ThinkIO™ - P

Premium DIN Rail PC
for Fieldbus and IO Systems

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INSTALLATION GUIDE

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

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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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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 the ThinkIO™ - P Hardware Reference Guide.

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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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.

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Two Year Warranty

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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).

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Chapter 1

General

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1. General

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

The product described in this manual is designed for use with WAGO-I/O-SYSTEM 750/753 families of input/output modules as well as being able to be operated in a stand-alone configuration. This installation guide refers primarily to the installation of the ThinkIO-P itself and, where appropriate, contains references to WAGO I/O modules. If required, refer to WAGO-I/O-SYSTEM 750/753 documentation for further information concerning installation of the WAGO modules.

The following chapters provide information about the ThinkIO-P 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-P as an integral element of the application.

1.1 The ThinkIO-P Application Concept

The ThinkIO-P 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-Ps.

The hardware of the ThinkIO-P 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 750/753 systems of input and output modules, the ThinkIO-P 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-P 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) 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 DP, CANopen, and DeviceNet. The ability to communicate is practically unrestricted which opens the way for almost any kind of application and functionality imaginable.

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1.2 Application Software Development

For IEC 61131-3 conformance, the standard for ThinkIO-P 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. Kontron offers also software development and runtime system support for Linux and Windows XP Embedded.

1.3 The ThinkIO-P Runtime Environment

The ThinkIO-P 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.

1.4 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-P supports both of these possibilities.

Located on-site with a single application system, the ThinkIO-P 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 (remote control via: SCADA, MES, or ERP).

The ThinkIO-P 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.

1.5 ThinkIO-P Documentation

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

Basic hardware descriptions as well as system information is provided by this manual and the related WAGO-IO-SYSTEM 750/753 documentation. However, only the WAGO documentation provides information concerning the WAGO I/O modules, their usage, and related hardware.

Software documentation concerning the ThinkIO-P itself is contained in other Kontron Modular Computers’ guides. Refer to the ThinkIO-P Project Publications Guide for further information.

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Application development software and operating system documentation is provided by their corresponding software development packages. 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-P application software is a function of the application itself and is not within the scope of this manual.

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Chapter 2

Safety

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2. Safety

The following precautions must be observed.

Caution, Electric Shock Hazard!

Ensure that the system main power is removed prior to installing or removing the ThinkIO-P. 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-P or other system components including process-side signal conditioning equipment.

ESD Equipment!

The ThinkIO-P contains electrostatic sensitive devices. Ensure that the following precautions are observed to avoid damaging the ThinkIO-P:

Discharge clothing before touching the assembly. Tools must also 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-P is designed only for use with WAGO-I/O-SYSTEM 750/753 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 life or health and may cause improper operation of or damage to the ThinkIO-P or other system components including process-side signal conditioning equipment.

Warning!

During operation the ThinkIO-P heats up and some parts of the enclosure may get hot enough to cause light burns if touched for a period of time longer than 1 to 2 seconds. Exercise care when handling a ThinkIO-P that has just been operated. If necessary, cool down the ThinkIO-P before handling it.

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Chapter 3

Prerequisites

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3. Prerequisites

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

3.1 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-P 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-P is to be mounted inside an enclosure, the enclosure itself must have been installed prior to installation of the ThinkIO-P. Refer to appropriate enclosure documentation for installation of the enclosure.

3.2 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 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.

3.3 Personnel Requirements

All individuals entrusted with designing, integrating, and operating of application systems involving the ThinkIO-P 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.

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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.

3.4 ThinkIO-P Mounting

The ThinkIO-P 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-P and associated WAGO 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-P 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-P rail clamps or the rail release mechanism on the bottom of any WAGO 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-P 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 WAGO I/O modules.

Installation of WAGO I/O modules must be done starting with the module closest to the ThinkIO-P 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.

3.5 Power Requirements

The ThinkIO-P 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-P and the WAGO interface module (K-Bus) which supplies the I/O module electronics with 5 V DC power.

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

If the 5 V DC power supplied via the ThinkIO-P is not sufficient, one or more additional WAGO internal supply modules will be required. Refer to appropriate WAGO documentation for further information.

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

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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.

3.6 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.

3.7 Thermal Requirements

It is the responsibility of the system designer to ensure that the operational thermal requirements of the ThinkIO-P are satisfied. Depending on the installation environment, it may be necessary to provide active cooling for the ThinkIO-P. For further information, refer to the ThinkIO-P Systems Consideration Guide - Thermal.

