

MX785201A

W-CDMA Protocol Test System (PTS)



- W-CDMA protocol test capability
- 3GPP Standard compliant development tool
- Uses the same interface as VST development tool
- Comprehensive on-line help
- Environment supporting TTCN test case execution
- TTCN test procedure library available
- Re-use of test cases from VST (Virtual Signaling Tester)

Introduction

The MX785201A Protocol Test System (PTS) is one of a family of test and verification tools from Anritsu for next generation wireless products. It is developed to provide the test support today's research and development engineers need to successfully meet demanding performance and time to market targets. The PTS is designed for testing the signaling protocol of 3G W-CDMA user equipment (UE).

The PTS and VST (Virtual Signaling Tester) products provide a common user interface thus reducing operator learn time as development progresses and migrates over the range of Anritsu's 3G development tools.

In addition, many test procedures generated for the PTS can be run on the VST and vice versa. This enables test procedures to be developed very early in the development cycle and to evolve as the user equipment includes more functions. A substantial saving in the investment in development of test procedures can be realized.

Overview

The MX785201A PTS core software is combined with the MD8480A W-CDMA Signaling Tester to make a system providing an environment to exercise Layer 3 and Layer 2 signaling protocols defined within the Third Generation Partnership Project (3GPP).

The protocols supported include Non Access Stratum (NAS), Mobility Management (MM), NAS Call Control (CC), etc., Radio Resource Control (RRC), Radio Link Control (RLC), Medium Access Control (MAC) and physical layer access procedures (PHY). When linked to a 3G Terminal (SUT System Under Test), the MX785201A PTS will enable the verification and subsequent validation of the signaling protocol of the SUT.

The software components that form the core MX785201A PTS product are described in

the System Overview and shown in the accompanying diagram. The lower layers reside in the MD8480A. This is connected to the ETS framework through TCP/IP.

The Protocol Test System software component runs on a Windows 95/NT™ PC. It executes TestStand™ test sequences made up of calls into a library of TTCN test cases through which can be defined:

- Sequences of layer 3 messages and expected responses
- Layer 3 to layer 2 service primitives to trigger specific layer 2 procedures, or to configure layer 2 operation
- Layer 3 to layer 1 service primitives to configure and initiate layer 1 operation
- Service primitives to and from user provided code modules for UE control

The layer 2 protocol stack and layer 3 test tools are functionally equivalent to those used in the Anritsu VST (Virtual Signaling Tester).

An application-programming interface (API) to enable user generated C-language test scenarios to be executed is available for the PTS if required as an alternative language.



3GPP Development and conformance tools

Anritsu already has a large number of discrete instruments ready to test the performance of next generation wireless terminals. These range from signal generators and transmitter testers capable of generating and measuring W-CDMA signals. The MD8480A specifically provides Layer 1 and RF signals for W-CDMA terminals and has been chosen by the World's leading terminal developers for next generation products.

MD8480A W-CDMA Signaling Tester



The MD8480A is a W-CDMA signaling tester that acts as a base station. It consists of a number of circuit boards within a 6U compact PCI rack. In its basic configuration, the MD8480A is supplied with a single RF transceiver and single base station

simulation. Circuit board options are available to provide an additional RF transceiver, a further two base station simulations and an ISDN interface. Future options will include GSM handover capability.

(For information on MD8480A refer to separate datasheet.)

VST Virtual Signaling Tester



The VST (Virtual Signaling Tester) complements the PTS by providing early testing for those teams developing the L2 and L3 protocols for 3G terminals prior to integration of the protocol stack with RF & baseband hardware. Test cases developed on the VST may then also then be run on the PTS.

