User Manual

Tektronix

K15 Protocol Tester

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This document supports device type PO61 and software version 1.00

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WARRANTY

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non–Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified service personnel should perform service procedures.

While using this product, you may need to access other parts of the system. Read the *General Safety Summary* in other system manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Use Proper Line Cords. Use only the telecommunication line cords designed and specified for the K15.

Use No. 26 AWG or larger cords as TNV-1 Connections. The telephone line cord is to be disconnected before accessing inside the equipment. Caution: To reduce the risk of fire, use only No. 26 AWG or larger telecommunications line cords.

Connect and Disconnect Properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Use Proper AC Adapter. To use the GPS option, use only the AC adapter specified for this product.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Do Not Operate With Open Slots. To avoid contamination and damage, always protect free slots with the blue plastic air baffles inside the unit and with blank panels on top of the unused slots.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

The common terminal is at ground potential. Do not connect the common terminal to elevated voltages.

With some interfaces only voltages corresponding to the default of the relevant connector are applied at the measuring sockets. However, high voltages from the line may occur at some of the measuring sockets. These measuring sockets are protected against accidental contact and are specially labeled.

Do Not Look into the End of a Fiberglass Cable. Never look into the end of a fiberglass cable or a single fiber which could be connected to a laser source. Laser radiation can damage your eyes because it is invisible and your pupils do not contract instinctively as with normal bright light. If you think your eyes have been exposed to laser radiation, you should have your eyes checked immediately by an eye doctor. The optical output's radiation power in our system corresponds to the laser class 1 in accordance with IEC 60825-1:1993/A2:2001.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

Use Proper Batteries. To avoid the risk of explosion, replace battery only with the same type and rating.

Dispose Used Batteries Properly. Used batteries must be recycled according to local regulations.

Certifications and Compliances

Consult the product specifications in the *Appendix A* for certifications and compliances.

Safety Terms and Symbols

Terms in This Manual. These terms may appear in this manual:

WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*

CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product. These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product. These symbols may appear on the product:

WARNING
High Voltage

WARNING
Laser Output
Laser Class 1

WARNING
Laser Output
End of a Fiber-glass Cable

Protective Ground
(Earth) Terminal

Electrostatically
Hazardous

CAUTION
Refer to Manual

Double
Insulated

Service Safety Summary

Only qualified service personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power. To avoid electric shock, switch off the instrument power, then disconnect the power cord from the mains power.

Use Care When Servicing with Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

Precautions

In order to guarantee correct functionality and to protect the K15 from damage, the following precautions should be taken.

Do Not Change the Pre-Configuration of the Device. The risk of changes (software developments or expansions) which the customer undertakes is carried by the customer. Regarding this Tektronix assumes no responsibility.

***NOTE**. The K15 Protocol Tester is supported by Tektronix only. Microsoft Support Services do not support this device.*

Implement Enhanced Security Measures for Network Operation. If you apply the protocol tester within a network or by way of a modem, then implement further and enhanced security measures.

- Access via an individual LAN

  If you operate your Protocol Testers within an individual LAN network, then protect this network against access from other PCs.

- Access via a company-wide Intranet

  If you operate your Protocol Testers within an Intranet, then implement an extended user administration and employ up-to-date virus scanners and firewalls.

- Access via Internet or modem

  If you want to access your Protocol Tester via the Internet, implement the same security measures as in Intranets (see above). You can also implement additional security measures with the help of virtual private networks (VPNs).

To implement additional security measures, contact your local system administrator or the Tektronix service center.

CAUTION. *The implementation of extended security measures is your sole responsibility. It is realized at customer's own risk and without liability to Tektronix.*

You should implement these measures especially while applying the Remote Desktop *software or when transferring files via a network.*

Preface

This manual describes the K15 Protocol Tester. It covers the following information:

- Describes the capabilities of the K15 Protocol Tester, its components and options.
- Explains how to setup the K15 Protocol Tester and start its operation.
- Lists specifications and troubleshooting methods of the K15 Protocol Tester.

About This Manual

The manual is composed of the following chapters:

- The *Safety Summaries and Precaution* are the most important parts of the manual. You should read them before you start working with the equipment and you should always follow these instructions.
- *Preface* provides an overview of this manual and further K15 documentation.
- *Product Description* provides a device description.
- *Getting Started* tells you how to set up and turn on the device.
- *In Case of Problems* addresses problems you may encounter while installing your device.
- *Appendices* provide technical data, interfaces and user service information.
- *Abbreviations* provides explanations of unique or uncommon abbreviations related to the K15 measurements.
- *Index* provides page number references to topics in alphabetical order.

Conventions

This manual uses the following conventions:

- The names of panel connectors and LEDs appear in the manual in the same format as found on the panel-label.
- In reference to the instrument, the following conventions apply:
  - When referring to the protocol tester (unit of hardware and software), 'K15' is used.
  - When referring to the software, 'K15 software' is used.
  - When referring to a measuring board, the nomenclature for the individual module is used.

The following text styles and markings have specific meaning in this manual:

Text style	Description
in Italics	The Italics fonts indicate menus and menu functions as well as commands, parameters and examples.
<Key>	Keys or key sequences are in angle brackets.
Bold	The Bold fonts indicate buttons of the Graphical User Interface.

Related Manuals and Online Documentation

This manual is part of a document set of standard-accessory manuals and online documentation. The following documents support the K15 Protocol Tester in detail:

To use the K15, the following documentation is provided:

- The *Short Introduction K15 Protocol Tester* assists you when making first measurements. This manual is available in a printed version and as a PDF online manual in the *\hlp* directory.
- A context-sensitive online help system is the K15 reference documentation for the graphical user interface. To open the Help window, press <F1> from any K15 application window.
- The Release Notes are delivered separately and contain the latest information about the current software version (readme.txt).
- Microsoft Windows XP Embedded is described in the Windows XP online help: click in the taskbar on *Start: Help and Support.*

  Help and Support is your comprehensive resource for information and tools. Use *Search*, *Index*, or the *Table of Contents* to gain access to the extensive Online Help system.

Contacting Tektronix

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Web site

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Technical support

For hotline service support, call:

+4930-386-22200 (8:00 a.m. – 6:00 p.m. GMT + 01:00)

or
1-800-833-9200 (This phone number is toll free in North America. After office hours, please leave a voice mail message. Outside North America, contact a Tektronix sales office or distributor; see the Tektronix web site for a list of offices.)

Or fax:
+4930-386-22546

Or contact us by e-mail:
mpt.hotline@tek.com

Product Description

The K15 Protocol Tester analyses complex mobile and core communication networks, such as UMTS, GPRS, and GSM networks.
It is a powerful multi-protocol and multi-interface tester based on a CompactPCI platform.

The K15 provides a series of monitoring applications for analyses. Using the variety of implemented communication protocols you can decode and analyze almost all signaling data online as well as offline. An intuitive Graphical User Interface makes measuring with the K15 easy for you. Filter and trigger functionalities help you to keep data simple for analysis, as well as simple statistics applications.

Due to its modular hardware and software design, the K15 realizes various configurations and combinations and is extendable for almost any future application.

Main Features

Powerful Platform

The K15 is based on a powerful CompactPCI platform with a Pentium III processor and 30 GB hard disk. It supports 10/100 Mbit/s Ethernet LAN connections as well as the connection of external devices to USB, COM, and SCSI ports.

High Measurement Capacity

The K15 provides five application slots for measurement boards. You can install the following boards:

- Power WAN board with eight bi-directional E1/DS1/J1 PCM links
- Power WAN Light board with four bi-directional E1/DS1/J1 PCM links
- Power WAN Light board with four bi-directional E1/DS1/J1 PCM links and two 10/100 Mbit/s fast Ethernet links
- PCE 2 board combination with any combination of the following two line interfaces:
  - E1/DS1/J1 electrical line interface with four bi-directional E1/DS1/J1 ATM links
  - STM-1 optical line interface with two bi-directional STM-1 links

Wide Range of UMTS Features and Applications

With the K15, you can monitor all protocols on Iu-PS, Iu-CS, Iur, Iub interface, including protocols encoded according to packed encoded rules (PER) such as RRC, RANAP, NBAP and RNSAP, as well as NAS protocols which ensure quality implementation to protocol definition and behavior.

Simultaneous handling of AAL2 and AAL5 virtual channels allows simultaneous testing of control and user plane protocols.

With the following UMTS applications you can perform problem-based evaluation of UMTS data:

- Iu and Iub interface calltrace (packet-switched and circuit-switched)
- Multi-Interface calltrace for Iu, Iub, and Gr interface
- Iub Mon application for monitoring signaling data of the control plane on the Iub Interface
- Automatic Iub configuration to identify signaling links and protocols
- ATM IMA monitoring

Wide Range of GPRS Features and Applications

With the K15, you can monitor all GPRS Gx-interfaces. At these interfaces, you can monitor all protocol layers regarding signaling and transmission plane including a huge number of protocol versions of Rel. 97, Rel. 98 and Rel. 99.

With the following GPRS applications, you can perform problem-based evaluation of GPRS data:

- GPRS Call Trace on Gb-, Gn-, Gp-, Gr-, Gc- interface
- Deciphering on GPRS Gb- interface (up to 10 000 subscribers)
- GPRS Statistics (network/cell-, subscriber-, service-based)
- Measurement of QoS parameters (delay, throughput)

Wide Range of Further Measurement Features and Applications

Besides the features and applications mentioned above, the K15 offers much more:

- Triggers and filters
- Real-time and post-capture analysis
- Statistics applications for further signaling networks, such as SS7, INAP, GSM and CDMA2000 networks

For CDMA2000, the K15 provides also a Multi-Interface calltrace application. Using this application, you can trace calls, connections or transactions across the A1 and A10/11 interfaces.

Powerful Tools

The K15 offers a variety of protocol-independent tools. Those tools are, for instance, the Traffic Analyzer that displays traffic information about each connected link, the Load Meter that informs about the capacity usage on the individual interfaces, and the Real Chart that displays the recorded data in various chart formats.

Graphical, Flexible Protocol Stack Editor

The K15 offers a number of predefined protocol stacks for measuring various networks. If necessary, you can change the existing stacks or build new ones using the graphical Protocol Stack Editor.

Convenient to Operate

The K15 Protocol Tester uses the familiar Microsoft Windows interface. User-friendly Help systems answer all questions during operation.

Hardware Concept

The modular concept of the K15 is based on compact and upgradeable hardware with powerful processors and communication controllers. User and measuring processes can be assigned to several processors.

The standard user interface and system management are based on a PC board with connection to the cPCI bus system of the measurement boards.

The K15 offers a versatile and portable solution with a variety of powerful measurement boards (see page 2).

***NOTE**. We also offer a wide range of cables and adapters as accessories, which you can order. Take a look in the WWW under Tektronix.com at our Cable and Accessory Guide or contact your local sales partner.*

Software Concept

The modular and flexible hardware concept of the K15 is complemented by the K15 software. To give you an overview, the concepts of the K15 software are briefly described in the following:

Usability

The K15 uses a Windows XP Embedded (XPe) operating system. The user interface is modeled according to the Windows standard, but also services like system control and network access can be carried out via Windows.

The K15 software offers a uniform set of configuration tools. You can adapt every tool to suit your special test tasks. The settings you change during this process can be stored and loaded again – for every individual tool, for a number of tools, or for the overall configuration.

Furthermore pre-defined test solutions - which can be deployed in a modular and complementary manner - are offered as a basis for the emulation of whole network elements. Modules for the automatic generation of calls are available for various protocol emulations.

Expansion capability

The K15 software has a modular design that makes it easy for you to create your optimal test environment. You can combine and activate any hardware configurations in a measurement scenario.

With the protocol stack editor you can relate individual protocol layers to each other. You can modify predefined protocol stacks or define completely new stacks.

Task distribution

Another essential concept of the K15 software is the modularization of steps to generate test cases. This allows, a step-by-step abstraction from the details of a test environment. As a consequence, your results can be reused to a very large extent.

When the test cases are precisely defined, the entire process is more efficient: for example, the choice of available messages is reduced accordingly.

Network Integration

Within the framework of a test scenario, you can use the K15 software to simultaneously monitor on different physical interfaces using any given combination of protocol structures. As network integration processes, this capability is becoming more and more important.

***NOTE**. The operating basics of the K15 software are described in detail in the K15 Short Introduction and the K15 Online Help*

Fields of Application

The K15 is designed for manufacturers of communication systems and components, network operators, and test laboratories.

As a programmable unit, the K15 is designed for development purposes and use in test laboratories. Due to its portability, it can also be used for measurement tasks in the field.

The K15 can be used as a monitor for acceptance, validation, and compatibility tests. It has been designed for the following purposes:

- To detect interferences in individual network segments
- To support the integration of different network elements
- To develop integration tests and to test new software versions

The **auto restart mechanism** enables error-free, long-term measurements even after a power outage.

Main Components

The K15 mainframe consists of a chassis with integrated display, CD-RW (Read-Write) drive and floppy disk drive. It is equipped with a keyboard with integrated touch pad.

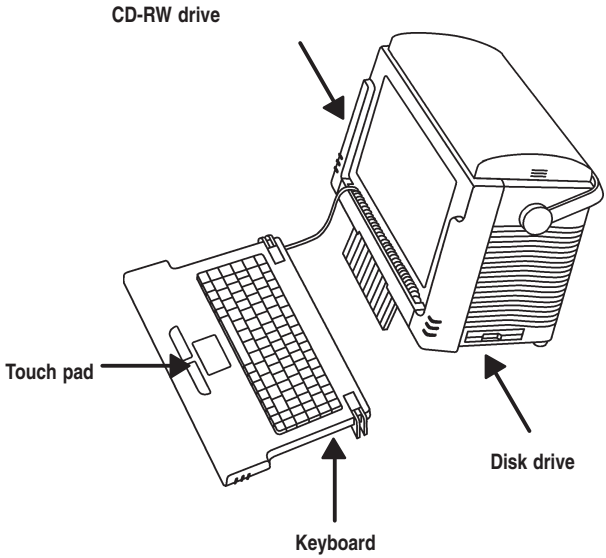

Figure 1: K15 front view

The integrated touch pad can be used as an alternative to the mouse. To move the pointer, slide your finger slightly over the surface of the pad. Tap the surface to simulate a click of the left mouse button, or use the pads control buttons to select the type of operation.

The floppy disk drive is located on the right bottom side of the device and the CD-RW drive is located on the left bottom side.

CAUTION. *Insert 3.5" diskettes into the floppy drive with the label field facing up.*

CAUTION. *To avoid equipment damage, do not insert foreign objects into the disk drive.*

CD-RW Drive

The CD-RW (Read-Write) drive can be used to read CD-ROMs and to burn blank CDs.

CAUTION. *Do not insert CDs with Autostart mechanism into the CD-RW drive while K15 applications are running. Automatically started software may disturb or interrupt your running applications.*

Windows XPe contains a built-in disc recording feature that makes it easy to burn your own data CDs. You do not need additional CD-recording software.

CAUTION. *Close all K15 applications before writing a CD; otherwise the application or the writing process may be interrupted.*

Use only high-quality blank CDs.

To write a CD, proceed as follows:

1. Insert a blank CD-R or CD-RW in your CD-RW drive. A dialog box opens, asking if you want to open a writable CD folder. Click OK. The Windows explorer opens displaying the CD drive.
2. On the *Start* menu, click *My Computer*, and navigate to the drive and folder where the files you want to copy are stored.
3. Select the files to copy, and drag/drop or copy/paste them to the open CD drive window.

   Windows XPe makes a copy of these files in a temporary storage area. The CD drive dialog box displays a list of the contents waiting to be recorded. Check that the files and folders that you intend to copy to the CD are displayed under *Files Ready to Be Written to the CD*.
4. In the left pane of the CD drive window, click *Write these files to CD*. The CD Writing Wizard opens. Follow the instructions of the wizard and wait until the successful writing is confirmed.
5. Click *Delete temporary files* in the left pane of the CD drive window. Windows deletes the files and folders from the temporary storage area and moves them to the Recycle Bin. The temporary storage area is then available for another set of files and folders that you want to copy to the CD.

Card Cage

The card cage inside the mainframe can be accessed by removing the device cover. It includes the Power Supply and the PC board with CPU and hard disk. Five slots are provided to carry measurement boards. Removable airblockers protect free slots inside the device and provide an appropriate airflow. Remove these blue plastic airblockers to install additional boards.

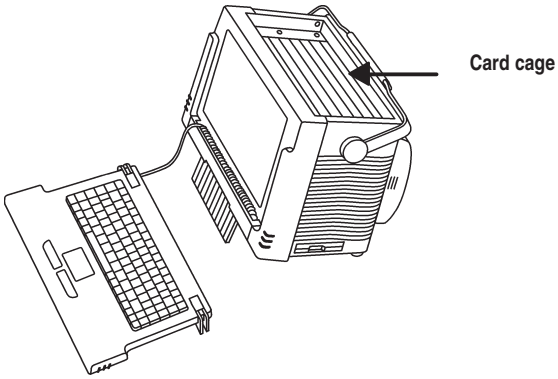

Figure 2: K15 card cage

The power supply is located in the two slots labeled *Power Supply.*
Slots 1 to 5 are dedicated for measurement boards. The PC board must be inserted into slot 6.
The systems IPMI Manager controls temperature and ventilation inside the system.

You should not need to access the backplane module (located on the bottom of the card cage).

CAUTION. *To avoid contamination and damage, always protect free slots with blue plastic air baffles inside the card cage and with blank panels on top of the card cage.*

Power Supply

The power supply is located in the slots labeled *Power Supply*.

A power-on indicator on the front panel (see figure 3) indicates the operating status of the power supply.

Figure 3: Front panel of the power supply

Table 1: LED on the Front Panel of the Power Supply

LED status	Meaning
green	OK
orange	failure
off	DC output off

Interfaces

All system connectors can be found on the rear of the device, on the rear panel.

Measurement connectors can be found on the front panels of the individual measurement boards. These connectors are described in the respective descriptions of the boards.

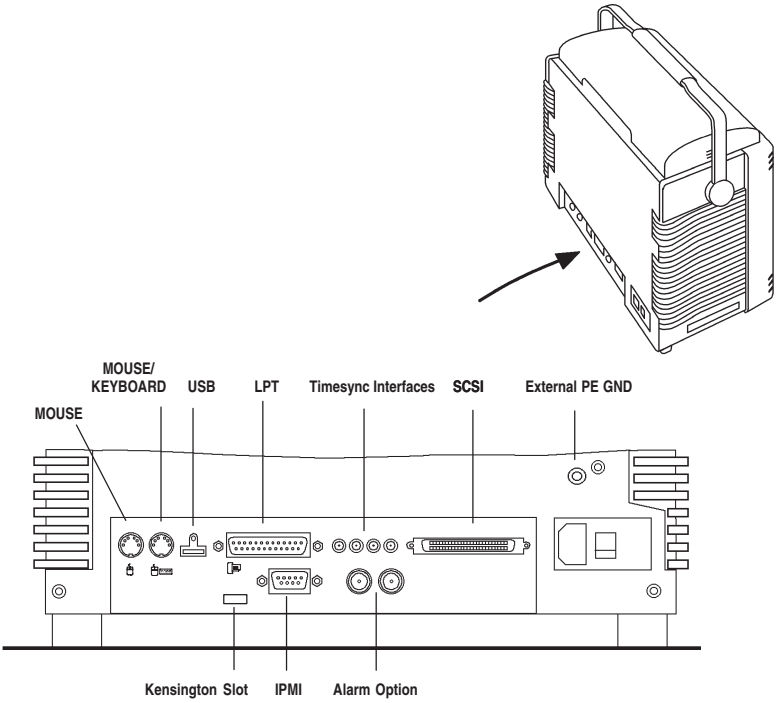

Figure 4: Rear panel connectors

The following interfaces are located on the rear of the device:

- MOUSE interface for connecting an external mouse
- MOUSE/KEYBOARD interface for connecting an external keyboard
- USB interface for connecting external devices
- LPT interface for connecting a printer
- Ultra SCSI interface, for example, for connecting an external drive
- Kensington Slot for connecting a security cable and locking the computer
- IPMI (Intelligent Platform Management Interface) emergency management port used as a debug interface for service purposes only

CAUTION. *Do not connect external devices to the IPMI interfaces.*

- Timesync interfaces for inter-chassis synchronization
- Alarm options

NOTE*. For further information on the pin assignments of the individual interfaces, refer to Appendix B.*

External PE GND. You can use the External PE GND screw terminal to connect a separate protective earth to the K15. To do so, use at least an AWG18 cable. Connect the protective earth cable between the screw head and flat washer of the PE GND. Be sure to make a good connection at the point where you connect the other end of the cable.

NOTE*. The K15 is intended to be electrically grounded. The delivered power cord is equipped with a three-wire grounding plug that has a third grounding pin. Connect this plug to a grounded AC socket.*

If you are not sure that your AC socket has a protective ground, you can connect a protective earth separately to the K15 at the rear PE GND screw terminal as described above.

PC Board

The PC board is a CompactPCI board with Intel Mobile Pentium III CPU. It must be located in slot 6.

CAUTION. *Do avoid damage, make sure that the Tektronix board handles do not stand in a completely vertical position when sliding the board into the unit. Observe also the red tabs on top of the guidance track.*

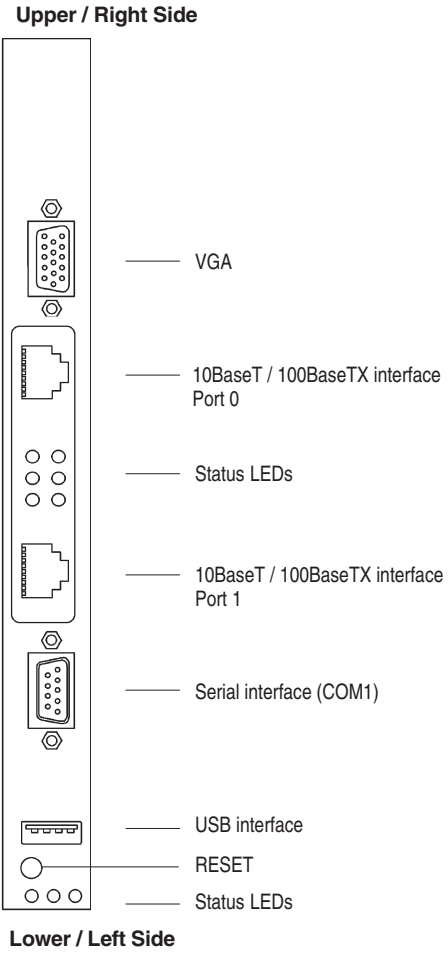

Figure 5: PC board front panel

The following interfaces are located on the front panel of the PC board:

- VGA interface for connecting an external VGA monitor
- PMC plug-in module with 2 Ethernet twisted pair sockets (10BaseT / 100BaseTX) for LAN connection and six status LEDs
- Serial interface (COM1) for connecting external devices
- USB interface for connecting external devices (Type USB 1.1)

***NOTE**. For further information about the pin assignments of the individual panel interfaces, the status LEDs, and the Reset button refer to Appendix B. The Bios standard settings can also be found in Appendix B.*

***CAUTION.** To avoid the risk of explosion, replace battery only with the same type and rating. Dispose of used batteries according to the instructions.*

Power WAN Board (PW)

The Power WAN board (PW) has four 15-pin D-sub connectors. On each connector you can monitor two E1, DS1, or J1 lines (uplink and downlink).

