ThinkIO™

DIN Rail PC
for Fieldbus and IO Systems

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29 April, 2004

HARDWARE REFERENCE GUIDE

The product described in this manual is in compliance with all applied CE standards.

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Environmental Protection Statement

This product has been manufactured to satisfy environmental protection requirements where possible. Many of the components used (structural parts, printed circuit boards, connectors, batteries, etc.) are capable of being recycled.

Final disposition of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

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Explanation of Symbols

CE Conformity

This symbol indicates that the product described in this manual is in compliance with all applied CE standards. Please refer also to the section “Applied Standards” in this manual.

Caution, Electric Shock!

This symbol and title warn of hazards due to electrical shocks (> 60V) when touching products or parts of them. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.

Please refer also to the section “High Voltage Safety Instructions” on the following page.

Warning, ESD Sensitive Device!

This symbol and title inform that electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Please read also the section “Special Handling and Unpacking Instructions” on the following page.

Warning!

This symbol and title emphasize points which, if not fully understood and taken into consideration by the reader, may endanger your health and/or result in damage to your material.

Note...

This symbol and title emphasize aspects the reader should read through carefully for his or her own advantage.

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For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

Warning!

All operations on this device must be carried out by sufficiently skilled personnel only.

Caution, Electric Shock!

Before installing your new Kontron product into a system always ensure that the mains power is switched off. This applies also to the installation of piggybacks.

Serious electrical shock hazards can exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing work.

Special Handling and Unpacking Instructions

ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory back-up, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the board.

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General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron Modular Computers GmbH and described in this manual or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board please re-pack it as nearly as possible in the manner in which it was delivered.

Special care is necessary when handling or unpacking the product. Please, consult the special handling and unpacking instruction on the previous page of this manual.

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Two Year Warranty

Kontron Modular Computers GmbH grants the original purchaser of Kontron's products a ***TWO YEAR LIMITED HARDWARE WARRANTY*** as described in the following. However, no other warranties that may be granted or implied by anyone on behalf of Kontron are valid unless the consumer has the express written consent of Kontron Modular Computers GmbH.

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If the customer's eligibility for warranty has not been voided, in the event of any claim, he may return the product at the earliest possible convenience to the original place of purchase, together with a copy of the original document of purchase, a full description of the application the product is used on and a description of the defect. Pack the product in such a way as to ensure safe transportation (see our safety instructions).

Kontron provides for repair or replacement of any part, assembly or sub-assembly at their own discretion, or to refund the original cost of purchase, if appropriate. In the event of repair, refunding or replacement of any part, the ownership of the removed or replaced parts reverts to Kontron Modular Computers GmbH, and the remaining part of the original guarantee, or any new guarantee to cover the repaired or replaced items, will be transferred to cover the new or repaired items. Any extensions to the original guarantee are considered gestures of goodwill, and will be defined in the "Repair Report" issued by Kontron with the repaired or replaced item.

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Chapter 1

Introduction

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1. Introduction

This Guide for the ThinkIO™ DIN Rail PC for Fieldbus and IO Systems is structured as follows:

- Preface
- Introduction
- Functional Description
- Installation
- Configuration

The Preface contains information concerning the revision status of this Guide, a table of contents, a list of tables, a list of figures, and information relating to the handling and general usage of this product.

The Introduction provides a very general description of this product which includes an overview, system interfacing diagrams, illustrations of the ThinkIO™ hardware, a product specification table, a listing of applicable standards, and a list of related documentation.

In the Functional Description, specific information is presented regarding the composition and functionality of the ThinkIO™ including interface definitions with corresponding descriptions. In addition, where applicable, application system considerations are provided to assist in understanding the requirements for integration of the ThinkIO™ in a complex of comprehensive solutions.

The Installation section contains the necessary information and procedures required to integrate the ThinkIO™ in an application system. Detailled safety and handling information as well as procedures for installation and removal are provided.

Configuration requirements for the ThinkIO™ are treated in the Configuration section. Pre-operation, before and after installation, as well as operational considerations are detailled here to ensure successful operation of the ThinkIO™.

1.1 Overview

The ThinkIO™ DIN Rail PC is a part of an innovative concept to integrate PC functionality and DIN Rail input / output modules to provide system integrators with a complete range of off-the-shelf solutions for industrial automation applications.

Through its integrated K-Bus coupler, the ThinkIO™ provides direct access to the complete family of the WAGO-I/O-SYSTEM 750 input / output modules. In addition, the ThinkIO™ is equipped with a comprehensive set of communications interfaces, LAN as well as Fieldbus, making it possible to satisfy requirements for distributed data processing and at the same time providing local and remote control of applications.

The following table provides a overview of the ThinkIO™ DIN Rail PC features.

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Table 1-1: ThinkIO™ Product Overview

ThinkIO™ FEATURES	DESCRIPTION

Product Type	DIN Rail PC for Fieldbus and IO Systems:
	- CPU: X-board™<861> CPU module
	  - National Semiconductor™ Geode™ SC1200 processor
	  - 266 MHz
	  - RAM: 32 or 128 MB SDRAM
	  - FlashDisk: 32 or 128 MB
	  - Low power consumption
	- Simplified Application Interface (SAI)
	  - Primary carrier board for X-board module, extension board
	  - Interface to K-Bus module
	  - System and Communications interfaces
	- Simplified Application Interface Extension Board (SAI/XB)
	  - Fieldbus processor (optional): CANopen, PROFIBUS-DP, DeviceNet
	  - CompactFlash Type I/II slot
	  - Monitor and control functions: status LEDs, control switches
	- K-Bus module (optional)
	  - Interface PC / IO modules
	  - Compatible with WAGO-I/O-SYSTEM 750 input / output modules
	- Form factor: ThinkIO™ assembled with K-Bus module
	  - W x H x L: 172 mm x 71 (65*) mm x 100 mm
	  * from upper edge of 35 DIN rail
	- Form factor: ThinkIO™
	  - W x H x L: 160 mm x 71 (65*) mm x 100 mm
	  * from upper edge of 35 DIN rail

I/O Interfaces	System:
	- CompactFlash (IDE), type I/II
	- COM1 (serial port)
	- Monitor and control (M / C)
	  - DVI (CRT, TFT)
	  - USB1, USB2 (keyboard, mouse, etc.)
	  - Serial port
	  - Operational status LEDs
	  - Operator switches (RUN, STOP, ReSeT)
	  - Configuration switches (DIP switches)

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Table 1-1: ThinkIO™ Product Overview

ThinkIO™ FEATURES	DESCRIPTION

I/O Interfaces	Communication:
	- LAN
	  - Fast Ethernet 1 (FE1)
	  - Fast Ethernet 2 (FE2)
	- Fieldbus (optional):
	  - PROFIBUS-DP
	  - CANopen
	  - DeviceNet
	  (Only one of the above Fieldbus interfaces is available per ThinkIO™)

	Application: - Digital inputs and outputs - Watchdog - K-Bus (WAGO-I/O-SYSTEM 750 input and output modules)
Software	System: - BIOS - EC1 firmware (Fieldbus controller) - LINUX - Windows CE - CoDeSys

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1.2 Design Illustrations

The following figures illustrate the interfacing of the ThinkIO™ within an Application System as well as basic ThinkIO™ external interfacing. Further, illustrations of the ThinkIO™ physical components and their layout are also provided.

Figure 1-1 illustrates the general interfacing of the ThinkIO™ within an application system. As the ThinkIO™ provides both local and wide area network (LAN/WAN) interfacing capability, it also indicates interfacing to higher level application monitor and control instances.

The ThinkIO™ system is designed to support three basic application interfaces:

- Fieldbus (optional)
- WAGO-I/O-SYSTEM 750 Input / Output Modules (optional)
- DIO and Watchdog (standard)

In addition to the LAN interfaces, ThinkIO™ offers several other local monitor and control interfaces: USB, COM (serial), and a DVI TFT/CRT display interface.

The basic external interfacing of both the ThinkIO™ and K-Bus module is shown in figure 1-2.

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Figure 1-1: ThinkIO™ Application System Interfacing Diagram

