Short Introduction

Tektronix

K15 Protocol Tester

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This document supports software version 1.00

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Tektronix Berlin
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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 LEERER MERKER* 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 contains operating information for the K15 Protocol Tester. It provides a functional overview for those of you who are new to using the K15.

To work with the K15, you should have the following qualifications:

- Knowledge of the measurement application field as well as experience with communications test applications
- Familiarity with signaling protocols
- Knowledge of PC and Windows XP Embedded (XPe)
- Familiarity with the safety requirements for electrical equipment for measurement, control and laboratory use
- 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 via the support unit.*

About This Manual

This manual is divided into the following sections:

- 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.
- *Configuration* describes which settings you must configure in order to run a measurement scenario.
- *K15 Measurement* describes how to select a type of measurement, how to start it, how to view, filter, and trigger data, and how to evaluate data by recording.
- *Applications* describes how to run further evaluation programs to interpret data (applications or statistics).
- *Tools* describes how to use other supplementary programs simultaneously with the main application.
- *Reference* comprises an encyclopedia of topics that describe the K15 software and give background and basic information on it.
- *Abbreviations* provides explanations of unique or uncommon abbreviations related to the K15 measurements.
- *Index* provides page number references to topics in alphabetical order.

***NOTE**. More detailed information about each of the sections contained in these chapters can be found in the K15 Online Help.*

Conventions

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

Text style	Description
in italics	Italics fonts indicate menus and menu functions as well as commands, parameters and examples.
<Key>	Keys or key sequences are in angle brackets.
Bold	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. See the following list for other documents supporting the K15 Protocol Tester:

- The *User Manual K15 Protocol Tester* provides all user-relevant product information. It assists you when setting up and starting the protocol tester for the first time. This user manual is available in 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 within a K15 application window.
- The Release Notes are delivered separately and contain the latest information on the current software version (readme.txt).
- Microsoft Windows XPe is described in the Windows XPe 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.

Service and Support

When you purchase a Tektronix product, Tektronix provides support to complete your solution. Technical support experts offer application-specific solutions and worldwide flexible support services, including on-site support, are designed to ensure that your instruments operate at peak performance. You 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.*

Contacting Tektronix

Address

Tektronix Berlin
Wernerwerkdamm 5
13629 Berlin
GERMANY

Web site

www.tektronix.com

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

Configuration

To run a measurement, you must configure hardware and software according to your desired measurement scenario.

Before you configure a measurement scenario, set up the device, install the measuring modules and switch on the device (see the *Getting Started* chapter in the *K15 User Manual*).

The easiest way to configure a measurement scenario is to start the autoconfiguration. The autoconfiguration configures measurement scenarios for specific traffic types automatically.

To configure the K15 manually, you must load an existing or the default configuration, which contains all available online and offline measurement scenarios. Then you can adapt these scenarios to your specific needs.

The configuration settings are made in the Data Flow window in the *Cards Overview* and *Measurement Scenarios* tabs.

The *Cards Overview* and *Measurement Scenarios* windows consist of two panes illustrating your settings:

- The left panes, *Tester Overview* and *List of Scenarios*, provide an overview and indicate the status of the configuration. The relationships between interface modules, data sources and measurement tasks are depicted as tree structures.
- The right panes, *Cards Overview* and *Measurement Scenarios*, contain a graphical representation of the configuration (interface modules or pipelines).

  The *Measurement Scenarios* tab of the Data Flow window displays the current configured measurement scenarios and sources. This tab keeps you informed about the currently active parameter settings and system state at all times. The grey boxes in the pipelines represent pipeline elements. The connecting lines indicate the data flow between those elements.

The file name of the current configuration is always visible in the title bar of the Data Flow window. If the configuration is not stored in a file, the title bar displays the word <UNTITLED>.

Whenever the protocol tester is running, one configuration is always active.

After configuring your desired measurement scenario, you can save configurations in setup (.s) files, which can be reloaded at any time. Thus, you can use a given scenario repeatedly without having to specify configuration parameters each time.

Configurations provide the following advantages:

- You can save predefined measurement configurations for use at a later point in time.
- If a long-term measurement is interrupted due to a power failure, the program loads the last used configuration and then continues the interrupted measurement (Auto-Restart). If you have loaded a configuration and changed it, it is important to save this configuration. Otherwise the protocol tester will not apply your changes during automatic start up.

The following flow chart shows the steps to be taken in preparing a measurement:

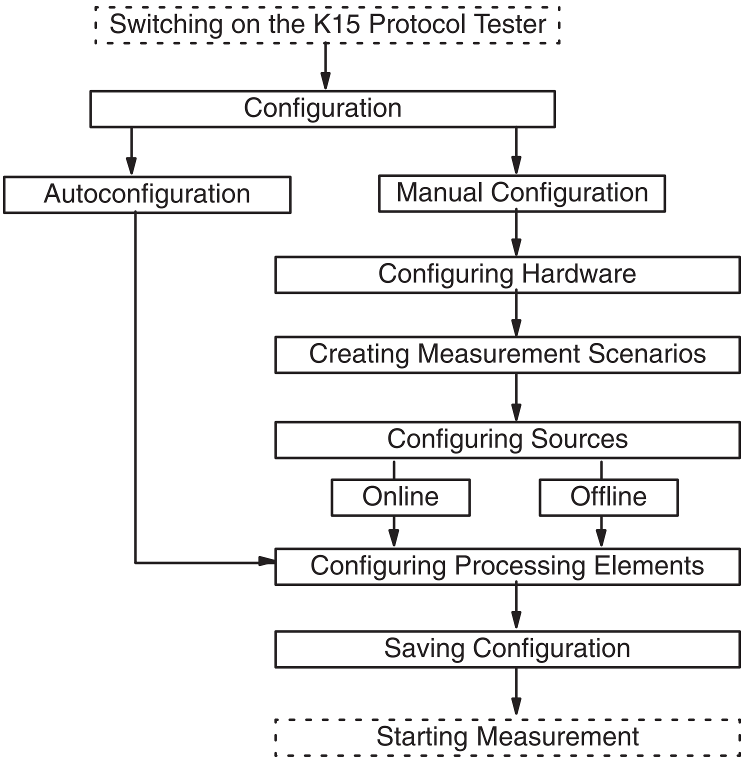


Figure 1: Configuration flow chart

Switching on the K15 Protocol Tester

After startup, the K15 Protocol Tester runs various self-tests. The *Status Window* opens, indicating the status of the connected interface modules and the main system.

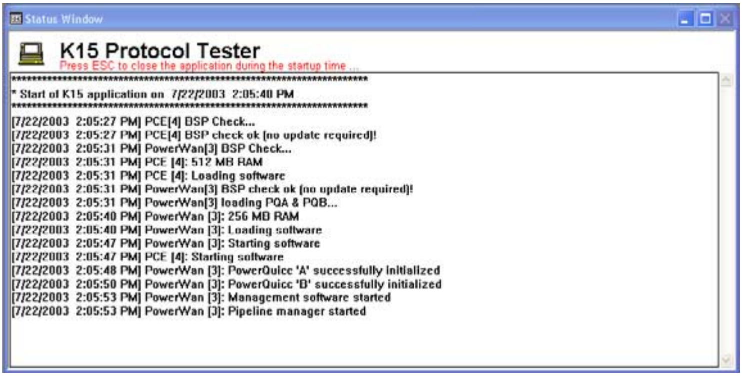


Figure 2: Status Window

The main program automatically starts and opens a dialog box in which you can select between loading a user-defined configuration, the default configuration, the PCM autoconfiguration, or the Iub autoconfiguration.

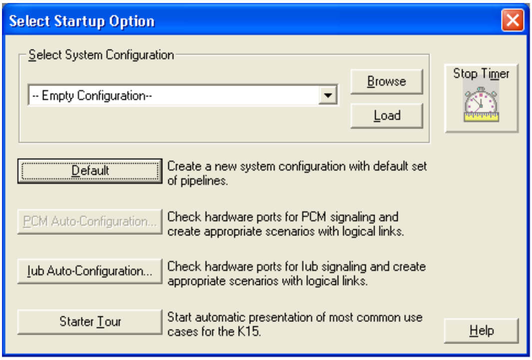


Figure 3: Select Startup Option dialog box

Autoconfiguration

For specific measurements, the K15 configures the measurement scenario automatically. You only need to connect your K15 to the IUT. The protocol tester then analyzes the received traffic and configures all parameters needed to measure the traffic of this connection.

You can use the Autoconfiguration for the following measurements:

- Measurements with signaling in SS#7, LAPD / LAPV, TRAU, ABIS, and HDLC (PCM Autoconfiguration) using the Power Wan or Power Wan Light measurement board
- Measurements at the UMTS Iub interface (Iub Autoconfiguration) using the PCE-2 measurement board

To start an Autoconfiguration, press the Autoconfiguration button in the *Select Startup Option* dialog box (see figure 3). An Autoconfiguration Wizard starts and guides you to your measurement scenario.

A detailed description of the Autoconfiguration you will find in chapter *Tools* on page 222.

Manual Configuration

To configure your K15 manually, load an existing system configuration in the *Select Startup Option* dialog box (see figure 3) or press the *Default* button.

The *Data Flow* window opens displaying the selected configuration. The following pages describe how you can adapt these configurations to your specific needs.

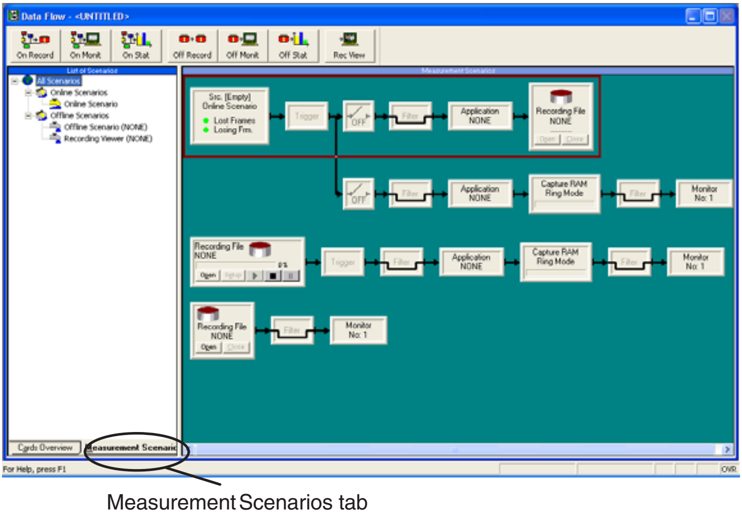


Figure 4: Data Flow Window with K15 default configuration

Configuring Hardware

Hardware is configured in the *Cards Overview* window. Open this window by clicking the *Cards Overview* tab of the *Data Flow* window.

The *Cards Overview* window provides an overview of the connected measurement boards. Here you can define the settings for the ports of the measurement boards or change the settings of an existing configuration.

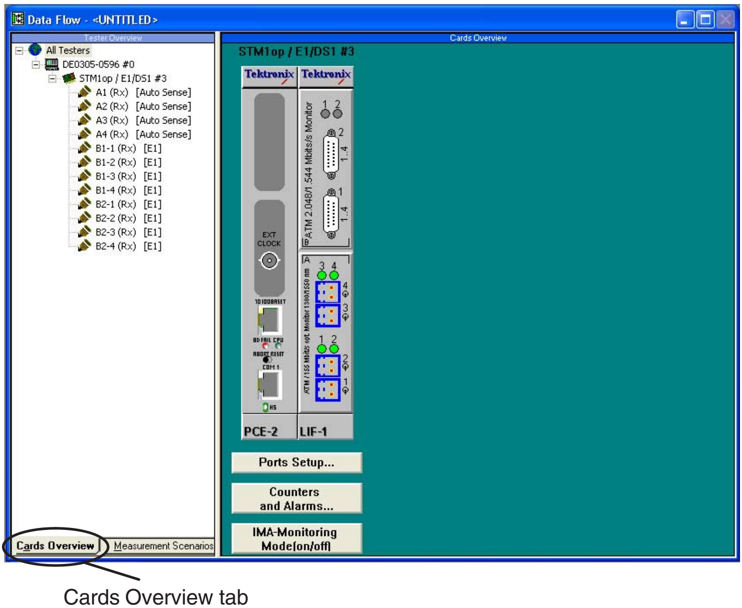


Figure 5: Cards Overview window

The *Tester Overview* pane on the left shows a list of measuring boards and ports.

The *Cards Overview* pane on the right graphically displays the individual boards with their ports. This overview also indicates the state of status-LEDs. This enables the control of the interfaces' states even if the protocol tester is controlled remotely.

To configure the hardware settings, proceed as follows:

1. In the *Cards Overview* pane, click the *Ports Setup...* command or a socket on the board to enter the *Ports Setup* dialog box.

   The following figure shows a port configuration example for a PCE-2 board with STM-1 line interfaces:

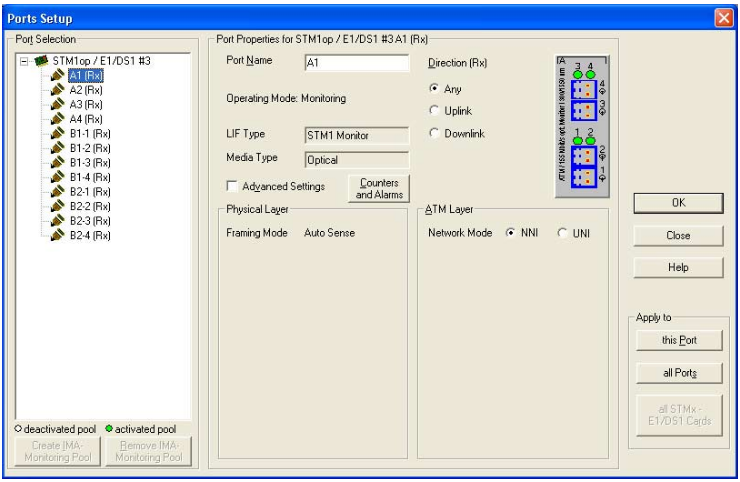


Figure 6: Port Setup dialog box

2. Configure the individual ports in this dialog box or change the existing settings.

   The default values in the *Ports Setup* dialog box match the imprint on the interface.

3. Confirm your settings with **OK**.

Now, that the ports are set up, the K15 has stored the characteristics of the signaling traffic.

NOTE. *With the Traffic Analyzer tool you can see how much traffic is on the connected lines before starting any measurement. See* Tools *on page 226.*

Creating Measurement Scenarios

After startup and configuring the hardware, you must configure the software. To configure the K15 measurement software you must first set up a suitable measurement scenario.

In the K15 program, a measurement scenario is represented as a pipeline of processing elements. Processing elements are all measurement modules that are required for a measurement scenario.

You can adapt predefined scenarios to your individual measurement task by configuring the processing elements in these scenarios.

Scenarios are created in the *Measurement Scenarios* window. Open this window by clicking the *Measurement Scenario* tab of the *Data Flow* window. The *Measurement Scenario* window provides an overview of the existing scenarios. In the default configuration some predefined scenarios are shown.

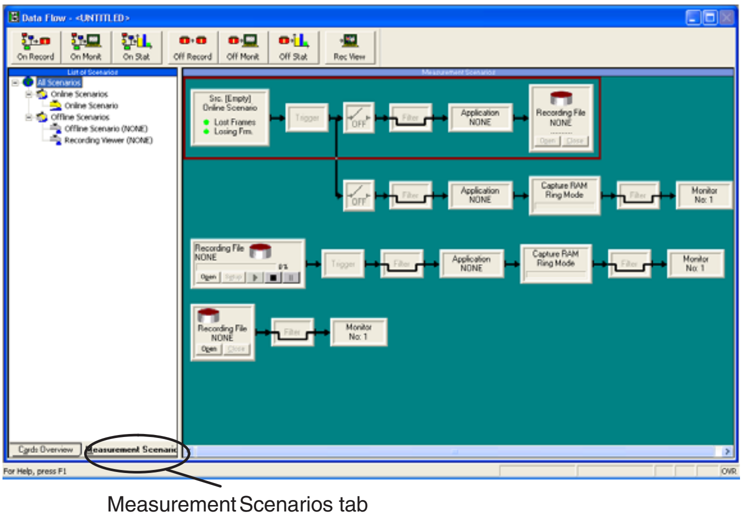


Figure 7: Measurement Scenarios window

The *List of Scenarios* pane on the left shows the names of the existing scenarios.

The *Measurement Scenarios* pane on the right graphically displays the existing scenarios. Depending on which level of the *List of Scenarios* tree you have clicked, you will see either individual or all scenarios in the *Measurement Scenarios* pane.

In the Pipeline Selection toolbar, various predefined pipelines are available for each scenario type (online and offline measurement).

Figure 8: Pipeline buttons

***NOTE**. The different types of measurement scenarios are described in* Selecting a Type of Measurement *on page 38.*

To configure a pipeline, proceed as follows:

1. **1.** Choose one of the pipeline buttons and drag it into the right window to create a new scenario or connect it to an existing scenario.

   The pipeline is inserted into the *Measurement Scenario* pane. The *List of Scenarios* pane displays an entry for the new scenario.

2. Enter a name for the scenario in the *List of Scenarios* pane.
3. Configure the source. See *Configuring Sources* on page 16.
4. After configuring the source, you can configure the processing elements for your measurement. See *Configuring Processing Elements* on page 23.

You can configure several pipeline branches per scenario. For example you may want to run an online measurement to analyze the received data in the monitor window and simultaneously write it to a recording file.

The number of pipelines or pipeline branches that can be configured depends on the available memory space on the interface modules. To avoid unnecessary usage of the memory, create only the pipeline branches that are actually required for the measurement. Refer also to the notes in the *Resources* help topic.

NOTE*. The analysis program Load Meter, which can run simultaneously with measurements, indicates the memory capacity utilization on the interface modules. If the Memory field of card 1 indicates that the limit has been reached, you should remove one or more pipeline branches.*

Configuring Sources

To carry out a measurement with the K15 Protocol Tester, you must define logical rules for the data flow that is to be measured. Those rules are for instance the assigned protocol stack and the specified channel decoding method.

Online Sources. To define logical rules for online measurements, you must configure the *Source* processing element, which defines logical links between the system under test and the protocol tester. Logical links are signaling links that represent the online data.

To configure a Source, all boards required for the measurement must have been initialized (check in the *Status* Window for *boot ok*); a pipeline must have been created, and the *Data Flow* window must be open.

You can combine several logical links in a single source and assign them to one or more measurement scenarios.

Offline Sources. Offline Sources are based on recording files. The settings for the logical links of an offline data source (offline scenario, data display) are saved in the recording file and can be changed to a limited extent (link names, link colors, protocol stacks).

Configuring Online Data Sources

An online source consists of a group of logical links. In the pipelines, an online source is represented by the *Source* processing element.

Configure sources as follows:

1. Click on the *Source (Src)* processing element. The *Logical Link Setup* dialog box opens. This dialog box looks different depending on the chosen interface. The following figure shows the *Logical Link Setup* dialog box for the STM-1 line interface:

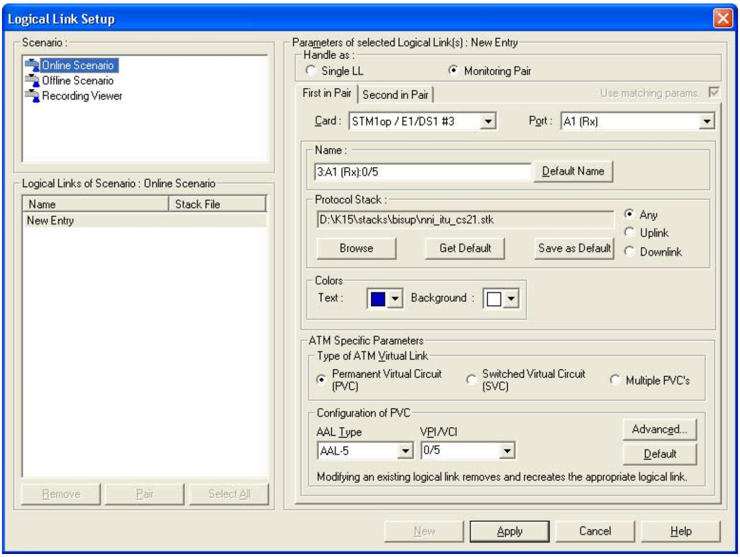


Figure 9: Logical Link Setup dialog box

The selection lists on the left display the scenarios of the current configuration and the logical links that are assigned to these scenarios. You can add new links to the scenarios and edit as well as remove existing links.

2. Configure the settings of your data source in this dialog box.

NOTE. *Detailed information on the individual settings can you find in the appropriate Help topics.*

3. Confirm your settings with **Apply**.

After defining one link, you can create more settings until all your connections are defined.

If you want to create a new logical link with settings identical to an existing one, select the appropriate logical link in the *Logical Links of Scenario* list. Then click **New**.

NOTE. *Most of the settings in the Logical Link Setup dialog box can only be made if you stop the measurement first. To do this, set the ON/OFF switch in all pipeline branches of the online scenario to OFF.*

Configuring Offline Data Sources

An offline source is based on a recording file. In the pipelines, an online source is represented by the *Playback Recording File* or the *View Recording File* processing element.

The *Playback Recording File* processing element (see page 29) allows you to play back the contents of a specific recording file into the system. Playback data can be edited and evaluated to the same degree as the data of an online measurement.

The *View Recording File* processing element (see page 29) allows you to open a recording file to view its contents in the offline monitor.

Configuring Playback Recording Files. Configure *Playback Recording Files* as follows:

1. Click **Open** on the *Playback Recording File* processing element. The *Recording Playback Configuration* dialog box opens and an *Open* dialog box that displays the standard directory for recording files *\k15\rec* or the last-used directory for recording files.

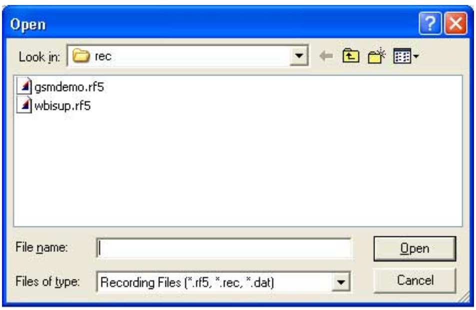


Figure 10: Dialog box to open Playback Recording Files

2. Select the desired file (file extension **.rf5*). If you have saved the recording file in question in a different directory, change directories as required.

3. Confirm your selection with **Open**. The *Recording Playback Configuration* dialog box will now list the logical links with the configuration data (Name, Protocol Stack, Colors) that were set when the recording file was created.

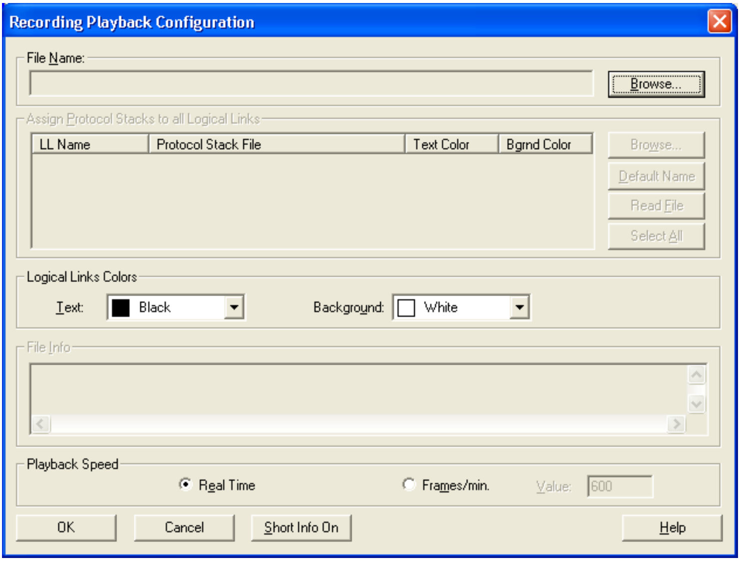


Figure 11: Recording Playback Configuration dialog box

4. If the open file does not contain the desired data, you can choose a different recording file using the *Browse* command next to the *File Name* field.

5. Select your preferred text and background colors for displaying the logical links and your desired playback speed *Realtime* or *Frames/min.*

Configuring View Recording Files. Configure *View Recording Files* as follows:

1. Click **Open** in the *Recording File* processing element. The *Recording Viewer Configuration* dialog box opens and an *Open* dialog box that displays the standard directory for recording files \k15\rec or the last-used directory for recording files.

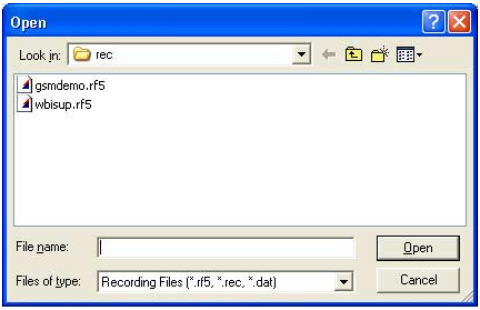


Figure 12: Dialog box to open View Recording Files

2. Select the desired file (file extension **.rf5*). If you have saved the recording file in question in a different directory, change directories as required.

3. Confirm your selection with **Open**. The *Recording Viewer Configuration* dialog box will now list the logical links with the configuration data (Name, Protocol Stack, Colors) that were set when the recording file was created.

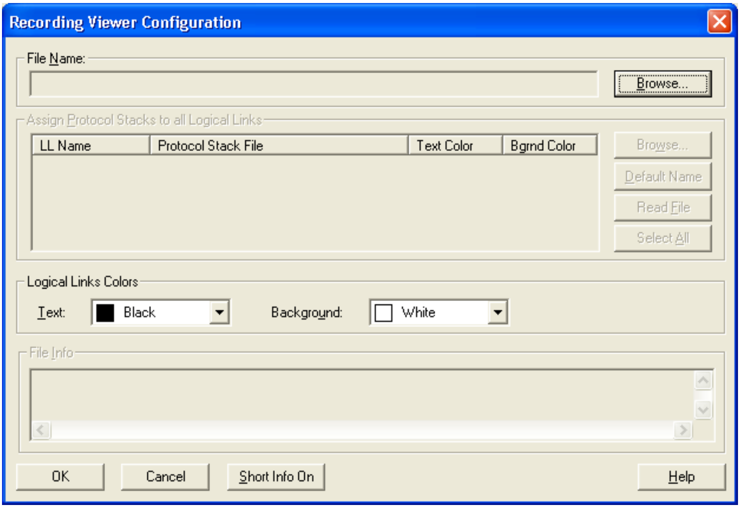


Figure 13: Recording Viewer Configuration dialog box

4. If the open file does not contain the desired data, you can choose a different recording file using the *Browse* command next to the *File Name* field.

5. Select your preferred text and background colors for displaying the logical links and your desired playback speed *Realtime* or *Frames/min.*

Configuring Processing Elements

Each pipeline features all measurement modules required for a measurement as standard. Using these processing elements, you can configure the parameters for your specific scenario. The following processing elements are available:

- Source (see page 16)
- Application
- Statistics
- Capture RAM
- Monitor
- Recording File (Write / Playback / View Recording File)
- On/Off Switch
- Filter
- Trigger

Application

K15 features specific applications providing problem-based analyses of signaling data. They are supplementary applications that you can use, for example, to start predefined statistical analyses. You can use up to two applications per Application pipeline-element. These applications are cascaded, therefore the measurement data is first processed by the position 1 application. These measurement results are then further processed by the position 2 application.

You can select applications only after configuring the online source or loading a recording file.

To configure, start, or stop a loaded application, proceed as follows:

1. Click the *Application* processing element. The Load/Unload Monitoring Application Programs dialog box opens.
2. Select the name of the application you want to switch to and confirm your selection with *OK*. The program window of the selected application is activated.

   Configure the application in this program window.

NOTE. *For further details about the individual applications, refer to the chapter* Applications *on page 123 and to the Online Help.*

Statistics

The *Statistics* processing element classifies and counts received signaling data based on adjustable criteria, while the data recording or data playback functions continue to run in the background. Using additional programs, you can display the counters managed in the *Statistics* processing element in graphical or tabular form and print them, if required.

Before selecting Statistics, you must configure an online source or load a recording file. If the pipeline contains an Offline Recording branch, you must also configure a file as data sink.

To call up Statistics, click the *Statistics* processing element. The Statistics window opens. Configure the Statistics application in this program window.

NOTE. *For further details, refer to* Statistics *on page 194 and the Online Help.*

Capture RAM

The *Capture RAM* processing element allows you to define the memory area reserved for buffering signaling data on the interface modules, either limiting the amount of data or writing received data continuously into the capture RAM. You can specify criteria for writing data to the capture RAM in the input filter.

The capture RAM allows you to ”uncouple” the speed of data reception from the monitor display. You can save the data contained in the capture RAM in a file and print them.

To define the Capture RAM, proceed as follows:

1. Click the processing element *Capture RAM*. The *Capture RAM Configuration* dialog box opens.

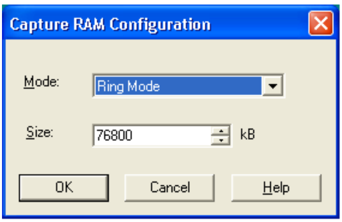


Figure 14: Capture RAM Configuration dialog box

2. In the *Mode* list, select the mode defining how data will be entered in the capture RAM:
   - *Ring Mode*: When the capture RAM limit has been reached, data continues to be added at the beginning of the memory area and overwrites the oldest data entered. Ring Mode is particularly suited for long-term measurements that you want to view on the monitor without interrupting data recording.
   - *Linear Mode*: The protocol tester writes data to capture RAM until the memory area is full. No more data will be entered. Linear Mode is suitable for scenarios that you have restricted in advance with appropriate filter criteria.
3. Enter the size of the memory area in the Size text field. The size of the capture RAM can be set anywhere between 16 kB and 256MB. It depends on the memory available on the interface modules. The status window indicates how much memory space there is for each module.

   If you are running several measurements simultaneously and the capture RAM exceeds a total of 256 MB, the value you entered will be reduced automatically.
4. Confirm your entries with **OK**.

Monitor

The *Monitor* processing element represents the Monitor main window, where signaling data are displayed and analyzed based on various criteria. You can analyze data that were currently received (Online Monitoring) or recorded data (Offline Monitoring).

To call up the Monitor window, click the *Monitor* processing element. The Monitor window opens.

NOTE. *For details on how to configure the Monitor window, refer to* Viewing the Measurement Results *beginning on page 48 and the Online Help.*

Recording File

There are three types of Recording File processing elements:

Playback Recording File

View Recording File

Write Recording File

Playback Recording File. Use the *Recording File* processing element to play back the contents of a specific recording file into a system in offline measurement tasks. Playback data can be edited and evaluated to the same degree as the data of an online measurement. To configure the *Playback Recording File* processing element, see page 19.

View Recording File. This processing element is part of the Record Viewer scenario. It allows you to open a recording file to view its contents. To configure the *View Recording File* processing element, see page 21.

Write Recording File. Use the *Write Recording File* processing element to define the file and conditions for saving the signaling data received. To configure the *Write Recording File* processing element, proceed as follows:

1. On the *Write Recording File* processing element, click **Open**. The *Recording Write Configuration* dialog box opens and an *Open* dialog box that displays the standard directory for recording files *\k15\rec* or the last-used directory for recording files.

Figure 15: Dialog box to open Write Recording Files

- To create a new Recording File, enter the name of the new recording file in the *File Name* field. The file extension *.rf5 is added automatically. The standard directory is *\k15\rec*. You can also choose a different directory.
- To use an existing Recording File, click **Browse** and select the desired file in the *\k15\rec* list.

2. Confirm your settings with **Open**.

3. Now you can configure some basic settings for writing the selected recording file in the *Recording Write Configuration* dialog box.

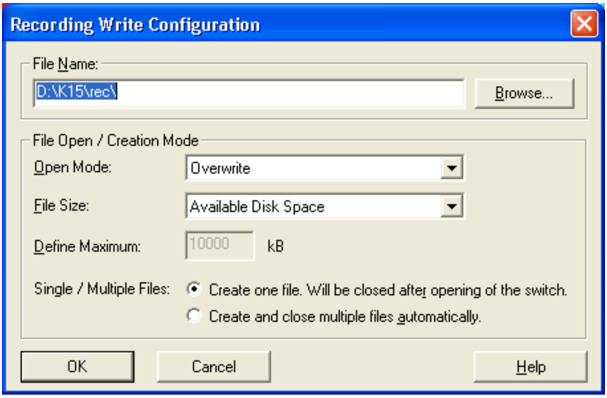


Figure 16: Recording Write Configuration dialog box

Confirm the settings in this dialog box with **OK**. The *Write Recording File* processing element and the *Measurement Scenarios* pane now display the selected file.

ON/OFF Switch

Use the *ON/OFF switch* processing element to start, interrupt and terminate online measurements.

As long as an *ON/OFF switch* processing element is still activated in a pipeline, neither a pipeline's data source nor the configuring pipelines settings can be changed. In this case, you will be informed by an onscreen message.

Filter

Use filters to reduce the amount of data to be evaluated (input filters) or displayed (display filters). The protocol tester uses filter criteria to check which data frames are allowed to pass for further analysis. Depending on its position in the pipeline, the *Filter* processing element serves as input (just after the Source) or display filter (just before the Monitor). You can easily apply the settings of any one filter to another.

NOTE. *For information on how to configure filters, refer to* Configuring Filters *on page 83 or to the appropriate topic in the Online Help.*

Trigger

With the help of triggers you can link events with predefined actions, called trigger actions. Events are linked with a trigger as trigger conditions. If a trigger condition is fulfilled, the defined trigger action will be carried out. A trigger condition, for example, is the receipt of a specific message. A trigger action, for example, is the termination of a file recording.

NOTE. *For information on how to configure triggers, refer to* Configuring Triggers *on page 95 or to the appropriate topic in the Online Help.*

Saving Configurations

Configurations are saved in setup files. You can save any number of configurations and load them individually as required. The standard directory for setup files is *\k15\config*. Setup files have the extension **.s*.

The following settings are saved in setup files:

Table 1: Saved Settings in Setup Files

Port Configuration	Number and type of interface modules installed Parameters of the configured interface modules
Online Measurement Scenarios	All configured logical links and the assigned pipelines including their configuration and activation status (ON, OFF) Activation status of configured pipelines (ON, OFF)
Offline Measurement Scenarios	Assignment of protocol stacks, name playback settings of recording files Activation status of configured pipelines (ON, OFF)
Processing Elements	Capture RAM: Capture RAM size and mode
	Filters: All filter settings
	Triggers: All defined conditions and actions
	Recording files: Name and settings for the recording or playing back of data
	Applications: Assignment of activated applications to configured pipelines
	Monitor: Screen settings (columns, panes)

NOTE*. The system only saves settings for the currently installed measuring modules. Information about previously installed measuring modules is lost if you load a configuration with hardware settings that do not correspond to the current installation and save this configuration again.*

To save the current configuration, proceed as follows:

1. Choose *Save System Configuration* from the *File* menu
or *Save System Configuration As* from the *File* menu
or press *<CTRL + S>*

The *Save* dialog box opens and the *\k15\config* directory is displayed.

2. Enter the desired name for the configuration file. The file extension **.s* is added automatically

3. Confirm your entries with **Save**.

The last used configuration is loaded automatically 30 seconds after the measurement software is started. During these 30 seconds, a dialog box is shown with which you can start another setup file.

You can also load a saved configuration (setup file) at a later point of time, such as after completing a measurement in order to begin a new one with different parameters.

If you do not load or create a configuration after starting up the protocol tester, the Data Flow window title bar displays the word <UNTITLED>.

NOTE. *If the system cannot detect a saved configuration, the default configuration is activated.*

Printing Configurations

You can print the current configuration to a system printer or to a printer connected via the printer interface. The printout lists the following information:

- Hardware configuration
- Source configurations
- Pipeline configurations

To print your current configuration, click *Print System Configuration* on the *File* menu.

Copying Configurations (Pack&Go)

You can use the Pack & Go Wizard to copy configurations with all of the linked files to another protocol tester or PC. The Pack & Go Wizard packs and compiles the required files in an archive file. After you have copied this configuration archive to the destination computer, you can unpack it there with the Pack & Go Wizard.

To pack your current configuration, click *Pack&Go...* on the *File* menu and follow the instructions of the wizard.

Loading Saved Configurations

If you have changed the previously loaded configuration, the software displays a query. Confirm with *Yes* if you want to save the previous configuration.

It is also possible to load a saved configuration (setup file) at system start or at a later time, for example when you have completed a measurement and want to begin a new one with different parameters.

To load a saved configuration, proceed as follows:

1. Select one of the setup files from the pick list in the *File* menu.

An *Open* dialog box appears, displaying the directory *\k15\config*.

2. Select the desired configuration file.

3. Confirm your selection with **Open**.

If you have changed the currently loaded configuration, the *Save* dialog box appears. You can now save the configuration before opening the new selected configuration.

The protocol tester loads the configuration. You can either accept the configuration as is or change the settings before starting measurement.

NOTE. *If an error occurs while the system is loading a setup file, the most recently loaded configuration is reactivated.*

K15 Measurements

With a configured K15 you can run several types of online and offline measurements. You can edit your measurement scenarios by changing data volumes or parameters. You can filter displayed messages and control a measurement by configuring triggers.

The following chapter guides you through the different aspects of working with the K15 Protocol Tester. It should help you get started by explaining the basic principles of the protocol tester.

This chapter provides background information needed to access and use the K15 features.

Selecting a Type of Measurement

After configuring the K15 you must select and start the desired measurement. There are two types of measurement scenarios – online and offline measurements. They differ in terms of the data sources they use.

Online Measurements. Online measurements monitor “live” data as it is received. The K15 is connected to the data lines being monitored.