Features

The Power WAN board provides the following features:

- 2.048 Mbps ± 10 ppm (E1), 1.544 Mbps ± 10 ppm (DS1 and J1) Software switchable between E1, DS1, and J1
- 75 Ω asymmetrical (E1); software switchable
- 120 Ω (E1), 100 Ω (DS1), 110 Ω (J1), all symmetrical, software switchable
- Four 15-pin D-Sub connectors, each one contains four Rx (75 asymmetrical, 100-120 Ω symmetrical)
- Able to monitor SS7 links
- Able to monitor HDLC high speed links
- Able to monitor an ATM high speed link
- Single CompactPCI slot solution. IPMI and PICMG compliant.
- ETSI ETS 300 019 Part 1-3, Class 1-3 for telecommunication centers: Operational and non-operational environment, vibration

***NOTE**. EN 60950, IEC 950, UL 1950: The measurement boards are designed for connecting to a telecommunication network (TNV-1 circuits); the appropriate interfaces are provided.*
If using coax cables consideration should be given to conducting an electrical strength test as part of the end product investigation.

Applied Standards. Using the Power WAN board, you can monitor interfaces according to the following standards:

- ITU-T, Recommendation G.703, Physical/electrical characteristics of hierarchical digital interfaces, 10/1998
- ITU-T, Recommendation G.704, Synchronous frame structure used at 1544, 6312, 2048, 8448 and 44746 kbit/s hierarchical levels, 10/1998
- TTC, JT-G.703 (J1 specification)
- ITU-T, Recommendation G.775, Loss of Signal (LOS), Alarm Indication Signal (AIS) and Remote Defect Indication (RDI) defect detection and clearance criteria for PDH signals, 10/1998
- ITU-T, Recommendation I.431, Primary rate user-network interface - Layer 1 specification, 03/93
- TTC, JT-I.431 (J1 specification)
- ANSI, T1.403-1995, Network and Customer Installation Interfaces - DS1 Electrical Interface, 1995
- ANSI, T1.408-1990, Integrated Services Digital Network (ISDN) Primary Rate - Customer Installation Metallic Interfaces Layer 1 Specification, 09/1990
- ANSI, T1.231-1997, Digital Hierarchy Layer 1 In-Service Digital Transmission Performance Monitoring, 10/1997
- ITU-T, Recommendation G.823, The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy, 03/2000

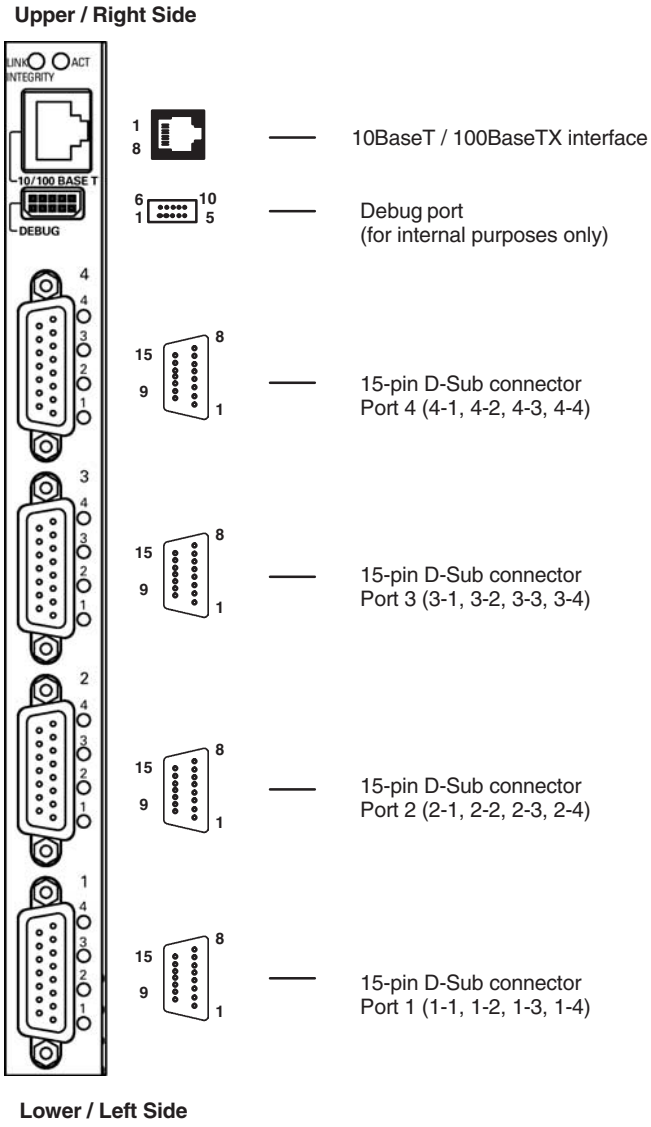

Figure 6: Power WAN board (PW)

The following interfaces are located on the front panel of the Power WAN board:

- 10BaseT / 100BaseTX interface for LAN connection
- Debug port for internal purposes only
- Four 15-pin D-Sub connectors to connect up to 16 physical bearers

CAUTION. *The telephone line cords of port 1 to 4 are to be disconnected before accessing inside the equipment. To reduce the risk of fire, use only No. 26 AWG or larger telecommunications line cords.*

NOTE*. For further information about the pin assignments of the individual panel interfaces, refer to Appendix B.*

Accessories. Power WAN boards require cables with a 15-pin D-Sub plug on the K15 side. For the IUT side, the following test cables are available:

- 1.6/5.6 plug with coax cable with Z=75 Ω. A 1.6/5.6 adapter on BNC makes the connection of the cable to BNC sockets possible.
- Bantam with Z=110 Ω
- Open ends (no plug) with Z=120 Ω
- RJ45
- 3-pin with Z=120 Ω
- Adapter cable for E1/DS1 (PRIME, PRIMO) cables
- Ethernet patch cable (straight through and cross over for Ethernet monitoring)

These cables can be ordered optionally. Detailed information about ordering number and prices can be found in the *Tektronix Cable and Accessory Guide for Protocol Analyzers* under *www.tektronix.com*.

***NOTE**. If using coax cables consideration should be given to conducting an electrical strength test as part of the end product investigation.*

Power WAN Light Board (PWL)

The Power WAN Light board (PWL) has two 15-pin D-sub connectors. On each connector you can monitor two E1, DS1, or J1 lines (uplink and downlink).

Features

The Power WAN Light board provides the following features:

- 2.048 Mbps ± 10 ppm (E1), 1.544 Mbps ± 10 ppm (DS1 and J1) Software switchable between E1, DS1, and J1
- 75 Ω asymmetrical (E1), software switchable
- 120 Ω (E1), 100 Ω (DS1), 110 Ω (J1), all symmetrical, software switchable
- Two 15-pin D-Sub connectors, each one contains four Rx lines (75 asymmetrical, 100-120 Ω symmetrical)
- Able to monitor SS7 links
- Able to monitor HDLC high speed links
- Able to monitor an ATM high speed link
- Single CompactPCI slot solution. Hot swap, IPMI, and PICMG compliant.
- ETSI ETS 300 019 Part 1-3, Class 1-3 for telecommunication centers: Operational and non-operational environment, vibration

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***NOTE**. EN 60950, IEC 950, UL 1950: The interface boards are designed for connecting to a telecommunication network (TNV-1 circuits); the appropriate interfaces are provided.*
If using coax cables consideration should be given to conducting an electrical strength test as part of the end product investigation.

Applied Standards. Using the Power WAN Light board, you can monitor interfaces according to the following standards:

- ITU-T, Recommendation G.703, Physical/electrical characteristics of hierarchical digital interfaces, 10/1998
- ITU-T, Recommendation G.704, Synchronous frame structure used at 1544, 6312, 2048, 8448 and 44746 kbit/s hierarchical levels, 10/1998
- TTC, JT-G.703 (J1 specification)
- ITU-T, Recommendation G.775, Loss of Signal (LOS), Alarm Indication Signal (AIS) and Remote Defect Indication (RDI) defect detection and clearance criteria for PDH signals, 10/1998
- ITU-T, Recommendation I.431, Primary rate user-network interface - Layer 1 specification, 03/93
- TTC, JT-I.431 (J1 specification)
- ANSI, T1.403-1995, Network and Customer Installation Interfaces - DS1 Electrical Interface, 1995
- ANSI, T1.408-1990, Integrated Services Digital Network (ISDN) Primary Rate - Customer Installation Metallic Interfaces Layer 1 Specification, 09/1990
- ANSI, T1.231-1997, Digital Hierarchy Layer 1 In-Service Digital Transmission Performance Monitoring, 10/1997
- ITU-T, Recommendation G.823, The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy, 03/2000

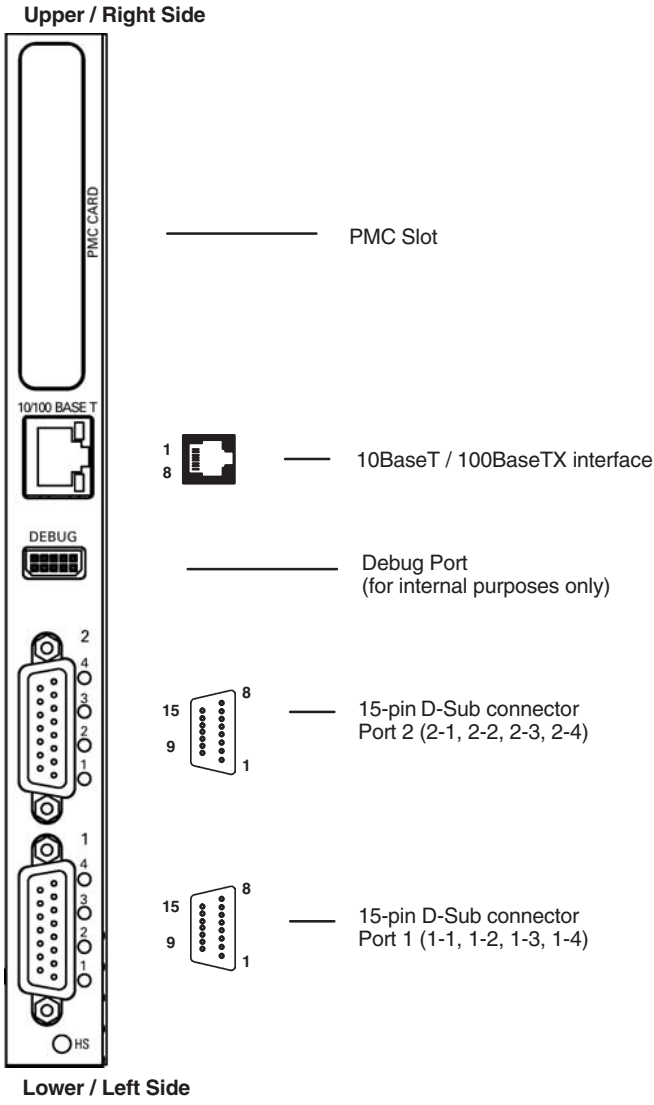


Figure 7: Power WAN light board (PWL)

The following interfaces are located on the front panel of the Power WAN Light board:

- Two 15-pin D-Sub to connect up to 8 physical bearers
- 10BaseT / 100BaseTX interface for LAN connection (PMC Slot)
- Debug Port for internal purposes only

CAUTION. *The telephone line cords of Port 1 and 2 are to be disconnected before accessing inside the equipment. To reduce the risk of fire, use only No. 26 AWG or larger telecommunications line cords.*

NOTE*. For further information about the pin assignments of the individual panel interfaces, refer to Appendix B.*

Optional Ethernet PMC Module

To enhance the functionality of your Power WAN Light board, you can add an optional Ethernet PMC plug-in module. This module provides two Ethernet twisted pair sockets (10 BaseT and 100BaseTX) and eight status LEDs.

Features

- 10BaseT = 10 Mbps
- 100BaseTX = 1000 Mbps
- Able to monitor one full duplex Ethernet link (Drop and Insert)
- Able to monitor two half duplex Ethernet links (Drop and Insert / Ethernet switch monitoring port)

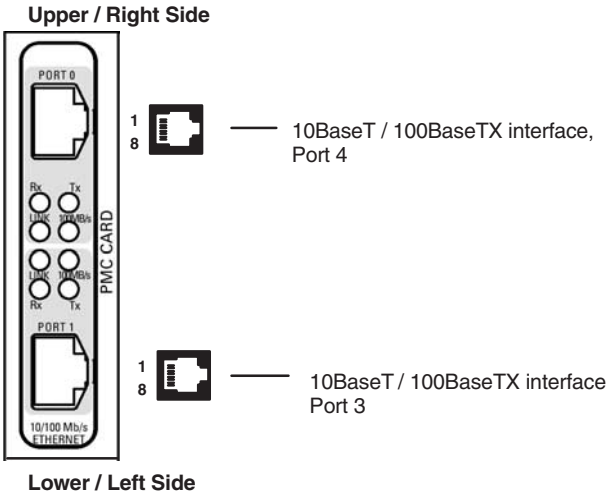


Figure 8: Optional PMC plug-in module for Power WAN Light boards

***NOTE**. For further information about the pin assignments of the individual panel interfaces, refer to Appendix B.*

Installation of the Ethernet PMC Module

Install the PMC module on your Power WAN Light board as follows:

1. Loosen and remove the two bolts from the PMC module shown below

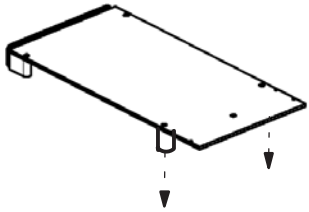


Figure 9: PMC Module with bolts

2. Remove the blank panel that protects the PMC slot of your Power WAN Light board and the protection film on the bottom side of the board.

   Therefore, loosen the two screws on the back of the Power WAN Light front panel and the two screws carrying the protection film on the rear side of the board as shown below.

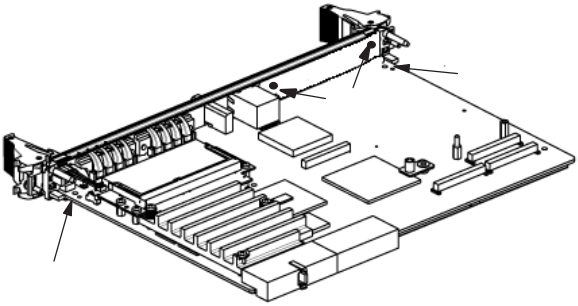


Figure 10: Screws to be removed from the Power WAN Light board

3. Carefully push the module from behind towards the Power WAN Light board's plug connections.

   Ensure that the voltage keying pin of the Power WAN Light board properly fits into the small cut-out of your PMC module.

4. Tighten the delivered four screws on the PMC module as shown in figure 11.

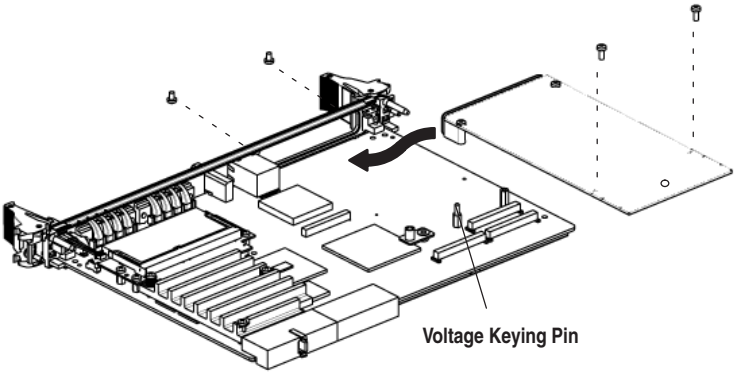


Figure 11: PMC module installation

Accessories. Power WAN Light boards require cables with a 15-pin D-Sub plug on the K15 side. For the IUT side, the following test cables are available:

- 1.6/5.6 plug with coax cable with Z=75 Ω. A 1.6/5.6 adapter on BNC makes the connection of the cable to BNC sockets possible.
- Bantam with Z=110 Ω
- Open ends (no plug) with Z=120 Ω
- 3-pin with Z=120 Ω
- Adapter cable for E1/DS1 (PRIME, PRIMO) cables
- Ethernet patch cable (straight through and cross over for Ethernet monitoring)

These cables can be ordered optionally. Detailed information about ordering number and prices can be found in the *Tektronix Cable and Accessory Guide for Protocol Analyzers* under *www.tektronix.com*.

***NOTE**. If using coax cables consideration should be given to conducting an electrical strength test as part of the end product investigation.*

ATM Boards: PCE-2 Board Combinations

PCE-2 board combinations are designed for monitoring in ATM networks with transmission rates of up to n times 155.520 Mbps.

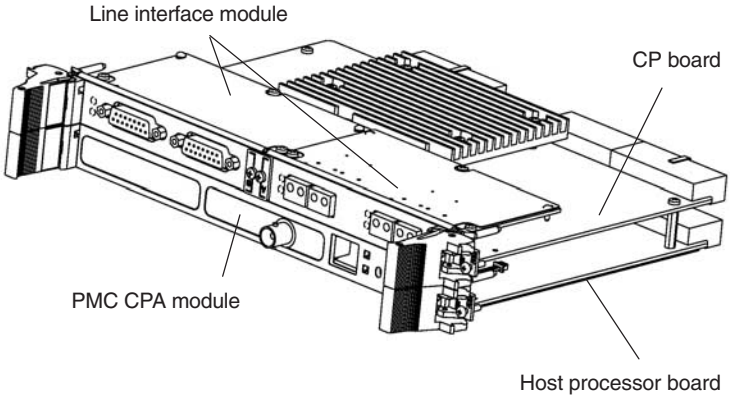


Figure 12: ATM PCE-2 board combination

PCE-2 board combinations consist of a PCE-2 board and one or two line interfaces (LIFs).

The PCE-2 board consists of the following components:

- Host processor board
- PMC Cell Processor Adaption (CPA) module for communication between host processor board and cell processor board.
- Cell processor (CP) board. This board carries the high performance C-Port network processor C-5.

The PCE-2 board is combined with one or two line interface modules. The following line interfaces are supported:

- STM-1 optical line interface
- E1/DS1/J1 electrical line interface

General Features

PCE-2 board combinations provide the following features:

- Monitoring of virtually any type of broadband network interface and data link layers up to transmission rates of STM-1.
- Adjusted and optimized firmware packages enabling a wide range of monitoring solutions for different types of physical interfaces with support of several types of data link and network layer protocols.
- Fast reload of firmware packages and flexible configuration option.
- PCE-2 physical interfaces can be fully synchronized according to their network transmit clock options.
- PCE-2 board combinations work internally with high-resolution time stamps (5 ns granularity) synchronized over all PCE-2 interfaces for Rx PDUs (Last Bit Out / Last Bit In).
- Automatic power-on self diagnostics software running at every system start.
- Support of AAL2 and AAL5 technologies, simultaneous handling of AAL2 and AAL5 based PDUs.
- Support of UMTS interfaces such as Iu-CS, Iu-PS, Iu-BC, Iub and Iur.

CAUTION. *When using the PCE-2 board combination, always provide proper ventilation. The environmental temperature of the PCE-2 board combination is permanently monitored by the PCE-2 system driver software. If the critical temperature level is exceeded, all active board and software components will be immediately disabled or interrupted. The boards could be damaged.*

Host Processor Board

This board processes the data streams from the interface modules.

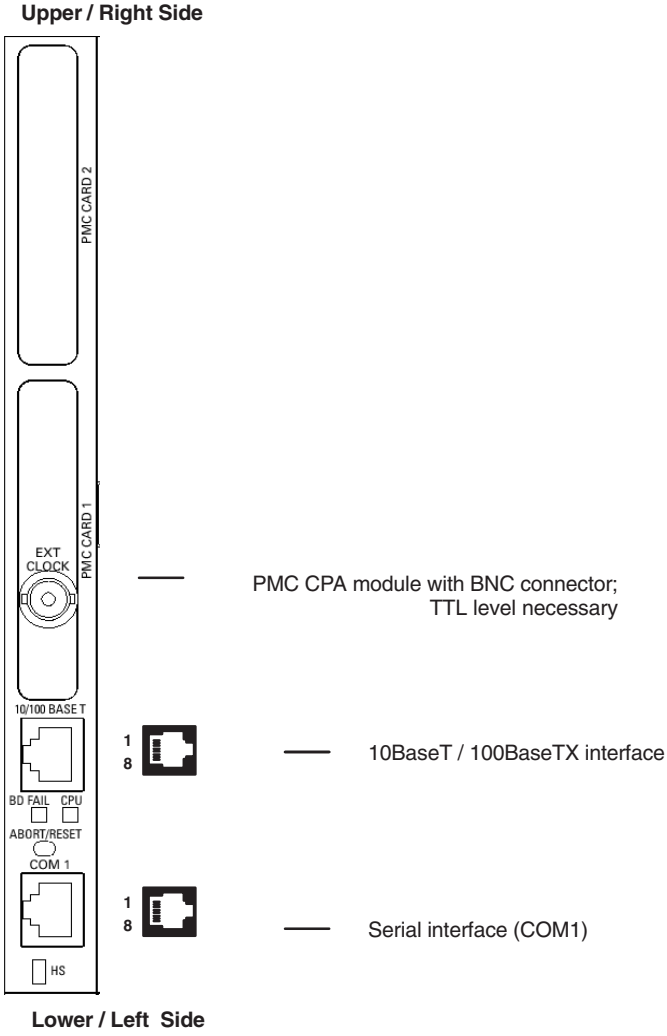


Figure 13: PCE-2 host processor board

The following interfaces are located on the front panel of the host processor board:

- PMC CPA Module with BNC connector: input for an external TTL clock (for future use, not yet supported).
- 10BaseT / 100BaseTX interface for LAN connection (debug port, for internal purposes only).
- The serial interface COM 1 is an asynchronous serial debug port for service purposes.