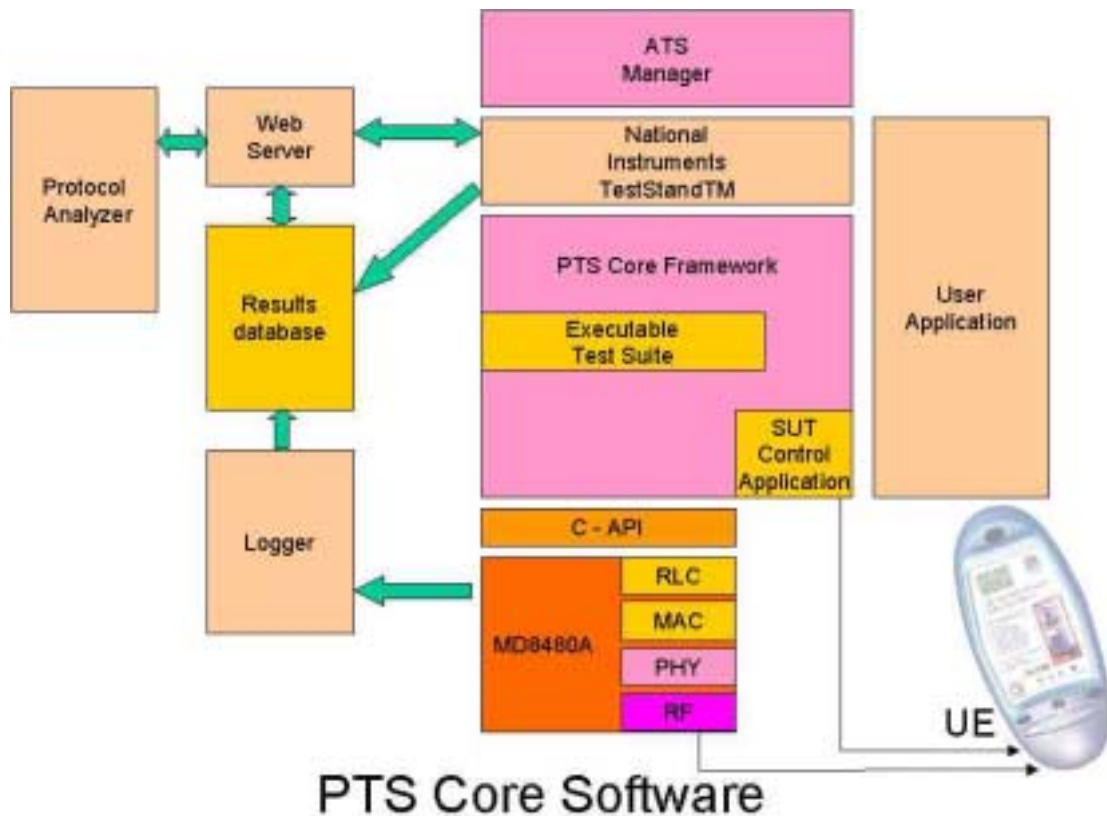
(For information on MX785101A refer to separate datasheet.)

Evolution with 3GPP

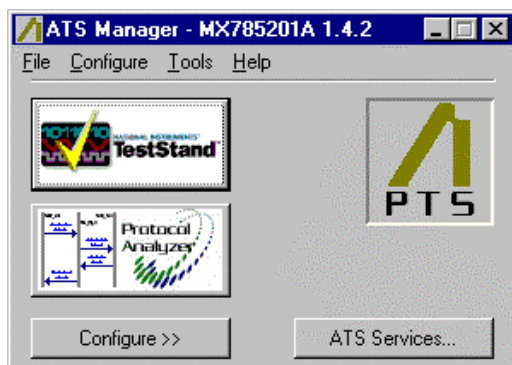
The capability of the PTS will evolve and additional capability added in-line with the 3GPP specifications. When available, the PTS will run the 3GPP Conformance Test Suite as defined in TS34.123.

In addition, the Protocol Test System will support the layer 1 and layer 2 parameter sets defined in the 3GPP specifications TS34.108.

