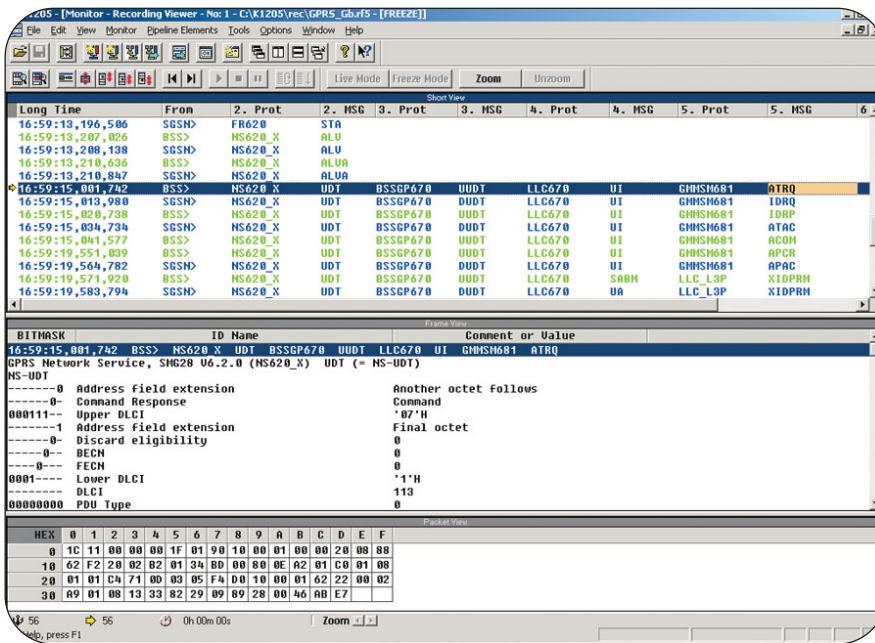


# K1297-G20 Series Protocol Tester

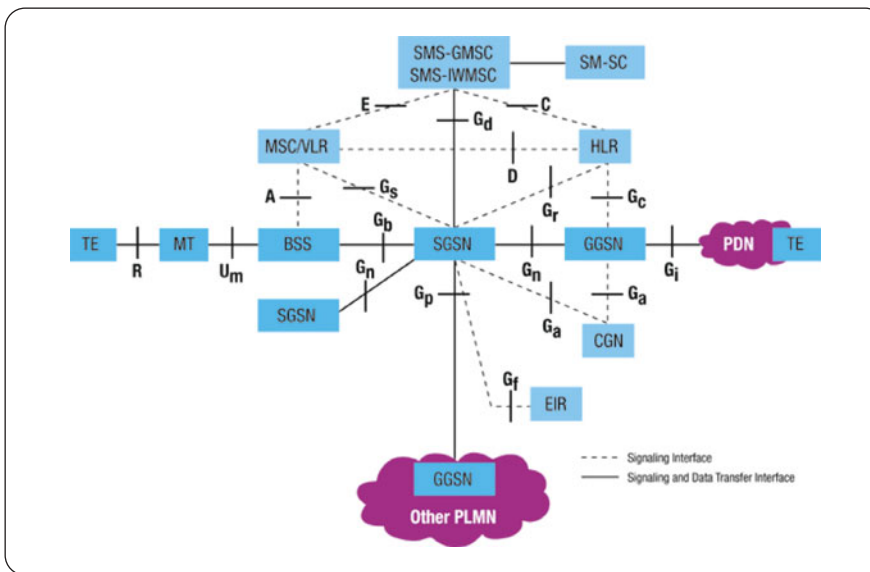
## ► GPRS Software



## GPRS Software

Tektronix GPRS software offers complete test solutions for functional tests of GPRS network elements, monitoring and analysis of GPRS networks, and end-to-end service quality testing. A combination of monitoring, simulation, and emulation functions, as well as capability of conformance and

interoperability testing is provided, chiefly needed during design and installation/ deployment of GPRS networks. This also includes monitoring and analysis functions needed during field trials, operation and maintenance, and network optimization.



► GPRS reference model.