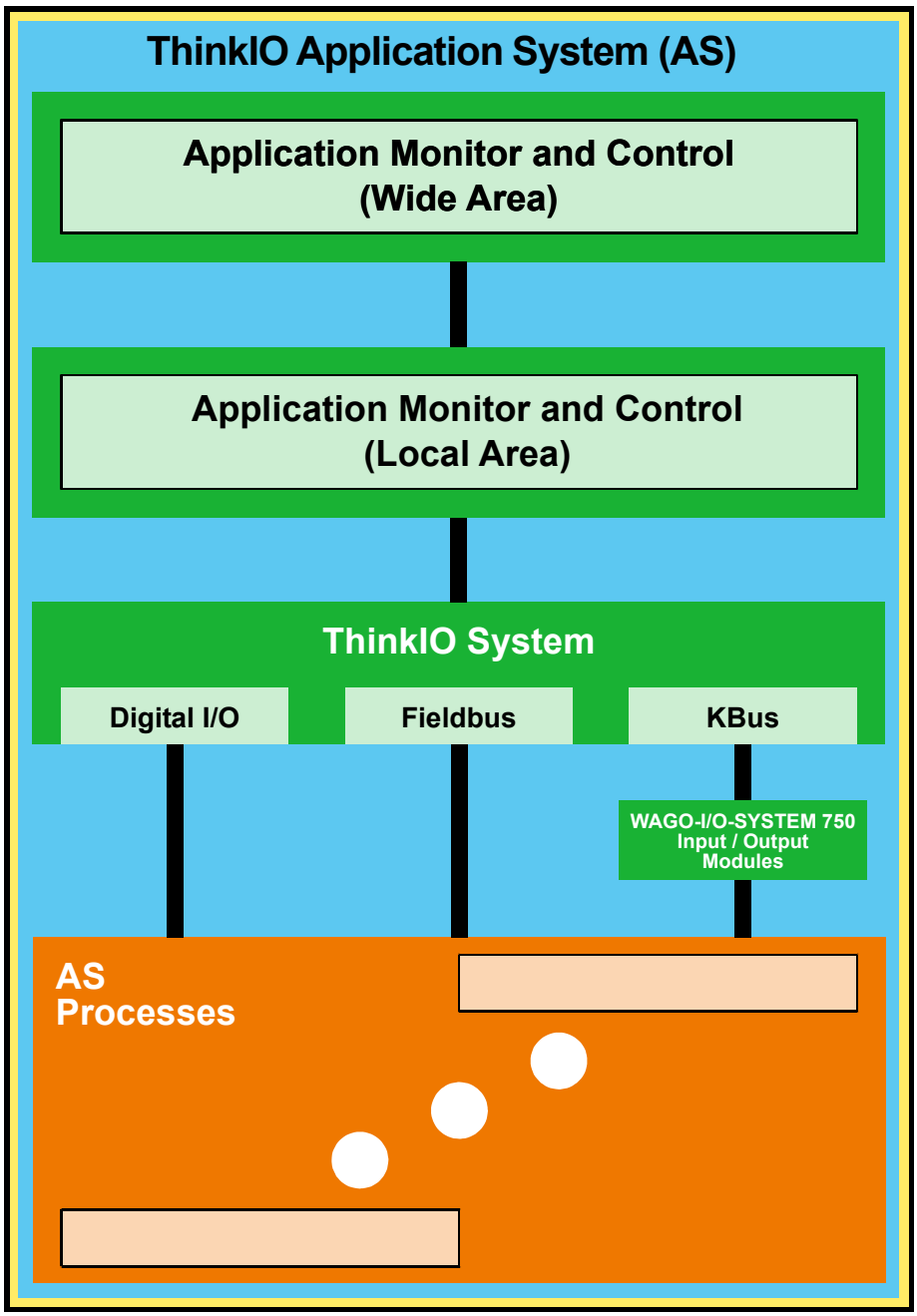

Figure 1-2: ThinkIO™ and K-Bus External Interfacing

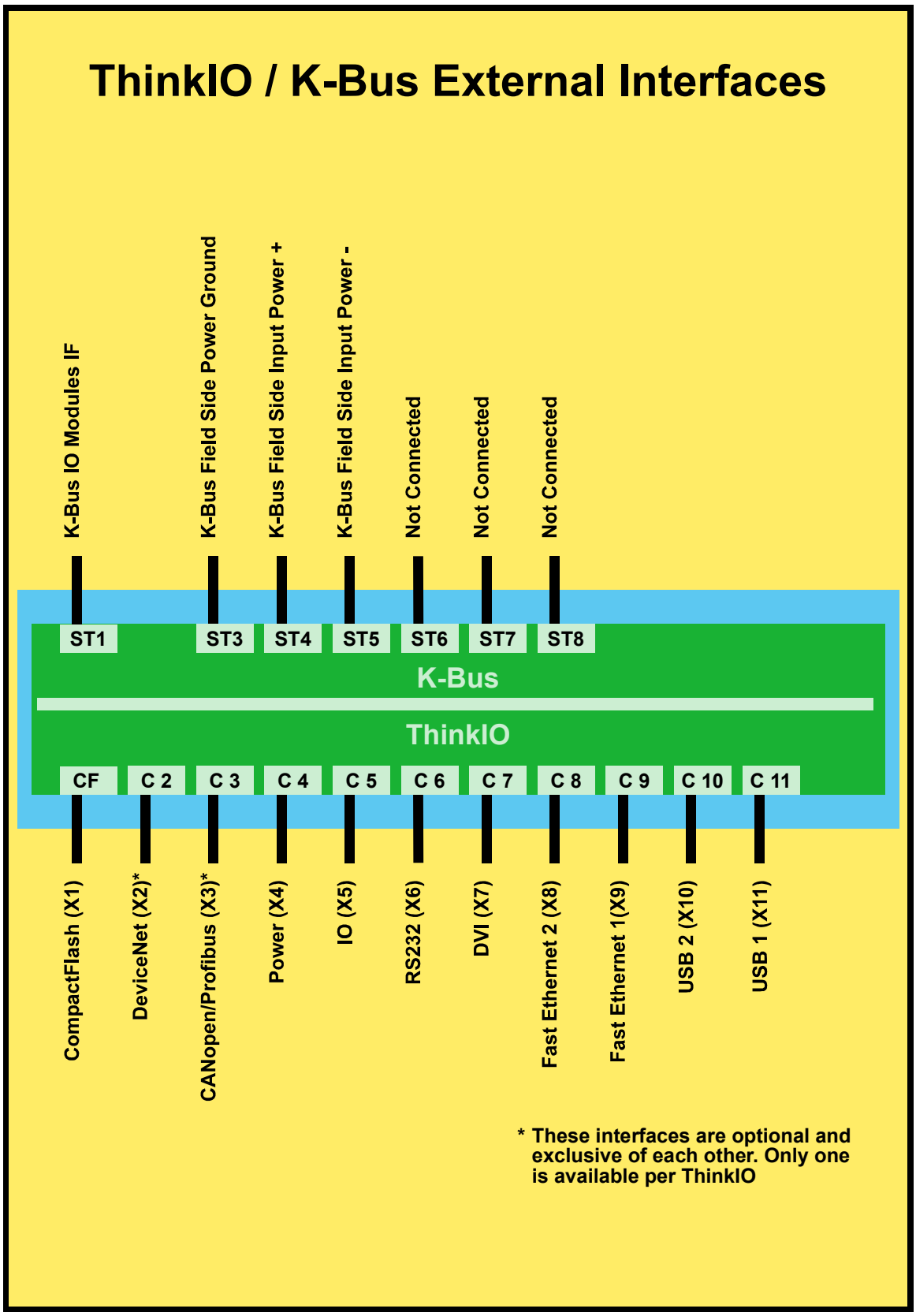

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Figure 1-3: ThinkIO™ with K-Bus Module Assembled on DIN Rail