Three measurement scenarios are available for online measurements:

- Online Recording (to record received data)
- Online Monitoring (to analyze received data in the Monitor)
- Online Statistics (to perform statistical analyses using received data)

Before starting an online measurement, you must configure at least one logical link in a source.

Offline Measurements. Offline measurements use data stored in recording files. The K15 is not connected to data lines.

Recorded data can be analyzed and processed in one of two ways: it can be viewed or played back. Playback data reproduce an online measurement. They can be edited and evaluated like online measurement data.

Four measurement scenarios are available for offline measurements:

- Recording Viewer (to view recorded data)
- Offline Recording (to filter recorded data and write it to a new recording file)
- Offline Monitoring (to edit and analyze recorded data in the Monitor)
- Offline Statistics (to perform statistical analyses of the recorded data)

Before starting an offline measurement, select a recording file for viewing or playback.

Online Recording

The Online Recording measurement scenario allows you to save received data to recording files and evaluate them later.

You can reduce the amount of data being recorded using input filters. You can set filter criteria for each event registered by the protocol tester, specifying whether it should be recorded for later evaluation.

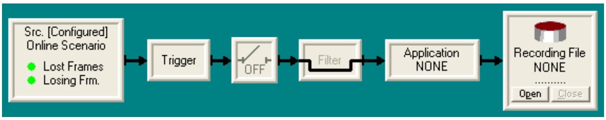


Figure 17: Online Recording measurement scenario

When using the Online Recording scenario, you can simultaneously monitor your data using the Online Monitor and perform statistical analyses using the Online Statistics by configuring appropriate pipeline branches.

Online Monitoring

The Online Monitoring measurement scenario allows you to analyze ”live” signalling data in the Monitor window. The data are displayed as they are received and simultaneously stored in the Capture RAM. You can passively monitor these data in the monitor window.

You can use input filters to reduce the amount of data entered into the Capture RAM. In addition you can specify in the display filter, which of the messages saved in the Capture RAM will be displayed in the monitor.

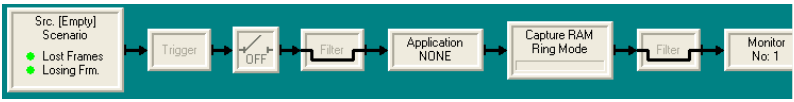


Figure 18: Online Monitoring measurement scenario

When using the Online Monitoring scenario, you can simultaneously write the data to a recording file (Online Recording) and perform statistical analyses (Online Statistics) by configuring appropriate pipeline branches.

Recording Viewer

The Recording Viewer measurement scenario displays recorded data in the Offline Monitor for your inspection.

Based on this quick overview, you can decide how you want to proceed with further data analysis or change your recording criteria.

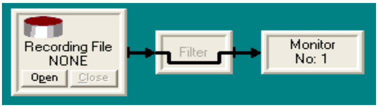


Figure 19: Recording Viewer measurement scenario

The Record Viewer allows you to scroll through a pre-recorded and decoded file. You can define filters for the screen output, but applications are not available.

Online Statistics

The Online Statistics measurement scenario helps you perform statistical analyses using data received online. Use the input filter to reduce the amount of data being analyzed.

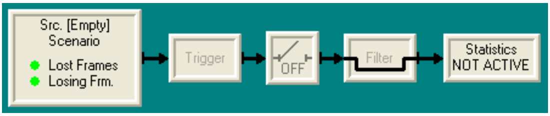


Figure 20: Online Statistics measurement scenario

For more in-depth analysis, the auxiliary program RealChart (see page 233) provides you with functions for graphically analyzing and evaluating data.

When using the Online Statistics scenario, you can simultaneously write data to a recording file (Online Recording) and analyze it using the Online Monitoring scenario by configuring appropriate pipeline branches.

Offline Recording

The Offline Recording scenario allows you to edit, filter and perform problem-specific analyses of recorded data and write the edited data to a new recording file. In this way, you can examine and then archive data (Recording Viewer) or analyze it in the offline monitor (Offline Monitoring).

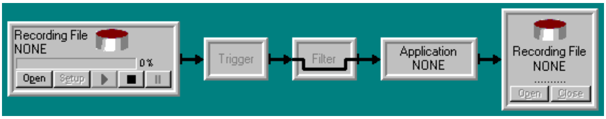


Figure 21: Offline Recording measurement scenario

When using the Offline Recording scenario, you can simultaneously monitor data using the Offline Monitor and perform statistical analyses using (Offline Statistics) by configuring appropriate pipeline branches.

Offline Monitoring

The Offline Monitoring scenario allows you to play data back into the system as well as edit and analyze it in the monitor. Use the input filter and problem-specific supplementary applications to restrict the data flow to include only the area you want to analyze later in the monitor.

Figure 22: Offline Monitoring measurement scenario

When using the Offline Monitor scenario, you can simultaneously write data to a new recording file (Offline Recording) and perform statistical analyses (Offline Statistics) by configuring appropriate pipeline branches.

Offline Statistics

The Offline Statistics measurement scenario allows you to evaluate recorded data using the Statistics application.

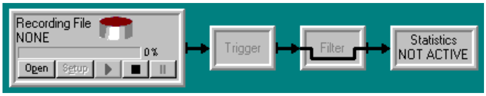


Figure 23: Offline Statistics measurement scenario

For more in-depth analysis, the auxiliary program RealChart (see page 233) provides you with functions for graphically analyzing and evaluating data.

When using the Offline Statistics scenario, you can simultaneously write data to a new recording file (Offline Recording) and analyze it using the Offline Monitoring by configuring appropriate pipeline branches.

Starting Measurements

If you have configured your measurement scenario and selected the type of measurement you can start the measurement.

Starting an Online Measurement. Activate the pipeline in the *Measurement Scenarios* tab of the *Data Flow* window by clicking the *ON/OFF* processing element of the pipeline branch to **ON**.

Starting an Offline Measurement. Select the desired file in the offline pipeline by clicking the **Open** button on the *Recording File* processing element. The *File Open* dialog box opens. The file type can be either from K15 (.rf5), K1103 (*.rec*) or K1297 (*.dat*). To start or continue the playback, click the triangle (play) button.

During Operation...

- The corresponding pipeline branch is highlighted.
- You can set and change the settings used to record and analyze data in the pipelines by configuring the processing elements.
- You can start several measurements simultaneously. The maximum number is determined only by the memory space available on the measurement boards.
- You should load the Load Meter program. This program provides capacity usage information on the individual measurement boards and the PC board (see page 231).

Stopping Measurements

Stop an Online Measurement. The following actions require you to stop a current online measurement:

- Adding new logical links to the source
- Removing existing links from the source
- Changing the assignments between logical links and protocol stacks
- Assigning a new pipeline branch
- Searching for data frames and text frames (measurement scenario Online Monitoring)

To stop online measurements, set the *ON/OFF* switch to OFF (in all pipeline branches, if you want to edit the data source).

Stop an Offline Measurement. Before performing the following actions, you need to stop all offline measurements. The following information only applies to data playback:

- Opening a new recording file
- Changing the assignments between logical links and protocol stacks
- Assigning a new pipeline branch
- Searching for data frames and text frames (measurement scenario Offline Monitoring)

To stop offline measurements, click the square (stop) button in the *Recording File* processing element.

Viewing Measurement Results

To view the signaling data of the activated data flow switch to the monitor main window by clicking the *Monitor* processing element at the right end of the pipeline.

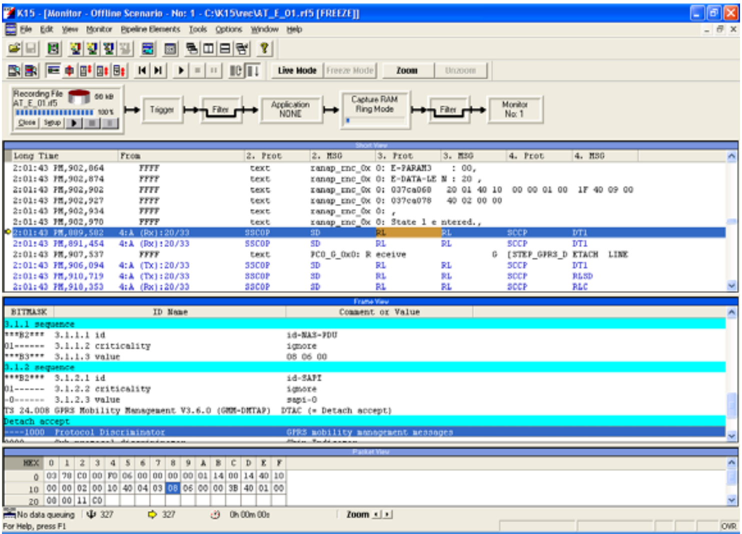


Figure 24: Monitor window

Monitor Pipeline Bar. The pipeline on which the current measurement is based is located above the pane and indicates the status and progress of the measurement, such as the Capture RAM usage or Layer 1 errors.

In the Monitor pipeline bar you can stop or interrupt the measurement, change parameters for the individual measurement, and open a new source.

Monitor Panes. The monitor features three panes that display measurement data at three different levels of complexity.

The *Short View* window pane lists the data packets (frames) recorded by the K15, displaying signaling data in single rows and short form. The preset columns display the time stamps, logical links, protocol names, and messages of levels 2 to 4.

The *Frame View* window pane shows the frame selected in the *Short View*. Here, it is displayed completely decoded down to the bit level. The first column shows the selected octet, the second column shows the name / meaning of the octet, and the third column shows the comment or value of the parameter. The protocol stacks loaded with the scenario determine which protocol parameters are shown.

The *Packet View* window pane displays the frame selected in *Short View* in HEX or ASCII, HEX plus ASCII, Binary, or EBCDIC. If you select an individual protocol parameter in the *Frame View*, the corresponding values are highlighted in the *Packet View* matrix (refer to the Online Help for further details).

Monitor Status Bar. The status bar is located at the bottom edge of the display. It contains information about the selected frame, the evaluation of time differences, and the zoom function settings.

***NOTE**. Details on all menus, buttons, and functions can you find in the appropriate help topics.*

Changing the Data Display

To view the measurement results, you can make adjustments to the data display settings. The following sections describe, how you can change the following display settings:

- Configuring the column settings in *Short View* and *Frame View*
- Specifying display levels for protocol parameters in *Frame View*
- Defining a color code for individual protocols in *Frame View*
- Specifying font settings for all panes
- Changing the data representation in the *Packet View*

The protocol tester saves all settings listed above internally when you close the monitor. If you open the monitor again during a later session, or if you load another configuration during the same session, the monitor will default to the settings that were selected last. It might therefore be necessary to change them again.

Configuring Column Settings. To configure monitor columns, click *Column Setup Short View* or *Column Setup Frame View* on the *Monitor* menu. A *Column Configuration* dialog box for one of the views opens.

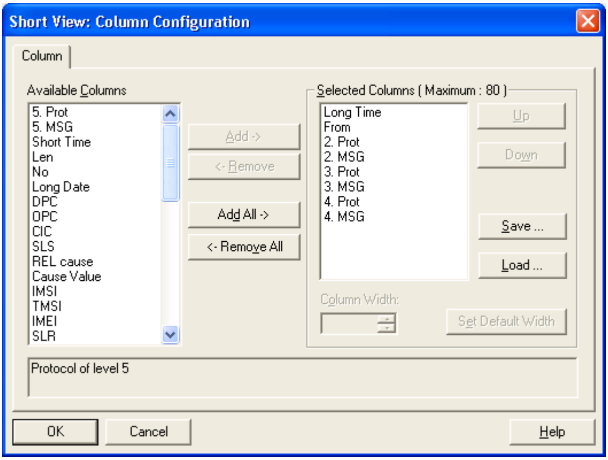


Figure 25: Column configuration for short view

In this dialog box you can add and remove columns. Using the *Up* and *Down* buttons, you can change the position of selected columns. Using the *Column Width* button, you can set the character width of the columns.

Column configuration files carry the extension **.mcc*. They are stored in the *\k15\config* directory.

Specifying Display Levels. In *Frame View*, you can select one of two different display levels for protocol parameters (complete or medium display).

To specify the display level, click *Monitor Setup –> Display Level* on the *Monitor* menu. The *Monitor Setup* dialog box opens. Click the *Display Leve*l tab in this dialog box.

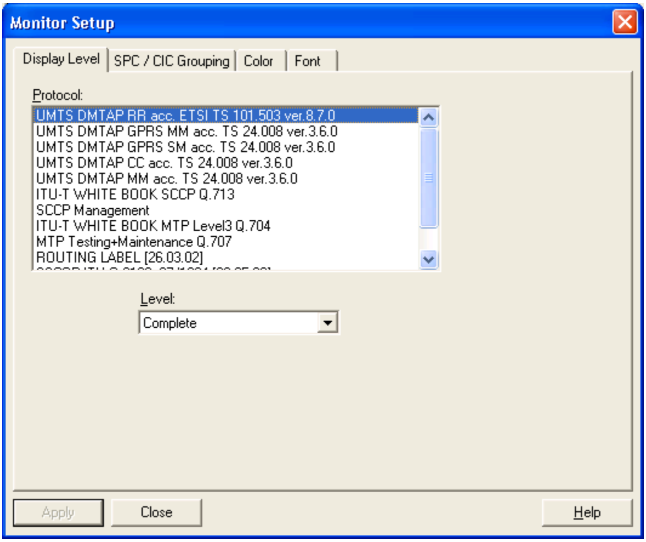


Figure 26: Display Level window

The protocol list box shows the protocols of all protocol stacks assigned to the source's logical links. In the *Level* list box you can select your desired setting.

NOTE*. The display level setting for a specific protocol is applied to all open* Monitor *windows.*

Defining Color-Coding Protocols. Protocols included in your measurement can be highlighted in color for improved differentiation. The color assignments apply to the *Frame View* display.

To define color-coding protocols, click *Monitor Setup –> Colors of Protocols* on the *Monitor* menu. The *Monitor Setup* dialog box opens. Click the *Color* tab in this dialog box.

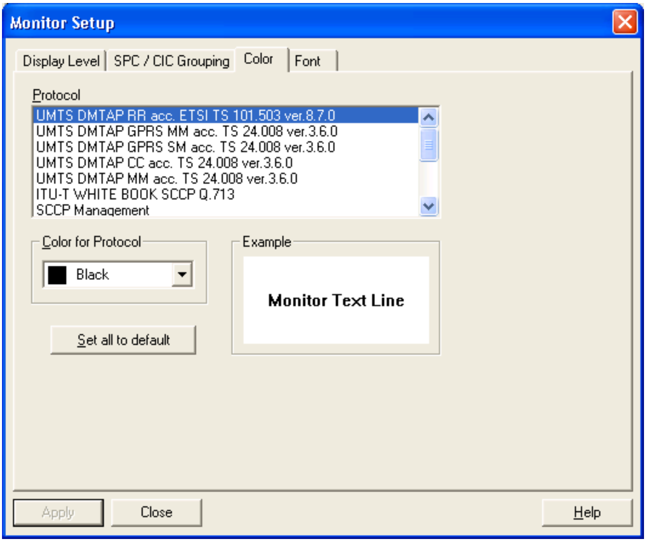


Figure 27: Monitor Setup dialog box, Color tab

If you have already defined colors for protocols in the *Protocol Stack Editor*, the *Monitor* will display the protocols in those colors; you can, however, change these settings as desired.

Adjustments to color settings are system-wide changes and will be applied to all protocol stacks containing this protocol.

Specifying Font Settings. Font settings are valid for all three monitor panes. Defaults are Fixedsys, Normal, 9pt. You can change the font used to display signaling data.

Change the font settings by clicking *Monitor Setup –> Font Setup* on the *Monitor* menu. The *Monitor Setup* dialog box opens. Click the *Font* tab in this dialog box and specify your desired font settings.

Changing Data Representation. The *Packet View* decodes the protocol parameters of the data frame selected in the *Short View*. If you mark an individual protocol parameter in *Frame View*, the associated values in the *Packet View* matrix are highlighted.

In the *Packet View;* data can be represented in HEX, ASCII, HEX + ASCII EBCDIC, or BIANRY format.

To change the data representation, click *Packet View Representation* on the *Monitor* menu and select the desired format.

Selecting Date and Time Formats

To the *Short View*, you can add columns with information regarding date or time by selecting *Columns Setup –> Short View* from the *Monitor* menu.

The corresponding system formats for date and time are used for long date, short date, long time and short time. These formats may be adapted in the Windows *Regional and Language Options* dialog box. To open this dialog box, click *Start –> Control Panel –> Regional and Language Options*.

***NOTE**. Tektronix does not recommend using self-defined date and time formats. Information regarding self-defined date and time formats can be taken from your operating system's documentation or Online Help.*

Copying Monitor Configurations

If you have opened several *Monitor* windows, you can easily copy the settings from one *Monitor* window to another. Press *Ctrl + M* in the *Monitor* window whose settings you want to copy and *Ctrl + Shift + M* in the *Monitor* window to which you want to apply the settings.

Reading Data as They Are Received (Live Mode)

You can view data simultaneously as they are received (LIVE). In the Live Mode, incoming frames are displayed immediately (live), and the screen scrolls automatically.

Live Mode is used for “passively monitoring” measurements. In *Short View*, a new line is inserted for each frame that passes the Capture RAM. This gives you a general impression of the signaling process over time. The system continuously updates the displays in *Frame View* and *Packet View* based on the signaling data transmission speed. In Live Mode there are two display modes: Ring Live and Linear Live.

You can change the way newly received data are displayed in Live Mode. In Ring Live Mode, new data overwrite the data that have already been displayed, and the new line scrolls across the screen from top to bottom, whereas in Linear Live Mode, the data already displayed scroll to the top. In Ring Live Mode, new data can be displayed very fast. This is particularly useful if the protocol tester is controlled remotely.

You can switch between modes in two ways:

- In the *Short View* or *Frame View* context menu call up the *Live Mode Presentation* menu item and select the *Ring Mode* or *Linear Mode* setting.
- In the *Monitor* toolbar click a *Ring Live Mode* button or a *Linear Live Mode* button to change the current mode.

Ring Live Mode Button

Linear Live Mode Button

Freezing the Display of Data (Freeze Mode)

You can freeze the display (FREEZE) for further data processing. In the Freeze Mode scrolling is performed manually with the cursors. Freeze mode suppresses the continuous display of new data allowing a more detailed analysis of frames.

In Freeze Mode, the continuous display of new data frames is suppressed (”frozen”), and you can select or search in the recorded data. Signaling data received while you work in Freeze Mode continues to be recorded in the Capture RAM.

***NOTE**. The* Recording Viewer *measurement scenario only supports Freeze Mode.*

You can switch between Live Mode and Freeze Mode in two ways:

- Select *Live Mode* or *Freeze Mode in* the *Short View* or *Frame View* context menu.
- Click the active button in the *Monitor* toolbar: *Live Mode* or *Freeze Mode*.

The new mode is displayed in the *Monitor* window title bar.

The data in each view is constantly updated. In *Live Mode* (indicated in the main window title bar), you can read the data as it is measured. This mode is set by default when you switch to the *Monitor* main window.

If you click on a view and scroll the contents using the arrow keys (↓ and ↑), the system automatically switches into Freeze Mode (indicated in the main window title bar). The continuous display of new data frames is then suppressed. In the background, measurement continues until the available storage is full. Then you receive the following error message:

Data is not available! Change to Live Mode (and back to Freeze Mode) in order to resynchronize Monitor Window and Capture RAM content.

Then click the *Live Mode* button to return to live mode.

Searching for Specific Data

You can carry out exact searches for specific messages or events in the received data. The search for specific data “filters” the data in the Capture RAM.

***NOTE**. Depending on your display filter configuration, the display of the data you search for may be suppressed even though they have been recorded. To avoid this conflict, run the search function only if you have not restricted the data display.*

To search for specific data, proceed as follows:

1. Stop the current measurement by clicking the *OFF* button in online pipelines or the *Stop* button in offline sources. Select a data frame.

2. To start a down search, press < CTRL > + < F3 > or select *Find –> Down* from the *Monitor* menu.
For an up search, press < CTRL > + < SHIFT > + < F3 > or select *Find –> Up* from the *Monitor* menu.

The *Filter Setup* dialog box opens. You can now specify your search criteria. This procedure is identical to defining a filter and is described in detail in chapter *Configuring Filters* on page 83. You can define several criteria for the search, for example, error events and messages.

3. After specifying your search criteria, close the dialog box with **OK**.

The *Monitor* now displays the first data frame that matches your search criteria. A message appears if no matching frames are found.

If you want to search for further data frames with this criterion, press the < F3 > key for a forward search or < SHIFT > + < F3 > for a backward search. These functions are also available via *Find Again* from the *Monitor* menu.

If you want to cancel a long search, click *Cancel* in the *Search Frame* in the *Capture RAM Status* dialog box.

***NOTE**. The search begins with the frame selected in Short View.*

Searching for Text

You can carry out exact searches for specific text frames in the Frame View as they are output, for example, by the applications. The search for specific text frames "filters" the data in the Capture RAM.

To search for text, proceed as follows:

1. Stop the current measurement by clicking the *OFF* button in online pipelines or the *Stop* button in offline sources. Select a data frame.
2. To start the search, press < CTRL > + < F7 >, or select *Monitor –> Find Text* from the *Monitor* menu. The *Search Text Setup* dialog box opens.

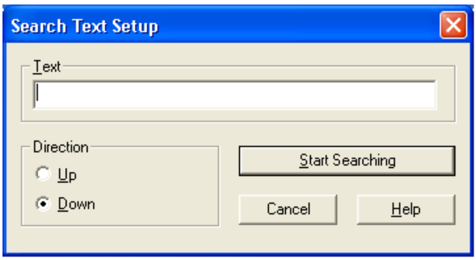


Figure 28: Search Text Setup dialog box

3. Enter the text you want to search for and change the search direction (Up, Down) if necessary. Capitalization is ignored during search.
4. Close the dialog box with *Start Searching*. The *Monitor* now displays the first text frame that matches your search string.

   If you want to search for further text frames with this search string, press the < F7 > key for a forward search or < SHIFT > + < F7 > for a backward search. These functions are also available via *Find Text Again* from the *Monitor* menu.

   If you want to cancel a long search, click *Cancel* in the *Search Frame* in *Capture RAM Status* dialog box.

Restricting the Display of Measured Data Using a Display Filter

The display filter allows you to filter the display of the received signaling data in the *Monitor*.

The display filter appears in the pipelines to the left of the Monitor processing element. If you have deactivated the pipeline bar, reactivate it or use the filter entry from the *Pipeline Elements* menu.

To configure the display filter, click on the *Filter* processing element. The *Filter Setup* dialog box opens. You can now specify your search criteria. This procedure is identical to defining a filter and is described in detail in chapter *Configuring Filters* on page 83. You can define several criteria for the search, for example, error events and messages.

Observe the following configuration notes:

***NOTE**. The filters allow you to adapt the recording and display criteria to your specific measurement scenario. The protocol tester software does not check your filter criteria specifications. It is therefore possible to define mutually exclusive filter criteria.*

Once you have configured the display filter, the name of the Filter *processing element is displayed in bold type.*

The display configuration might impair the search function. When searching in the recorded data, data frames that have been filtered out will not be shown. Check the display filter settings and change them if required before searching in the recorded data.

Call up Protocol Information Regarding the Displayed Data

You can call up protocol information concerning the displayed data:

The Protocol Stack Editor gives you an overview of the protocols contained in the currently loaded stack.

The Protocol Help contains detailed information on the messages and parameters of individual protocols.

Calling up the Protocol Stack Editor. To call up the Protocol Stack Editor, proceed as follows:

1. Switch to the Freeze Mode.
2. Position the cursor on a data frame in Short View or Frame View.
3. Press < F5 > or select *Open Protocol Stack from Event* from the *Monitor* menu.

   The *Protocol Stack Editor* opens and displays the allocated stack.

NOTE*. If necessary, you can change the stack in the Protocol Stack Editor (see page 112). The changes will become valid for the current measurement when you restart the pipeline.*

Calling up the Protocol Help. To call up the Protocol Help, proceed as follows:

1. Switch to the Freeze Mode.
2. Place the cursor in the *Short View* or *Frame View* on the protocol or message for which you require information.
3. Press < F2 > or select the *Protocol Help* menu item from the context menu.

   The Protocol Help opens and displays the information regarding the protocol or the message.

Zooming to the Data Frames of Individual Connections

Using the zoom function, you can display all messages for a single connection.

To enable the zoom function, proceed as follows:

1. Switch to Freeze Mode.
2. In *Short View*, select a message that you want to investigate.
3. To enable the zoom function, click the **Zoom** button in the toolbar. The *Zoom* dialog box opens.

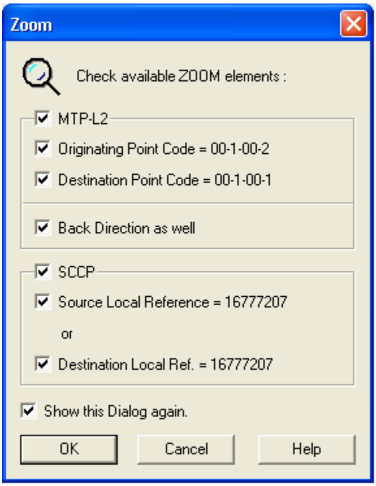


Figure 29: Zoom dialog box

Use this dialog box to set zoom parameters. The available configuration options depend on the protocol level assigned to the frame highlighted in *Short View*.

The buttons in the monitor window titlebar indicate whether the zoom function is active. In active state, the following buttons are highlighted:

A summary of the zoom condition is displayed in the status bar.

NOTE*. As long as the zoom function is active, the display filter is automatically deactivated (bypass mode), to ensure that an unfavorably configured display filter does not negatively affect the zooming of messages.*

When deactivating the zoom function, the display filter is reset to its original state.

The zoom function and display filter cannot simultaneously be activated. If you try to configure the display filter while the zoom function is activated, a warning note will be displayed. Then, you can either deactivate the zoom function or, alternatively, leave the display filter in the bypass mode.

Evaluating Time Differences Between Messages

The protocol tester assigns a time stamp to each event received, indicating the time of reception. To evaluate the difference between single events, the following preconditions must be fulfilled:

- The *Short View* is shown.
- The Freeze Mode is set.

To display differences by using the keyboard, proceed as follows:

1. Press < CTRL > + < TAB > (several times if required) to switch to *Short View*.
2. With the < UP ARROW > and < DOWN ARROW > keys scroll to the event that will serve as the starting point of the difference calculation.
3. Press < F9 > or select *Reference for Timestamp –> Timestamp Format* from the *Monitor* menu.

   The selected event is highlighted and a break icon is placed before the line. The status bar displays the number of the reference frame.
4. Scroll up or down in the recorded data using the cursor keys until you reach the event that will serve as the end point of the calculation.
5. Read the time difference in the status bar.

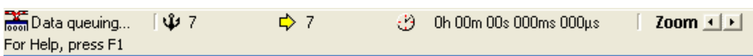


Figure 30: Monitor status bar

The clock symbol displays a negative time difference if the reference event was received later than the last selected event. The arrow symbol pointing to a number displays the number of the last selected frame.

***NOTE**. If you select a frame block, the time difference between the first and the last frame of this block is displayed. The reference time is set automatically.*

To display differences by using the mouse, proceed as follows:

1. Press the < ALT > key and keep it pressed.

2. In the *Short View* click on the event that will serve as the starting point for the difference calculation.

The selected event is highlighted.

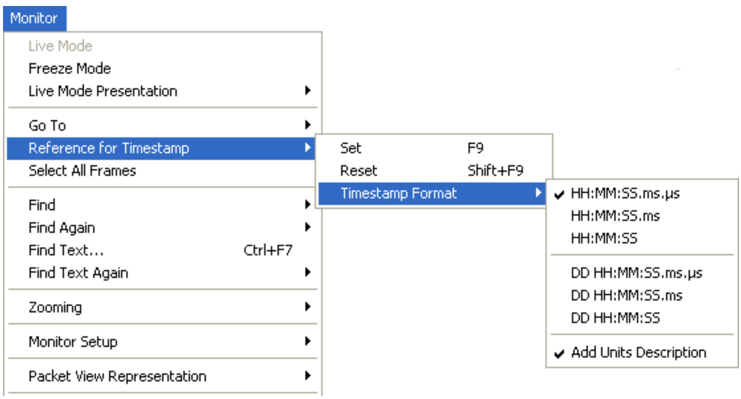
3. Search the recorded data for the event that will represent the ending point of the calculation. Select this event using the left mouse button.

4. Read the time difference in the status bar (see figure 30).

To deactivate the reference selection, press < Shift > + < F9 > or select *Reference for Timestamp –> Reset* from the *Monitor* menu.

The default format is *hh : mm : ss . ms . µs*. You can choose a different time format as follows:

1. Select the menu item *Reference for Timestamp –> Timestamp Format* from the *Monitor* menu.



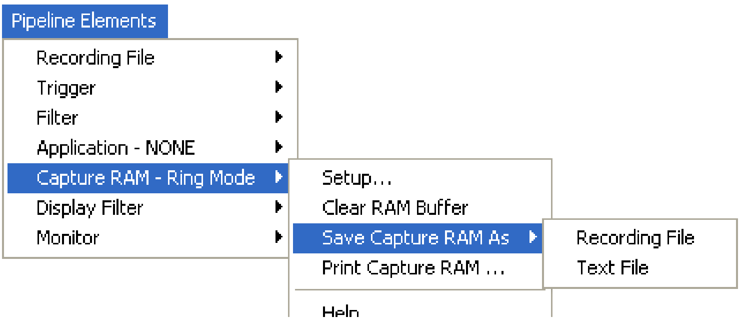
2. Select the desired time format. The *Add units description* option additionally shows the units in the status bar.

Editing Capture RAM Data

During the evaluation of measurement data in the monitor, you can print or delete the contents of the Capture RAM or save them in a file.

Saving Capture RAM Data. To save Capture RAM data, proceed as follows:

1. Select *Capture RAM – Ring Mode –> Save Capture RAM As...* from the *Pipeline Elements* menu. Select either *Recording file* or *Text file*.



Either the standard directory for Capture RAM files \k15\rec or the directory that was last used for Capture RAM files opens.

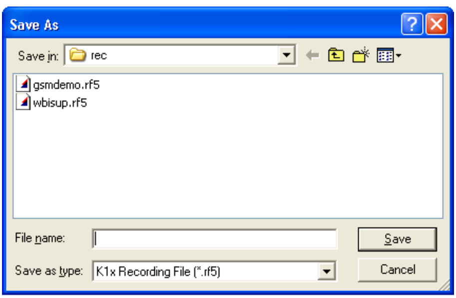


Figure 31: Save As dialog box

2. Enter a file name and confirm with **Save**.

3. Determine whether you want to save the data in short form (*Short View*) or together with all the parameters (*Frame View*). If required, you can save the *Packet View* values with the data (Append Packet View).
4. Confirm with **OK**.

Printing Capture RAM Data. To print Capture RAM data, proceed as follows:

1. Select *Capture RAM – Ring Mode –> Print Capture RAM...* from the *Pipeline Elements* menu.

   The *Print* dialog box opens.

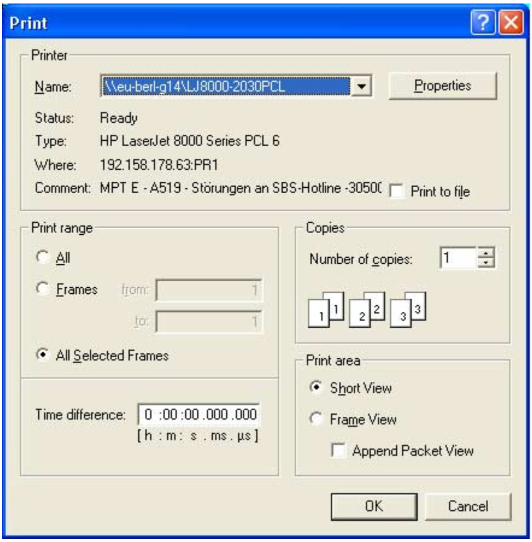


Figure 32: Print dialog box

2. Specify whether you want to print the data displayed in *Short View* or in *Frame View*. As an option, you can also add the *Packet View* values to the printout (Append Packed View).
3. Confirm with **OK** to start the printout.

Deleting Capture RAM Data. You can delete the Capture RAM if you have continuously restricted the parameters during the running measurement, for example by repeatedly configuring the input filter. Deleting the Capture RAM updates the *Monitor* display to show only data corresponding to the current settings.

To delete data from the Capture RAM, proceed as follows:

1. Select *Capture RAM –> Clear RAM Buffer* from the *Pipeline Elements* menu.

   A TekMain Query pops up asking you if you really want to delete data from Capture RAM.

2. Confirm the query. The data are deleted from the Capture RAM.

   The monitor only displays the currently received signaling data.

Automatic Deletion. In the following situations, the contents of the Capture RAM are deleted automatically:

- If you change the Capture RAM settings during the current measurement
- If you open a new recording file or if you stop the file playback and restart it
- If you delete a logical link from the online data source

NOTE. *If you have selected Ring Mode in the* Capture RAM *dialog box, the system may overwrite data that have already been received or played back while you are working in Freeze Mode. If you jump to one of these "old" data frames, an error message appears. To synchronize the display, switch to Live Mode and then back to Freeze Mode.*

Saving Message Blocks

The *Monitor* features the option to save selected parts of the recorded data (message blocks) in a new recording file. This function applies only to data / frames currently displayed on the screen. Frames in the recorded data are not displayed because the configuration of the display filter will not be saved. The Display Level set in the *Frame View*, however, is saved.

***NOTE**. If you have set the Capture RAM to Ring Mode, some of the selected frames may not be saved because they have already been overwritten prior to storing. To make sure that all selected frames can be saved, stop the monitoring, select the desired frames, and then save them.*

To save frames, proceed as follows:

1. From the *Monitor* menu, select *Save marked Frames As... Recording File* or *Text File*.

   The *Save As* dialog box opens, displaying the *\k15\rec* directory or the directory that was last used to save frames (see figure 31).

2. Enter a name in the *File name* field.
3. Confirm your entries with **Save**.

   If you enter the name of an existing file, a prompt appears. Confirm this prompt with **Yes** if you want to overwrite the existing file.

4. Determine whether you want to save the data in short form (*Short View*) or together with all the parameters (*Frame View*). If required, you can save the *Packet View* values with the data (Append Packet View).
5. Confirm with **OK**.

Printing Selected Data

The *Monitor* allows you to print selected parts of the recorded data (message blocks). Only those data / frames currently visible on the screen will be printed. Frames in the recorded data that are not displayed due to an active display filter are suppressed in the printout. The printout is created in accordance with the Display Level set in the *Frame View*.

***NOTE**. To make sure that all selected frames can be printed, stop the monitoring, select the desired frames, and then print them.*

To print frames, proceed as follows:

1. Select *Print marked Frames...* from the *Monitor* menu, or press < CTRL > + < P >.

The *Print* dialog box opens (see figure 32).

2. Define the *Print range*.

3. Specify whether you want the data printed in short form (*Short View*) or including all parameters (*Frame View*) in the *Print area*. You can also add the *Packet View* values to the printout (Append Packet View).

4. If you select *Print to file*, you can write the data to a file for printing at a later time. In this case, the *Print to File* dialog box opens, displaying the *k15\rec* directory. Enter a binary file extension (**.prn*).

5. To continue the current measurement, click in the *Monitor* toolbar.

***NOTE**. If you experience any problems with printing, check the printer configuration and installation. For more information, refer to the Windows cue cards for problems with the printer.*

Copying into the Clipboard

You can copy a selected segment from the *Short View* or the *Frame View* into the clipboard.

1. Select the data in the *Short View* or the *Frame View*.

2. Press < CTRL > + < C > or select the menu item *Copy Lines to Clipboard* from the *Edit* menu.

The selected frames are now inserted into the clipboard.

NOTE. *If you have set the Capture RAM to Ring Mode, some of the selected frames may not be exported to the clipboard because they have already been overwritten prior to storing. To make sure that all selected frames can be exported, stop the monitoring, select the desired frames and then export them.*

Tips on Displaying Measurement Data

Saving or Printing Online. During a measurement you can print selected frames or save them in a file. If you have selected Ring Mode in the *Capture RAM* dialog box, currently received data might be lost because no new measurement data is assigned to the Capture RAM's memory area used by these processes.

Data Errors. Errors at the receiver interfaces (layer 1 errors) are displayed in plain text in the *Monitor Frame View*; data errors and decoding errors are displayed in red by default in the *Monitor Short View*. Decoding errors may indicate protocol violations of the monitored systems. They can also be the result of using inappropriate protocol stacks. For more information, refer to the notes on the display of layer 1 errors with online measurements.

Receiver Overrun. If during an online measurement the system receives more data frames than it can process, you will receive an error message. The loss of one or more frames is displayed in *Frame View* before the last frame which was completely received. Possible reasons are:

- A short-term overload in the measuring hardware. If the measurement is running smoothly otherwise and the lost frames are not important, no action is required.
- Too many logical links have been configured. In this case, re-configure the source.

***NOTE**. The system records the loss of frames in a recording file and displays a message in the Offline Monitor as text.*

Working with Frames

The data displayed on the *Monitor* may be saved, copied and printed. In order to do this, select the displayed data (or segments thereof). The following sections describe how to navigate and select data in the recorded data.

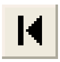
Selecting Frames in the Short View

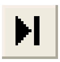
Press < CTRL > + < TAB > (several times, if required) to activate *Short View*. You can select frames in the monitor in *Short View* as follows:

Selecting the First Frame. To select the first frame in the recorded data, select *Go to First available frame* from the *Monitor* main menu.

Selecting the Last Frame. To select the last frame in the recorded data, select *Go to last available frame* from the *Monitor* main menu.