System overview



ATS manager



The ATS Manager provides a user interface which allows configuration of the MX785201A PTS, launch of the test sequencer tool to select and execute pre-prepared Layer 3 and Layer 2 Test

Procedures and browse the results of the Test Procedures using the Protocol Analyzer.

Protocol Analyzer

All Layer 3, Layer 2 and Layer 1 message exchanges between the MX785201A PTS and the System Under Test are logged. These messages are decoded to show the name and content of each field and displayed using the Protocol Analyzer. Raw captured data is displayed in hexadecimal format.

National Instruments TestStand™



The MX785201A PTS uses the National Instruments TestStand™ run-time engine as a high level sequencing tool. The TestStand™ development system is used to create test sequences.

PTS Core Components

C-API

As an alternative language to TTCN to develop Layer 3 and Layer 2 Test Procedures, a 'C' based Application Programmer's Interface (C-API) is included in the form of a DLL.

Executable test suite

Layer 3 and Layer 2 test cases are implemented using TTCN (Tree and Tabular Combined Notation). Created TTCN tests are compiled to an Executable Test Suite (ETS) which interfaces to the MX785201A PTS via the GCI Management Interface and the GCI Operational Interface. These provide an open, standardized interface to TTCN based executable test suites. The MX785201A PTS has been developed to work with the Telelogic Tau development kit for TTCN creation, editing & compiling. The GCI framework provided by the MX785201A PTS provides support for a number of Test Suite Operations (TSOs) and also Protocol Implementation Conformance Statement (PICS/PIXIT).

Codec

The ETS is supported by a codec capable of encoding and decoding Radio Resource Control (RRC), Non Access Stratum (NAS) and lower layer configuration data.

Thin RRC

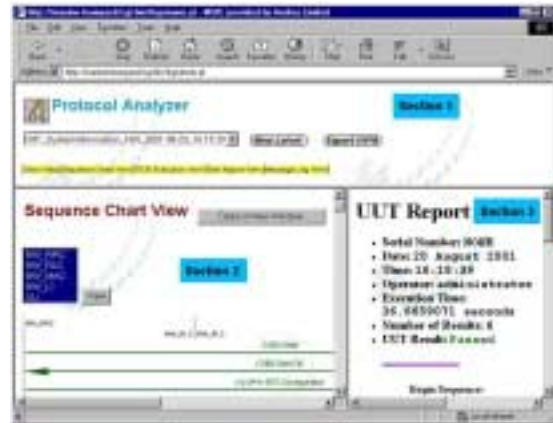
A thin RRC is provided to load NAS messages into RRC direct transfer messages and unloads NAS messages from RRC direct transfer messages transparently.

SUT Control Application

The MX785201A PTS frame-work provides an API to support automatically communicating with the UE to replace keyboard or internal (to UE) signals.

Logger and Results Database

The logger captures data from the majority of components in the system and stores it in the Results Database. This data is used by the Protocol Analyzer to create message sequence charts and display decoded messages.



RLC and MAC

RLC and MAC layers conforming to the 3GPP specifications TS25.322 Radio Link Control Protocol Specification and TS25.321 Medium Access Control Specification are supplied as part of MD8480A.

TE (Terminal Equipment)

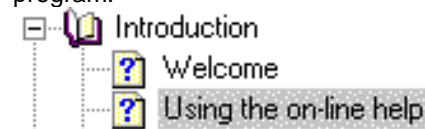
The TE is an optional component available as part of the MD8480A in the MX785201A PTS. It supports a number of features including voice AMR 12.2K Codec, ISDN, IP and PPP.

Layer 1

The MX785201A PTS provides a physical layer 1 connection to the UE by using the MD8480A.

