 27CA (Kontron) Intel(R) 82801G (ICH7 Family) USB Universal Host Controller - 27CB (Kontron) Intel(R) 82801G (ICH7 Family) USB2 Enhanced Host Controller - 27CC (Kontron) Intel(R) 82801GB/GR (ICH7 Family) LPC Interface Controller - 27B8 (Kontron) Mobile Intel(R) 945GM/GU Express Chipset Family
(Kontron) Demo Shortcuts for ThinkIO	(Kontron) KBus Demo and Test (Kontron) KOMMisc Demo and Test (Kontron) SRAM Demo and Test
(Kontron) I82801 SMBus driver	(Kontron) RTC sync Service Installer
(Kontron) RTC sync Service Installer	VC80 Redistributable Runtime Lib (Kontron) I82801 SMBus driver
(Kontron) RTC user application	(Kontron) RTC sync Service Installer VC80 Redistributable Runtime Lib

After adding the macro component to the target design and running the dependency check that all components of the list above have been added to the components list unless some of them were deselected prior the dependency check (refer to section 6.3 Settings).

6.2 Settings

Each component of the "(Kontron) ThinkIO-Duo-Components" macro can be selected or deselected.



Note...

Deselecting a component which is part of the dependencies list will be disregarded, if simultaneously a component is selected, which depends on the deselected component.

7. Transfer of the Runtime Image to the Target Machine

All files and directories of the runtime image must be copied to the target device. Depending on the target machine interfaces for storage devices and/or network connections, there are several options to copy the runtime image.

Headless targets and targets booting from a read-only device require special preparation which is not addressed by this document. Refer to the HELP menu or the Microsoft library.

Note...

Ensure that the boot device drive letter in the target designer configuration is the same as the actual drive letter of the boot device of the target machine, otherwise the FBA will be aborted with an error.

7.1 Creating a Boot Device for FAT16/FAT32

If possible prepare a memory stick with a bootable DOS partition. If a memory stick is not available, prepare a bootable DOS floppy disk.

The memory stick or floppy should contain the following files: "bootprep.exe", "format.com", "fdisk.exe" or better "xfdisk.exe" (freeware), and a freeware called "LFN" (a collection of DOS commands which is able to handle long file names).

7.2 Preparing the Compact Flash (CF)

Perform the following to prepare an external CompactFlash:

- Insert the CF into the ThinkIO-Duo.
- Boot the target machine with DOS from the floppy or the memory stick.
- If required, use "fdisk.exe" or another suitable application to create a primary partition on the CompactFlash. If there is a primary partition already present (e.g. FAT16), then delete all partitions from the CF and create a new primary partition and activate it.
- Run: "FORMAT <CF drive letter>:"
- Run "BOOTPREP.EXE from stick/floppy: (syntax: "bootprep /d<CF drive letter>"). This prepares the CompactFlash for booting Win XPe.

  The program is found under: "Program Files\Windows embedded\utilities".
- Remove the CF from target machine and insert it into the development machine. Copy the XPe image from the development machine to the Compact Flash. Ensure that the Target Device Settings of the image are set to drive "C".

Note...

The CF must not be partitioned or formatted on the development machine as this will most likely result in an unbootable CF for the target machine.

The following procedure applies to the internal CompactFlash:

- First copy the target image onto a CF (e.g. FAT32 formatted) large enough to hold the complete image.
- Insert this CF into the external CF slot of the ThinkIO-Duo
- Boot the target machine with DOS from the floppy or the memory stick.
- If required, use "fdisk.exe" or another suitable application to create a primary partition on the internal CompactFlash. If there is a primary partition already present (e.g. FAT16), then delete all partitions from the CF and create a new primary partition and activate it.
- Run: "FORMAT <CF drive letter>:"
- Run "BOOTPREP.EXE from stick/floppy: (syntax: "bootprep /d<CF drive letter>"). This prepares the CompactFlash for booting Win XPe.

  The program is found under: "Program Files\Windows embedded\utilities".
- Now copy the image from the external CF onto the internal CF.

7.3 Run First Boot Agent (FBA)

To run the First Boot Agent, perform the following:

- Shut down the ThinkIO-Duo and disconnect all external boot devices (e.g. CF, USB stick, etc).
- Restart and enter the BIOS Setup.
- Change the Boot Settings Configuration to boot from external or internal CF as required
- Insert the external CF with the target image, save the BIOS settings, and then restart, or if using the internal CF, save the BIOS settings, and then restart the ThinkIO-Duo.

After the FBA finishes, the ThinkIO-Duo is rebooted automatically.

Note...

In case the internal CF holds the Windows XPe image and a CF in the external CF slot is being used as storage device, Windows will assign the drive letter "D" to the internal CF during the boot phase.

In case the Windows XPe image was assigned to the drive letter "C" (which is normally the case) problems may arise when running applications which were previously installed on "C".

In order to avoid this problem make the following adjustment to the BIOS setup:

- Remove the external CF
- Restart and enter the BIOS setup.
- Enter the Advanced Settings/IDE Configuration
- Change the IDE Master to "Not installed" and save the settings
- Insert the external CF again and reboot.

8. Known Problems

8.1 The ThinkIO-Duo has Two Video Adapter Functions

The FBA will install the Intel graphic driver for one adapter only! This does not degrade the video functionality.

The driver for the second video adapter function is required for the MultiDisplay Mode and may be installed manually:

- Open the Device Manager
- Select the 2nd video adapter under Display adapters.
- In the Action menu select "Uninstall device"
- In the Action menu select "Scan for hardware changes"
- After the Hardware Update Wizard starts, select "Install software automatically"
- After the Hardware Update Wizard finishes, reboot the computer.

9. Application Development

Some features of the ThinkIO-Duo can be used in custom designed applications. The ThinkIO-Duo Windows XP Embedded BSP contains demo applications including source code and API description for:

FEATURE	SEE DEMO PROGRAM	SUPPORTING DRIVER
User LED programming	Test_misc.exe	KOMMisc.sys
Watchdog programming	TIOWatchdogDemo.exe	KOMMisc.sys
Run/Stop switch position polling	Test_misc.exe	KOMMisc.sys
Use of non-volatile memory (SRAM/MRAM)	Test_SRAM.exe	SRAM.sys
KBus programming	KbusApiDemo.exe	KBus.sys

Test applications without demo sources:

	SEE DEMO PROGRAM	SUPPORTING DRIVER
Hardware Monitor	Hwmon.exe	SCH311x.sys
Real Time Clock (RTC)	RTCsync.exe	KomRtcAPI.dll

For further Information see the various help files and source codes under the folder "Demo-Sources". Ready to use test or demo applications can be found in the "Files" folder.

Also, refer to the ThinkIO-Duo Hardware Reference Guide for further information.