Selecting Any Frame. To select any individual frame, scroll using the < UP ARROW > key or < DOWN ARROW > key or click the following buttons in the *Monitor* toolbar:


First Available Frame


Last Available Frame

Selecting a Frame Block (Using the Keyboard). To select a block of frames, press one of the following key combinations:

1. Press < CTRL > + < TAB > (several times if required) to activate Short View.

2. Press and hold the < SHIFT > key

   a. Select the frames line by line using the < UP ARROW > and < DOWN ARROW > keys.

   b. Select a larger block using the < PAGE UP > and < PAGE DOWN > keys.

   c. Press the < HOME > key to select all frames from the current position to the first frame in the Capture RAM.

   d. Press the < END > key to select all frames from the current position to the last frame in the Capture RAM.

Selecting a Frame Block (Using the Mouse). To select a block of frames using the mouse:

1. Click the desired frame using the left mouse button and hold the left mouse button.

2. Drag the mouse in the desired direction (up or down in the recorded data) until the desired block is selected.

3. Release the left mouse button.

Selecting a Number of Frames (Using the Keyboard). To select a number of frames that are not in a block:

1. Select a frame or frame block as described above.
2. Press and hold the < CTRL > key.
3. Using the < ARROW UP >, < ARROW DOWN >, < PAGE UP >, < PAGE DOWN >, < HOME > or < END > keys, move the selection to the desired frame.
4. Select the frame with the < SPACEBAR >.
5. Select any further frames you want to include.
6. Release the < CTRL > key.

Selecting a Number of Frames (Using the Mouse). To select a number of frames that are not in a block:

1. Select a frame or frame block as described above.
2. Press and hold the < CTRL > key.
3. Select another frame by clicking the desired frame with the left mouse button.
4. Select any further frames you want to include.
5. Release the < CTRL > key.

Selecting All Frames in the Short View. To select all frames in Short View, click *Select All Frames* on the Short View or the Frame View context menu.

Selecting Frames in the Frame View

Selecting Individual Parameters Using the Keyboard. Press < CTRL > + < TAB > (several times if required) to activate *Frame View*.

1. To select the first parameter of the current message, press < HOME >.
2. To select the last parameter of the current message, press < END >.
3. To select any message parameter, scroll up or down using the < UP ARROW >, < DOWN ARROW >, < PAGE UP>, or < PAGE DOWN> key.

Selecting Individual Parameters Using the Mouse. To select a message parameter in *Frame View*, click it with the left mouse button.

Selecting the Parameter Block Using the Keyboard. To select a block of message parameters, press one of the following key combinations:

1. Press < CTRL > + < TAB > (several times if required) to activate *Frame View*.

2. Press and hold the < SHIFT > key.

  a. Select message parameters line by line using the < UP ARROW > and < DOWN ARROW > keys.

  b. Select a larger section using < PAGE UP> and < PAGE DOWN >.

  c. Press < HOME > to select all message parameters from the current position to the first message parameter of this frame.

  d. Press < END > to select all message parameters from the current position to the last message parameter of this frame.

Selecting the Parameter Block Using the Mouse. To select a block of parameters using the mouse:

1. Click the desired frame with the left mouse button.

2. Hold the left mouse button.

3. Drag the mouse in the desired direction (up or down in the recorded data) until the desired block is selected.

4. Release the left mouse button.

Selecting Frames According to Number or Point of Time

To select a frame according to the serial number or the time:

1. Select *Go To... –> Frame Index or Timestamp* from the *Monitor* menu. The *Go To* dialog opens.

To enter the serial number, select *Frame Index* and enter the number. The valid range of numbers is given.

To enter the time, select *Timestamp* and enter the time. This searches for the frame whose time stamp is closest to the specified time.

2. Click **OK**.

Selecting Identical Parameters

When the Frame View is active you can navigate directly in the *Short View*. This way you can easily view the same parameter of different messages:

1. Select the desired parameter in the frame and press < CTRL >.

2. Navigate with < UP ARROW >, < DOWN ARROW >, < PAGE UP >, < PAGE DOWN>, < HOME > or < END >.

The cursor now jumps to the same position in the corresponding message. If this message does not contain the same parameter at this position, the cursor jumps to the preceding or following line.

Scrolling Horizontally

You can move the display horizontally if the data displayed side by side do not fit into the *Monitor* pane (*Short View* or *Frame View*).

To scroll horizontally, use the < UP ARROW > or < DOWN ARROW > key or use the mouse to move the scroll bar underneath the respective display.

Deactivating the Selection

To deactivate your selection, click anywhere in Short View or in Frame View with the left mouse button or Press < UP ARROW > or < DOWN ARROW >.

Configuring Filters

Filters help you reduce the amount of data being evaluated. The K15 uses filter criteria to determine whether data frames, or the messages they transport, are admitted for further analysis. Filters can be used to:

- Reduce the amount of data saved in the Capture RAM
- Select messages for the monitor's search function
- Specify which messages are to be analyzed in an application
- Assign the messages counted by the Statistics application counters

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NOTE. *You can only configure filters after configuring the online source or loading a recording file. If the pipeline contains an Offline Recording branch, additionally you have to configure a file as data sink.*

Data frames or the messages they transport must meet the following requirements in order to pass a filter for further analysis:

- They must originate from a source selected in the *Logical Links* tab.
- They must fulfill the criteria of at least one of the following tabs: *Protocols, Binary, Error Event* or *Frame Type*.
- They must correspond to the settings in the *Timestamp / Length* tab.

To configure a filter, proceed as follows:

1. Click the *Filter* processing element. The *Filter Setup* dialog box opens.

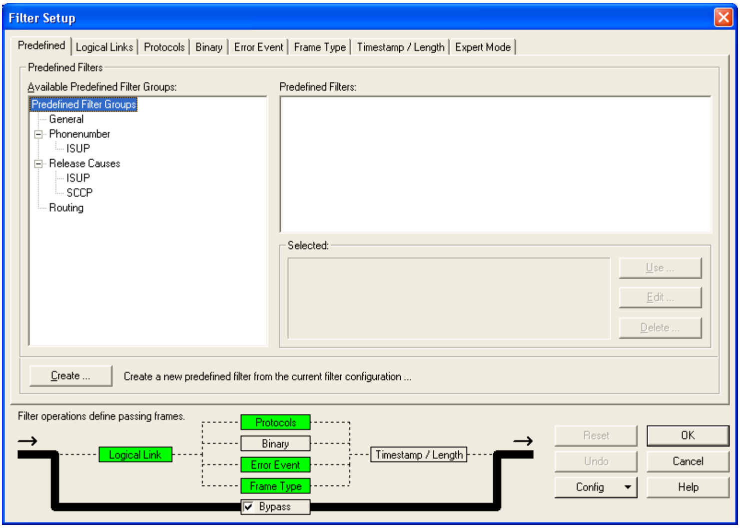

Figure 33: Filter Setup dialog box for Filters

2. Specify filter criteria by setting subfilters in this dialog box (see *Setting Subfilters* on page 85).

   The lower part of the *Filter Setup* dialog box shows a filter overview that illustrates the relationships between the various tab settings. Once you have specified criteria for a subfilter, it is displayed in a different color in the filter overview and the line widths illustrating the data flow are adjusted accordingly.

3. Confirm with **OK**.

Setting Subfilters

Each subfilter corresponds to one of the tabs displayed in the upper part of the *Filter Setup* dialog box (see figure 33). These tabs provide access to the subfilters that combine to make up a filter.

Predefined Tab. In the *Predefined* tab of the *Filter Setup* dialog box you can save filter configurations as predefined filters and activate them quickly when required.

In contrast to filter files, in which you save entire filter configurations, you can use predefined filters to save frequently required filter settings and to supplement them with further settings for a current measurement.

Another major difference between predefined filters and filter files is that the templates are protocol stack-independent. Under some circumstances, a predefined filter that was created with a specific protocol stack might not work with the currently used protocol stack. This will be the case if one of the protocols used in both protocol stacks bears different names.

You can:

- Save a filter configuration as a predefined filter
- Load and edit an existing predefined filter
- Delete existing predefined filters

The standard directory for predefined filters is *\k15\config*. Predefined filters have the file extension **.ftm*.

NOTE. *When a predefined filter is loaded, individual links (*Logical Links *tab) are switched on and off automatically only if the configuration of each logical link corresponds to the configuration saved in the predefined filter. You can search for differences in the* Logical Link Setup *dialog box.*

Logical Links Tab. In the *Logical Links* tab you can specify the source for the frames allowed to pass the filter. You need to select at least one of the available sources in order for the subfilter to admit frames for further analysis.

Protocols Tab. In the *Protocols* tab, you can define filter criteria for protocols as well as their messages and parameters. This applies to all received data frames decoded by the protocol tester. You can select the subfilter's criteria from four lists which successively allow for more detailed settings. By selecting an entry from a list, the selection possibilities of the respective next lists are changed.

Binary Tab. In the *Binary* tab you can define pattern matches that act as filter criteria for selecting frames. Only frames matching the specified patterns are admitted.

Error Events Tab. In the *Error Event* tab you can restrict the quantity of status and error messages to level 1 or level 2.

Decoding Errors: You can set whether or not decoding errors are to be displayed in the monitor. Decoding errors are output when data frames cannot be correctly decoded with the assigned protocol stacks. The *Decoding Errors* option is only available for the Display Filter.

- *Only correct decoded frames*: This option suppresses the output of decoding errors.
- *Only frames with decoding errors*: This option only allows the output of decoding errors and not of data frames.

Frame Type Tab. The *Frame Type* tab allows you to specify which frame types you want to permit for further processing. Use this subfilter to exclude application outputs, transparent data frames or protocol data frames from further processing.

Available Frame Types:

- *Text Frames* are text messages generated by the applications or the protocol tester's system software and inserted into the data flow.
- *Protocol Frames* are usually decoded by the protocol tester and can be selected as filter conditions in the *Protocols* tab. The data sources of this frame type are all logical links you specified in the *Logical Link Setup* dialog box.

  This option corresponds to the Bypass Protocol Filter option of the Protocols subfilter.
- Transparent Data Frames are not decoded by the protocol tester. The sources of this frame type are all logical links for which you specified Transparent as the level 2 method.

***NOTE**. The* Protocol Frames *option supercedes corresponding settings that you have made in the* Protocols *tab. If, for example, you have only admitted selected messages and parameters for further processing in* Protocols, *and then in the* Frames *tab, you activate the* Protocol Data Frames *option, then all protocol frames can pass the filter. If you have configured the Protocols subfilter, you should not activate this frame type.*

Timestamp / Length Tab. The *Timestamp / Length* tab is used to specify protocol-independent filter criteria. Once one of these subfilters is active, only frames or messages that fulfill its criteria are admitted.

The *Timestamp* Filter allows you to specify a time period during which data are admitted for further analysis.

The *Length* Filter allows you to select all transmitted frames with a certain data length.

Expert Mode Tab. You can define individual filters in the *Expert Mode* tab of the *Filter Setup* dialog box. The expert mode is an alternative to the other subfilters. You can configure a filter either with the subfilters or in the expert mode.

NOTE. *The expert mode should only be used by people who have a sound knowledge of protocols and experience in the formulation of expressions in programming languages.*

If you configure a filter with the help of subfilters, the expert mode "protocols" your settings in the background. Using this protocol, you can check the subfilter and then individually change it in the expert mode.

NOTE. *Once* Expert Mode *is enabled by clicking the* Enable user defined configuration *box, all other filter pages are deactivated. To reactivate those pages, press* **Reset**. *This operation discards all unsaved configuration settings.*

For further details...

You will find a full description of all filter criteria in the *Filter* book in the Online Help.

Saving Filter Settings

You can save your current filter settings in filter files and reload them later. This makes it easy to instantly restore a given filter configuration or apply it to another measurement.

To save your filter settings, select the *Save Filter Configuration As...* command from the context menu of the *Filter* processing element.

A bold type label on the processing element indicates that you have specified filter criteria.

Loading Filter Files

Filter configurations can be permanently saved in filter files and read in from these files.

1. Select *Load Filter Configuration...* from the context menu of the *Filter* processing element. The standard directory for filter files *\k15\config* or the last-used directory for filter files opens.
2. Select the desired filter file (file type **.flt*) in *\k15\config* directory. If you have saved the file in a different directory, change directories as required.
3. Confirm your selection with **Open**. The selected filter file is loaded and the filter is configured. Please note that this action overwrites all current filter settings.

NOTE. *When the protocol tester loads filter settings from a file, individual links will only be switched on or off in the* Logical Links *tab if the configuration of the currently used logical links agrees with the link configuration saved in the filter file. In the* Protocols *tab, settings are only made for those protocols that are contained in the currently loaded protocol stacks. In the event of non-agreement, you will receive a corresponding message. You should then check the current link configuration in the* Logical Link Setup *dialog box.*

Bypassing Filter Settings

To deactivate a filter temporarily, click the *Bypass* check box in the lower part of the *Filter Setup* dialog box.

The filter configuration remains unchanged and can be reactivated easily.

As long as a filter is bypassed, all frames and messages are allowed to pass. The filter element of the corresponding pipeline branch indicates that the “bypass mode” was activated.

NOTE*. If you change filter settings, the “bypass mode” will be automatically deactivated.*

Copying Filter Configurations

You can apply the settings of one filter to another filter. To copy filter configurations, proceed as follows:

1. Select *Copy Filter Configuration* from the context menu of the processing element Filter you want to copy.
2. Select *Paste Filter Configuration* from the context menu of a second processing element Filter.

Copying filters is subject to the same protocol restrictions as loading a filter file.

Saving Predefined Filters

In order to save a new predefined filter, you first need to configure the filter with the required settings. To save predefined filters, proceed as follows:

- Go to the *Predefined* tab and click **Create**. The *Predefined Filter Properties* dialog box is displayed.
- Enter a *Name* and a clear text *Description* for the new predefined filter.
- If required, select the *Group*, and *Sub-Group* (protocol stack) to which the predefined filter is to be assigned. If required, you can also create a new group / sub-group, by entering its name in the *Group* and *Sub-group* fields. You can, for example, use groups for a topic-specific sorting of the predefined filters and sub-groups, or for a sorting according to protocol stacks.
- Select *Overview* to control the settings of the *Protocols* subfilter. If required, edit parameter values in the *Protocols Filter Overview* dialog box.

Variables in Predefined Filters. In the *Checked Predefined Filter items are variables* area, the predefined filter variables are displayed with their standard values. Active variables are marked with a question mark in the list. When loading the predefined filter, you can individually change the values of the variables. Protocol variables additionally enable you to change the logical operation of the respective protocol parameter.

NOTE. *It is not possible to overwrite an existing predefined filter, and an error message will advise you of this. If you enter the name of an existing predefined filter, a new one will be created automatically.*

All filter settings are also saved when saving the configuration files (*.s).

You can save current filter settings in filter files and load them again later.

Loading Predefined Filters

The list will only display predefined filters that belong to the currently selected protocol stacks. To load predefined filters, proceed as follows:

1. Select a group/sub-group from the *Available Predefined Filter Groups* list and one of the predefined filters displayed in the *Predefined Filters* list. The *Selected* field will show the description of the selected predefined filter application.
2. Select the command **Use...** The predefined filter settings are activated. If the selected predefined filter contains active variables, the *Properties* dialog box for each variable is opened automatically.
3. Set the desired parameter value in that dialog box.

NOTE. *If a scenario is based on several protocol stacks using the same protocol, the* Edit Parameter Value(s) *dialog box will be opened for each protocol stack. Set the variable value for each separate protocol stack.*

Dependencies Between Predefined Filters and Protocol Stacks. If, when you are loading the predefined filter, the warning *Some of the Protocol Filter settings couldn't be loaded...* is displayed, the predefined filter does not match the loaded protocol stack. This means that at least one protocol variable of the predefined filter was not found in the current stack configuration.

To correct the error, use protocol stacks for which the predefined filter is intended or create a new predefined filter for the currently used protocol stacks. You can also load the protocol stacks that match the predefined filter, check the predefined filter's settings and then create a new predefined filter with the desired protocol stacks.

Concluding the Filter Settings. After loading the desired predefined filter, you can define further filter criteria by going to the appropriate tab in the filter dialog box, or conclude the settings by closing the *Filter* dialog box with **OK**.

Resetting Filter Configurations

You can reset all the settings of a filter. The filter then lets all frames and messages pass through. If this standard configuration is activated, the *Filter* processing element is represented in normal typeface.

1. Select *Reset Filter Configuration,* from the context menu of the *Filter* processing element.

   A query appears.

2. Confirm this query to reset the filter.

You can configure filters in the *Filter Setup* dialog box, which you can open via the *Filter* processing element.

Deleting Predefined Filters

A predefined filter can be deleted if it is no longer needed.

NOTE*. A group or sub-group will be deleted automatically from the predefined filter directory if you remove the last or only predefined filter from this group or sub-group.*

Filter Files

A filter's configuration is automatically saved in its respective configuration file (**.s*). However, you can also separately save filter configurations in filter files and reread the desired filter file into a filter as required. The default directory for filter files is *\k15\config*, and the extension for filter files is **.flt*.

The protocol tester saves the following general filter settings in filter files and restores them when a filter file is loaded:

- Status of the links in the *Logical Links* tab
- Comparison pattern and status of the *Binary* tab
- Settings in the *Error Event* and *Frame Type* tabs
- Time and length settings in the *Timestamp/Length* tab
- Status of the *Bypass* switch

The protocol tester saves the following protocol specific filter settings in filter files and restores them when a filter file is loaded:

- Names of the protocol stacks used
- Status of switches in the *Protocols* and *Messages of...* lists
- Operations and comparison values of the *Parameters of...* list
- *Parameter Grouping* settings

NOTE*. All protocol-specific settings depend on the protocol stack selected in each case.*

Additionally, the filter file contains the syntax of all filters configured in Expert Mode.

It is also possible to save filter configurations as Predefined Filters. Using these predefined filters as a basis, you can in turn generate filter files.

Configuring Triggers

Using a trigger you can start an action during a measurement when a certain state or event occurs. You can control measurement processes such as the receipt of a specific message. A trigger action, for example, is the termination of a file recording.

The settings of a trigger always refer to the data source (source or recording file) of the respective pipeline. Depending on the trigger definition, the trigger conditions apply to the entire pipeline or to individual branches.

A trigger condition defines the event that is supposed to trigger one or more actions.

You can save the configuration after you have set or changed trigger settings. By so doing, you can also use these trigger settings for future measurements. The trigger settings are saved in the configuration file (*.s).

A trigger cannot be configured unless the data source (source or recording file) has been configured.

To configure triggers, proceed as follows:

1. Click the *Trigger* processing element. The *Trigger Configuration* dialog box opens. In this dialog box trigger conditions and trigger actions can be created, edited, deleted and renamed.

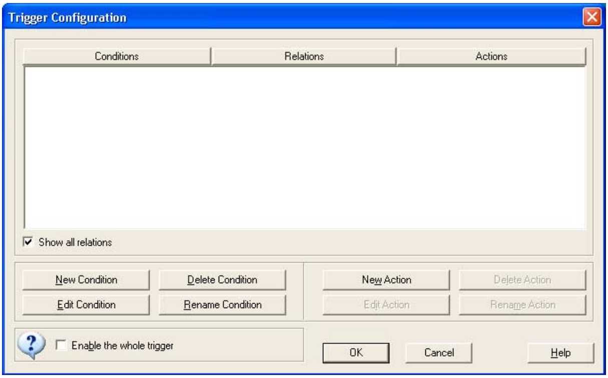

Figure 34: Trigger Configuration dialog box

2. Create a new trigger condition or select an existing condition for editing. The *Filter Setup* dialog box opens. In this dialog you can define the desired trigger conditions (see *Defining Trigger Conditions* on page 97).

3. Create a new trigger action or select an existing action for editing (see section *Defining Trigger Actions* on page 99).

4. Link a trigger condition with one or more actions clicking the *New Action* command button (see *Linking Trigger Conditions with Trigger Actions* on page 107).

Defining Trigger Conditions

You can define trigger conditions in the *Filter Setup* dialog box.

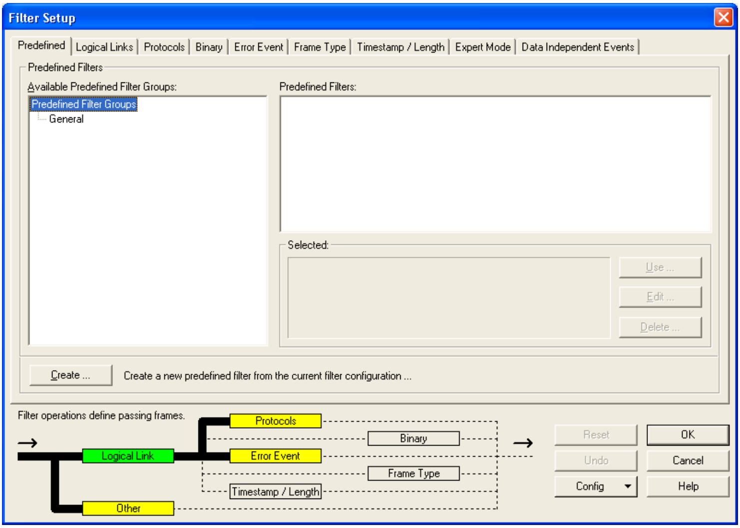

Figure 35: Filter Setup dialog box for Triggers

This dialog box has several tabs that correspond to subfilters. Except for the *Data Independent Events* tab, these subfilters correspond to the subfilters in the *Filter Setup* dialog box for Filters (see figure 33).

With the subfilters, you can define the properties of data frames that are to count as trigger conditions. You can define the properties of data frames on the basis of criteria such as protocol parameters or time stamps.

The subfilters are explained in chapter *Setting Subfilters* on page 85.

Trigger Condition: Data Independent Events. In addition to the tabs of the *Filter Setup* dialog box, the *Data Independent Events* tab allows you to define system states as trigger conditions. System states are contingent upon the contents of the data frames received. The trigger recognizes the following states: *Recording file full, Capture RAM full,* and *Time* (Point in time reached or period over). Select an option:

- *Recording File Full* if the trigger should be activated as soon as a recording file is full. This trigger condition will not be applied unless you have configured the *Write Recording File* processing element. If you create a series of recording files, the trigger is activated as soon as the first file of the series is full.
- *Capture RAM Full* if the trigger should be activated as soon as the Capture RAM is full. Note that some actions automatically delete the Capture RAM data. For this trigger condition, the Capture RAM should be configured in the *Linear Mode* (see page 27).
- *Time* if the trigger should be activated at an absolute or relative point in time, either once or repeatedly. Time triggers can be activated at a specific point in time, at regular intervals, or within a preset time period.

NOTE*. To avoid unnecessary usage of the system's capacity, you should include no more than three active conditions in the measurement. The more complex these conditions are, the more system resources are required for the trigger function, thus leaving less resources for other measurement functions.*

During the measurement, you can check the system capacity usage with the Load Meter *program (see page 231).*

Defining Trigger Actions

The current trigger actions are displayed in the right column of the *Trigger Configuration* dialog box. Trigger actions can be newly created, edited, deleted and renamed in this dialog box.

The protocol tester is delivered with a set of trigger actions:

Trigger Action: Clear Capture RAM. Clears the Capture RAM. With this trigger action you can clear the Capture RAM, for example, at a predefined point in time or as soon as the Capture RAM is full.

If you have selected this trigger action, the *Select Pipeline Element... dialog box* opens. It displays the pipeline with the configured branches.

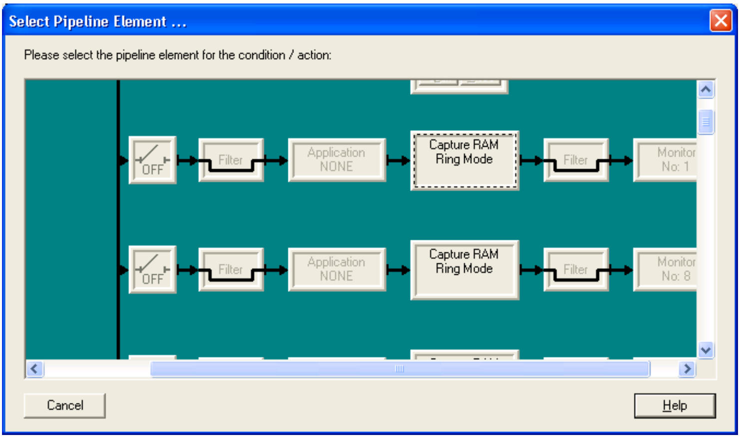

Figure 36: Select Capture RAM for trigger

To set this trigger action, click the desired *Capture RAM* processing element. The *Select Pipeline Element...* dialog box closes. The trigger action is set.

Trigger Action: Display Message Box. Displays a message / query. This trigger action displays a user-defined message / query during the current measurement.

The configuration of the trigger condition determines how many message boxes are displayed. If you link this action with a condition that is very frequent, the number of screen messages can become confusing. You should therefore link this action only with conditions that are rarely fulfilled.

If you have selected this trigger action, the *Display Message Action* dialog box opens. To set the trigger action:

1. In the *Title* text field, enter a title for the window displayed.
2. Enter the message text in the *Text* field.
3. Select an appropriate message icon in *Options*.
4. Confirm with **OK**.

Trigger Action: Execute Command. Executes a program. This trigger action executes a program as soon as the event has occurred.

If you have selected this trigger action, the *Execute Action* dialog box opens. To set the trigger action, proceed as follows:

1. In the *Program* text field, enter the desired execute file (for example, **.exe, *com, *.cmd, *.bat*). Use the ... button to search the file system.
2. In the *Arguments* text field, you can enter any additional information for the program you want to load.
3. *Execute*: Determine the properties of the window in which the application is started (minimized, maximized, or normal window size).
4. *Priority*: Determine with which priority you want Windows XPe to execute the application in the current process.
5. Confirm with **OK**.

Trigger Action: Filter Enable / Disable. Enables or disables an input filter. This trigger action controls the behavior of the input filter after the trigger condition has been fulfilled. For example, you can enable the input filter at a specific point in time or after a specified data-frame has passed the trigger.

If you have selected this trigger action, the *Select Pipeline Element...* dialog box opens. It displays the pipeline with the configured branches.

If you edit an already set *Filter Enable / Disable* action, the *Action* dialog box opens first. In this dialog box, click *Select* to call up the *Select Pipeline Element...* dialog box. To set the trigger action:

1. Click the desired *Filter* processing element.

   The *Select Pipeline Element...* dialog box closes and the *Action* dialog box opens.

2. Select the desired *Enable* or *Disable* option and confirm with **OK**.

Multiple assignment is not possible in this dialog box. If you want to multiple-assign the *Filter Enable / Disable* action to the trigger condition B (for example, to disable the previous trigger condition, A, and to enable the next condition, C), you have to assign this action twice. Repeat the select action, select condition, and select option steps.

Trigger Action: Insert Text Message. Inserts trace messages into the recorded data flow. This trigger action inserts a character string (trace message) into the Capture RAM after the event that triggered the action. In addition to this trace message, the time stamp and the source of the event (logical link) are given.

If you have selected this trigger action, the *Insert Text Message* dialog opens. To set the trigger action, enter the desired character string in the *Message* text field and confirm with **OK**.

Trigger Action: Recording File Prolog / Epilog. Records the prolog and epilog of a trigger event. This trigger action records the prolog and epilog of a trigger event. The prolog, for example, shows you what caused the event. As a prerequisite for this, you must set a recording pipeline in which the *Write Recording File* element is configured.

After you have selected the trigger action, the *Recording File Prolog / Epilog* dialog box opens. To set the trigger action:

1. Specify the amount of data (0 – 512 kB) to be stored before and after the trigger event in the Prolog and the Epilog.

2. Click **Select**.

   The *Select Pipeline Element...* dialog box opens.

3. Click the desired *Write Recording File* processing element.

   The *Select Pipeline Element...* dialog box closes.

4. End the *Recording File Prolog / Epilog* dialog box with **OK**.

Figure 37: Prolog Epilog trigger

Trigger Action: Send String (COM-Port). Sends a message (character string) to a separate system. This trigger action sends a message to a separate system via the serial interface as soon the event occurs. This separate system could be, for example, a different computer.

If you have selected this trigger action, the *Send Message* dialog box opens. To set the trigger action:

1. Enter the desired string in the *Data* text field. The *Special characters* list provides an overview of the available ANSI characters with the respective HEX and DEC values.

***NOTE**. You can use all of the characters under Special characters only if the serial interface has been configured for the transmission of eight data bits. If the serial interface has been configured for the transmission of seven bits or less, you can only use a reduced number of characters for the actual transmission.*

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2. In *Output-Device*, select the *Port* of the serial interface.
3. Click **Configure...** The *Advanced Port Configuration* dialog box opens.
4. Enter the appropriate parameters in this dialog box.

   If you want to send a large amount of data via the COM interface, the Baud rate should be increased accordingly.
5. Close the *Advanced Port Configuration* and *Send Message* dialog boxes with **OK**.

Trigger Action: Send Windows Message. Sends a window message to one or more applications. This trigger action sends a registered window message (IPC) to a running application. You will find more detailed information on registered window messages in the reference documentation of your programming tools.

If you have selected this trigger action, the *Send Window Message* dialog box opens. To set the trigger action, proceed as follows:

1. In the *Name* text field, enter the identifier of the windows message, for example, HandyCall.
2. Enter the respective values in the *Word-Parameter* and *Long-Parameter* fields.
3. Click **Advanced...** to select the application to which you want to send the window message. The *Window Message Configuration* dialog box opens.
4. Select an option:
   - *Broadcast Message*, if the message is to be sent to all applications that can interpret this message.
   - *Direct Message*, to select a specific application. In the *Window* text field, enter the path or the window title of the desired application. A partial string is sufficient for the window title; the selection is not case-sensitive.
5. Close the *Window Message Configuration* and *Send Window Message* dialog boxes with **OK**.

Trigger Action: Switch Close / Open. This trigger action starts or stops an online measurement after the event has occurred. The pipeline branch for the measurement is activated or deactivated. You can make the measurement start or stop at a specific point in time, or after a specific data-frame has passed the trigger.

If you have selected this trigger action, the *Select Pipeline Element...* dialog box opens. It displays the pipeline with the configured branches.

***NOTE**. If you edit a previously set Switch Close / Open action, the Action dialog box opens first. In this dialog box, click* **Select** *to call up the* Select Pipeline Element... *dialog box.*

To set the trigger action, proceed as follows:

1. Select the desired *ON/OFF* switch processing element.

   The *Select Pipeline Element...* dialog box closes and the *Action* dialog box opens.

2. Select the desired *Open* or *Close* option and confirm with **OK**.

***NOTE**. Multiple assignment is not possible in this dialog box. If you want to multiple-assign the* Switch Close / Open *action to the trigger condition B (for example, to set the switch to OFF for the previous trigger condition, A, and to ON for the next condition, C), you have to assign this action twice. Repeat the steps select action, select condition, and select option.*

Trigger Action: Trigger Condition Enable / Disable. This trigger action activates and deactivates the trigger conditions. This trigger action will not be applied unless you have defined at least one trigger condition.

If you have selected this trigger action, the *Enable / Disable Condition* dialog box opens. To set the trigger action:

1. Select the desired trigger condition in the *Condition* list.
2. Select the desired *Enable* or *Disable* option and confirm with **OK**.

NOTE. *Multiple assignment is not possible in this dialog box. If you want to multiple-assign the* Enable / Disable Action *to the trigger condition B (for example, to set the switch to OFF for the previous trigger condition, A, and to ON for the next condition, C), you have to assign this action twice. Repeat the steps select action, select condition, and select option.*

Trigger Action: Trigger OFF. This action stops the trigger. If you have configured more than one active trigger condition, you can deactivate the trigger, for example, as soon as one specific condition is fulfilled. You can also use this trigger action to disable the trigger as soon as a specific chain of actions has been carried out.

If you have selected this trigger action, it is set in the *Actions* column on the right in the *Trigger Configuration* dialog box. Apart from the link with a trigger condition, no further settings are required for this action.

Linking Trigger Conditions with Trigger Actions

The links (relations) between trigger conditions and trigger actions are displayed as lines between the trigger conditions and the trigger actions.

The check boxes indicate which conditions and actions have been activated (refer to Online Help).

Editing Trigger Links

The current links are represented by lines between the trigger conditions and the trigger actions in the *Trigger Configuration* dialog box. You can create links between trigger conditions and trigger actions in this dialog box.

In the *Show all relations* box, you can determine whether all of the links are displayed or only the links of the selected trigger condition.

When creating new trigger actions, the respective links are automatically generated.

Activating / Deactivating the Entire Trigger

Before activating the entire trigger, you must define the desired trigger conditions and link them to actions in the *Trigger Configuration* dialog box.

Testing Triggers

Before incorporating a trigger in your measurement, you can test the configuration of individual trigger conditions. The trigger test simulates events; no data pass through the pipeline. With the help of this test, you can run through a chain of actions before the actual measurement.

Prerequisites for the trigger test:

- The data source must be configured.
- The trigger conditions you want to test must be activated.
- The trigger must be activated.

All of the defined trigger conditions are displayed in the context menu of the *Trigger* processing element.

In the context menu of the processing element Trigger, click **Enabled** to activate the trigger. (The command has to be marked with a check.)

From the context menu under *User Condition*, select the trigger condition you want to test. If unsure, check in the *Trigger Configuration* dialog box whether the condition has been activated.

The actions linked to this trigger condition will be carried out once.

Assigning Protocol Stacks

Protocol stacks contain the interpretation rules for processing measurement data. The interpretation rules are derived from the protocols in the stack, the parameters of these protocols, and the relationships between them.

To be familiar with these rules, the K15 refers to description files (**.upd* files) installed in the *\k15\protocols* directory. It provides a number of predefined protocol stacks for measurements in various networks. You can find a list of all available protocols and protocol stacks under *\k15\stacks*.

In the following situations you must assign protocol stacks:

- When configuring sources, you must assign protocol stacks to determine the interpretation rules for this measurement.
- During a measurement, it may be necessary to change an assigned stack, if the decoded data in the *Monitor* window does not contain test-related information.

Use the Protocol Stack Editor (PSE) to create or modify the existing protocol stacks. To open the PSE, select *Open –> Protocol Stack* from the *File* menu in the *Data Flow* window.

Protocol Stack Editor

The Protocol Stack Editor, PSE, is the graphical environment to create or modify protocol stacks. It is possible to have more than one PSE open at a time. By using the *Data Flow* window toolbar, switching between the *Protocol Stack Editor* windows is easy.

The *Protocol Stack Editor* window contains a toolbar and two panes. The left pane is called the *Protocol Stack View*, and the right pane is called *Layer View*.

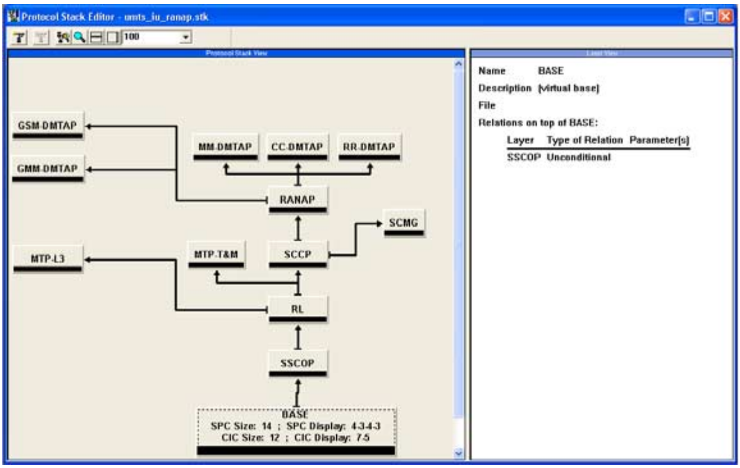


Figure 38: Protocol Stack Editor

Protocol Stack View. The *Protocol Stack View* displays the protocol stacks graphically as block icons. You can open, edit and save protocol stacks as well as add and delete protocols here. Standard protocol stacks are preset for every interface module installed. You can change this setting.

The protocol tester decodes the protocol stacks from bottom to top, that means, the BASE block icon will get a message first and then pass it up to the next decoder, which lays graphically above it. This is the general method in all protocol stacks.

The *BASE* icon represents the root for every protocol stack. General features for the whole stack will be defined here, such as SPC size and grouping. The *BASE* offers various alternative parameters, which differ between MTP- and LAPx-based stacks.

Layer View. The *Layer View* displays parameter information on selected protocols. Furthermore, it displays the relationships between the selected protocol and the neighbour protocols.

- Name: Short name of the decoder. The entry is used in all other parts of the K15 application where a reference to a particular protocol is needed, such as filter protocol settings or the Monitor window.
- Description: Long name of the protocol. This description is also used in other parts of the application for a more detailed description of the protocol that is used.
- File: Shows the path to the protocol. The extension of protocol is **.upd* (User Part Description).
- Relations on Top of: Displays all protocols that have a relationship with the selected protocol and are higher than (on top of) it. Looking for a message the protocols being on top of other protocols are deeper encapsulated. The relations list will display the short name of the other protocol, the relation defining parameter and the used value.

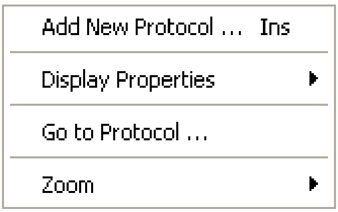
NOTE*. Assignments between logical links and protocols must always be unique. This is especially important if your measurement includes a protocol stack that contains both MTP and LAPx parameters.*

Modifying Protocol Stacks

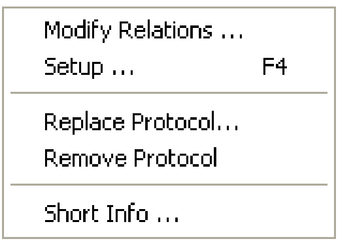
You can modify an existing stack by either including new protocols, remove unused protocols, or changing the relation parameters. The color that is used in the Monitor can also be defined in the PSE.