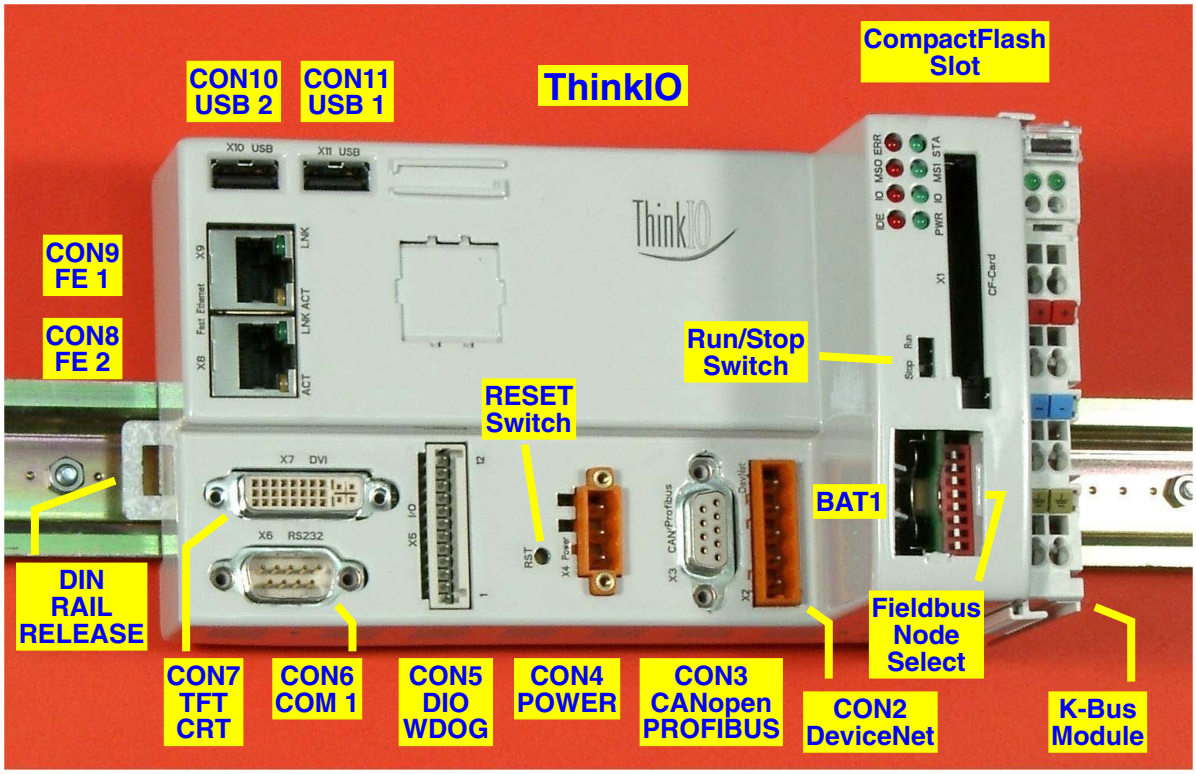

Figure 1-4: Rear View of ThinkIO™ without the K-Bus Module

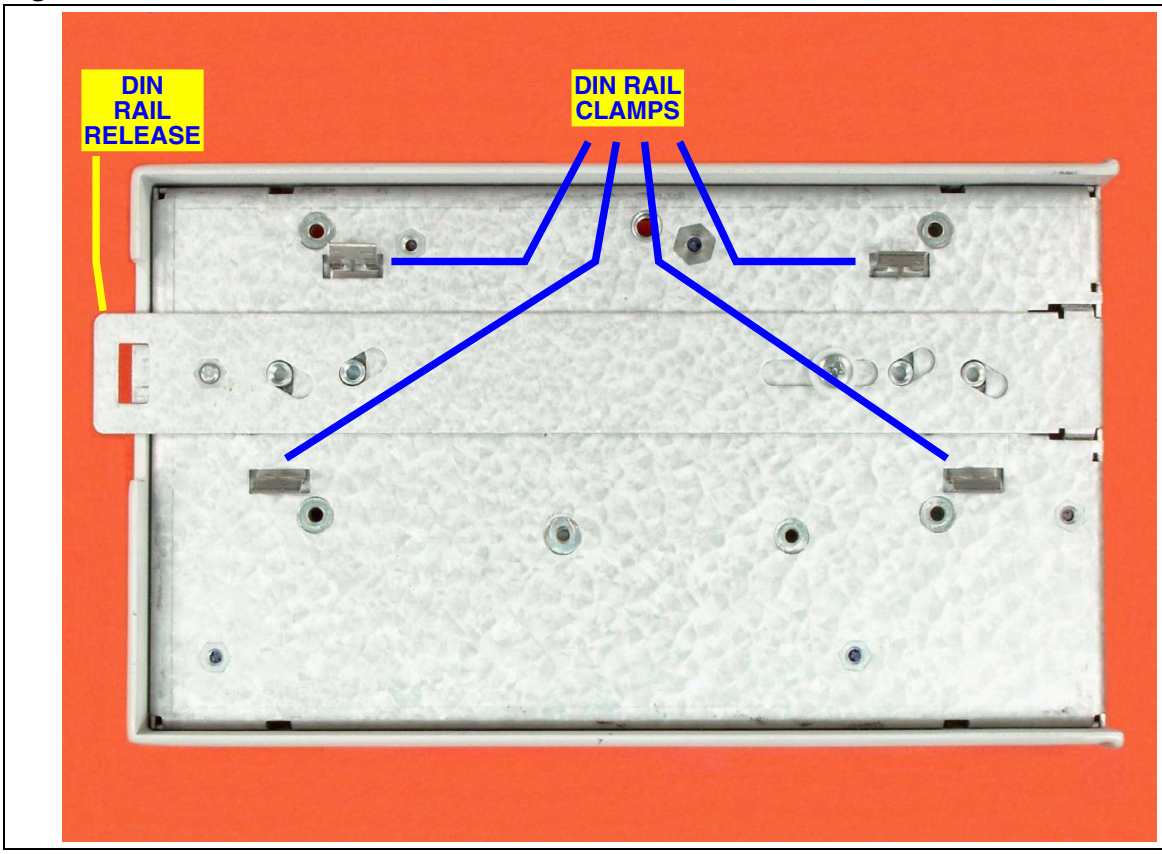

Figure 1-5: View of K-Bus Module - I/O Module Side

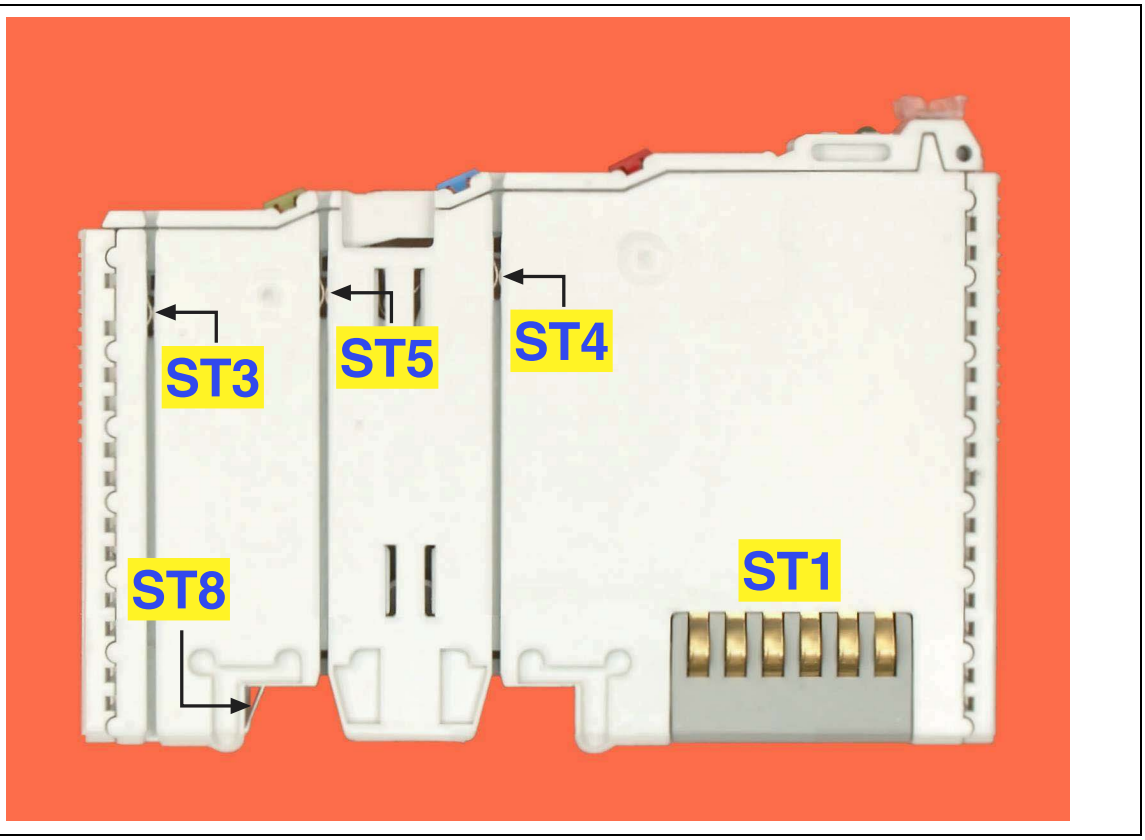

Figure 1-6: Top and Bottom Views of K-Bus Module

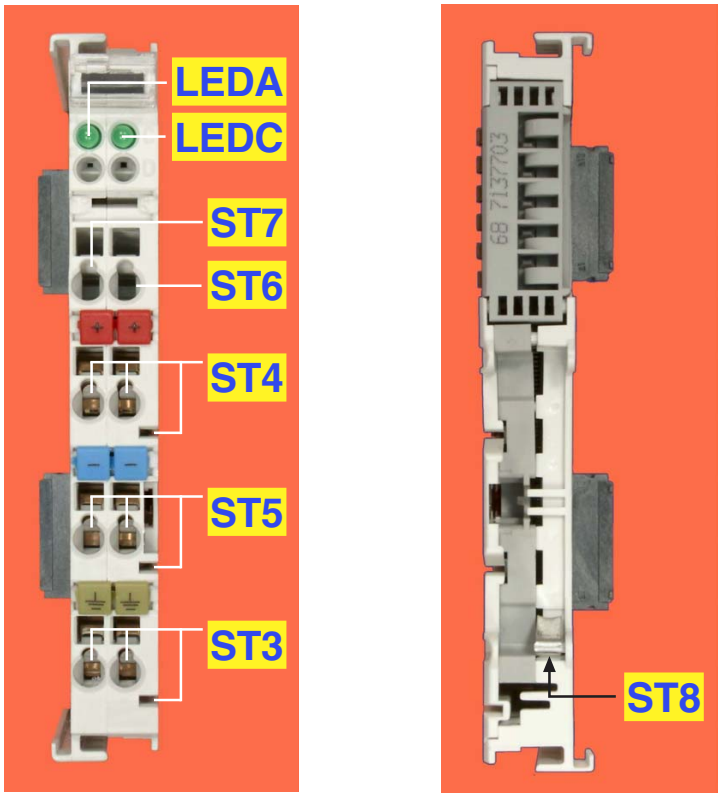

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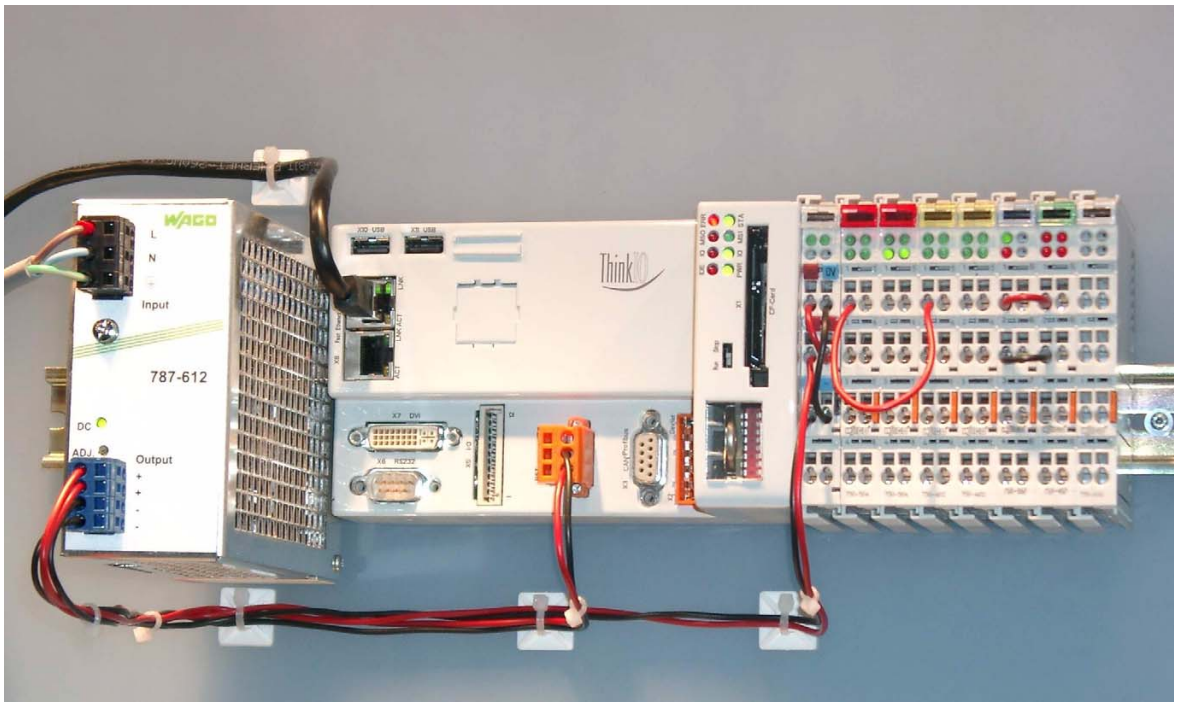
Figure 1-7: ThinkIO™ with K-Bus Module in Application Environment



1.3 Technical Specifications

Table 1-2: ThinkIO™ Main Specifications

	DESIGNATOR	TYPE	SPECIFICATIONS
CPU and Controllers	X-board™<861> CPU Module		x86 compatible, compact, embedded CPU module - National Semiconductor Geode SC1200 processor (266 MHz) - SDRAM: up to 128 MB - FlashDisk: up to 128 MB
	K-Bus Module		WAGO-I/O-SYSTEM 750 K-Bus controller - compatible to all of WAGO's "750"-Series input / output modules - Form factor: K-Bus module - W x H x L: 12 mm x 64* mm x 100 mm * from upper edge of 35 DIN rail
	Fieldbus		EC1 Embedded Communication Controller - Supports PROFIBUS DP, CANopen, or DeviceNet - Programmable for one or the other of the above fieldbusses - Fieldbus to be programmed must be specified at time of ordering
ThinkIO Interfaces	Application Process and Monitor and Control		Types: - Fast Ethernet (two, 10/100BASE-T, FE1, FE2) - PanelLink (one, DVI (TFT/CRT)) - Serial (one, RS232, COM1) - USB (two, USB 1.1, USB1, USB2) - Digital input (two channels) - Digital output (two channels) - Watchdog (one output channel, relay contacts) - Fieldbus (optional, one of the following: PROFIBUS-DP, CANopen, or DeviceNet, as either Master or Slave) - CompactFlash, type I/II - Run / Stop switch - Reset switch - Operational status indicators (eight LEDs) - Fieldbus Identification switches (eight, DIP type switch) - Backup battery
K-Bus Module	IO Modules and Field Side Power		Types: - I / O bus for WAGO-I/O-SYSTEM 750 input / output modules - + 5 V power bus for input / output modules - Field side power supply via power jumper contacts - Operational status indicators (two LEDs)

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Table 1-2: ThinkIO™ Main Specifications (Continued)

	DESIGNATOR	TYPE	SPECIFICATIONS
Power Interfaces	CON 4	+ 24 V	Main input power interface to the ThinkIO™: - Tolerance: - 25% to +30% - 3-pin male receptacle
	ST1 (K-Bus)	+ 5 V	Input power interface to input / output module electronics - Maximum current load: 1.0 A - Power jumper contacts
	ST4 (K-Bus)	EXT +	Field side input power interface to input / output modules - Is function of application requirements (module types installed and their power requirements) - Electrically isolated from module electronics - Maximum electrical loading: 10 A - Contacts: - Double CageClamp™, internally bridged - Power jumper contact, female, internally bridged to CageClamp™
	ST5 (K-Bus)	EXT -	Field side input power interface to input / output modules - Is function of application requirements (module types installed and their power requirements) - Electrically isolated from module electronics - Maximum electrical loading: 10 A - Contacts: - Double CageClamp™, internally bridged - Power jumper contact, female, internally bridged to CageClamp™
	ST3 (K-Bus)	Shield (Ground)	Field side power shielding (ground) interface to input / output modules - Is function of application requirements (module types installed and their power requirements) - Electrically isolated from module electronics - Contacts: - Double CageClamp™, internally bridged - Power jumper contact, female, internally bridged to CageClamp™
	ST8 (K-Bus)	Shield (Ground)	K-Bus module to DIN rail ground contact - Contact: - Sliding spring - Internally not connected
	Battery socket	AUX Power	Battery input power interface to ThinkIO™ for power backup of RTC and SRAM memory devices - Battery type: 3.3 V, 170 mAh, lithium, non-rechargeable - Battery: Panasonic CR2032

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Table 1-2: ThinkIO™ Main Specifications (Continued)

	DESIGNATOR	TYPE	SPECIFICATIONS
General	Electrical		Main input power voltage: + 24 V DC (nominal) Main input power range: - 25% to + 30%
	Power Consumption		ThinkIO™ in stand-alone configuration: 10.5 watts @ 24 volts ThinkIO™ plus K-Bus module: 13.5 watts @ 24 volts (nominal with no I/O module loading) ThinkIO™ plus K-Bus module: 18.5 watts @ 24 volts (maximum with I/O module loading) A maximum of 5 watts @ 5 volts is available for I/O modules. If more is required, a separate external power source is required as well as an appropriate WAGO-IO-SYSTEM 750 power module.
	Temperature Range		Operational: 0ºC to +65ºC Standard Storage: -10ºC to +85ºC
	Climatic Humidity		93% r.h. at 40° C, non-condensing (acc. to IEC 60068-2-78)
	Dimensions		Form factor: ThinkIO™ assembled with K-Bus module - W x H x L: 172 mm x 71 (65*) mm x 100 mm * from upper edge of 35 DIN rail Form factor: ThinkIO™ stand-alone - W x H x L: 160 mm x 71 (65*) mm x 100 mm * from upper edge of 35 DIN rail
	Weight(s)		ThinkIO™ plus K-Bus module: 541g (with all connectors populated) ThinkIO™ in stand-alone configuration: 494 g (with all connectors populated)

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1.4 Applied Standards

The Kontron Modular Computers' ThinkIO™ DIN Rail PC complies with the requirements of the following standards:

Table 1-3: Applied Standards

	TYPE	STANDARD
CE	Emission	EN55022
	Immunity, Industrial Environment	EN61000-6-2
	Immunity, IT Equipment	EN55024
	Electrical Safety	EN60950 Note: The ThinkIO™ is specified I/O only for: SELV and EVL. It is **NOT SPECIFIED** for "Hazardous"
MECHANICAL	Mechanical Dimensions	IEEE 1101.1
	Carrier Rail	EN50022 (DIN 35)
ENVIRONMENTAL TESTS	Vibration, Sinusoidal	IEC 60068-2-6
	Random Vibration, Broadband	IEC 60068-2-64
	Bump	IEC 60068-2-29
	Single Shock	IEC 60068-2-27
	Temperature Tests A: Cold	IEC 60068-2-1
	Temperature Tests B: Dry Heat	IEC 60068-2-2
	Climatic Humidity	IEC 60068-2-78

WARNING!