Simple Installation

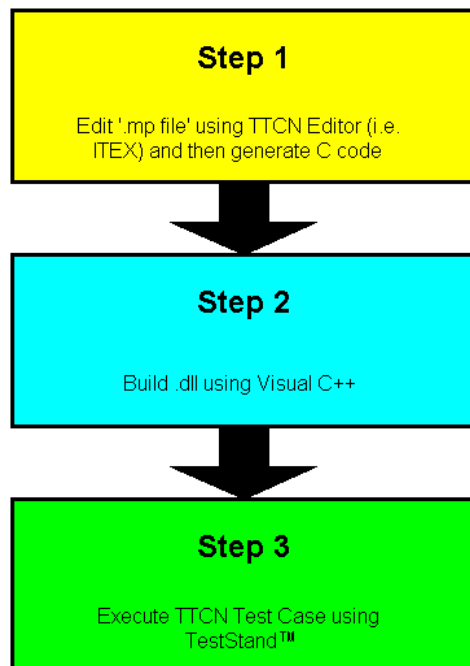
The distribution software set is provided on CD-ROM with a self-contained installation program.



The installation process is straightforward and the user is guided through the process using self-explanatory prompts. The PTS Quick Start Guide details the installation procedure and information about the hardware setup requirements.

Process Overview

The process for creating, building and executing a TTCN test case is shown in the following diagram.



For the test procedures in the optional libraries, the following is provided:

- The source .mp file (with source code only) option
- The TestStand™ sequences
- A Visual C++ Project and Environment to build the appropriate '.dll'.
- A set of generated .C files for every .mp file (as exported by Telelogic Tau)

Running a TTCN Test Case

Test sequences using the supplied DLLs or custom DLLs may be executed straight from the ATS Manager. After starting a TestStand™ session, files may be opened from a simple pull down menu. After selecting the test sequence required a dialog box with the same title as the sequence file appears in the TestStand™ Sequence editor window, with a list of the steps to be run:



TestStand™ Sequence Editor Screen

Developing Custom TTCN Test Procedures

This method requires knowledge of TTCN. New TestStand™ sequences and TTCN Test Cases may be generated by the user. Alternatively the sequences and test cases available for the PTS may be used as templates to derive new procedures. The optional PTS Integration Library Source Code (MX785201A-31) includes the library of test sequences included in the PTS Integration Library in TTCN *.mp form, i.e. as source code.

Support & Training

Ongoing support from the start

Support for a product that is as specialized as the PTS requires a number of different options. Anritsu has developed a full suite of support and training options to suit different users and applications.

Software Update and Maintenance contract

Customers are encouraged to take out software update and maintenance contracts to ensure that they keep up with both the latest software and tracking with the latest 3GPP version supported. Approximately every three months a new version of the PTS software is introduced and made available to all participants in the scheme. For those not in the scheme, updates can be purchased individually as required.

Premium Support

Anritsu provide access to their engineering support for users that reach a critical milestones or require specialist assistance during development and proving of their terminal designs. This can be purchased on a per day basis and can be arranged in advance where it needs to be planned into a development program and can even be supplied as an on-site activity if required.

On Site Installation and Commissioning

Installation and commissioning is usually expected to take approximately two days. This service is offered in addition to the initial training.

Using the Anritsu Test System On-Line Help

The aim of the help is to familiarize the user with the basic features and capabilities of the system by the use of working examples. Using the on-line help system is very easy, making use of the browser to navigate through the menus. First time users will find explanations throughout the "help" to guide them through and help understand the software and operation of the system.

Training

A two-day product training course is available as an option with the PTS and comprises a combination of classroom and practical activities. Training can be provided

either at the customer site or at Anritsu facilities.

The training course will provide some training on those aspects of third party software products used in conjunction with the PTS but will be limited to those parts of the products relevant to the PTS operation and use. This training should not be seen as a substitute for comprehensive training on these third party packages. The following third party software packages are used in conjunction with the PTS

Supplier	Tool
National Instruments	TestStand
Telelogic	TTCN Test Suite
Microsoft	Visual C++

Courses are arranged to cover:

- System operation
- Selecting and running test sequences
- Selecting and running test cases
- Viewing and analyzing results



Support Desk

Where possible we provide local support in territory or from a local field office. This is the first line of support, which is backed up from our International support desks. From day one we aim to provide an efficient support service and fast response time to technical questions.