***NOTE**. For further information about the pin assignments of the individual panel interfaces, refer to Appendix B.*

***CAUTION.** Risk of explosion if battery is replaced by an incorrect type. Dispose used batteries according to the instructions.*

Line Interface Modules

Depending on your order, one or two line interface modules are firmly mounted on the PCE-2 board. Any combination of the follwing two The line interfaces is possible:

- STM-1 optical line interface
- E1/DS1/J1 electrical line interface

NOTE. *EN 60950, IEC 950, UL 1950: The interface boards are designed for connecting to a telecommunication network (TNV-1 circuits); the appropriate interfaces are provided.*

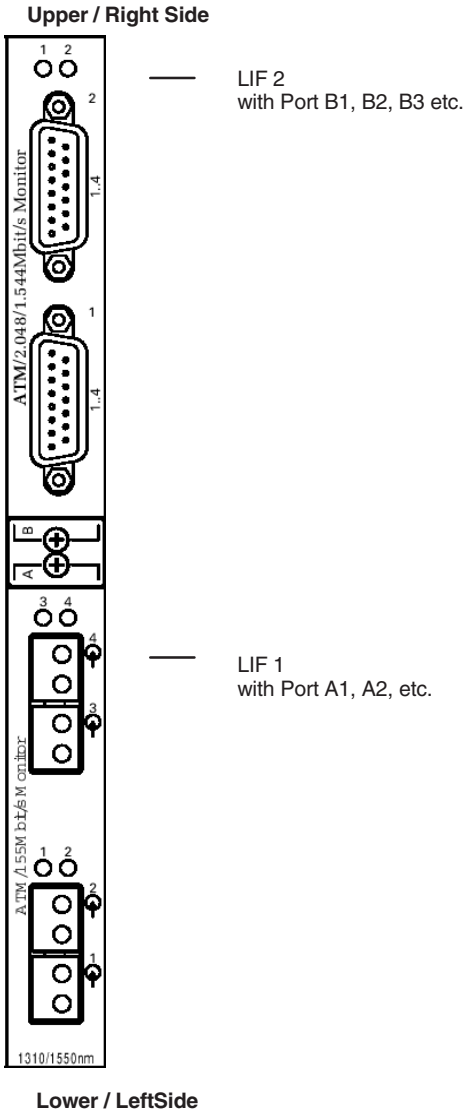


Figure 14: PCE-2 line interface, STM-1 Optical Line Interface

STM-1 Optical Line Interface

Each STM-1 optical line interface has four Rx ports for monitoring two bi-directional lines. Each STM-1 optical interface provides the following features:

- 155.520 Mbps ± 20 ppm
- ITU G.957-S1.1 optical
- ITU G.708
- SDH (SONET) section, line and path overhead processing
- 4 x Rx, sensitivity -3 to -28,5 dbm, 1200-1600 nm (single and multimode)

You can equip each PCE-2 board with one or two STM-1 line interface modules. Always install the first line interface (LIF A) on the lower / left half and the second line interface (LIF B) on the upper / right half of the PCE-2 board.

Each STM-1 Rx port is part of a duplex LC connector. The following connections are possible:

- SC singlemode connections using the standard adapter cable
- SC multimode connections using optional multimode fiber cables
- ST and FC connections for singlemode and multimode using optional adapters

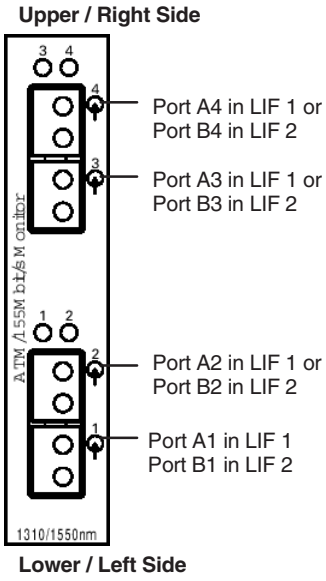


Figure 15: STM-1 optical line interface

WARNING. *Never look into the end of a fiberglass cable or a fiber that could be connected to a laser source. Laser radiation can damage your eyes because it is invisible and your pupils do not contract instinctively as with normal bright light. If you think your eyes have been exposed to laser radiation, you should have your eyes checked immediately by an eye doctor. The optical output's radiation power corresponds to the laser class 1 in accordance with IEC 60825:1993/A2:2001.*

NOTE*. Observe ESD safety regulations. Otherwise erroneous measurement results could occur.*

Specific Features. The firmware for PCE-2 board combinations with STM-1 line interfaces supports the following features:

- Four STM-1 Rx lines on two PCE-2 STM-1PCE line interfaces
- Selection between SDH/SONET framing
- Performance Monitoring functions at regenerator/multiplex section layer and VC-4/SPE-3c HO path layer
- ATM cell adaptation for STM-1/STS-3c according ITU I.432.1/I.432.2 and ANSI T1.646-1995
- ATM cell header correction mode according to ITU I.432.1
- User-Network Interface (UNI) and Network-Node Interface (NNI) as ATM mode selectable
- Online processing for receiving AAL5 CPCS (ITU I.363.5), AAL2 SSSAR (ITU I.363.2 and ITU I.366.1) and AAL0 (raw ATM cells)
- Support of 8192 AAL2 Rx CID's simultaneously (over all ATM interfaces)
- Comprehensive signal/error as well as performance statistics at SDH/SONET layers, at ATM cell level and for all ATM adaptation layers, separated (aggregated) for each physical interface, ATM VCL (VPI/VCI) or AAL2 connection (CID)

Applied Standards. Using PCE-2 board combinations with STM-1 line interfaces, you can monitor interfaces according to the following standards:

- ITU-T, Recommendation G.707, Network node interface for the synchronous digital hierarchy (SDH), 03/1996
- ITU-T, Recommendation G.783, Characteristic of synchronous digital hierarchy (SDH) equipment functional blocks, 04/1997
- ANSI, T1.105-1995, SONET Basic Description including Multiplex Structure, Rates, and Formats, 10/1995
- ANSI, T1.231-1997, Digital Hierarchy Layer 1 In-Service Digital Transmission Performance Monitoring, 10/1997
- ITU-T, Recommendation I.432.1, B-ISDN user-network interface-Physical layer specification: General characteristics, 02/1999
- ITU-T, Recommendation I.432.2, ISDN user-network interfaces - Physical layer specification, 155 520 kbit/s and 622 080 kbit/s operation, 08/1996
- ITU-T, Recommendation I.361, B-ISDN ATM layer specification, 02/1999
- ANSI, T1.646-1995, Broadband ISDN Physical Layer Specification for User-Network Interfaces including DS1/ATM, 05/1995
- Bellcore, GR-1248-CORE, Generic Requirements for Operations of ATM Network Elements, Issue 3, 08/1996
- ITU-T, Recommendation I.610, B-ISDN Operation and Maintenance Principles and Functions, 02/1999
- ITU-T, Recommendation I.363.2, B-ISDN Adaptation layer specification: Type 2 AAL, 09/1997
- ITU-T, Recommendation I.366.1, Segmentation and Reassembly Service Specific Sublayer for AAL Type 2, 09/1998
- ITU-T, Recommendation I.363.5, B-ISDN Adaptation layer specification: Type 5 AAL, 08/1996

Accessories. For the STM-1 line interface module, the following cables and adapters can be ordered as an option:

- Singlemode fiber cable, LC-SC
- Singlemode fiber cable with 10 dB attenuator, LC-SC
- Multimode fiber cable, LC-SC
- Adapter for multimode and singlemode fibers, SC-SC
- Adapter for multimode and singlemode fibers, SC-FC
- Adapter for multimode and singlemode fibers, SC-ST

E1/DS1/J1 Electrical Line Interface

The E1/DS1/J1 ATM line interface has two 15-pin D-sub connectors. On each connector you can monitor two E1, DS1, or J1 lines (Rx and Tx).

The E1/DS1/J1 line interface provides the following features:

- 2.048 Mbps ± 10 ppm (E1), 1.544 Mbps ± 10 ppm (DS1 and J1) Software switchable between E1, DS1, and J1
- 75 Ω asymmetrical (E1)
- 120 Ω (E1), 110 Ω (J1), 100 Ω (DS1), all symmetrical
- Able to monitor ATM data on four bi-directional E1/DS1/J1 lines
- ETSI ETS 300 019 Part 1-3, Class 1-3 for telecommunication centers: Operational and non-operational environment, vibration
- AF-PHY-0086.001; Inverse Multiplexing for ATM (needs to be supported by optional software)

You can equip each PCE-2 board with one or two E1/DS1/J1 line interface modules. Always install the first line interface (LIF A) on the lower / left half of the and the second line interface (LIF B) on the upper / right half of the PCE-2 board.

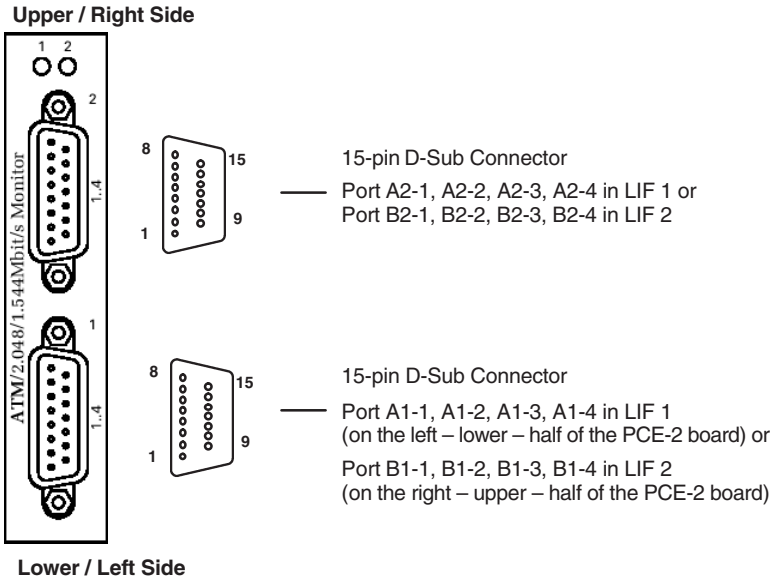


Figure 16: E1/DS1/J1 electrical line interface

CAUTION. *The telephone line cords of port 1 and 2 are to be disconnected before accessing inside the equipment. To reduce the risk of fire, use only No. 26 AWG or larger telecommunications line cords.*

NOTE*. Observe ESD safety regulations. Otherwise erroneous measurement results could occur.*

Specific Features. The firmware for PCE-2 board combinations with E1/DS1/J1 line interfaces supports the following features:

- Eight E1/DS1/J1 ATM Rx lines on two PCE-2 E1/DS1/J1 line interfaces
- ATM cell delineation according to ITU-T I.432.1 and ITU-T I.432.3
- User-Network Interface (UNI) and Network-Node Interface (NNI) as ATM mode selectable
- Up to 4096 open ATM VCL's are supported simultaneously, available to all ATM interfaces.
- Online AAL reassembling for AAL5 CPCS (ITU-T I.363.5), AAL2 SSSAR (ITU-T I.363.2 and ITU-T I.366.1) and AAL0 (raw ATM cells)
- Support of 8192 AAL2 Rx CID's simultaneously (over all ATM interfaces)
- Comprehensive signal/error as well as performance statistics for Rx at physical layers, at ATM cell level and for all ATM adaptation layers, separated (aggregated) for each physical interface, ATM VCL (VPI/VCI) or AAL2 connection (CID)

Applied Standards. Using PCE-2 board combinations with E1/DS1/J1 line interfaces, you can monitor interfaces according to the following standards:

- ITU-T, Recommendation G.703, Physical/electrical characteristics of hierarchical digital interfaces, 10/1998
- ITU-T, Recommendation G.704, Synchronous frame structure used at 1544, 6312, 2048, 8448 and 44746 kbit/s hierarchical levels, 10/1998
- TTC, JT-G.703 (J1 specification)
- ITU-T, Recommendation G.775, Loss of Signal (LOS), Alarm Indication Signal (AIS) and Remote Defect Indication (RDI) defect detection and clearance criteria for PDH signals, 10/1998
- ITU-T, Recommendation I.431, Primary rate user-network interface - Layer 1 specification, 03/93
- TTC, JT-I.431 (J1 specification)
- ANSI, T1.403-1995, Network and Customer Installation Interfaces - DS1 Electrical Interface, 1995
- ANSI, T1.408-1990, Integrated Services Digital Network (ISDN) Primary Rate - Customer Installation Metallic Interfaces Layer 1 Specification, 09/1990
- ANSI, T1.231-1997, Digital Hierarchy Layer 1 In-Service Digital Transmission Performance Monitoring, 10/1997
- ITU-T, Recommendation G.823, The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy, 03/2000
- ITU-T, Recommendation G.804, ATM cell mapping into Plesiochronous Digital Hierarchy (PDH), 02/1998
- ITU-T, Recommendation I.432.1, B-ISDN user-network interface - Physical layer specification: General characteristics, 02/1999
- ITU-T, Recommendation I.432.3, B-ISDN user-network interfaces - Physical layer specification: 1544 kbit/s and 2048 kbit/s operation, 02/1999

- ITU-T, Recommendation I.361, B-ISDN ATM layer specification, 02/1999
- ANSI, T1.646-1995, Broadband ISDN Physical Layer Specification for User-Network Interfaces including DS1/ATM, 05/1995
- Bellcore, GR-1248-CORE, Generic Requirements for Operations of ATM Network Elements, Issue 3, 08/1996
- ITU-T, Recommendation I.363.2, B-ISDN Adaptation layer specification: Type 2 AAL, 09/1997
- ITU-T, Recommendation I.366.1, Segmentation and Reassembly Service Specific Sublayer for AAL Type 2, 09/1998
- ITU-T, Recommendation I.363.5, B-ISDN Adaptation layer specification: Type 5 AAL, 08/1996
- ATM Forum AF-PHY-086-001, Inverse Multiplexing for ATM, V1.1

Accessories. For the E1/DS1/J1 line interface, the following cables and adapters can be ordered as an option:

- Monitoring coax cable, 1.6/5.6 3m, unbalanced, 75 Ω
- Adapter cable for monitoring, 0.3 m, balanced, 120 Ω

CAUTION. *For safety reasons, do not connect the Tektronix Bantam cable with 9-pin D-sub connectors to this adapter cable.*

- Monitoring cable open ends, 3m, balanced, 120 Ω
- Monitoring cable with bantam connector, 3m, balanced, 120 Ω
- Monitoring cable with Siemens connector, 3m, balanced, 120 Ω
- Monitoring cable with RJ45 connector

NOTE*. For more information see the Cable and Accessory Guide at Tektronix.com or contact our local sales partner.*

Time Synchronization Kit

Using the optional Time Synchronization kit you can precisely synchronize your K15 system clock to the Universal Coordinated Time (UTC).

The Time Synchronization kit consists of the following components:

- GPS antenna
- Synchronization interface module
- Power supply
- Cables
- Trimble software including User Guides for installing the kit

***NOTE**. To synchronize your K15 system clock, you do not need to install the Trimble software. Synchronize the K15 system clock using the K15 NTP Configuration tool as described on page 54.*

GPS Antenna. The GPS antenna is actually a combined GPS antenna and receiver.

You must install this antenna anywhere outdoors, at a place that has a relatively unobstructed view to the sky, preferentially on top of the roof. For details on how to install the GPS antenna, refer to the Acutime 2000 User Guides delivered on the Trimble CD ROM.

WARNING. *The GPS antenna does not provide any protection against the affects of lightning or other atmospheric discharges.*

Proper grounding and adequate surge suppression must be provided when it is installed.

To protect against atmospheric discharges, the surge protectors provided with the antenna must be installed and properly grounded at both ends of the cable. Surge protectors will not protect persons or property from the affects of a direct lightning strike.

The GPS antenna must be installed in compliance with all local regulations.

Synchronization Interface Module. The Synchronization interface module is the I/O and power interface to the GPS antenna. It is connected to the antenna and to your K15. Connect the synchronization interface module to the K15 as follows:

1. After you have installed the GPS antenna, connect the interface cable from the antenna to the serial interface (RS422/24V DC) of the synchronization interface module.
2. Using the RS232 cable, connect Port A of the module to the serial interface on the front panel of the K15 PC board.
3. Using the Tektronix BNC to SMB coax cable, connect the PPS interface of the module to the 1 PPS coax connector of the Timesync interface on the rear of the K15.

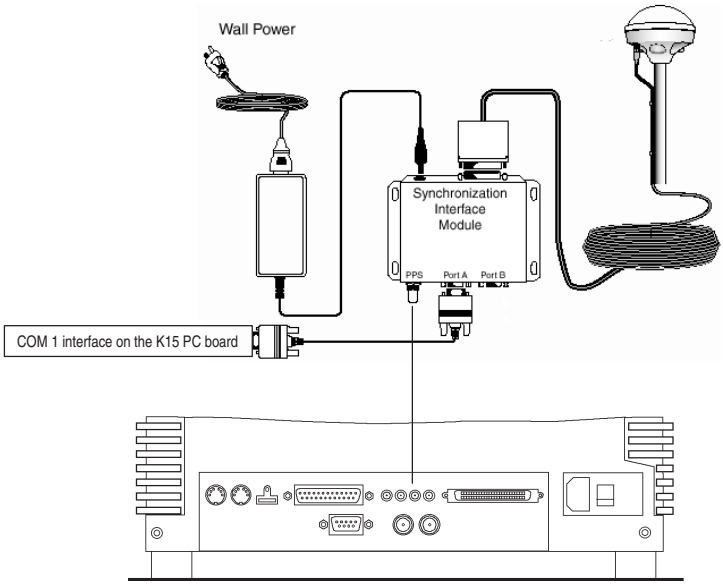


Figure 17: Installing the GPS antenna

4. Using the power cord, connect the synchronization interface module to a socket with protective ground.

Synchronizing the K15 system clock to UTC. Use the K15 NTP (Network Time Protocol) Configuration tool to synchronize the K15 system clock. Activate this tool as follows:

1. Switch your K15 on and start the K15 software.
2. Select the *NTP Configuration* entry from the K15 *Tools* menu.

   The *Network Time Protocol - Service Configuration* dialog box opens.

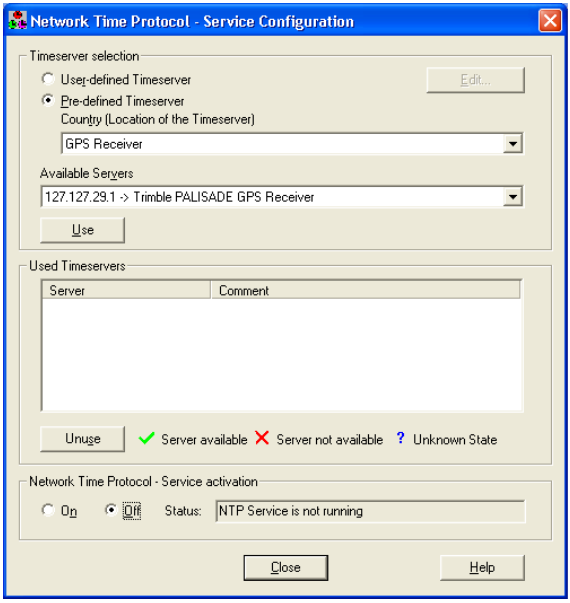


Figure 18: Network Time Protocol – Service Configuration dialog box

3. Click *Pre-defined Timeserver* in the *Timeserver Selection* group and select *GPS receiver* in the upper drop-down list box.

   The available GPS server is displayed in the lower drop-down list box.

4. Press *Use* to select the available server for synchronizing the K15 system clock. Then the server is also displayed in the Used Timeservers list in the lower half of the dialog box.

5. To start the time synchronization, select *On* in the *Network Time Protocol – Service activation* box.

   Time synchronization process starts. It is finished, when the entry in the Status field is changed from *NTP Service is NOT synchronized* to *NTP service is synchronized*.

External Hard Disk Drive

Using the optional external hard disk drive you can easily increase your K15's storage capacity for user data.

The external hard disk drive consists of the following components:

- Portable drive carrier
- Fixed 3.5" SCSI hard disk (up to 140 GB)
- Power cord
- 68-pin hard disk cable (HD68)
- SCSI terminator

The external hard disk drive provides interfaces, switches, and indicators as shown in the following figure:

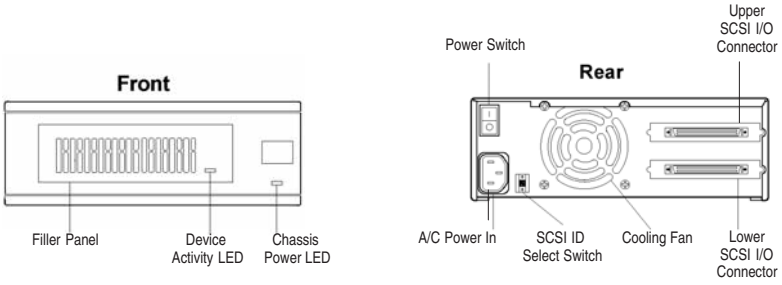


Figure 19: External hard disk drive, front and rear view

***NOTE**. Before installing device drivers, you should consult the device documentation provided by the manufacturer.*

***NOTE**. At the moment, you can connect only one external hard disk drive. Do not connect power cords longer than 3 meters.*

Connecting the External Hard Disk

To connect the external hard disk drive to your K15, proceed as follows:

1. Switch off your K15 Protocol Tester.
2. Using the HD68 cable, establish a connection between the SCSI interface on the K15 rear panel (see figure 4) and the upper SCSI I/O connector on the rear of the external hard disk drive.
3. To connect more than one external hard disks, establish a connection between the lower SCSI I/O connector on the rear of the first external hard disk drive and the upper SCSI I/O connector on the rear of the second external hard disk drive.
4. Terminate the lower SCSI I/O connector on the rear of the external hard disk drive carrier using the delivered SCSI terminator.
5. Select the appropriate SCSI ID number for the external hard disk drive as shown in Figure 20.
   - Select SCSI ID 3 for the first external hard disk drive.
   - Select SCSI ID 4 for the second external hard disk drive etc.

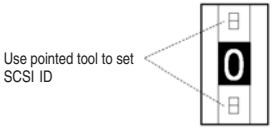


Figure 20: SCSI ID Select Switch

CAUTION. *Do not select SCSI ID 7 for an external hard disk drive. This ID is usually reserved for the host.*

6. Using the proper power cord, connect the rear panel A/C Power In connector to a socket with protective ground. The Chassis Power LED indicates that power is being supplied to the device.
7. Press the rear panel Power Switch to turn on the device. The Device Activity LED indicates that the device is active.
8. Start your K15 Protocol Tester. The K15 computer management automatically detects the new external device.
9. Select *Start / Administration / Computer Management* to view the detected disk. The *Computer Management* dialog box opens. The new disk is displayed as Disk 0.

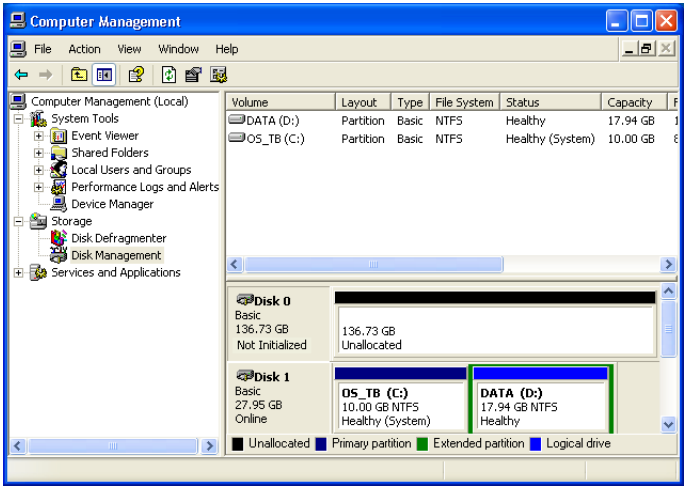


Figure 21: Computer Management dialog box

To completely integrate the new disk into your system, you must now initialize the disk, create a new partition, and format the new disk.

Initializing and Formatting the External Hard Disk

Perform the following steps to integrate the new disk into your system.

Initialize the New Disk. To initialize the new disk proceed as follows:

1. Click *Disk Management* in the tree view of the *Computer Management* dialog box (see figure 21). The *Initialize and Convert Disk Wizard* opens.
2. Follow the instructions in the wizard. Select Disk 0 to initialize and unselect Disk 0 disk to convert.
3. Confirm your settings by pressing the *Finish* button and wait until the initializing process is finished.