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Chapter 4

Installation

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4. Installation

This chapter deals with the installation of a ThinkIO-P and, if required, WAGO I/O modules in an application environment. Refer to Chapter 5 for installation in an application development environment.

4.1 Initial Installation Procedures

The following procedures are intended to be applied only for the initial installation of the ThinkIO-P in an application system.

To install the ThinkIO-P proceed as follows:

1. Ensure that all prescribed safety requirements and commissioning prerequisites are observed.

WARNING!

To satisfy CE requirements regarding ESD protection, special dust caps must be installed on connectors X3, X6, and X7 (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-P. 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. Refer to appropriate ThinkIO-P documentation for further information.

2. Ensure that the ThinkIO-P 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.

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3. Verify the correct positioning for the ThinkIO-P on the carrier rail and install as follows:

Note...

The ThinkIO-P carrier rail mounting assembly is comprised of four spring loaded clamps and their associated carrier rail eject handles for simultaneously opening of the clamps. As the clamp spring loading tension is quite high, the ThinkIO-P cannot be "snapped" onto the carrier rail. The spring tension must first be released before attempting to seat the ThinkIO-P.

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

   1. Position the ThinkIO-P on the carrier rail at position indicated.
   2. Apply pressure to the eject handles so as to allow the ThinkIO-P to engage with the carrier rail.
   3. Push the ThinkIO-P onto the carrier rail and release the eject handles.
   4. Ensure that the ThinkIO-P 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).

4. If WAGO I/O modules are to be installed refer to the appropriate application and WAGO documentation for their installation before proceeding.

Warning!

The remaining procedures concern themselves with the installation of ThinkIO-P 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. If (an) end stop(s) for the carrier rail is(are) required proceed as follows.
   1. Verify the correct positioning of the end stop(s).
   2. Install the end stop(s) according to the end stop installation documentation.
6. Connect all cables as required by the application. Refer to appropriate application documentation for cabling requirements.

Note...

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

7. 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.
8. Once the cabling is verified, the application system is ready for initialization. Refer to appropriate application documentation for further information.

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4.2 Replacement Procedures

The following procedures assume that the ThinkIO-P in question is installed in an existing application and it is necessary to remove and reinstall it or to replace it with another ThinkIO-P.

Warning!

DO NOT use these procedures to initially install a ThinkIO-P.

Refer to the Initial Installation Procedures for a first installation.

Failure to comply with the above may cause equipment damage, result in injury to personnel, or both.

4.2.1 ThinkIO-P Removal

To remove the ThinkIO-P proceed as follows:

1. Ensure that all safety requirements are observed.

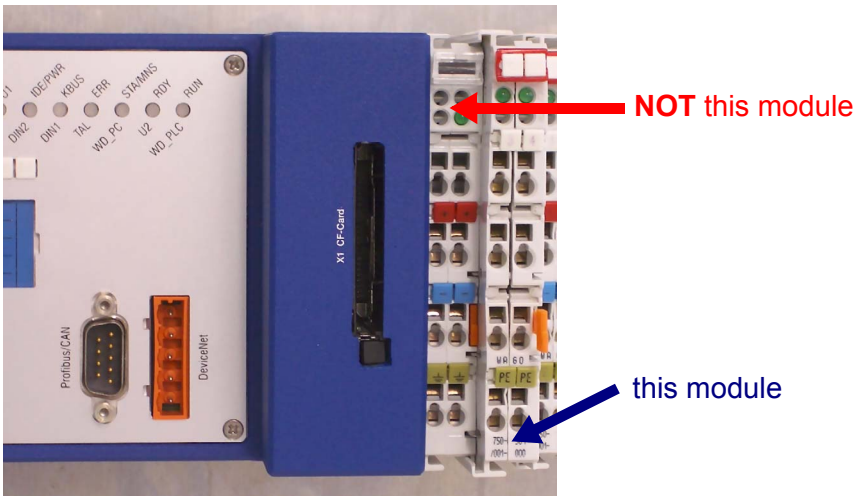
Warning!

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...

If the application also includes WAGO I/O modules, removal of the ThinkIO-P also requires removal of the WAGO I/O module closest to the ThinkIO-P (**not the WAGO interface module** (K-Bus)). See figure below. This must be performed before the removal of the ThinkIO-P. This is required to prevent possible damage to the ThinkIO-P and for ease of removal.



2. Disconnect all ThinkIO-P 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: X3, X6, and X7 (CAN/Profibus, RS232, DVI).

WARNING!

