MX847040B
TD-SCDMA/GSM Simulation Kit

MD8470A
Signalling Tester
MD8470A Signalling Tester

MX847040B TD-SCDMA/GSM Simulation Kit

- Product Introduction -

Your Benchtop Mobile Communications Network

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Anritsu Corporation
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1. Quick Review of Anritsu Test Solution
Market Background

- TD-SCDMA is about to start full-scale deployment in China.
- As TD-SCDMA becomes a new world standard, UE and network quality are a major issue.

To improve UE quality, Anritsu provides TD-SCDMA test solutions ranging from RF to protocol, application, and production line tests.
- Anritsu solutions will help grow your TD-SCDMA business.
Anritsu supports various test solutions for TD-SCDMA UE R&D.
- Core Technology
- RF
- Protocol
- Application

These solutions support TD-SCDMA as well as other world communication standards (W-CDMA, GSM, CDMA2000).

Signal Analyzer MS2690A/91A/92A
Digital Modulation SG MG3700A
Radio Communication Analyzer MT8815B/20B
Signalling Tester MD8470A

Anritsu TD-SCDMA Solutions for R&D
Major MD8470A and MT8815B/20B Targets at TD-SCDMA UE Verification

- The key to quality products and services is testing at every phase of development.

**Development (R&D)**

- Application Software
- Protocol (L2/L3)
- RF (L1)

**Integration Phase**

- Functional Verification
- RF Parametric Verification

**System Test Phase**

- Conformance Test

**Field Test**

**Market**

- Quality Assurance
- Operator Validation

**Mfg.**

- MT8815B/20B Radio Communication Analyzer
- MD8470A Signalling Tester

**Discover What’s Possible™**
MD8470A Signalling Tester for TD-SCDMA

- The MD8470A is a base station simulator that helps mobile UE development and evaluation engineers verify all the UE functions.
- The all-in-one design supports both protocol and application testing for TD-SCDMA HSDPA/HSUPA and GSM/(E)GRPS.

Key Features

<table>
<thead>
<tr>
<th>Protocol Testing</th>
<th>Application Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Simulates TD-SCDMA HSPA and GSM/(E)GPRS network using script mode</td>
<td>- Supports voice call, video call and SMS tests</td>
</tr>
<tr>
<td>- Supports various protocol sequence tests with flexible interface</td>
<td>- Supports video streaming, web browsing, rich-content downloading (music, games) and MMS with appropriate server</td>
</tr>
<tr>
<td>- Provides protocol logging and decode feature for evaluation and troubleshooting</td>
<td>- Supports HSDPA/HSUPA data throughput tests with built-in IP performance monitor</td>
</tr>
<tr>
<td>- Supports InterRAT handover on single platform (TD-SCDMA HSPA ↔ GSM/(E)GPRS)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Regression/Stress Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Simulates continuous testing for voice call, video call, handover, cell-reselection etc. using dedicated sample scenarios</td>
</tr>
</tbody>
</table>
TD-SCDMA Mobile Phone Issues

TD-SCDMA UEs may face the following issues:

- **Call Connection Stability**
  - Unstable basic call connection
    - Voice, Video, Packet (HSDPA/HSUPA), SMS, Multicall
  - Unstable UE behavior during handover
    - TD-SCDMA ↔ GSM
    - TD-SCDMA ↔ TD-SCDMA, GSM/GPRS ↔ GSM/GPRS
  - UE cannot select best network

- **Performance**
  - Poor battery performance
    - Standby and talk time
    - Multimedia (MMS, music, streaming...)
  - Low data throughput

Anritsu’s MD8470A is the ideal TD-SCDMA UE test solution for these issues.
Anritsu Solution Proposal [1/4]

Basic Call Connection Stability

Issues

- Call connection fails sometimes in real networks
- Requires verification of UE behavior with reference network

Anritsu Solution Proposal

- The MD8470A simulates TD-SCDMA HSPA to perform the following protocol and function tests.

[Protocol Tests]
- UE-originated voice call, UE-terminated voice call
- UE-originated packet call, UE-call release
- NW-call release, etc.