Create an Extended Partition on the New Disk. To create an extended partition on the new disk, proceed as follows:

1. Use the right-mouse button (right-click) to open the Disk 0 context menu in the *Computer Management* dialog box.

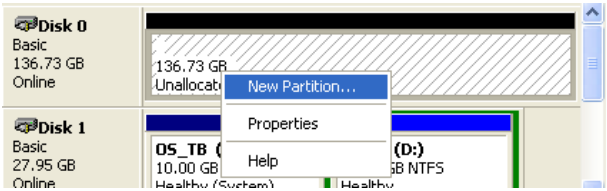


Figure 22: Disk 0 context menu

2. Select *New Partition...* from the Disk 0 context menu. The *New Partition Wizard* opens.
3. Follow the instructions in the wizard.
   - Select *Extended partition* as partition type.
   - Do not change the displayed partition size.
4. Confirm your settings by pressing the *Finish* button and wait until the partitioning process is finished.

Create a Logical Drive and Format the Disk. To create a logical drive within the extended partition of the new disk and format the disk, proceed as follows:

1. Right-click to open the Disk 0 context menu in the *Computer Management* dialog box again.
2. Select *New Logical Drive...* The *New Partition Wizard* opens once again.
3. Follow the instructions in the wizard.
   - Select *Logical Drive* as partition type.
   - Do not change the displayed partition.
   - Assign a free drive letter of your choice.
   - Specify the following format settings. Enter a appropriate *Volume Name* of your choice.

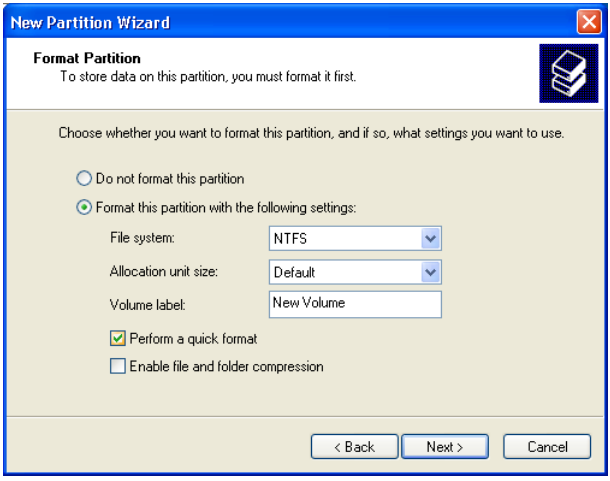


Figure 23: Format settings

4. Confirm your settings by pressing the *Finish* button and wait until the formatting process is finished.

   The new disk drive is displayed in your Windows XP Explorer.

PC Configuration

The protocol tester is delivered completely configured. The following software components are already installed:

- Windows XP Embedded (XPe) SP1
- Internet Explorer 6.0
- Acrobat Reader 5.0
- Software components for initializing the measurement boards
- Measurement applications as ordered

The hard disk is divided into two partitions**:**

- C: Primary partition with the operating system and some non-application-specific programs and files
- D: Extended partition with K15 specific installation files under *D:\K15* and free memory space for storing user data

Operating System

The user interface application of the K15 runs under Microsoft Windows XPe.

CAUTION. *The K15 is delivered with a specially configured version of Windows XPe.*

The Windows XPe installation is supported by Tektronix only. Microsoft Support Services do not support this installation.

The risk of changes (software developments or expansions) which the customer undertakes is carried by the customer. Regarding this Tektronix assumes no responsibility.

Windows XPe is delivered in the English version. It starts immediately after you set up and switch on your K15. Activation is not necessary.

Windows XPe is described in detail in the Windows XP online help. To open the online help, click *Start: Help and Support* on the taskbar. *Help and Support* is your comprehensive resource for Windows XPe information and tools.

Preconfigured Accounts, Automatic Logon

Upon delivery, the device is configured with the following user accounts:

Table 2: Account Data

User name	Password	State
Administrator-K15	xinortket15k	on
Administrator	xinortkeT51K	on (built-in)
Guest	(none, left blank)	off

CAUTION. *Do not rename the accounts and do not change the Group Memberships of the accounts, because this might make the device unusable.*

Autologon Account. *Administrator-K15* is pre-configured as autologon account. Use always this account when:

- Operating the K15
- Operating the Remote Desktop Client

CAUTION. *Do not change the pre-configured Administrator-K15 account, since password changes also require modifications of the automatic logon.*

For those changes, precise knowledge about the concept of user accounts and user groups in Windows XP is required. The risk of changes which the customer undertakes is carried by the customer.

The password for the autologon account (by default: Administrator-K15) account is visible in the registry for everyone who has physical access to the device.

CAUTION. *For safety reasons, do not use the password of the autologon account (by default: Administrator-K15) for other accounts and on other system units (PCs, Unix networks, etc.)*

Security Requirements

Security Requirements for Stand Alone Systems. The pre-configuration of the device has been chosen for a stand-alone system without enhanced security requirements for ease of operation. Particular security measures are not necessary.

Security Requirements for Network Operation. If you apply the Protocol Tester within a network or by way of a modem, then implement further and enhanced security measures.

We strongly recommend to observe for instance the following general statements:

- Access via an individual LAN

  If you operate your Protocol Testers within an individual LAN network, then protect this network against access from other PCs.

- Access via a company-wide Intranet

  If you operate your Protocol Testers within an Intranet, then implement an extended user administration and employ up-to-date virus scanners and firewalls.

- Access via Internet or modem

  If you want to access your Protocol Tester via the Internet, implement the same security measures as in Intranets (see above). You can also implement additional security measures with the help of virtual private networks (VPNs).

To implement additional security measures, contact your local system administrator or the Tektronix service center.

CAUTION. *The implementation of extended security measures is your sole responsibility. It is realized at customer's own risk and without liability to Tektronix.*

You should implement these measures especially while applying the Remote Desktop *software or when transferring files via a network.*

Ethernet Connection and Remote Operation

If you want to operate the protocol tester in a local Ethernet network, you can use the built-in network adapter of the protocol tester. To establish an Ethernet connection, connect your Ethernet cable to the 10BaseT / 100BaseTX connector of the K15 PC board.

The pre-installed protocol is TCP/IP. The properties for the default connection can you see in the *Local Area Connection Properties* dialog box.

To open this dialog box, select *Start / Control Panel / Network Connections* and double-click an active *Local Area Connection*. A *Status* dialog box for this connection opens. By pressing the *Properties* button you open the *Local Area Connection Properties* dialog box.

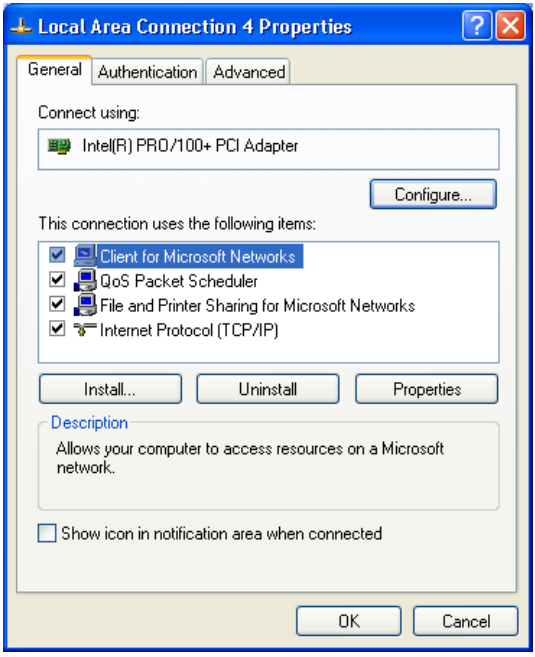


Figure 24: Local Area Connection Properties, Generals tab

The protocol tester can be remotely operated with the help of Remote Desktop. Using Remote Desktop you can connect each Windows computer to a K15. This allows you to remotely control your K15 without being in field or test laboratory.

- Computers with operating system Windows XP Professional can be connected immediately to your K15.
- To connect computers running Windows 95 or a more recent version of Windows to your K15, you must install the Remote Desktop Connections Client software.

  The Remote Desktop Connections Client software is available on the delivered Windows XP recovery disk. To install it, start the *msrdpc.exe*

To activate Remote Desktop, proceed as follows:

1. Enable the Remote Desktop feature on your K15: click *Start –> Control Panel –> System*. The *System Properties* dialog box opens.
2. Open the *Remote* tab and enable *Allow users to connect remotely to this computer*. Close the *System Properties* dialog box.
3. On the control computer side: Select *Start –> All Programs –> Accessories –> Communications –> Remote Desktop Connection*. The *Remote Desktop Connection* dialog box opens.

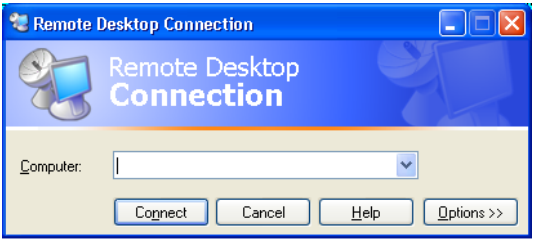


Figure 25: Remote Desktop dialog box

4. Enter the name of the K15 and click **Connect**.

Software Program Modules

The K15 software consists of three program modules used to define measurement tasks and to evaluate measurements. These modules are realized as main windows. In this way, you can simultaneously display all settings relevant to a measurement task or select them alternately. The program modules are:

- Data Flow: to configure hardware and sources and to define measurement tasks
- Protocol Stack Editor: to define the relations between protocols and their display parameters and to create your own protocol stacks
- Monitor: to display and evaluate online and offline measurements

Data Flow Window

The main window is the Data Flow Window, which contains a graphical display of configured measurement scenarios. Scenarios are represented by pipelines.

The left part of the window contains a list of all the scenarios, each corresponding to a pipeline in the right part of the window. The scenarios define such things as interface, port, time slot, and bit-rate for the connected link.

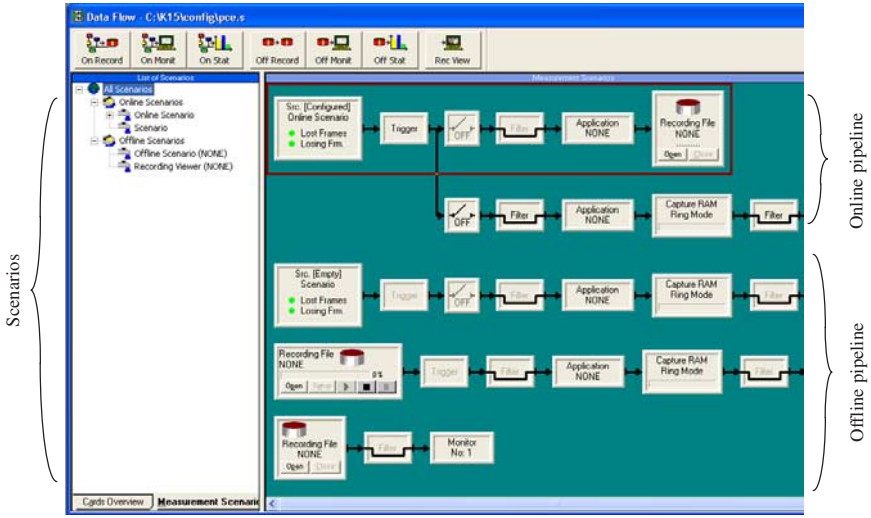


Figure 26: Data Flow Window with pipelines

Protocol Stack Editor

Data transmission involves the exchange of data packets between two stations via a connection (for example, a PCM link). For the messages to be understood, the data packets must adhere to certain rules, called protocols.

If you want to perform a measurement using the protocol tester, the unit must be familiar with the rules of data exchange. For this purpose, the protocol tester refers to description files (User Part Descriptions, UPD) that describe the protocol rules in machine-readable format. Although protocol levels are essentially separate entities, relationships do exist between them. A telephone, for example, must be able to recognize whether a telephone number or an alerting signal is being transmitted. The relationships between protocols are defined in protocol stacks. You can change or create new relationships between the protocols in a given protocol stack using the protocol stack editor.

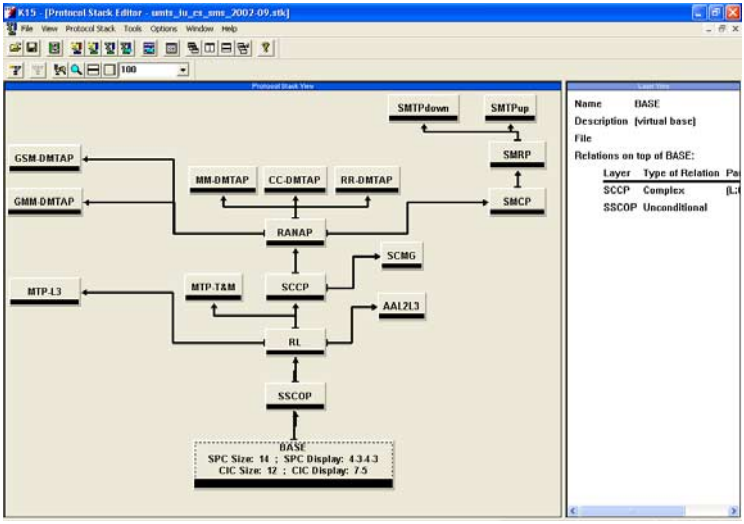


Figure 27: Protocol Stack Editor

Monitor Window

The monitor main window (see figure 28) consists of three views (see each title bar). The Short View is shown in the upper part the window, the Frame View in the middle and the Packet View in the lower part. These three views display the data flow at different levels of complexity.

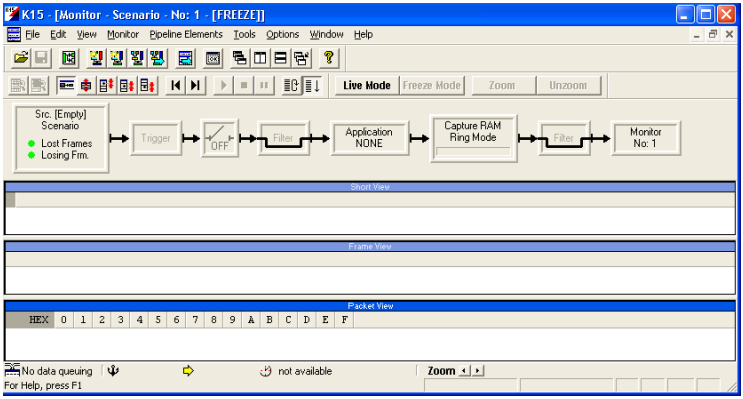


Figure 28: Monitor window

***NOTE**. The user manual K15 Protocol Tester Operating Basics and a context-sensitive online help system provide detailed information about using the K15 software.*

Service and Support

When we deliver a Tektronix product to you, we provide support to complete your solution. Our technical support experts offer application specific solutions. Our worldwide flexible support services, including on-site support, are designed to ensure that your instruments operate at peak performance. You always will receive a timely response when you need it, where you need it.

NOTE. *Microsoft Support Services cannot be used for the Windows XPe installation. The K15 Protocol Tester is supported by Tektronix only.*

Getting Started

This chapter describes all steps needed to install your K15 for the first time. It deals mainly with installing hardware, setting up the device, installing the measurement boards, and connecting the K15 to the item under test.

The basic operating software is already installed on the hard disk upon delivery. If you ordered additional software, such as microprocessor or bus support, you will need to install it. Refer to the installation instructions that are shipped with the additional software.

If you are working with the K15 for the first time, you should also read the *K15 Short Introduction*. This manual is available in a printed version and as a PDF online manual in the \hlp directory.

Prerequisites

You should have the following qualifications to work with the K15:

- Knowledge of the safety requirements for electrical equipment for measurement, control and laboratory use
- Knowledge of the measurement application field as well as experience with communications test applications
- Familiarity with signaling protocols
- Knowledge of PC and Windows XPe
- Completion of a K15 training course

NOTE. *The participation in a K15 training course is recommended. Information on training courses is available from your local sales partner or through the support unit.*

Inspecting the Shipment

The device has been delivered according to your requirements. Please inspect the shipment for visible transport damage and for completeness using.

You should also verify the following:

- Verify that you have the correct power cords for your geographical area.
- Verify that you have backup copies of the installed software. New devices always contain a Windows XP recovery disk.

  This CD can be used to restart the device in case of a major hardware or software failure. It contains the state of the device at the time of production without K15 software. With this CD you can reproduce the user accounts and the driver configuration that existed when the device was produced. The reproduction of the user accounts is necessary if the passwords have been lost (after being changed).

  Store this backup software in a safe location where you can easily retrieve the software for maintenance purposes.

  ***NOTE**. For further information on how to use the Recovery Disk refer to Appendix D.*

- Verify that you have all the standard and optional accessories that you ordered.

Setting Up the K15

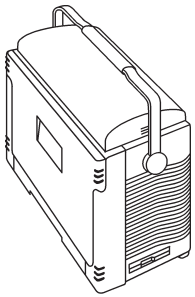
Read this section before starting any installation procedures. This section describes site considerations, power requirements, and ground connections for your device.

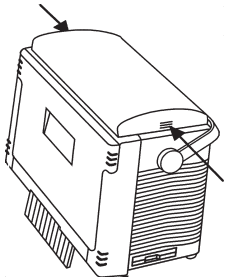
The portable mainframe is designed for field service but not for outdoor operation. For proper cooling, at least 5 cm of clearance is recommended on both sides of the mainframe.

CAUTION. *After cold transportation, warm up instrument without powering on at least four hours.*

Proceed as follows when setting up the device:

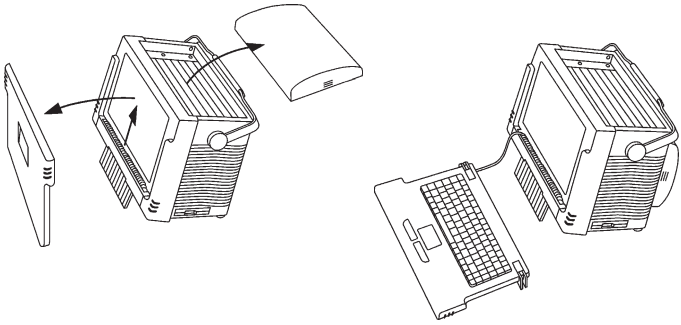
1. Place the chassis on a stable surface with the front panel facing you. To achieve an optimal view angle, the device can be tilted to 15° by placing the large dark front foot in a vertical position. It is then be used as device rest.
2. Fold back the handle until it locks and set the device in the desired position.





3. Slide the keyboard up and pull it away from the device. Place the keyboard in front of the device.

Push the cover latches, remove the device cover, and attach it to the back of the instrument as shown in the following figures.



4. If you want to connect an external keyboard, proceed as follows:

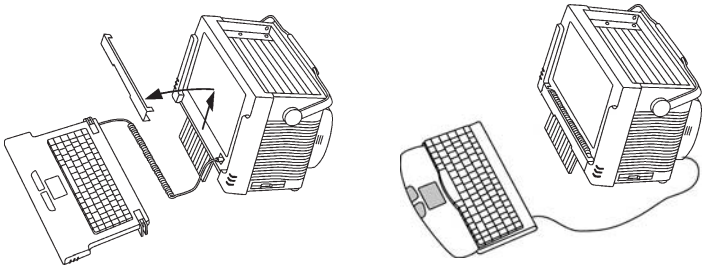
a. Push the front cover below the display slightly downwards and fold this cover towards you.

The keyboard connection interface (KEYBOARD) is located behind the front cover, beneath the display. This interface is a PS/2 interface.

b. Disconnect and remove the keyboard cable of the default keyboard.

c. Place the external keyboard in front of the device.

d. Connect the keyboard cable to the right PS/2 connector (MOUSE/KEYBOARD) at the rear of the device and the mouse cable to the left PS/2 connector (MOUSE) at the rear of the device.



CAUTION. *If you use a keyboard with touch pad, do not connect an external mouse to* the *left PS/2 connector (MOUSE) at the rear of the device.*

Always connect only ONE PS/2 keyboard and one PS/2 mouse to the K15.

5. Check for incorrect or failed fuses.

   If the fuses need to be changed, use an appropriate tool, such as a flat blade screwdriver and insert it into the slot next to the on/off switch (see figure 37 on page 96)

   Pull the cover towards you, then pull the red strip and change the fuses. Refer also to table C–1 on page C-2).

6. If you ordered additional hardware, you will need to install it. Refer to the installation instructions that are shipped with the hardware.

CAUTION. *Connect the keyboard, mouse, and other accessories before applying power to the mainframe.*

Connecting the accessories after turning on the device can damage the accessories.

Installing Measurement Boards

Upon delivery, all boards are preinstalled in your K15. You can easily install and remove the measurement boards from slots 1 to 5.

WARNING. *Only qualified personnel should perform service procedures. Read the Service Safety Summary and the General Safety Summary before performing any service procedures.*

CAUTION. *To exchange measurement boards, the device must be switched off completely.*

The telephone line cords of the ports are to be disconnected before accessing inside the equipment.

CAUTION. *The boards are susceptible to static-discharge damage. Install boards only in a static-free environment. Observe standard handling precautions for static-sensitive devices while servicing the unit. Always wear a grounded wrist strap, or equivalent, while installing boards.*

All boards must be installed in the correct slot for the proper operation of the instrument. The following figure illustrates the slot assignment:

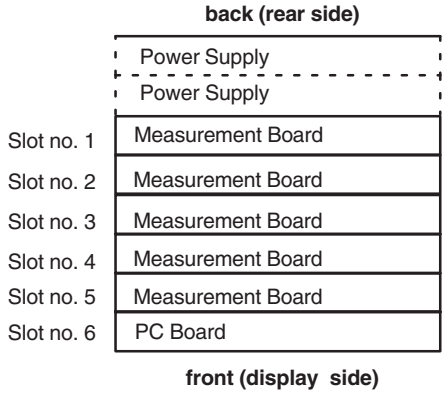


Figure 29: K15 Slot Assignment

CAUTION. *If you put a board into the wrong slot, you could damage the board and the instrument.*

Slot 6 is reserved for the PC board only. Do not put the PC board into other slots and do not put other boards into slot 6.

A PZD size 1 screwdriver is required for board installation.

Proceed as follows to install measurement boards:

1. Loosen the two PZD screws on the slot cover and remove the slot cover and the screws.

***NOTE**. To have more space during the installation procedure, it might be advisable to also remove the neighboring slot covers.*

2. Carefully remove the blue plastic air baffles on the left side of the slot.
3. Make sure that no foreign parts fall or lie on the bus and its pins.

   Check if the red cPCI rack keys of the new board match to their counterparts on the slot-frame.
4. With board handles not in a completely vertical position, slide the board slowly, carefully, and straight into the slot along the guidance track and into place.

***CAUTION.** When sliding the board into place, be sure to not bend any of the sensitive pins on the bus.*

5. Click the board handle in place and fasten the screws on the front panel.

You can control the individual measurement boards and the interface sockets using applications.

Installing PCE-2 Board Combinations

Install PCE-2 board combinations in two free slots between slot no. 1 and no. 5.