To satisfy CE requirements regarding ESD protection, special dust caps must be installed on connectors X3, X6, and X7 (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-P. In the event they are damaged or lost, replacement caps may be obtained by contacting Kontron Modular Computers.

4. If WAGO I/O modules are installed, disconnect all cabling to the WAGO I/O module closest to the ThinkIO-P 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. If WAGO I/O modules are installed, remove the WAGO I/O module closest to the ThinkIO-P 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. Dispose of the WAGO I/O module as required observing safety and ESD requirements.

Note...

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

Warning!

During operation the ThinkIO-P heats up and some parts of the enclosure may get hot enough to cause light burns if touched for a period of time longer than 1 to 2 seconds. Exercise care when handling a ThinkIO-P that has just been operated. If necessary, cool down the ThinkIO-P before handling it.

6. Apply pressure to the ThinkIO-P carrier eject handles to release the carrier rail retaining clamps and remove it from the carrier rail.
7. Dispose of the ThinkIO-P as required observing applicable environmental regulations governing the handling and disposition of this type of product.

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4.2.2 ThinkIO-P (Re-)Installation

The following procedure assumes that the ThinkIO-P in question is to be installed in an existing application and is not an initial installation. Refer to the Initial Installation Procedures for further information.

To install the ThinkIO-P proceed as follows:

1. Ensure that all safety requirements and commissioning prerequisites are observed. In addition, verify that the Initial Installation Procedures have been performed. If not, proceed to the Initial Installation Procedures.

WARNING!

To satisfy CE requirements regarding ESD protection, special dust caps must be installed on connectors X3, X6, and X7 (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-P. 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. Refer to appropriate ThinkIO-P documentation for further information.

2. Ensure that the ThinkIO-P 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 5 of the Removal procedure.
4. Install the ThinkIO-P as follows:

Note...

The ThinkIO-P carrier rail mounting assembly is comprised of four spring loaded clamps and their associated carrier rail eject handles for simultaneously opening of the clamps. As the clamp spring loading tension is quite high, the ThinkIO-P cannot be "snapped" onto the carrier rail. The spring tension must first be released before attempting to seat the ThinkIO-P.

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

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Note...

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

The ThinkIO-P 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-P so that there is both pressure on the ThinkIO-P 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-P jams during this procedure, remove it and start again.

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

1. Position the ThinkIO-P so as to engage the WAGO I/O module closest to the ThinkIO-P position on the carrier rail.
2. Push the ThinkIO-P in the direction of the carrier rail until it makes contact with the carrier rail
3. Apply pressure to the eject handles so as to allow the ThinkIO-P to engage with the carrier rail.
4. Push the ThinkIO-P onto the carrier rail and release the eject handles.
5. Ensure that the ThinkIO-P 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 K-Bus module is properly aligned with the first I/O module.

Warning!

The remaining procedures concern themselves with the installation of ThinkIO-P 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 ThinkIO-P protective dust caps away. They must be retained for future use in the event it is necessary to remove the ThinkIO-P 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 operation.

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4.3 ThinkIO-P Operation

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

4.3.1 Initialization Prerequisites

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

- All applicable ThinkIO-P application software has been installed and verified prior to the ThinkIO-P installation.
- The ThinkIO-P must have been installed in compliance with either the Initial Installation Procedures or the Replacement Procedures contained in 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-P or the remainder of the application system before verification of compliance has been accomplished.

4.3.2 ThinkIO-P Initialization

Initialization of the ThinkIO-P is a function of the basic power up logic (hardware, firmware, BIOS, and operating system software) as well as the application system software itself.

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

Basic ThinkIO-P initialization in any event is as follows:

- Apply power to the ThinkIO-P and application system elements.
- The power up sequence begins automatically.
- The power up sequence ends (was successful).
- The system now searches for a boot device as follows:
  - USB floppy disk
  - USB CDROM
  - USB memory stick
  - External CompactFlash (ThinkIO-P socket: X1)
  - Onboard CompactFlash
- Upon detecting a boot 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-P are functions of the application system and as such are not within the scope of this manual.

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Chapter 5

Development Installation

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5. Development Installation

The previous chapter Installation dealt with the installation of a ThinkIO-P in an application environment. This chapter provides information to assist in the usage of the ThinkIO-P in an application development environment (ADE).

5.1 Initial Installation Procedures

The following procedures are intended to be applied only for the initial installation of the ThinkIO-P in an application development system.

To install the ThinkIO-P proceed as follows:

1. Ensure that all prescribed safety requirements and commissioning prerequisites are observed.

WARNING!