To satisfy CE requirements regarding ESD protection, special dust caps must be installed on connectors CON 3, CON 6, and CON7 (CAN/Profibus, RS232, and DVI) when these connectors are not in use, i.e. no cable is connected. This is intended to prevent electrostatic discharging to the pins of these connectors.

Appropriate dust caps are supplied with the ThinkIO™. In the event they are damaged or lost, replacement caps may be obtained by contacting Kontron Modular Computers.

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1.5 Related Publications

Table 1-4: Related Publications

	ISSUED BY	DOCUMENT
WAGO-I/O-SYSTEM	WAGO Kontakttechnik GmbH	WAGO-I/O-SYSTEM 750 Input / Output Modules WAGO-I/O-SYSTEM 758 I/O-IPC Internet Address: www.wago.com

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Chapter 2

Functional Description

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2. Functional Description

The following chapters present more detailed information about the ThinkIO™ DIN Rail Automation PC whereby the system components and their basic functionality are discussed in general.

2.1 General Information

The ThinkIO is comprised basically of the following:

- X-board™<861> CPU Module
  - Embedded multimedia ready PC module
  - CPU: National Semiconductor SC1200
  - Memory: SDRAM, FLASH, EEPROMs, BIOS FLASH
- PCI-Local-Bus bridge
- Board Process and Communications Controller (BPCC
- Fast Ethernet controller
- PanelLink controller
- Memory: SRAM, EEPROMs
- Power supply
- EC1 fieldbus controller (optional)
- CompactFlash (type II) socket (CON5)
- Operational status LEDs (LED1G, LED1R, LED2G, LED2R, LED3G, LED3R, LED4G, LED4R)
- Run/Stop switch
- Reset switch
- Programming switches for the Fieldbus node number (S2)
- Backup battery (B1)
- K-Bus Module (optional)
  - Interface module for DIN Rail expansion Input / Output modules
  - Compatible to WAGO I/O SYSTEM 750 modules
  - Fieldside power interfaces
  - LEDs A and C
- Software
  - BIOS
  - EC1 firmware (optional; fieldbus communications)
  - LINUX, Windows CE
  - CoDeSys for Linux (optional)
  - Fieldbus (optional): PROFIBUS DP, CANopen, DeviceNet

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2.2 ThinkIO™ Interfaces

The ThinkIO™ DIN Rail Automation PC provides basic system and communications interfacing as well as providing interfacing capability to the K-Bus module and its family of I/O modules.

The following interfaces are available on the ThinkIO™:

- DeviceNet (CON2) (optional)
- CAN/PROFIBUS (CON3) (optional)
- Input Power (CON4)
- Digital Input / Output (CON5)
- COM (CON6)
- DVI (CON7)
- Fast Ethernet 2 (CON8)
- Fast Ethernet 1 (CON9)
- USB2 (CON10) (USB 1.1)
- USB1 (CON11) (USB 1.1)

The DeviceNet and CAN/PROFIBUS interfaces are optional, exclusive interfaces. Only one or the other of these interfaces is available at a time on the SAI.

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2.2.1 Interface: DeviceNet (CON2)

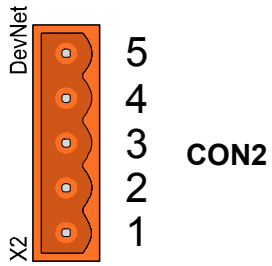
This fieldbus interface is optional and is exclusive of the other fieldbus interfaces available with the ThinkIO™. If installed, it is the only fieldbus interface available. The connector for this interface is a 5-pin, male, WAGO connector.

The following table and figure provide pinout information for this interface.

Table 2-1: DeviceNet Interface (CON2)

SIGNAL	PIN
DEVNET_V+	5
CAN_+	4
SHIELD	3
CAN_-	2
DEVNET_V-	1

Figure 2-1: DeviceNet Interface (CON2)



2.2.2 Interface: CANopen (CON3)

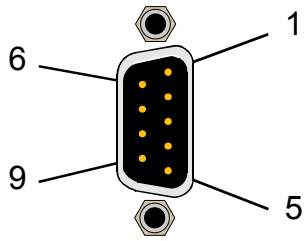
This fieldbus interface is optional and is exclusive of the other fieldbus interfaces available with the ThinkIO™. If installed, it is the only fieldbus interface available. The connector for this interface is a 9-pin, male, D-Sub connector.

The following table and figure provide pinout information for this interface.

Table 2-2: CANopen Interface (CON3)

SIGNAL	PIN
CAN_+5V	9
NC	8
CAN_+	7
NC	6
NC	5
NC	4
CAN_GND	3
CAN_-	2
NC	1

Figure 2-2: CANopen Interface (CON3)



WARNING!

To satisfy CE requirements regarding ESD protection, a special dust cap must be installed on this connector when it is not in use, i.e. no cable is connected. This is intended to prevent electrostatic discharging to the pins of these connectors.

An appropriate dust cap is supplied with the ThinkIO. In the event it is damaged or lost, a replacement cap may be obtained by contacting Kontron Modular Computers.

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2.2.3 Interface: PROFIBUS-DP (CON3)

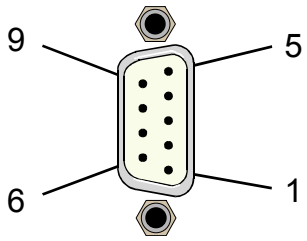
This fieldbus interface is optional and is exclusive of the other fieldbus interfaces available with the ThinkIO™. If installed, it is the only fieldbus interface available. The connector for this interface is a 9-pin, female, D-Sub connector.

The following table and figure provide pinout information for this interface.

Table 2-3: PROFIBUS-DP Interface (CON3)

SIGNAL	PIN
PB_+5V	9
NC	8
PB_-	7
NC	6
NC	5
NC	4
PB_+	3
PB_ENA	2
PB_GND	1

Figure 2-3: PROFIBUS-DP Interface (CON3)



WARNING!

To satisfy CE requirements regarding ESD protection, a special dust cap must be installed on this connector when it is not in use, i.e. no cable is connected. This is intended to prevent electrostatic discharging to the pins of these connectors.

An appropriate dust cap is supplied with the ThinkIO. In the event it is damaged or lost, a replacement cap may be obtained by contacting Kontron Modular Computers.

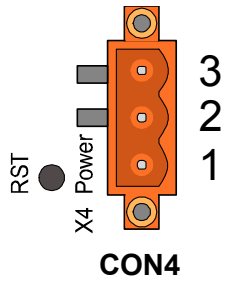
2.2.4 Interface: Input Power (CON4)

The ThinkIO™ input power should be a nominally 24 V DC whereby a tolerance range of - 25% to + 30% (18.0 V DC … 31.2 V DC range) is permitted. The connector for this interface is a 3-pin, male, WAGO connector.

Table 2-4: Input Power Interface (CON4)

SIGNAL	PIN
V_EXT	1
GNDEXT	2
Shield	3

Figure 2-4: Input Power Interface (CON4)



CON4

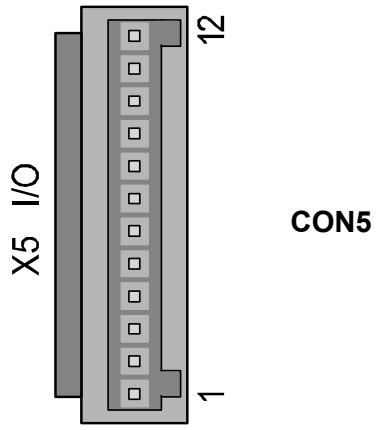
2.2.5 Interface: Digital Input / Output - DIO (CON5)

The following table and figure provide pinout information for this interface. The connector for this interface is a 12-pin, male connector.

Table 2-5: Digital Input/Output - DIO Interface (CON5)

SIGNAL	PIN
DIN0	1
~DIN0	2
DIN1	3
~DIN1	4
DOUT0	5
~DOUT0	6
DOUT1	7
~DOUT1	8
WDOG	9
REL_NC	10
REL_NO	11
SHIELD	12

Figure 2-5: Digital Input/Output - DIO Interface (CON5)



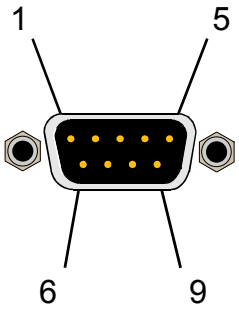
2.2.6 Interface: COM (CON6)

The following table and figure provide pinout information for this interface. The connector for this interface is a 9-pin, male, D-Sub connector.

Table 2-6: COM Interface (CON6)

SIGNAL	PIN
DCD1	1
RXD1	2
TXD1	3
DTR1	4
GND	5
DSR1	6
RTS1	7
CTS1	8
RI1	9

Figure 2-6: COM Interface (CON6)



WARNING!

To satisfy CE requirements regarding ESD protection, a special dust cap must be installed on this connector when it is not in use, i.e. no cable is connected. This is intended to prevent electrostatic discharging to the pins of these connectors.

An appropriate dust cap is supplied with the ThinkIO. In the event it is damaged or lost, a replacement cap may be obtained by contacting Kontron Modular Computers.

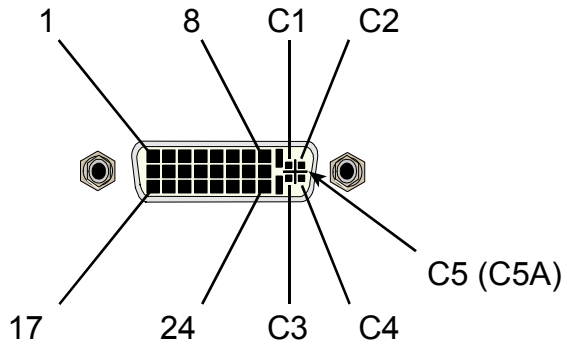
2.2.7 Interface: DVI (CON7)

The following table and figure provide pinout information for this interface. The connector for this interface is a 30-contact, female DVI compliant combined analog and digital receptacle connector.

