Fastwel

TK-8000

**Intel Pentium M Based
Fanless
Embedded Controller
with IP52 Protection**

User Manual

Rev. 002 E

September 2014

*The product described in this manual is compliant
to all related CE standards.*

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Revision History

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Notation Conventions

Warning, ESD Sensitive Device!

This symbol draws your attention to the information related to electro static sensitivity of your product and its components. To keep product safety and operability it is necessary to handle it with care and follow the ESD safety directions.

Warning!

This sign marks warnings about hot surfaces. The surface of the heatsink and some components can get very hot during operation. Take due care when handling, avoid touching hot surfaces!

Caution: Electric Shock!

This symbol warns about danger of electrical shock (> 60 V) when touching products or parts of them. Failure to observe the indicated precautions and directions may expose your life to danger and may lead to damage to your product.

Warning!

Information marked by this symbol is essential for human and equipment safety. Read this information attentively, be watchful.

Note...

This symbol and title marks important information to be read attentively for your own benefit.

General Safety Precautions

This product was developed for fault-free operation. Its design provides conformance to all related safety requirements. However, the life of this product can be seriously shortened by improper handling and incorrect operation. That is why it is necessary to follow general safety and operational instructions below.

Warning!

Only sufficiently skilled personnel must handle this product.

Warning!

When handling this product, special care must be taken not to hit the heatsink (if installed) against another rigid object. Also, be careful not to drop the product, since this may cause damage to sensitive components.

Please, keep in mind that any physical damage to this product is not covered under warranty.

Note:

This product is guaranteed to operate within the published temperature ranges and relevant conditions. However, prolonged operation near the maximum temperature is not recommended by Fastwel or by electronic chip manufacturers due to thermal stress related failure mechanisms. These mechanisms are common to all silicon devices, they can reduce the MTBF of the product by increasing the failure probability. Prolonged operation at the lower limits of the temperature ranges has no limitations.

Caution, Electric Shock!

Before installing this product into a system and before installing other devices on it, always ensure that your mains power is switched off.

Always disconnect external power supply cables during all handling and maintenance operations with this product to avoid serious danger of electrical shock.

Unpacking, Inspection and Handling

Please read the manual carefully before unpacking the product, disassembling the chassis, or mounting devices inside your system. Keep in mind the following:

ESD Sensitive Device!

Electronic modules and their components are sensitive to static electricity. Even a non-perceptible by human being static discharge can be sufficient to destroy or degrade a component's operation! Therefore, all handling operations and inspections of this product must be performed with due care, in order to keep product integrity and operability:

■ Preferably, unpack or pack, assemble or disassemble this product only at EOS/ESD safe workplaces. Otherwise, it is important to be electrically discharged before touching the electronic modules. This can be done by touching a metal part of your system case with your hand or tool. It is particularly important to observe anti-static precautions when setting jumpers or replacing components.

■ If the product contains batteries for RTC or memory back-up, ensure that the module is not placed on conductive surfaces, including anti-static mats or sponges. This can cause short-circuit and result in damage to the battery and other components.

■ Store this product in its protective packaging while it is not used for operational purposes.

Unpacking

The product is carefully packed in a carton box to protect it against possible damage and harmful influence during shipping. Unpack the product indoors only at a temperature not less than +15°C and relative humidity not more than 70%. Please note, that if the product was exposed to the temperatures below 0°C for a long time, it is necessary to keep it at normal conditions for at least 24 hours before unpacking. Do not keep the product close to a heat source.

Following ESD precautions, carefully take the product out of the shipping carton box. Proper handling of the product is critical to ensure correct operation and long-term reliability. When unpacking the product, and whenever handling it thereafter, be sure to hold electronic modules preferably by the front panel, card edges or ejector handles. Avoid touching the components and connectors.

Retain all original packaging at least until the warranty period is over. You may need it for shipments or for storage of the product.

Initial Inspection

Although the product is carefully packaged, it is still possible that shipping damages may occur. Careful inspection of the shipping carton can reveal evidence of damage or rough handling. Should you notice that the package is damaged, please notify the shipping service and the manufacturer as soon as possible. Retain the damaged packing material for inspection.

After unpacking the product, you should inspect it for visible damage that could have occurred during shipping or unpacking. If damage is observed (usually in the form of bent component leads or loose socketed components), contact Fastwel's official distributor from which you have purchased the product for additional instructions. Depending on the severity of the damage, the product may even need to be returned to the factory for repair. DO NOT apply power to the product if it has visible damage. Doing so may cause further, possibly irreparable damage, as well as result in a fire or electric shock hazard.

If the product contains socketed components, they should be inspected to make sure they are seated fully in their sockets.

Handling

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

In order to keep Fastwel's warranty, you must not change or modify this product in any way, other than specifically approved by Fastwel or described in this manual.

Technical characteristics of the systems in which this product is installed, such as operating temperature ranges and power supply parameters, should conform to the requirements stated by this document.

Retain all the original packaging, you will need it to pack the product for shipping in warranty cases or for safe storage. Please, pack the product for transportation in the way it was packed by the supplier.

When handling the product, please, remember that electronic modules, their components and connectors require delicate care. Always keep in mind the ESD sensitivity of the product.

Three Year Warranty

Fastwel Co. Ltd. (Fastwel), warrants that its standard hardware products will be free from defects in materials and workmanship under normal use and service for the currently established warranty period. Fastwel's only responsibility under this warranty is, at its option, to replace or repair any defective component part of such products free of charge.

Fastwel neither assumes nor authorizes any other liability in connection with the sale, installation or use of its products. Fastwel shall have no liability for direct or consequential damages of any kind arising out of sale, delay in delivery, installation, or use of its products.

If a product should fail through Fastwel's fault during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labor and materials rates.

Warranty period for Fastwel products is 36 months since the date of purchase.

The warranty set forth above does not extend to and shall not apply to:

1. Products, including software, which have been repaired or altered by other than Fastwel personnel, unless Buyer has properly altered or repaired the products in accordance with procedures previously approved in writing by Fastwel.

2. Products, which have been subject to power supply reversal, misuse, neglect, accident, or improper installation.

Returning a product for repair

1. Apply to Fastwel company or to any of the Fastwel's official representatives for the Product Return Authorization.

2. Attach a failure inspection report with a product to be returned in the form, accepted by customer, with a description of the failure circumstances and symptoms.

3. Carefully package the product in the antistatic bag, in which the product had been supplied. Failure to package in antistatic material will VOID all warranties. Then package the product in a safe container for shipping.

4. The customer pays for shipping the product to Fastwel or to an official Fastwel representative or dealer.

1 Introduction

1.1 Overview

The product described in this Manual is Fastwel TK-8000, a highly integrated fanless industrial computer with IP52 protection designed to work in harsh environment either as human-operated or unattended system at remote location. Data acquisition and processing, industrial automation, transport as well as security are among the major application areas of Fastwel TK-8000.

Having inside Pentium M 1.8 GHz CPU with 2 MB L2 cache, 1 GB DDR SDRAM with ECC and embedded Graphics Engine with VGA output up to 2048×1536@75 Hz, Fastwel TK-8000 is capable to perform major computing and visualization tasks in industrial applications within extended temperature range from –40°C to +70°C.

Modern board architecture and robust mechanical design ensure capability of Fastwel TK-8000 to withstand up to 50G shock, up to 5G vibration and up to 95% humidity level without operability loss. All electronic components including CPU, SDRAM memory, and 32 MB flash memory are soldered on board. TK-8000 is equipped with conduction cooling system for effective heat sinking from CPU and other critical components to the all-metal chassis.

Two Gigabit Ethernet channels provide Fastwel TK-8000 with high speed communication links important for fast data exchange with server or storage facility, for working in Remote Desktops operation mode or any other bandwidth-hungry applications. Two RS232 ports, two RS485 ports, four USB 2.0 ports and one multi-mode parallel port provide connectivity to peripheral devices. Audio interface is available via three audio jacks. The system can be expanded using one PC/104 or PC/104-Plus module installed on the processor module inside the system chassis; however, this may require the front panel design changes.

Fastwel TK-8000 can be ordered with CF or SSD installed having either IDE or SATA interfaces.

BIOS of Fastwel TK-8000 can be configured for booting from onboard flash, CF storage or via LAN and USB. TK-8000 supports wide range of real time (QNX, WinCE) and non-real time (Windows XP/XP Embedded and Linux) operating systems. Fastwel TK-8000 requires external 9-30V DC power supply.

Some of the TK-8000 features are:

- ■ Durable wallmount aluminum alloy housing with IP52 protection
- ■ Wide operating temperature range
- ■ Fanless design with Intel® Pentium® M 1.8 GHz processor
  - ▪ Up to 2 MB L2 on-die cache running at CPU speed
  - ▪ 400 MHz processor system bus
- ■ 82855GME GMCH and 6300ESB (Hance Rapid) ICH chipset
- ■ 1 GB of soldered PC2700 DDR SDRAM memory with ECC
- ■ PC/104 or PC/104-Plus expansion capability
- ■ Integrated high performance VGA controller
  - ▪ 2D/3D accelerator
  - ▪ Video memory up to 64 MB shared with system
  - ▪ Analog display support with resolutions of up to 2048×1536 pixels at 16 bits and 75 Hz
- ■ Two Gigabit Ethernet interfaces (via PCI-X bus): 10Base-T, 100Base-TX, and 1000Base-T
- ■ Space for one EIDE or SerialATA 2.5" disk drive inside the housing
- ■ Internal CompactFlash Type I/II socket (true IDE mode)
- ■ Four serial ports on the front and rear panels
  - ▪ High speed NS16C550 compatible
  - ▪ COM1 and COM2 – RS-232 (rear panel)
  - ▪ COM3 and COM4 – RS-485 (front panel)
- ■ Four USB 2.0 ports
- ■ Audio: AC97 codec LM4550
  - ▪ Line In stereo
  - ▪ Line Out stereo
  - ▪ Microphone input
- ■ Parallel port: SPP/ECP/EPP compatible
- ■ Hardware monitor: voltages and temperature monitoring, system control functions (LM87)
- ■ Programmable watchdog timer
- ■ Additional counters and timers integrated in the ICH
- ■ Real-time clock with Li battery
- ■ One 1 MB on-board FWH for BIOS storage
- ■ DC 9~30V input with Phoenix connector, optional external AC input power adapter
- ■ Phoenix® BIOS

1.2   TK-8000 Versions

At the present time, the TK-8000 system is offered in flexible configuration. The options include different processors, the size of soldered system memory, and other options described in this section. Other configuration options are available upon request.