Two different context menus can be called, depending on where you right-click in the Protocol Stack View pane.

- General Context Menu: Call the context menu that does not point to a decoder icon to open the general context menu.



- Protocol Context Menu: Call the context menu that points to a decoder icon to open the protocol context menu.



Adding Protocols

To add a new protocol, proceed as follows:

1. Select *Add new Protocol* from the *Protocol Stack* menu or click the corresponding icon in the toolbar.

   The *Add Protoco*l dialog box opens. All available protocols in the *\k15\protocols* directory and its subdirectories are listed.

   The list displays descriptions for all available protocols. Select a protocol description (the associated protocol description file is displayed below the list).

2. Confirm with **OK**. The selected protocol is added to the *Protocol Stack View*.

3. Move the new protocol icon to a position that is higher than the existing protocol which will act as the lower layer. To do this, left-click on the new protocol icon, leave the button pressed, and move the icon to an appropriate position.

Configuring Protocols

To configure protocols, select the desired protocol icon and proceed as follows:

1. Select **Setup** from the *Protocol Stack* menu or click the corresponding icon in the toolbar.

   The *Protocol Setup* dialog box opens, displaying the *Protocol* tab. This dialog box allows you to set and edit the following protocol characteristics:

   - *Name* represents the short designation for the protocol. The maximum length of this field is **8 characters**. Ensure that the name is unique. If the same name is already being used in the protocol stack, an error message is displayed.
   - *Description* contains a description of the protocol. The maximum length of this field is 40 characters.
   - The other two fields show the path to the UPD file and certain conditions for a protocol relationship. They are for information only and cannot be modified. To change the representation in the *Monitor Frame View* window of this protocol select the *Display Color* tab to define the color.

2. Confirm with **OK**.

   The PSE will display the configured protocol decoder using the new name and the new representation color.

Modifying Protocol Relations

To define or modify a protocol relation, proceed as follows:

1. Select the protocol that will act as lower layer.
2. Select *Modify Relations* from the *Protocol Stack* menu.

   The *Protocol Setup* dialog box opens again, displaying the *Relations* tab. This dialog box allows you to define on top of relations.
3. Confirm your entries with **OK**.

   Coming back to the PSE window, the *Protocol Stack View* will show a line between the protocol decoder icons and the layer view pane will display the parameters specified for the relations.

NOTE. *The modifications will automatically be valid in the protocol stack, but it is necessary to save the protocol stack file before the changes are applied in the protocol tester's decoder and in other parts of the application, such as the Monitor window.*

Changes made in protocol stacks are not applied to running measurements. In order to apply changes, it is necessary to stop and restart the measurement. However, the software will do this automatically if you confirm the relevant prompt with Yes.

Saving Protocol Stacks

To save a new or modified protocol stack, proceed as follows:

1. If you want to save a modified protocol stack, select *File –> Save Protocol Stack* from the *Protocol Stack* menu. The modified protocol stack file is saved.
2. If you want to save a new protocol stack, select *File –> Save Protocol Stack as* from the *Protocol Stack* menu.

   The *\k15\stacks* directory is displayed. Change to one of its subdirectories if necessary.
3. Enter a name for the protocol stack file. The extension for protocol stack files is **.stk* and it will be automatically assigned.
4. Click **Save**. The current protocol stack configuration is saved.

Protocol Help

This feature provides additional help for the actual protocol and its parameters, related to the implementation of the specification. It also describes the meaning of the parameters in the protocols. To call up the Protocol Help, see page 62.

Delayed Evaluation of Data by Recording

Delayed interpretation of long-term measurements is made possible by recording the measurement data. You can run offline scenarios of these recordings on your K15 using so-called recording files.

Recording of Monitoring Data

The signaling data of the active data flow can be recorded in a special recording file for subsequent evaluation and/or offline analysis. This recording feature can be used in conjunction with or as an alternative to online monitoring.

Preliminary Steps. The protocol tester has been properly connected to the data line and turned on. The measurement boards booted without errors and the application has been started.

Make sure you are in the *Measurement Scenarios* pane of the *Data Flow* window.

Start Recording. Create an Online Recording measurement scenario as described on page 12.

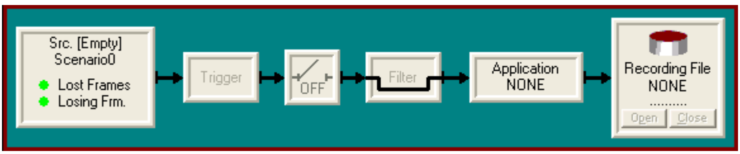


Figure 39: Online Recording measurement scenario

1. Click the *Recording File* processing element to create a recording file. The *Open* dialog box appears.

2. Choose one of the indicated files or create a new one by entering a name in the *File name* box. The *Recording Write Configuration* dialog box appears:

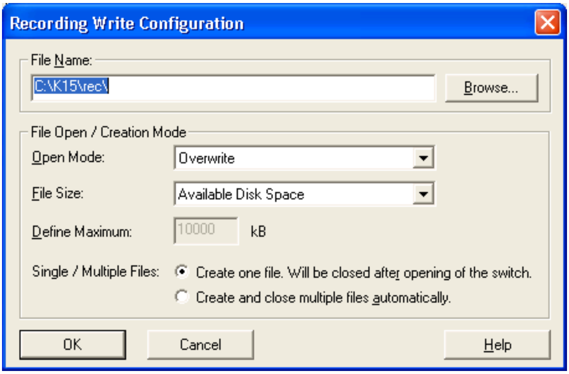


Figure 40: Recording Write Configuration dialog box

Storing all your recording files in *k15**rec*\\ facilitates the search for individual files later on.

Press *Browse* if you want to locate an existing file.

You do not need to enter the file extension **.rf5* for the recording files when entering the file name. The program appends it automatically.

The remaining settings are optional.

3. Confirm your entries with **OK**. The name of the recording file appears in the *Recording File* processing element.

4. To start recording, click the *ON/OFF* switch of the recording pipeline branch to *ON*.

   The signaling data of the activated data flow are written to the recording file until the file is full or until you terminate the process. The data in the recording file can be read after the current measurement is complete.

   You can stop recording by clicking the *ON/OFF* switch of the Recording branch to *OFF* **.**

NOTE. *In most cases, data are recorded and reviewed at different times. It is possible however to check the contents of the recording file immediately after recording data. A description on how to review recorded data is provided on the following pages.*

Reviewing Recorded Data

To view the signaling data stored in a recording file with the record viewer, proceed as follows:

1. Start the Recording Viewer measurement scenario as described on page 12. The pipeline of the Record Viewer appears in the *Measurement Scenarios* pane of the *Data Flow* window.

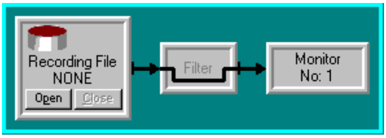


Figure 41: Recording Viewer measurement scenario

2. Click the *Recording File* processing element. The following *Open* dialog box appears.

   Select the recording file you want to work with by double-clicking it. K15 and K1205 recording files end with *.rf5*. K1103 recording files end with *.rec*. K1297 and K1197 recording files end with *.dat*.

   The *Recording Viewer Configuration* dialog box opens.

3. Using this dialog box you can change the protocol stacks assigned to the logical links.

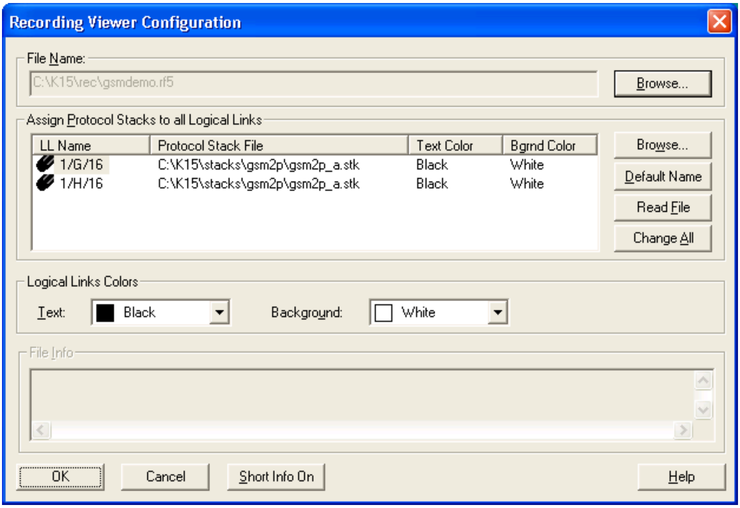


Figure 42: Recording Viewer Configuration dialog box

4. Confirm your selection with **OK**. The name of the recording file is entered automatically into the *Recording File* processing element. The pipeline of the activated data flow is now highlighted.

5. If you want to filter the signaling data according to certain criteria, click the *Filter* processing element. The *Filter Setup* dialog box for the Display Filter opens (see figure 33).

   Proceed with your settings and confirm your selection with *OK*.

6. To view the signaling data, switch to the *Monitor* window by clicking the *Monitor* processing element at the right end of the pipeline. The Monitor window with the three views appears. You can scroll through the recorded data flow using the arrow keys in the individual views (see *Working with Frames* on page 75).

Applications

The protocol tester software package includes applications for performing problem-based evaluations of signaling data. These applications are separate measurement programs and help, for example, in analyzing protocol-specific information. You can include applications in Monitoring, Statistics and Recording scenarios.

The following applications are available:

Table 2: K15 Applications

Application	Short Description
AbisMon	Analyzes the messages exchanged on the Abis interfaces
BHCA (Busy Hour Call Attempts)	Counts the call attemps within a specified time period.
CallMon	Creates an extensive statistical analysis of calls on all TUP (incl. BTNUP) and ISUP protocols. Analyzes up to 10 different telephone numbers or areas of telephone numbers.
CallTrace (Single- and Multi-Interface)	Traces one or more calls on several interfaces of a network, searches for parameters from different network interfaces simultaneously.
CallTrace / Sequencer	Traces one or more calls on particular UMTS and GPRS interfaces (Iu, Iub, all Gx interfaces).
Count All	Classifies and counts the received messages sorted according to protocols.
Decipher	Deciphers signalling data on the GPRS-Gb interface.
Erlang	Measures the signaling load on the logical links.
GPRS MM/SM Statistics	Displays details of events in GPRS MM/SM networks.

Table 2: K15 Applications (Cont.)

Application	Short Description
GPRS Gb Analyzer	Displays details of events in GPRS networks.
IP Traffic Analyzer	Visualizes the data flow of IP based protocols.
Iub Monitor	Monitors the dynamically created control plane of AAL2 links on the Iub interface.
NFN (Nortel Frame Number) (can only be used for GPRS Nortel-type protocols)	Calculates the Frame Number (FN) implicitly contained in the data flow from the following parameters: Multi Frame Number (MFN), Block Number (BN) and Number of Idle Bursts (Nib).
PCR (Preventive Cyclic Retrans-mission)	Enables you to filter out repeated MSUs from an offline pipeline by means of the PCR procedure.
Service Profile Statistics	Displays IP service profiles for UMTS networks.
Statistics	Classifies and counts the received signaling data on the basis of different, changeable criteria in real time.
TCA (Traffic Channel Analysis)	Analyzes a signaling channel and evaluates the traffic channel assignment.
UMTS IuX Statistics	Evaluates important signaling procedures based on measurements on the Iu, Iub, and Iur interfaces
IMA Monitoring	Monitors an ATM cell stream that is transferred via different physical links

Starting Applications

Before starting an application, you should configure all of the pipeline's other processing elements. You must configure at least one logical link in the online source or a recording file with a channel where signaling occurs.

***NOTE**. If the pipeline's configuration is not complete or inadequate protocol stacks have been assigned to the data source, an error message appears prior to start-up. In this case, reconfigure the data source (Source or Recording File) by assigning different stacks.*

Except for the IMA Monitoring (see page 208), you can start any application by pressing the *Application* pipeline element.

The *Load / Unload Monitoring Application Programs (Mon APP)* dialog box opens. Select the desired application and press **OK**.

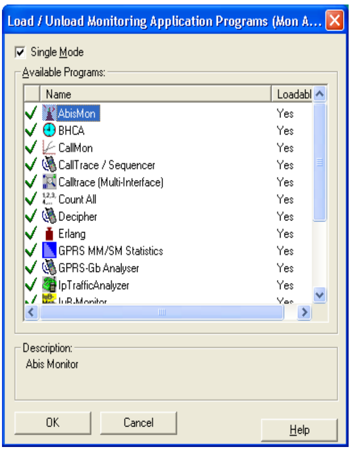


Figure 43: Load / Unload Application Programs dialog box

If you want to run the application over a longer period of time, please read the tips on running Long-Term Measurements in the Online Help.

***NOTE**. The set parameters for an application cannot be changed during the measurement. To change the settings, the application must be stopped (command:* Stop*) and then restarted after the changes have been made.*

Processing Applications

During the measurement, the parameters set for the application cannot be changed. To change the settings, you must stop the application and restart after making the changes.

Running Several Applications

You can run an application in multiple operations or run different applications in parallel (in different pipeline branches). The protocol tester automatically assigns a number to each application you start. The number is displayed on the respective *Application* processing element, for example, CallTr / Seq_1, CallTr / Seq_2.

***NOTE**. Running too many applications can cause the system resources of the protocol tester to reach their limits. You should therefore configure only the pipelines and applications that are actually required for the current measurement. Refer also to the notes in the* Resources and Optimizing Performance *help topics.*

Run Two Applications in one Pipeline. To run two applications in one pipeline at the same time, proceed as follows:

1. Deselect the *Single Mode* box. This activates the right part of the dialog box shown in figure 43.
2. Select the appropriate function and click *Load / Unload*. Loaded functions are now shown in the list box on the right. To start the applications, press **OK**.

Abis Mon

AbisMon is a pre-defined statistics application to assist network operators in extending and optimizing an existing network. AbisMon provides statistics diagrams and traffic analyzing tools.

The AbisMon application analyzes the messages exchanged on the Abis interface between a Base Transceiver Station (BTS) and the attached Base Station Controller (BSC). Suitable protocol stacks for proper operation includes the GSM, GSM Phase 2, GSM Phase 2+ or similar Abis stacks. Only the first 64 logical links of a data source can be analyzed, other links will be ignored.

Setting Up an Abis Mon Application. Set up the application as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *AbisMon* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *AbisMon* dialog box opens.

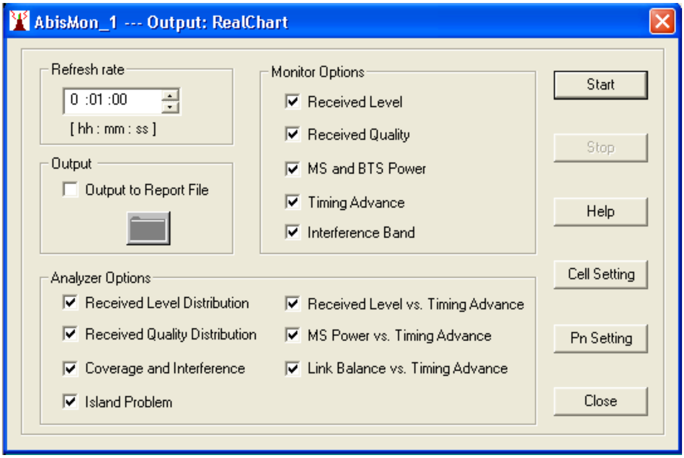


Figure 44: AbisMon dialog box

3. Activate the check boxes to specify which diagrams types you need.
4. Configure the refresh rate, *Pn Setting* and the appropriate *Cell names*.
5. Press **Start**. The RealChart window opens to display the desired diagrams.

Evaluating an Abis Mon Application. You can monitor your network by viewing and rating the diagrams. Consider to compare and rate the displayed information over a longer period before deciding if and what action has to be done to optimize the network.

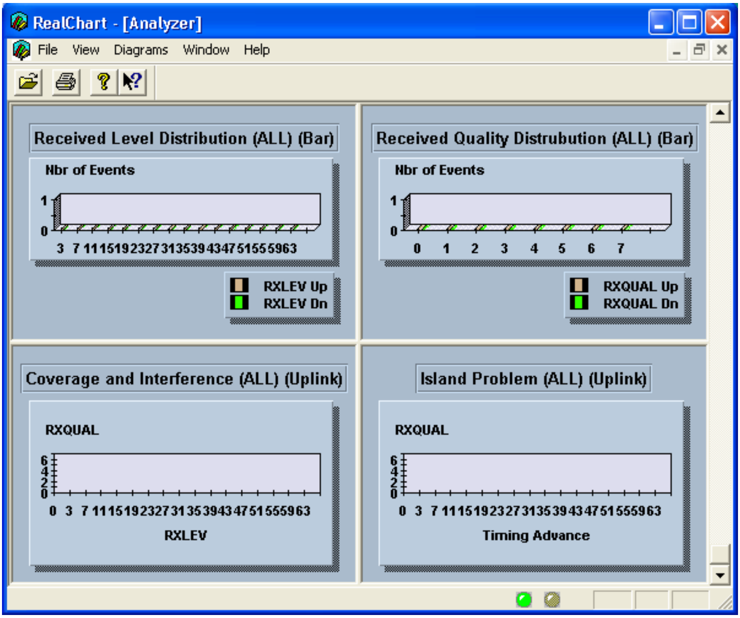


Figure 45: AbisMon results

BHCA (Busy Hour Call Attempts)

The BHCA (Busy Hour Call Attempts) application is a pre-defined statistics application that records the number of connection attempts (IAM Messages) per hour or per day; this way you get an overview of the call traffic on the connected lines. A counter is set for every IAM recorded during a specific time period.

The application analyzes all ISUP protocols.

Setting Up a BHCA Application. To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *BHCA* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The ... dialog box opens.

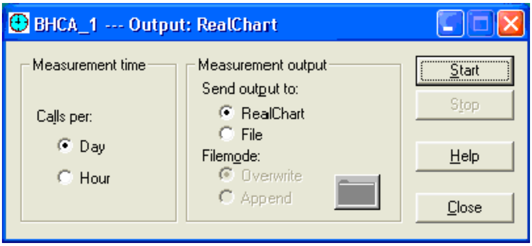


Figure 46: BHCA dialog box

3. Specify whether you want to classify the recorded *Calls per: Day* or per *Hour* in the *Measurement time* field.
4. Select one of the options under *Send output to:*
5. If you want to save the data in a file, determine whether they are to be written in a new file or in an existing one under *Filemode*.

   To select location or file, click the *File* button. The *d:\k15\log* directory opens. You can create a new *.csv file or select an existing one.
6. Confirm with **Start**.

Evaluating a BHCA Application. The results of the BHCA application can be transferred to the RealChart tool or saved in the *.csv (Comma Separated Value) file format. *.csv files can be read in again by the CDR Viewer (see page 254) or by many other programs, such as Microsoft-Excel.

In the RealChart window, the evaluation of the call attempts is displayed in a bar chart. A timeline indicates the number of call attempts per hour or per day.

CallMon

This application enables you to carry out a statistical analysis of connections. Using this application you can analyze all connections or a maximum of 20 specific call number ranges or call numbers.

The Call Monitor application analyzes the protocols ISUP, TUP, and BTNUP and the interfaces Abis and A.

Setting Up a CallMon Application. To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.

2. Select *CallMon* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *CallMon* dialog box opens.

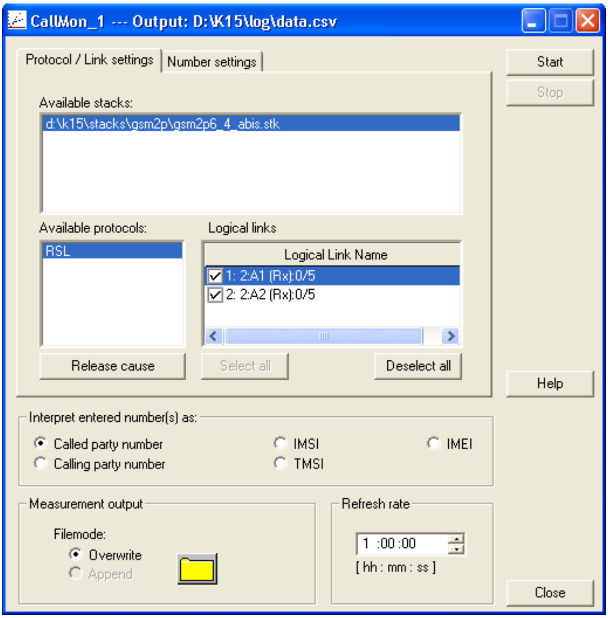


Figure 47: CallMon dialog box

3. Select the desired protocol stacks, protocols and logical links from the lists in the *Protocol / Link settings* tab.

4. Configure the release causes that are to be treated as correct behavior by the Call Monitor application.

   Therefore, click the *Release cause* button. The *CallMon Release Causes* dialog box opens.

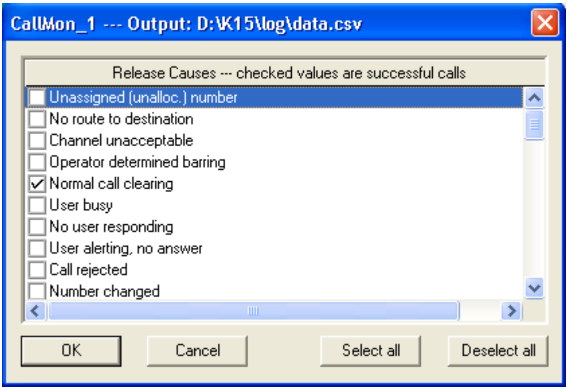


Figure 48: CallMon release causes

   Select the release causes that display correct behavior. All non-activated release causes will be treated as errors.

5. Confirm your selection with **OK**.

6. Configure your desired call number ranges in the *Number Settings* tab. You can also use wildcards to analyze number ranges. Refer to the Online Help for further details.

7. In the *Protocol / Link settings* tab, determine an interval in which the measured values are to be read out in the *Refresh rate* field.

8. Determine whether the data are written into a new or an existing file in the *Measurement Output* group box.

9. Start the application with **Start**.

Evaluating a CallMon Application. The results of the CallMon application can be transferred to the RealChart tool or saved in the *.csv (Comma Separated Value) file format. *.csv files can be read in again by the CDR Viewer (see page 254) or by many other programs, such as Microsoft-Excel.

In the RealChart window, the results are displayed in a table. Each column represents statistical information for an interval corresponding to the *Refresh Rate* setting. Each line represents information about a call number range in a an interval.

The displayed in information are explained in the Online Help.

CallTrace (Single and Multi-Interface) – MICT

Using the Single and Multi-Interface CallTrace (MICT) you can monitor up to 4 network interfaces. You can search for common parameters such as phone numbers and measure the time needed by specific network elements (Delay Measurement). The application provides scenarios for analyzing the following network interfaces and protocols:

- UMTS UTRAN: Iub, Iu-CS, and Iu-PS interface
- GPRS: Gb, Gn, and Gr interface
- GSM: Abis and A interface
- CDMA2000: A1, A10, A11 interface
- CDMA: IS-41 interface
- SS7: MAP, ISUP, and CAP (INAP)

***NOTE**. At the moment, the Singel and Multi-Interface CallTrace (MICT) supports maximal three different protocol stacks for each interface.*

You can run the Single and Multi-Interface CallTrace simultaneously with applications that have been loaded in other pipeline branches. You can also run several Multi-Interface Calltrace applications at the same time.

***NOTE**. A number of the functions of the Single and Multi-Interface CallTrace (MICT) are also available in the CallTrace / Sequencer application with which individual network interfaces can be analyzed. For performance reasons, the MICT does not support all of the search criteria that you can select in this application (e.g. release causes). Instead it supports search criteria that can be evaluated during the call setup phase. If you need more detailed search criteria for your measurements, you should therefore use the CallTrace / Sequencer.*

Setting Up a Single and Multi-Interface CallTrace (MICT). To set up a Single and Multi-Interface CallTrace you must configure at least two logical links in the online source or a recording file with two signaling channels. The protocol stacks used in the data source must be supported by the MICT application.

To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *CallTrace (Single and Multi-Interface)* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *Scenario Configuration* dialog box opens for configuring the application.

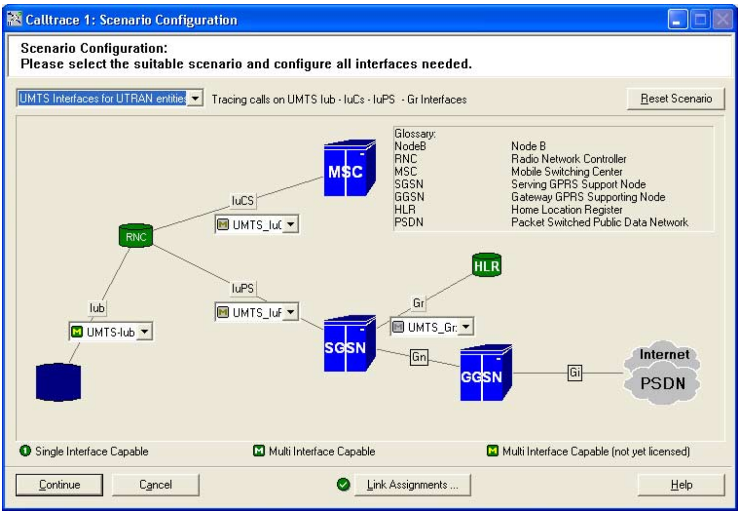


Figure 49: Scenario Configuration dialog box

3. Select a scenario from the scenario list box on top of the dialog box.

NOTE. *To monitor an Iub interfaces with the Single and Multi-Interface CallTrace, allways start the Iub Monitor Application first.*

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4. Select the appropriate calltrace for each interface from the lower list boxes.

5. Press the *Link Assignments...* button to check your configuration. The *Link Assignment* dialog box opens.

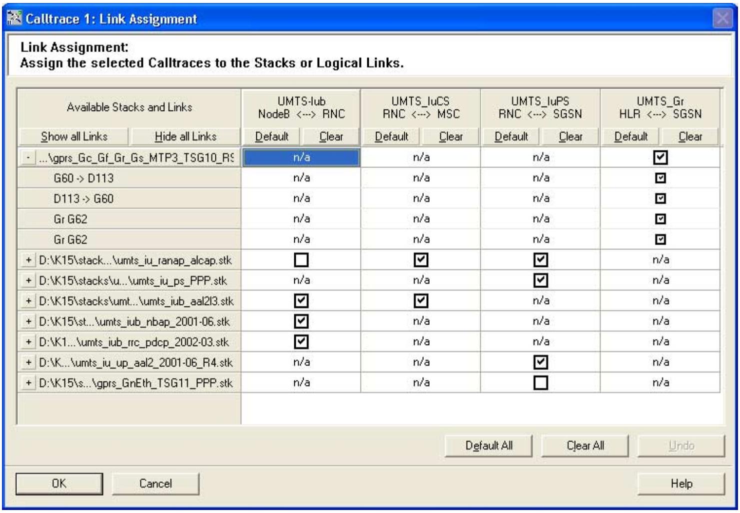


Figure 50: Link Assignment dialog box

Each line represents a link that can be traced. The individual colums indicate on which interface this link is traced. You can change the basic setting in this dialog box. The settings in this dialog box do not change the configuration made in the *Data Flow* window.

Press the *OK* button, if all settings are properly configured. The *Continue* button in the *Scenario Configuration* dialog box is now activated.

6. Press the *Continue* button in the *Scenario Configuration* dialog box. The *Configuration* dialog box opens.

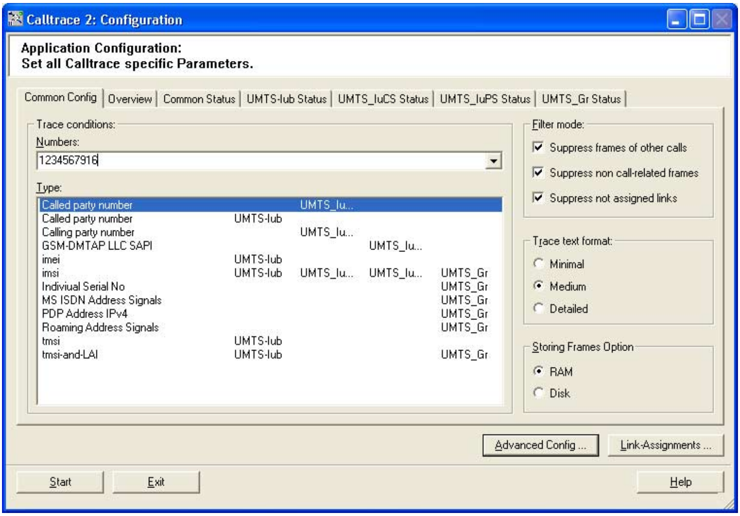


Figure 51: Configuration dialog box

Enter your search criteria in the *Common Config* tab.

On the left side you can enter one or more call numbers in the *Number* field. Up to 16 numbers are possible. Separate the numbers by a comma or a semicolon. Do not use any spaces between the characters.

From the *Type* list, select the type of number, such Called Party Number, IMSI etc.

On the right side of the dialog box, you can determine filter modes, display formats for the *Monitor* window and suitable options for storing protocol data frames of global calls for later use with the Frame view and MSC diagram.

All other tabs in the dialog box are intended for displaying the status and the results of the application while it is running and after you have stopped the application.

7. Press Start to run the application. The *Status* dialog box opens.

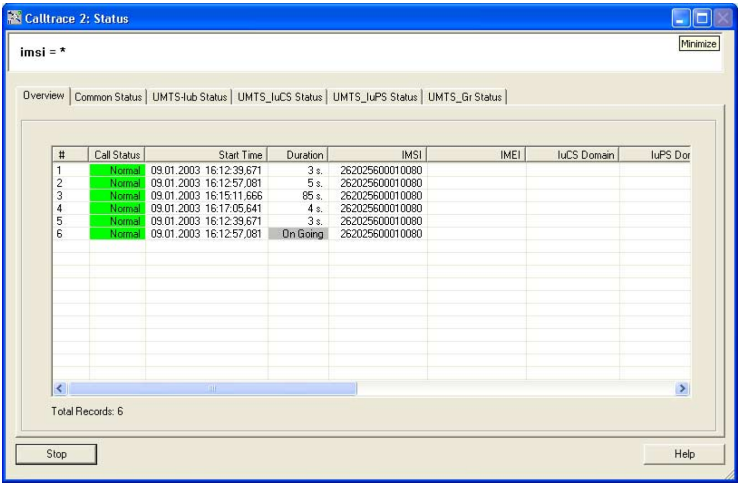


Figure 52: Status dialog box

This dialog box provides a quick overview of the analysis. The main trace condition is displayed at the top of the status dialog.

The *Overview* tab shows an overview of global calls while they are being processed. The displayed global calls have matched the trace conditions configured before. The list of global calls is constantly refreshed while the Multi-Interface Calltrace is active.

The other tabs are also constantly refreshed when the Single and Multi-Interface CallTrace is active. For each network interface involved a separate tab will be added to the dialog box. These tabs display tables that summarize the calls at the appropriate interface.

Evaluating a Single and Multi-Interface CallTrace (MICT) Detailed Single and Multi-Interface CallTrace results can be output as Message Sequence Charts (MSCs) or as clear trace text lines in the *Monitor* window.

To monitor more detailed information, double-click on a line in the *Overview* tab of the *Status* dialog box (see figure 52). The *MSC Diagram* dialog box opens.

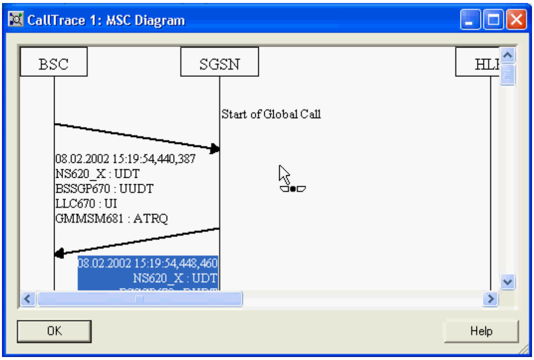


Figure 53: MSC Diagram dialog box

In this dialog box, the protocol data frames collected for a global call can be viewed as a Message Sequence Chart. The representation generally follows the ITU-T standard Z.120. A chart provides an overview of the call processing at the various network interfaces.

Double-clicking on a line in the *Overview* tab of the *Status* dialog box also opens a *Monitor* window. This specialized *Monitor* window only displays the selected call. The trace text lines are displayed together with the protocol data frames.

CallTrace / Sequencer

The CallTrace/Sequencer application provides functions for tracing one or more calls. The system can be set to recognize and evaluate calls as a rule or based on a completely or partially entered call number. It displays the results in the *Monitor* window together with the data frames displayed there. The CallTrace/Sequencer application analyzes protocol-specific data.

This application is available for all SS7, GPRS and CDMA interfaces depending on the software packages purchased.

For UMTS interfaces use the Single and Multi-Interface CallTrace (see page 138).

Setting Up a CallTrace/Sequencer Application. For CallTrace/Sequencer applications you must define a search pattern for the selected protocol. You can, for instance, specify the desired telephone number and other search criteria.

To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *CallTr/Seq* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *CallTr/Seq* dialog box opens for loading the protocol-specific application.

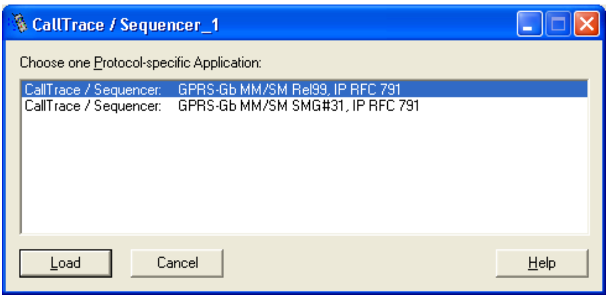


Figure 54: CallTr/Seq dialog box

3. Select and load the protocol specific application you want to analyze.

The *CallTr/Seq* dialog box opens for configuring work mode and parameters. Depending on the selected Calltrace this window can vary slightly. The selected protocol and the serial number of the application are displayed in the title of this dialog box.

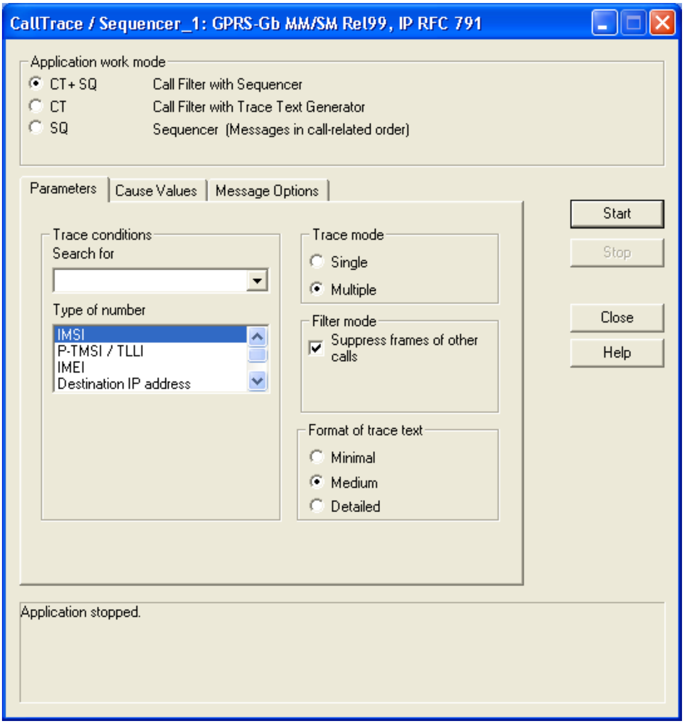


Figure 55: CallTr/Seq Iu Interface - Parameters Tab

4. Choose the desired number, parameter, or values (such as *CalledParty-Number*, *Release Cause*, etc.) for the selected protocol in this dialog box.