Table 2-7: DVI Interface (CON7)

SIGNAL	PIN	SIGNAL	PIN	SIGNAL	PIN
TXD2-	1	TXD1-	9	TXD0-	17
TXD2+	2	TXD1+	10	TXD0+	18
GND	3	GND	11	GND	19
NC	4	NC	12	NC	20
NC	5	NC	13	NC	21
DDCCLK	6	VCC_DVI	14	GND	22
DDCDATA	7	GND	15	TXCP	23
CRT_VSY	8	NC	16	TXCN	24
CRT_R	C1	CRT_G	C2	CRT_B	C3
CRT_HSY	C4	GND	C5	GND	C5A

Figure 2-7: DVI Interface (CON7)



WARNING!

To satisfy CE requirements regarding ESD protection, a special dust cap must be installed on this connector when it is not in use, i.e. no cable is connected. This is intended to prevent electrostatic discharging to the pins of these connectors.

An appropriate dust cap is supplied with the ThinkIO. In the event it is damaged or lost, a replacement cap may be obtained by contacting Kontron Modular Computers.

2.2.8 Interface: Fast Ethernet 2 (CON8)

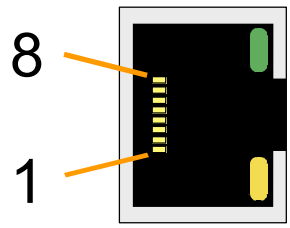
This is a 10/100BASE-T Fast Ethernet compliant interface. The connector for this interface is an 8-contact, RJ45 type connector. In addition, there are two operational status LEDs built into this connector: ACT (yellow) and LINK (green). When the LINK LED is on steady, a link has been established. When the ACT LED blinks, there is activity on the link.

The following table and figure provide pinout information for this interface.

Table 2-8: Fast Ethernet 2 Interface (CON8)

SIGNAL	PIN
TX+	1
TX-	2
RX+	3
RXC/CMT	4
RXC/CMT	5
RX-	6
RXC/CMT	7
RXC/CMT	8

Figure 2-8: Fast Ethernet 2 Interface (CON8)



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2.2.9 Interface: Fast Ethernet 1 (CON9)

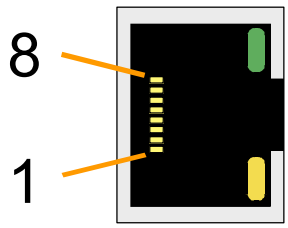
This is a 10/100BASE-T Fast Ethernet compliant interface. The connector for this interface is an 8-contact, RJ45 type connector. In addition, there are two operational status LEDs built into this connector: ACT (yellow) and LINK (green). When the LINK LED is on steady, a link has been established. When the ACT LED blinks, there is activity on the link.

The following table and figure provide pinout information for this interface.

Table 2-9: Fast Ethernet 1 Interface (CON9)

SIGNAL	PIN
TX+	1
TX-	2
RX+	3
RXC/CMT	4
RXC/CMT	5
RX-	6
RXC/CMT	7
RXC/CMT	8

Figure 2-9: Fast Ethernet 1 Interface (CON9)



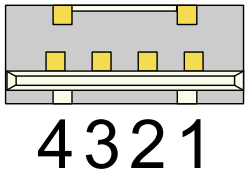
2.2.10 Interface: USB2 (CON10)

The following table and figure provide pinout information for this interface. The connector for this interface is a USB standard compliant connector.

Table 2-10: USB2 Interface (CON10)

SIGNAL	PIN
USB_GND	4
USB_P1	3
USB_N1	2
USB_VCC1	1

Figure 2-10: USB2 Interface (CON10)



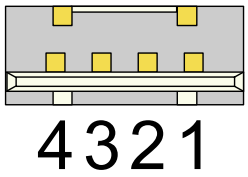
2.2.11 Interface: USB1 (CON11)

The following table and figure provide pinout information for this interface. The connector for this interface is a USB standard compliant connector.

Table 2-11: USB1 Interface (CON11)

SIGNAL	PIN
USB_GND	4
USB_P2	3
USB_N2	2
USB_VCC2	1

Figure 2-11: USB1 Interface (CON11)



2.2.12 Interface: CompactFlash (CON5 (X1))

This interface is a standard IDE type interface which supports CompactFlash (type I and II) modules including IBM Microdrives.

2.2.13 Interface: Operational Status LEDs

For monitor and control purposes, the ThinkIO™ provides eight operational status LEDs. The following table provides as description of these LEDs.

Table 2-12: Operational Status LEDs

LED	MARKING	DESCRIPTION
LED1R	ERR	Fieldbus application dependent, refer to appropriate documentation for further information.
LED1G	STA	Fieldbus application dependent, refer to appropriate documentation for further information.
LED2R	MS0	The function of this LED is application dependent.
LED2G	MS1	The function of this LED is application dependent.
LED3R	IO	During system initialization, if continues to blink, indicates that the K-Bus initialization has failed. The blink sequence provides error information. After system initialization, it is available for application use.
LED3G	IO	During system initialization, if on, indicates that the K-Bus has been initialized and is operational (LED3R stops blinking and is off. After system initialization, it is available for application use.
LED4R	IDE	When on, the CompactFlash interface is being accessed After system initialization, it is available for application use.
LED4G	PWR	When on, external power is applied. After system initialization, it is available for application use.

2.2.14 Interface: Run/Stop Switch

This switch provides an operational control function which is application dependent. Refer to appropriate documentation for further information.

2.2.15 Interface: Reset Switch

This switch provides an operational control function which is application dependent. Refer to appropriate documentation for further information.

2.2.16 Interface: Fieldbus Node Number Switch

This eight position DIP switch provides an operational control function which is application dependent. Refer to appropriate documentation for further information.

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2.2.17 Interface: Backup Battery (B1)

The backup battery interface provides the capability to power the RTC and SRAM from a lithium battery when main power is not available.

2.3 K-Bus Module Interfaces

The K-Bus module provides system interfacing between the ThinkIO™ and the WAGO-I/O-SYSTEM 750 I/O modules. For a description of the WAGO I/O modules and their operation refer to the WAGO documentation.

The following interfaces are available on the K-Bus module:

- I/O modules (ST1)
- Power (ST3, 4, 5, 6, 7, 8)
- Operational status LEDs

2.3.1 Interface: System (ST1)

This interface provides interfacing between the K-Bus module and the WAGO-IO-SYSTEM 750 input / output modules. It supplies 5 volt power to the K-Bus as well as providing for control and data exchange between the K-Bus module and the input / output modules.

2.3.2 Interface: Power (ST3, 4, 5, 6, 7, 8)

These interfaces provide power interfacing capability via the K-Bus module to the WAGO-IO-SYSTEM 750 input / output modules. They are physically isolated from the K-Bus module electronics and the ThinkIO™ and serve only as distribution points for input power to other IO modules.

Refer to WAGO-IO-SYSTEM 750 documentation for further information concerning the use of these interfaces and Input / output module power requirements.

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The following table provides pinout information for these interfaces.

Table 2-13: Power (ST3, 4, 5, 6, 7, 8)

CONNECTOR	MARKING	DESCRIPTION
ST3	GND GND	Input power ground or shield - dual CageClamp™ plus power jumper contact to next IO module
ST4	+ +	Input power plus voltage - dual CageClamp™ plus power jumper contact to next IO module
ST5	- -	Input power minus voltage - dual CageClamp™ plus power jumper contact to next IO module
ST6	0V	Dummy connector - single CageClamp™ - not connected internally
ST7	24V	Dummy connector - single CageClamp™ - not connected internally
ST8	none	Power ground or shield - Spring contact to DIN rail - not connected internally

2.3.3 Interface: Operational Status LEDA

This interface indicates the operational status of the K-Bus module. When on, it indicates that the K-Bus is operating. When off, either there is no power applied to the system or a reset of the system is in progress.

2.3.4 Interface: Operational Status LEDC

This interface indicates whether or not if field side power is applied. When on, it indicates the presence of field side power (24 V DC). When off, there is no field side power applied to the system.

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Chapter 3

Installation

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3. Installation

The ThinkIO™ has been designed for easy installation. However, the following standard precautions, installation procedures, and general information must be observed to ensure proper installation and to preclude damage to the ThinkIO™ or injury to personnel.

The product described in this manual is designed for use with WAGO-I/O-SYSTEM 750 input/output modules as well as being able to be operated in a stand-alone configuration. This installation procedure refers primarily to the installation of the ThinkIO™ itself and, where appropriate, references to WAGO I/O modules. If required, refer to WAGO-I/O-SYSTEM 750 documentation for further information concerning installation of WAGO-I/O-SYSTEM 750 I/O modules.

3.1 Safety Requirements

The following electrical hazard precautions must be observed.

Caution, Electric Shock Hazard!

Ensure that the system main power is removed prior to installing or removing the ThinkIO™. Ensure that there are no other external voltages or signals being applied to this device or other devices within the system.

Failure to comply with the above could endanger your life or health and may cause damage to the ThinkIO™ or other system components including process-side signal conditioning equipment.

ESD Equipment!

The ThinkIO™ contains electrostatically sensitive devices. Please observe the following precautions to avoid damaging the ThinkIO™:

Discharge your clothing before touching the assembly. Tools must be discharged before use.

Do not touch any board components, connector pins, or board conductive circuits.

If working at an anti-static workbench with professional discharging equipment, ensure compliance with its usage when handling this product.

Warning!

The ThinkIO™ is designed only for use with WAGO-I/O-SYSTEM 750 input/output modules. It is **NOT DESIGNED** for use with any other type of input/output modules.

Failure to comply with the above could endanger your life or health and may cause improper operation of or damage to the ThinkIO™ or other system components including process-side signal conditioning equipment.

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3.2 Commissioning Prerequisites

Before beginning the installation of the ThinkIO™, there are a number of prerequisites which must be complied with in order to ensure that the ThinkIO™ is properly integrated in an application. The following chapters provide more detailled information and guidance for system designers and integrators to assist them in achieving a successful application.

3.2.1 System Concept

Application system designers must provide a complete description of the system to be implemented. This must include the required configuration of the ThinkIO™ as well the WAGO I/O modules. In addition, ambient environment conditions must have been taken into consideration when planning the primary and auxiliary elements of the system: e.g. enclosure housing, mounting, power consumption, thermal design requirements, electrical power and signal grounding, and electro-magnetic compatibility requirements to name a few.

Prior to installation, all physical components of the application system should be available including cables with connectors if required as well as auxiliary hardware such as power supplies, mechanical assemblies, etc. Mechanical tolerances, cable lengths, and clearances must be verified before beginning work. In addition, all application relevant documentation must be available to the integrator at the time of installation.

In the event the ThinkIO™ is to be mounted inside an enclosure, the enclosure itself must have been installed prior to installation of the ThinkIO™. Refer to appropriate enclosure documentation for installation of the enclosure.

3.2.2 ThinkIO™ Mounting

The ThinkIO™ is only designed for mounting on a "top hat" carrier rail which complies with the European standard EN 50022 (DIN 35).

It may be mounted in any position including vertically. When mounted vertically, an end stop must be installed at the lower end of the carrier rail to prevent the ThinkIO™ and associated I/O modules from sliding off the rail.

If a 7.5 mm height carrier rail is used, care must be taken to ensure that the ThinkIO™ can be properly seated on the rail. Interference can occur if rail mounting screws or rivets are too high and contact is made with the ThinkIO™ rail release bar retainer screw head or the rail release mechanism on the bottom of any I/O module. In this case, flat rivets or countersunk screws must be used for mounting the carrier rail.