The customer can choose necessary configuration options using the following template:

| 1 | – | 2 | – | 3 | – | 4 | | 5 |

1   Basic product name:
TK-8000-02

2   Processor:
C1.0   Celeron M 1.0 GHz, ULV, 400 MHz FSB
P1.4   Pentium M 1.4 GHz, LV, 400 MHz FSB
P1.8   Pentium M 1.8 GHz, 400 MHz FSB

3   Soldered system memory:
RAM512   512 MB soldered DDR SDRAM
RAM1024   1024 MB soldered DDR SDRAM

4   Other options:
CompactFlash card options (\CF####)

Option	Volume
\CF1024	1024 MB, industrial
\CF2G	2 GB, industrial
\CF4G	4 GB, industrial
\CF8G	8 GB, industrial
\CF16G	16 GB, industrial

2.5" disk drive installed
\HDDxx   Hard disk drive 2.5", xx GB
\SSDxx   Solid state disk 2.5", xx GB

Operating system
\XPP   Windows XP Pro
\XPE   Windows XP Embedded
\LNX   Linux 2.4.20, 2.6.11
\WCE   Windows CE
\QNX   QNX 6.0, 4.25

External power supply
\ACDC   External AC/DC power supply unit

Example:

TK-8000-02 – P1.8 – RAM1024 \CF2G \HDD120 \XPE

BoxPC, Pentium M, DDR, FFD 32 MB, SVGA, LVDS, 2x Gigabit Ethernet
Pentium M 1.8 GHz, 400 MHz FSB
1024 MB soldered DDR SDRAM
2 GB CompactFlash card
Hard disk drive 2.5", 120 GB
Windows XP Embedded

1.3   Delivery Checklist

Before you begin operating your PC, please make sure that the following materials are enclosed:

1.   TK-8000 embedded controller
2.   One Phoenix power connector
3.   Two wallmount brackets
4.   Adaptor for mounting a HDD/SSD
5.   Screw package
6.   CD-ROM with documentation and service software
7.   Protective caps set for all front and rear panel connectors (installed on TK-8000)
8.   Consumer package

Note:

Keep the original package at least until the warranty period is over.
It can be used for future storage or warranty shipments.

1.4   System Diagrams

The diagrams in this section give visual information about the TK-8000 system design, its appearance, and connectors. The diagrams may not reflect insignificant differences between the revisions of TK-8000.

1.4.1   Module Appearance

Figure 1-1:   TK-8000 Appearance: Rear and Front Views

*The appearance may vary for different versions of the system
due to continuous improvement and development efforts.*

1.4.2   Dimensions and Layout Diagrams

Figure 1-2:   **TK-8000 Top View: Dimensions**
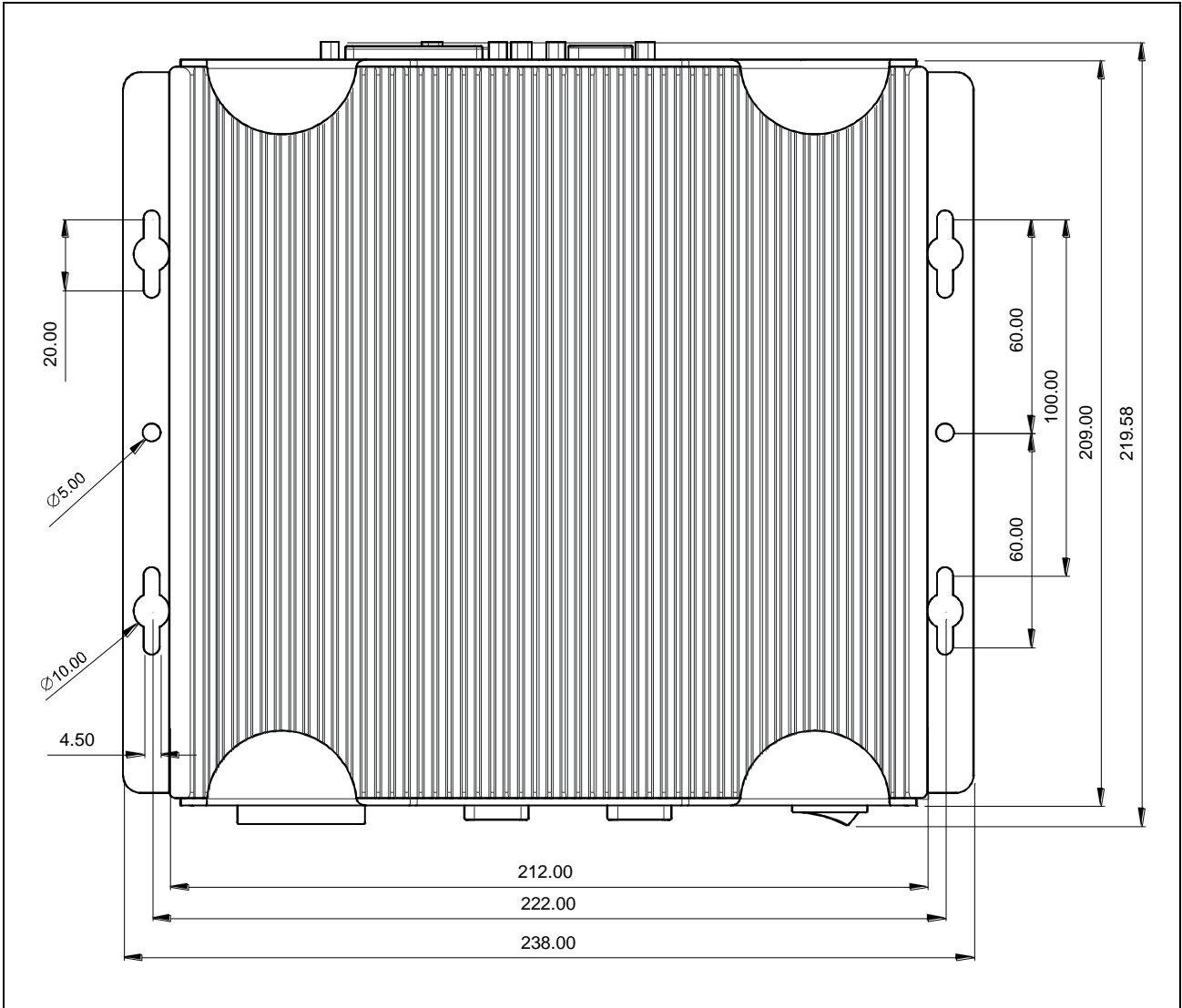
Figure 1-3:   TK-8000 Front Panel: Dimensions and Layout
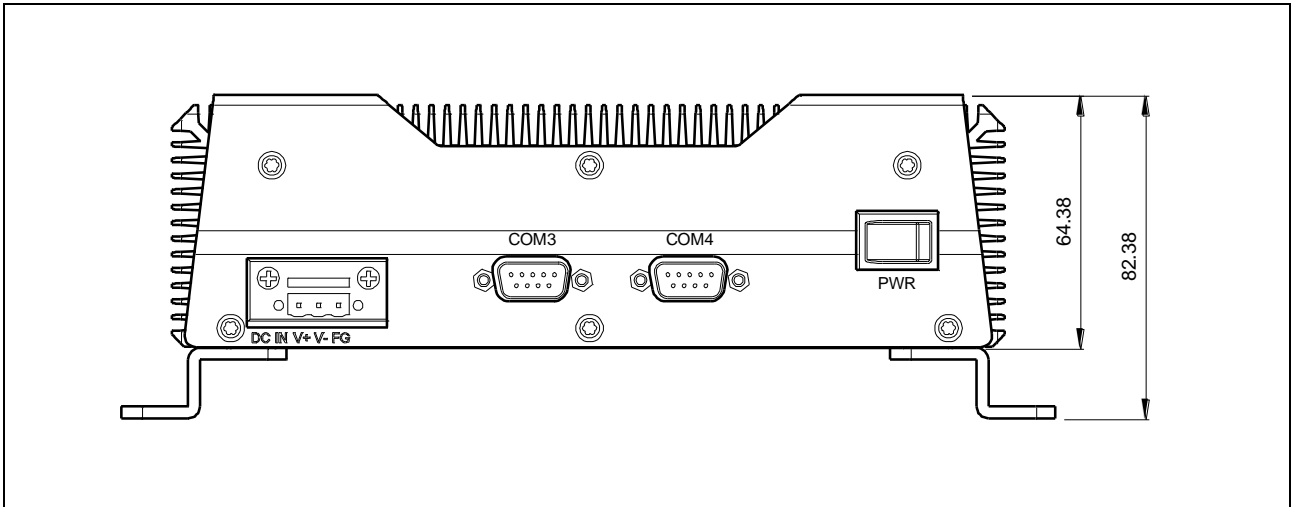
The layout may slightly vary for different versions of the computer.

Figure 1-4:   TK-8000 Rear Panel: Layout
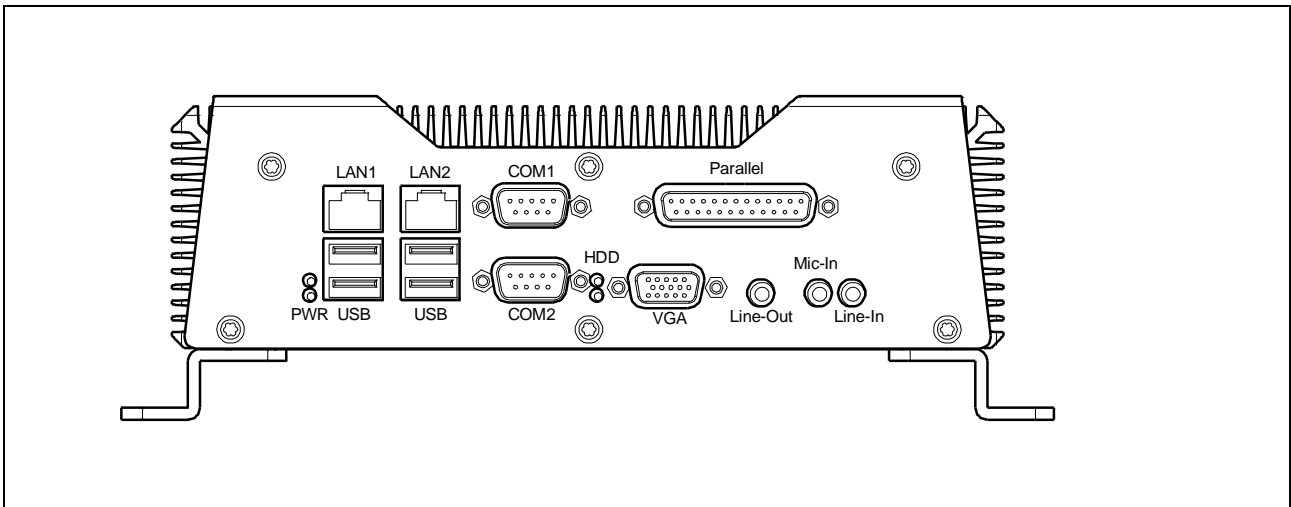
The layout may slightly vary for different versions of the computer.