5. To specify the search criteria in more detail, open the *Cause Value* tab in the *CallTr/Seq* dialog box.

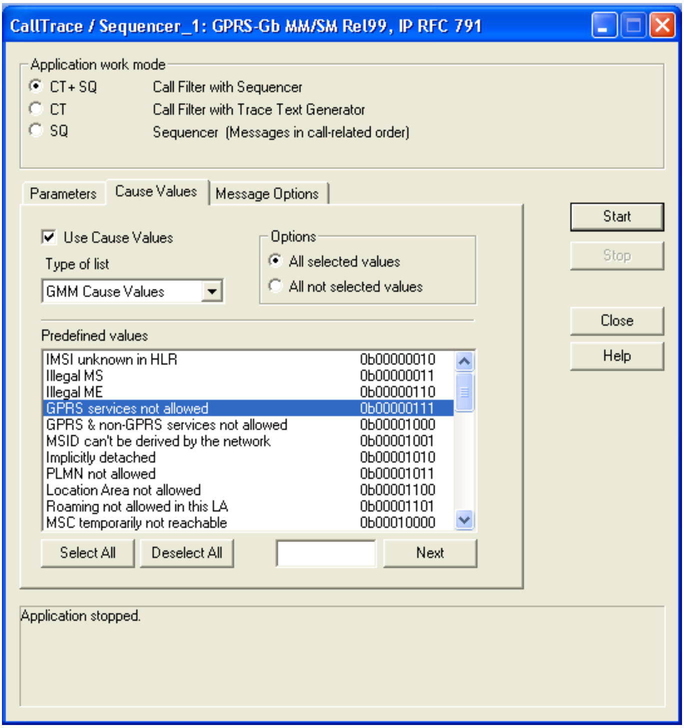


Figure 56: CallTr/Seq Iu Interface - Cause Value Tab

6. To specify the messages in more detail, open the *Message Options* tab in the *CallTr/Seq* dialog box.

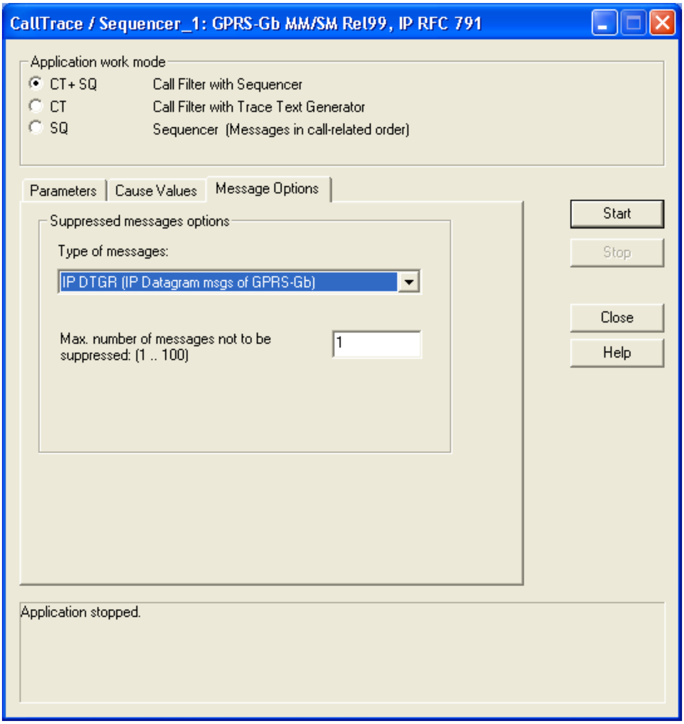


Figure 57: CallTr/Seq Iu Interface - Message Options tab

The CallTrace/Sequencer status display in the lower section of the *CallTrace/Seq* dialog box provides a quick overview of the status of the analysis. It is constantly refreshed when the CallTrace/Sequencer is active.

Evaluating a CallTrace/Sequencer Application. The CallTrace/Sequencer results are output in the Monitor window in the context of the data frames displayed there.

They are displayed in clear text in the monitor's *Short View* pane. You may need to reconfigure the column settings in *Short View* for optimal display.

If you have activated the *Medium* or *Detailed* option in the *Format of trace text* setting, additional texts are inserted in the monitor. These texts give brief information on the values in the calls that have been traced.

If you have selected the work mode *Call Filter with Sequencer*, all messages that are received and cannot be assigned to a call will be output between the CallTrace blocks.

You can also display only the CallTrace/Sequencer results in the *Monitor* window. Select *No Protocols* on the *Protocols* tab of the display filter to exclude all other messages from the analysis.

Count All

The Count All application is a pre-defined statistics application that counts all the received messages and sorts them according to protocol and message type. This provides an overview of the protocol-specific signalling traffic at the connected links.

This application analyzes all protocols.

Setting Up a Count All Application. To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *Count All* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *Count All* dialog box opens.

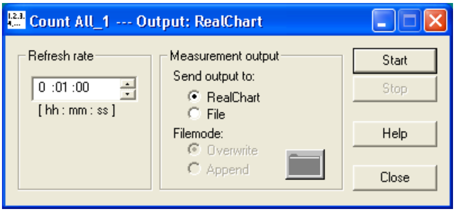


Figure 58: Count All dialog box

3. In the *Refresh rate* field, specify the time period during which you want the system to read out the measured values.
4. Select your desired output format under *Send output to.*
5. If you want to save the data in a file, determine whether they are to be written in a new file or in an existing one under *Filemode*.

   To select location or file, click the *File* button. The *d:\k15\log* directory opens. You can create a new *.csv file or select an existing one.
6. Confirm with **Start**.

Evaluating a Count All Application. The results of the Count All application can be transferred to the RealChart tool or saved in the *.csv (Comma Separated Value) file format. *.csv files can be read in again by the CDR Viewer (see page 254) or by many other programs, such as Microsoft-Excel.

After starting a Count All application, the *RealChart* window opens. The values in the table are refreshed for each time period. The window provides an overview of the individual protocols and messages in the form of a table.

The displayed in information are explained in the Online Help.

Decipher

This application deciphers signaling data on the GPRS-Gb interface. Ciphered messages, for which the subscriber ID (IMSI) and key (Kc) are known, are replaced by deciphered messages and thus enable a further analysis of the signaling data.

On the GPRS-Gr interface, the Decipher application determines with the help of IMSIs the transmitted on the Gb interface and keys required to decipher the signalling data on the GPRS-Gb interface.

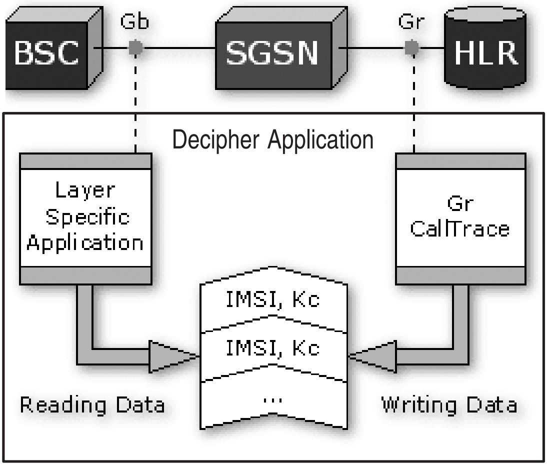


Figure 59: Deciphering on the Gb interface

The following configurations are possible when working with the Decipher application:

- You can configure a joint pipeline with logical links for the GPRS-Gb and GPRS-Gr interfaces. To do this, assign a respective suitable protocol stack to the logical links of this pipeline.
- You can configure two pipelines. The data sources of these pipelines are differing logical links with differing protocol stacks.

  In the first pipeline, you must assign a protocol stack for the GPRS-Gb interface to the logical links. Now, the IMSIs and keys determined by Decipher are used via the LSA (Layer Specific Application) to decipher the signalling data transmitted via the Gb interface. In this pipeline, you can also use another application.

  In the second pipeline, you must assign a protocol stack for the GPRS-Gr interface to the logical links and then start the Decipher application in this pipeline. Now, Decipher determines the IMSIs and keys transmitted via this interface.

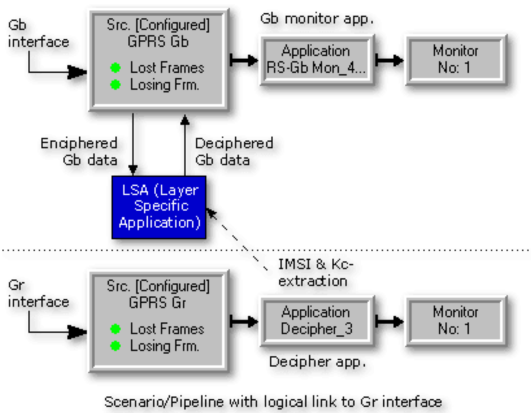


Figure 60: Decipher configuration with two pipelines

Setting Up a Decipher Application. The Decipher application can only evaluate protocols and messages activated in the protocol filter. Before starting the application, check the configuration of the protocol filter for correctness. If required, switch the filter over to the bypass mode to enable all protocols to pass the filter.

To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *Decipher* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *Decipher* dialog box opens.

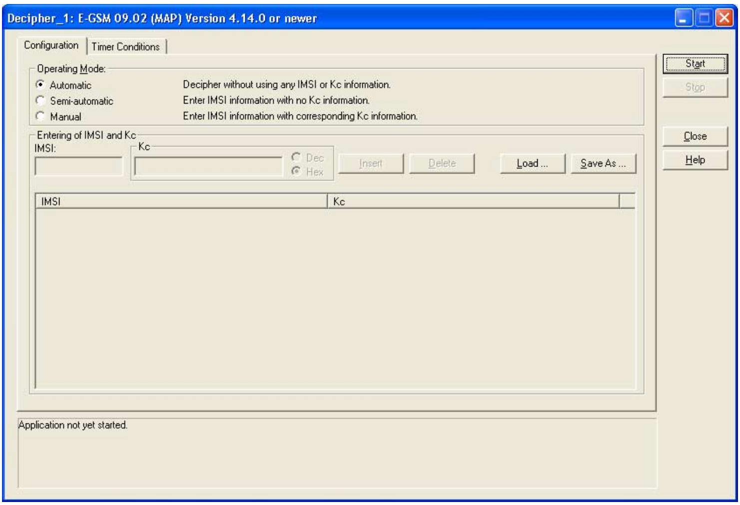


Figure 61: Decipher dialog box

3. In this *Configuration* tab of the *Decipher* dialog box, you can configure the application and specify how the IMSIs and Kcs are to be determined.

   The Decipher application supports three operating modes, with which IMSIs and keys can be determined: automatic, semi-automatic, and manual mode.

   - The automatic mode (option *Automatic*) saves all IMSIs and the respective assigned keys transmitted by the GPRS-Gr interface (max. 25,000).
   - In the semi-automatic mode (option *Semi-automatic)*, you must enter the IMSIs yourself. The respective keys will then automatically be assigned via the GPRS-Gr interface.
   - In the manual mode (option *Manual*), you must enter both the IMSIs and the keys yourself or load them from a file. This mode does not require a connection to the GPRS-Gr interface.

   Under *Operating Mode*, select the desired operating mode. If you have selected the Semi-automatic or Manual mode enter the IMSIs (semi-automatic) or IMSIs and keys (manual) in the field below. In the last two cases, the Decipher application will apply only for the entered IMSIs.

4. You can also configure special timer settings. Therefore, click on the *Timer Conditions* tab. The following dialog box opens:

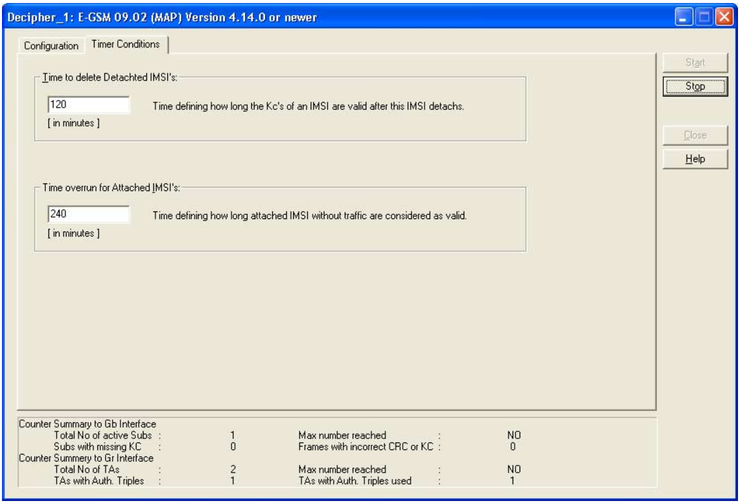


Figure 62: Timer Conditions tab

Enter the desired conditions in the following fields:

- *Time to delete Detached IMSI's*: The protocol tester saves received information about subscribers even if a detach request (DTRQ) was received. Enter a time interval (in minutes) after which the information about the subscriber was deleted. If you enter the value ”0”, the subscriber information will be immediately deleted after DTRQ.
- *Time overrun for Attached IMSI's*: Enter a time interval (in minutes). If a GPRS session is not active during this time interval (no data traffic), it will be assumed that the session has been ended. The corresponding session data (session data / Kc & IMSI & subscriber flags) will then be deleted.

5. Press the *Start* button to start the application.

Evaluating Decipher Applications. After the application has been started, statistical information is given in the Status pane of the *Decipher* dialog box. During measurement this information is continuously updated.

Figure 63: Status pane of the Decipher dialog box

The decipherer on the Gb interface displays the following statistical values:

- *Total No of active Subs* indicates the number of subscriber data sets currently active. This also includes detached, but not timed out subscribers.
- *Max. number reached* indicates if the maximum subscriber number has been reached (YES) or if it has NOT yet been reached.
- *Subs with missing KC* indicates the total number of subscribers with missing KCs.
- *Frames with incorrect CRC or KC* displays the total number of data frames with the wrong KC or incorrect CRC checksum.

The decipherer on the Gr interface displays the following statistical values:

- *Total No of TAs* displays the total number of TCAP transactions already evaluated by the application.
- *Max. number reached* indicates if the maximum number of transactions has been reached (YES) or if it has NOT yet been reached.
- *TAs with Auth. Triples* indicates the total number of transactions referring to authentication requests.
- *TAs with Auth. Triples used* indicates the total number of authentication requests handled for the Gb interface.

Switch to the K15 *Monitor* window. The K15 displays the signaling data on the Gb interface completely deciphered.

Erlang

The Erlang application is a pre-defined statistics application that measures the signaling load in the individual signaling channels.

This application analyses all protocols and protocol stacks.

Setting Up an Erlang Application. To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *Erlang* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *Erlang* dialog box opens. The *Logical links* group box contains a list of all logical links and protocol stacks contained in the source or recording file.

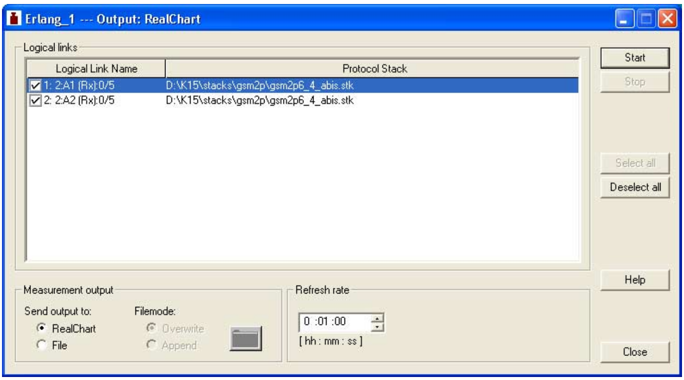


Figure 64: Erlang dialog box

3. Specifiy for which logical links the Erlang measurement is to be carried out by clicking the check boxes next to the respective links.

   A checkmark indicates that the link is selected. Using the *Deselect all* and *Select all* buttons, you can reverse or assign the entire selection.

4. Specify a time period in which the measured values are to be read out in the *Refresh rate* field.
5. Select one of the options under *Send output to*. *Real Chart* transfers the results of the Erlang application to the RealChart tool. *File* saves the results in a *.csv (Comma Separated Value) file.

6. If you want to save the data in a file, determine whether they are to be written in a new file or in an existing one under *Filemode*.

   To select location or file, click the *File* button. The d:\k15\log directory opens. You can create a new *.csv file or select an existing one.

7. Confirm with **Start**.

Evaluating an Erlang Application. The results of the Erlang application can be transferred to the RealChart tool or saved in the *.csv (Comma Separated Value) file format. *.csv files can be read in again by the CDR Viewer (see page 254) or by many other programs, such as Microsoft-Excel.

After starting an Erlang application, RealChart starts up, displaying the measured values in tables and bar charts. The values are refreshed and the diagrams drawn new for each time period.

Table rows include the recording date (the time at which data were received), the starting time of each interval, the Erlang value for each logical link and the average Erlang value per interval. You can adapt the diagram display to your individual requirements.

You can save the data, export them into a number of database formats, and print them in RealChart. A new *RealChart* window opens for the new results, even if one has already been opened for a previous statistical analysis.

GPRS MM/SM Statistics

The GPRS MM/SM Statistics application provides you with an overview of GPRS mobility and session management procedures for the entire GPRS network.

This application analyzes all protocol stacks that use GMM/SM as a protocol layer.

Setting Up a GPRS MM/SM Application. To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *GPRS MM/SM Statistics.* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *GPRS MM/SM Statistics* dialog box opens.

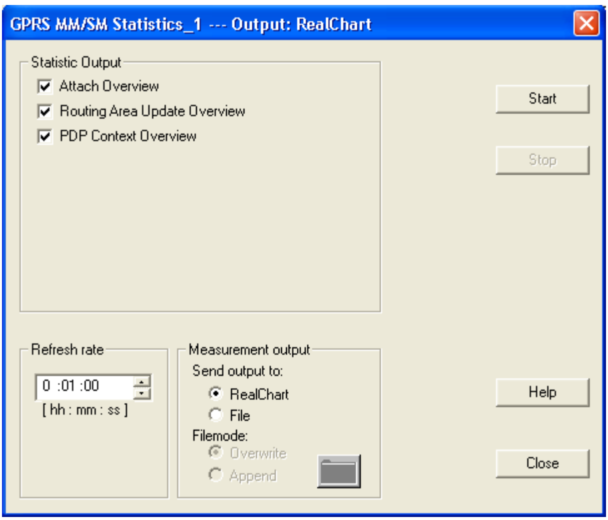


Figure 65: GPRS MM/SM Statistics dialog box

3. Determine the statistics that are to be displayed in the *Statistics Output* group box.
   - *Attach Overview* states the relation between the requested connection setups (Attach Req.) and those that are accepted (Attach Accept) or rejected (Attach Rej.). For this purpose, the MTRQ (Attach Request), ATAC (Attach Accept) and ATRJ (Attach Reject) messages are evaluated.
   - *Routing Area Update Overview* shows the temporal course of routing messages. These messages show all changes in the routing area of an MS (Mobile Station) within a GPRS network. For this purpose, the RARQ (Routing Area Update Request), RAAC (Routing Area Update Accept) and RARJ (Routing Area Update Reject) messages are evaluated.
   - *PDP Context Overview* shows the temporal course of the PDP context connections. For this purpose, the APCR/RPCA (Activate PDP Context Request/Request PDP Context Activation), APAC (Activate PDP Context Accept), APRJ/RPCR (Activate PDP Context Reject/Request PDP Context Activation Reject) and MPCA/MPCR (Modify PDP Context Accept/Modify PDP Context Request) messages are evaluated.
4. Determine a time period in which the measured values are to be read out in the *Refresh rate* field.
5. Select one of the options under *Send output to*. *Real Chart* transfers the results of the Erlang application to the RealChart tool. *File* saves the results in a *.csv (Comma Separated Value) file.
6. If you want to save the data in a file, determine whether they are to be written in a new file or in an existing one under *Filemode*.

   To select location or file, click the *File* button. The *d:\k15\log* directory opens. You can create a new *.csv file or select an existing one.
7. Confirm with **Start**.

Evaluating a GPRS MM/SM Application. You can follow the evaluation of the results in real time in the RealChart tool. After starting the application, RealChart starts up, displaying the measured values in a table. Per interval, one new table line with the current values is output.

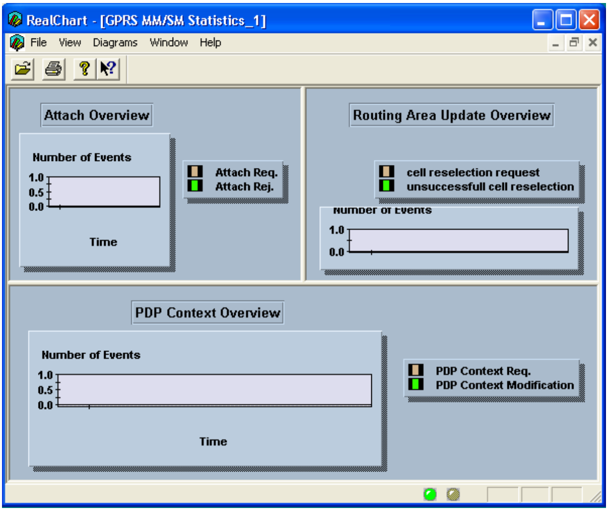


Figure 66: Evaluating a GPRS MM/SM application

The window gives you an overview of the individual protocols and messages. Three different representations are available:

- The *Attach Overview* displays the relation between the requested, accepted and rejected connection setups.
- The *Routing Area Update Overview* shows the temporal course of routing messages.
- The *PDP Context Overview* shows the temporal course of the PDP context connections.

You can choose between displaying the *Number of Events* or the data volume of data transmitted thereby in bytes (Volume of Events).

GPRS-Gb Analyzer

The GPRS-Gb Analyzer application provides you with an overview of the GPRS connections and requested connections, as well as their ”Quality of Service Parameters” (QoS).

The data can be analyzed statistically during the current measurement. Filters can be set to exclude data of minor interest. The results of the GPRS-Gb Analyzer can be saved in a statistics file for later evaluation.

Setting Up a GPRS Gb Analyzer Application. To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *GPRS-Gb Analyzer* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *GPRS-Gb Analyzer* main window opens.

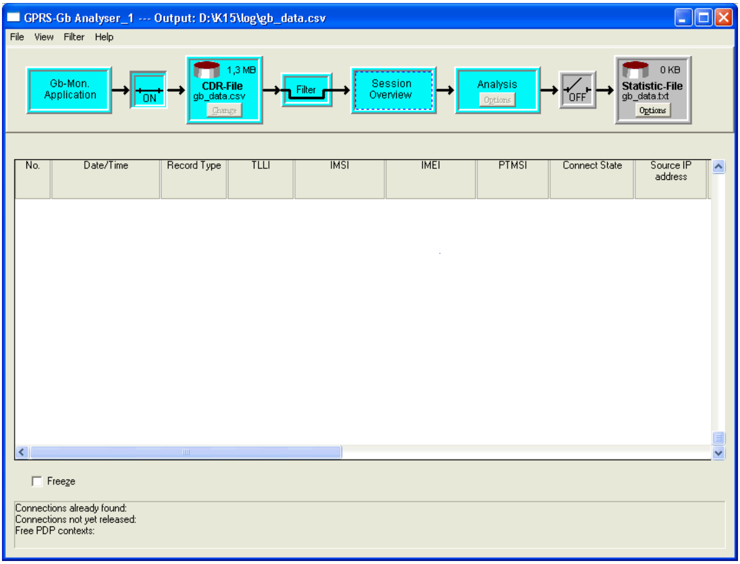


Figure 67: GPRS-Gb Analyzer main window

The current GPRS-Gb Analyzer pipeline will be displayed in the upper section of the main window. This visualizes the current configuration. Each processing element represents a part of the application.

The application is configured, started and monitored in this window.

3. Switch off the *On/Off* switch in the GPRS-Gb Analyzer pipeline next to the CDR File processing element. The *Start* dialog box opens.

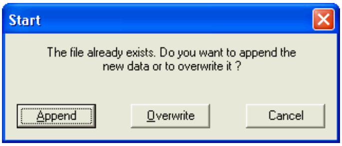


Figure 68: Start dialog box

Select *Append* if you want to add the new data to the end of the file or select *Overwrite* if old data can be overwritten.

4. Switch on the *On/Off* switch next to the *CDR File* processing element. The contents of the CDR file are displayed in the *GPRS-Gb Analyzer* main window.

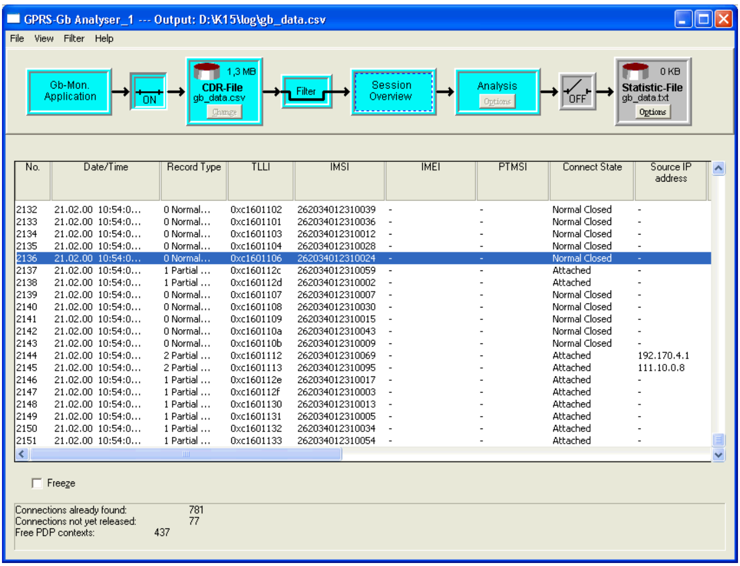


Figure 69: Loaded GPRS Gb Analyzer

5. To define filter options, click the *Filter* processing element in the GPRS-Gb Analyzer pipeline. The *Filter settings* dialog box opens.

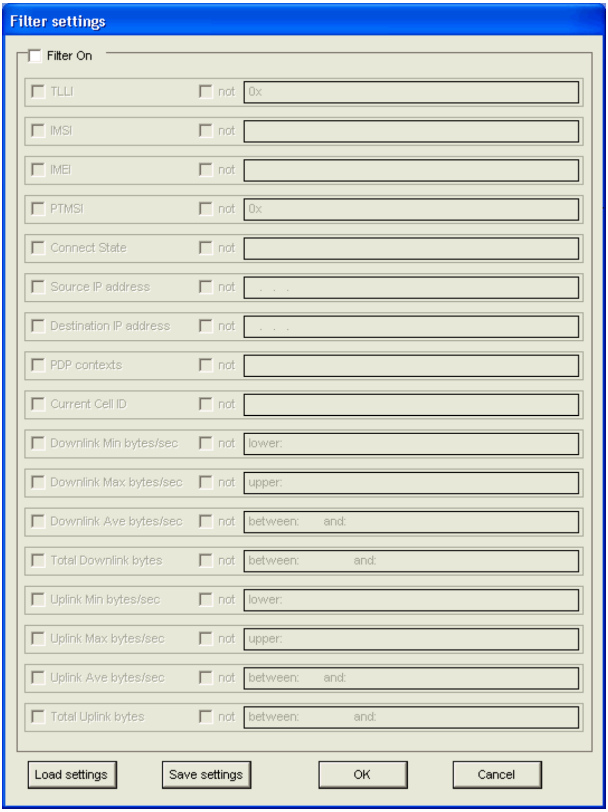


Figure 70: GPRS-Gb Analyzer, Filter settings dialog box

Activate the *Filter On* check box and configure your desired filter options. For further details, refer to the Online Help.

Evaluating a GPRS Gb Analyzer Application. The results from the GPRS-Gb Analyzer application are displayed in the *GPRS-Gb Analyzer* main window (see figure 69).

Each line represents the connection state for each data record or a call detail record (CDR). You can also view details of a data record from the event list. Therefore, double-click on one of the data records in the main window. The *GPRS Gb Mon Detail View* dialog box opens.

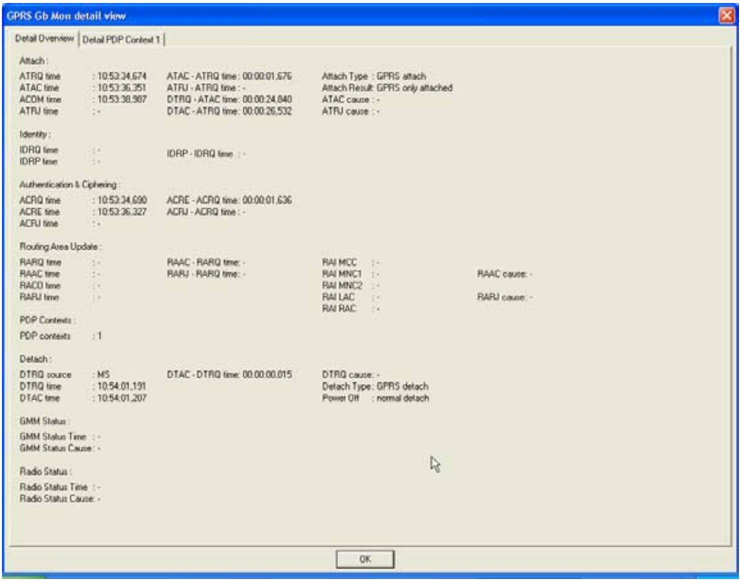


Figure 71: GPRS-Gb Analyzer, Detail view

You can also evaluate data records in the *Analysis* window of the GPRS-Gb Analyzer or record them in a statistics file as described below.

Evaluating the Results in the Analysis Window. *Analysis* is only selectable if you have installed the GPRS-Gb Analysis packet. Call up the *Analysis* window by clicking the *Analysis* element in the GPRS-Gb Analyzer pipeline.

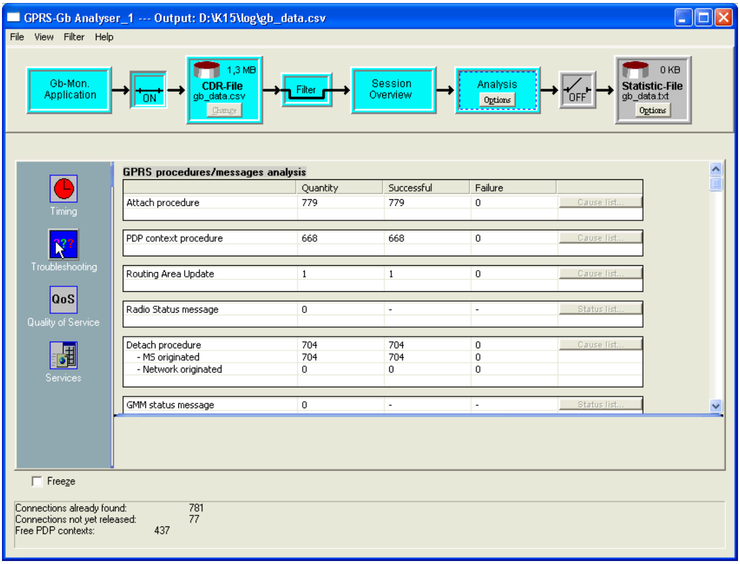


Figure 72: GPRS-Gb Analyzer, Analysis window

This window enables access to the following evaluations: Timing, Troubleshooting, Quality of Service and Service statistics. Select one of these statistics by clicking the corresponding button on the left toolbar of the *Analysis* pane.

You can also analyze failure causes in detail. To do this, click on the *Cause list* button next to the corresponding list entry. The *Cause List* dialog box opens displaying the detailed list of failure causes.

For further evaluation, select one or more specific causes from the list. Activate the appropriate check box of the desired entries. The *Matched Causes* dialog box opens. A list of assigned data records and their parameters will be displayed for each selected failure cause.

Evaluating the Results by Writing them in a Statistics File. The statistics created by the Analysis can be written in a statistics file. If you have configured a filter, only the data that were able to pass this filter will be stored in the file.

Supported output formats are *.txt and *.xml. You can open a statistics file from an external program that supports the formats *.txt or *.xml. For further information, refer to the appropriate topics in the Online Help.

To write the analysis in a statistics file, click the Options button of the Statistics-File processing element. The *Statistics File Option* dialog box opens.

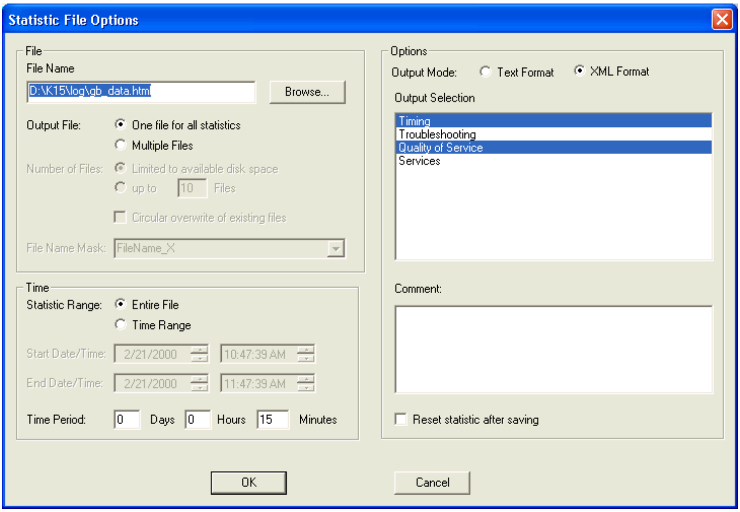


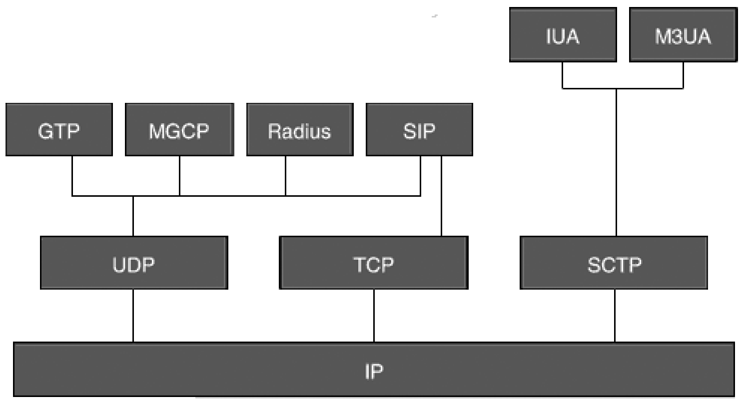
Figure 73: GPRS-Gb Analyzer, Statistics File Option dialog box

Define your desired statistics files in this dialog box. For further information, refer to the Online Help.

IP Traffic Analyzer

The IP Traffic Analyzer shows active communication flows characterized by IP addresses or specific protocol features over an IP network at high level. If you configure the filter object in the K15 main application you can monitor only the IP traffic of interest.

The application recognizes traffic types with the following protocols:



The application supports the following configurations:

- GPRS and GPRS_IP with GB_IP (NS_IP) and Gn with GTP;
- IPS7 (MAP_IP over SCTP)
- VoIP systems running MGCP and SIP

Setting Up an IP Traffic Analyzer Application. To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *IP Traffic Analyzer* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *IP Traffic Analyzer* dialog box opens.

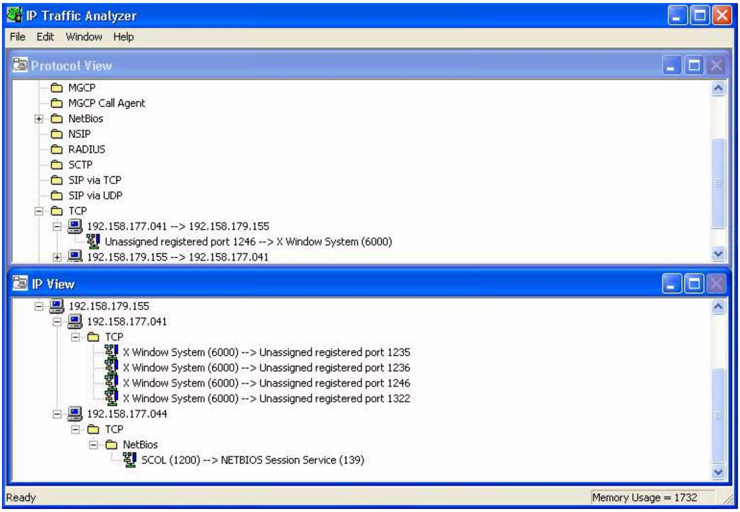


Figure 74: IP Traffic Analyzer dialog box

3. Configure the application to display protocols using static port numbers running on top of SCTP, TCP, and UDP in their own folder.

4. Edit the *protocols.txt* under *d:\k15\app\IpFlowAnalyzer* as shown in the following example:

```
UDP ”GTP”                3386
UDP ”MGCP”               2427
UDP ”MGCP Call Agent”    2727
UDP ”SIP”                5060
UDP ”RADIUS”             1812
#UDP ”MIP”               434
#UDP ”IKE”               500
TCP ”SIP”                139
SCTP ”IUA”               9900
#SCTP”M2UA”
SCTP ”M3UA”              2905
#SCTP”SUA”
#SCTP”NSIP”
```

   The first column must include the word ”UDP”, ”TCP”, or ”SCTP” to distinguish the transport protocol. The next column must contain a quoted string to use in the display. The last column is a decimal port number for the protocol. Lines beginning with ”#” are considered comments.

5. If needed, edit the *port-numbers.txt* under *d:\k1297\app\IpFlowAnalyzer*.

   TCP and UDP port numbers are translated to names from the IANA list at http://www.isi.edu/in-notes/iana/assignments/port-numbers. The *port-numbers.txt* is a copy of this list. It is scanned at program start up.

6. For further settings, select *Configure* from the *Edit* menu. The Configure dialog box opens.

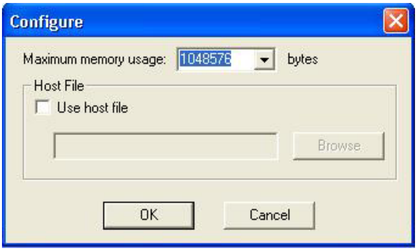


Figure 75: Configure dialog box

If your memory capacity is limited you can reduce the memory usage on the measurement card configured as master, using the *Maximum memory usage* field.

If you have a host file, click *Use host file*, and enter the name. IP addresses will be resolved to names.

Evaluating an IP Traffic Analyzer Application. You can follow the evaluation of the results in real time in the *Traffic Analyzer* dialog box.

The *Protocol View* is used to focus on protocol usage between computers. All computers using the listed protocols will be displayed in the protocol folder.

In the *IP View*, the first leaf is a sending computer. The child leaf shows the computer the sending computer is communicating with. The child leaf of the receiving computer shows the protocols the computers are using.

Iub Monitor

The Iub Monitor application monitors signaling data of the control plane on the Iub interface (between RNC and Node B) in UMTS networks.

It monitors dynamically opened AAL2 links on the Iub interface. For that purpose, it traces NBAP, ALCAP (AAL2L3), and RRC signaling data on the Iub control plane.

The Iub Monitor application runs only on STM-1 or E1/DS1/J1 line interface modules. It can only be started once per pipeline to ensure that a dynamic channel is only opened once within the respective pipeline. This procedure prevents the occurrence of resource problems.

In offline pipelines, logical links can not be opened dynamically.

Preparing an Iub Monitor Application. To prepare an Iub Monitor Application, proceed as follows:

1. Connect the STM-1 or E1/DS1/J1 line interface for passive monitoring (refer to the User Manual, chapter *Getting Started* for further details).
2. Configure the software according to the connected lines in the *Ports Setup* dialog box (see figure 6). For example, connect downlink direction to port A1 and uplink direction to port A2.
3. Configure an *Online Monitoring* pipeline.
4. Configure the *Source* processing element: In the *Logical Link Setup* dialog box, create Control Plane links (NBAP and ALCAP) for all connected NodeBs.