## ► Features & Benefits

Simultaneous Monitoring on All  $G_x$ -interfaces ( $G_a$ ,  $G_b$ ,  $G_c$ ,  $G_d$ ,  $G_r$ ,  $G_s$ ,  $G_n$ ,  $G_p$ ,  $G_r$ ,  $G_s$ )

Monitoring on  $A_{bis}$ -interfaces (Alcatel, Ericsson, Lucent, Motorola, Nokia, Nortel, Siemens)

GPRS/EDGE Support for Selected Manufacturer Proprietary  $A_{bis}$ -interfaces

Automatic Configuration of GPRS/EDGE  $A_{bis}$ -interface channels

Single Call and Transaction Trace on  $G_b$ -,  $G_n$ -,  $G_r$ -,  $G_c$ -,  $G_p$ -interface

Multi Interface Call Trace on  $G_b$ ,  $G_r$ ,  $G_s$ / $G_p$  and A Interface in Case Data Sessions are Interrupted by Voice Calls

Deciphering on  $G_b$ -interface up to a Value of 5000 Users

Monitoring and Analysis of GPRS Sessions and Crucial QoS Parameters at the  $G_b$ -interface (GPRS  $G_b$  Monitor/Analyzer)

Simulation and Emulation of All Network Elements (BSS, SGSN, GGSN, VLR, HLR)

Simulation of an Entire GPRS Network Switching Subsystem (NSS) Including Internet Access

Traffic Generation Across the GPRS Network for End-to-End Diagnostics

Simulation of up to 100,000 Subscribers (BSS or SGSN) Per Interface Module

Support for Gb over IP (GbIP)

## ► Applications

Network Optimization and Troubleshooting

Functional and Interoperability Testing

Evaluate Delays, Transmission Rates, and Round Trip Time

Conformance Testing

Replace (emulate) a Network Element (e.g., HLR) by a Protocol Tester

Replace (emulate) a Network Subsystem by a Protocol Tester

Capacity Tests for Control- and User Plane

COMPUTING

COMMUNICATIONS

VIDEO

# K1297-G20 Series Protocol Tester

## ► GPRS Software

### Solutions for Network Monitoring and Optimization

#### Monitoring

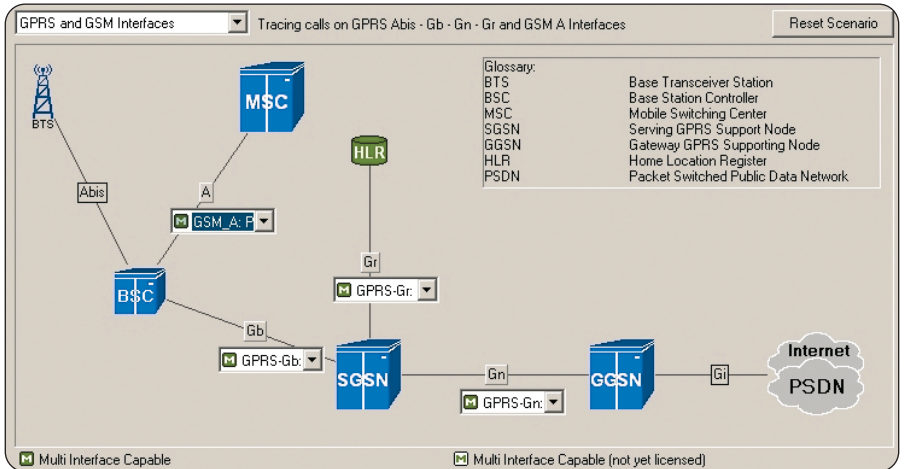
GPRS network managers struggle with the difficult problems of network installation, deployment, and optimization. GPRS software for the K1297 consists of all necessary GPRS features and applications that help users overcome their most difficult network issues. They can be carried out in off-line mode and online mode.

#### Single Interface and Multi Interface Call and Transaction Traces

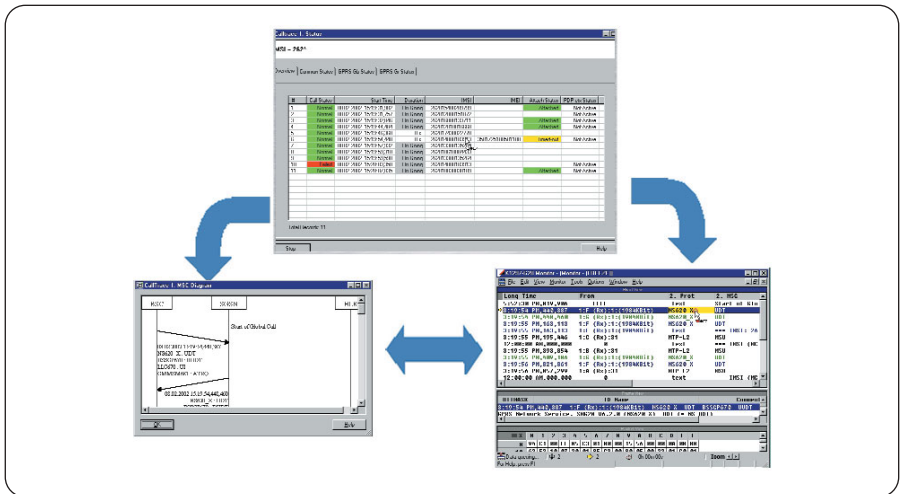
Single Interface Call and Transaction Traces allow a fast overview about all data and messages related to a call/transaction. This offers fast and easy analysis of subscriber-related problems.