1.5 Technical Specifications

1.5.1 Processor, Memory and Chipset

CPU

TK-8000 is equipped with one of the following Intel® processors:

Pentium® M

- Up to 1.8 GHz
- Up to 2 MB L2 on-die cache
- 400 MHz PSB
- Supports SpeedStep® III for low power mode

Low Voltage Pentium® M

- Up to 1.4 GHz
- Up to 2 MB L2 on-die cache
- 400 MHz PSB
- Supports SpeedStep® III for low power mode

Ultra Low Voltage Celeron® M

- Up to 1.0 GHz
- Up to 512 KB L2 on-die cache
- 400 MHz PSB

Memory

Main system memory:

- Up to 1 GB of soldered DDR SDRAM memory, ECC support
- Memory frequency: 333 MHz (PC2700)

Flash memory:

- 1 MB flash memory Firmware Hub (a part of the chipset)
- One 256 byte EEPROM for storing CMOS data when operating without battery
- 30 KB FRAM memory for emergency storage of vital user data

1.5.2 Interfaces

PC/104 and PC/104-Plus Interfaces

- 16-bit, 8.33 MHz ISA bus
- 32-bit, 33 MHz PCI bus; 3.3V / 5.0V compatible;
  PCI bus mastering devices are supported

Gigabit Ethernet

Two 10/100/1000 MB/s Gigabit Ethernet interfaces based on
Intel 82546GB dual port Ethernet PCI-X bus controller

- Two RJ45 rear panel connectors
- Automatic mode recognition
- Automatic cabling configuration recognition

Cabling requirement: Category 5, UTP, four-pair cabling

Serial ports

- COM1 and COM2: RS-232, two 9-pin D-sub rear panel connectors;
limited functionality (see subsection 2.3.4 for details)
- COM3 and COM4: RS-485 or TTL level UART interface; 16C550 compatible UART;
two 9-pin D-sub front panel connectors;

USB Interface

- Four USB 2.0 Type A sockets at rear panel
- Support for UHCI and EHCI

Parallel port

Multi-Mode™ parallel port

- Standard Mode IBM PC/XT, PC/AT, and PS/2 compatible bidirectional parallel port
- SPP/ECP/EPP compatible
- Available at rear panel via DB-25 connector

VGA CRT Interface

- Video controller integrated in 855GME
- Built-in Intel 2D/3D graphics accelerator
- Supports analog display resolutions of up to 2048 x 1536, 16 bit at 75 Hz
- HW motion compensation for software MPEG2 and MPEG4 decoding
- Video memory up to 96 MB shared with system
- 15-pin D-sub VGA rear panel connector

Keyboard and Mouse

Keyboard and mouse connection via USB connector

Audio Interface

- AC'97 2.3 compatible controller
- Three standard 3.5 mm coaxial rear panel connectors: Line-In, Line-Out, Mic-In

Mass Storage

Optional internal 2.5" SSD or HDD with Serial ATA or IDE interfaces

Fastwel Flash Disk® (FFD)

- 32 MB soldered NAND flash disk (up to 1 GB as an option)

CompactFlash:

- CompactFlash Type I/II internal socket (true IDE mode)
- CompactFlash 4.1 specification supported

1.5.3   Monitoring and Control

Thermal Management

CPU overtemperature protection is provided by:

- ■ Internal processor temperature control unit initiates CPU shut down
- ■ Processor frequency control conforms to ACPI specification
- ■ Processor die temperature monitor can report processor temperature to the user program
- ■ Custom designed heat sinking system

Temperature Monitor

- ■ LM87 hardware monitor for supervision of the on-die CPU temperature and the board surface temperature

Watchdog Timers

- ■ FPGA based programmable watchdog timer
- ■ Programmable watchdog timer integrated in 6300ESB ICH

LEDs

Four LEDs are located on the rear panel:

- ■ D7 GP Green LED: Power
- ■ D7 GP Red LED: FPGA Xilinx controlled
- ■ D8 GP Green LED: Super I/O controlled
- ■ D8 GP Red LED: Storage device activity indicator

Gigabit Ethernet status (1 and 2, optional):

- ■ Line: yellow: Line connected
- ■ Act: green: Network activity

1.5.4   Other

Mechanical

Aluminum alloy chassis, wall mounting

Dimensions: with wall-mount brackets: 238 mm × 209 × 82.4 mm
(9.4" × 6.5" × 3.2")

without brackets: 212 mm × 209 mm × 64.4 mm
(8.3" × 6.5" × 2.5")

see Dimensions Diagram

Net weight: 3.3 kg (7.28 lb)

Gross weight: 4 kg (8.82 lb)

Power Supply

- ■ DC input: 9 ... 30 V
- ■ Optional external AC/DC power adaptor, AC input: 100 ... 240 V
- ■ Power on/off switch at front panel

Battery

3.0 V lithium battery for RTC in a battery holder on the processor module;
use PANASONIC BR2032 or compatible

Temperature Ranges

    Operating: -40°C ... +70°C (CF or SSD)
    Storage: -55°C ... +85°C

Shock

    50G peak acceleration, 11 ms (CF or SSD)

Vibration

    5G RMS, 50…500 Hz (CF or SSD)

Humidity

    RH 5% to 90%, non-condensing

EMC

    CE/FCC Class A

1.5.5 Software

BIOS

    Enhanced Phoenix® flash-based BIOS

- Reserved CMOS memory
- LAN, USB, Multi boot and Quick boot support
- ACPI 3.0
- Software enable/disable function for the Ethernet and COM port configuration
- Plug&Play capability

Supported Operating Systems

- Fastwel DOS
- Microsoft® Windows® CE5.0/XP/XPE
- Linux® 2.4.20, 2.6.11
- QNX®

2 Interfaces and Connectors

TK-8000 is based on the Fastwel CPC800-02 processor module. For information on the features and detailed specifications of this processor module, please refer to the CPC800-02 User Manual.

2.1 PC/104 and PC/104-Plus Interfaces

PC/104 and PCI-104 connectors are located on the processor module of TK-8000. One PC/104 or PC/104-Plus expansion module can be installed on the processor module inside the system chassis; however, this may require the front panel design changes.

PC/104 Connector

The PC/104 interface accepts an 8- or 16-bit PC/104 expansion modules. The PC/104 bus uses a 104-pin 0.10" (2.54 mm) pitch header located on the top side of the processor module. This interface header will carry all of the appropriate 8 MHz ISA bus signals.

The contact configuration of PC/104 header is shown in Figure 2-1. Two tables below give the designation of this header contacts.

Figure 2-1:   PC/104 J11 Connector Contacts Layout
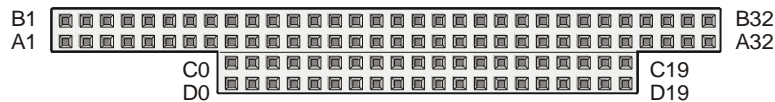
Table 2-1:   **PC/104 J11 (Rows A and B) Connector Contacts Designation**

Pin #	Signal	In/Out	Pin #	Signal	In/Out
A1	/IOCHK	–	B1	GND	Ground
A2	SD7	In/Out	B2	RESETDRV	Out
A3	SD6	In/Out	B3	+5V	Power
A4	SD5	In/Out	B4	IRQ9	In
A5	SD4	In/Out	B5	-5V	–
A6	SD3	In/Out	B6	DRQ2	In
A7	SD2	In/Out	B7	-12V	Power
A8	SD1	In/Out	B8	/ENDXFR	In
A9	SD0	In/Out	B9	+12V	Power
A10	IOCHRDY	In	B10	KEY	–
A11	AEN	Out	B11	/SMEMW	Out
A12	SA19	Out	B12	/SMEMR	Out
A13	SA18	Out	B13	/IOW	Out
A14	SA17	Out	B14	/IOR	Out
A15	SA16	Out	B15	/DACK3	Out
A16	SA15	Out	B16	DRQ3	In
A17	SA14	Out	B17	/DACK1	Out
A18	SA13	Out	B18	DRQ1	In
A19	SA12	Out	B19	/REFRESH	Out
A20	SA11	Out	B20	SYSCLK	Out
A21	SA10	Out	B21	IRQ7	In
A22	SA9	Out	B22	IRQ6	In
A23	SA8	Out	B23	IRQ5	In
A24	SA7	Out	B24	IRQ4	In
A25	SA6	Out	B25	IRQ3	In
A26	SA5	Out	B26	/DACK2	Out
A27	SA4	Out	B27	TC	Out
A28	SA3	Out	B28	BALE	Out
A29	SA2	Out	B29	+5V	Power
A30	SA1	Out	B30	OSC	Out
A31	SA0	Out	B31	GND	Ground
A32	GND	Ground	B32	GND	Ground

Table 2-2:   **PC/104 J11 (Rows C and D) Connector Contacts Designation**

Pin #	Signal	In/Out	Pin #	Signal	In/Out
C0	GND	Ground	D0	GND	Ground
C1	/SBHE	Out	D1	/MEMCS16	In
C2	LA23	Out	D2	/IOCS16	In
C3	LA22	Out	D3	IRQ10	In
C4	LA21	Out	D4	IRQ11	In
C5	LA20	Out	D5	IRQ12	In
C6	LA19	Out	D6	IRQ13	In
C7	LA18	Out	D7	IRQ14	In
C8	LA17	Out	D8	/DACK0	Out
C9	/MEMR	Out	D9	DRQ0	In
C10	/MEMW	Out	D10	/DACK5	Out
C11	SD8	In/Out	D11	DRQ5	In
C12	SD9	In/Out	D12	/DACK6	Out
C13	SD10	In/Out	D13	DRQ6	In
C14	SD11	In/Out	D14	/DACK7	Out
C15	SD12	In/Out	D15	DRQ7	In
C16	SD13	In/Out	D16	+5V	Power
C17	SD14	In/Out	D17	/MASTER	In
C18	SD15	In/Out	D18	GND	Ground
C19	KEY	–	D19	GND	Ground

Note:

In the tables above:

"–" - Not used;
"Power" - The power is supplied to the module installed in a stack
In/Out column shows the data transfer direction for a processor module
    being the bus master.

PCI-104 Connector

PCI-104 connector is a 120-pin (30x4) 2 mm pitch header located on the top of the processor module. This interface header carries all of the appropriate 32-bit 33 MHz PCI signals.

Figure 2-2:   **PCI-104 J4 Connector Contacts Layout**
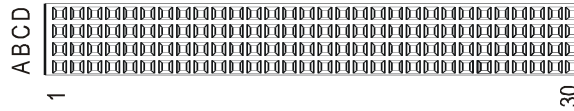
Table 2-3:   **PCI-104 J4 Connector Contacts Designation**

Pin	A	B	C	D
1	GND/5.0V_KEY2	Reserved	+5	AD00
2	VI/O	AD02	AD01	+5V
3	AD05	GND	AD04	AD03
4	/C/BE0	AD07	GND	AD06
5	GND	AD09	AD08	GND
6	AD11	VI/O	AD10	M66EN
7	AD14	AD13	GND	AD12
8	+3.3V	/C/BE1	AD15	+3.3V
9	/SERR	GND	Reserved	PAR
10	GND	/PERR	+3.3V	Reserved
11	/STOP	+3.3V	/LOCK	GND
12	+3.3V	/TRDY	GND	/DEVSEL
13	/FRAME	GND	/IRDY	+3.3V
14	GND	AD16	+3.3V	/C/BE2
15	AD18	+3.3V	AD17	GND
16	AD21	AD20	GND	AD19
17	+3.3V	AD23	AD22	+3.3V
18	IDSEL0	GND	IDSEL1	IDSEL2
19	AD24	/C/BE3	VI/O	IDSEL3
20	GND	AD26	AD25	GND
21	AD29	+5V	AD28	AD27
22	+5V	AD30	GND	AD31
23	/REQ0	GND	/REQ1	VI/O
24	GND	/REQ2	+5V	/GNT0
25	/GNT1	VI/O	/GNT2	GND
26	+5V	CLK0	GND	CLK1
27	CLK2	+5V	CLK3	GND
28	GND	/INTD	+5V	/RST
29	+12V	/INTA	/INTB	/INTC
30	-12V	Reserved	Reserved	GND/3.3V_KEY

The PC/104-Plus VIO selector (J3) is located on the top side of the processor module next to the PCI-104 header and allows to set the voltage supplied to PCI interface I/O buffers. It is a standard 3-pin (2.54" pitch) header. Figure below presents explanation of its jumper positions.