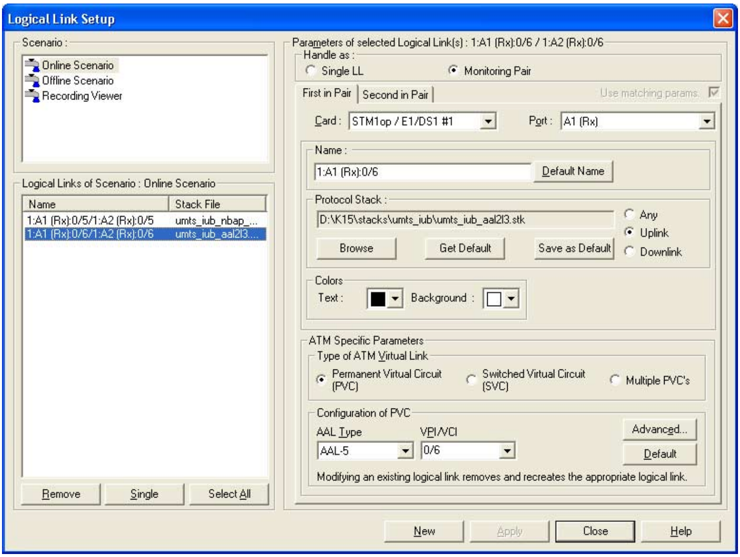


Figure 76: Logical link setup for Iub Monitor

5. Save the configuration in a *.s file.

6. In the *Logical Link Setup* dialog box, create the fixed Common Transport Channels for each cell of a NodeB. Take care of direction and port. PCH and FACH are downlink channels, RACH is an uplink channel.

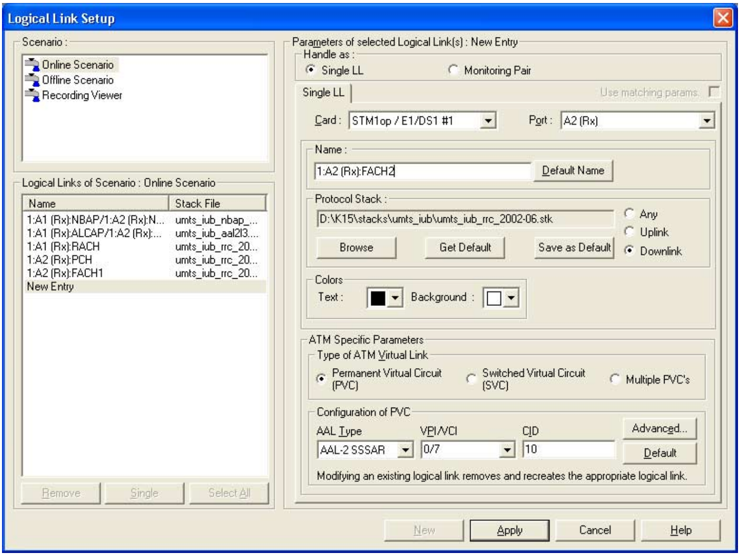


Figure 77: Logical Link Setup dialog box

Since these links are unidirectional and fixed they can be created as Single PVC (Permanent Virtual Circuits) links.

As these links are carried over the bi-directional Frame Protocol (FP) on the Iub interface, you can configure them as bi-directional to get the complete FP information.

7. To get the complete FP information, click **Advanced**. The *Advanced LL Settings* dialog box opens.

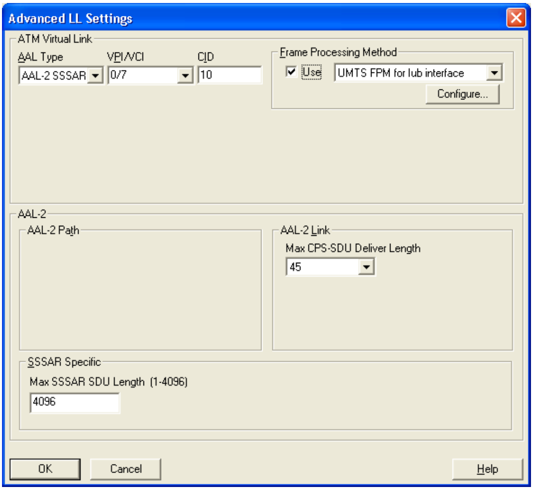


Figure 78: Advanced LL Settings dialog box

8. Select the box for UMTS Frame Processing Methods in the *Advanced LL Settings* dialog box. The *Edit Frame Processing Parameters for IUB Interface* opens.

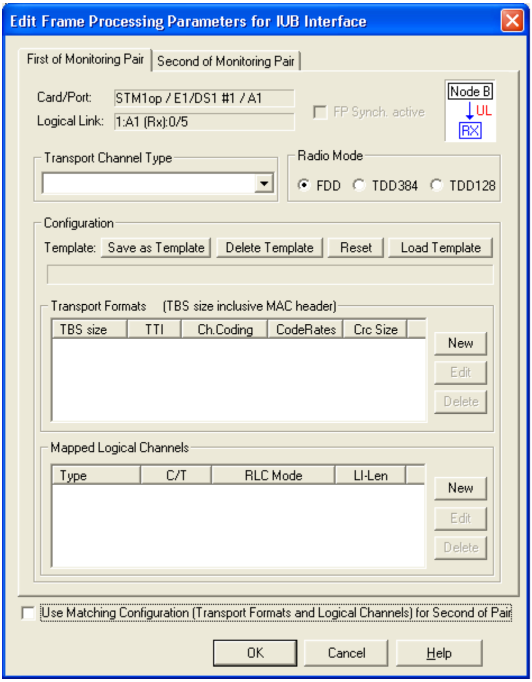


Figure 79: Edit Frame Processing Parameters for IUB Interface dialog box

9. Edit the Frame Processing Parameter for the Iub interface. Refer to the Online Help for further details.

10. Save the configuration in a *.s file.

Setting Up an Iub Monitor Application. Set up the application as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *Iub Monitor* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *Iub Monitor* dialog box opens.
3. In the *Common Config* tab, select the configuration mode and a protocol stack file for the dynamically opened channels (refer to the Online Help for further details).

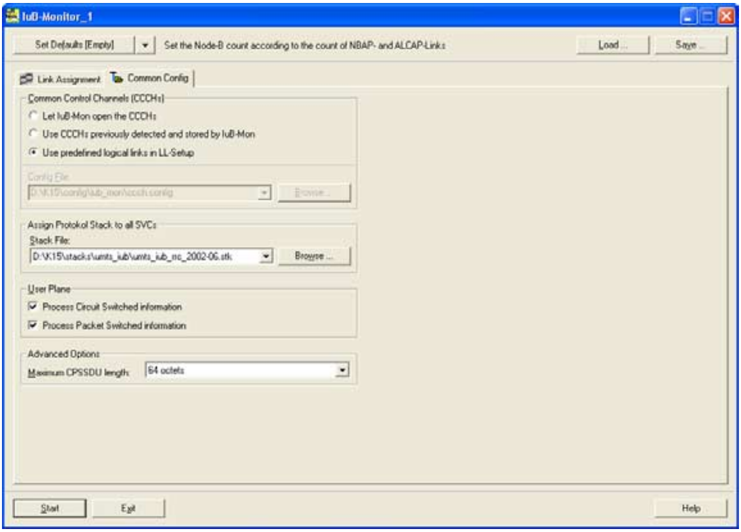


Figure 80: Iub Monitor dialog box, Common Config tab

4. In the *Link Assignment* tab, change the number of Node B devices. For each Node B you must assign the NBAP Rx link pair, the ALCAP Rx link pair and the appropriate Node B path mapping (refer to the Online Help for further details).

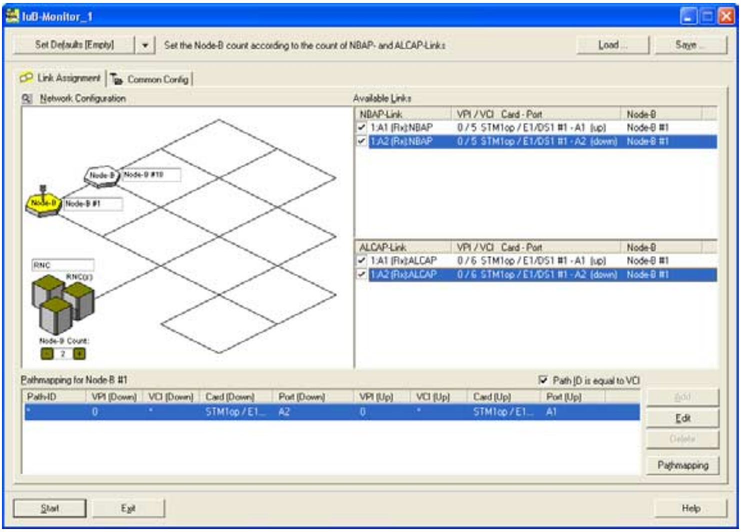


Figure 81: Iub Monitor dialog box, Link Assignment tab

5. Click **Start** to start the Iub Monitor application.

Control Iub Monitor Applications. Control the Iub Monitor application with the following commands:

- *Start*, to activate the application.
- *Exit*, to terminate the application. The current measurement is continued without any interruptions. Dynamic channels can not be opened and closed any more.

***NOTE**. If you terminate the Iub Monitor application, all channels opened from the Iub Monitor application will be closes and the created SVC links are deleted. If you open the pipelines ON/OFF switch during the measurement, the DCH channels (RACH, FACH, PCHs) will stay active.*

The Iub Monitor configuration is stored in the setup file of the measurement scenario. Two buttons are available in the upper right corner of the *Iub Monitor* dialog box for manual operation:

- *Load*, to load a previously saved Iub Monitor configuration (*.iux)
- *Save*, to save the Iub Monitor configuration

***NOTE**. The parameters for the Iub Monitor applications can not be changed during the measurement. To change the settings, you must exit from the application (command Exit). Restart it after the settings have been changed.*

Evaluating an Iub Monitor Application. You can view the history of the protocol trace in the *Monitor* window. If you notice the correct signaling on the configured SVC links, the IubMon application is up and running.

NFN (Nortel Frame Number)

The Nortel Frame Number application calculates the Frame Number (FN) implicitly contained in the data flow from the following parameters in the data flow: Multi Frame Number (MFN), Block Number (BN) and Number of Idle Bursts (Nib).

The calculated Frame Number (FN), status and error messages are fed into the pipeline as text messages and can be evaluated in the monitor.

The Nortel Frame Number application can only be used for GPRS Nortel-type protocols. When used with other protocols, error messages (sync lost) will generally appear on the monitor. In this event, reconfigure the data source (Source or Recording File), by assigning different stacks.

The applicable protocol-stack files are:

abis_nt_31_99_d.stk	abis_nt_31_99_u.stk
abis_nt_32_99_d.stk	abis_nt_32_99_u.stk
abis_nt_smg28_d.stk	abis_nt_smg28_u.stk
abis_nt_smg29_d.stk	abis_nt_smg29_u.stk
Abis_nt_smg30_d.stk	abis_nt_smg30_u.stk
Abis_nt_smg31_d.stk	abis_nt_smg31_u.stk

Setting Up an NFN Application. To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *NFN* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *NFN* dialog box opens.

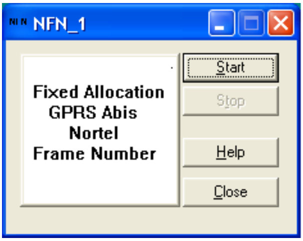


Figure 82: NFN dialog box

3. Start the application.

Evaluating an NFN Application. The Nortel Frame Number application feeds the calculated frame number (FN) and the status and error messages as text messages into the pipeline. The messages can be evaluated in the monitor.

The following text messages may be displayed:

- *try to sync*: Synchronization is started
- *FN*: Calculated frame number
- *sync lost*: The synchronization was lost
(Parameter BN is in the wrong sequence, e.g. due to transmission error or the wrong protocol stack). Synchronization is restarted.
- *MFN check ok*: The plausibility check returns no errors.
- *MFN check failed*: The plausibility check using the parameter multi frame number (MFN) in block 0 failed.

PCR (Preventive Cyclic Retransmission)

The PCR application enables you to filter out repeated MSUs from an offline pipeline by means of the PCR procedure (preventive cyclic retransmission). You may want to remove these messages in order to obtain a smaller amount of data consisting of relevant data.

The use of this application only makes sense for offline pipelines if the recording file contains non-suppressed PCR MSUs. In online pipelines, the logical link can remove the PCR MSUs.

The application can be applied for all MTP-based protocols.

Setting Up a PCR Application. To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *PCR* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *PCR* dialog box opens.

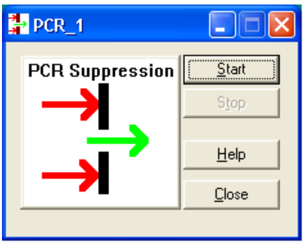


Figure 83: PCR dialog box

3. Start the application. All PCR MSUs are now suppressed during your measurement.

Service Profile Statistics

The Service Profile Statistics application provides you with an overview of the IP-based TCP and UDP protocols' service profiles.

The availability of the specific protocol layer in the protocol stack used is a condition for the use of the Service Profile Statistics application: The TCP or UDP protocol must, as a rule, be in the protocol stack. If this is not the case, you will be informed accordingly.

NOTE*. Only when the above-stated protocol layers are in the stacks of the configured links can the Service Profile Statistics application be started. Otherwise, configure the data source again (Source or Recording File), by assigning different stacks.*

Setting Up a Service Profile Statistics Application. To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *Service Profile Statistics* in the dialog box. The *Service Profile Statistics* dialog box opens.

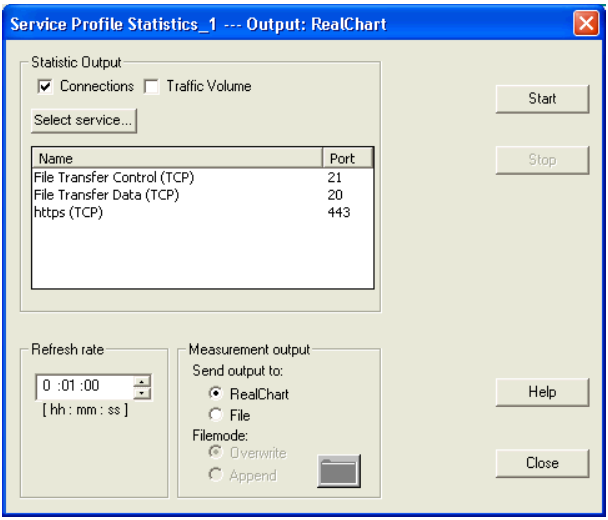


Figure 84: Service Profile Statistics dialog box

3. Select services to be taken into account when displaying results. Therefore, click the *Select Services* button. The *Service Profile Output Configuration* dialog box opens.

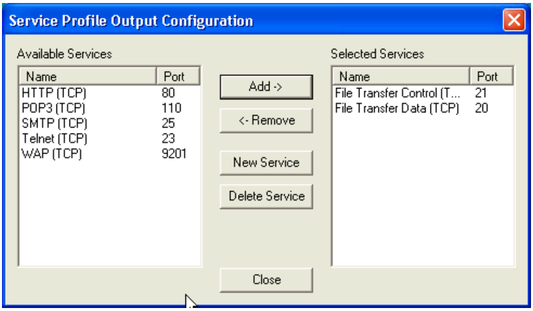


Figure 85: Service Profile Output Configuration dialog box

Confirm your settings with Close and go back to the *Service Profile Statistics* dialog box.

4. In the *Service Profile Statistics* dialog box, select the statistics that are to be displayed from the *Statistics Output* list:

- *Connections* shows the temporal course of connections to the selected services. These statistics are only displayed for services of the connection-oriented TCP protocol.
- *Traffic Volume* shows the temporal course of the data throughput of the selected services.
- Use *Select Service* to define the services to be displayed: The current output configuration is displayed in the list view. The service designation, port number and protocol specification (TCP or UDP) are displayed for each activated service.

5. Determine a time period in which the measured values are to be read out in the field *Refresh rate*.
6. Select one of the *Send output to:* options under *Measurement output*.
7. If you want to save the data in a file, determine whether they are to be written in a new file or in an existing one under *Filemode*. The *Overwrite* option creates a new file or overwrites an existing one. The *Append* option adds data to an existing *.csv file.

   To select location or file, click the *File* button. The *d:\k15\log* directory opens. You can create a new *.csv file or select an existing one.
8. Confirm with **Start**.

NOTE. *The parameters for the Service Profile Statistics cannot be changed during the measurement. To change the settings, the application must be stopped (command:* Stop*) and then restarted after the changes have been made.*

Evaluating a Service Profile Statistics Application. You can follow the evaluation of the results in real time in the RealChart tool. Per interval, one new table line with the current values is created.

Depending on the settings in the *Statistics Output* list of the main window, the service utilization is displayed in the respective charts:

- If the option *Connections* is activated in the main window, the *Number of connections* chart is displayed. An individual value is shown for each service selected in the output configuration.
- If the option *Traffic Volume* is activated in the main window, the *Volume of service* chart is displayed. An individual value is shown for each service selected in the output configuration.You will find further notes regarding the representation of the tables and graphics in the *RealChart* section on page 233.

In the *Service Profile Output Configuration* dialog box you can select the services to be taken into account when displaying results (refer to the Online Help for further details).

Statistics

The Statistics application allows you to evaluate and graphically display received signaling data or data from a recording file on the basis of different configured *counters* in real time.

Counters are changeable criteria that you must configure before starting the application. They are are based on specific protocols, logical links, errors, and/or frame lengths, that counts messages of this type as they are received.

The K15 reads and displays the value of each defined counter on the screen at adjustable time intervals. A separate *Statistics* dialog box and a separate *RealChart* displaying the relevant counter states are opened for each measurement task (pipeline branch).

You can use up to 50 counters in one Statistics application.

You can use the statistics application for all protocols, interfaces and networks. All measurement boards support this application.

Setting Up a Statistics Application. To use the Statistics application, create a scenario that transfers the messages received to the Statistics application. The following measurement scenarios are available for statistical analysis: Online / Offline Monitoring, Online / Offline Statistics, and Online / Offline Recording.

To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *Statistics* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *Statistics* window with *Default Configuration* dialog box opens.

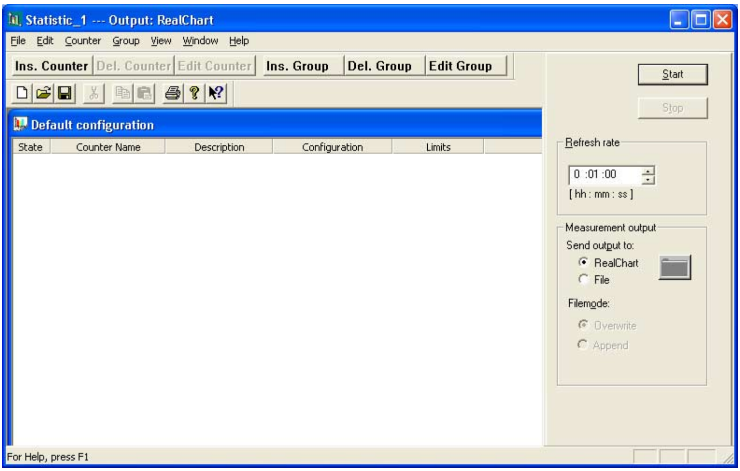


Figure 86: Statistics window with Default Configuration dialog box

3. Define a counter for each message you want to analyze.

To add a new counter, press the *Ins. Counter* button on the toolbar. The *Edit a new counter* dialog box opens.

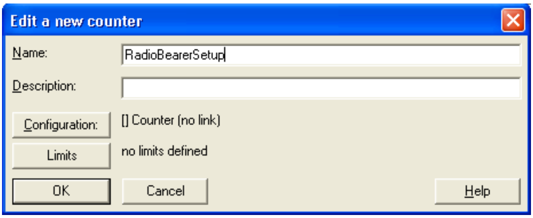


Figure 87: Edit a new counter dialog box

- Enter a short Name and Description of the counter.
- Click *Configuration* to specify the message or the event that you want to pass through the filter for this counter. The *Filter Setup* dialog box opens. The tabs in this dialog box are similar to the tabs in the *Filter Setup* dialog box and allow similar settings and selection criteria (see page 83).

  You can either select an individual message or a combination of different messages for each counter. Each data frame admitted by the filter increases the counter by one.
- Click *Limits* to define time limits.

  When you set a limit, the counter value will be tested after an adjustable period of time. If this value is greater or lesser than the limit, a trigger action will be carried out.

  Set an upper or lower limit. When doing so, activate the repeat mode of the trigger condition in the *Trigger Configuration* dialog box.
- Confirm your setting with **OK**. The *Default Configuration* dialog box displays the defined counter(s). By clicking the individual entries you can still edit the counter properties.

4. If needed, define Groups for several counters.

   You can combine several counters into a single table or diagram for display in RealChart. All counters in a diagram belong to one group, of which several can be specified.

   To define a Group, press the *Ins. Group* button on the toolbar in the *Statistics* window. Each group has a name that also serves as the diagram title. A tab is set up for each group at the bottom edge of the window.

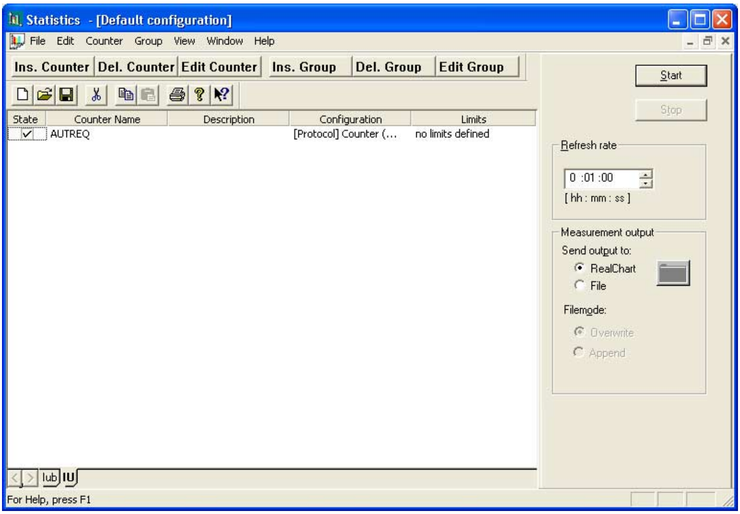


Figure 88: Statistics window with Groups

5. Set the desired time interval for the counter to tell the system when to read the counters and refresh the diagrams in RealChart. Enter the interval in the *Refresh Rate* field on the right side of the *Statistics* window.

6. Use the buttons on the right side of the *Statistics* window to define the output destination of the statistics and to start and stop the measurement.

   The default output destination is RealChart. The RealChart tool evaluates tabular data in real time and displays the results in various chart formats. You can save the data, export them into a number of database formats, and print them in RealChart.

   To set the output destination to be a file, click *Output to: File*. *Output to: File* saves the output in *.csv file format. You can determine whether the data are to be written in a new file or to be appended in an existing one:

   - Click *File.* The *\k15\log* directory opens.
   - Create a new *.csv file or select an existing one.

   The *.csv files can be read in again by the CDR Viewer (see page 254) or by many other programs, such as Microsoft-Excel.

7. Click the *Start* button to start the statistical analysis.

   You can run several statistical analyses simultaneously by configuring several pipeline branches that transfer signaling data to the Statistics application.

Evaluating Statistics with RealChart. After starting a statistical analysis, the RealChart window opens. The results for each statistical analysis are displayed in a separate window. Using a context menu you can define an individual display and diagram type for each group.

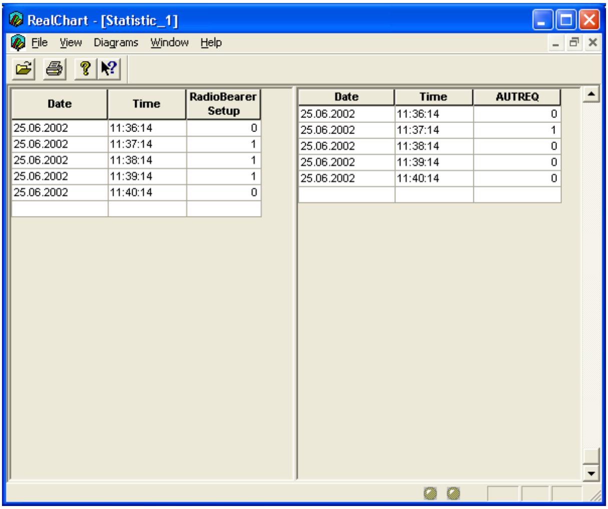


Figure 89: Possible output format of the Statistics application

You can save RealChart files and reload them as required. The standard directory for RealChart files is *d:\K15\rcdata*. Analysis files have the extension *.rcd.

Saving Statistics Configurations in the Main Program. You can also save a Statistics configuration in the setup file of the K15 main program:

- When you exit a statistics application, the application displays the following query: *Save Configuration?* Confirm the query with **Yes**. A prompt appears asking you to enter a name for the configuration.
- Enter a file name (file type *.sts) and click **Save**.

The Statistics configuration is linked to the associated pipeline. It is now saved in the setup file of the K15 main program. The next time you start this K15 setup file, the Statistics configuration is enabled automatically.

TCA (Traffic Channel Analysis)

With the Traffic Channel Analysis application you can analyze a signaling channel. The traffic channel (basic channel) assignment controlled by this signaling channel is evaluated on the basis of this channel's signaling. The application supports all ISUP/TUP/BT NUP protocols.

Setting Up a TCA Application. To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.

2. Select *TCA* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *TCA* dialog box opens.

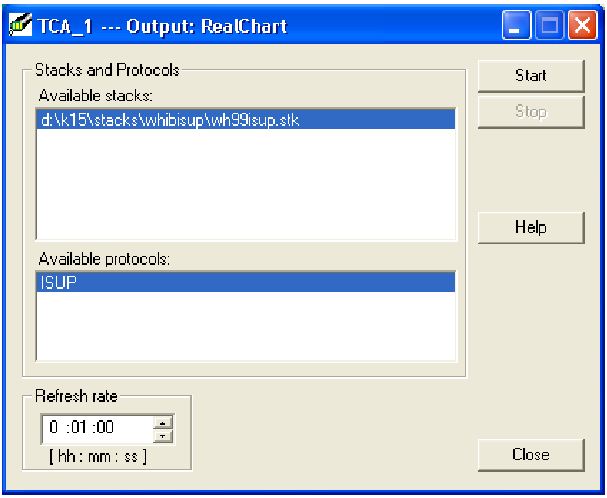


Figure 90: TCA dialog box

In this dialog box you can define the settings for the application. Two lists in the TCA dialog display the protocol stacks assigned to the data source or the recording file and the available protocols in these stacks.

3. Select the desired protocol stack in Available protocol stacks.

   The Available protocols list now displays the protocols (from this stack) that you can monitor. Select the desired protocol.

4. In the Refresh rate field, specify a time period in which the measured values are to be read out.

5. Confirm your settings with **Start**.

Evaluating a TCA Application. The RealChart tool displays the results of the Traffic Channel Analysis application in tables and diagrams. Three output formats are available:

- Table of the currently used traffic channels

  This view is displayed after the application starts. The current PCM link assignment is displayed. The view is refreshed approximately every 3 seconds, regardless which refresh rate has been set.

  For a better overview, a new line is started for every 16 PCM links. The line header indicates the range of PCM links in a line, the column header the offset.

  To find the cell for a PCM link, go to the correct line first. You will find the right column by subtracting the column beginning from the PCM number.

- Table with maximum number of traffic channels used in a specific time period

  To activate this view, click anywhere in the RealChart window using the right mouse button. In the context menu, select *Max. used Channels: Max. used Channels*.

  In this view, a new line is started for every time period (Setting the Refresh rate). Each line indicates the maximum usage of all the PCM links in this time period. Use the horizontal scroll bar to display the PCM links with higher numbers.

- Bar chart with maximum number of traffic channels used in a specific time period

  To activate this view, click anywhere in the RealChart window using the right mouse button. In the context menu, select the *Max. used Channels: Bar* menu. In this menu, choose which PCM links are to be displayed.

  The temporal development of the maximum usage of 8 PCM links is displayed. The temporal resolution of this chart is determined by the refresh rate setting. Use the horizontal scroll bar to determine which time period is displayed.

UMTS IuX Statistics

The UMTS IuX Statistics allows you to evaluate and graphically display important signaling procedures based on measurements on the Iu, Iub, and Iur interfaces.

It analyzes statistically:

- The number of call-setup procedures for the circuit-switched domain (CC_DMTAP protocol must be part of the selected protocol stack)
- The number of attach procedures for the packet-switched domain (GMM_DMTAP protocol must be part of the selected protocol stack)
- PDP context activation and modification procedures for the packet-switched protocols (GSM_DMTAP protocol must be part of the selected protocol stack)

Setting Up a UMTS IuX Statistics. To set up the application, proceed as follows:

1. Click the *Application* processing element in the pipeline.
2. Select *UMTS IuX Statistics* in the *Load / Unload Monitoring Application Programs (Mon APP)* dialog box. The *UMTS IuX Statistics* dialog box opens.

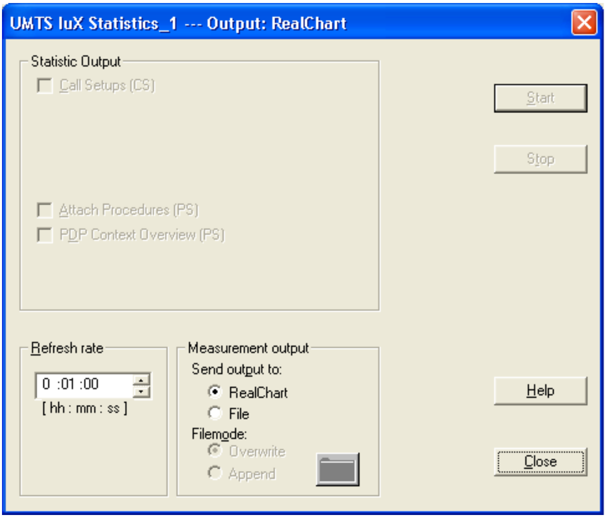


Figure 91: UMTS IuX Statistics dialog box

3. Select the type of *Statistics Output* you want to analyze in the upper pane of this dialog box.
4. Set the desired time interval for the counter to tell the system when to read the counters and refresh the diagrams in RealChart. Enter the interval in the *Refresh Rate* field on the left side of lower pane.

5. Use the check boxes on the right side of the lower pane to define the output destination of the statistics.

The default output destination is RealChart. The RealChart tool evaluates data in real-time and displays the results in various chart formats. You can save the data, export them into a number of database formats, and print them in RealChart.

To set the output destination to be a file, click *Output to: File*. *Output to: File* saves the output in *.csv file format. You can determine whether the data are to be written in a new file or to be appended in an existing one:

- Click *File* . The *\k15\log* directory opens.
- Create a new *.csv file or select an existing one.

The *.csv files can be read in again by the CDR Viewer (see page 254) or by many other programs, such as Microsoft-Excel.

6. Click the *Start* button to start the statistical analysis.

Evaluating the UMTS IuX Statistics with RealChart. After starting a statistical analysis, the RealChart window opens. The results for the statistical analysis are displayed in one of the separate windows. Using a context menu (right mouse click) you can define an individual display and diagram type for each group.

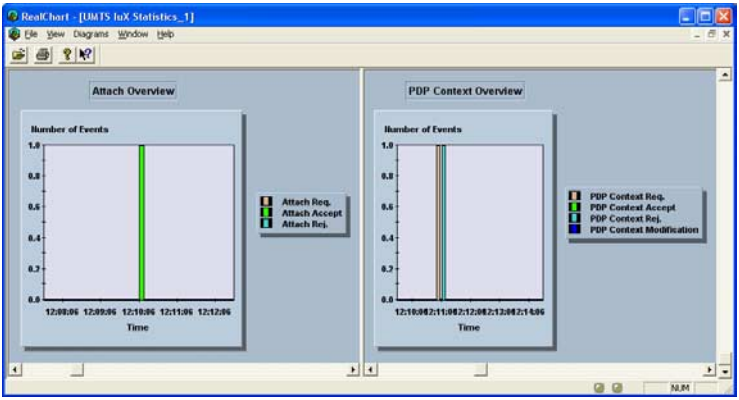


Figure 92: Possible output format of the UMTS IuX Statistics application

IMA Monitoring

IMA (Inverse Multiplexing for ATM) provides the inverse multiplexing of an ATM cell stream over up to 32 physical links and to retrieve the original stream at the far-end from these physical links. This technique involves inverse multiplexing and de-multiplexing of ATM cells in a cyclical fashion among links grouped to form a higher bandwidth logical link whose rate is approximately the sum of the link rates. This is referred to as an IMA Group.

The K15 protocol tester is able to monitor the original cell stream transferred via the different physical links of an IMA group. Several ports can be grouped together into an IMA monitoring pool. This IMA pool can then be used to create the logical links required as the data source for an online measurement scenario.

The K15 Protocol Tester monitors all higher protocol layers that are transferred via AAL-2 or AAL-5 over IMA lines (IMA Groups).

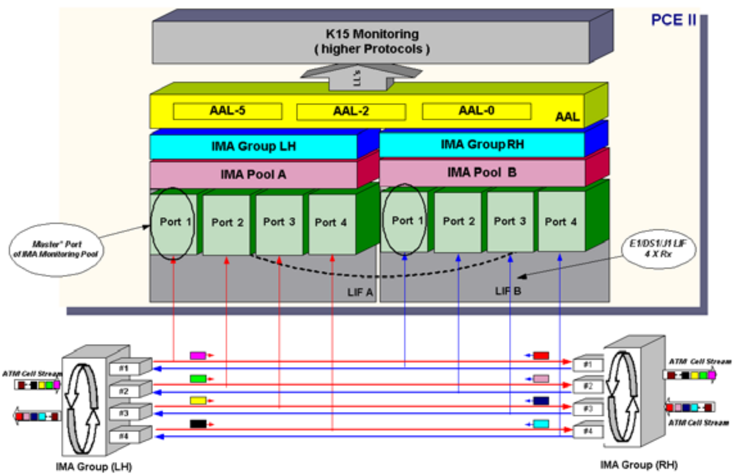


Figure 93: IMA Monitoring structure with protocol layers

Prerequisites. In order to set up IMA monitoring, the following conditions must be met:

- Your protocol tester must be equipped with a PCE-2 board combination with at least one E1/DS1/J1 monitoring line interface module.
- All physical links of an IMA group designated for IMA monitoring must be connected to the same PCE-2 board. For this reason, it is possible to monitor IMA groups with up to 16 physical links using a PCE-2 board equipped with two E1/DS1/J1 line interface modules.
- To configure IMA pools with two directions, one direction must be connected with LIF A and the other direction with LIF B.
- If you want to create an IMA monitoring pool for one of your PCE-2 board combinations, the measurement board is switched to a special IMA monitoring mode.

Setting up an IMA Monitoring Configuration. The IUT forms an IMA Group of four Rx/Tx links. To monitor both directions you must create two separate IMA pools. Using one E1/DS1/J1 LIF you create only one pool.

To set up an IMA Monitoring configuration, proceed as follows:

1. Start the K15 software and load the Default configuration. Switch to the *Cards Overview* pane in the *Data Flow* window.

2. Switch to the IMA-Monitoring mode.

Therefore, scroll down the *Data Flow* window, press the *IMA-Monitoring Mode [on/off]* button under the PCE-2 board combination.

The *K15 - Cards Overview (Information)* dialog box opens. This dialog box tells you that the PCE-2 board will be switched to the IMA Monitoring mode. Confirm this information with **OK**.

3. Open the *Ports Setup...* dialog box.

In the *Cards Overview* pane, press the *Ports Setup...* button under the PCE-2 board combination to open the *Ports Setup* dialog box. The *Ports Setup* dialog box opens.

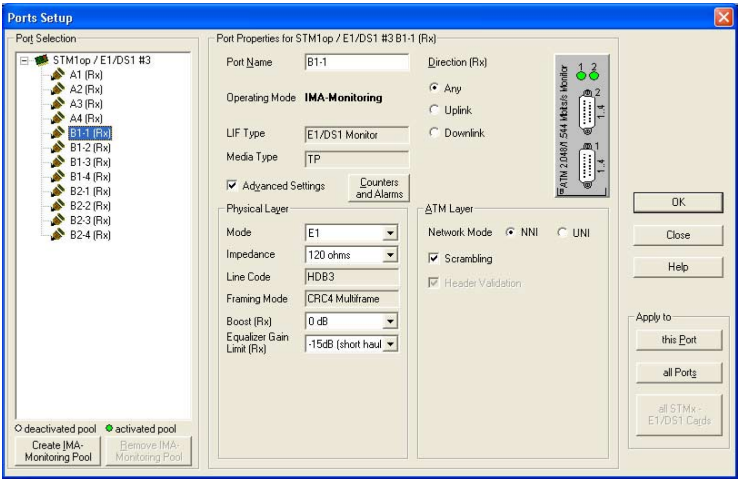


Figure 94: Ports setup for IMA Monitoring

4. Select the IMA master port in the *Ports Selection* pane.

As master port you can select each E1/DS1/J1 port in the *Port Selection* treeview list. The master port defines a number of characteristics for all IMA Monitoring pool members.

5. Press the *Create IMA Monitoring Pool* button.

The layout of the *Ports Setup* dialog box changes. A new IMA pool is inserted in the *Port Selection* treeview list. A little white circle indicates the deactivated state of the IMA pool.