Always begin the initial installation with the mounting of the ThinkIO™ first. Ensure that it is positioned on the carrier rail so as to allow for the installation of all other required I/O modules and the end stop. If required, install the end stop before proceeding with the I/O modules.

Installation of I/O modules must be done starting with the module closest to the ThinkIO™ and then adding the remaining modules. Always install modules from above, and ensure that each one is properly engaged with the previous module and seated on the carrier rail before proceeding with the installation of the next module.

3.2.3 Component Integrity

When integrating application systems care must be taken to ensure the integrity of all system components. In the event of components being compromised or being exposed to compromising influences (visible damage, exposure to hostile environment, improper operation, suitability

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for use, etc.) the components in question must not be integrated in a system until their status is verified and found to be acceptable.

When components are selected for integration in a given application system, they must comply with application requirements as well as all applicable industry standards for their intended use.

3.2.4 Personnel Requirements

All individuals entrusted with designing, integrating, and operating of application systems involving the ThinkIO™ must be fully qualified to perform their required functions or be under the direct supervision of such qualified individuals.

In particular, **all individuals** involved directly with the application system must be knowledgeable of and observe all applicable safety requirements, and they must be able to detect and respond appropriately to any and all violations thereof. In addition, before proceeding with commissioning, personnel must be familiar with all applicable procedures including those in the Installation chapter of this manual.

Kontron Modular Computers GmbH rejects any and all liability for damages (personnel, material, third party, or consequent) resulting from failure to observe applicable safety requirements.

It is imperative that responsible personnel (designers, integrators, and operators) inform themselves of applicable safety requirements for the application for which they are responsible. For further assistance, contact Kontron Modular Computers GmbH before proceeding with commissioning.

3.2.5 Power Requirements

The ThinkIO™ itself is designed for operation with 24 V DC main power. The WAGO I/O modules are designed to accept power from two different sources. The first source is via the ThinkIO™ and the K-Bus module which supplies the I/O module electronics (5 V DC) and is electrically isolated from the second source.

The second source is the field side input power. This power can range from 24 V DC to 230 V AC and is electrically isolated from the first source. This power input is required for different types of I/O modules for sensing and actuating voltages.

As power requirements are a direct function of the application, it is imperative to observe the ThinkIO™ and the WAGO I/O module power requirements. The basic ThinkIO™ requirements are contained in this manual. Individual WAGO I/O module requirements and power connecting schemes are available in the appropriate WAGO documentation.

Integrity of a system, in particular grounding (power as well as signal) is of utmost importance in order to ensure proper and safe operation of the application system. For this reason, extreme care must be taken when removing or installing components as hazardous voltages may be present and any compromising of power grounding can result in either personnel injury or damage to equipment or both.

3.2.6 Shielding Requirements

Shielding is a function of the application requirements as well as the application environment. The installation of shielding as such is not within the scope of this manual, however, it is necessary for integrators and maintenance personnel to be aware of shielding requirements. In particular, when performing installation or removal of components, shielding integrity must be ensured otherwise improper operation may result.

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3.3 Initial Installation Procedures

The following procedures are intended to be applied only for the initial installation of the ThinkIO™ in an application system. For replacement of a ThinkIO™ in an existing application system refer to chapter 3.4.

To install the ThinkIO™ proceed as follows:

1. Ensure that the safety requirements indicated in chapter 3.1 and the commissioning pre-requisites indicated in chapter 3.2 are observed.

WARNING!

To satisfy CE requirements regarding ESD protection, special dust caps must be installed on connectors CON 3, CON 6, and CON7 (CAN/Profibus, RS232, and DVI) when these connectors are not in use, i.e. no cable is connected. This is intended to prevent electro-static discharging to the pins of these connectors.

Appropriate dust caps are supplied with the ThinkIO™. In the event they are damaged or lost, replacement caps may be obtained by contacting Kontron Modular Computers.

Warning!

Failure to comply with the instruction below may cause damage to the product or result in improper system operation. Please refer to chapter 4 for configuration information.

2. Ensure that the ThinkIO™ is properly configured for operation before installing.

Note...

Care must be taken when applying the procedures below to ensure that when the product is assembled along with the other application system components that it is not damaged through contact with the other components of the system.

3. If an end stop for the carrier rail is **not** required proceed to step 5.
4. To install an end stop for the carrier rail proceed as follows:
    1. Verify the correct positioning of the end stop.
    2. Install the end stop according to the end stop installation documentation.

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5. Verify the correct positioning for the ThinkIO™ on the carrier rail and install as follows:

Note...

The ThinkIO™ carrier rail mounting assembly is comprised of four spring loaded clamps and a carrier rail release bar for simultaneously opening of the clamps. As the clamp spring loading tension is quite high, the ThinkIO™ cannot be "snapped" onto the carrier rail. The spring tension must first be released before attempting to seat the ThinkIO™.

As this assembly is mounted on the bottom of the ThinkIO™ it is not possible to visually observe clamp engagement with the carrier rail. For this reason, care must be taken when installing the ThinkIO™ to ensure positive engagement with the carrier rail.

1. Position the ThinkIO™ on the carrier rail at position indicated.
2. Using a flat blade screwdriver, release the carrier rail retaining clamps.

Note...

This is done by inserting the screwdriver in the hole in the retaining bar and turning it in either direction far enough to release the retaining clips.

3. Push the ThinkIO™ onto the carrier rail and release the retaining bar.
4. Ensure that the ThinkIO™ is seated firmly on the carrier rail. If not, repeat steps 2 and 3 until it is properly seated (all four retaining clamps have engaged the carrier rail).

6. Install all remaining WAGO I/O modules in accordance with appropriate application and WAGO documentation.

Warning!

The remaining procedures concern themselves with the installation of ThinkIO™ and WAGO I/O module cabling.

Before proceeding with the instructions below, ensure that there is no power applied to any of the cables to be connected. Failure to comply with this instruction may cause equipment damage, result in injury to personnel, or both.

7. Connect all cables as required by the application. Refer to appropriate application documentation for cabling requirements.

Note...

Do not throw the special protective dust caps away. They must be retained for future use in the event it is necessary to remove the ThinkIO™ from the system.

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8. Before applying any power to the application, all cabling must be verified to comply with the application requirements. Do not proceed before this is accomplished.
9. Once the cabling is verified, the application system is ready for initialization. Proceed to chapter 3.5.

3.4 Replacement Procedures

The following procedures are intended to be applied when a ThinkIO™ is to be replaced in an existing application system.

3.4.1 ThinkIO™ Removal

To remove the ThinkIO™ proceed as follows:

1. Ensure that the safety requirements indicated in chapter 3.1 are observed.

Warning!

Failure to comply with the above may cause equipment damage, result in injury to personnel, or both. In particular, power must be removed from all components involved.

Care must be taken when applying the procedures below to ensure that when the product is removed it is not damaged through contact with other components in the system.

Note...

Removal of the ThinkIO™ also requires removal of the WAGO I/O module closest to the ThinkIO™. This must be performed before the removal of the ThinkIO™. This is required to prevent damage to the ThinkIO™ and for ease of removal.

2. Disconnect all ThinkIO™ cabling ensuring that cable ends or pins are secured so as not to make contact with any other system components. If necessary, insulate cable ends when removing.
3. Ensure that the special protective dust caps are installed on connectors: CON 3, CON 6, and CON 7 (CAN/Profibus, RS232, DVI).

WARNING!

To satisfy CE requirements regarding ESD protection, special dust caps must be installed on connectors CON 3, CON 6, and CON7 (CAN/Profibus, RS232, and DVI) when these connectors are not in use, i.e. no cable is connected. This is intended to prevent electro-static discharging to the pins of these connectors.

Appropriate dust caps are supplied with the ThinkIO™. In the event they are damaged or lost, replacement caps may be obtained by contacting Kontron Modular Computers.

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4. Disconnect all cabling to the WAGO I/O module closest to the ThinkIO™ ensuring that cable ends are secured so as not to make contact with any other system components. If necessary, insulate cable ends when removing.
5. Remove the WAGO I/O module closest to the ThinkIO™ by pulling firmly on the orange release tab until the module is disengaged from the carrier rail. Then pull the module completely out of the assembly.

Note...

During the following procedure, it is necessary to securely hold the ThinkIO™ to prevent it from falling and being damaged.

6. Using a flat blade screwdriver, release the carrier rail retaining clamps and remove the ThinkIO™ from the carrier rail.

Note...

This is done by inserting the screwdriver in the hole in the retaining bar and turning it in either direction far enough to release the retaining clips.

7. Dispose of the ThinkIO™ as required observing applicable environmental regulations governing the handling and disposition of this type of product.

3.4.2 ThinkIO™ Installation

To install the ThinkIO™ proceed as follows:

1. Ensure that the safety requirements indicated in chapter 3.1 and the commissioning prerequisites indicated in chapter 3.2 are observed. In addition, verify that the initial installation procedures have been performed. If not, proceed to chapter 3.3.

WARNING!

To satisfy CE requirements regarding ESD protection, special dust caps must be installed on connectors CON 3, CON 6, and CON7 (CAN/Profibus, RS232, and DVI) when these connectors are not in use, i.e. no cable is connected. This is intended to prevent electrostatic discharging to the pins of these connectors.

Appropriate dust caps are supplied with the ThinkIO™. In the event they are damaged or lost, replacement caps may be obtained by contacting Kontron Modular Computers.

Warning!

Failure to comply with the instruction below may cause damage to the product or result in improper system operation. Please refer to chapter 4 for configuration information.

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2. Ensure that the ThinkIO™ is properly configured for operation before installing.

Note...

Care must be taken when applying the procedures below to ensure that when the product is assembled along with the other application system components that it is not damaged through contact with the other components of the system.

3. Reinstall the WAGO I/O module removed previously in step 4 of the Removal procedure.

4. Install the ThinkIO™ as follows:

Note...

The ThinkIO™ carrier rail mounting assembly is comprised of four spring loaded clamps and a carrier rail release bar for simultaneously opening of the clamps. As the clamp spring loading tension is quite high, the ThinkIO™ cannot be "snapped" onto the carrier rail. The spring tension must first be released before attempting to seat the ThinkIO™.

As this assembly is mounted on the bottom of the ThinkIO™ it is not possible to visually observe clamp engagement with the carrier rail. For this reason, care must be taken when installing the ThinkIO™ to ensure positive engagement with the carrier rail.

1. Position the ThinkIO™ so as to engage the WAGO I/O module closest to the ThinkIO™ position on the carrier rail.

Note...

In the following procedure step, the ThinkIO™ must be assembled together with the WAGO I/O module stack. To achieve this, the ThinkIO™ K-Bus module retaining flange must properly engage the corresponding flange of the WAGO I/O module so as to interlock with it.

The ThinkIO™ must be so aligned that it can be engaged with a minimum of force. It may be necessary to exert force on the K-Bus module itself. In this case, hold the ThinkIO™ so that there is both pressure on the ThinkIO™ as well as the K-Bus module. Care must be taken to ensure that the K-Bus module is not damaged by this procedure.

If the ThinkIO™ jams during this procedure, remove it and start again.

Do not hammer or pound on the ThinkIO™ to install it.

2. Push the ThinkIO™ in the direction of the carrier rail until it makes contact with the carrier rail

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3. Using a flat blade screwdriver, release the carrier rail retaining clamps.

Note...

This is done by inserting the screwdriver in the hole in the retaining bar and turning it in either direction far enough to release the retaining clips.