[Function Tests]
- Voice/Video/Packet call (Rel. 4, HSPA)
- Messaging (SMS/MMS)

[Regression/Stress Tests]
- Continuous various service testing (e.g. Thousand loop)

- Sample scenarios can verify UE behavior.
- The Log viewer analyzes Layer-3 problems in real time.
Anritsu Solution Proposal [2/4]

- Call Connection Stability (Handover)

**Issues**
- Call connection fails sometimes at handover
- Requires reproduction of status at handover and cell selection/reselection

**Anritsu Solution Proposal**

- The MD8470A supports handover and cell selection/reselection between 2G, 2.5G, 3G and 3.5G systems
  - TD-SCDMA HSPA ↔ GSM/(E)GPRS
  - TD-SCDMA HSPA ↔ TD-SCDMA HSPA
- Network parameters for handover, cell selection/reselection can be changed.
- The Log viewer supports easy analysis of UE behavior at handover and cell selection/reselection.

Data Throughput Performance

Issues
- Lower data throughput performance than expected
- Requires verification of impact of various application software or under external stress factors

Anritsu Solution Proposal
- The MD8470A simulates networks for all 3GPP TS25.306 TD-SCDMA HSPA UE categories, allowing users to configure the fastest TD-SCDMA data environment using the built-in server PC.
- The Throughput Monitor function monitors data throughput in real time.
- Simultaneous services (voice + packet, SMS + packet, etc.) are supported for stress testing verification.
Anritsu Solution Proposal [4/4]

- **Battery Performance**

**Assumed Issues**
- Simple standby and talk-time measurements are inadequate.
- Battery performance must be verified when using mobile applications.

**Anritsu Solution Proposal**

- The MD8470A support for external packets allows users to test battery performance with application servers, such as MMS, e-mail, streaming and music downloads.
- Network conditions can be configured flexibly by modifying the C-scenario script controlling network Layer-3 behavior.
2. MD8470A Signalling Tester
Product Overview
TD-SCDMA HSPA Network Simulation

Anritsu Solution for
TD-SCDMA HSPA Network Simulation

MD8470A Signalling Tester

New TD-SCDMA Options
- MU847040B TD-SCDMA/HSPA Signalling Unit
- MX847040B TD-SCDMA/GSM Simulation Kit
- MX847040B-13 TD-HSPA Software
Test Configuration

- Ethernet and handset interfaces support various data communication services.
- An application server can be installed in the built-in PC.
- The all-in-one platform provides a development environment including an application server.

A network simulator is an essential test tool for every development stage.

Ethernet and handset interfaces support various data communication services.

An application server can be installed in the built-in PC.

The all-in-one platform provides a development environment including an application server.

A network simulator is an essential test tool for every development stage.
Features of TD-SCDMA Options

- Simulates TD-SCDMA HSDPA/HSUPA network
- Supports simulation using flexible scenarios (in C)
- Supports various TD-SCDMA HSDPA/HSUPA channel combinations
- Supports bearers, including voice, packet, and SMS
- Provides high-performance test platform to support all 3GPP TS25.306 TD-SCDMA HSDPA/HSUPA UE categories
- Provides powerful protocol message logging and decode functions for efficient troubleshooting
- Provides monitoring functions for downlink channel power, uplink power and timing alignment
- Supports installation of two TD-SCDMA units for testing IntraRAT handover and GSM/GPRS/EGPRS options for testing InterRAT handover of dual-mode phones
Protocol Tests

Flexible Protocol Sequence Test

- The C-based scripting interface offers full and flexible control of Layer 3 behavior.
- Freely-defined test parameters and sequences support TD-SCDMA/GSM protocol sequence testing, semi-normal testing and interrupt testing.

Protocol Test Item Examples
- Registration
- UE-originated voice call
- UE-terminated voice call
- UE-originated packet call
- UE-originated SMS
- UE call release
- NW-call release
- UE terminated ……etc.

MX847040B Control Software
Handover Tests

All-in-One 2-Cell Environment

- The all-in-one MD8470A supports 2-cell InterRAT/IntraRAT tests, including cell selection, reselection and handovers.
- In addition to roaming verification when moving between different carriers, the MD8470A can verify the quality of high-speed packet-based multimedia services at TD-SCDMA HSPA and EGPRS InterRAT.