Figure 2-3:   **PC/104-Plus VIO Selector J3 Positions**
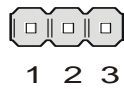
The jumper should be removed only if the module is powered via J4 connector from a PC/104-Plus power supply module. In case the processor module receives power through J1 power connector, the jumper must be installed in one of the two positions, described below.
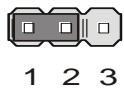
Contacts 1-2 closed, +5 V power is supplied to PCI interface I/O buffers
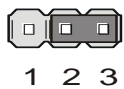
Contacts 2-3 closed, +3.3 V is supplied.

2.2   Graphics Controller

The 855GME chipset of the processor module includes a highly integrated graphics accelerator delivering high performance 2D and 3D video capabilities. The graphics controller provides interface to a standard analog monitor via the VGA connector on TK-8000 rear panel.

Integrated 2D/3D graphics features:

- Resolutions up to 1600×1200 at 100 Hz, 1920×1440 at 85 Hz and 2048×1536 at 75 Hz
- 3D Setup and Render Engine
- 3D Graphics Rasterization Enhancements
- High Quality Texture Engine
- Full 2D hardware acceleration
- Intel® 855GM/855GME DVMT graphics core
- Intelligent Memory Management
- Integrated 350 MHz DAC

2.2.1   DVM Technology

The 855GME chipset supports the Dynamic Video Memory Technology (DVMT). This technology provides use of all available memory in the most efficient way for maximum graphics performance. DVMT dynamically responds to requests from applications allocating the required amount of video memory. The Intel® 855GME graphics driver is allowed to request up to 96 MB of system memory. When not needed by the graphics subsystem, the memory is freed up for other applications. Thus, memory usage is balanced for optimal graphics and system memory performance.

To support legacy VGA devices the internal video-controller needs at least 1 MB of system memory. Thus, the reported system memory size is always 1 MB less than available amount of physical memory.

2.2.2 Supported Resolutions

The integrated 350 MHz RAMDAC of the 855GME chipset allows direct connection of a progressive scan analog monitor with a resolution of up to 2048 × 1536 at 75 Hz. The supported resolution depends on the color depth and on the vertical scanning frequency, as illustrated in the table below.

Table 2-4:   Supported Display Modes

Display Mode	Color Resolution vs. Vertical Frequency											
	8-bit Indexed				16- bit				32- bit			
	60	75	85	100	60	75	85	100	60	75	85	100
640 × 480	×	×	×	×	×	×	×	×	×	×	×	×
800 × 600	×	×	×	×	×	×	×	×	×	×	×	×
1024 × 768	×	×	×	×	×	×	×	×	×	×	×	×
1280 × 1024	×	×	×	×	×	×	×	×	×	×	×	×
1600 × 1200	×	×	×	×	×	×	×	×	×	×	×	×
1920 × 1440	×	×	×		×	×	×		×	×	×	
2048 × 1536	×	×			×	×			×	×		

2.2.3 VGA CRT Interface and Connector

Figure 2-4:   D-Sub VGA-CRT Connector
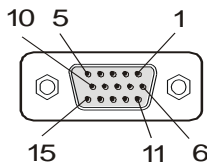
The 15-contact female D-Sub standard connector is used to connect a VGA CRT analog monitor to the TK-8000. This connector is located on the rear panel.

Table 2-5:   VGA Connector Pinout

Pin Number	Signal	Function	In/Out
1	Red	Red video signal output	Out
2	Green	Green video signal output	Out
3	Blue	Blue video signal output	Out
9	VCC_MON	Power +5V, 200 mA	Out
12	DDC_DATA	I^2C™ data	In/Out
13	HSYNC	Horizontal sync.	TTL out
14	VSYNC	Vertical sync.	TTL out
15	DDC_CLOCK	I^2C™ clock	Out
5, 6, 7, 8	GND	Signal ground	–
4, 10, 11	NC	–	–

2.3 Audio Interface

The following standard audio connectors are located on the rear panel of TK-8000:
Line-Out, Mic-In, and Line-In.

2.4 Serial Interfaces

COM1 and COM2 (RS-232 with limited functionality, see below) ports are available at the rear panel of TK-8000 as two 9-pin D-Sub connectors, and COM3 and COM4 interfaces are available via the 9-pin D-Sub connectors on the front panel. All COM ports are compatible with the 16550 controller (see the note below) and include a complete set of handshaking and modem control signals, maskable interrupt generation and data transfer of up to 460.8 Kb/s. Switching between RS-485 and TTL modes for COM3 and COM4 ports is performed in BIOS Setup; the default setting is RS-485.

Table 2-6:   Functions of the Serial Port Interfaces

Interface	Location	Function
COM1	Rear panel	RS232
COM2	Rear panel	RS232
COM3	Front panel	RS485*
COM4	Front panel	RS485*

> *   *TTL signals are not connected to the contacts of front panel connectors*
> *for the current version of the computer.*

Figure 2-5:   D-Sub Serial Connectors
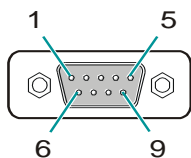
According to "Intel 6300ESB I/O Controller HUB (ICH) Specification update", it has limited functionality due to unexpected behavior of serial port interrupt enable register.

Below is an abstract from this document:

2. Behavior of Serial Port Interrupt Enable Register

Problem: The Serial Port Interrupt Enable Register (IER) bit 1 [3f9h] (Transmit Data request Interrupt Enable) will not change status if the bit has been set previously.

Implication: Will not cause an interrupt if the register bit has been set already. This hinders the serial ports from being fully 100 percent 16550 compatible.

Workaround: Customers may be able to implement a BIOS workaround to clear out the bit IER bit 1 to '0' before programing the bit to '1'.

Status: No fix.

Thus, serial ports integrated in South bridge are compatible with standard UART 16550, except the following registers:

1. Changed designation of bits 4 and 5 of IER (Interrupt Enable Register)
2. Changed designation of bits 6 and 7 of FCR (FIFO Control Register)

For details see "IntelR 6300ESB I/O Controller Hub Datasheet. February 2004", pages 667-671.

Serial connectors' pinouts are presented in the tables below.

Table 2-7: **Serial Port Connectors: COM1 and COM2 Pinouts**

Pin	RS232	Pin	RS232
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RIN
5	GND	–	–

Table 2-8: **Serial Port Connectors: COM3 and COM4 Pinouts**

Pin	Signal	Pin	Signal
1	Data1	6	Data1#
2	NC	7	NC
3	NC	8	NC
4	NC	9	NC
5	GND	–	–

Note:

The RS485 interfaces (COM3 and COM4) provide for support of up to 256 network segments. In case the computer is supposed to serve as a terminal network device, it is necessary to mention this fact when ordering TK-8000. The required SMT 120 ohm terminal resistors will be installed at the factory.

2.5 USB Interfaces

Figure 2-6: **USB Connectors**

TK-8000 supports four USB 2.0 ports, they are available via standard A-type USB sockets at rear panel. All four ports are high-speed, full-speed, and low-speed capable.

UHCI compliant Hi-speed USB 2.0 allows data transfers of up to 480 Mb/s – 40 times faster than a full-speed USB (USB 1.1).

One USB peripheral may be connected to each port. To connect more than four USB devices use an external hub. The USB power supply is protected by a self-resettable 500 mA fuse.

The table below presents the contacts' designation of USB connectors.

Table 2-9: **USB Connectors Pinout**

Pin Number	Signal	Function	In/Out
1	VCC	VCC signal	–
2	UV0–	Differential USB–	–
3	UV0+	Differential USB+	–
4	GND	GND signal	–

2.6   Parallel Port Interface

Figure 2-7:   **D-Sub LPT Connector**
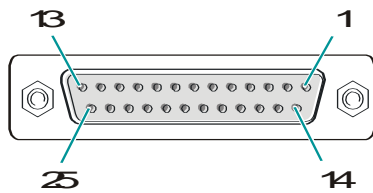
Standard parallel port (IEEE1284, ECP/EPP) is available via the standard 25-contact female connector at rear panel of TK-8000. Its contacts designation is presented below.

Table 2-10:   **D-Sub LPT Connector Pinout**

Pin #	LPT1 Signals	Pin #	LPT1 Signals
1	/STROBE	14	/AUTOFD
2	D0	15	/ERR
3	D1	16	/INIT
4	D2	17	/SELIN
5	D3	18	GND
6	D4	19	GND
7	D5	20	GND
8	D6	21	GND
9	D7	22	GND
10	/ACK	23	GND
11	BUSY	24	GND
12	PE	25	GND
13	SEL	–	–

2.7   Gigabit Ethernet

Figure 2-8:   **Gigabit Ethernet Connectors**
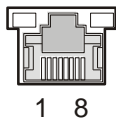
TK-8000 includes two 10Base-T / 100Base-TX / 1000Base-T Ethernet ports based on the Intel® 82546GB dual-port Gigabit Ethernet PCI-X bus controller. Each of the two rear panel Ethernet connectors is realized as an RJ45 connector for twisted-pair cabling.

The Intel® 82546GB Gigabit Ethernet controller architecture combines high performance and low power consumption. The controller's features include independent transmit and receive queues to limit PCI-X bus traffic, and a PCI-X interface that maximizes the use of bursts for efficient bus usage.

The interfaces provide automatic detection and switching between 10Base-T, 100Base-TX, and 1000Base-T operation modes. Each of the two Ethernet channels may be disabled via the BIOS Setup or user software utility to release system resources .

Table 2-11: **Gigabit Ethernet Connectors Pinouts**

Pin	10Base-T		100Base-TX		1000Base-T	
	I/O	Signal	I/O	Signal	I/O	Signal
1	O	TX+	O	TX+	I/O	BI_DA+
2	O	TX–	O	TX–	I/O	BI_DA–
3	I	RX+	I	RX+	I/O	BI_DB+
4	–	–	–	–	I/O	BI_DC+
5	–	–	–	–	I/O	BI_DC–
6	I	RX–	I	RX–	I/O	BI_DB–
7	–	–	–	–	I/O	BI_DD+
8	–	–	–	–	I/O	BI_DD–

MDI / Standard Ethernet Cable

Integrated Ethernet LEDs (Optional)

Green: Line: This LED indicates network connection. The LED lights up when the line is connected.

Green: Act: this LED monitors network activity. The LED lights up when network packets are sent or received through the RJ45 port. When this LED is not lit, it means that the computer is not sending or receiving network data.

2.8 EIDE Interface

The EIDE interface supports several operation modes: PIO mode, 8237-type DMA mode, Ultra DMA/33 modes. In PIO mode the central processor controls the data transfers. In all the DMA modes the CPU is not engaged in data transfer. DMA modes are similar to each other, but differ in data transfer protocols details and DMA clock frequency, thus providing different transfer rates. Only ATA/33 mode is available at the current version of the processor module, providing transfer rates of up to 33.3 MB/sec.