The “Multi Interface Call Trace” application is an expert software that permits tracing calls/sessions in real-time and offline as they evolve over multiple interfaces.

Simple parameters are used to identify the subscriber (for example, IMSI) and to trigger the search. The call/session is traced even if parameters identifying the subscriber change dynamically during the transactions (such as IMSI, P-TMSI). The call/session is traced even if it spans multiple interfaces (for example Gb, Gr, Gn) and involves different network elements (for example SGSN, HLR, GGSN).



► Call Trace User Interface.



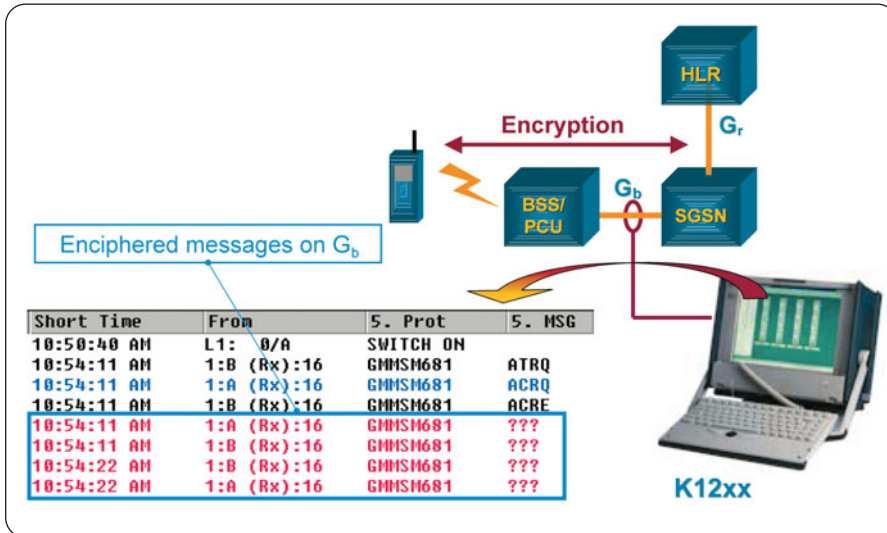
► Multi Interface Call and Transaction Trace Application.

The GUI allows drill-down troubleshooting from the problem symptom to the root cause with just a mouse-click.

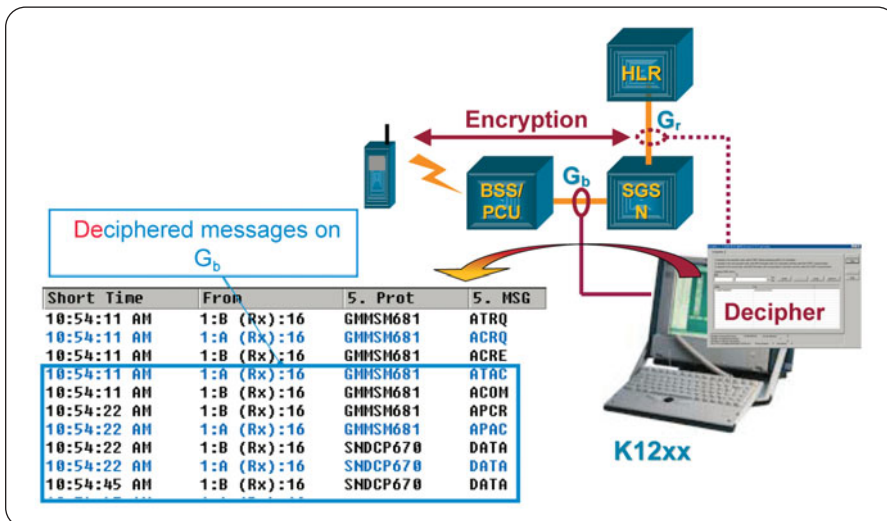
The “Overview Window” lists detected calls/sessions and highlights their status (normal, failed) at a glance for quick problem identification, and allows filtering out uninteresting (normal) calls.