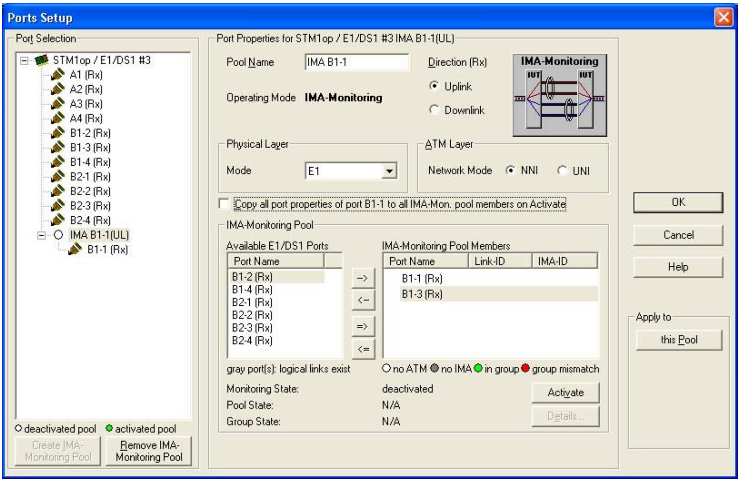


Figure 95: IMA Port parameter settings

The master port is always the first in a list of pool members (port A1 or B1). If you do not want to use this port you have to delete the whole pool. Thus, the port cannot be removed from the pool by the buttons, which are used to move port in or out of the pool.

6. Adjust the port parameter settings for the master part.

The parameters *Direction*, *Mode,* and *Network Mode* for the master port are always applied to all ports of the IMA pool.

Check *Copy all port properties...* if the remaining port properties like *Impedance*, *Boost (Rx)* etc. should be applied from the master port to the other pool members.

7. Add pool member ports to the pool.

To add and remove ports, press the arrow keys between *Available E1/DS1/J1 Ports* and *IMA Monitoring Pool Members*.

8. Press the *Activate* button and check the status of the LEDs.

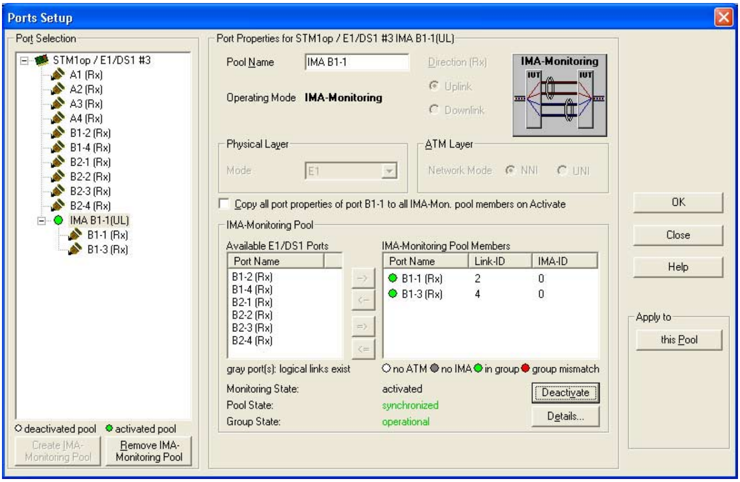


Figure 96: IMA Pool member settings

If the *Pool State* is synchronized and the *Group State* is operational the pool configuration is done.

9. Close the *Ports Setup* dialog box.

10. Switch to the *Measurement Scenarios* pane in the *Data Flow* window and open the *Logical Link Setup* dialog box.

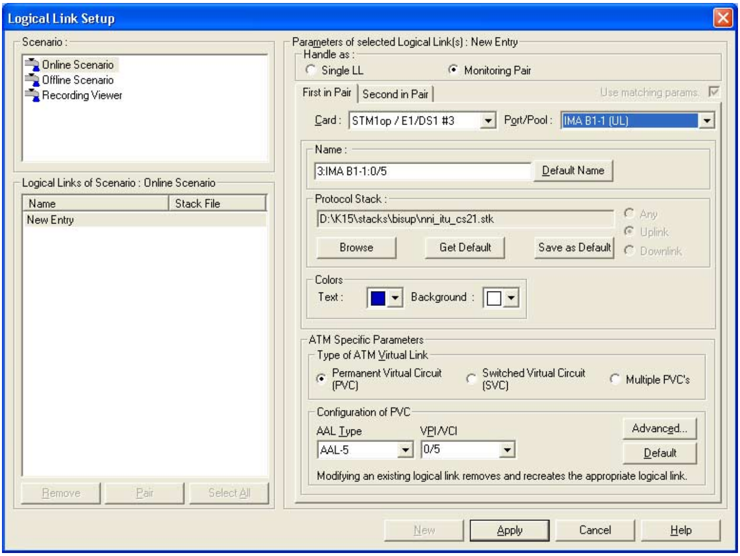


Figure 97: Logical link setup for IMA Monitoring

Select the appropriate line interface module in the *Card* field and the appropriate IMA pool in the *Port/Pool* field. Make the link settings according to your needs (Protocol stack, VPI / VCI, etc.) and press the *Apply* button. Now monitoring is possible on the IMA links.

NOTE*. If you have created only IMA pools with one direction select the Single LL radio button in the* Logical Link Setup *dialog box. Otherwise no IMA pools will be available in the list.*

Evaluating an IMA Monitoring Application. After setting up your IMA monitoring configuration, switch back to the K15 Data Flow window and activate your pipeline. Click the *Monitor* processing element to open the *Monitor* window. The Monitor displays the IMA traffic according to your configuration.

Additionally, the *Ports Setup* dialog box displays a summary of status information for activated IMA pools. These status information are queried from the measurement boards and continuously updated.

To evaluate an IMA Monitoring application in the Ports Setup dialog box, select one IMA pool entry from the *Port Section* treeview list. The *IMA Monitoring Pool* part of the dialog box displays the desired status information:

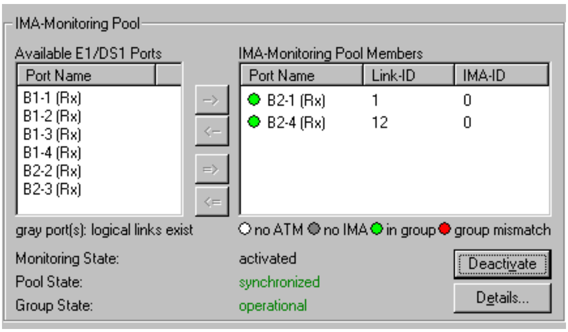


Figure 98: IMA Monitoring Pool part of the Ports Setup dialog box

The states of the individual ports are displayed in the *IMA-Monitoring Pool Members* list. The IMA pool/group status will be displayed in the *Monitoring State, Pool State* and *Group State* indicator fields.

For further details click the *Details* button. The *IMA Statistics Overview* dialog box opens.

Tools

The protocol tester is delivered with a number of supplementary analysis programs that you can run simultaneously with the main application. Tools are available via the K15 *Tools* main menu or in the *d:\K15\Tools* or *d:\K15\bin* directory. The following tools are available:

Table 3: K15 Tools

Tool	Function	Where to start
PCM Autoconfiguration	Creates online scenarios to monitor signaling traffic on Power Wan and Power Light boards	Tools main menu
Iub Autoconfiguration	Creates online scenarios to monitor signaling traffic on PCE-2 board combinations for the Iub interface	Tools main menu
Traffic Analyzer	Provides traffic information about each connected ATM line	Tools main menu
Load Meter	Provides information about the status of the overall system (hardware and software)	Tools main menu
RealChart	Displays data collected by Statistics applications graphically	Tools main menu
Key Manager	Administers license keys	Tools main menu
NTP Configuration	Synchronizes clocks between several PC systems	Tools main menu
Record File Merger	Summarizes recording files	d:\k15\Tools
Record File Converter	Converts the format of recording files	d:\k15\Tools
FSN Test	Analyzes Forward Sequence Numbers (FSN) in recording files with SS#7 data	d:\k15\Tools

Table 3: K15 Tools (Cont.)

Tool	Function	Where to start
CDR Viewer	Analyzes the CDR output files (*.csv) of the GPRS-Gb Analyzer and Calltrace / Sequencer applications independently of the actual application.	d:\k15\Tools
Rf5 File Mutator	Processes a source rf5 file by producing a destination rf5 file in which some confidential information (such as IMSI, IMEI, and others) are conveniently masked.	d:\k15\Tools
IP2Hex2IP	Converts IP addresses into hexadecimal values and vice versa	d:\k15\Tools
Rec2Ascii	Exports recording files into text files	d:\K15\bin
Configuration Files Packer	Archives the system configuration	d:\K15\bin

PCM Autoconfiguration

The automatic PCM configuration detects signaling traffic on Power WAN and Power WAN Light boards and creates online scenarios to monitor these data.

Autoconfiguration settings are called strategies and stored as **.stg* files under *d:K15\app\pcmcheck*

Using the *Autoconfiguration Wizard* you can limit the scan of the autoconfiguration to specific signaling types, ports, and channels and control the assignment of logical links to the online scenarios.

To run an PCM Autoconfiguration, proceed as follows:

1. Connect the Power Wan or Power Wan Light board to your IUT.
2. Select *PCM Auto-Configuration* from the *Tools* menu. The first *Autoconfiguration Wizard* dialog box opens.

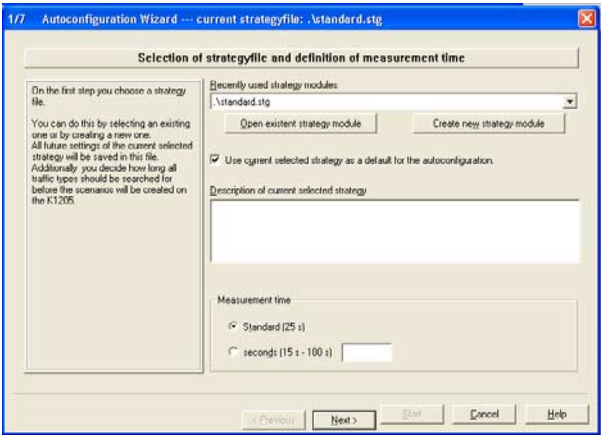


Figure 99: PCM Autoconfiguration Wizard, page 1

3. Follow the instructions on your screen. The Autoconfiguration Wizard guides you through a sequence of seven steps for the definition of the strategy. In the individual steps you can define signaling types, protocol stacks, rules for logical links, measurement scenarios and pipelines.

   You do not need to go through all of the steps. However, we recommend that you do. The more accurately you define a strategy, the more precise the autoconfiguration will be.

4. Conclude your settings by clicking the *Start* button in one of the *Autoconfiguration Wizard* dialog boxes. Autoconfiguration is now activated.

   Signaling detection can last up to three minutes. A progress indicator displays the percentage of the Autoconfiguration process.

   Once the autoconfiguration is complete, the *Traffic Analyzer* window (see figure 103) opens and displays the links detected by autoconfiguration.

5. In the *Traffic Analyzer* window, once again you can select particular links you want to configure.

   To conclude the autoconfiguration, click **Configure**. Autoconfiguration creates now the measurement scenarios according to your settings.

6. Go back to the *Data Flow* window. In the *Measurement Scenarios* tab you can activate the configured measurement scenario(s).

Iub Autoconfiguration

The automatic Iub configuration detects signaling traffic at the UMTS Iub interface for PCE-2 board combinations with E1/DS1/J1 and STM1-1 line interfaces and creates online scenarios to monitor the detected data.

***NOTE**. The Iub Autoconfiguration does not detect the type of traffic on your connected line. Thus, always make sure to be connected to an Iub interface before starting the UMTS Iub autoconfiguration.*

Autoconfiguration Wizard. Using the *Autoconfiguration Wizard* you can limit the scan of the Autoconfiguration to your specific needs. The wizard guides you to your own, user-defined Autoconfiguration. In seven steps you can define parameters that shall be detected by the Autoconfiguration. Those parameters are for instance:

- Strategy files and measurement time

  Saved autoconfiguration settings are called strategies. They are stored as **.iub* files under *d:K15\bin*

- Type of measurement scenario to be created by the Autoconfiguration
- IUB traffic types to be detected by the Autoconfiguration (NBAP, ALCAP, FACH, RACH, or PCH)
- Filter criteria on specific ports, such as Direction, VPI, VCI, or CID range
- Network parameters as RNC manufacturer, operator, maximum number of cells, and number of NodeBs
- Protocol versions and protocol stacks. Therefore the K15 provides lists of NBAP and RRC protocol versions.

To start an Iub Autoconfiguration, proceed as follows:

1. Connect the PCE-2 board combination to your IUT.

2. Select *Iub Auto-Configuration* from the *Tools* menu. The first *Iub Autoconfiguration Wizard* dialog box opens.

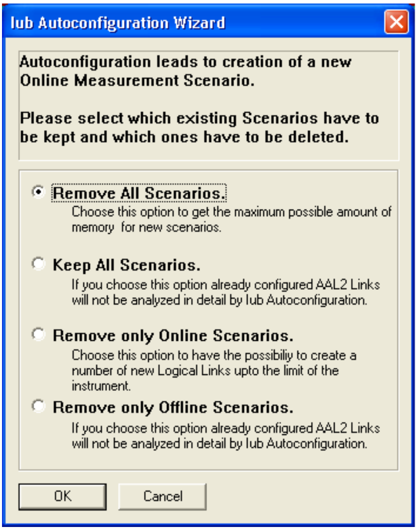


Figure 100: Iub Autoconfiguration Wizard

3. In the *Iub Autoconfiguration Wizard* dialog box, select which type of Scenario you would like to create and press the *OK* button.

   Now, the Autoconfiguration Wizard starts guiding you through the sequence of seven steps. Each step is represented by its own dialog box. Follow the instructions in these dialog boxes to define parameters for your autoconfiguration.

   Always press *Next* to enter the next dialog box.

4. Conclude your settings by clicking the *Start* button in the *7/7 Autoconfiguration Wizard* dialog box. Autoconfiguration is now configured.

Duration of signaling detection depends on your configuration. A progress indicator displays the percentage of the autoconfiguration process. Once the autoconfiguration is complete, the *Autoconfiguration Process Results* dialog box opens and displays the ATM links detected by autoconfiguration.

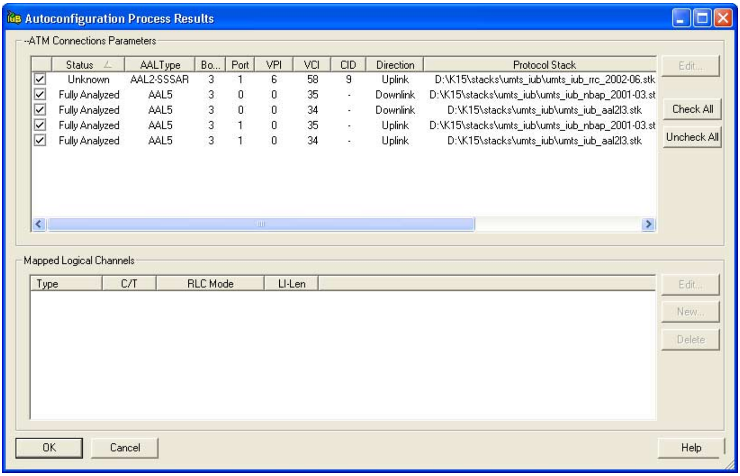


Figure 101: Autoconfiguration Process Results dialog box

The *ATM Connections Parameters* list in the upper part of this dialog box contains all parameters detected by autoconfiguration. If their status is not completely analyzed yet (see the *Status* column), you can edit these parameters by selecting some of the settings and clicking the *Edit* button on the right of this list.

The *Mapped Logical Channels* list in the lower part of this dialog box contains the parameters of the logical link channels mapped for a certain ATM channel. You can add, edit, or delete logical channels using the corresponding button on the right of this list.

5. In the *ATM Connections Parameters* list select the ATM links you want to be configured as Logical Links. Therefore select the appropriate check boxes in the first column or press the *Check All* button on the right of the list.
6. To conclude the autoconfiguration, click the *OK* button. Autoconfiguration creates now the measurement scenarios according to your settings.
7. Go back to the *Data Flow* window. In the *Measurement Scenarios* tab, the scenarios configured by autoconfiguration are displayed.
8. Start the Iub Mon application in these scenarios (see page 178). Configure the appropriate path mapping for each Node-B in the *IuB-Mon* dialog box.
9. Start the Iub Mon application manually.

Traffic Analyzer

The Traffic Analyzer tool provides traffic information about each connected line. It analyzes the traffic by channel scanners based on each measurement board.

To run the Traffic Analyzer tool, select *Traffic Analyzer* from the *Tools* menu in the K15 main window. The *Traffic Analyzer* window opens. This window looks different depending on the chosen interface. The following figure shows the *Traffic Analyzer* window for the PCE-2 boards.

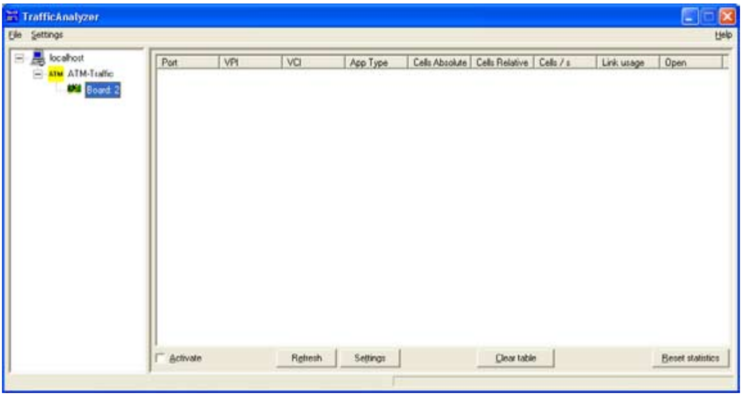


Figure 102: Traffic Analyzer window for ATM traffic

Left Window Pane. The left window pane lists the data type and all related boards.

The top level icon represents the connected protocol tester. The second level icons represent the available data types.

The lowest level shows the available measurement boards for the data type. The number of the measurement board represents the slot in which the board is installed.

To select a data type, click on the data type icon. To select a measurement board, click on a measurement board icon .

Right Window Pane. For ATM traffic, the right window pane lists the current traffic detected at the ports of the PCE-2 board. New lines are added for every ATM connection at the port. The following parameters of each link are displayed:

- *Port* displays the Port name of the PCE-2 board combination.
- *VPI* displays the value of VPIs detected on the selected port.
- *VCI* displays the value of VCIs detected on the selected port.
- CID displays the channel ID for AAL2 links.
- *App Type* displays the application type (AAL2, AAL5 or OAM) of the ATM link.
- *Cells Absolute* displays the number of received cells since the link was identified (User Cells Absolute).
- *Cells Relative* displays the number of received cells since the link was identified or since the counter was reset (User Cells Relative).
- *Cells/s* displays the number of received cells per second (User Cell Rate).
- *Link usage* displays the band with utilization of the link (Link Rate Portion).
- *Open* displays the status of the K15 measurement software (*Yes* means that the selected channel is configured as a logical link of a measurement scenario, *No* means that the channel is not activated by the K15 software).

NOTE*. If you configure several ports to form an IMA pool, only the master port will be shown in the connection table.*

For PCM traffic, the right window pane lists the current traffic detected at the ports of the Power Wan or Power Wan Light board.

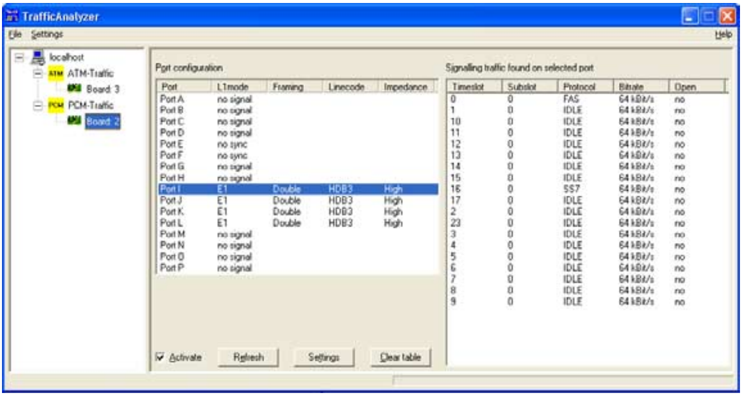


Figure 103: Traffic Analyzer window for PCM traffic

The following parameters are displayed:

- *Layer 1 mode, Framing, Linecode,* and *Impedance* for all ports.
- *Timeslot, Subslot, Protocol,* and *Bitrate* for the selected port. *Open* displays the status of the K15 measurement software (*Yes* means that the selected channel is configured as a logical link of a measurement scenario, *No* means that the channel is not activated by the K15 software).

Below the tables, a set of buttons allows you to change the display characteristics:

- Use the *Activate* option to enable or disable the traffic scanner query completely.
- Click *Refresh* to update the contents of the table.
- Click *Setting* to change the ATM Scanner Settings.
- Click *Clear* to delete the contents of the table.
- Click *Reset* Statistics to reset the statistics for each link. This will set the value shown in the Cells Relative column too.

Status Bar. The status bar at the bottom edge of the window contains information about the operational mode of the Traffic Analyzer tool.

To configure the channel scanner settings, click the *Settings* button in the Traffic Analyzer window. One of the following dialog boxes opens:

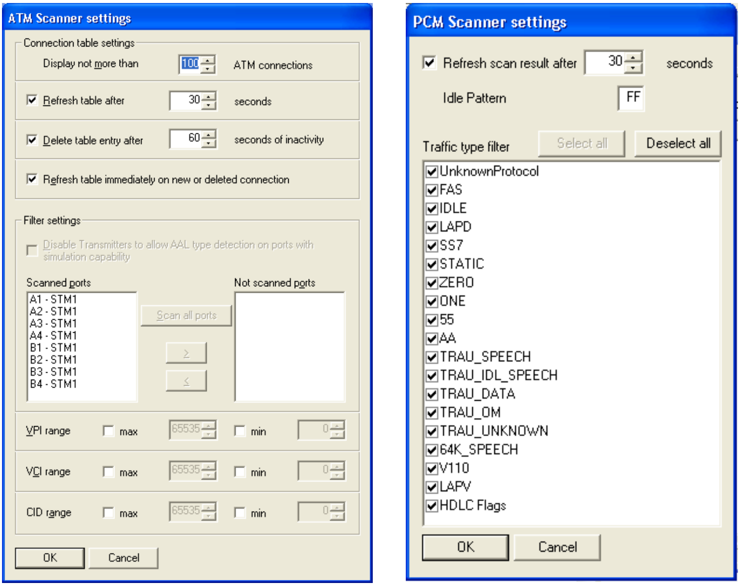


Figure 104: ATM and PCM Scanner Settings dialog box

In these dialog boxes, you can define the desired table settings and some filter limitations. For further details refer to the appropriate Online Help topics.

Load Meter

The *Load Meter* program provides capacity usage information on the individual K15 measurement boards and the PC card while running measurements.

Load Meter is automatically loaded when the main program starts. If you have deactivated the *Autostart* option, you can start Load Meter from the main program by clicking *Tools –> Load Meter.*

A window opens and displays a capacity usage bar as well as the usage in percent for each selected module.

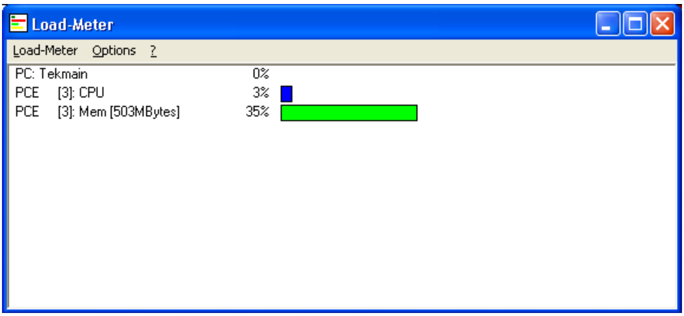


Figure 105: Load Meter window

NOTE. *If several interface cards are installed on the K15, it is best to use* ***all*** *cards* ***except for the first one*** *to receive data. The system uses the memory area of the first card to manage the specified configuration. This configuration allows the optimum load distribution even when running the links at a high load.*

In case of an overload situation (too much traffic on a link) the display will contain red bars. Then you should reduce data traffic as follows:

- Delete logical links that are not required.
- Deactivate or delete pipelines that are not required.
- Deactivate applications that are not required.
- Configure the input filter to process only the data that is relevant to the measurement.
- Deactivate one or more Triggers.

RealChart

The RealChart tool works only together with one of K15 statistics applications (Abis Mon, BHCA, CallMon, CountAll, Erlang, GPRS MM/SM, Service Profile Statistics, Statistics, TCA, or UMTS IuX Statistics).

The tool evaluates tabular data in real time and displays it on-screen in various chart formats. Using RealChart, you can visually analyze and create presentations using measurement data.

The system transfers data for statistical analysis to RealChart, which then displays it either numerically (in tables) or in line, bar, or pie charts.

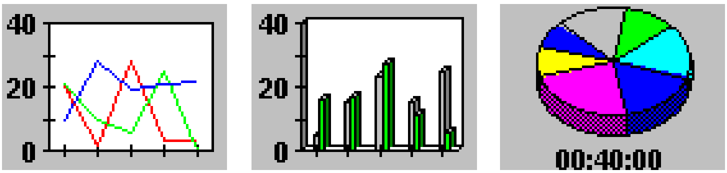
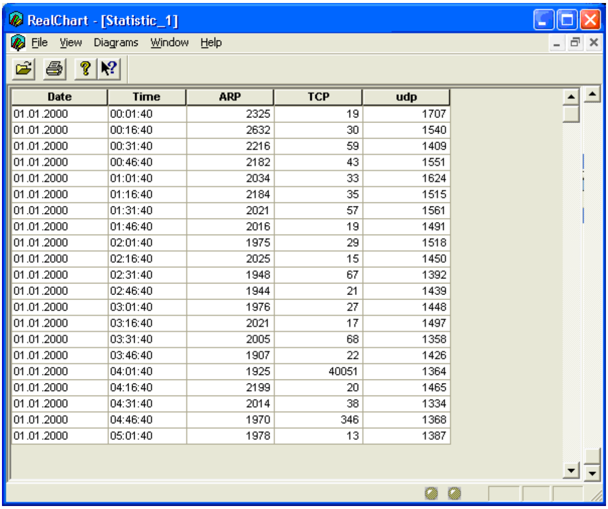


Figure 106: Real Chart diagram types

It is possible to run more than one statistical analysis simultaneously that transfer signaling data to RealChart. The results for each measurement scenario (pipeline branch) are displayed in a separate window of the RealChart program.

To run the RealChart tool, select RealChart from the Tools menu in the K15 main window. The RealChart Window opens.



Date	Time	ARP	TCP	udp
01.01.2000	00:01:40	2325	19	1707
01.01.2000	00:16:40	2632	30	1540
01.01.2000	00:31:40	2216	59	1409
01.01.2000	00:46:40	2182	43	1551
01.01.2000	01:01:40	2034	33	1624
01.01.2000	01:16:40	2184	35	1515
01.01.2000	01:31:40	2021	57	1561
01.01.2000	01:46:40	2016	19	1491
01.01.2000	02:01:40	1975	29	1518
01.01.2000	02:16:40	2025	15	1450
01.01.2000	02:31:40	1948	67	1392
01.01.2000	02:46:40	1944	21	1439
01.01.2000	03:01:40	1976	27	1448
01.01.2000	03:16:40	2021	17	1497
01.01.2000	03:31:40	2005	68	1358
01.01.2000	03:46:40	1907	22	1426
01.01.2000	04:01:40	1925	40051	1364
01.01.2000	04:16:40	2199	20	1465
01.01.2000	04:31:40	2014	38	1334
01.01.2000	04:46:40	1970	346	1368
01.01.2000	05:01:40	1978	13	1387

Figure 107: RealChart window

To define the display of RealChart diagrams, select *Properties* from the *Diagrams* menu. The *Edit Diagram* dialog box opens (refer to the Online Help for further details).

RealChart offers a number of additional display options for evaluations using the statistics application. The data values of each counter group defined in the statistics application are displayed in individual diagrams.

The *Diagrams* menu in the *Real Chart* window allows you to switch between groups and to define an individual display and diagram type for each group. Select the desired counter group in the *Diagrams* menu and the desired display in this group's submenu:

- *Number of Event*s: Shows the number of messages.
- *Volume of Events*: Shows the number of transmitted bytes.

Select a diagram type and modify the display of a diagram type via *Properties....*

To print the current view, select *Print –> Table* or *Print –> Diagram* from the *File* menu in the *Real Chart* window.

To save statistical analyses, select *Save As...* from the *File* menu. The standard directory for RealChart files is \k15\rcdata. Analysis files have the extension *.rcd

To export data in a foreign file format, choose the format in the Save as type list:

- *.csv Text file format
- *.xls Excel file format
- *.mdb Access file format
- *.dbf Dbase file format

When you reload a saved evaluation file, it appears in a new window.

Key Manager

With the Key Manager tool you can administer license keys for the K15. You can view the installed keys, add newly licensed ones and remove expired, duplicate, or invalid keys.

***NOTE**. Before using the Key Manager, please ensure that the system date has been correctly set. You can open the system calendar by double-clicking the clock in the taskbar.*

Make safety copies (for example on disk) of the licensed key files before using the Key Manager.

To call up the Key Manager tool, select the *Key Manager* entry from the K15 *Tools* menu.

The Key Manager is started. When called up by the K15 menu, the key file used by the K15 software is automatically opened.

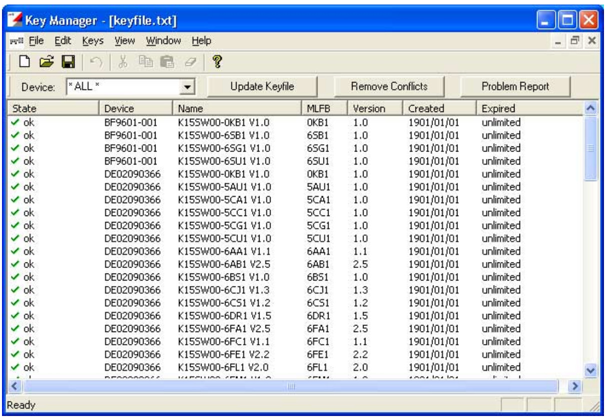


Figure 108: Key Manager dialog box

Each key is displayed in a separate line. Keys subject to a time limit, expired keys and invalid keys are displayed at the beginning of the list.

The title bar displays the number of expired, duplicate, or invalid keys.

Modified key files which have not yet been saved are displayed with the character * in the title bar. The individual columns have the following meaning:

- *State* displays the state of the individual keys. Refer to the Online Help for details.
- *Device* displays the device number (PC version: dongle number), for which the key is valid.
- *Name* displays the ordering number of the paket for which the key is valid.
- *MLFB* and *Version* display detail information about the paket.
- *Created* displays the creation date of the key. For time-limited pakets, the first valid date is displayed.
- *Expired* displays the last valid date for a time-limited key. For keys with unlimited validity, unlimited is displayed.

Updating Expired Keys. To replace expired keys with newly licensed ones or updated keys, proceed as follows:

1. Select *Open* from the *File* menu.
2. Select the *keyfile.txt* from the *c:Windows*\\ directory and confirm with *Open*.

   This way you open the key file used by the K15 software.
3. Select *Update Keyfile* from the *Keys* menu or press the *Update Keyfile* button.
4. In the *Select Keyfile for the Update...* dialog box, select the newly licensed key file, for example *a:\\keyfile.txt.*
5. Confirm the *Remove Conflicts?* query with *Yes*.
6. The Key Manager will now remove expired, invalid, and duplicate license keys.
7. Save the modified key file by selecting *Save* from the *File* menu.
8. If required, terminate the K15 software and restart it.

Creating a Problem Report. To create a key file problem report for the Tektronix Support, proceed as follows:

1. Select *Problem Report* from the *Keys* menu or press the *Problem Report* button.

   The *Keyfile Problem Report* dialog box opens, displaying a preview of the report. It displays always a problem report for the keyfile used for the current installation.

2. Press *Save*.

3. In the *Save Keyfile Problem Report...* dialog box, enter a file name and a directory for the report file, and confirm with *Save*.

4. Send the file to the Tektronix Support.

Removing Expired, Duplicate or Invalid Keys. In order to remove expired, duplicate or invalid keys from a key file, press the *Remove Conflicts* button or select *Remove Conflicts* from the *Keys* menu.

Only keys with the assigned conditions *OK* and *Limited* will remain saved. All other keys are removed from the key file.

Copying Keys. To copy keys from one key file to another:

1. Open the source and target files.
2. Arrange these two file windows in such a way that you can view them both at the same time.
3. Select one or more source keys using the keyboard or the mouse.
4. Copy the key(s) in one of two ways:
   a. Drag and drop the source file's key into the target file's window.
   b. Select *Edit: Copy* in the source file and then select *Edit: Paste* in the target file.

Deleting Keys. To delete keys, proceed as follows:

1. Select one or more source keys using the keyboard or the mouse,
2. Press < Del > or select *Erase* from the *Edit* menu.

As long as the file has not been closed, you can undo the deleting process by selecting *Undo* from the *Edit* menu.

Saving Key Files. When you have finished editing a key file, save the file. This is necessary to ensure that the modified keys will be used when restarting the K15 software.

NOTE. *No safety copies will be created by the saving process. Therefore, make sure before saving a file, that all changes made to this file are correct.*

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1. Activate the window of the file to be saved.
2. Select *Save* from the *File* menu. The key file and all changes to the file are saved.

NTP Configuration Tool

To monitor links on distant sites of a communications network it is necessary to carry out the measurement concurrently with two or more protocol testers. In order to evaluate and merge measurement data of several protocol testers, it is crucial to synchronize the system time of all involved protocol testers to a reference time source.

Windows XPe Time Synchronization. Windows XPe automatically synchronizes each system to an Internet time server. To activate or deactivate this functionality, select *Start / Control Panel / Date and Time*. The *Date and Time Properties* dialog box opens. Open the *Internet Time* tab.

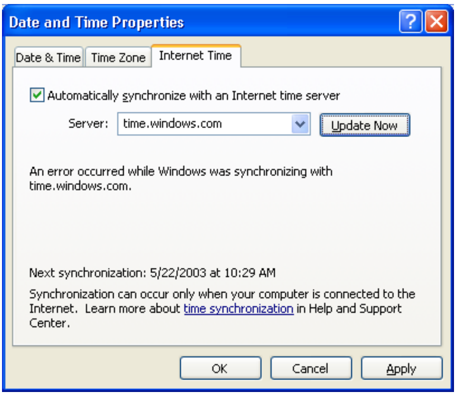


Figure 109: Date and Time Properties dialog box

The Windows XPe time service uses a subset of the Network Time Protocol (NTP) named SNTP (Simple NTP). It synchronizes only once a week.

K15 NTP Configuration Tool. If the protocol tester is connected to a TCP/IP-based network, you may operate the K15 NTP Configuration tool.

The K15 NTP Configuration tool synchronizes the clock of K15 Protocol Testers to an NTP reference clock. Using the NTP Configuration tool, it is possible to synchronize several protocol testers via the Internet and archive an accuracy of down to 10 ms.

You can use the NTP Configuration tool to continuously correct the clock of a protocol tester.

The NTP Configuration tool also runs with Windows XPe. For this purpose, you must disable the Windows XPe time service, when using the NTP Configuration tool. Disable the Windows XPe configuration tool by deselecting the *Automatically synchronize with an Internet time server* checkbox in the *Date and Time Properties* dialog box (see figure 109).

To implement an NTP configuration using the NTP Configuration tool, proceed as follows:

1. Select the *NTP Configuration* entry from the K15 *Tools* menu.

   The *Network Time Protocol - Service Configuration* dialog box opens. In the default configuration, the *Network Time Protocol - Service activation* is switched to *Off* and the list of *Used Timeservers* is empty.

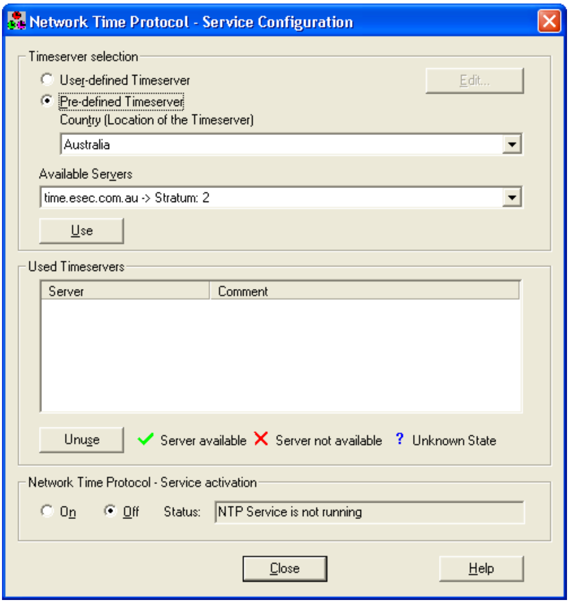


Figure 110: Network Time Protocol - Service Configuration dialog box

2. Select the *Pre-defined Timeserver* option. Select your country from the *Country (Location of the Timeserver)* list.

   The *Available Servers* list will change. Several predefined and well known time servers for your country will be offered.

3. If none of the time servers in the *Available Serveres* list suits your needs or if you want to use an Intranet time server, select the *User-defined Timeserver* option and click **Edit**.