The current version of TK-8000 supports two EIDE channels, but only one of them is available for user devices connection. Primary channel is used by CompactFlash, secondary channel is routed via the standard AT HDD 44-pin onboard connector of the processor module (J9), which can be used for connection of EIDE devices.

Figure 2-9: **IDE HDD On-Board Connector**
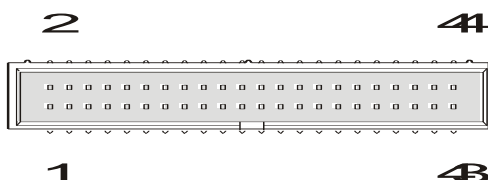
A standard AT HDD 44-pin IDC connector is mounted on the top side of the processor module. It is possible to connect both secondary master and secondary slave devices to this EIDE channel. Maximum IDE cable length is 50 cm. The pinout of the standard AT HDD connector is shown in the table below.

Table 2-12:   Standard EIDE HDD Connector (J9) Pinout

Pin Number	Signal	Function	In/Out
1	/RESET	Reset HD	Out
2	GND	Ground signal	–
3	DD7	HD data 7	In/Out
4	DD8	HD data 8	In/Out
5	DD6	HD data 6	In/Out
6	DD9	HD data 9	In/Out
7	DD5	HD data 5	In/Out
8	DD10	HD data 10	In/Out
9	DD4	HD data 4	In/Out
10	DD11	HD data 11	In/Out
11	DD3	HD data 3	In/Out
12	DD12	HD data 12	In/Out
13	DD2	HD data 2	In/Out
14	DD13	HD data 13	In/Out
15	DD1	HD data 1	In/Out
16	DD14	HD data 14	In/Out
17	DD0	HD data 0	In/Out
18	DD15	HD data 15	In/Out
19	GND	Ground signal	–
20	–	–	–
21	DRQ	DMA request	In
22	GND	Ground signal	–
23	/IOW	I/O write	Out
24	GND	Ground signal	–
25	/IOR	I/O read	Out
26	GND	Ground signal	–
27	/IOCHRDY	I/O channel ready	In
28	GND	Ground signal	–
29	/DACK	DMA Ack	Out
30	GND	Ground signal	–
31	IRQ	Interrupt request	In
32	/CS16	–	–
33	DA1	Address 1	Out
34	–	ATA66/100 Detect	–
35	DA0	Address 0	Out
36	DA2	Address 2	Out
37	/CS1	Select Register #1	Out
38	/CS3	Select Register #3	Out
39	DASP	IDE Activity	Out
40	GND	Ground signal	–
41	+5V	+5V	–
42	+5V	+5V	–
43	GND	Ground signal	–
44	–	–	–

2.9 SerialATA Interface

Figure 2-10: SATA Connector
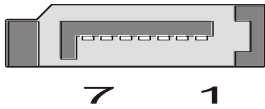
The processor module of TK-8000 bears two on-board SATA connectors (J7, J8) for attachment of SerialATA HDDs or SSDs with the exchange rate of up to 150 MB/s. The connectors' pinout is presented in the table below.

Table 2-13: SATA Connectors (J7, J8) Pinout

Contact Number	Function
1	GND
2	TXP
3	TXN
4	GND
5	RXN
6	RXP
7	GND

2.10 CompactFlash Socket

CompactFlash card is a compact removable mass storage device. It provides full IDE functionality compatible with the 16-bit ATA/ATAPI-4 interface. TK-8000 has an internal CompactFlash Type I/II 50-pin socket (J23) on the bottom side of the processor module. It is accessible from the outside of the system chassis via an opening closed with separate cover.

Figure 2-11: CompactFlash Slot Cover
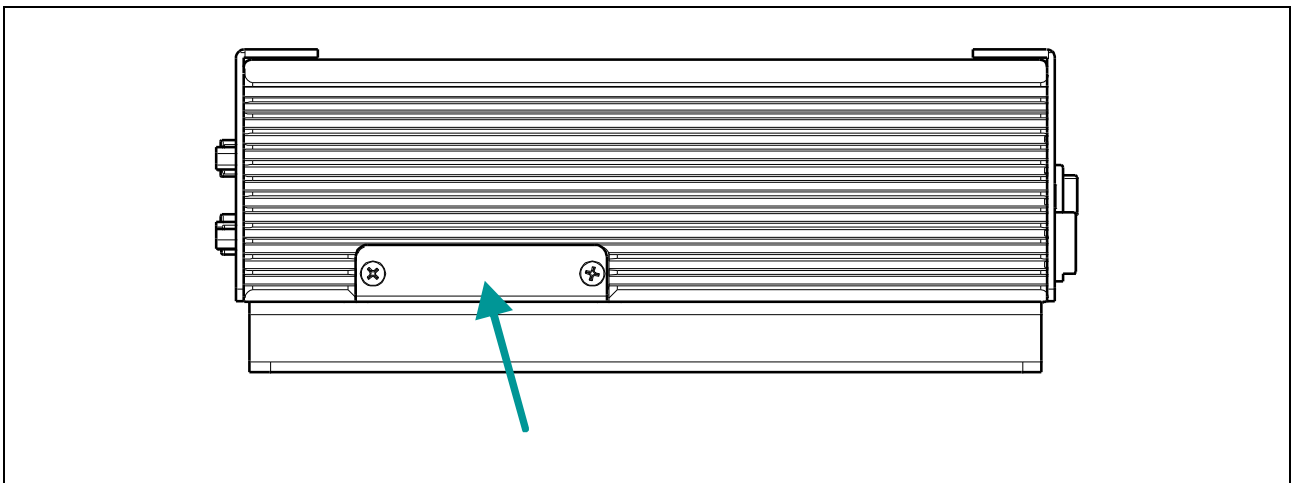
CompactFlash socket is connected to the primary master EIDE channel.

Table 2-14:   CompactFlash Socket (J23) Pinout

Pin Number	Signal	Function	In/Out
1	GND	Ground signal	–
2	D03	Data 3	In/Out
3	D04	Data 4	In/Out
4	D05	Data 5	In/Out
5	D06	Data 6	In/Out
6	D07	Data 7	In/Out
7	IDE_CS0	Chip select 0	Out
8	GND	–	–
9	GND	–	–
10	GND	–	–
11	GND	–	–
12	GND	–	–
13	3.3 V	3.3 V power	–
14	GND	–	–
15	GND	–	–
16	GND	–	–
17	GND	–	–
18	A02	Address 2	Out
19	A01	Address 1	Out
20	A00	Address 0	Out
21	D00	Data 0	In/Out
22	D01	Data 1	In/Out
23	D02	Data 2	In/Out
24	IOCS16	–	–
25	CD2	–	–
26	CD1	–	–
27	D11	Data 11	In/Out
28	D12	Data 12	In/Out
29	D13	Data 13	In/Out
30	D14	Data 14	In/Out
31	D15	Data 15	In/Out
32	IDE_CS1	Chip select 1	Out
33	VS1	–	–
34	IORD	I/O read	Out
35	IOWR	I/O write	Out
36	3.3 V	3.3 V power	–
37	INTRQ	Interrupt	In
38	3.3 V	3.3 V power	–
39	CSEL	Master/Slave	Out
40	VS2	–	–
41	Reset	Reset	Out
42	IORDY	I/O ready	In
43	INPACK	DMA Request	Out
44	REG	DMA Acknowledge	–
45	ACTIVE	IDE Activity	–
46	PDIAG	DMA Mode Detect	–
47	D08	Data 08	In/Out
48	D09	Data 09	In/Out
49	D10	Data 10	In/Out
50	GND	–	–

2.11 Power Supply

Figure 2-12: External Power Supply Connector

DC IN V+ V- FG
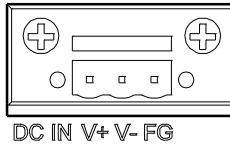
DC power is supplied to TK-8000 via the Phoenix connector on the front panel. The mating connector is included in the supplied set. DC input voltage is 9 to 30 V.

Optional external AC/DC power adapter (1757912001) is available with AC input voltage of 100 ... 240 V and output voltage of +19 VDC. Power cable (1702031831) is ordered separately.

The table below presents designation of the power connector contacts.

Table 2-15: Power Supply Connector Pinout

Front Panel Label	Designation
V+	9 … 30 VDC
V-	0
FG	GND (it is not required for operation)

System power on/off switch (PWR) is located on the front panel as well.

2.12 Soft Power and Reset Connectors

2-pin connectors SoftPower (J28) and Reset (J29) are located on the top side of the processor module. These connectors can be used at the factory for debugging purposes only. They are not connected to any external connectors at the current version of TK-8000. Please, refer to the processor module User Manual for detailed description. (*TBA*)

2.13 LED Indicators

There are four LED indicators on the rear panel of TK-8000. Their functions are presented in the table below.

Table 2-16:   Rear Panel LEDs

Name	Function
D7 Green	General purpose LED controlled by Super I/O
D7 Red	General purpose LED controlled by FPGA Xilinx XC3S200
D8 Green	General purpose LED controlled by Super I/O
D8 Red	Storage device activity

LED's Default Functions:

D7 (red) – has no default function – programmable only.

D7 (green) – "System Boot State". D7 (green) blinks while system is starting boot sequence and lights up when the boot procedure successfully finished.

D8 (red) – "Storage device activity". D8 (red) lights up while IDE or SATA device is accessed.

D8 (green) – has no default function – programmable only.

2.13.1   D7 Red LED Control

D7 Red LED is controlled by means of FPGA XILINX XC3S200 using bit#3 (LED) of the control register.

Programming sequence:

- Enter configuration mode:

```
MOV    DX, 302H
MOV    AL, 46H
OUT    DX, AL
MOV    AL, 57H
OUT    DX, AL
```

- Write to LDN register logical device number (number 1, the same as WD)

```
MOV    DX, 302H
MOV    AL, 7
OUT    DX, AL
MOV    DX, 303H
MOV    AL, 1
OUT    DX, AL
```

- Control register is available via F0 index register. To read value from control register:

```
MOV    DX, 302H
MOV    AL, F0H
OUT    DX, AL
MOV    DX, 303H
IN     AL, DX     ; AL contains control register value
```

- Now LED can be switched on:

```
OR    AL, 8      ; set bit#3
OUT   DX, AL
```

   …or switched off:

```
AND   AL, 247    ; clear bit#3
OUT   DX, AL
```

- To leave configuration mode:

```
MOV   DX, 302H
MOV   AL, 57H
OUT   DX, AL
MOV   AL, 46H
OUT   DX, AL
```

Moreover, red D7 LED is lit when a BIOS error is detected and Reset signal is generated.

2.13.2   D7 Green and D8 Green LEDs Control

D7 and D8 indicators are controlled via Super I/O LPC47M10X controller registers programming.

For control purposes, GPI42 line is programmed as output. Setting logical "1" at it lights up the LED, setting logical "0" switches it off.

3 Installation and Setup

TK-8000 is easy to install. However, it is necessary to follow the procedures and safety regulations below to install hardware and software correctly without damage to the equipment, or harm to personnel.

For details on installation of an operating system, please refer to the relevant software documentation.