The line interface modules must be installed on the PCE-2 board according to specific rules:

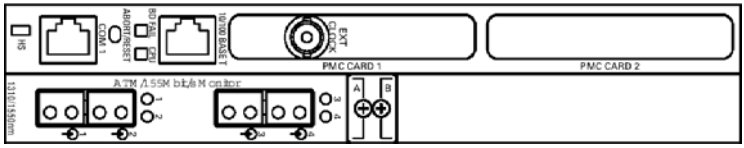
- In PCE-2 board combinations with only one line interface module, this module is always installed on the left (lower) half of the host processor board. Those line interfaces are referred to as LIF A.
- In mixed PCE-2 board combinations, the STM-1 module is always installed on the left (lower) half of the PCE-2 board. It is referred to as LIF A. The E1/DS1/J1 line interface is installed on the right (upper) half of the PCE-2 board and is referred to as LIF B.
- There are no PCE-2 board combinations with a line interface module installed only on the right half of the PCE-2 board.

CAUTION. *If you install a line interface in the wrong place, you could damage the board and the instrument.*

Place the line interface modules according to the following figures:

One STM-1 Line Interface Module. In PCE-2 board combinations with one STM-1 LIF, install the STM-1 module on the left half of the PCE-2 board.

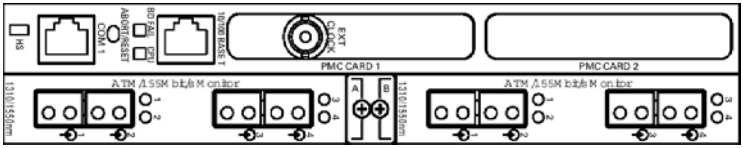
back (rear side)



front (display side)

Two STM-1 Line Interface Modules. In PCE-2 board combinations with two STM-1 LIFs, install the first STM-1 module on the left half of the PCE-2 board and the second one on the right half.

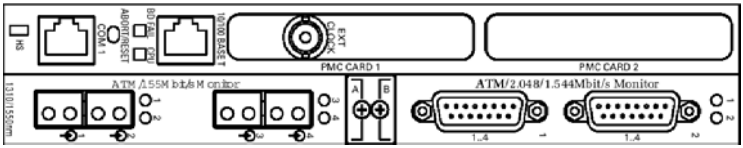
back (rear side)



front (display side)

One STM-1 and One E1/DS1/J1 Line Interface Module. In PCE-2 board combinations with one STM-1 and one E1/DS1/J1 LIF, install the STM-1 LIF on the left half of the PCE-2 board and the E1/DS1/J1 LIF on the right half.

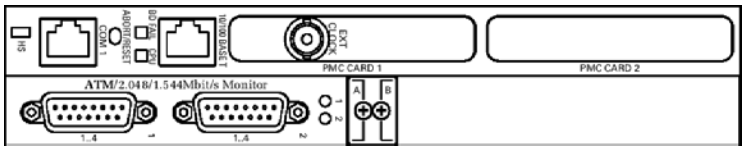
back (rear side)



front (display side)

One E1/DS1/J1 Line Interface Module. In PCE-2 board combinations with one E1/DS1/J1 LIF, install the E1/DS1/J1 module on the left half of the PCE-2 board.

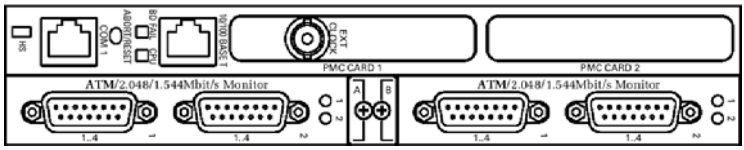
back (rear side)



front (display side)

Two E1/DS1/J1 Line Interface Modules. In PCE-2 board combinations with two E1/DS1/J1 LIFs, install the first E1/DS1/J1 module on the left half of the PCE-2 board and the second one on the right half.

back (rear side)



front (display side)

Connecting the Items Under Test

The K15 can be connected to Items Under Test (IUT) in the *on* or *off* state using the cables available as accessories.

***NOTE**. Tektronix offers a wide range of cables and adapters that you can order to use with your protocol tester.*

For more information, about accessories, go to the Cable and Accessories Guide for Protocol Analyzer *under www.tektronix.com or contact your local sales partner.*

Connecting Electrical Measurement Boards

This section describes, how you must connect Power WAN, Power WAN Light or PCE-2 board combinations with electrical line interface(s) to the Item under Test.

Passive Monitoring via Protected Monitoring Points. If available, use the protected monitoring points of your IUT to establish a connection between the K15 and the IUT.

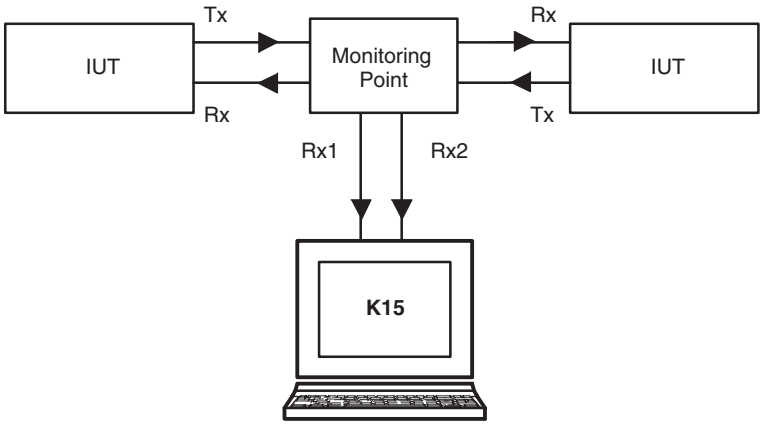


Figure 30: Connecting electrical measurement boards to monitoring points

Protected monitoring points can send either E1 data (75 Ω asymmetrical or 120 Ω symmetrical), DS1 data (100 Ω symmetrical), or J1 data (110 Ω symmetrical). Select the appropriate cable for your data type.

For this monitoring mode, the cable length can be more than three meters.

CAUTION. *For E1 connections, pay attention to possible impedance differences. The impedance can be set using the K15 application.*

Control the electrical requirements using the K15 application, via *Ports Setup / Advanced Settings*:

- Set *Mode* either to E1, DS1, or J1.

  For E1 mode, select 75 Ω (asymmetrical) or 120 Ω (symmetrical) as *Impedance*.

  For DS1 mode, select 100 Ω (symmetrical) as *Impedance*.

  For J1 mode, select 110 Ω (symmetrical) as *Impedance*.

- Set the *Boost (Rx)* to the value that complies with the attenuation of the monitor point.

Passive Monitoring Without Monitoring Points. If your IUT does not have monitoring points, connect the K15 to the IUT using wire stubs.

Adding wire stubs to communication links disturbs signal transmission because of signal reflections. Therefore, the length of the wire stubs should be kept as short as possible. Usually the impact of reflection caused by wire stubs that are shorter than three meters can be neglected.

The cable length of the wire stubs should be less than three meters.

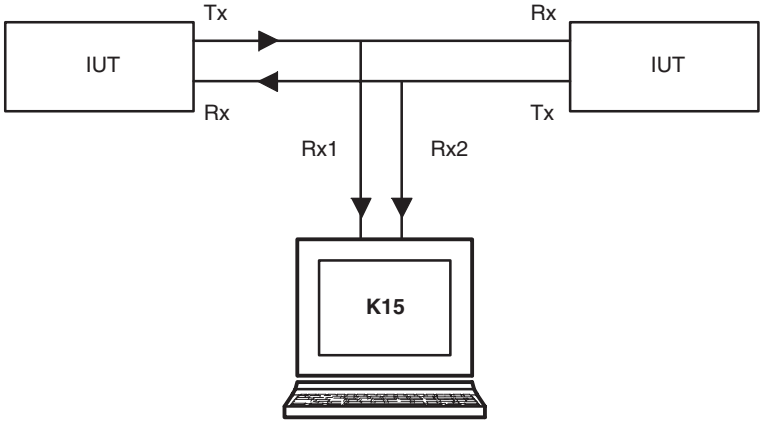


Figure 31: Connecting electrical measurement boards with wire stubs

Control the electrical requirements using the K15 application via *Ports Setup / Advanced Settings*:

- Set the *Impedance* to high-resistant.
- Set the *Boost (Rx)* to 0 dB.

Connecting Ethernet Interface Boards

This section describes how you must connect the PMC Ethernet module to the Item under Test.

Passive Monitoring with Monitoring TAP. If available, use a protected monitoring TAP to establish a connection between the K15 and the IUT.

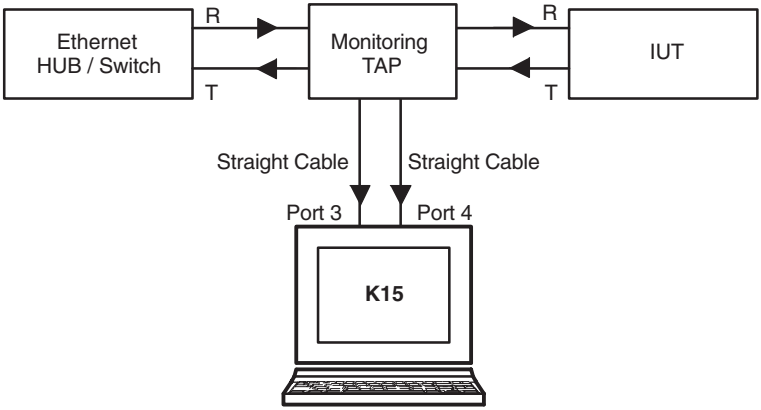


Figure 32: Connecting Ethernet boards to monitoring TAPs

Passive Monitoring without Monitoring TAP. If there is no monitoring TAP available, establish the connection between the K15 and the IUT as shown below:

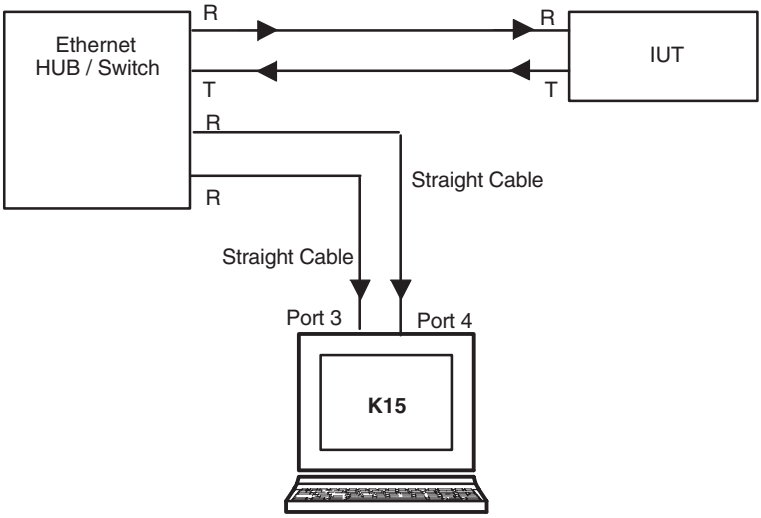


Figure 33: Connecting Ethernet boards to a monitoring port

Connecting Optical Measurement Boards

This section describes how you must connect PCE-2 board combinations with optical line interface(s) to the Item under Test.

Passive Monitoring via Monitoring Points. If available, use the protected monitoring points of your IUT to establish a connection between the K15 and the IUT.

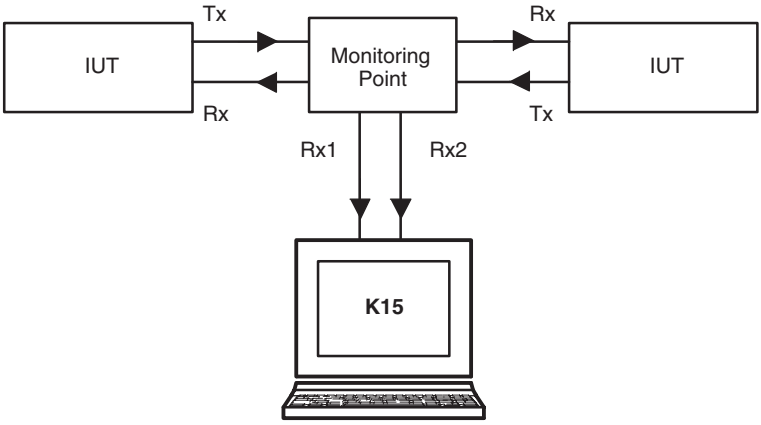


Figure 34: Connecting STM-1 LIFs to monitoring points

Monitoring points transmit optical signals either in singlemode fibers or in multimode fibers. Depending on the fiber, you must select the required cable.

Make sure that the optical input power at the optical input ports of the K15 and the output power of the monitoring point complies with the specified sensitivity value (see page 39). To check the optical output power, you need an optical power meter.

Passive Monitoring with Optical Couplers. If your IUT does not have monitoring points, connect your K15 via two optical couplers to the IUT.

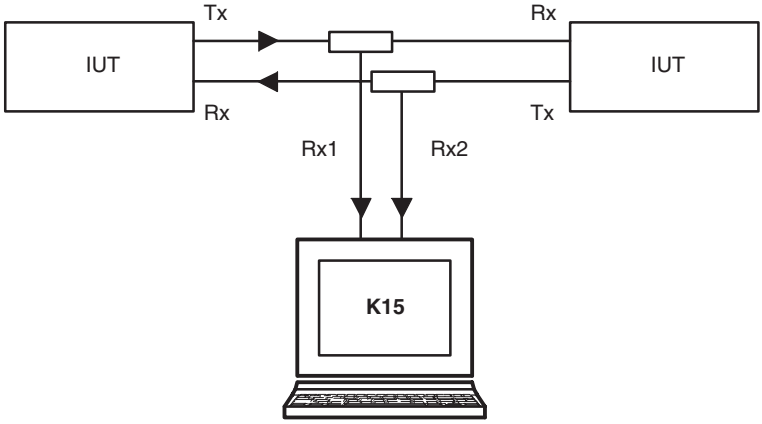


Figure 35: Connecting STM-1 LIFs with symmetrical optical couplers

Optical couplers have one input and two outputs. They split an optical input signal into two optical output signals. They split the power of the input signal either into equal shares (symmetrical couplers) or into unequal shares (asymmetrical couplers).

Specific couplers are required for singlemode and for multimode applications. Depending on your IUT, you must select the required coupler.

Make sure that the input power provided at the optical inputs of the K15 and of the coupler output comply with their specified values. Therefore, select splitters with an appropriate split ratio.

Tektronix offers symmetrical (50 % – 50 %) and asymmetrical (90 % – 10 %) couplers. Figure 35 shows a test case using symmetrical couplers.

Connect asymmetrical couplers as shown below:

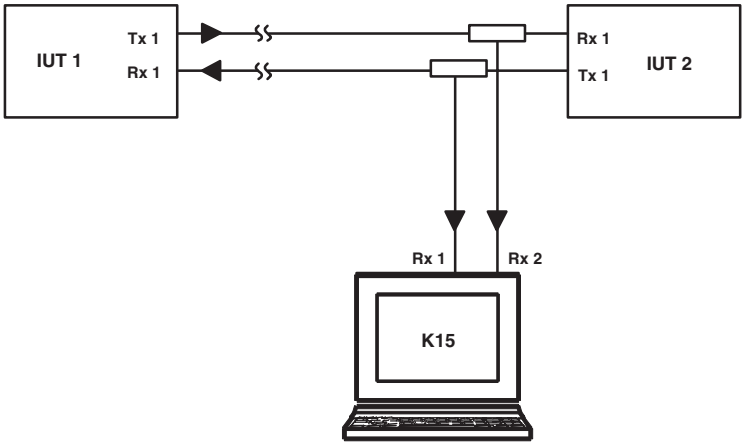


Figure 36: Connecting STM-1 LIFs with asymmetrical optical couplers

To connect the coupler to your IUT, proceed as follows:

1. Connect the coupler input to the Tx port of your IUT.
2. Connect one coupler output to the regular Rx port or your IUT.
3. Connect the second coupler output to a free port of the optical STM-1 interface of your K15.

WARNING. *Never look into the end of a fiberglass cable or a fiber that could be connected to a laser source. Laser radiation can damage your eyes because it is invisible and your pupils do not contract instinctively as with normal bright light. If you think your eyes have been exposed to laser radiation, you should have your eyes checked immediately by an eye doctor. The optical output's radiation power corresponds to the laser class 1 in accordance with IEC 60825:1993/A2:2001.*

Connecting Peripherals

External devices can be connected to your K15 in several ways. Some devices, such as keyboard, mouse, or USB devices, are connected to the front panels of the installed boards of your K15. Other devices, like printers and external drives, are connected to ports on the rear panel of your protocol tester. The location of the different interface connectors is shown in figure 4 on page 15.

For a device to work properly with Windows, a device driver must be installed on the system. Each device is supported by one or more device drivers, which are typically supplied by the device manufacturer. However, some device drivers are included with the operating system. If the device is Plug and Play, Windows XPe can automatically detect it and install the appropriate device drivers.

If the device is not automatically installed by the operating system, the *Found New Hardware Wizard* will appear and ask you to insert any media, such as compact discs or floppy disks, that were provided with the device.

Non-Plug and Play devices are installed using the *Add Hardware Wizard.* To start this wizard, click *Start –> Control Panel –> Add Hardware*.

Before manually installing device drivers, you should consult the device documentation provided by the manufacturer.

You must be logged on as an Administrator or as a member of the Administrators group in order to install or configure a peripheral device.

CAUTION. *To avoid product damage, always power off the K15 before installing any accessories.*

Turning On the K15

Perform the following steps to turn on the K15 for the first time:

1. Make sure that the keyboard cable is connected to the keyboard interface.
2. Using the proper power cord, connect the rear panel power connector to a socket with protective ground (see Figure 37) .
3. Press the power switch to turn on the device. The power switch is located on the rear of the device (see Figure 37). The LED on the front panel of the power supply indicates that the device is powered up.

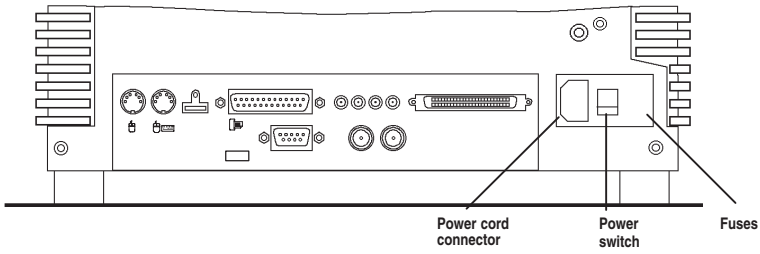


Figure 37: Line fuse, power cord connector, and power switch locations

4. The protocol tester is set ready-to-run upon delivery.

   You can start the K15 software manually by double-clicking on the K15 icon. The operating system loads, and then the K15 application is started from the `Startup` folder.

5. The following window *K15 Status Window* appears on the screen, indicating the initialization of your configuration:

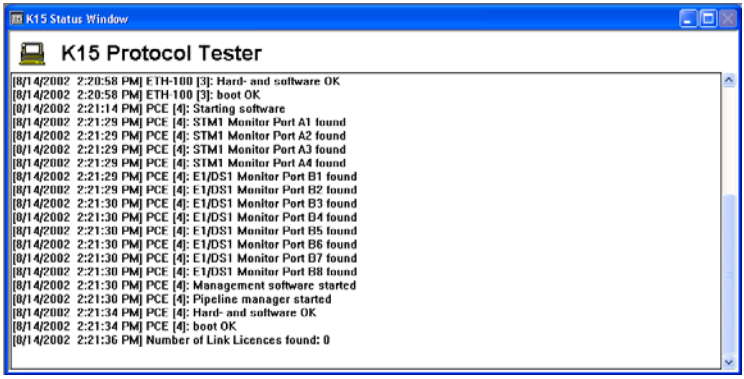


Figure 38: K15 Status Window

6. Wait until the *K15 Status Window* is minimized in the taskbar.

   If you start Windows XPe for the first time, you are automatically logged on as administrator with the following information:

   ```
   User name: Administrator-K15
   Password: xinortket15k
   ```

CAUTION. *Do not change the pre-configured Administrator-K15 account, since password changes also require modifications of the automatic logon.*

For those changes, precise knowledge about the concept of user accounts and user groups in Windows XP is required. The risk of changes which the customer undertakes is carried by the customer.

Software Installation

System updates and upgrades or new software programs are commonly delivered on CD-ROM with a setup program and a Readme file. You should read the Readme file carefully before installing the software.

***NOTE**. The device is ready for use upon delivery. Windows XPe and the application have already been installed.*

To install new software, system updates or upgrades, proceed as follows:

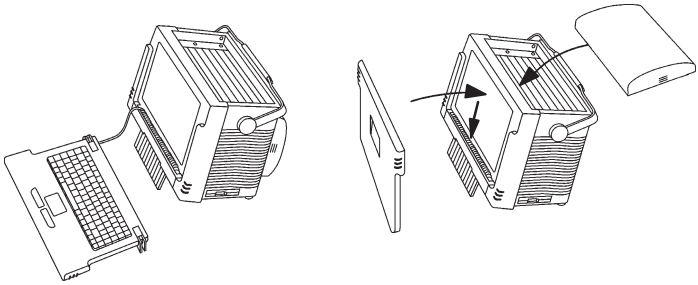
1. Insert the installation CD into the CD-RW drive. If installation does not start automatically, go to step 2.
2. Start the installation process. How to start it is explained in the Readme file delivered with the software.
3. Follow the setup program instructions.

Switching Off and Transporting the K15

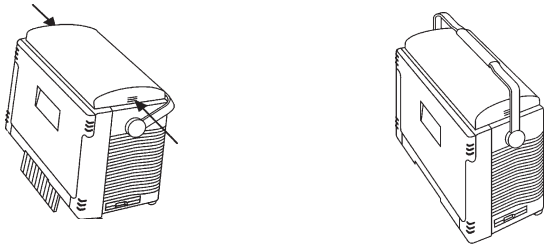
Before you switch off the K15, shut down the operating system, switch off the device using the power switch (see Figure 37), and disconnect the power cord.

For transport purposes, proceed as follows:

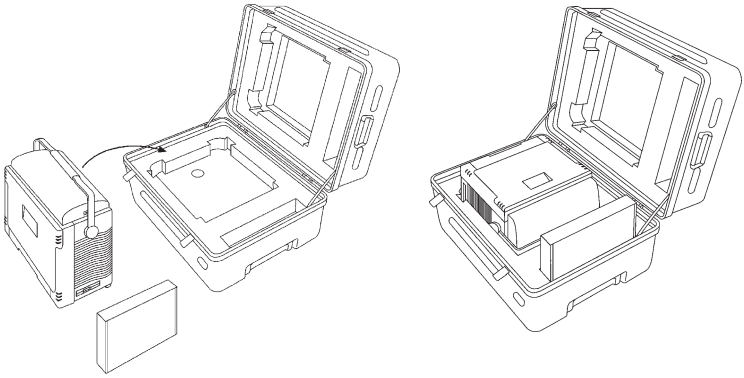
1. Put the keyboard cable behind the front cover, beneath the display. Put the keyboard in the vertical tracks beside the display to protect it against damage.



2. Fold the cover over the slots. Fix the cover by its latches on both sides. Move the front foot into a horizontal position.



3. Use the optional transport case to transport the device over long distances. Put the device into the transport case as shown below.



Appendix A: Specifications

This chapter lists all general specifications for the portable mainframe. Additional technical data of the CPU can be found in Appendix B.

Characteristic Tables

The following specifications apply to all portable mainframes unless otherwise noted.

The performance limits in this specification are valid only when the portable mainframe is in an environment with temperature, altitude, humidity, and vibration within the operating limits described in these specifications.