4. Push the ThinkIO™ onto the carrier rail and release the retaining bar.
5. Ensure that the ThinkIO™ is seated firmly on the carrier rail. If not, repeat steps 3 and 4 until it is properly seated (all four retaining clamps have engaged the carrier rail).
6. Ensure that the ThinkIO™ K-Bus module is properly seated on the carrier rail.

Note...

It can happen that when the ThinkIO™ is seated on the carrier rail that the K-Bus module is not quite seated. This can be verified by comparing the position of the K-Bus module with that of the WAGO I/O module next to it. If necessary, push the K-Bus module lightly in the direction of the carrier rail until it is flush with the top of the WAGO I/O module.

Warning!

The remaining procedures concern themselves with the installation of ThinkIO™ and WAGO I/O module cabling.

Before proceeding with the instructions below, ensure that there is no power applied to any of the cables to be connected. Failure to comply with this instruction may cause equipment damage, result in injury to personnel, or both.

5. Connect all cables as required by the application. Refer to appropriate application documentation for cabling requirements.

Note...

Do not throw the special protective dust caps away. They must be retained for future use in the event it is necessary to remove the ThinkIO™ from the system.

6. Before applying any power to the application, all cabling must be verified to comply with the application requirements. Do not proceed until this is accomplished.
7. Once the cabling is verified, the application system is ready for initialization.

3.5 ThinkIO™ Initialization

The following chapters provide information concerning the initialization of the ThinkIO™ in an application system.

3.5.1 Initialization Prerequisites

The following prerequisites must be complied with prior to putting the ThinkIO™ into operation:

- All applicable ThinkIO™ application software has been installed and verified prior to the ThinkIO™ installation.
- The ThinkIO™ must have been installed in compliance with chapters 3.1, 3.2, 3.3, and 3.4 of this manual.
- The remaining elements of the application system must be configured and ready for operation.
- All personnel involved directly with the operation of the application system have been informed of the pending operation of the application system.

Warning!

Failure to comply with the above may cause equipment damage, result in injury to personnel, or both. In particular, power must not be applied to the ThinkIO™ or the remainder of the application system before verification of compliance has been accomplished.

3.5.2 ThinkIO™ Initialization

Initialization of the ThinkIO™ is a function of the basic power up logic (hardware, firmware, BIOS, and operating system software) as well as the application system software itself. In addition, where the ThinkIO™ has been integrated in a development environment, extended initialization is possible.

Therefore, the applicable procedures for the ThinkIO™ initialization must be included in the application system documentation provided by the system designer and be available to operating personnel.

Basic ThinkIO™ initialization in any event is as follows:

- Apply power to the ThinkIO™ and application system elements.
- The bootup sequence begins automatically.
- The bootup sequence ends (bootup was successful).
- The system now searches for a bootable device as follows:
  - USB floppy disk
  - USB CDROM
  - USB memory stick
  - External CompactFlash (ThinkIO™ socket: X1)
  - Onboard CompactFlash
- Upon detecting a bootable device, the system loads the master boot record and turns control over to it. After this the remaining system software components are loaded along with any application software that is to be installed. Exactly what software is loaded is a function of the application system as a whole.
- Control is now transferred to either the operating system or the application software as required.

Any further operations involving the ThinkIO™ are functions of the application system and as such are not within the scope of this manual.

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Chapter 4

Configuration

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4. Configuration

The ThinkIO™ hardware is delivered pre-configured for operation. Only the positioning of the Run/Stop switch and the fieldbus node number switch which are application dependent are required to be performed by the user. Refer to appropriate fieldbus documentation for the settings required for these switches.

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Chapter 5

BIOS

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5. BIOS

The X-board<861>™ Module is equipped with an Insyde XpressROM™ BIOS, which is located in an onboard Flash EEPROM.

You can update the BIOS using a Flash utility.

5.1 Determining the BIOS Version

To determine the BIOS version, the summary screen in the BIOS setup must be activated. The information is located in the summary screen (upper lefthand corner where it says: Rev: XBD...).

5.2 Setup Guide

The Insyde BIOS Setup Utility changes system behavior by modifying the BIOS configuration. The setup program uses a number of menus to make changes and to turn features on or off.

The BIOS setup menus documented in this section represent those found in most models of the X-board<861>. The BIOS Setup for specific models can differ slightly.

5.3 Start BIOS Setup Utility

To start the setup utility, press <**F1**> during boot up when the following string appears.

Press F1 to enter Setup

The Main Menu then appears.

5.4 BIOS Setup Navigation

Navigation through the setup can be done either by using the cursor keys, or by pressing the character keys that are shown in front of every menu item.

A menu item is either a field for selecting and changing an entry or a submenu. To change an entry, or to jump into a submenu, press the enter key <ENTER>.

To jump back from a submenu press the <ESC> key.

In the option column, **bold text** indicates the BIOS default values.

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5.5 Main Menu

Table 5-1: BIOS Main Menu

KEY	FEATURE	OPTION	DESCRIPTION
A	Time	HH:MM:SS	Set the system time
B	Date	MM/DD/YYYY	Set the system date
C	Motherboard Device Configuration		Submenu for Device Configuration
F	Power Management		Submenu for Power Management
H	Miscellaneous Configuration		Submenu for Miscellaneous Configuration
L	Load Defaults		Loads the setup defaults
S	Saves Values Without Exit		Save all values and stay in Setup Utility
Q	Exit Without Save		Quit Setup Utility without saving the changes
X	Save Values and Exit		Saves all changes and exit Setup Utility

5.5.1 Motherboard Device Configuration Submenu

Table 5-2: Motherboard Device Configuration Submenu

KEY	FEATURE	DESCRIPTION
A	Drive Configuration	Submenu for Drive Configuration
B	Onboard Super I/O Configuration	Submenu for Super I/O Configuration
F	Video and Flat Panel Configuration	Submenu for Video and Flat Panel Configuration
G	PCI Configuration	Submenu for PCI Configuration
R	Return to Main Page	Returns to Main Menu

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5.5.2 Drive Configuration

Table 5-3: IDE Configuration

FEATURE	OPTION	DESCRIPTION
Chipset IDE Channel	**Primary** Disabled	Switch the single IDE channel ON and OFF
Max PIO mode for Drive 1	**Auto** PIO0 PIO1 PIO2 PIO3 PIO4	Switches on the maximum transfer mode of the IDE Drive 1
Max PIO mode for Drive 2	**Auto** PIO0 PIO1 PIO2 PIO3 PIO4	Switches on the maximum transfer mode of the IDE Drive 2

Table 5-4: Boot ROM Configuration

FEATURE	OPTION	DESCRIPTION
CD-ROM Boot-ROM	**Enabled** Disabled	Enable and Disable the possibility to boot from IDE CD-ROM devices
USB Mass Storage Boot-ROM	**Enabled** Disabled	Enable and Disable the possibility to boot from USB Mass Storage devices
Lanboot Option ROM	Enabled Flag Controlled **Disabled**	Enable and Disable the possibility to boot from LAN using the “Etherboot” protocol.

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Table 5-5: Boot Order Configuration

FEATURE	OPTION	DESCRIPTION
1.	**Floppy Disk** Onboard CompactFlash External CompactFlash USB Mass Storage IDE-CDROM Drive None Network Boot	Selects the 1st boot device
2.	Floppy Disk Onboard CompactFlash External CompactFlash **USB Mass Storage** IDE-CDROM Drive None Network Boot	Selects the 2nd boot device
3.	Floppy Disk Onboard CompactFlash External CompactFlash USB Mass Storage **IDE-CDROM Drive** None Network Boot	Selects the 3rd boot device
4.	Floppy Disk Onboard CompactFlash **External CompactFlash** USB Mass Storage IDE-CDROM Drive None Network Boot	Selects the 4th boot device
5.	Floppy Disk **Onboard CompactFlash** External CompactFlash USB Mass Storage IDE-CDROM Drive None Network Boot	Selects the 5th boot device
6.	Floppy Disk Onboard CompactFlash External CompactFlash USB Mass Storage IDE-CDROM Drive None **Network Boot**	Selects the 6th boot device

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Table 5-5: Boot Order Configuration

FEATURE	OPTION	DESCRIPTION
7.	Floppy Disk Onboard CompactFlash External CompactFlash USB Mass Storage IDE-CDROM Drive None **Network Boot**	Selects the 7th boot device

5.5.3 Onboard Super I/O Configuration

Table 5-6: Onboard Super I/O Configuration

FEATURE	OPTION	DESCRIPTION
Serial Port A	**0x3F8 IRQ 4** 0x2F8 IRQ 3 0x3E8 IRQ 4 0x2E8 IRQ 3 Disabled	Selects the resources of 1st onboard serial port
Serial Port B	0x3F8 IRQ 4 **0x2F8 IRQ 3** 0x3E8 IRQ 4 0x2E8 IRQ 3 Disabled	Selects the resources of 2nd onboard serial port

5.5.4 Video and Flat Panel Configuration

Table 5-7: Video Configuration

FEATURE	OPTION	DESCRIPTION
Video Memory	**4 MB** None 1.0 MB 1.5 MB 2.0 MB 2.5 MB 3.0 MB 3.5 MB	Selects the size of Video Memory. This value is reducing the RAM
Flat Panel Mode	**Enabled** Disabled	Enables and disables the flat panel interface
Flat Panel Type	**Auto Detect** Use Panel ID 640x480 800x600 1024x768	Switches between usage of I²C EEPROM, fixed Panel ID in setup or standard settings for common panels
Panel ID	00000	Flat panel ID to be used without EEPROM directly to set in the setup

Table 5-8: Backlight Configuration

FEATURE	OPTION	DESCRIPTION
Brightness Control	**Disabled** Enabled	Enable and disable the Control of DACs on the I²C bus to control the brightness via JIDA
Initial Brightness	**Last Value** 0% (OFF) 10% ... 90% 100% (Full ON)	Select the initial brightness of the backlight, if it is controlled via JIDA on the I²C bus

Table 5-9: Contrast Configuration

FEATURE	OPTION	DESCRIPTION
Contrast Control	**Disabled** Enabled	Enables or disables the Control of DACs on the I²C bus to control the contrast via JIDA
Initial Contrast	**Last Value** 0% (OFF) 10% ... 90% 100% (Full ON)	Selects the initial contrast of the STN panel, if it is controlled via JIDA on the I²C bus

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5.5.4.1 PCI Configuration

Table 5-10: PCI Configuration

FEATURE	OPTION	DESCRIPTION
PCI INTA#	**IRQ 9** IRQ 10 IRQ 11 IRQ 12 IRQ 14 IRQ 15 Disabled IRQ 3 IRQ 4 IRQ 5 IRQ 6 IRQ 7	Fixes an interrupt to PCI INT line A
PCI INTB#	IRQ 9 **IRQ 10** IRQ 11 IRQ 12 IRQ 14 IRQ 15 Disabled IRQ 3 IRQ 4 IRQ 5 IRQ 6 IRQ 7	Fixes an interrupt to PCI INT line B
PCI INTC#	IRQ 9 IRQ 10 IRQ 11 IRQ 12 IRQ 14 IRQ 15 Disabled IRQ 3 IRQ 4 **IRQ 5** IRQ 6 IRQ 7	Fixes an interrupt to PCI INT line C (exclusively used by chipset integrated audio controller).