The “Arrow Diagram” graphically displays, in a very intuitive way, the message flow (arrows) and network elements (vertical lines) involved in a call/session without requiring a deep protocol knowledge.

The “Detailed Monitor Window” shows all the details of protocol messages and parameters for in-depth troubleshooting of root cause of problems.



▶ Deciphering solution – enciphered messages.



▶ Deciphering solution – deciphered messages.

**Deciphering**

GPRS network operators transmit ciphered data between GPRS terminals and the network more often than they previously have. Whenever enciphering is switched on in GPRS networks, all signaling data and payload above the protocol layer Logical Link Control (LLC) are encrypted. K1297-G20 Protocol Testers supply the first deciphering test and observation tools, enabling analysis and processing of all data above the protocol layer LLC.

The GPRS Deciphering application decrypts Control- and User Plane messages on the Gb-Interface not only for GPRS but also for UMTS mobiles (e.g., after an Intersystem Change for PS-Services from UTRAN to GSM BSS). It supports the GPRS Encryption Algorithm-1 and -2 (GEA 1 and GEA-2). In automatic mode the application collects ciphering keys (Kc or CK) from the Gr-Interface (see picture below). In manual mode no access to the Gr-Interface is required. This is a special use case for test labs, where the user can manipulate the ciphering key.

# K1297-G20 Series Protocol Tester

## ► GPRS Software

### RLC/MAC Reassembling

The RLC/MAC reassembling application picks up frames at the GPRS  $A_{bis}$  interface that are cut into slices of different sizes depending on the coding scheme and assembles them to the original frame. This comprises LLC frames and RLC control frames.

### Benefits of RLC/Mac Monitoring on the $A_{bis}$ -Interface:

- **Verification of PCU** transportation layer implementation (NEM only)
- **Verification/Observation of Air Interface parameter** (e.g., Power level, Receiver sensitivity)
- **Analysis of faulty behavior** related to the Air Interface (e.g., Retransmissions)
- **Compliance** verification of Mobiles and Network (Interoperability)

### Automatic Configuration of $A_{bis}$ GPRS/EDGE interface (Siemens)

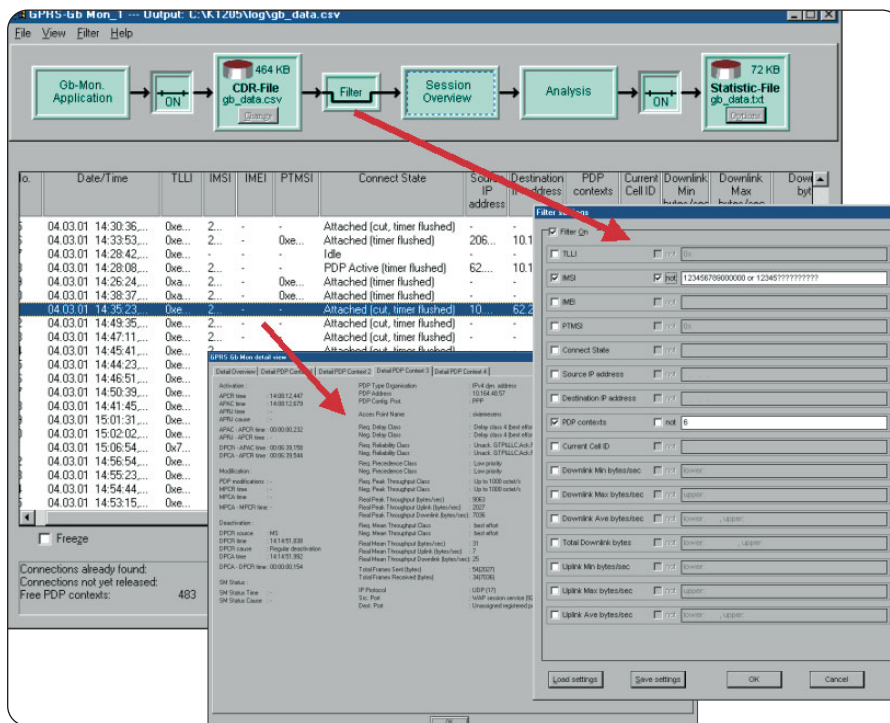
The GPRS/EDGE Automatic Configuration is an application that guides the technicians in configuring the instrument for  $A_{bis}$  monitoring and allows them to reduce overhead time needed for instrument set-up. Once the RSL link on the  $A_{bis}$  interface has been identified, the application automatically configures all the necessary logical links containing USER DATA FRAMES and assigns the proper bandwidth to the logical links.