3.1 Safety Regulations

The following safety regulations must be observed when installing or operating the TK-8000. Fastwel assumes no responsibility for any damage resulting from infringement of these rules.

Warning!

When handling or operating the processor module, special attention should be paid to the heat-sinking system, because it can get very hot during operation. Do not touch the heat-conducting parts.

Moreover, the processor module should not be placed on any surface or in any kind of package until the module and its heat-conducting parts have cooled down to ambient temperature.

Caution!

Always switch off the system power before connecting or disconnecting the power supply cable to the computer's power connector. Disregarding this requirement could be harmful for your life or health and can damage the processor module or entire system.

ESD Sensitive Equipment!

This product comprises electrostatically sensitive components. Please follow the ESD safety instructions to ensure operability and reliability:

- Use grounding equipment, if working at an anti-static workbench. Otherwise, discharge yourself and the tools in use before touching the sensitive equipment.
- Try to avoid touching contacts, leads and components.
- Disconnect power cable before mounting or removing PC/104 or PC/104-Plus expansion module.

Extra caution should be taken in cold and dry weather.

3.2   Hardware Installation

A lot of peripheral devices can be connected to the TK-8000. Their installation procedures differ significantly. Therefore the following sections provide mainly general guidelines regarding installation of peripheral devices. The details on external devices connection can be found in documentation supplied with these devices.

For some operations it is necessary to dismount the covers of the system chassis. The diagram below shows the TK-8000 disassembled.

Figure 3-1:   Disassembled TK-8000
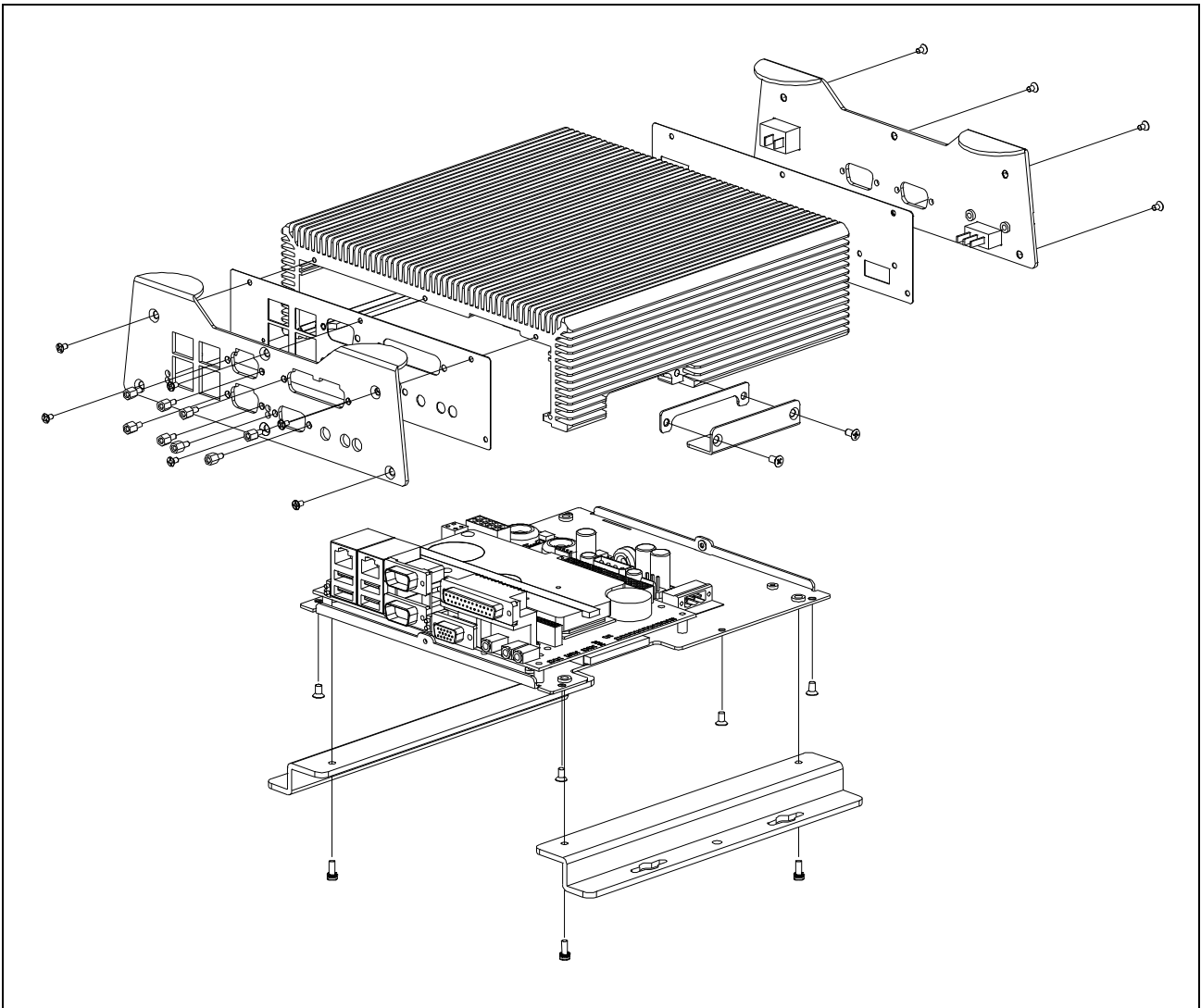
3.2.1   USB Devices Connection

TK-8000 can accept Plug&Play connection of USB 2.0 computer peripheral devices (printers, keyboards, mice, etc.) All USB devices may be connected or disconnected while the host power is on.

3.2.2 CompactFlash Cards Installation

CompactFlash socket on the processor module of TK-8000 supports any 3.3 V or 5 V CompactFlash ATA type I/II cards. The CompactFlash slot is accessible via the side opening of the system chassis.

Note:

Connection of the CompactFlash cards while the power is on may damage your system.

Note:

It is recommended to use CompactFlash-cards, which has been initialized and formatted in this module.
By default, TK-8000 utilizes LBA mode. Utilization of CompactFlash cards, which has been initialized and formatted in another mode, may lead to errors in operation.

1. Unscrew the side lid of TK-8000.

2. Carefully slide the correctly oriented CF card into the CF slot and gently press to engage the contacts completely.

3. Attach the side lid to the chassis and tighten the screws.

3.2.3 Battery Replacement

The lithium battery installed on the processor module of TK-8000 must be replaced with Panasonic BR2032 or a battery with similar characteristics.

The expected life of a 190 mAh battery (Panasonic BR2032) is about 5 years. However, this typical value may vary because battery life depends on the operating temperature and the shutdown time of the system in which the battery is installed.

Note:

It is recommended to replace the battery after approximately 4 years to be sure it is operational.

Note:

Always diconnect power supply cables from the processor module before replacing the battery.

Replacing the battery, make sure the polarity is correct ("+" up).

Dispose of used batteries according to the local regulations.

3.2.4   PC/104 and PC/104-Plus Expansion Module Installation

The PC/104 and PCI-104 connectors on the processor module of TK-8000 allow you to install interface expansion modules; however, this may require the front panel design changes.

Warning!

When installing any PC/104 or PC/104-Plus module, avoid excessively flexing the processor board. Mate pins correctly and use the required mounting hardware.

Note...

Before installing and operating the PC/104-Plus expansion modules it is necessary to set the voltage supplied to PCI interface I/O buffers using the J3 VIO selector of the processor module. See details below.

Note...

To allow an additional amount of distance between the processor module and the expansion module, it is recommended to use stackthrough intermediate connectors and additional standoffs. ISA (1375795-2, 1375795-4) and PCI (AMP 1375799-1, AMP 1375799-4) spacers are offered by Tyco/AMP.

3.2.4.1   PC/104-Plus Voltage Selection

The PC/104-Plus voltage should be set before installation of PC/104-Plus expansion modules on the processor module.

Figure 3-2:   **PC/104-Plus VIO Selector J3 Positions**
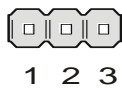
There is a standard 3-pin header for PC/104-Plus voltage selection. The explanation of its jumper positions is presented below.
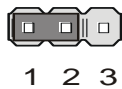
Contacts 1-2 closed, +5 V power is supplied to PCI interface I/O buffers
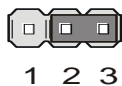
Contacts 2-3 closed, +3.3 V

3.2.5 HDD or SSD Installation

Ensure that the computer is off and the power cable is disconnected before proceeding with installation.

To install a disk drive inside the system chassis, it necessary to disassemble the computer:

1. Unscrew the rear panel, the front panel, the CF cover, and the bottom lid.

2. To assemble the disk drive unit, mount the disk on the plate placing four black dumpers between them and tighten four screws.

3. Connect data and power cables to the disk drive.

4. Fasten the disk drive unit on the chassis with four screws.

5. Fasten the bottom lid and the CF cover with the eight screws.

6. Fasten the front panel and the rear panel.

3.2.6 Wall-Mount Kit Installation

Get the brackets ready and fasten each bracket with screws on the bottom lid.

3.3 Drivers Installation

The TK-8000 comes with a CD-ROM that contains necessary drivers and utilities.

Table 3-1: **Drivers Location**

OS	Description	Folder Name
Windows XP *	Audio Driver	\win2k_xp\audio\
	Chipset Driver	\win2k_xp\chipset\
	Ethernet Driver	\win2k_xp\eth\
	Video Driver	\win2k_xp\graphics\
	ISA Bridge Driver	\win2k_xp\ite8888\
Linux 2.4	Ethernet Driver	\linux\eth\
	DRI Video Driver	\linux\graphics\

*   - fully compatible with Windows XP Professional SP3.

Insert the TK-8000 CD-ROM into the CD-ROM drive. The Autorun program will run automatically. Choose the drivers to install following instructions below.

3.3.1   Windows XP

Audio Driver Installation

1.   Double click the System icon to open up your System Properties window.

2.   Click Hardware and then Device Manager in the System Properties window.

3.   Locate and right click the driver; select Update driver.

4.   In the opened wizard's window check "Yes, this time only" and press Next.

5.   In the next window check "Install from a list or specific location" and press Next.

6.   In the next window check "Don't search. I will choose the driver to install" and press Next.

7.   Press "Have disk" button, locate and select the driver (*\win2k_xp\audio*) and press "OK".

8.   To start installation press "Next".

9.   To complete installation press "Finish".

Chipset Driver Installation

1.   Click on the *\win2k_xp\chipset* folder and then double click on the *infinst_enu.exe*.

2.   Follow the instructions of the wizard, it will guide you through the installation process.

LAN Driver Installation

1.   Click on the *\win2k_xp\eth* folder and then double click on the *PRO2KXP.exe*

2.   Follow the instructions of the wizard, it will guide you through the installation process.

Graphics Driver Installation

1.   Click on the *\win2k_xp\graphics* folder and select Windows folder

2.   Double click on the *win2k_xp141950.exe*

3.   Follow the instructions of the wizard, it will guide you through the installation process.

ISA Bridge Driver Installation

1.   Double click the System icon to open up your System Properties window.

2.   Click Hardware and then Device Manager in the System Properties window.

3.   Right click the driver and select Update driver.
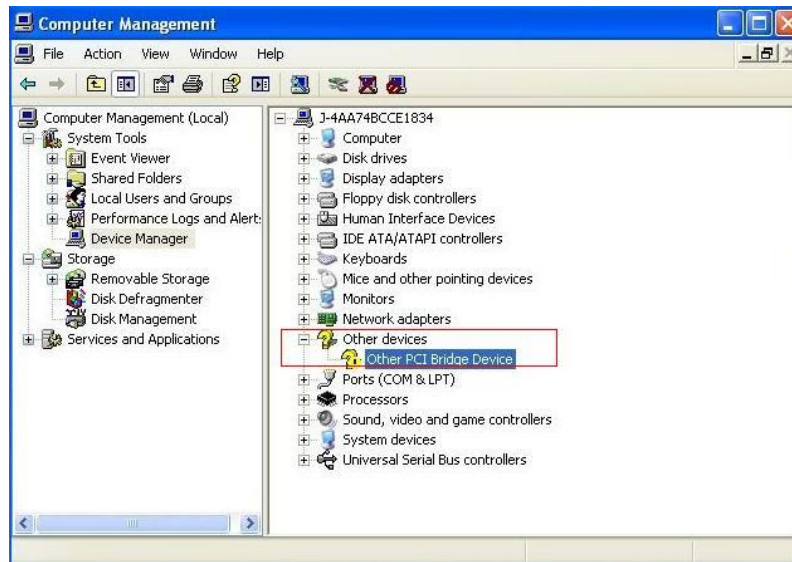
4. In the opened wizard's window check "Yes, this time only" and press Next.