Table A–1: Environmental Specifications

Characteristic	Description
Temperature:	Operating: +5°C to +40°C Non-operating: -20°C to +60°C After cold transportation, warm up the instrument without powering at least four hours.
Relative humidity:	Operating: up to 80 % below 30°C, derate to 45 % at 40°C, non-condensing Non-operating: up to 90 % below 30°C, derate to 60 % at 20°C, non-condensing
Altitude:	Operating: 0 to 3000 m Non-operating:0 to 12 000 m
Shock:	Operating half-sine: 11 ms, 2 g (1 g if accessing hard drive media) Non-operating half-sine: 11 ms, 30 g

Table A–1: Environmental Specifications (Cont.)

Characteristic	Description
Vibration:	Operating random: 0.22 gRMS, 5 - 500 Hz (access to hard drives is not allowed during vibration) Non-operating random: 2.18 gRMS, 5 - 500 Hz
Acoustic noise	≤ 63 dBa 50 dBa for low power-consumption applications

Table A–2: Internal Controller

Characteristic	Description
Operating system	Microsoft Windows XP Embedded
CPU	Mobile Pentium III, ≥ 500 MHz
Hard disk drive	IDE (Integrated device electronics) hard disk drive ≥ 30 GB, 2.5”
CD Read-Write drive	Standard PC compatible IDE (Integrated device electronics) ≥ 24x4x4, Read-Write drive located at the left side of the unit
Floppy disk drive	Standard 3.5” 1.44 MB, located at the right side of the unit

Table A–3: CPU Characteristics

Characteristic	Description
Processor	Mobile Pentium III, ≥ 500 MHz 256 KB L2 cache on chip, full speed
Memory	≥ 256 MB SDRAM ECC ≥ 4 kbit serial EEPROM ≥ 114 Byte NVRAM-10year
RT clock	User programmable, allows real time functions
Bus interface	PICMG Rev.2.1 compliant; 32-bit wide

Table A–3: CPU Characteristics (Cont.)

Characteristic	Description
VGA interface	One connector on the PC board front panel
Ethernet interface	Two 10/100 BaseTX connectors on the front panel of the PMC module
Serial interface	RS-232; one connector on the PC board front panel
USB interface	One connector on the PC board front panel

Table A–4: Characteristics of the Power WAN Board

Characteristic	Description
Processor system 1	IBM PPC750, ≥450 MHz 1MByte L2 cache ≥ 256 MB DRAM memory
Processor system 2	Motorola Power QUICC-II (MPC8260) CPU running ≥ 200 MHz CPM running ≥ 133 MHz ≥ 32 MB SRAM memory
Processor system 3	Motorola Power QUICC-II (MPC8260) CPU running ≥ 200 MHz CPM running ≥ 133 MHz ≥ 32 MB SRAM memory
Line interface	Four line interfaces, connected to 16 E1/DS1/J1 lines (monitoring)
Ethernet interface	One 10/100 BaseTX (RJ45) connector on the front panel for connecting the K15 to a LAN
Serial interface	Serial RS-232 debug interface on the front panel (for internal purposes only)

Table A–5: Characteristics of the Power WAN Light Board

Characteristic	Description
Processor system 1	IBM PPC750, ≥450 MHz 1MByte L2 cache ≥ 256 MB memory
Processor system 2	Motorola Power QUICC-II (MPC8260) CPU running ≥ 266 MHz CPM running ≥ 200 MHz ≥ 32 MB memory ≥ 66 MHz SDRAM 8 MB strata flash 64 kB dual port RAM
Line interface	Two line interfaces, connected to 4 E1/DS1/J1 lines (monitoring)
PMC slot	One free PMC slot to install one PMC plug-in module
Ethernet interface	One 10/100 BaseTX (RJ45) connector on the front panel for connecting the K15 to a LAN
Serial interface	Serial RS-232 debug interface on the front panel (for internal purposes only)

Table A–6: Characteristics of the PCE-2 Host Processor Board

Characteristic	Description
Processor	IBM PPC750, ≥450 MHz 1MByte L2 Cache
Memory	512 MB DRAM
Bus interface	Local PCI bus 64 bit, 33 MHz
Ethernet interface	One 10/100 BaseTX (RJ45) connector on the front panel for connecting the K15 to a LAN
Serial interface	Serial RS-232 debug interface on the front panel (for internal purposes only)

Table A–7: Rear Panel Interfaces

Characteristic	Description
PS/2 interface Mouse	Provides connection to an external mouse
PS/2 interface Mouse / Keyboard	Provides connection to an external keyboard/mouse
USB interface	Provides connection to an external keyboard, mouse, scanner (USB1.1)
LPT interface	Provides printer connection
IPMI (Intelligent Platform Management Interface)	Used as debug interface for service purposes
Timesync interfaces	For 1 pps/10 MHz I/O, GPS signals can be accepted
Alarm options	Two, on the rear of the unit, providing potential free connection to external devices
SCSI interface	Ultra SCSI 68pol Sub-D, Half Pitch Single ended Up to 40Mbps

Table A–8: Display System

Characteristic	Description
Type	TFT LC active-matrix color display with backlight and sleep mode
Dimensions	14.1” diagonal
Resolution	1024 x 768 pixel, XGA compliant
Options	External monitor can be connected to a VGA connector on the PC board

Table A–9: Keyboard

Characteristic	Description
Type	Full-QWERTY keyboard, attachable to the front of the unit Option: External keyboard can be connected to a PS/2 connector on the rear of the device
Dimensions	23 mm (H) x 363 mm (L) x 270 mm (W)
Weight	Approx. 0.9 kg
Pointing device	Built-in touch pad or pointing input device Two programmable keys Option: External mouse can be connected to a PS/2 connector on the rear of the device

Table A–10: Backplane Characteristics

Characteristic	Description
Features	One cPCI segment, passive; 6 slots;, 33 MHz
Clock / Sync.	Distributed on P2, four signals (1PPS/10MHz from external reference and NetSync1/2)

Table A–11: Platform Management Subsystem

Characteristic	Description
Features	IPMI compliant Fan speed control Over temperature control Platform hardware ID management Power outage control
Interface	IPMI interface on the rear of the device (used as debug interface for service purposes)

Table A–12: Power Supply

Characteristic	Description
Type	Industrial grade, 350 W DC output power Plug-in module with over-temperature protection
AC input	550 VA, 100 – 240 VAC (+/- 10%), 50/60 Hz
DC output	50 W per application slot DC output for cPCI boards: +5 V, +3.3 V, +12 V, -12 V 35 A, 30 A, 10 A, 2.5 A
Fuse data	6.3 A Time-delayed, 250 V

Table A–13: Cooling

Characteristic	Description
Cooling system	Forced air circulation (negative pressurization) using four fans operating in parallel
Cooling clearance	50 mm (2 in) from both sides of mainframe; unit should be operated on a flat, unobstructed surface

Table A–14: Mechanical

Characteristic	Description
Overall dimensions (excluding handle)	**Without top cover and keyboard:** 290 mm (11.4 in) H x 380 mm (15 in) W x 220 mm (8.7 in) D **With top cover and keyboard** 340 mm (13.4 in) H x 380 mm (15 in) W x 240 mm (9.5 in) D
Weight	Approx. 10 kg without application boards, cables and accessories
Top cover	Detachable plastic cover, providing 67 mm (2.6 in) space for interconnections over front panels of boards
Support feet	12 mm (0.5 in) on the bottom side; allowing front panel inclination
Transport handle	Plastic rotating handle
Options	Hard shell transport case, with wheels and retractable handle, 470 mm (18.5 in) H x 615 mm (24 in) W x 410 mm (16 In) D

Table A–15: Certifications and Compliances

Characteristic	Description
EC Declaration of Conformity - EMC	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities: Compliance was achieved under the following conditions*: EN 61326 EMC requirements for Class A electrical equipment for measurement, control and laboratory use. IEC 61000-4-2 Electrostatic Discharge Immunity (Performance Criterion B) IEC 61000-4-3 RF Electromagnetic Field Immunity (Performance Criterion A) IEC 61000-4-4 Electrical Fast Transient / Burst Immunity (Performance Criterion A) IEC 61000-4-5 Power Line Surge Immunity (Performance Criterion A) IEC 61000-4-6 Conducted RF Immunity (Performance Criterion A) IEC 61000-4-11 Power Line Dips and Interruptions Immunity (Performance Criterion B) EN 61000-3-2 AC Power Line Harmonic Emissions EN 61000-3-3 Flicker * Emissions which exceed the level required by this standard may occur when this equipment is connected to a test object. Shielded cables on all external I/O ports; front panel screws properly tightened; conductive chassis rails of the boards connected to chassis ground; cable shields connected to chassis ground via metal shell connectors bonded to a conductive module front panel; all peripherals comply to the standards above. For minimum RF emissions, it is essential that the conditions above are implemented. Failure to do so could compromise the EMC compliance of the equipment containing the board. Unused cPCI module slots are covered with the specified blank front panels.

Table A–15: Certifications and Compliances (Cont.)

Characteristic	Description
EC Declaration of Conformity - Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 73/23/EEC as amended by 93/68/EEC EN 61010-1: /A2 1995 Safety requirements for electrical equipment for measurement, control, and laboratory use
US Nationality Recognized Testing Laboratory (NRLT) Listing	UL3111-1 Standard for electrical measuring and test equipment
Canadian Certification	CAN/CSA C22.2 No. 1010.1 Safety requirements for electrical equipment for measurement, control and laboratory use
C-Tick Mark	AS/NZS 2064.1/2

Safety Certification Compliance	
Temperature (operating)	+5°C to +40°C
Altitude (maximum operating)	3000 meters
Equipment type	Test and Measuring
Safety Class	Class I - Grounded product (as defined in IEC61010-1)
Pollution Degree	Pollution Degree 2 (as defined in IEC61010-1) *Note: Rated for indoor use only.*

CAUTION. *To reduce the risk of fire, use only No. 26 AWG or larger telecommunications line cords for the K15. Use only the telecommunication line cords designed and specified for the K15*

CAUTION. *EN 55022: This is a class A product. In a domestic environment, this product may cause radio interference in which case you may be required to take adequate measures.*

Appendix B: Interfaces

Rear Panel Interfaces

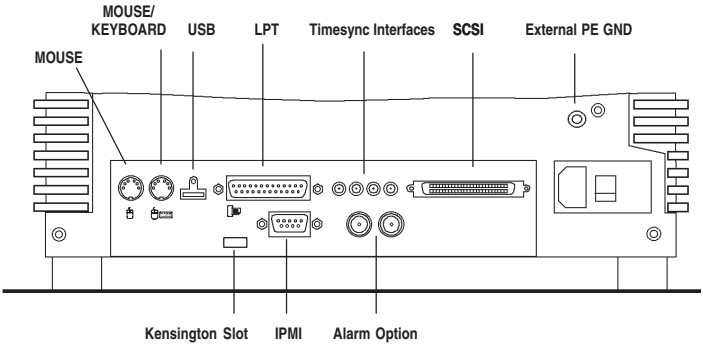


Figure B–1: Rear panel interfaces

The following interfaces are provided on the rear of the device:

- MOUSE interface
- MOUSE/KEYBOARD
- USB interface
- LPT interface
- Timesync interfaces
- Ultra SCSI interface
- IPMI (Intelligent Platform Management Interface)
- Alarm options
- External PE GND (M4x6 screw)

PS/2 Interface (MOUSE) / PS/2 Interface (MOUSE/KEYBOARD)

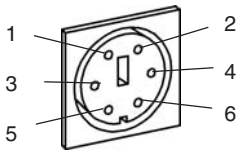


Table B–1: Pin Assignment for the MOUSE Interface

Pin	Assignment	Pin	Assignment
1	Mouse data	4	+ 5 V
2	Not connected	5	Mouse clock
3	Ground	6	Not connected

Table B–2: Pin Assignment for the MOUSE/KEYBOARD Interface

Pin	Assignment	Pin	Assignment
1	Keyboard data	4	+ 5 V
2	PS/2 Mouse data	5	Keyboard clock
3	Ground	6	PS/2 Mouse clock

USB Interface

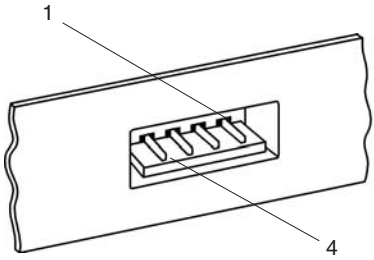


Table B–3: Pin Assignment for the USB Interface

Pin	Assignment
1	Vcc
2	Data–
3	Data+
4	Ground

LPT Interface

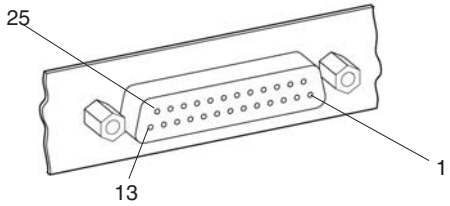


Table B–4: Pin Assignment for the LPT Interface

Pin	Assignment	Pin	Assignment
1	STROBE	14	Auto feed
2	DB0	15	Error
3	DB1	16	Initialize
4	DB2	17	Select input
5	DB3	18	Ground
6	DB4	19	Ground
7	DB5	20	Ground
8	DB6	21	Ground
9	DB7	22	Ground
10	ACK	23	Ground
11	BSY	24	Ground
12	Paper end	25	Ground
13	Select		

Timesync Interfaces

Table B–5: Coax Connectors of the Timesync Interfaces

Coax Connector	Assignment
1	SYNC 2
2	SYNC 1
3	1 PPS
4	10 MHz Clock

***NOTE**. The described interfaces will must be enabled by the appropriate software.*

Do not use these interfaces without the appropriate software.

Ultra SCSI Interface

Up to six peripheral devices can be connected to the controller of the system processor via the SCSI interface. Each peripheral device must be assigned an individual address (SCSI ID). The controller occupies address 7 as standard. When not connected with a peripheral device, the SCSI socket is terminated automatically.

***NOTE**. Assign one of the free addresses 2 - 6 to the devices that you want to operate via the external SCSI connection. Do not assign address 1. If you want to boot from an external device, set the SCSI address to 0. Switch on the device before switching on the SCSI connected device.*

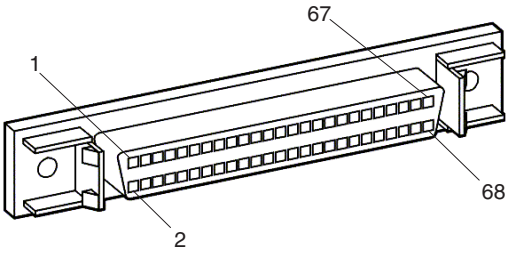


Table B–6: Pin Assignment for the SCSI Interface

Pin	Assignment	Pin	Assignment
1	Ground	35	Data 12
2	Ground	36	Data 13
3	Ground	37	Data 14
4	Ground	38	Data 15
5	Ground	39	DP 1
6	Ground	40	Data 0
7	Ground	41	Data 1
8	Ground	42	Data 2
9	Ground	43	Data 3
10	Ground	44	Data 4
11	Ground	45	Data 5
12	Ground	46	Data 6
13	Ground	47	Data 7
14	Ground	48	DP 0
15	Ground	49	Ground
16	Ground	50	Ground
17	TERMPWR	51	TERMPWR
18	TERMPWR	52	TERMPWR
19	Not connected	53	Not connected
20	Ground	54	Ground
21	Ground	55	ATN
22	Ground	56	Ground
23	Ground	57	BSY
24	Ground	58	ACK
25	Ground	59	RST

Table B–6: Pin Assignment for the SCSI Interface (Cont.)

Pin	Assignment	Pin	Assignment
26	Ground	60	MSG
27	Ground	61	SEL
28	Ground	62	CD
29	Ground	63	REQ
30	Ground	64	IO
31	Ground	65	Data 8
32	Ground	66	Data 9
33	Ground	67	Data 10
34	Ground	68	Data 11

Serial Interface (IPMI)

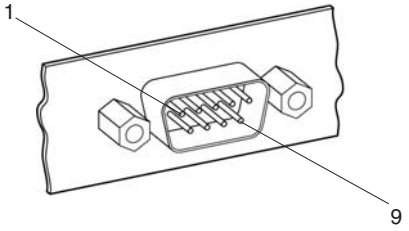


Table B–7: Pin Assignment for the IPMI Serial Interface

Pin	Assignment	Pin	Assignment
1	DCD	6	DSR
2	RxD	7	RTS
3	TxD	8	CTS
4	DTR	9	RI
5	Ground		

Alarm Options

The maximum turn-off voltage is 60 V DC / 42 V AC, the maximum turn-off current is 1.5 A, the maximum permanent current is 1.5 A, the maximum turn-off power is 100 W.

Table B–8: Relay contacts for the Alarm Options

Relay Contact	Assignment
1	Rx
2	Tx

***NOTE**. The described options must be enabled by the appropriate software.*

PC Board Front Panel Interfaces

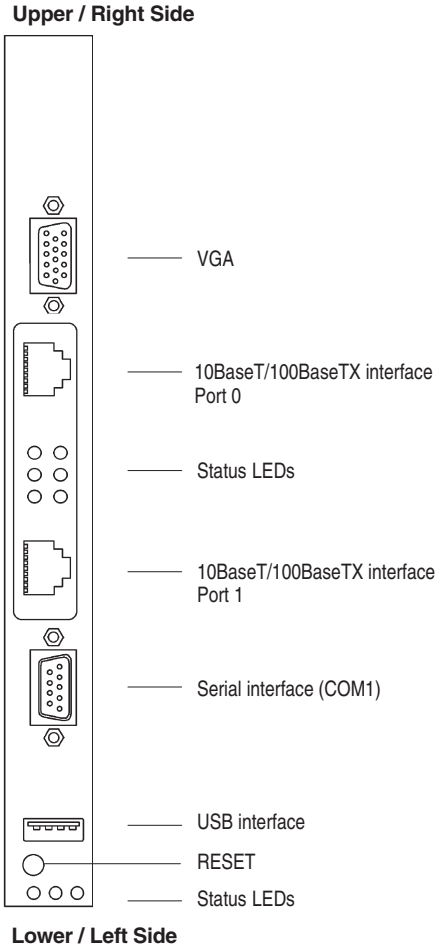


Figure B–2: PC board front panel interfaces

The following indicators, keys and interfaces are located on the front panel of the PC board:

- Covered 10BaseT / 100BaseTX interface

CAUTION. *Do not connect lines to the covered Ethernet port on the upper / right side of the PC board front panel.*

- VGA interface
- PMC module with two Ethernet twisted pair sockets (10BaseT and 100BaseTx) and six status LEDs
- Serial interface (COM1)
- USB interface
- Reset key
- Status LEDs

External Monitor Interface (VGA)

The external monitor interface (VGA) is located on top of the device on the PC board front panel. It supports a resolution of up to 1600 x 1200.

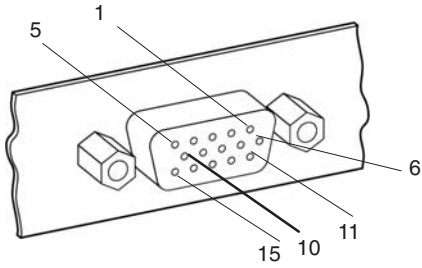


Table B–9: Pin Assignment for the VGA Interface

Pin	Assignment	Pin	Assignment	Pin	Assignment
1	Red	6	Red ground	11	Not connected
2	Green	7	Green ground	12	DDC data
3	Blue	8	Blue ground	13	HSYNC
4	Not connected	9	+ 5 V	14	HSYNC
5	Ground	10	Ground	15	DDC clock

10BaseT / 100BaseTX Interface

The Ethernet twisted pair connectors 10BaseT and 100BaseTX are on the PMC module, in the middle of the PC board front panel. They are DTE connectors.

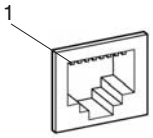


Table B–10: Pin Assignment for 10BaseT/100BaseTx Interfaces

Pin	Assignment
1	TxD +
2	TxD –
3	RxD +
4	Not connected
5	Not connected
6	RxD –
7	Not connected
8	Not connected

Status LEDs of the Ethernet Sockets. The status LEDs of the Ethernet sockets on the PMC module have the following meaning:

Table B–11: LEDs of the PMC Module

Name	Description
LINK (link integrity)	Indicates link integrity. If link is good in either 10 or 100 Mbps mode, the LED is on. If link is bad, the LED is off.
100MB/s (speed)	This LED is on if the data rate is 100 Mbps and off if it is at 10Mbps. The LED retains its last known state when the link is down.
ACT (activity)	Indicates either transmit or receive activity. When there is activity, the LED is on. When there is no activity, the LED is off.

Serial Interface (COM1)

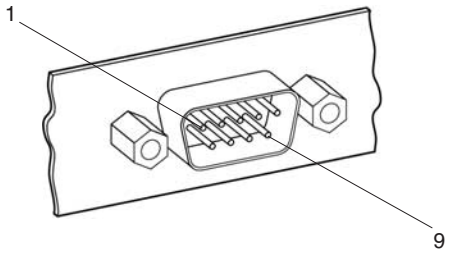


Table B–12: Pin Assignment for the COM1 Interface

Pin	Assignment	Pin	Assignment
1	DCD	6	DSR
2	RxD	7	RTS
3	TxD	8	CTS
4	DTR	9	RI
5	Ground		

USB Interface (USB)

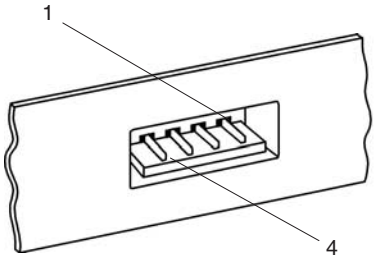


Table B–13: Pin Assignment for the USB Interface

Pin	Assignment
1	Vcc
2	Data–
3	Data+
4	Ground

Reset Key

To reset the instrument, press with a pointed tool the RESET switch located behind the small hole on the front panel of the PC board.

When enabled and toggled, the mechanical reset key instantaneously generates a PCI reset. The key can be programmed to reset globally or locally via the PCI Bus Control Register. A reset of all on-board I/O devices and the CPU is performed when the reset key is pushed to the active position. RESET is held active until the key is back in the inactive position, however at least 200 ms are guaranteed by a local timer. Power fail (below approximately 4.7 V) and power up – both lasting at minimum 200 ms to 300 ms – also force a reset to start the CPU.

Status LEDs

The following status LEDs are located on the left side of the PC board front panel:

Table B–14: LEDs on the Front Panel of the PC Board

Name	Description
LED EXT	"Hot Swap LED": The PC board is not hot swappable in that case. This LED is not active.
LED POWER	"Power LED": Possible LED status red or off. During power up BIOS turns this LED off to indicate the CPU has started. During operation the LED status depends on the user software.
LED STAT	"Status LED": Possible LED status green or off. During power up BIOS turns this LED off to indicate the CPU has started. Before entering the OS boot sequence the green LED is turned on. During operation the LED status depends on the user software.

CPU Bios Settings

This section provides information about the BIOS default settings and the main settings of the operating system.

BIOS Standard Settings

With the BIOS (Basic Input/Output System) Setup Utility you can configure the operations of the PC board. To access the Setup Utility, press the DEL key when prompted during the Power-On sequence.