From	2. MSG	3. Prot	3. MSG	Procedure Code	Last Prot	Last MSG
G62	.. SD	RL	RL		SCCP	CC
Cr G62	MSU	SCCP	UDT		MAP	BEG
Cr G62	MSU	SCCP	UDT		MAP	END
G62	.. SD	RL	RL		SCCP	CC

BITMASK	ID Name	Comment or Value
01010110	Length	86
3.1.2.2.1	Quintuplet List	
10100001	Tag	(CONT C [1])
01010100	Length	84
3.1.2.2.1.1	Authentication Quintuplet	
00110000	Tag	(UNIV C Sequence (of))
01010010	Length	82
3.1.2.2.1.1.1	1.1 Rand	
00000100	Tag	(UNIV P OctetString)
00010000	Length	16
**B16**	Authentication Random No	02 05 96 bd 18 7a 9a d7 20 07 cd 7f be 01 60 d9
3.1.2.2.1.1.2	1.2 XRES	
00000100	Tag	(UNIV P OctetString)
00010000	Length	8
**B8**	XRES	cc f5 58 34 bb 2c b0 75
3.1.2.2.1.1.3	1.3 CK	
00000100	Tag	(UNIV P OctetString)
00010000	Length	16
**B16**	CK	57 58 f4 11 f4 47 15 11 f1 19 42 d3 54 85 66 15
3.1.2.2.1.1.4	1.4 IK	
00000100	Tag	(UNIV P OctetString)
00010000	Length	16
**B16**	IK	f9 26 d5 9e c9 33 95 aa 51 c9 d0 68 75 12 e5 d0
3.1.2.2.1.1.5	1.5 AUTN	
00000100	Tag	(UNIV P OctetString)
00010000	Length	16
**B16**	AUTN	52 e5 03 bf 78 83 00 01 6f a9 2e dc 4b cd 67 4e

► *Ciphering Key collection on the  $G_i$ -interface.*



► GPRS G<sub>b</sub> monitor.

**GPRS G<sub>b</sub> Monitor/Analyzer**

The GPRS G<sub>b</sub> Monitor application provides an extensive overview on the traffic that is actually running on the G<sub>b</sub>-interface of a GPRS network. Numerous filter possibilities, including cell ID, IMEI, IMSI, and IP addresses, are available; measuring Quality of Service (QoS) parameters, such as throughput and response time, is easily accomplished.

The GPRS G<sub>b</sub> Analyzer application, which is placed on top of the GPRS G<sub>b</sub> Monitor, provides crucial statistics, detects failed GMM, SM procedures and enables easy and rapid troubleshooting.

**Solutions for Active Testing**

**Simulation/Emulation of GPRS Network Elements**

Create and emulate functioning network elements for test purposes. Emulate multiple network elements (NE) in parallel to real NE for complex test scenarios. Compare reaction of emulated to real NE.

**Home Location Register Emulation**

Replace expensive Home Location Register (HLR) in test networks. Take advantage of features such as fault tolerant reaction and fast reset capability. Parameters are easy to set.

**Base Station Subsystem and Mobile Emulation**

Emulate thousands of mobiles (MS) on multiple Base Station Subsystems (BSS) with one K1297 Protocol Tester. By emulating MS and BSS, you'll be able to identify Network Switching Subsystem (SGSN, GGSN, HLR, PDN) problems quickly and easily.

**Network Switching Subsystem Emulation**

Browse the Web with a GPRS mobile and BSS connected to K1297-G20 Protocol Tester, replacing the entire GPRS core network. Find BSS or mobile problems by reducing error possibilities by emulating the complete Network Switching Subsystem (NSS).

**Short Message Service Testing**

Ensure Short Message Service (SMS) functionality via GPRS G<sub>b</sub>- and G<sub>d</sub>-interface.