5. In the next window check "Install from a list or specific location" and press Next.

6. In the next window check "Don't search. I will choose the driver to install" and press Next.

7. Press "Have disk" button, locate and select the driver (*win2k_xp\ite8888*) and press "OK".

8. To start the installation press "Next".

9. To complete the installation press "Finish".

3.3.2   Linux 2.4

Ethernet Driver Installation

To uncompress the files (to get the files out of a tarball), use the following command in Linux:

```
tar xvfz e1000-7.2.9.tar.gz
```

Graphics Driver Installation

To uncompress the files (to get the files out of a tarball), use the following command:

```
tar xvfz Intel-3.4.3006-20051209.i386.tar.gz
```

3.4 Watchdog Timer

The watchdog timer eliminates system hang-ups both during the start-up process (for example, in case of mistakes in BIOS, when the additional timer is not able to restart the system) and during normal operation. The timeout period is set in BIOS Setup program. On the expiry of the timeout period the watchdog timer issues "Reset" signal. During start-up process watchdog timer monitors BIOS code execution. If BIOS error is detected, the system is automatically reset and red D7 LED is lit indicating system failure state. The instructions on watchdog timer programming can be found in the following subsections.

FPGA XILINX XC3S200 is used to control the watchdog timer. 17 lower bits of the 24-bit WD FPGA register are used to program the watchdog timeout period. It is possible to set the timeout period from 0 to 512 seconds with increments of 30.52 μs by changing the value in this register.

By default, without prior initialization, the watchdog timeout period is set to maximum that is 512 seconds. The equation below can be used to calculate the timeout T_{WD} in μs as a function of the decimal value in the WD register (K_{WD}):

$$T_{WD} [\mu s] = K_{WD} * 10^6 / 2^{15}$$

For example, decimal value "1" of K_{WD} (000001h) corresponds to the timeout of 30.52 μs, and K_{WD} = 16777215 (FFFFFFh) – 512 seconds.

3.4.1 Access to Watchdog Registers

The unit's configuration is based on Plug-and-Play architecture. Watchdog timer registers are available via standard I/O registers (Index and Data ports) in configuration mode.

Port	Address	Operation
Config Port	302h	Write
Index Port	302h	Read/Write
Data Port	303h	Read/Write

3.4.2 Configuration Mode

Configuration mode is enabled by writing <46h><57h> to Config Port. Configuration mode is disabled by writing <57h><46h> to Config Port. Index and Data ports are available in configuration mode only.

3.4.3   **Watchdog Timer Programming**

The procedures of watchdog timer programming is described below:

- Enter configuration mode

```
MOV    DX, 302H
MOV    AL, 46H
OUT    DX, AL
MOV    AL, 57H
OUT    DX, AL
```

- Write to LDN register a logic device number (watchdog timer has logical number 1)

```
MOV    DX, 302H
MOV    AL, 7
OUT    DX, AL
MOV    DX, 303H
MOV    AL, 1
OUT    DX, AL
```

- Watchdog timer registers are available for read and write now.
  For example, to read status register 3eh and to write the value from it back:

```
MOV    DX, 302H
MOV    AL, 3EH
OUT    DX, AL
MOV    DX, 303H
IN     AL, DX
OUT    DX, AL
```

- To exit configuration mode:

```
MOV    DX, 302H
MOV    AL, 57H
OUT    DX, AL
MOV    AL, 46H
OUT    DX, AL
```

3.4.4 Global Configuration Registers

Index	Type	Hard Reset	Configuration Register
7h	R/W	01h	Logical Device Number

Logical Device Number register (index 7h)

Index = 7h		
Bit	**Name**	**Description**
7:1	-	Not used
0	LDN	Write/Read: Writing to this register selects logical device.

3.4.5 Logical Devices Configuration Registers

Index	Type	Hard Reset	Configuration Register
30h	R/W		Activate
60h	R/W		I/O port base address bits [15:8]
61h	R/W		I/O port base address bits [7:0]
70h	R/W	00h	Primary interrupt select

Activate register

Index = 30h		
Bit	**Name**	**Description**
7:1	-	Not used
0	Activate	Write/Read: 1 – Current logical device enabled 0 – Current logical device disabled

I/O port base address registers

Index = 60h		
Bit	**Name**	**Description**
7:1	-	Not used
0	I/O_Base_Adress[15:8]	Write/Read: Current logical device base address bits 15:8
Index = 61h		
Bit	**Name**	**Description**
7:1	-	Not used
0	I/O_Base_Adress[7:0]	Write/Read: Current logical device base address bits 7:0

Primary interrupt select register

Index = 70h		
Bit	**Name**	**Description**
7:4	-	Not used
3:0	Interrupt_select	Write/Read: 00h – Interrupt disabled 01h – IRQ1 02h – SMI 03h – IRQ3 04h – IRQ4 05h – IRQ5 06h – IRQ6 07h – IRQ7 08h – IRQ8 09h – IRQ9 0ah – IRQ10 0bh – IRQ11 0ch – IRQ12 0dh – IRQ13 0eh – IRQ14 0fh – IRQ15

3.4.6 Watchdog Timer Registers (Logical Device 1)

Index	I/O Port Address	Type	Hard Reset	Configuration Register
30h	–	R/W		Activate
38h	Base+0	R/W		Timer current value [7:0]
39h	Base+1	R/W		Timer current value [15:8]
3ah	Base+2	R/W		Timer current value [23:16]
3bh	Base+3	R/W	00h	Timer initial value [7:0]
3ch	Base+4	R/W	40h	Timer initial value [15:8]
3dh	Base+5	R/W	00h	Timer initial value [23:16]
3eh	Base+6	R/W	00h	Status register
3fh	Base+7	R/W	03h	Control register
60h	–	R/W		Base [15:8] – I/O port base address bits [15:8]
61h	–	R/W		Base [7:3] – I/O port base address bits [7:3] Base [2:0] – should be 0
70h	–	R/W	00h	Primary interrupt select

4   Phoenix® BIOS Setup

The Phoenix® BIOS in your computer is a customized version of a standard BIOS for IBM PC AT-compatible personal computers equipped with Intel®x86 and compatible processors. The BIOS provides low-level support for the system central processing, memory, and I/O subsystems.

With the help of BIOS Setup program, you can modify BIOS configuration parameters and control special features of your computer. The Setup program offers a convenient menu interface to modify basic system configuration settings and to switch between the subsystems operation modes. These settings are then stored in a dedicated battery-backed memory, CMOS RAM, that retains the information when the system power is switched off.

To start the Phoenix BIOS Setup utility turn on or reboot your system. PhoenixBIOS displays this message:

```
            Press <F2> to enter SETUP
```

Pressing <F2> lets you enter the Setup utility. The first screen is the Main Menu.

4.1   Main Menu

The Main Menu screen is shown below.
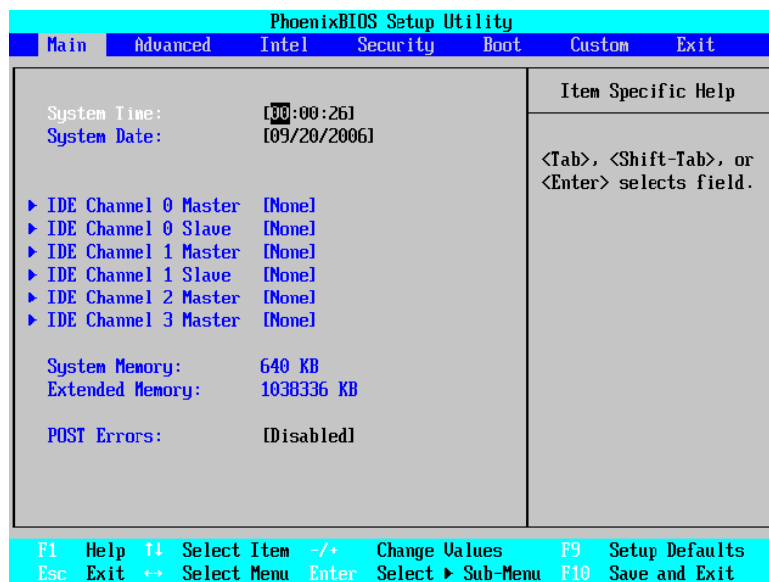
The following subsections explain the purpose of main functional areas of the screen and give description of the fields.

Menu Bar

The Menu Bar at the top of the window lists these selections:

Menu	Purpose
Main	Basic system configuration
Advanced	Use to set the Advanced Features available on your system's chipset
Intel	Intel chipset-specific parameters
Security	Configuration of system security settings
Boot	Boot sequence configuration
Custom	Configuration of special board features
Exit	Exits the Setup utility

Use the left and right (←, →) arrow keys to make a selection.

For a description on exiting the Main Menu, see "Exit Menu" section below.

Legend Bar

The legend bar at the bottom of the screen lists the keys to navigate within menu system, to make your selections or exit the current menu. The following table describes the legend keys and their alternates.

Key	Function
<F1> or <Alt-H>	General Help window (See below)
<Esc>	Exit this menu
← or → arrow keys	Select a different menu
↑ or ↓ arrow keys	Move cursor up and down
<Tab> or <Shift-Tab>	Cycle cursor between the fields
<Home> or <End>	Move cursor to top or bottom of window
<PgUp> or <PgDn>	Move cursor to next or previous page
<F5> or <->	Select the next lower value for the field
<F6> or <+> or <Space>	Select the next higher value for the field
<F9>	Load the Default Configuration values for the complete BIOS
<F10>	Save and exit
<Enter>	Execute command or select ► Submenu
<Alt-R>	Refresh screen

To select an item, use the arrow keys to move the cursor to the field you want. Then use the plus-and-minus value keys to select a value for that field. The Save Values command in the Exit Menu save the values currently displayed in all the menus.

A pointer ► marks all submenus. To display a submenu, use the arrow keys to move the cursor to the submenu you want, and then press <Enter>.