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Table 5-10: PCI Configuration

FEATURE	OPTION	DESCRIPTION
PCI INTD#	IRQ 9 IRQ 10 **IRQ 11** IRQ 12 IRQ 14 IRQ 15 Disabled IRQ 3 IRQ 4 IRQ 5 IRQ 6 IRQ 7	Fixes an interrupt to PCI INT line D (exclusively used by chipset integrated audio controller).

5.5.5 Power Management

Table 5-11: Power Management Configuration

FEATURE	OPTION	DESCRIPTION
Power Management Mode	**Legacy & APM** Disabled Legacy	Selects the Power Management Mode

Table 5-12: Wakeup Mask Configuration

FEATURE	OPTION	DESCRIPTION
Wakeup Mask PIC1	**0x12**	Selects the Interrupts 0-7 by Hexadecimal no. as wakeup event
Wakeup Mask PIC2	**0x10**	Selects the Interrupts 8-15 by Hexadecimal no. as wakeup event

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Table 5-13: Timeout Configuration

FEATURE	OPTION	DESCRIPTION
Video Timeout	**Disabled** 1 Second 5 Seconds 10 Seconds 15 Seconds 30 Seconds 45 Seconds 1 Minute 5 Minutes 10 Minutes 15 Minutes 30 Minutes 45 Minutes 60 Minutes 90 Minutes 120 Minutes	Time till the Video is switched off
Standby Timeout	See Video Timeout	Time till standby mode
Suspend Timeout	See Video Timeout	Time till suspend mode
Harddisk Timeout	See Video Timeout	Time till HDD is switched off

5.5.6 Miscellaneous Configuration

Table 5-14: Splash Screen Configuration

FEATURE	OPTION	DESCRIPTION
Splash Screen	Enabled **Disabled**	Enables or disables the splash screen during boot (boot logo)
Clear Splash Screen	Enabled **Disabled**	Enables or disables clearing of splash screen after display
Splash Screen Timeout	**00000**	Time until splash screen times out. Set in milliseconds

Table 5-15: Summary Screen Configuration

FEATURE	OPTION	DESCRIPTION
Summary Screen	Enabled **Disabled**	Enables or disables the summary screen
Summary Screen Timeout	**00100**	Time until summary screen times out in milliseconds

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Table 5-16: Watchdog Configuration

FEATURE	OPTION	DESCRIPTION
Watchdog	**Disabled** Reset	Sets the watchdog mode
Watchdog Delay	**10 Seconds** 30 Seconds 1 Minute 2 Minutes 5 Minutes 10 Minutes 15 Minutes 30 Minutes	The watchdog will only start to count down after the given delay
Watchdog Timeout	**10 Seconds** 30 Seconds 1 Minute 2 Minutes 5 Minutes 10 Minutes 15 Minutes 30 Minutes	The watchdog must be triggered within this time interval
Legacy USB Configuration	**Enabled** Disabled During Post	Control USB legacy support

Table 5-17: Legacy USB Configuration

FEATURE	OPTION	DESCRIPTION
Legacy USB Support	Disabled **Enabled**	Enables or disables USB support for legacy devices (keyboard, mouse) for operating under DOS

Table 5-18: Customer ROM

FEATURE	OPTION	DESCRIPTION
	Disabled Enabled Flag Controlled	Configure customer option ROM start

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5.6 Updating a BIOS

The BIOS flash utility "Phlash" provides the capability to update an existing BIOS from an USB floppy disk without having to install a new ROM chip.

5.6.1 Prerequisites for Updating

BIOS updating is only possible for ThinkIO hardware with a revision index of 2 or higher. To ascertain the hardware index, proceed as follows:

- Enter BIOS-Setup
- Go to Miscellaneous Configuration
- Set Summary Screen to Enabled
- Set Summary Screen Timeout to 03000
- Save Values and Exit

In the top left corner of the summary screen you will see the BIOS version information in the form:

Rev: XBD1Rxyy

where: x = hardware revision index code of the ThinkIO
6 = index 1 or earlier
9 = index 2 or later
yy = BIOS release index

Only if the hardware revision index code equals 9, is an update possible. If the hardware revision index code equals 6 or any other number, please contact the technical support group at Kontron Modular Computers GmbH for further assistance.

5.6.2 BIOS Updating

The first step in updating a BIOS is to create an MS-DOS bootable floppy disk. Ensure that no memory managers like "emm386" are loaded.

Then copy the following files:

- PHLASH.EXE the update utility
- platform.bin an information file for the Phlash program
- XBD1R9xx.ROM the binary image of the new BIOS

to the floppy disk.

Next, create an "autoexec.bat" file which executes the command:

```
phlash [filename]
```

where the filename is the name of the BIOS ROM image, e.g. XBD1R906.ROM.

The next step is to connect a USB floppy disk drive to the ThinkIO™ and boot the system using the floppy disk. The update of the BIOS is then executed automatically. After a successful update, reboot the ThinkIO™, enter the BIOS setup, and load the BIOS default settings. After this has been accomplished, changes may be made to the BIOS settings if required. When completed, proceed with the bootup of the ThinkIO™.

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5.7 Restoring a BIOS

When the BIOS is updated, it is possible that the BIOS may become corrupted making it impossible to boot the system. This can happen if power fails or fluctuates when updating the Flash ROM.

To remedy this type of situation, the ThinkIO™ is equipped with a boot block Flash ROM. The boot block region contains a fail-safe recovery routine. If the boot block code finds a corrupted BIOS (checksum failure), it boots into the Crisis Recovery mode. In this mode the BIOS can be restored from a bootable floppy disk.

If the BIOS is damaged and the system is unbootable, the system must be forced into the Crisis Recovery mode with an update key. This key must be plugged into the serial interface (X6) on the ThinkIO™ front panel. The BIOS update floppy (as described in chapter 5.6) must be inserted into a USB floppy drive which is connected to the ThinkIO™ via an USB cable.

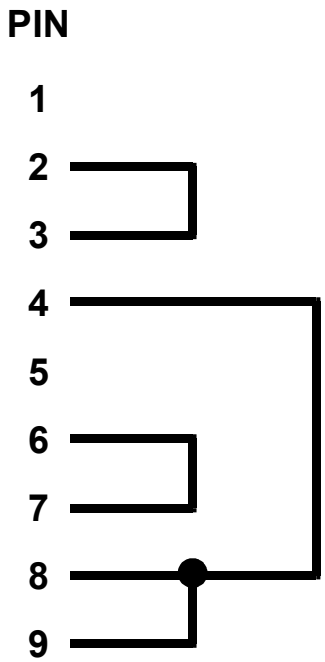
Apply power to the ThinkIO and it will automatically enter the Crisis Recovery Mode.

During Crisis Recovery there are no display indications. The system does not detect when the Crisis Recovery is finished, therefore, it is necessary to observe that the LED on the floppy disk drive is off for at least two minutes. After this has been observed, remove power from the system off, remove the Crisis Recovery disk, and then apply power to the system again.

During the first bootup with the new BIOS, enter the BIOS setup with F1 and load the BIOS default settings before proceeding.

The following figure provides the pin layout of the update key for the female D-Sub connector.

Figure 5-1: Update Key Pinout



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Chapter 6

System Considerations

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6. System Considerations

The following chapters provide information about the ThinkIO™ concerning either subjects of a more general nature or those specific aspects of applications which require consideration when developing concepts and designs which implement the ThinkIO™ as an integral element of the application.

6.1 The ThinkIO™ Application Concept

The ThinkIO™ is in itself a complete functional unit. It possesses all of the necessary hardware and software qualities required to perform autonomously within a system of applications. It can not only function as the "brains" of an application, it is capable of performing as a sub-system, as a standalone system, or can form a super-system when combined with other ThinkIO™s.

The hardware of the ThinkIO™ provides a very comprehensive set of interfaces which allow connection to virtually any type of communications and input/output systems. With the addition of direct interfacing capability to the WAGO-I/O-SYSTEM 750 system of input and output modules, the ThinkIO™ has access to a very wide range of industry standard process monitor and control devices which are suitable for the most demanding of application systems.

The other half of the story is the software functionality which provides the ability for the ThinkIO™ to be integrated at almost any level of an application system.

Flexible firmware as well as a choice of development platforms and operating systems simplify enormously the application realization process whether it be in terms of time, money, availability of technical know-how, implementation in existing environments, upgrading ability, protection of investment, etc.

The implementation of CoDeSys (WAGO-I/O-*PRO* CAA) as the platform for standard PLC applications (IEC 61131-3 conformance) offers system designers in one package a modern, industry standard, PLC development system and runtime environment.

For developers of custom applications or applications which require special functionality for standard PLC implementations, other development and operating systems (Linux and Windows CE) are available.

Extensive communications support for applications is also provided. Standard Fast Ethernet as well as fieldbus software are available which include TCP/IP intranet/Internet, LAN/WAN, and the fieldbusses: PROFIBUS, CANopen, and DeviceNet. The ability to communicate is practically unrestricted which opens the way for almost any kind of application and functionality imaginable.

6.2 Application Software Development

For IEC 61131-3 conformance, the standard for ThinkIO™ is the CoDeSys development and runtime environment. This package offers the ability to create PLC programs, compile, install, and debug applications. The runtime environment provides the application program with a standard platform which generally eliminates the need for any direct interfacing with the underlying operating system. This permits the developer to concentrate fully on the application development, exploiting the advantages that such a powerful and competent development tool offers.

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Kontron offers also software development and runtime system support for Linux and Windows CE. For Linux, the ELinOS development system is available. Windows CE is supported by the Platform Builder, Microsoft eMbedded Visual C++®, and Microsoft Visual Studio®.

6.3 The ThinkIO™ Runtime Environment

The ThinkIO™ runtime environment involves not only the application itself, but also supports program development and maintenance. While the application is the primary consideration, it may be desirable or necessary for developers or maintenance personnel to intervene in an operating system. The exact mechanism for accomplishing this is a function of the given application.

6.4 Applications

Modern day applications can vary from relatively simple to extremely complex. In particular, when many application elements are involved or elements are physically separated by greater distances it is necessary to “simplify” as much as possible. Simplification can range from reduction in the total number of elements involved to simply standardizing the types of elements involved including both hardware and software. ThinkIO™ supports both of these possibilities.

Located on-site with a single application system, the ThinkIO™ can provide a wide variety of standard monitor and control functions for local application processes. At the same time it can maintain interfacing with other application systems as well as supervisory functionality which may or may not be located on-site.

The ThinkIO™ is also quite well suited for higher level supervisory functions either on-site or from remote locations wherever they may be. Fixed intranet as well as Internet solutions are possible. The supervisory functions supported may be either of a hierarchical structure or open nature.

6.5 ThinkIO™ Documentation

There are a number of sources concerning documentation for the ThinkIO™ and related components.

Basic hardware descriptions as well as system information is provided by this manual and the related WAGO-IO-SYSTEM 750 and 758 documentation. However, only the WAGO documentation provides information concerning the WAGO I/O modules, their usage, and related hardware.

Software documentation concerning the ThinkIO™ itself is contained in the Kontron manuals: Linux-BSP-ThinkIO and WindowsCE-BSP-ThinkIO.

Application development software and operating system documentation is provided by their corresponding software development packages, in this case, for Linux (ELinOS) and Windows CE. In addition, CoDeSys (equivalent to WAGO-IO-*PRO* CAA) PLC software documentation is provided by 3S-Smart Software Solutions GmbH. Information concerning configuration and operation of the Hilscher EC1 fieldbus chip is provided either by the CoDeSys documentation or is included in the Sycon software package from Hilscher.

ThinkIO™ application software is a function of the application itself and is not within the scope of this manual.

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