The Setup Utility displays the configuration options and values that apply to all installed components. With the Setup Utility display you can access all possible settings via appropriate menus.

The setup item default settings are given in tables B–15 through B–20. These tables list all optional on-board peripherals installed. The Boot and Exit menus do not have “default” values:

Table B–15: Standard CMOS Setup

Setting	Default setting
System Date	mm/dd/yyy
System Time	hh:mm:ss
Floppy Drive A	1.44 MB 3 1/2”
Floppy Drive B	not installed
Primary Master	Auto On
Primary Slave	Auto On
Secondary Master	Auto On
Secondary Slave	Not installed
Boot Sector Virus Protection	Disabled

Table B–16: Advanced CMOS Setup

Setting	Default setting
Quick Boot	Enabled
Primary Master ARMD emulated as	Auto
Primary Slave ARMD emulated as	Auto
Secondary Master ARMD emulated as	Auto
Secondary Slave ARMD emulated as	Auto
1st Boot Device	Floppy
2nd Boot Device	ATAPI CD-ROM
3rd Boot Device	1st IDE-HDD
Try other Boot Devices	Yes
Initialize I2O Devices	Yes
Initial Display Mode	BIOS
Floppy Access Control	Read-Write
Hard Disk Access Control	Read-Write
S.M.A.R.T. for Hard Disks	Enabled
Boot Up Num–Lock	On
PS/2 Mouse Support	Enabled
System Keyboard	Present
Primary Display	VGA/EGA
Password Check	Setup
Boot to OS/2	No
Wait for “F1” if error	Enabled
Internal Cache	Write Back
External Cache	Write Back
System BIOS Cacheable	Enabled
Onboard VGA	Enabled

Table B–16: Advanced CMOS Setup (Cont.)

Setting	Default setting
On Board VGA Display Mode	CRT+ DFP
On Board VGA Panel Type	1024x768 T24
Stretch Text Modes	Yes
Stretch Graphics Modes	No
Symbios SCSI BIOS	Disabled

Table B–17: Advanced Chipset Setup

Setting	Default setting
USB Function	Enabled
USB KB/Mouse Legacy Support	Disabled
Port 64/60 Emulation	Disabled
SERR#	Disabled
PERR#	Disabled
USWC Write Post	Enabled
BX Master Latency Timer (Clks)	64
DRAM Integrity Mode	ECC Hardware
Memory Hole	Disabled
Power Down SDRAM	Enabled
PIIX4 SERR#	Disabled
TypeF DMA Buffer Control1	Disabled
TypeF DMA Buffer Control2	Disabled
DMA-0 Type	Normal ISA
DMA-1 Type	Normal ISA
DMA-2 Type	Normal ISA

Table B–17: Advanced Chipset Setup (Cont.)

Setting	Default setting
DMA-3 Type	Normal ISA
DMA-5 Type	Normal ISA
DMA-6 Type	Normal ISA
DMA-7 Type	Normal ISA
PCI Downstream Window 1 Type	Disabled
PCI Downstream Window 1 Size	N/A
PCI Downstream Window 2 Type	Disabled
PCI Downstream Window 2 Size	N/A
PCI Downstream Window 3 Type	Disabled
PCI Downstream Window 13 Size	N/A
PCI Upstream Window 0 Type	Disabled
PCI Upstream Window 0 Size	N/A
PCI Upstream Window 1 Type	Disabled
PCI Upstream Window 1 Size	N/A
PCI Upstream Window 2 Page Site	Disabled
VMEbus System Controller State	Auto
VMEbus DTACK# Inactive Filter	Disabled
VMEbus Access Windows Size	512MB
Spread Spectrum Clock Modulation	High

Table B–18: Power Management Setup

Setting	Default setting
Power Management / APM	Disabled
Green PC Monitor Power State	Suspend

Table B–18: Power Management Setup (Cont.)

Setting	Default setting
Video Power Down Mode	Stand By
Hard Disk Power Down Mode	Suspend
Hard Disk Time Out (minute)	Disabled
Standby/Suspend Timer Unit	4 min
Standby Timer Out	Disabled
Suspend Timer Out	Disabled
Slow Clock Ratio	50% - 62.5%
Display Activity	Ignore
Device 6 (Serial port 1)	Ignore
Device 7 (Serial port 2)	Ignore
Device 8 (Parallel port)	Ignore
Device 5 (Floppy Disk)	Ignore
Device 0 (Prim Master IDE)	Monitor
Device 1 (Prim Slave IDE)	Ignore
Device 2 (Sec Master IDE)	Ignore
Device 3 (Sec Slave IDE)	Ignore
Processor Temperature Limit	85 C
Thermal Duty Cycle	87.5 %

Table B–19: PCI / Plug and Play Setup

Setting	Default setting
Plug and Play Aware O/S	No
PCI Latency Timer (PCI Clocks)	64
PCI VGA Palette Snoop	Disabled

Table B–19: PCI / Plug and Play Setup (Cont.)

Setting	Default setting
PCI IDE Bus Master	Disabled
DMA Channel 0	PnP
DMA Channel 1	PnP
DMA Channel 3	PnP
DMA Channel 5	PnP
DMA Channel 6	PnP
DMA Channel 7	PnP
IRQ3	PCI/PnP
IRQ4	PCI/PnP
IRQ5	PCI/PnP
IRQ7	PCI/PnP
IRQ10	PCI/PnP
IRQ11	PCI/PnP
IRQ14	PCI/PnP
IRQ15	PCI/PnP
Reserved Memory Size	Disabled
Reserved Memory Address	C8000

Table B–20: Peripheral Setup

Setting	Default setting
On Board FDC	Auto
Drive and Port Interface	A:FDC, B:FDC
Swap Floppy Drives	No
On Board Serial Port1	3F8

Table B–20: Peripheral Setup (Cont.)

Setting	Default setting
On Board Serial Port2	2F8
On Board Serial Port2 CIR	N/A
Serial Port2 Mode	Normal
Serial Port2 IR DMA Channel	N/A
Serial Port2 Duplex Mode	Half
Serial Port2 Receiver Polarity	High
Serial Port2 Xmitter Polarity	High
Serial Port2 IR Interface	RX2/TX2
On Board Parallel Port	378
Parallel Port Mode	Normal
EPP Version	N/A
Parallel Port IRQ	7
Parallel Port ECP DMA Channel	N/A
OnBoard IDE	Both
CompactPCI sideband INTP IRQ	Auto
On Board IPMI controller	Auto
On Board High-res Timer IRQ	Auto
On board Ethernet #1 connector	Front
On board Ethernet #2 connector	Front

Power WAN Board (PW)

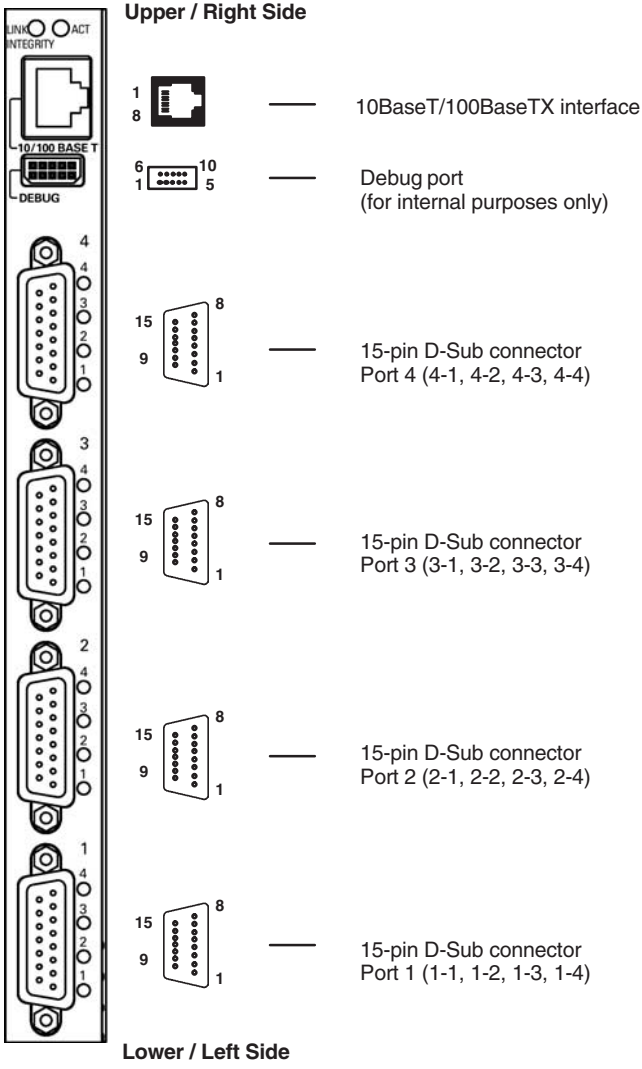


Figure B–3: Power WAN board

The following interfaces are located on the front panel of the Power WAN board:

- 10BaseT/100BaseTX interface
- Debug port (for internal purposes only)
- Four 15-pin D-Sub connectors

10BaseT / 100BaseTX Interface

One 10BaseT/100BaseTX interface, DTE-Type, is available on the front panel of each Power WAN board.

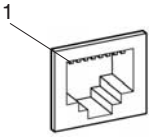


Table B–21: Pin Assignment for 10BaseT/100BaseTX Interface

Pin	Assignment
1	TD +
2	TD –
3	RD +
4	Not connected
5	Not connected
6	RD –
7	Not connected
8	Not connected

15-pin D-Sub Connectors

Four 15-pin D-sub connectors are available:

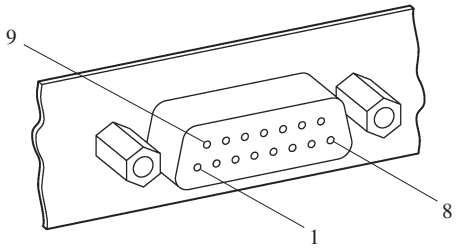


Table B–22: Pin Assignment for the 15-pin D-sub Connector

Pin	Assignment	Pin	Assignment
1	Not connected	9	Not connected
2	Rx 2 (Tip)	10	Rx 2 (Ring)
3	Rx 1 (Tip)	11	Rx 1 (Ring)
4	Not connected	12	Not connected
5	Not connected	13	Rx 3 (Tip)
6	Rx 3 (Ring)	14	Rx 4 (Tip)
7	Rx 4 (Ring)	15	
8	Not connected		

The status LEDs besides the D-Sub connectors with monitoring cables have the following meaning:

orange:	Powered up
green:	Synchronized
green blinking:	Configured, but no signal
red blinking:	Signal, but not synchronized
red:	Alarm

Power WAN Light Board (PWL)

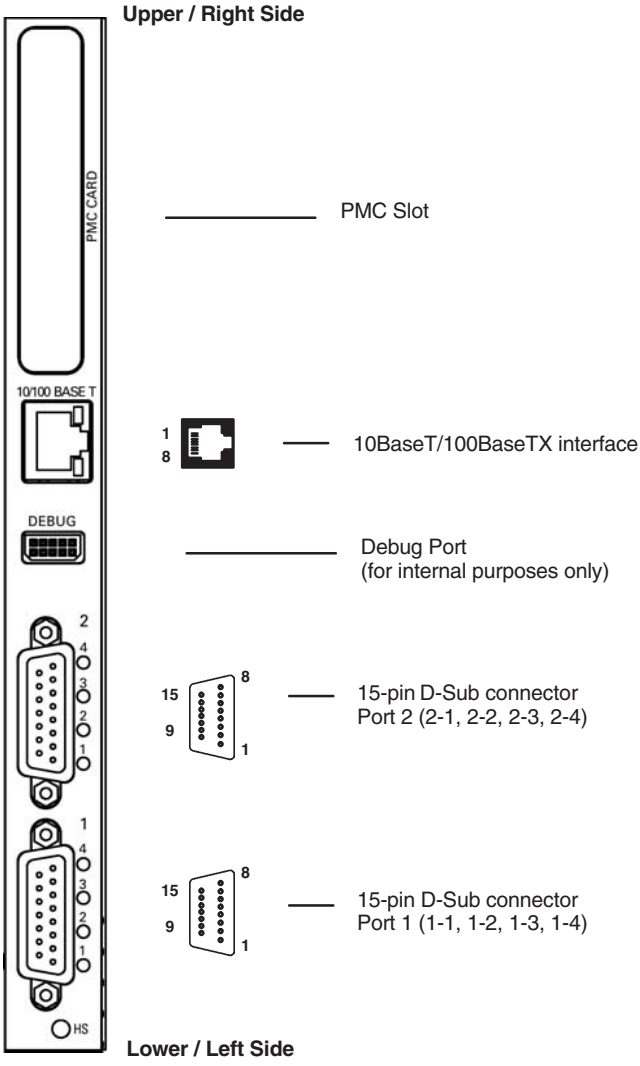


Figure B–4: Power WAN Light board

The following interfaces are located on the front panel of the Ethernet / PCM E1/DS1 board:

- 10BaseT/100BaseTX interface
- Debug port (for internal purposes only)
- Two 15-pin D-Sub connectors

10BaseT / 100BaseTX Interface

One 10BaseT/100BaseTX interface, DTE-Type, is available on the front panel of each Power WAN board.

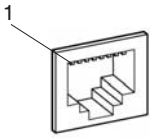


Table B–23: Pin Assignment for 10BaseT/100BaseTX Interface

Pin	Assignment
1	TD +
2	TD –
3	RD +
4	Not connected
5	Not connected
6	RD –
7	Not connected
8	Not connected

15-pin D-Sub Connectors

Four 15-pin D-sub connectors are available:

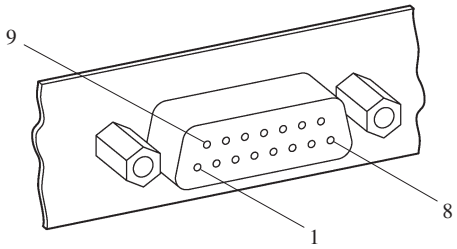


Table B–24: Pin Assignment for the 15-pin D-sub Connector

Pin	Assignment	Pin	Assignment
1	Not connected	9	Not connected
2	Rx 2 (Tip)	10	Rx 2 (Ring)
3	Rx 1 (Tip)	11	Rx 1 (Ring)
4	Not connected	12	Not connected
5	Not connected	13	Rx 3 (Tip)
6	Rx 3 (Ring)	14	Rx 4 (Tip)
7	Rx 4 (Ring)	15	
8	Not connected		

PMC Module

The two 10BaseT / 100BaseTX interfaces (DTE type) on the front panel of the PMC module have the same pin assignment as the 10BaseT/100BaseTX interface on the front panel of the Power WAN Light board (see page B-32).

The eight status LEDs of the 10BaseT/100BaseTX interfaces have the following meaning:

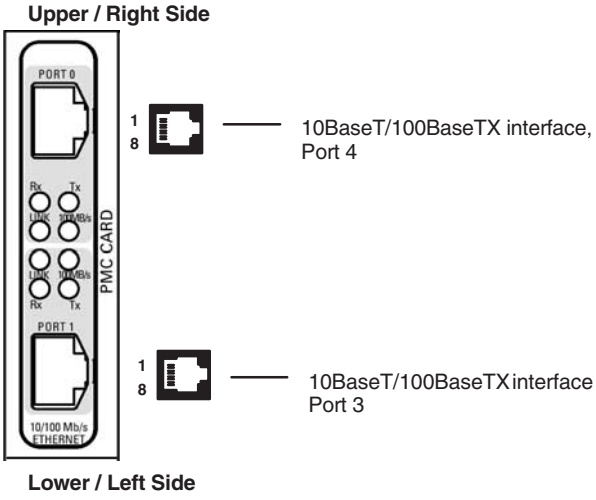


Table B–25: LEDs of the Power WAN Light board

Name	Description
LINK (link integrity)	Indicates link integrity. If link is good in either 10 or 100 Mbps mode, the LED is on. If link is bad, the LED is off.
100MB/s (speed)	This LED is on if the data rate is 100 Mbps and off if it is at 10Mbps. The LED retains its last known state when the link is down.
Rx/Tx ACT (activity)	Indicates either transmit or receive activity. When there is activity, the LED is on. When there is no activity, the LED is off.

PCE-2 Host Processor Board

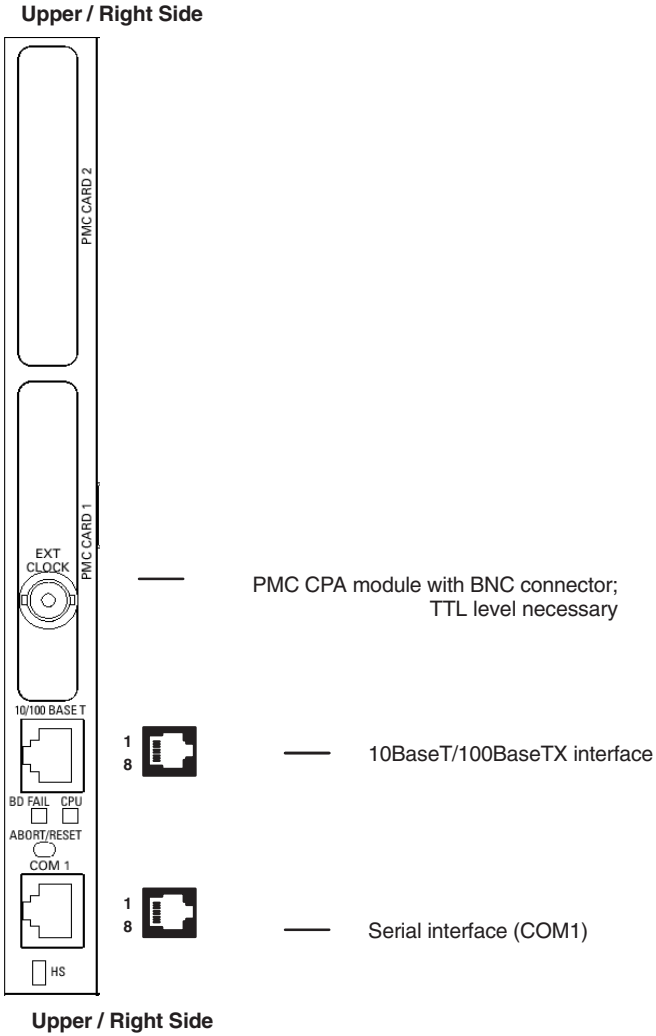


Figure B–5: Host processor board

The following interfaces are located on the front panel of host processor board:

- BNC connector
- 10BaseT / 100BaseTx
- Serial interface

BNC Connector

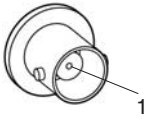


Table B–26: Pin Assignment for the BNC Connector

Pin	Assignment	Pin	Assignment
1	Rx	2	CDS (Signal ground)

10BaseT / 100BaseTX Interface

One 10BaseT/100BaseTX interface, DTE-Type, is available on the front panel of host processor board.

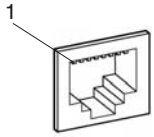


Table B–27: Pin Assignment for 10BaseT/100BaseTx Interface

Pin	Assignment
1	TD +
2	TD –
3	RD +
4	Not connected
5	Not connected
6	RD –
7	Not connected
8	Not connected

Serial Interface (COM1)

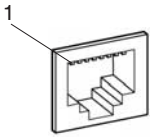


Table B–28: Pin Assignment for the SERIAL Interface

Pin	Assignment
1	DCD
2	RTS
3	Ground
4	TxD
5	RxD
6	Ground
7	CTS
8	DTR

STM-1 Optical Line Interface

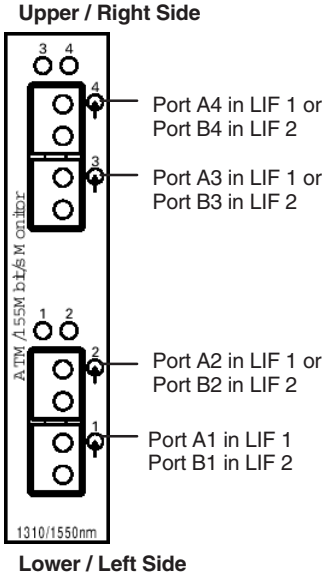


Figure B–6: STM-1 optical line interface

The four LEDs on the front panel show the state of the associated Rx ports:

Table B–29: LED Status: STM-1 Line Interface

State Indication	LED x
Initialization	orange
Valid Rx signals on port x	green
No valid Rx signals on port x	red

E1/DS1/J1 Electrical Line Interface

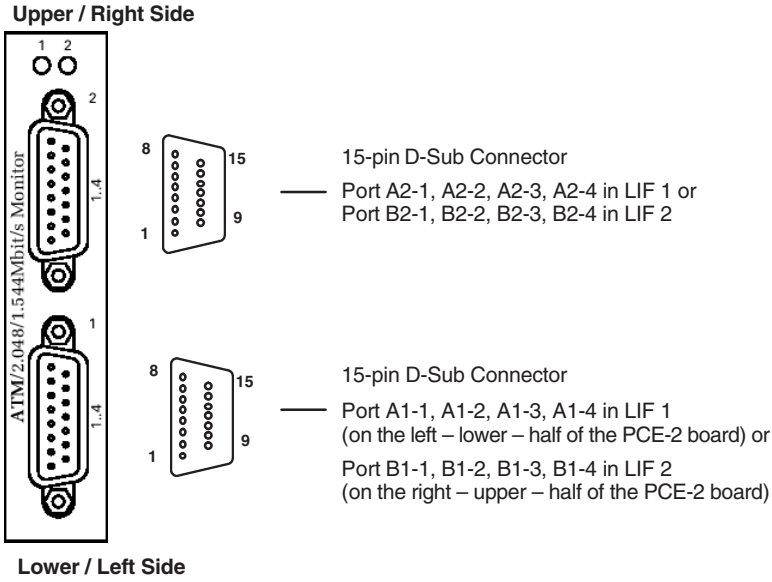


Figure B–7: E1/DS1/J1 electrical line interface

The two LEDs on the front panel show the progress of initialization during the boot process.

Table B–30: LED Status: E1/DS1/J1 Line Interface

State indication	LED 1	LED 2
After power up	orange	orange
Initialization	orange	orange /shortly after red
In operation	off	green
Failure	orange / red	orange / red

15-pin D-sub connectors

Two 15-pin D-sub connectors are available:

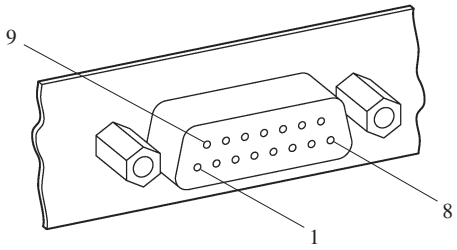


Table B–31: Pin Assignment for the 15-pin D-sub Connector

Pin	Assignment	Pin	Assignment
1	Not connected	9	Not connected
2	Rx 2 (Tip)	10	Rx 2 (Ring)
3	Rx 1 (Tip)	11	Rx 1 (Ring)
4	Not connected	12	Not connected
5	Not connected	13	Rx 3 (Tip)
6	Rx 3 (Ring)	14	Rx 4 (Tip)
7	Rx 4 (Ring)	15	
8	Not connected		

Appendix C: In Case of Problems

This chapter provides information that addresses problems you may encounter while installing your device.