To satisfy CE requirements regarding ESD protection, special dust caps must be installed on connectors X3, X6, and X7 (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-P. 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. Refer to appropriate ThinkIO-P documentation for further information.

2. Ensure that the ThinkIO-P 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 system components that it is not damaged through contact with the other components.

3. If at all possible it is highly recommended that the ThinkIO-P be physically secured within the ADE. This can be accomplished by mounting it on a DIN rail that is securely fastened to a work bench or by other means which will ensure that the ThinkIO-P is not damaged by falling or contact with other ADE elements. To install on a DIN rail proceed with step 4, otherwise go to step 7.

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4. Verify the correct positioning for the ThinkIO-P on the carrier rail and install as follows:

Note...

The ThinkIO-P carrier rail mounting assembly is comprised of four spring loaded clamps and their associated carrier rail eject handles for simultaneously opening of the clamps. As the clamp spring loading tension is quite high, the ThinkIO-P cannot be "snapped" onto the carrier rail. The spring tension must first be released before attempting to seat the ThinkIO-P.

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

   1. Position the ThinkIO-P on the carrier rail at position indicated.
   2. Apply pressure to the eject handles so as to allow the ThinkIO-P to engage with the carrier rail.
   3. Push the ThinkIO-P onto the carrier rail and release the eject handles.
   4. Ensure that the ThinkIO-P 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).

5. If WAGO I/O modules are to be installed refer to the appropriate application and WAGO documentation for their installation before proceeding. Analog to the ThinkIO-P itself, the WAGO I/O modules must be secured so as to prevent damage or improper operation. This is best accomplished by installing them on a secure DIN rail. If this is not possible, then by some other means which ensures their safety and proper operation.

Warning!

The remaining procedures concern themselves with the installation of ThinkIO-P 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.

6. If (an) end stop(s) for the carrier rail is(are) required proceed as follows.

   1. Verify the correct positioning of the end stop(s).
   2. Install the end stop(s) according to the end stop installation documentation.

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

Note...

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

8. Before applying any power to the ADE, all cabling must be verified to comply with the application requirements. Do not proceed before this is accomplished.
9. Once the cabling is verified, this part of the ADE is ready for initialization. Proceed to chapter 5.3 for operation of the ThinkIO-P.

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5.2 Replacement Procedures

The following procedures assume that the ThinkIO-P in question is installed in an existing ADE and it is necessary to remove and reinstall it or to replace it with another ThinkIO-P.

Warning!

DO NOT use these procedures to initially install a ThinkIO-P.

Refer to the Initial Installation Procedures for a first installation.

Failure to comply with the above may cause equipment damage, result in injury to personnel, or both.

5.2.1 ThinkIO-P Removal

To remove the ThinkIO-P proceed as follows:

1. Ensure that all safety requirements are observed.

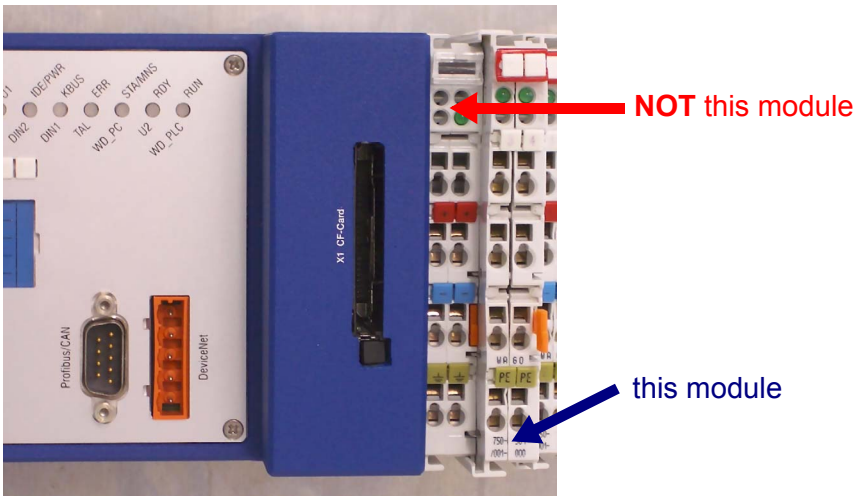
Warning!

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...

If the application also includes WAGO I/O modules, removal of the ThinkIO-P also requires removal of the WAGO I/O module closest to the ThinkIO-P (**not the WAGO interface module** (K-Bus)). See figure below. This must be performed before the removal of the ThinkIO-P. This is required to prevent possible damage to the ThinkIO-P and for ease of removal.