# K1297-G20 Series Protocol Tester

## ▶ GPRS Software

### **Integrated Test Functions**

Integrated test functions in Mobile/Base Station Subsystem provide fast and easy testing and execution of:

- ▶ GPRS attach/detach
- ▶ IMSI attach/detach
- ▶ Combined GPRS/IMSI attach/detach
- ▶ Location area updates
- ▶ Routing area updates
- ▶ Cell reselection
- ▶ PDP Context activation/modification/deactivation
- ▶ Transfer of IP data
- ▶ Paging for CS and PS

### **Enhanced Test Tools**

The enhanced Test Management System enables local and/or remote automated and regression testing with the K1297-G20, reducing manual test time. ISO Standards require change management support; with the “shared file system approach,” users can fulfill these requirements and successfully complete regression testing according to the ISO standards. Automatically recording files for all test cases provides test results in full detail, down to the bit level, if needed.

## ► Ordering Information

Please refer to the K1297 Protocol Testers for further information.

Please note that besides the following ordering numbers additional packages, upgrades, and offline software are available.

### GPRS Software for K1297-G20 (selection)

**7KK1221-6SP11** – K1297-G20 SW Monitoring GPRS; G<sub>b</sub>-, G<sub>f</sub>-, G<sub>n</sub>-, G<sub>s</sub>-, G<sub>c</sub>-, G<sub>d</sub>-, G<sub>f</sub>-, G<sub>r</sub>-, G<sub>a</sub>-interfaces; including G<sub>b</sub> Monitor and SMS over GPRS.

**7KK1221-6SQ11** – K1297-G20 SW Monitoring for all GSM and GPRS signaling interfaces.

**7KK1221-7SP11** – K1297-G20 SW Mon/Sim/Emu GPRS Interfaces; G<sub>b</sub>-, G<sub>f</sub>-, G<sub>n</sub>-, G<sub>s</sub>-, G<sub>c</sub>-, G<sub>d</sub>-, G<sub>f</sub>-, G<sub>r</sub>-, G<sub>a</sub>-interfaces; including SMS over GPRS.

**7PK1221-6GF11** – K1297-G20 SW Monitoring GPRS Deciphering; enhancement for 7KK1221-6SP11 or 7KK1221-6SQ11.

**7PK1221-6GM11** – GPRS Multi Interface Call Trace for A-, G<sub>b</sub>-, G<sub>n</sub>- and G<sub>f</sub>-Interface.

**7PK1221-6JJ11** – K1297-G20 SW Monitoring IP; including NBSS; NBDG; NBNS; NFS; DNS; SMNP; Telnet; FTP; Radius; MIP; IKE and others.

**7PK1221-6GX11** – K1297-G20 prot. SW Mon NSIP Package; Network Services over IP (3GPP TS 48.016); Prereq.: current system version (7KK1220-0SC/Dxx) & 7PK1221-6/7GB11.

**7PK1221-7GB11** – K1297-G20 Protocol SW Mon/Sim/Emu GPRS G<sub>b</sub>; including NS (GSM08.16); BSSGP (GSM08.18); LLC (GSM04.64); SNDCCP (GSM04.65); GMM/SM (GSM04.08; TS24.008); Emulation of 240 mobile users.

**7KK1223-5GB11** – GPRS Capacity Test Extension Package for up to 100.000 subscribers.

**7PK1221-7GX11** – K1297-G20 prot. SW Mon/Sim/Emu GPRS Gb-IP Package; incl. NS (3GPP TS 48.016 ); Prerequisite: Current System Version (7KK1220-0SCxx) & 7PK1221-7GB11.

**7PK1221-7GN11** – K1297-G20 SW Mon/Sim/Emu 2.5G and 3G Mobile G<sub>n</sub>, G<sub>p</sub>, G<sub>a</sub>, lu-PS; GTP (GSM09.60; TS29.060).

**7PK1221-7GS11** – K1297-G20 SW Mon/Sim/Emu GPRS G<sub>s</sub>; including BSSAP+ (GSM09.18; TS29.018).

**7PK1221-7MM11** – K1297-G20 SW Mon/Sim/Emu 2.5G and 3G Mobile MAP; including MAP (GSM09.02; TS29.002) and TCAP 6.x and higher.

**7PK1221-7MS11** – K1297-G20 SW Mon/Sim/Emu Mobile SMS; (TS 24.011, TS 23.040, GSM 03.40, GSM 04.11 and IS637 CDMA).

**7PK1221-7TP11** – K1297-G20 SW Mon/Sim/Emu Transport Packet Data; including X.25, LAP B, FR, IPv4, ARP/RARP, TCP and UDP, ICMP, IEEE802.3 MAC.

# K1297-G20 Series Protocol Tester

▶ GPRS Software

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