Libraries available

Three types of library

The various libraries available can be segmented into Integration, R&D and Conformance libraries. National Instruments TestStand™ is required to implement the test cases in these libraries.

Integration libraries

Integration libraries provide a proven set of test scripts that have been tested on real terminals. These test cases take the user through specific integration milestones (e.g. RRC Connection, Location Update, Voice call etc.) and provide a straightforward method for testing of terminals during the integration process. They provide a step by step test approach to prove functionality in a UE.

PTS Executable TTCN Integration Library (MX785201A-30)

The Test Procedures are 3GPP compliant and are designed to meet the particular needs of an Integration environment. The PTS Integration Library provides TestStand™ Sequences and an executable form of the TTCN test cases.

PTS TTCN Integration Library Source Code (MX785201A-31)

This Library includes the source code for the Test Procedures and TestStand™ sequences included in MX785201A-30. This will allow more experienced users to make changes to the parameters in order to test more specific details of the terminal design.

R&D libraries

R&D libraries provide more flexible test capability and allow experienced designers to exercise their terminals over a wide range of parameters and scenarios. These libraries are available in executable form and as source code.

PTS Executable R&D Library (Single cell) (MX785201A-32)

This library provides testing in a single cell environment. It requires the MD8480A in basic form.

PTS TTCN R&D Library (Single cell) source code (MX785201A-33)

Includes the source TTCN in the form of a *.mp file for all the procedures supplied in the PTS Executable R&D library above

PTS Executable TTCN R&D Library (Multi Cell) (MX785201A-34)

This library allows for soft and hard handover. A further two base station simulators are required to be fitted in the basic MD8480A unit to perform all the tests in this library.

PTS TTCN R&D Library (Multi cell) source code (MX785201A-35)

Includes the source TTCN for the above library.

PTS Executable R&D Library (FDD/GSM) (MX785201A-36)

This library provides the ability to handover from W-CDMA to GSM and GSM to W-CDMA. It requires the GSM option for MD8480A to be fitted. The MX785201A-32 and MX785201A-34 libraries are also required to perform these tests.

PTS TTCN R&D Library (FDD/GSM) source code (MX785201A-37)

Includes the source TTCN for the above libraries. The MX785201A-33 and MX785201A-35 libraries are also required to perform these tests.

Conformance libraries

These libraries currently are being written by 3GPP and when they are available they will be the authority for 3GPP conformance. These libraries are expected to change, as the 3GPP specifications are refined. Anritsu will provide the latest versions available, and for those users within the support scheme, the libraries will be updated regularly.

3GPP Executable ATS Library (MX785201A-38)

The 3GPP standards body plan to provide a Conformance Test Suite as defined in TS 34.123-3 UE Conformance Specification, Part 3 – Abstract Test Suite. This Test Suite will be provided for execution on the PTS. This Test Suite is still under development within the standards organization, and will be downloadable from the 3GPP web-site in source form. This option covers the adapter software needed to execute the Abstract Test Suite.

3GPP Executable ATS Library - Intersystem (MX785201A-39)

This option contains the adapter needed to run the official 3GPP test cases for intersystem handover.

System Requirements

Minimum Specification

The minimum requirements for running the Anritsu Test System are:

- 233 MHz Pentium II
- 90 MB RAM
- 3 GB Hard Drive
- Screen resolution 1024*768 XGA

Recommended Specification

The recommended specification for running the Anritsu Test System is:

- 1 GHz Pentium III
- 512 MB RAM
- 30 GB Hard Drive
- 17" Monitor with screen resolution 1280*1024

Browsers and Platforms Supported

Platform	Browser
Windows NT™ (recommended)	Internet Explorer™: V4 and above Netscape Communicator™ or Navigator™: V4 and above
Windows 95™	Internet Explorer™: V4 and above Netscape Communicator™ or Navigator™: V4 and above