Item Specific Help Window

The help window on the right side of each menu screen displays the field-specific help text, it updates as you move the cursor from field to field.

General Help Window

Pressing <F1> or <Alt-H> on any menu brings up the General Help window that describes the legend keys and their alternates.

```
                    PhoenixBIOS Setup Utility
    Main    Advanced    Intel    Security    Boot    Custom    Exit
                                                                    ▓p
    Sy
    Sy                         General Help                      │ or
         Setup changes system behavior by modifying the BIOS     │eld.
    ▶ ID configuration. Selecting incorrect values may
    ▶ ID cause system boot failure; load Setup Default values to
    ▶ ID recover.
    ▶ ID
    ▶ ID <Up/Down> arrows select fields in current menu.
    ▶ ID <PgUp/PgDn> moves to previous/next page on scrollable menus.
         <Home/End> moves to top/bottom item of current menu.
    Sy
    Ex   Within a field, <F5> or <-> selects next lower value and
         <F6>, <+>, or <Space> selects next higher value.
    PO
                              [Continue]

    F1  Help  ↑↓  Select Item  -/+    Change Values   F9   Setup Defaults
    Esc  Exit  ↔   Select Menu  Enter  Select ▶ Sub-Menu  F10  Save and Exit
```

The scroll bar on the right of any window indicates that there is more than one page of information in the window. Use <PgUp> and <PgDn> to display all the pages. Pressing <Home> and <End> displays the first and last page. Pressing <Enter> displays each page and then exits the window.

Press <Esc> to exit the window.

Main Menu Selections

Main Menu screen offers possibility to set system time and date, to enter type, specifications, and control options for the devices connected to IDE channels. Additionally, this menu screen gives information on the amount of the detected main and extended system memory, and allows to set system response to POST errors.

⚠ **Warning:**

Incorrect settings may cause your system to malfunction.
To correct mistakes, return to Setup and restore the Setup Defaults with <F9> and re-enter the correct drive parameters.

4.2 Advanced Menu

The Advanced Menu screen is shown below.

```
                    PhoenixBIOS Setup Utility
    Main    Advanced    Intel    Security    Boot    Custom    Exit

                                                Item Specific Help
    Installed O/S:                  [WinXP]
    Reset Configuration Data:       [No]
    Large Disk Access Mode:         [DOS]        Select the operating
    Local Bus IDE adapter:          [Both]       system installed
                                                 on your system which
    Parallel ATA:                   [Both]       you will use most
    Serial ATA:                     [Enabled]    commonly.
    Native Mode Operation:          [Auto]
                                                 Note: An incorrect
  ▶ Advanced Chipset Control                     setting can cause
  ▶ Super I/O Device Configuration               some operating
  ▶ Keyboard Features                            systems to display
  ▶ Cache Memory                                 unexpected behavior.
  ▶ PCI/PNP ISA IRQ Resource Exclusion

    Legacy USB Support:
    Enable memory gap:              [Disabled]  ▼

    F1   Help   ↑↓  Select Item  -/+   Change Values   F9   Setup Defaults
    Esc  Exit   ↔   Select Menu  Enter Select ▶ Sub-Menu F10  Save and Exit
```

This menu screen gives access to advanced system configuration parameters. Submenus allow setting thermal and power control options, configuring serial and parallel ports, adjusting keyboard behavior, enabling cache memory use for various system components, and reserving IRQs for legacy ISA devices.

Remember, that incorrect settings can cause your system to malfunction.

4.3   Intel Menu

The Intel menu screen offers a number of submenus containing chipset-specific control fields.

```
                    PhoenixBIOS Setup Utility
     Main     Advanced    Intel    Security    Boot    Custom    Exit

                                              Item Specific Help
    ▶ CPU Control Sub-Menu
    ▶ MCH Control Sub-Menu
    ▶ Video (Intel IGD) Control Sub-Menu      These items control
    ▶ ICH Control Sub-Menu                    various CPU parameters.

    ▶ ACPI Control Sub-Menu
    ▶ APM Control Sub-Menu
    ▶ Workaround Control Sub-Menu




     F1   Help  ↑↓  Select Item  -/+   Change Values   F9   Setup Defaults
     Esc  Exit  ↔   Select Menu  Enter Select ▶ Sub-Menu F10  Save and Exit
```

CPU power and thermal management, MCH and ICH control options, integrated graphics controller parameters, as well as ACPI and APM control – all these features are available via submenus on this screen.

4.4   Security Menu

Various system security settings, such as supervisor password and other access control parameters, are collected at this menu screen.

```
                    PhoenixBIOS Setup Utility
     Main     Advanced    Intel    Security    Boot    Custom    Exit

                                              Item Specific Help
     FirstWare Authentication Level  [High]
     Supervisor Password Is:         Clear
     User Password Is:               Clear    Select FirstWare
                                              authentication level
     Set Supervisor Password         [Enter]
     Set User Password

     Diskette access:
     Fixed disk boot sector:         [Normal]
     Virus check reminder:           [Disabled]
     System backup reminder:         [Disabled]
     Password on boot:




     F1   Help  ↑↓  Select Item  -/+   Change Values   F9   Setup Defaults
     Esc  Exit  ↔   Select Menu  Enter Select ▶ Sub-Menu F10  Save and Exit
```

4.5 Boot Menu

```
                    PhoenixBIOS Setup Utility
    Main    Advanced    Intel    Security    Boot    Custom    Exit

                                              Item Specific Help

         +Removable Devices
         +Hard Drive                      Keys used to view or
          CD-ROM Drive                    configure devices:
          Network Boot                    <Enter> expands or
                                          collapses devices with
                                          a + or -
                                          <Ctrl+Enter> expands
                                          all
                                          <Shift + 1> enables or
                                          disables a device.
                                          <+> and <-> moves the
                                          device up or down.
                                          <n> May move removable
                                          device between Hard
                                          Disk or Removable Disk
                                          <d> Remove a device
                                          that is not installed.

    F1    Help   ↑↓  Select Item   -/+   Change Values    F9   Setup Defaults
    Esc   Exit   ↔   Select Menu   Enter Select ▶ Sub-Menu F10  Save and Exit
```

After you turn on your computer, it will attempt to load the operating system from the chosen device. If it cannot find the operating system on that device, it will attempt to load it from one or more other devices in the order specified in the Boot Menu. Boot devices (i.e., with access to an operating system) can include: hard drives, floppy drives, CD ROMs, removable devices (e.g., Iomega Zip drives), and network cards.

Use the keys described in Item Specific Help to arrange devices in order to specify the priority of the devices from which the BIOS will attempt to boot the operating system.

4.5.1 Boot Details

4.5.1.1 Booting without a Monitor, Keyboard or Mouse

To boot without a monitor, keyboard or mouse set the item "POST Errors" to "Disabled" at the page "Main Menu" in PhoenixBIOS Setup program. This setting is a default one.

> **Note!**
>
> If the computer was booted without a connected monitor, the display will be empty, even if a monitor is connected later during operation. To get the correct display output it is necessary to reboot the computer with a connected monitor. This is a Intel VideoBIOS particularity.

4.5.1.2 Booting from USB

To boot from a device connected to USB:

- Connect the device to boot from to a USB port. The appropriate USB controller should be enabled;
- Enter the PhoenixBIOS Setup program;
- Find this USB device at the "Boot" page and use «+» «–» buttons to move it in order to change its boot priority;
- Save changes and reboot the module.

To get the on-line help about the details of BIOS Setup program operation, please apply to the screen tips and the integrated help system.

Phoenix® BIOS Setup   **Fastwel**   TK-8000

4.6   Custom Menu

Selecting "Custom" from menu bar on the Main Menu displays a menu shown below.

```
                     PhoenixBIOS Setup Utility
    Main      Advanced    Intel    Security    Boot    Custom    Exit

                                                   Item Specific Help
     ▶ Temperature Control Sub-Menu
     ▶ Hardware Monitor Sub-Menu

       Gigabit Ethernet 1              [Enabled]
       Gigabit Ethernet 2              [Enabled]

       Fastwel Flash Disk             [Enabled]
       Disable SMI Causes             [Disabled]
       Watchdog Timer                 [Disabled]

       IT8888 ISA VGA                 [Disabled]
     ▶ IT8888 ISA Decode IO Sub-Menu
     ▶ IT8888 ISA Decode Memory Sub-Menu




    F1   Help  ↑↓  Select Item  -/+   Change Values   F9   Setup Defaults
    Esc  Exit  ↔   Select Menu  Enter Select ▶ Sub-Menu  F10  Save and Exit
```
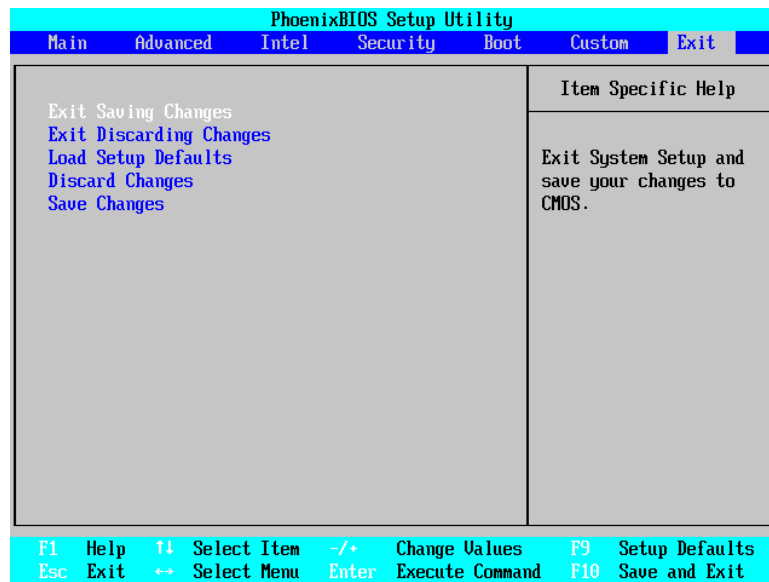
Temperature Control submenu contains a number of fields with some ACPI settings, such as temperature threshold values and control constants. Hardware Monitor submenu displays temperatures and voltages supervised by the hardware monitor. This menu screen also provides possibility to control other product-specific features, including Gigabit Ethernet channels, Fastwel flash disk, SMI sources, watchdog timer, and IT8888 PCI-to-ISA bridge.

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4.7 Exit Menu

Selecting "Exit" from menu bar on the Main Menu or pressing <Esc> at any Main Menu screen displays the following menu.

```
                      PhoenixBIOS Setup Utility
     Main     Advanced     Intel    Security    Boot    Custom    Exit

                                                     Item Specific Help
       Exit Saving Changes
       Exit Discarding Changes
       Load Setup Defaults                         Exit System Setup and
       Discard Changes                             save your changes to
       Save Changes                                CMOS.










     F1   Help   ↑↓  Select Item   -/+   Change Values   F9   Setup Defaults
     Esc  Exit   ↔   Select Menu   Enter Execute Command  F10  Save and Exit
```

Note that <Esc> does not exit this menu. You must select one of the items from the menu to exit. Here you can select whether or not to save changes made to BIOS parameters during the current session to CMOS memory and exit BIOS Setup utility.