2. Disconnect all ThinkIO-P 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: X3, X6, and X7 (CAN/Profibus, RS232, DVI).

WARNING!

To satisfy CE requirements regarding ESD protection, special dust caps must be installed on connectors X3, X6, and X7 (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-P. In the event they are damaged or lost, replacement caps may be obtained by contacting Kontron Modular Computers.

4. If WAGO I/O modules are installed, disconnect all cabling to the WAGO I/O module closest to the ThinkIO-P 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. If WAGO I/O modules are installed and the assembly is installed on a DIN rail, remove the WAGO I/O module closest to the ThinkIO-P 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. Otherwise, simply disengage the ThinkIO-P from the WAGO I/O module stack. Dispose of the WAGO I/O module (stack) as required observing safety and ESD requirements.

Note...

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

Warning!

During operation the ThinkIO-P heats up and some parts of the enclosure may get hot enough to cause light burns if touched for a period of time longer than 1 to 2 seconds. Exercise care when handling a ThinkIO-P that has just been operated. If necessary, cool down the ThinkIO-P before handling it.

6. If required, apply pressure to the ThinkIO-P carrier eject handles to release the carrier rail retaining clamps and remove it from the carrier rail.
7. Dispose of the ThinkIO-P as required observing applicable environmental regulations governing the handling and disposition of this type of product.

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5.2.2 ThinkIO-P (Re-)Installation

The following procedure assumes that the ThinkIO-P in question is to be installed in an existing ADE and is not an initial installation. Refer to the Initial Installation Procedures for further information.

To install the ThinkIO-P proceed as follows:

1. Ensure that all safety requirements and commissioning prerequisites are observed. In addition, verify that the Initial Installation Procedures have been performed. If not, proceed to the Initial Installation Procedures.

WARNING!

To satisfy CE requirements regarding ESD protection, special dust caps must be installed on connectors X3, X6, and X7 (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-P. 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. Refer to appropriate ThinkIO-P documentation for further information.

2. Ensure that the ThinkIO-P 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 required, reinstall the WAGO I/O module removed previously in step 5 of the Removal procedure.

4. The following procedures assume an installation on a DIN rail. If this is not the case, disregard that information which applies to a DIN rail installation.
   Install the ThinkIO-P as follows:

Note...

The ThinkIO-P carrier rail mounting assembly is comprised of four spring loaded clamps and their associated carrier rail eject handles for simultaneously opening of the clamps. As the clamp spring loading tension is quite high, the ThinkIO-P cannot be "snapped" onto the carrier rail. The spring tension must first be released before attempting to seat the ThinkIO-P.

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

1. If required, position the ThinkIO-P so as to engage the WAGO I/O module closest to the ThinkIO-P position on the carrier rail.

Note...

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

The ThinkIO-P 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-P so that there is both pressure on the ThinkIO-P 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-P jams during this procedure, remove it and start again.

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

2. Push the ThinkIO-P in the direction of the carrier rail until it makes contact with the carrier rail
3. Apply pressure to the eject handles so as to allow the ThinkIO-P to engage with the carrier rail.
4. Push the ThinkIO-P onto the carrier rail and release the eject handles.

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5. Ensure that the ThinkIO-P 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).

Warning!

The remaining procedures concern themselves with the installation of ThinkIO-P 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 ADE.

Note...

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

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

5.3 ThinkIO-P Operation

The following chapters provide information concerning the initialization of the ThinkIO-P in an ADE.

5.3.1 Initialization Prerequisites

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

- All ThinkIO-P software elements required for application development have been installed and verified prior to the ThinkIO-P installation.
- The ThinkIO-P must have been installed in compliance with either the Initial Installation Procedures or the Replacement Procedures contained in this chapter.
- The remaining elements of the ADE must be configured and ready for operation.
- All personnel involved directly with the operation of the ADE have been informed of the pending operation of the ADE.

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-P or the remainder of the application system before verification of compliance has been accomplished.

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5.3.2 ThinkIO-P Initialization

Initialization of the ThinkIO-P is a function of the basic power up logic (hardware, firmware, BIOS, and operating system software) as well as the application system software itself.

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

Basic ThinkIO-P initialization in any event is as follows:

- Apply power to the ThinkIO-P and application system elements.
- The power up sequence begins automatically.
- The power up sequence ends (was successful).
- The system now searches for a boot device as follows:
  - USB floppy disk
  - USB CDROM
  - USB memory stick
  - External CompactFlash (ThinkIO-P socket: X1)
  - Onboard CompactFlash
- Upon detecting a boot 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-P are functions of the application development and as such are not within the scope of this manual.