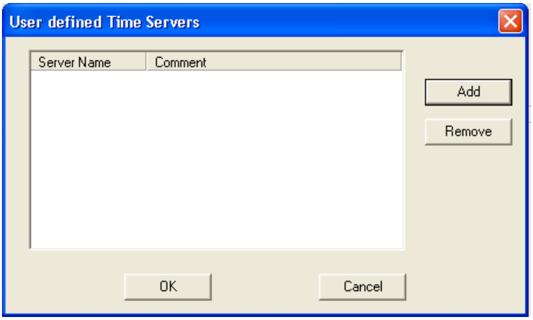


Figure 111: User defined Time Servers dialog box

4. Click **Add** to add a new entry. The *New Server* dialog box opens.

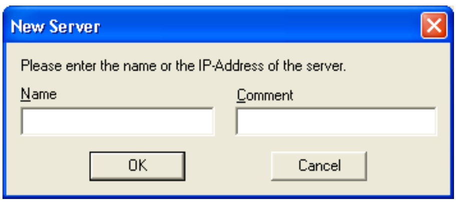


Figure 112: New Server dialog box

Enter the IP address or DNS name of the time server in the name input field. You may also specify a *Comment*. Confirm with **OK**.

The new entry is added to the *Available Servers* list in the *Network Time Protocol - Service Configuration* dialog box.

5. In the *Network Time Protocol - Service Configuration* dialog box, select one of the entries from the *Available Servers* list. Click **Use**.

   A new entry is added to the *Used Timeservers* list. A small icon will indicate the status of the new entry.

6. Activate the NTP Service. Select the *On* option under *Network Time Protocol - Service activation*.

   The NTP Service is started. The *Status* display changes. After a while, at least one of the configured servers should be displayed with the green icon. If the time difference between the local machine and the time servers is rather significant, the synchronization may take some time. If the time difference of the local machine drops below a certain value, the *NTP Service is sychronized* message will be displayed.

Time Synchronization by Other Technologies. Besides the Windows XPe time synchronization and the K15 NTP Configuration tool, you can synchronize the clocks of several PC systems by GPS-based time receivers or time receivers operating with long-wave radio (DCF77 in central Europe). You must purchase one of these receivers for each protocol tester and install the new equipment.

As an option, Tektronix offers a time synchronization kit, including GPS antenna and synchronization interface module. This kit is described in detail in the *K15 User Manual.*

Record File Merger

Using the Recordfile Merger you can merge two recording files to form a new recording file. The new file contains all the messages of the two original files.

When the recording files are merged, data from the files can be translated; for example, all the messages of a logical link can be assigned to a different timeslot and protocol stack. With this tool it is also possible to translate the data of a single recording file.

To start the Recordfile Merger, select *Run...* in the Windows *Start* menu and enter *d:\k15\tools\RecordFileMerger.exe* in the *Run* dialog box.

The *Recordfile Merger* dialog box opens.

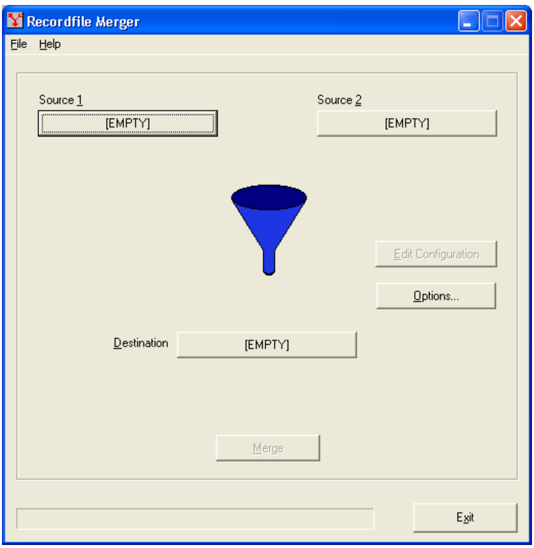


Figure 113: Recordfile Merger dialog box

Merging two Files. To merge two files, proceed as follows:

1. Select two source recording files using the *Source 1* and *Source 2* buttons. These files will not be changed.
2. In *Destination*, select the name of the destination file. The destination file will be overwritten. Therefore, do not select a source file as a destination file.
3. Select *Options* to set appropriate options.
4. Use the *Edit Configuration* button to check the options and configure a translation, if required.
5. Select *Merge* to create the destination file.

   You can analyze the destination file in an offline pipeline.

Translating a Single File. To translate a single file, proceed as follows:

1. Select a source recording file using the *Source 1* button. This file will not be changed.
2. In *Destination*, select the name of the destination file. The destination file will be overwritten. Therefore, do not select the source file as the destination file.
3. Select *Options* and activate the Use only one Sourcefile (copy mode) check box in the Options dialog box.
4. Use the *Edit Configuration* button to configure the translation.
5. Select *Copy* to create the destination file. Confirm the query *Do you want to use the edited configuration* with *Yes*.

   You can analyze the destination file in an offline pipeline.

Record File Converter

The Record File Converter tool converts the file format of recording files into various formats. You can select *Interactive Mode* or *Batch Mode*.

To call up the Record File Converter tool, select *Run...* in the Windows *Start* menu and enter *d:\k15\tools\RecFileConverter.exe*.

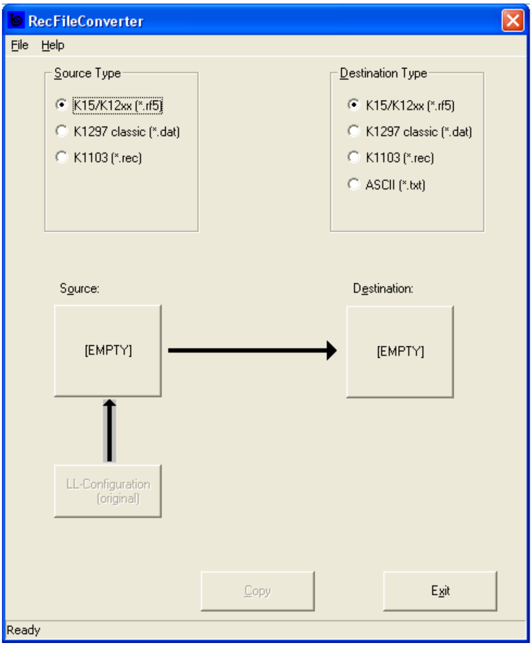


Figure 114: RecFileConverter dialog box

Interactive Mode. To convert a recording file, proceed as follows:

1. Under *Source Type*, select the format of your source file. The available formats are K15/K12xx (*.rf5), K1297 (*.dat), and K1103 (*.rec).
2. Click *Source* and select the source file.
3. Under *Destination Type*, select the output format. The available formats are K15/K12xx (*.rf5), K1297 (*.dat), K1103 (*.rec), and ASCII (*.txt).
4. Click *Destination* and enter the directory and name of the destination file.

***NOTE**. If the output K1297 (*.dat) format was selected and the input format is either K15/K12xx (*.rf5) or K1103 (*.rec), then additional Mapping Information is required for conversion.*

---

5. Start the conversion with **Copy**.

Batch Mode. The Record File Converter tool's batch mode can be used to export several files without user intervention. This function requires you to have experience with the creation of batch files.

The call instruction is:
d:\k15\tools\RecFileConverter.exe [Options] Source Destination [Mapfile].

For an explanation of the options, call up
d:\k15\tools\RecFileConverter.exe.

***NOTE**. The batch file's sequence is not normally stopped when calling up the Record File Converter tool. To stop the sequence until the export has terminated, place* start / wait *at the beginning of the call-up line.*

FSN Test

With the FSN Test tool, you can analyze recording files with SS#7 data. Missing and double FSNs (Forward Sequence Numbers) are included in the analysis.

Run the FSN Test tool as follows:

1. Select *Run...* in the Windows *Start* menu and enter *d:\k15\tools\FSNTest.exe* in the *Run* dialog box. The *FSN Test* dialog box opens.

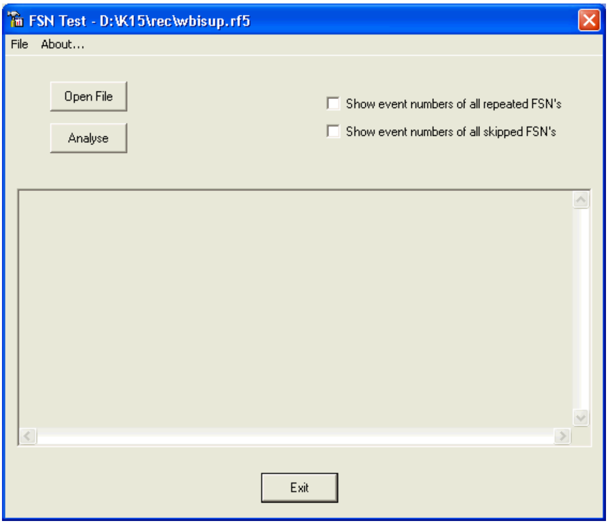


Figure 115: FSN dialog box

An analysis using the standard options provides an overview of the number and first occurrence of incorrect FSNs for each logical link. If you use other options, the data output may become very extensive.

If you want to view the numbers of all frames with repeated FSNs, activate *Show event numbers of all repeated FSN's*.

If you want to view the numbers of all frames with missing FSNs, activate *Show event numbers of all skipped FSN's*.

2. Activate *Open File* and select the recording file to be analyzed.
3. Press the *Analyse* button. The analysis is carried out. The results are displayed in the text field.

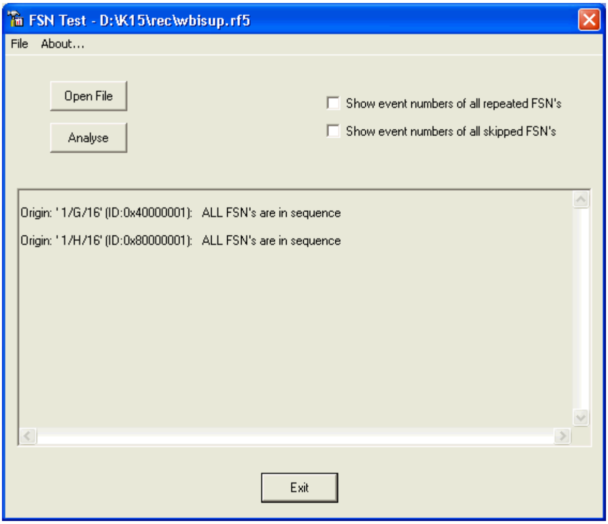


Figure 116: FSN test results

If you want to carry out another analysis with other options, change the options and activate Open File again.

4. Exit the tool with *Exit*.

CDR Viewer

With the CDR Viewer tool you can analyze the CDR output files (*.csv) of the GPRS-Gb Analyzer and Calltrace / Sequencer applications and *.csv (Comma Separated Value) files created by the K15 RealChart tool (see page 233) independently of the actual applications.

As with the GPRS-Gb Analyzer application (see page 166), you can thus obtain an overview of the GPRS connections as well as the requested GPRS connections and their respective quality of service parameters (QoS).

Displaying CDR Output Files. To display CDR output files, proceed as follows:

1. Select *Run...* in the Windows *Start* menu and enter *d:\k15\tools\CDRViewer.exe* in the *Run* dialog box. The *CDR Viewer* dialog box opens.
2. On the *CDR File* processsing element click **Open.**
3. Select a CDR file of the format *.csv (Comma Separated Value) which was either generated with the GPRS-Gb Analyzer application or the Calltrace/Sequencer. The standard directory for application output files is *d:\k15\log*.
4. Confirm with **Open**. The CDR Viewer starts data representation.

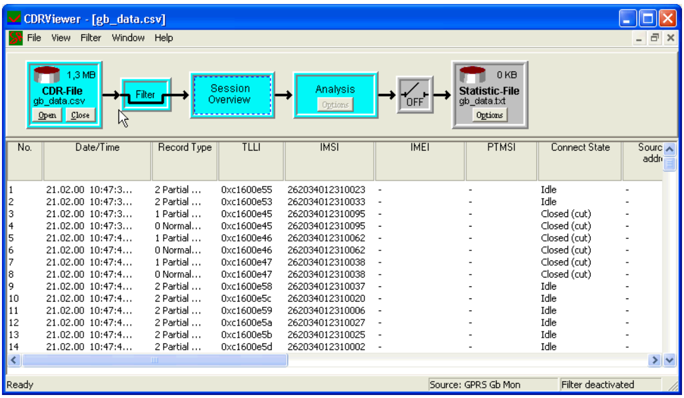


Figure 117: CDR Viewer dialog box

The contents of the CDR file are now displayed in the *Overview* pane of the CDR Viewer. Call up the *Overview* pane by clicking the *Session Overview* processing element in the CDR Viewer pipeline.

Each line in the *Overview* pane represents a data record or a call detail record (CDR). In order to receive these data records, specific messages of the GPRS-Gb protocol are evaluated, for example PDP contexts (Packet Data Protocol). The connection state is also displayed in the *Overview* pane for each data record.

Setting Filters. With suitable filter settings you can easily hide data records that are only of minor interest to you. Currently, the filtering process is only supported by CDR files of the GPRS-Gb Analyzer application. To activate filter settings, click the *Filter* processing element in the CDR Viewer pipeline.

Analysing CDR Files. The contents of a CDR file which has been generated with the GPRS-Gb Analyzer application can be monitored in the *Analysis* pane. Therefore, click the *Analysis* processing element in the CDR Viewer pipeline. *Analysis* is only selectable if you have installed the GPRS-Gb Analysis packet.

Writing Statistic Files. The contents of a CDR file which has been generated with the GPRS-Gb Analyzer application can also be written in a statistics file. Therefore, click the *Statistic-File* processing element in the CDR Viewer pipeline.

***NOTE**. For further details refer to the appropriate Online Help topics.*

Displaying *.csv Files Created by the RealChart Tool. With the CDR Viewer tool you can also read in and display *.csv (Comma Separated Value) files created by the K15 RealChart tool (see page 233). To read in and display those *.csv files, proceed as follows:

1. Select *Run...* in the Windows *Start* menu and enter *d:\k15\tools\CDRViewer.exe* in the *Run* dialog box. The *CDR Viewer* dialog box opens.
2. On the *CDR File* processsing element click **Open.**
3. Select a *.csv (Comma Separated Value) which was generated with the K15 RealChart tool. The standard directory for application output files is *d:\k15\log*.
4. Confirm with **Open**. The CDR Viewer starts data representation.

Rf5 File Mutator

The Rf5 File Mutator processes a source rf5 file by producing a destination rf5 file in which some confidential information (such as IMSI, IMEI, and others) are masked. If the process is well configured, the produced destination file is an ”anonymous” version of the source file.

The Rf5 File Mutator is designed for GPRS protocols only. Exception: for MTP based protocols it can also mask OPC and DPC messages.

If the K15 software is installed, the Rf5 File Mutator works with the stacks configured in the source file using the K15 standard directories for stacks and protocol description files. The Rf5 File Mutator works only together with the K15 software.

To run the Rf5 File Mutator tool, proceed as follows:

1. Select *Run...* in the Windows *Start* menu and enter *d:\k15\tools\Rf5Mutator.exe* in the *Run* dialog box. The *File Mutator* dialog box opens.

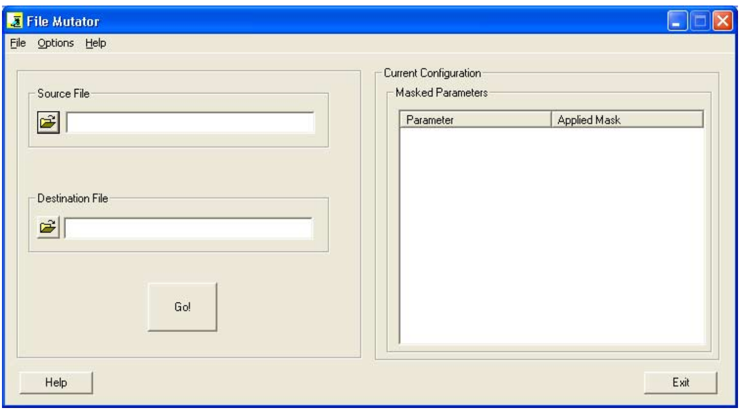


Figure 118: File Mutator dialog box

2. Select the *Source File* in the *File Mutator* dialog box. Path and name of the *Destination File* are entered automatically. The destination path complies with the source file path. As name, the name of the source file plus ending *.mutated.rf5* is entered.

After you have selected the *Source File*, the *Configure* dialog box opens automatically.

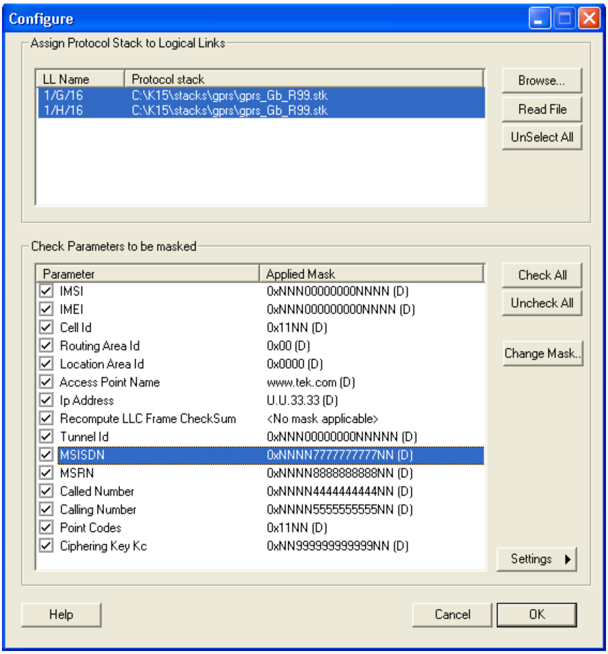


Figure 119: Configure dialog box

3. Configure the process in the *Configure* dialog box.

   Select the protocol stacks to be assigned to each logical link in the source file. Modify the list of parameters to be masked and define a custom mask for each parameter.

4. To define a custom mask, click the *Change Mask* button. The *Mask Configuration* dialog box opens. Select *Custom Mask* and change the settings displayed in that group. All maskable parameters are listed in the appropriate Online Help topic.

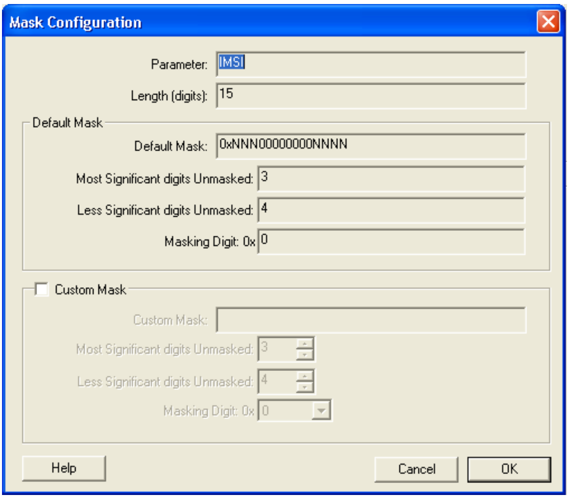


Figure 120: Mask Configuration dialog box

5. Confirm your settings with *OK* in the *Mask Configuration* and *Configure* dialog boxes.

6. Check your configuration in the *Current Configuration* panel of the File Mutator dialog box.

7. Start the process by clicking the *Go!* button in the *File Mutator* dialog box. The changed file will be stored in the *Destination File* directory defined above.

IP2Hex2IP

Using the IP2Hex2IP tool, you can convert IP addresses into hexadecimal values and vice versa.

To run the IP2Hex2IP tool, proceed as follows:

1. Select *Run...* in the Windows *Start* menu and enter *d:\k15\tools\IP2Hex2IP.exe* in the *Run* dialog box. The *IP2Hex2IP* dialog box opens.

Figure 121: IP2Hex2IP dialog box

2. If you want to convert an IP address into a hexadecimal value, enter the IP address into the *IP Address* field. The hexadecimal address will be displayed automatically in the *Hex Address* field.

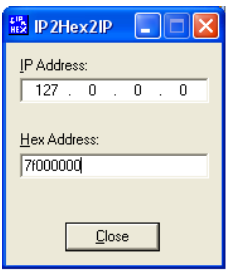


Figure 122: IP2Hex2IP results

3. If you want to convert a hexadecimal value into an IP address, enter the IP address into the *Hex Address f*ield. The hexadecimal address will be displayed automatically in the *IP Address* field.
4. Click the *Close* button to leave the dialog box.

Rec2Ascii

Using the Rec2Ascii tool, you can export a recording file into a text file. An interactive mode as well as a batch mode are available for this. It can be executed only on a protocol tester not on a PC.

Interactive Mode. To open the Rec2Ascii tool, select *Run...* in the Windows *Start* menu and enter *d:\k15\bin\Rec2Ascii.exe* in the *Run* dialog box. The *Recording File Export* tool starts.

Figure 123: Recording File Export wizard

A wizard helps you to prepare the tool for converting your file. Follow this wizard to enter your settings. In step 6, all selected settings are listed. If you want to make any changes to the settings, return to the respective setting using <<*Back* and *Next* >>.

Start the conversion by pressing *Export* in step 6.

Batch Mode. The batch mode of the Rec2Ascii tool can be used to export a number of files without user intervention. All frames of the recording file are exported in this mode. You should have some experience of batch file processing to use this function.

The batch mode function is called up with *d:\k15\bin\Rec2Ascii.exe* [options]. Refer to the Online Help for further details about the required options.

The Rec2Ascii.ini File. You can configure the short view format by changing entries in the Rec2Ascii.ini file. Therefore, open the file *\k15\bin\Rec2Ascii.ini* file with an ASCII editor and change the entries.

***NOTE**. It is advisable to make a copy of the file before changing it.*

The file format used for exporting is described in the Rec2Ascii.ini file.

If you want to create a list of all the possible column names of a recording file, activate the *Write only possible columns to file* option when selecting the destination file in the interactive mode. The column names instead of the contents of the recording file are exported.

***CAUTION.** Except for the* Rec2Ascii.exe *and the* ConfigPacker.exe*, do not execute any .exe file from the* \bin *directory. The other .exe files in the* \bin *directory are INTERNAL test tools for operating K15 measurements.*

Configuration Files Packer

When problems occur during configuration, the Tektronix Support may ask you to archive and send your system configuration using the Configuration Files Packer. Unlike the Pack & Go Wizard, which archives the active configuration, the Configuration Files Packer archives the system configuration.

If the ConfigPacker.exe, lspzipx.dll and lspuzipx.dll files are not in the installation's bin-directory, use the Windows Explorer to copy the files from the *\setup* directory on the K15 installation CD into the *\k15\bin* directory. If you have installed the protocol tester in a different directory than *\k15*, use the corresponding directory.

To start the Configuration Files Packer tool, select *Run...* in the Windows *Start* menu and enter *\k15\bin\ConfigPacker.exe* in the dialog *Run*. The Configuration Files Packer's wizard starts.

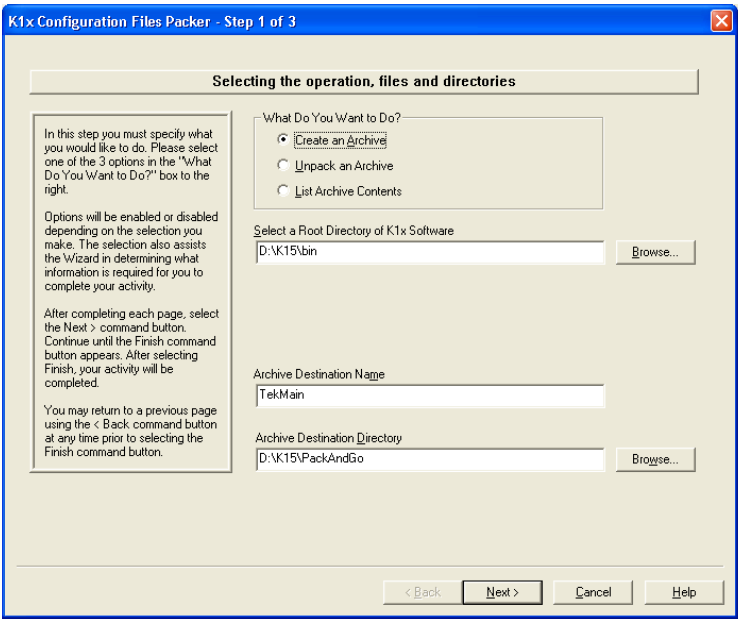


Figure 124: Configuration Files Packer dialog box

Use the Configuration Files Packer's wizard to archive the system configuration together with all linked files. It compresses all necessary files and places them in an archive file.

Archive the system configuration as follows:

1. Configure Step 1 of the wizard.

Select *Create an Archive* in the ... – *Step 1 of 3* dialog box.

If necessary, enter the K15 installation's basic directory, for example, *d:\k15*, under *Select a Directory of K15 Application*.

Enter the name of the archive to be created under *Archive Destination Name*. Under *Archive Destination Directory*, enter the path of the archive to be created, for example *c:\tmp*.

Click *Next*>>. The *Installation Type* dialog box opens.

2. In the *Installation Type* dialog box, choose the type of your K15 installation and confirm your selection with **OK**.

3. Configure Step 2 of the wizard.

The files required by the configuration are displayed in the *Standard Files Set* list. If a configuration file is not available at the expected position, a grey check box appears. In this case, select the entry, then select *Browse* and enter the position of the file.

In the *I would like to attach additional Files* field, select whether you want to include additional files in the archive. If this field is deactivated, Step 4 will be left out.

Click *Next*>>, respectively, *Finish*.

4. Configure Step 3 of the wizard.

In the *Optional Files* list, click *Browse* and select a file. Repeat the last step until you have included all the desired files in the list.

If you want to remove files from the list, select *Remove* or *Remove All* and click *Finish*.

The archive file is created. The file extension is *.zip.

***NOTE**. An extended Zip format is used. Therefore, only use the Configuration Files Packer when editing the archive.*

The options *Unpacking the Configuration Archive* and *Creating a List of Archived Files* in the Configuration Files Packer dialog box are only used by the Tektronix Support to analyze your configuration in case of problems. Even so, these options are described in the Online Help.

***CAUTION.** Except for the* Rec2Ascii.exe *and the* ConfigPacker.exe*, do not execute any .exe file from the* \bin *directory. The other .exe files in the* \bin *directory are INTERNAL test tools for operating K15 measurements.*

Reference

System Information Files (keyfile.txt, .ini, . cfg, .cnf)

The protocol tester uses the following files to save configurations and information about the status of the system.

\K15\bin\K15.ini

In this file the window settings, toolbar configuration, selected standard protocol stacks and the last-used directories are saved. If you want to restore default settings, delete this file from the bin directory as follows:

1. Terminate the main program.
2. Delete the file *\K15\bin\K15.ini*.
3. Restart the main program.

The default settings are now restored. The protocol tester automatically creates a new K15.ini file.

\K15\bin\protocol.cfg

The protocol.cfg file contains a list of all protocols available in the system. This reference list is automatically created when you start the main program and makes the protocol selection list available immediately in the Protocol Stack Editor. This file also stores protocol color codes that you have assigned when editing stack files.

You can reset all protocol colors in all stacks to the default color (black) by deleting the protocol.cfg file as follows:

1. Terminate the main program.
2. Delete the file *\K15\bin\protocol.cfg*.
3. Restart the main program.

The protocol tester automatically creates a new protocol.cfg file, restoring the default colors of all protocols in all protocol stacks.

\K15\bin\grouping.cnf

This file stores user-specific SPC and CIC groupings. Overwrite this file to restore the default settings in the selection boxes. The *\K15\bin* directory includes a file with the default settings: grouping_def.cnf.

To restore the default settings for the SPC and CIC groupings:

1. Terminate the main program.

2. Delete the *\K15\bin\grouping.cnf* file or move it to a directory of your choice.

3. Select the *K15\bin\grouping_def.cnf* file \in the Windows Explorer and press < CTRL > + < C >.

4. Press < CTRL > + < V > to paste the file.

5. In the *\K15\bin* directory, rename the copied file from *Copy of grouping_def.cnf* to *grouping.cnf*.

■ Restart the main program.

The default settings in the SPC and CIC grouping selection boxes are restored.

Configuration Files

All other configuration settings in the K15 program are saved in the setup files (file extension *.s). The standard directory for setup files is *\K15\config*. Refer also to the Setup Files help topic.

\K15\bin\segdef.ini

For some SCCP-based protocols and O+M protocols, a segmentation of messages may occur (long messages of the upper protocol level are divided into several shorter messages of the lower protocol level). To ensure that these segmented messages are correctly processed in the upper protocol levels and correctly displayed in the monitor, the segments must be reassembled.

The entries in the file segdef.ini indicate the protocols for which a reassembly of segmented messages is performed. Since a reassembly detracts from the performance, only those protocols that need reassembly are entered here.

Every entry begins with the keyword SEGPARAM. The relative path of the protocol's upd file follows. The next specification is the type of reassembly with the values SCCP_REASM (SCCP reassembly) or OAM_REASM (O+M reassembly). Entries with the # symbol at the beginning of the line are comments.

If you make changes in this file, you should subsequently reload the configuration or restart the protocol tester for the changes to become effective.

\K15\bin\lsa.ini

This configuration file determines which LSA modules are to be loaded. A text line beginning with a semicolon is a comment. All other lines must contain a designation for a valid LSA module. On the other hand, an LSA module can also load a configuration file of its own, for example *\K15\bin\reasm_ip.ini* (see below).

Restart the protocol tester after changing this file to ensure that the changes become valid.

\K15\bin\reasm_ip.ini

With the IP Version 4 and IP Version 6 protocols, the IP packets may be fragmented by splitting long IP packets into several (shorter) IP fragments during transmission. In order to ensure the IP packets' correct processing as well as correct display on the monitor, the fragments must then be defragmented. This procedure is carried out by an LSA - Layer Specific Application. IP packets that are not fragmented are transmitted without the support of the LSA module.

The entries in the reasm_ip.ini file control the defragmenting process. A text line beginning with a semicolon is a comment. All other lines each contain a numerical value in the following order:

- The first value switches the defragmenting process off (0) or on (1).
- The second value switches the check sum mechanism off (0) or on (1).
- The third value sets a timeout value for the protocol version IP Version 4. If one or more fragments are missing for the assembling process of a complete IP packet, the re-assembling process of the IP packet will be halted after the set time.
- The fourth value sets the timeout value for the protocol version IP Version 6.
- The fifth value determines whether the generated IP packet's timing mark contains the value of the first (1) or the last (0) fragment.

Restart the protocol tester after changing this file to ensure that the changes become valid.

\K15\bin\zoom.ini

This file specifies which monitor zoom functions are available. Restart the protocol tester after changing this file to ensure that the changes become valid.

File Structure, File Types, Directories

The software uses the following file extensions and types. Where they exist, the associated standard directories are also listed. If you have not used the preset installation directory during installation, the installation directory you have selected will be used as the standard directory instead of d:\k15.

Table 4: File Extensions

Extension	File Type	Directories
.app	Description files for applications (special measurement programs)	d:\k15\bin
.bpf	Configuration files of the IP prefilter	d:\k15\config
.cnf	Values and defaults of the SPC/CIC groupings	d:\k15\bin
.chm	Help files for the main program and tools	d:\k15\hlp
.csv	Application's output files	d:\k15\log
.dat	K1197 and K1297-Classic recording files	d:\k15\rec or user directory
.dll	Execution files for applications, tools and the main program	d:\k15\app\... d:\k15\bin d:\k15\tools
.exe	Execution files for applications, tools and the main program	d:\k15\bin d:\k15\app\... d:\k15\tools
.flt	Filter files	d:\k15\config or user directory
.ftm	Feature files for filter configurations	d:\k15\config
.mcc	Monitor's column settings	d:\k15\config
.ini	Configuration files for the main program and tools	d:\k15\...
.nrm	(Binary files) Protocol descriptions	d:\k15\protocols\...
.rcd	Statistics files	d:\k15\app\realchart

Table 4: File Extensions (Cont.)

Extension	File Type	Directories
.rec	K1103 recording files	d:\k15\rec or user directory
.rf5	K15/K1205/K1297-G20 recording files	d:\k15\rec or user directory
.s	Setup (configuration) files	d:\k15\config
.stg	Strategy files for the autoconfiguration	d:\k15\app\pcmcheck
.stk	Files for the protocol stack editor	d:\k15\stacks\...
.sts	Statistics configuration files	d:\k15\config
.upd	(Binary files) protocol descriptions	d:\k15\protocols\...

Toolbars

Common Toolbar

You can open and switch windows using the following buttons in the common toolbar:

Table 5: Command Buttons

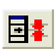
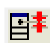
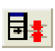
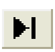
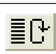
Button	Meaning	Button	Meaning
	Monitor Window(s)		Data Flow Window (main screen)
	Create a new MTP- based protocol stack		Create a new LAPx-based protocol stack
	Open the protocol stack editor.		Change between different protocol stack editors
	Switch between different monitor windows		Status Window
	Arrange Icons		Cascade Windows
	Tile Windows (vertical)		Tile Windows (horizontal)
	Monitor Setup		Change Column Configuration
	Show / Hide Pipeline Bar		Maximize Frame View
	Minimize Short View		Minimize Frame View
	Minimize Packet View		Go to first available frame
	Go to last available frame		Start Measurement
	Stop Measurement		Pause Measurement
	Display in Live Mode		Display in Ring Mode

Table 5: Command Buttons (Cont.)

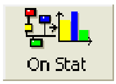
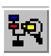
Button	Meaning	Button	Meaning
	Add Online Monitoring Pipeline		Add Online Recording Pipeline
	Add Online Statistics Pipeline		Add Offline Monitoring Pipeline
	Add Offline Recording Pipeline		Add Offline Statistics Pipeline

Table 6: Protocol Stack Editor

Icon	Meaning
	Call Add Protocol dialog box
	Delete Protocol from the selected protocol stack
	Call Protocol Setup dialog box

Menu Bar

This section describes functions available from the menu bar. For more information about these menus, see the Online Help.

The K15 software includes the following main menus accessible in all program situations:

Table 7: Standard Main Menu

Menu	Function
File	Access to file functions (open, save, close, print). Access to already opened files.
View	Define display of toolbars.
Tools	Start the autoconfiguration. Access to supplementary programs (tools).
Options	Access to toolbars and window options of the K15 software.
Window	Access to currently open main windows. Commands for arranging windows on the screen.
Help	Access to K15 Online Help.

In addition, there are main menus for the program modules of the K15 software. These main menus are only displayed if the corresponding main window is in the foreground.

Table 8: Additional Menus of the Program Modules

Window	Menu	Function
Data Flow	Scenarios	Configuration of online and offline scenarios. Adding / removing pipelines.
Protocol Stack Editor	Protocol Stack	Configuring protocol stacks. Editing protocol parameters.

Table 8: Additional Menus of the Program Modules (Cont.)

Window	Menu	Function
Monitor	Monitor	Searching through messages. Restricting display. Setting data representation.
	Pipeline Elements	Access to the processing elements of the actual pipeline.
	Edit	Searching through messages and text messages; Copying data into the clipboard; Copying configuration of monitor window.

Context Menus

In many program situations, context menus feature the commands directly associated with an item on the screen. These context menus only appear temporarily and are closed once you have selected a command.

There are two ways of opening context menus:

- Select the relevant screen item (such as a processing element in a pipeline) and click the right mouse button.
- Select the relevant screen item and press < UP ARROW > + < F10 >.

Shortcut Keys and Buttons

Keyboard Layout

The K15 keyboard was designed specifically for use with a measuring device and features special function keys. The function keys and key combinations are also listed in the individual Help topics.

Furthermore, you can operate the K15 entirely via keyboard. For operators who are used to working with the mouse, the following list provides an overview of software operation if no mouse is available.

All menus, dialogs, options, lists or commands feature an underlined letter (access key). Pressing < ALT > + < ACCESS KEY > activates the desired menu, field, or function.

Table 9: Programs and Windows

Action	Press
Switch between programs	< ALT > + < TAB >
Switch between main windows	< CTRL > + < F6 >
Switch between tabs in a main window	< CTRL > + < PAGE UP > or < CTRL > + < PAGE DOWN >
Switch between panes on a tab	< CTRL > + < TAB >
Open main menu	< ALT > + < ACCESS KEY >
Close program	< ALT > + < F4 >

Table 10: Menus

Action	Press
Select menu	< ALT > + < ACCESS KEY >, for example, < ALT > + < W > for Window menu
Open menu	< UP ARROW > or < DOWN ARROW > + < RETURN >

Table 10: Menus (Cont.)

Action	Press
Close menu	< ESC >
Open context menu	< UP ARROW > + < F10 >
Close context menu	< ESC >
Open system menu of main program	< ALT > + < SPACEBAR >

Table 11: Processing Elements

Action	Press
Open the dialog of a selected processing element	< SPACEBAR >

Table 12: Directory Trees

Action	Press
Open a directory tree level	< RIGHT ARROW > or < + >
Close a directory tree level	< LEFT ARROW > or < – >
Move cursor up / down in a directory tree	< UP ARROW > / < DOWN ARROW >

Table 13: Dialogs

Action	Press
Select element, for example a text field	< ALT > + < ACCESS KEY >
Select next / previous field in the dialog	< TAB > / < UP ARROW > + < TAB >

Table 13: Dialogs (Cont.)

Action	Press
Activate / deactivate check box option	< SPACEBAR >
Reverse selection of a dialog field	< ESC >
Select next element within group boxes	< DOWN ARROW >
Select previous element within group boxes	< UP ARROW>

Table 14: Lists

Action	Press
Select entry in list boxes...	< SPACEBAR > after selecting entry using < UP ARROW > or < DOWN ARROW >
... and accept them for the input line of the list	< RETURN >
Select consecutive entries in a list	< UP ARROW > + < DOWN ARROW > or < UP ARROW > + < UP ARROW >
Select non-consecutive entries in a list	< CTRL > while selecting entry using < UP ARROW > or < DOWN ARROW > and confirm with < SPACEBAR >

Table 15: List Boxes

Action	Press
Open	< DOWN ARROW >
Close	< ALT] + < UP ARROW]
Select entry	< DOWN ARROW] and < RETURN] to select entry

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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