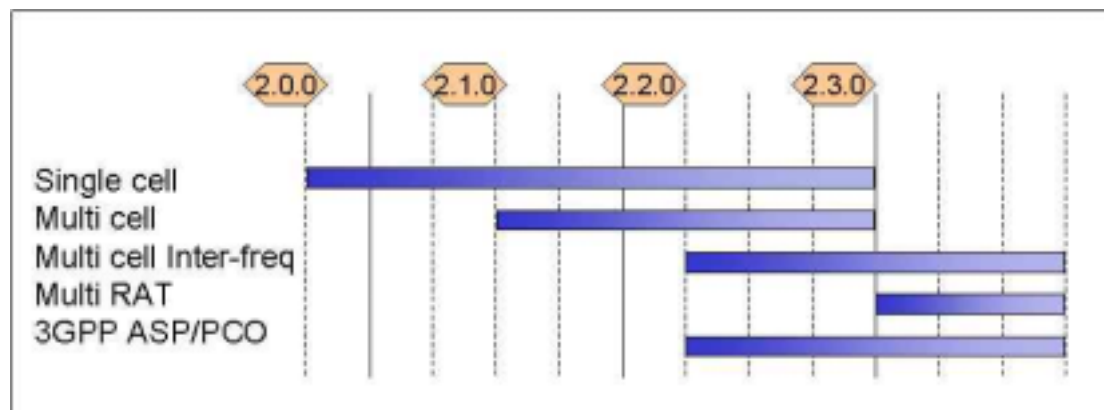
Ordering Information

Please specify model/order number, name and quantity when ordering.
Italic blue text below indicates the option is planned for future.

Model/Order No.	Description
MX785201A	PTS Core Software Single Cell ETS Framework
	Options
<i>MX785201A-10</i>	<i>Multi-Cell Capability (SHO)</i>
<i>MX785201A-11</i>	<i>Multi-Cell (Inter-frequency) Capability (HHO) [Note: requires opt10]</i>
<i>MX785201A-12</i>	<i>Multi-RAT (FDD/GSM) Capability [Note: requires opt10 and 11]</i>
<i>MX785201A-15</i>	<i>3GPP Compliant TTCN Adapter [Note: requires opt10, 11 and 12 as appropriate]</i>
	Libraries
MX785201A-30	Executable TTCN Integration Library
MX785201A-31	TTCN Integration Library Source Code
<i>MX785201A-32</i>	<i>Executable R&D Library (Single Cell)</i>
<i>MX785201A-33</i>	<i>TTCN R&D Library (Single Cell) source code</i>
<i>MX785201A-34</i>	<i>Executable TTCN R&D Library (Multi Cell) [Note: requires opt32]</i>
<i>MX785201A-35</i>	<i>TTCN R&D Library (Multi-Cell) source code [Note: requires opt33]</i>
<i>MX785201A-36</i>	<i>Executable Multi-RAT Library (FDD/GSM) [Note: requires opt32 and 34]</i>
<i>MX785201A-37</i>	<i>Multi-RAT Library (FDD/GSM) source code [Note: requires opt33 and 35]</i>
<i>MX785201A-38</i>	<i>3GPP ATS Library (Executable)</i>
<i>MX785201A-39</i>	<i>3GPP ATS Library (Executable) - Inter-system</i>
	Support
MX785201A-01	National Instruments TestStand™
MX785201A-20	Software Update and Maintenance Contract
MX785201A-21	Training Course (2 days)
MX785201A-22	Premium Support (per day)
MX785201A-23	Installation & Commissioning (1 day)

Note that libraries require the underlying core functionality to be present to function fully.

The PTS is intended to evolve along with 3GPP specifications and terminal capability. Version 2.0.0 is planned to evolve as shown in the timeline below.



Specifications are subject to change without notice.

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