TD-SCDMA/TD-HSPA (2-Cell IntraRAT)
- Cell Selection
- Cell Reselection
- Handover (Baton / Hard Handover)
  - Voice Call (AMR: Handset, Loopback)
  - Video Call (Loopback)
  - Packet Call (up to DL2.8M/UL2.0M)
  - Multi-Call (Voice + Packet, Video + Packet)

TD-SCDMA/TD-HSPA, GSM/(E)GPRS (InterRAT)
- Cell Selection
- Inter-system Cell Reselection
- Inter-system Handover
  - Voice Call (TDS: AMR ↔ GSM: EFR)
  - Packet Call (TD-HSPA ↔ (E)GPRS)
The MD8470A supports a full range of TD-SCDMA application tests. Also, combined use with application servers provides an end-to-end environment simulating various services.

The following TD-SCDMA sample scenarios are bundled with the MD8470A.

- TD-SCDMA Voice Call (AMR 12.2 kbps)
- TD-SCDMA Voice Call HHO (Baton / HHO)
- TD-SCDMA Video Call (AV 64 kbps)
- SMS
- TD-SCDMA Packet Call (DL 64 kbps/UL 64 kbps)
- TD-SCDMA Packet HHO (Baton / HHO)
- TD-SCDMA HSDPA Packet Call (DL 2.8 Mbps)
- InterRAT Cell Reselection (TD-SCDMA / GSM)
- InterRAT Voice Call (TD-SCDMA / GSM)
- InterRAT Packet Call (TD-SCDMA / GSM)

Application Test Item Examples
- Voice/Video calls
- Web browsing
- SMS/MMS messaging
- Content download and execution, including images, video streams, ring tones, and Java etc.
Regression/Stress Tests

Continuous Test Environment

- The following type of continuous loop testing can be supported using Scenario Scheduler with dedicated sample scenarios.
- C-scenario can also generate Pass or Fail result after finishing the continuous testing for checking the UE call quality.

- **Regression Test Item Examples**
  - Voice Call Continuous Loop
  - Video Call Continuous Loop
  - TD-HSDPA Download
  - Continuous Simultaneous Services (Voice call + Packet)
    (Video call + Packet)
  - Continuous Cell reselection
  - Continuous Handover (InterRAT / IntraRAT Handovers)
  - Power Changing During Call etc.
Data Throughput Tests

Data Throughput Measurement

- Actual data throughput can be verified at a fixed rate or at a rate determined by the TD-SCDMA HSPA UE category and CQI value.
- An efficient development environment for optimizing terminal throughput is easily configured.
**TD-HSPA Software Specification**

**Supports All HSPA UE Categories in TS25.306**

The MX847040B-13 performance is ideal for feasibility verification of mobile terminals at the highest data rate.

### TD-HSDPA

<table>
<thead>
<tr>
<th>HS-DSCCH category</th>
<th>Maximum number of HSDSCH codes per timeslot</th>
<th>Maximum number of HSDSCH timeslots per TTI</th>
<th>Maximum number of HS-DCH transport channel bits that can be received within an HSDSCH TTI</th>
<th>Total number of soft channel bits</th>
<th>Maximum Throughput [bps]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1</td>
<td>16</td>
<td>2</td>
<td>2788</td>
<td>11264</td>
<td>557600</td>
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<tr>
<td>Category 2</td>
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<td>2788</td>
<td>33792</td>
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<tr>
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<td>5600</td>
<td>22528</td>
<td>1120000</td>
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<td>Category 4</td>
<td>16</td>
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<td>5600</td>
<td>45056</td>
<td>1120000</td>
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<td>Category 5</td>
<td>16</td>
<td>2</td>
<td>5600</td>
<td>56784</td>
<td>1120000</td>
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<tr>
<td>Category 6</td>
<td>16</td>
<td>2</td>
<td>8416</td>
<td>33792</td>
<td>1683200</td>
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<tr>
<td>Category 7</td>
<td>16</td>
<td>3</td>
<td>8416</td>
<td>67584</td>
<td>1683200</td>
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<tr>
<td>Category 8</td>
<td>16</td>
<td>3</td>
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<td>Category 10</td>
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<td>Category 11</td>
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<tr>
<td>Category 12</td>
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<td>4</td>
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<td>135168</td>
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<tr>
<td>Category 13</td>
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<td>Category 14</td>
<td>16</td>
<td>5</td>
<td>14043</td>
<td>112640</td>
<td>2808600</td>
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<tr>
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<td>5</td>
<td>14043</td>
<td>188960</td>
<td>2808600</td>
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</table>