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Chapter 6

Maintenance

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6. Maintenance

Except for replacement of the backup battery for the RTC and SRAM there are no user serviceable parts within the ThinkIO-P. For corrective maintenance of the ThinkIO-P, contact Kontron's technical support. For replacement of the backup battery refer to chapter 6.1

6.1 Replacement of the Backup Battery

The backup battery is located underneath the ThinkIO-P front plate. To replace the battery perform the following.

1. Ensure that all safety requirements are observed.

Warning!

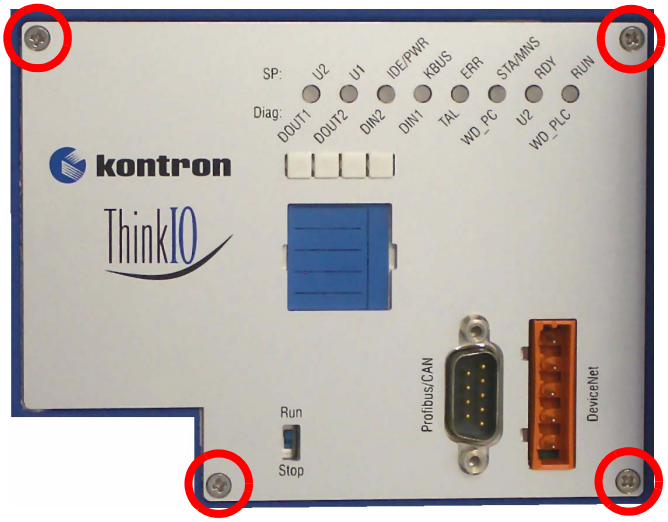
Failure to comply with the above may cause equipment damage, result in injury to personnel, or both. In particular, power must be removed from all components involved.

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

2. Acquire an appropriate battery (CR2025, 3V, Li-Mn button cell for example).
3. If required, remove the cable connected to X2 or X3.

Warning!

The front plate of the ThinkIO-P is secured by four retaining screws. When the last retaining screw is removed there is nothing holding the plate. Depending on how the ThinkIO-P is mounted the plate can fall off and be damaged. Take care to ensure that the plate does not fall off when applying the following procedures.



4. Remove the four front plate retaining screws.
5. Remove the front plate being careful not damage it or the connectors X2 or X3.

6. Remove the old battery and replace it with the new battery.

Note...

There are two possible battery holders for the ThinkIO-P. The first one has a flat spring retainer which holds the battery down in the holder. The second has a round spring which pushes the battery under two retaining flanges.

In either case, the battery can be removed using the left hand thumb and forefinger. Ensure that ESD requirements are met when applying the following procedures.

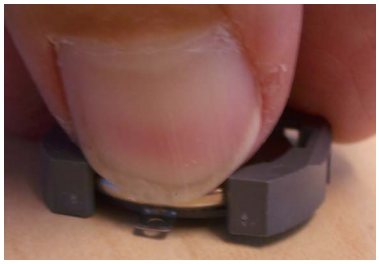
In the first case, slide the thumbnail under the retaining spring and lift up while at the same time pressing the far side of the battery down with the forefinger so as to cause the battery to be pushed up and out of the holder.

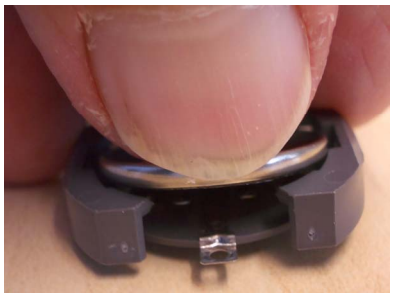
In the second case, simply push the battery back with the thumbnail until it is released from the holder and lift it with the thumbnail out of the holder.

Refer to the figures below for both methods.

First Case

Second Case





7. Reinstall the front plate ensuring that it is properly seated (LEDs properly fed through their holes in the front plate). If necessary, temporarily secure the front plate with adhesive tape to prevent it from falling off.

8. Reinstall the four front plate retaining screws ensuring that they are not over tightened or cross threaded.
9. If required, remove the adhesive tape installed in step 7.
10. If required, reinstall the cable that was disconnected in step 3.
11. Dispose of the old battery as required by local regulations.

This completes the replacement of the backup battery.

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