Software Problems

Your instrument is delivered with all basic software already installed. Before running any of the applications, you should check the release notes to verify that the software is compatible with the firmware.

Many software problems can be due to corrupted or missing software files. In most cases, the easiest way to solve software problems is to reinstall the software and follow the on-screen instructions.

Refer to Table C–1 on the following page for a list of software and hardware troubleshooting information and recommended action.

If you suspect problems with the application software, contact your Tektronix Service Center.

Common Problems

Use Table C–1 to help isolate and eliminate problems. This list is not exhaustive, but it may help you eliminate problems that are quick to fix, such as a blown fuse.

Table C–1: Failure Symptoms and Possible Causes

Symptom	Possible causes and recommended action
Device does not turn on	Verify that the power cord is connected to the device and to the power source. Press the Power switch and verify that the instrument receives power by listening for the fans to start and checking that some front-panel indicators light up. Check that power is available at the power source. Check for incorrect or failed fuse. The correct fuse is a 6.3 A Time-delayed, 250 V. It is located beside the power switch on the rear of the device (see figure 37). If needed change the fuse as follows: 1. Switch off the device. 2. Disconnect the power cord. 3. Remove the fuse holder at the rear of the device with a flat-head screwdriver. 4. Remove the fuse. 5. Install the clip on the other side of the fuse holder. 6. Rotate the fuse holder 180 degrees. 7. Install the new fuse. Make sure to only use the proper fuse type and rating. Software failure: contact your Tektronix service center.
Display is blank	If the display is blank, try connecting an external monitor; if both displays are blank, contact your Tektronix service center. Check the controller BIOS setups (see page B-19) for the monitor.

Table C–1: Failure Symptoms and Possible Causes (Cont.)

Symptom	Possible causes and recommended action
Device does not complete the power-on sequence	Check for disk in disk drive; make sure that the device boots from the hard disk drive. Possible software failure or corrupted hard disk; see Software Problems at the beginning of this chapter.
Device does not recognize accessories such as monitor, printer, or keyboard	Check that accessories are properly connected or installed. Try connecting other standard PC accessories or contact your Tektronix service center.
Windows comes up but the application does not	The K15 is not set up to start the application at power-on. Start application from the desktop by double-clicking on the Final Setup icon located on the desktop. Faulty or corrupt software; reinstall the application software.

Appendix D: Windows XPe Troubleshooting

Preventive Measures

This Appendix describes how you can protect yourself against unexpected system failures and how you can deal with them.

The best preventive measure you can take is having a current backup. We recommend to backup your system on a regular basis as follows:

- Perform regular system backups for your Windows XPe configuration using the System Restore tool.
- Perform regular system backups for your K15 user data using the Backup tool.

System Restore

System Restore is a component of Windows XPe that you can use to restore your operating system to a previous state, if a problem occurs, without losing your personal user data.

NOTE. *System Restore is installed and activated at the factory. It needs at least 200 MB of disk space available to work properly.*

System Restore monitors changes to the system and automatically creates easily identified restore points. Restore points are stored states of your operating system that allow you to revert the system to a previous time.

Create restore points each time you make significant changes to your operating system, e.g. before and after installations of new or different device drivers or before and after software installations.

Creating Restore Points. Follow these steps to create restore points:

1. Exit all applications.
2. Select *Start / All Programs / Accessories / System Tools / System Restore.*

   The *System Restore Wizard opens.* Follow the instructions in the wizard.
3. Click *Create a restore point*, and then click **Next**.
4. In the *Restore point description* box, type a name to identify this restore point. System Restore automatically adds to this name the date and time that this restore point is created.

   - To finish creating this restore point, click **Create**.
   - To cancel restore point creation and return to the Welcome to System Restore screen, click **Back**.
   - To cancel restore point creation and exit the *System Restore Wizard*, click **Cancel**.

If you do not like the state of your computer after you restore it, you can undo the restoration or select another restore point. All successful restorations are reversible. All failed restorations are automatically reversed by System Restore.

NOTE*. The possible number of restore points depends on the available space on the partition where your operating system folder is located. If you do not have sufficient space available, System Restore is not activated.*

Restore the K15 by Restore Points. Follow the following steps to restore states of your operating system by restore points:

1. Exit all applications.
2. Access the *System Restore Wizard* via *Start / All Programs / Accessories / System Tools / System Restore.* Click *Restore my computer to an earlier time*, and then click **Next**.
3. Select the date when the restore point was created from the calendar in the *Select a Restore Point* dialog box. All of the restore points that were created on the selected date are listed by name in the list box to the right of the calendar. Click **Next**.
4. Confirm your selection in the *Confirm Restore Point Selection* dialog box and click **Next**.

   System Restore shuts down Windows and restores your K15 to the selected date and time.

   After the restoration Windows restarts using the settings from the date and time listed above.

Backup Tool

Windows XPe includes Backup, a tool that backups and restores your K15 user data.

We recommend to backup your K15 user data each time you make significant changes to your K15 software.

Backup the K15 User Data. To backup your K15 user data, proceed as follows:

1. Exit all applications.
2. Select *Start / All Programs / Accessories / System Tools / Backup.* The *Backup or Restore Wizard* opens.
3. Click **Next** to start configuring the backup process.
4. In the second wizard window (*Backup or Restore*), select *Backup Files and Settings* and click **Next**.
5. In the following wizard windows, select which folder, files and items you want to backup as well as type, destination, and name of the backup process.

   Follow the wizard instructions to define these settings.
6. At the end of the configuration, the backup process starts automatically. The *Backup Progress* dialog box opens and displays all information about this process.

Restore the K15 User Data. To restore your K15 user data, proceed as follows:

1. Exit all applications.
2. Select *Start / All Programs / Accessories / System Tools / Backup.* The *Backup or Restore Wizard* opens.
3. Click **Next** to start configuring the restore process.
4. In the second wizard window (*Backup or Restore*) select *Restore Files and Settings* and click **Next**.
5. In the following wizard windows, select which folder, files and items you want to restore as well as type, destination, and name of the restored process.

   Follow the wizard instructions to define these settings.
6. The last wizard window *(Completing the Backup or Restore Wizard*) lists all restore settings you have created.

   Specify additional restore options by clicking the *Advanced* button or close the wizard and start the restore process by clicking the *Finish* button.

   The *Restore Progress* dialog box opens and displays all information about this the restore process.

Repair Measures

The following pages describe how to repair or reinstall a damaged Windows XPe installation on the K15.

***NOTE**. For general troubleshooting tips read the Windows online help. To open the online help, click Start: Help and Support on the taskbar.*

Under rare circumstances, the K15 may not start (boot). These circumstances include:

1. Installation of faulty third-party drivers
2. Erroneous changes in the Registry
3. Deleting or replacing system files by mistake

In these circumstances the Windows XPe boot process might crash with error messages, dark or blue screen.

Another problem occurs when the passwords of all accounts have been changed and have been forgotten. In this case the device starts, but does not log on automatically and no one can log on manually.

In all these instances, switch off your device and try to restart it. If Windows does not start again, carry out the Windows XPe installation repair process.

To carry out the repair process restart the K15 by the delivered K15 Recovery-CD as described on the following pages.

Recovery Disk

New devices always contain a K15 Recovery CD.

Using this CD you can reproduce the user accounts and the driver configuration that existed when the device was produced. The reproduction of the user accounts is necessary if the passwords have been lost (after being changed).

This CD can be used to restart the device in case of a major hardware or software failure. It contains the state of the device at the time of production without K15 software.

***NOTE**. Store this backup software in a safe location where you can easily retrieve the software for maintenance purposes.*

Repair the K15 by Recovery Disk. To repair the K15 by the recovery disk, proceed as follows:

1. Switch on the device. When the red *American Megatrend* logo appears, immediately press the <DEL> key to access the PC BIOS settings.

   A blue window appears titled as *AMIBIOS HIFLEX SETUP UTILITY.*

2. Check the BIOS settings:

   - Use the <CURSOR DOWN> key in order to move to the menu item called *ADVANCED CMOS SETUP.* Confirm with <ENTER>.

     Another blue window appears titled as
     AMIBIOS SETUP – ADVANCED CMOS SETUP.

   - The menu items *1st / 2nd / 3rd Boot Device* define the BIOS boot sequence.

     Ensure that the boot device with setting *ATAPI–CD* comes before the boot device with setting *1st IDE-HDD* in the BIOS boot sequence.

CAUTION. *Do not change other parameters in the PC BIOS because the device might become unusable or the performance might degrade. If you have opened a menu that is not described here, press the <ESC> key immediately in order to leave the menu.*

3. Press <ESC> to quit the BIOS window. To take over the changed settings, press <F10> for *Save & Exit Setup*.

4. Insert the K15 Recovery CD into the CD-RW drive. The K15 restarts. During the setup you will be asked several questions (whether you agree with the products licence agreement etc.) Confirm all of these questions to follow up.

   The EasyRestore program starts.

5. Follow the instructions in the *EasyRestore* wizard and start the recovery process. The recovery process may take some minutes. A progress indicator displays the percentage of the process that has been completed.
6. Remove the K15 Recovery CD from the CD-RW drive.
7. Press <CTRL> <ALT> <DELETE> to restart the device.
   - Windows XPe starts. The initialization phase takes some minutes.
   - An *XPe by Tektronix* dialog box opens displaying the current windows settings (computer name, domain name, and account). Confirm these settings with OK.
   - Another *XPe by Tektronix* dialog box opens. Enter the actual computer name or your device into this dialog box and confirm your entry with OK.

     Windows XPe restarts once again. The image of the K15 Recovery CD has been restored on your K15.

Reinstall the K15 Software. After the Windows XPe repair process, you must reinstall the K15 software. To reinstall the K15 software, proceed as follows:

1. Insert the K15 installation CD into the CD-RW drive. If installation does not start automatically, go to step 2.
2. Start the installation process. How to start it is explained in the Readme file delivered with the software.
3. Follow the setup program instructions.

Changing the Boot Sequence

As a protection against certain computer viruses (boot sector viruses) the boot sequence in the PC BIOS has been changed so that the device will not start from a floppy disk.

Under certain circumstances, however, it may be necessary to start from a floppy disk. If you want to boot the K15 from a floppy disk, change the BIOS Boot sequence as follows:

1. Switch on the device. A black screen appears.
2. Press the <DEL> key to access the BIOS CMOS Setup.

   A blue window appears titled as *AMIBIOS HIFLEX SETUP UTILITY.*
3. Use the <CURSOR DOWN> key in order to move to the menu item called: *ADVANCED CMOS SETUP.* Confirm with <ENTER>.

   Another blue window appears titled as
   AMIBIOS SETUP – ADVANCED CMOS SETUP.
4. Use the <CURSOR DOWN> key in order to move to the menu item called: *1st Boot Device – Disabled.*
5. Use the <PAGE UP> or <PAGE DOWN> keys to select the desired *Available Option: Floppy.*
6. To quit the window, press <ESC>. To take over the changed settings, press <F10> for *Save & Exit Setup*.
7. Confirm the *SAVE to CMOS and EXIT* dialog with the <Y> key. The device will be restarted.

CAUTION. *Do not change other parameters in the PC BIOS because the device might become unusable or the performance might degrade. If you have opened a menu that is not described here, press the <ESC> key immediately in order to leave the menu.*

Abbreviations

2G
Second Generation

3G
Third Generation

3GPP
Third Generation Partnership Project (of ETSI)

8PSK
Eight phase Shift Keying

A bis
Interface between BTS and BSC

A
Interface between BSS and GSM-NSS

AAL
ATM Adaptation Layer

AAL2
ATM Adaptation Layer Type 2

AAL5
ATM Adaptation Layer Type 5

AC
Authentication Center

ALCAP
Access Link Control Application Part

AMPS
Advanced Mobile Phone Service

AMR
Adaptive Multi-Rate (speech codec)

ANSI
American National Standards Institute

ANSI T1
Standards Committee T1 Telecommunication of the American National Standards Institute

ARIB/TTC
Association of Radio Industries and Business/Telecommunication Technology Committee

ASN.1
Abstract Syntax Notation One

ASP
Abstract Service Primitive

ATM
Asynchronous Transfer Mode

ATS
Abstract Test Suite

AuC
Authentication Center

BEC
Backward Error Correction

BHCA
Busy Hour Call Attempt(s)

BMC
Broadcast/Multicast Control

BSC
Base Station Controller

BSS
Base Station Subsystem

BSSAP
BSS Application Part

BSSGP
Base Station Subsystem GPRS Protocol

BTS
Base Transceiver Station

CAMEL
Customized Application for Mobile Enhanced Logic

CAP
CAMEL Application Part

CATT
China Academy of Telecommunication Technology

CBR
Constant Bit Rate (Data Stream)

CC
Call Control

CCITT
Comité Consultatif International Téléphonique et Télécommunication

CCS7
Common Control Signaling System No 7 (SS7)

CCU
Channel Codec Unit

CDMA
Code Division Multiple Access

CDMA2000
3rd Generation Code Division Multiple Access

CIC
Cricuit Id Code

CID
Channel Identifier

CKSN
Ciphering Key Sequence Number

CM
Call Management Protocols, Connection Management

CN
Core Network

COS
Corporation for Open Systems, USA

CPCS
Common Part Convergence Sublayer

CRNC
Controlling RNC (Radio Network Controller)

CS
Circuit Switched

CS-CN
Circuit Switched Core Network

CSE
CAMEL Service Environment

CT
Conformance Test

CTR
Common Technical Regulation

CTS
Conformance Test Services. Project conducted by EU and European partners to achieve harmonized European tests.

D-AMPS
Digital AMPS

DCE
Data Communications Equipment

DCH
Dedicated Channel

DECT
Digital Enhanced Cordless Telephone

DIS
Draft International Standard

DL
Downlink

DLCI
Direct Link Connection Identifier

DNS
Domain Name Server

DoE
Demo of Equivalence. Harmonizing campaign between imple-mentations of test suites, usual for CTS.

DPC
Destination Point Code

DRNC
Drift Radio Network Controller

DRNS
Drift Radio Network Subsystem

DTE
Data Terminal Equipment

E1
2.048 kbps

EDGE
Enhanced Data Rates for GSM Evolution

EFR
Enhanced Full Rate (speech codec)

EIR
Equipment Identity Register

ESE
Emulation Scenario Editor
(also Emulation Stack Editor)

ETR
ETSI Technical Report

ETS
Executable Test Suite

ETSI
European Telecommunication Standards Institute

FDD
Frequency Division Duplex

FDMA
Frequency Division Multiple Access

FEC
Forward Error Correction

FER
Frame Error Rate

FM
Fault Management

FM
Frequency Modulation

FORTH
Programming Language (FORTH Inc.)

FR
Frame Relay

Gb
Interface between BSS and SGSN

Gc
Interface between GGSN and HLR

Gd
Interface between SGSN and GMSC

Gf
Interface between SGSN and EIR

Gi
Interface between GGSN and external PDN

Gn
Interface between SGSN and GGSN

Gp
Interface between SGSN and GGSN of external PLMN

Gr
Interface between SGSN and HLR

Gs
Interface between SGSN and VMSC/VLR

GGSN
Gateway GPRS Support Node

GMM
GPRS Mobility Management (protocols)

GMSC
Gateway Mobile Service Switching Center

GMSK
Gaussian Minimum Shift Keying

GPRS
General Packet Radio Service

GSM
Global System for Mobile Communication

GSM-R
GSM Railway

gsmSCF
GSM Service Control Function

gsmSSF
GSM Service Switching Function

GSN
GPRS Support Node

GTP
GPRS Tunneling Protocol

GTP-C
GTP Control

GTP-U
GTP User

GTT
Global Title Translation

HLR
Home Location Register

HO/HoV
Handover

HR
Half Rate

HSCSD
High Speed Circuit Switched Data

HTTP
HyperText Transfer Protocol

ICO
Intermediate Circular Orbits

IETF
Internet Engineering Task Force

IMEI
International Mobile Equipment Identification

IMSI
International Mobile Subscriber Identity

IMT-2000
International Mobile Telecommunications 2000

IMUN
International Mobile User Number

IN
Intelligent Network

INAP
Intelligent Network Application Part

IP
Internet Protocol

IPv4
IP version 4

IPv6
IP version 6

IS
International Standard

IS-95
Interim Standard ’95

ISDN
Integrated Services Digital Network

ISO
International Standards Organization

ISP
Internet Service Provider

ISUP
ISDN User Part

ITU
International Telecommunication Union

ITU TS
International Telecommunication Union-Telecommunication Standards Section

ITUN
SS7 ISUP Tunneling

Iu
UTRAN Interface between RNC and CN

Iub
UTRAN Interface between Node B and RNC

Iu-CS
UTRAN Interface between RNC and the Circuit Switched Domain of the CN

Iu-PS
UTRAN Interface between RNC and the Packet Switched Domain of the CN

Iur
UTRAN Interface between two RNCs

IUT
Implementation Under Test

IWF
Interworking Function

kbps
Kilobits per Second

LEM
Local Emulation Manager

LLC
Logical Link Control

LT
Line Termination

LU
Location Update

MAC
Medium Access Control

MAP
Mobile Application Part

Mbps
Megabits Per Second

MBS
Message Building System

MC
Multi-Carrier

MC-CDMA
Multi-Carrier CDMA

MCE
Multi-protocol Encapsulation

MDTP
Multi Network Datagram Transmission Protocol

ME
Mobile Equipment

MM
Mobility Management (protocols)

MOC
Mobile Origination Call

MS
Mobile Station

MSC
Mobile Services Switching Center, Message Sequence Chart

MSISDN
Mobile Subscriber ISDN address

MSRN
Mobile Station Roaming Number

MSS
Mobile Satellite System

MT
Mobile Telephone

MTC
Mobile Terminating Call

MTP
Message Transfer Part

MTP3b
Message Transfer Part level 3 (broadband) for Q.2140

NAS
Non Access Stratum

NBAP
Node B Application Protocol

NE
Network Element

NMT
Nordic Mobile Telephony

NNI
Network-Node Interface

Node B
UMTS Base Station

NRT
Non-Real Time

NSS
Network Switching Subsystem

NS-VC
Network Service - Virtual Connection

NT
Network Termination

O&M
Operation and Maintenance

OAM
Operation, Administration, and Maintenance

OMC
Operation and Maintenance Center

OS
Operations System

OSA
Open Service Architecture

OSI
Open Systems Interconnection

OSS
Operation Subsystem

OSTC
Open Systems Test Consortium

PCO
Point of Control and Observation

PCR
Program Clock Reference

PCU
Packet Control Unit

PDC
Personal Digital Communication

PDCP
Packet Data Convergence Protocol

PDH
Plesiochronous Digital Hierarchy

PDN
Packet Data Network

PDP
Packet Data Protocol

PDU
Protocol Data Unit

PICS
Protocol Implementation Conformance Statement (ISO 9646). Here: Test Suite Parameter

PIXIT
Protocol Implementation eXtra Information for Testing (ISO 9646). Here: Test Suite Parameter

PLMN
Public Land Mobile Network

PMR
Private Mobile Radio

PS
Packet Switched

PS-CN
Public Switched Core Network

PSTN
Public Switched Telephone Network

QoS
Quality of Service (ATM Network Channels)

QPSK
Quadrature Phase Shift Keying (or, Quaternary Phase Shift Keying)

RAB
Radio Access Bearer

RAN
Radio Access Network

RANAP
Radio Access Network Application Part

RFC
Request for Comment

RLC
Radio Link Control

RLP
Radio Link Protocol

RNC
Radio Network Controller

RNS
Radio Network Subsystem

RNSAP
Radio Network Subsystem Application Part

RNTI
Radio Network Temporary Identity

RR
Radio Resource

RRC
Radio Resource Control

RRM
Radio Resource Management

RTT
Radio Transmission Technology

Rx
Receiver

SAAL
Signaling ATM Adaptation Layer

SAP
Service Access Point

SAPI
Service Access Point Identifier

SCCP
Signaling Connection Control Part

SCR
System Clock Reference

SCTP
Simple Control Transmission Protocol

SDH
Synchronous Digital Hierarchy

SDL
State Definition Language

SDO
Standard Developing Organization

SDU
Service Data Unit

SGSN
Serving GPRS Support Node

SIETEM
Test Manager for TTCN Environment

SIM
Subscriber Identity Module

SM
Session Management

SMS
Short Message Service

SNDCP
Subnetwork Dependent Convergence Protocol

SPC
Signaling Point Code

SPE
Signal Processing Equipment

SRNC
Serving Radio Network Controller

SRNS
Serving Radio Network Subsystem

SS#7
Signaling System No. 7. Also Common Channel Signaling System No. 7.; ITU Q.700 series

SSCOP
Service Specific Connection Oriented Protocol

SSF
Service Switching Function

SSN
Subsystem Number

SSP
Service Switching Point

SSS
Switching Subsystem

STC
Signaling Transport Converter

STM1
Synchronous Transport Module -Level 1

SUT
System Under Test

SW
Software

T1
1544 kbps

TACS
Total Access Communication System

TBF
Temporary Block Flow

TBI
Temporary Block Identifier

TBR
Technical Basis for Regulation

TC
Transcoder

TCAP
Transaction Capability Application Part

TCP
Transmission Control Protocol

TD-CDMA
Time Division-Code Division Multiple Access

TDD
Time Division Duplex

TDMA
Time Division Multiple Access

TD-SCDMA
Time Division - Synchronous CDMA

TE
Terminal Equipment

TEID
Tunneling Endpoint ID

TETRA
TErrestrial Trunked Radio Access

TIA
Telecommunications Industry Association

TID
Tunnel Identifier

TMSI
Temporary Mobile Station Identity

TN-CP
Transport Network-Control Plane

TPC
Transmission Power Control

TR
Termination

TRAU
Transcoder and Rate Adaptor Unit

TRX
Transceiver

TS
Technical Specification

TSCC
Test Scenario Control Center

TTA
Telecommunications Technology Association

TTCN
Tree and tabular combined Notation. ISO 9646-3, ITU X.292

TUP
Telephone User Part

Tx
Transmitter

UBR
Unspecified Bit Rate

U MSC
U MSC Mobile Switching Center (the integration of the MSC and the SGSN in one physical entity (UMTS+MSC =UMSC)

U MSC-CS
U MSC Circuit Switched

U MSC-PS
U MSC Packed Switched

U SIM UMTS
Subscriber Interface Module

U SSD
Unstructured Supplementary Service Data

UDP
User Datagram Protocol

UE
User Equipment

UICC
UMTS IC Card

UL
Uplink

Um
GSM Air Interface

UMTS
Universal Mobile Telecommunication System

UNC
Universal Naming Convention

UNI
User-Network Interface

UP
Uplink, User Part, User Plane

USF
Uplink State Flag

USIM
UMTS Subscriber Identity Module

UTRA
UMTS Terrestrial Radio Access

UTRAN
UMTS Terrestrial Radio Access Network

Uu
UMTS Air interface

UWC-136
Universal Wireless Communication

V5.1, V5.2, V.110
ITU Interfaces

VBR
Variable Bit Rate (data stream)

VC
Virtual Connection

VCI
Virtual Channel Identifier

VHE
Virtual Home Environment

VLR
Visitor Location Register

VMSC
Visited MSC

VPI
Virtual Path Identifier

WCDMA
Wideband CDMA, Wideband Code Division Multiple Access

WLL
Wireless Local Loop

X.25, X.75
ITU Interfaces

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