### TD-HSUPA

<table>
<thead>
<tr>
<th>E-DCH category</th>
<th>Maximum number of E-DCH timeslots per TTI</th>
<th>Maximum number of E-DCH transport channel bits that can be received within an E-DCH TTI</th>
<th>Maximum Throughput [bps]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1</td>
<td>2 (Note 1, 3)</td>
<td>2754</td>
<td>550800</td>
</tr>
<tr>
<td>Category 2</td>
<td>3 (Note 1, 3)</td>
<td>4162</td>
<td>832400</td>
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<tr>
<td>Category 3</td>
<td>2 (Note 2, 3)</td>
<td>5532</td>
<td>1106400</td>
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<tr>
<td>Category 4</td>
<td>3 (Note 2, 3)</td>
<td>8348</td>
<td>1669600</td>
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<tr>
<td>Category 5</td>
<td>4 (Note 2, 3)</td>
<td>11160</td>
<td>2232000</td>
</tr>
<tr>
<td>Category 6</td>
<td>5 (Note 2, 3)</td>
<td>11160</td>
<td>2232000</td>
</tr>
</tbody>
</table>
Protocol Analysis

- When edited and compiled scenarios are loaded into the dedicated control software and executed, simulation is performed by controlling the MD8470A.
- After the test, analysis of simulation results is supported by the decode function for protocol messages (RRC, NAS [RR, CC, MM, GMM, SM], SMS, SS [Supplementary Services] Config) and filtering function.
External Control Interface

Ideal for R&D/UE Verification
- Supports Automatic and Continuous Testing

The DLL library allows external applications to control the MX847040B Control Software. By using this library, external applications can control scenario loading, parameter setting, and simulation execution to support multiple scenarios, repeated testing, and automated test systems.

The Scenario Scheduler application is bundled with the MD8470A to execute scenarios continuously using the external control function of the MX847040B Control Software.
### Supported TD-SCDMA Downlink Channel

<table>
<thead>
<tr>
<th>Channel</th>
<th>Logical Channel</th>
<th>Transport Channel</th>
<th>Physical Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common</td>
<td>BCCH</td>
<td>BCH</td>
<td>P-CCPCH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2Codes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DwPCH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1Codes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FPACH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2Codes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PICH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max 16Codes</td>
</tr>
<tr>
<td>PCCH</td>
<td>PCH</td>
<td>S-CCPCH</td>
<td>2Codes x4</td>
</tr>
<tr>
<td>CCCH/DCH/DTCCH</td>
<td>FACH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dedicated</td>
<td>DCC+DTCCH</td>
<td>DCH</td>
<td>DPCH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max 16Codes, 4Slots</td>
</tr>
</tbody>
</table>

### Supported TD-SCDMA Uplink Channel

<table>
<thead>
<tr>
<th>Channel</th>
<th>Logical Channel</th>
<th>Transport Channel</th>
<th>Physical Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common</td>
<td>CCCH</td>
<td>RACH</td>
<td>UppCH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Derived</td>
<td>DCC/DTCCH</td>
<td>DCH</td>
<td>DPCH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max 2Codes, 4Slots</td>
</tr>
</tbody>
</table>

### Supported Bearer Service

<table>
<thead>
<tr>
<th>Service</th>
<th>Data rate</th>
<th>DL Physical Channel</th>
<th>UL Physical Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol (Standalone DCCH)</td>
<td>12.2 kbps</td>
<td>DPCH (1code)</td>
<td>DPCH (SF8, 1code)</td>
</tr>
<tr>
<td>Voice Call (GSM-AMR)</td>
<td>64 kbps</td>
<td>DPCH (2codes)</td>
<td>DPCH (SF8, 1code)</td>
</tr>
<tr>
<td>Packet Switched Data</td>
<td>64 kbps</td>
<td>DPCH (6codes)</td>
<td>DPCH (SF2, 1slot)</td>
</tr>
<tr>
<td></td>
<td>144 kbps</td>
<td>DPCH (9codes, 2slots)</td>
<td>DPCH (SF1, 2slots)</td>
</tr>
<tr>
<td></td>
<td>384 kbps</td>
<td>DPCH (SF1, 3slots)</td>
<td>DPCH (SF2+SF16, 4slots)</td>
</tr>
<tr>
<td>Packet Switched Data (HSDPA)</td>
<td>2.8 Mbps</td>
<td>HS-PDSCH (16codes, 5slots)</td>
<td></td>
</tr>
<tr>
<td>Packet Switched Data (HSUPA)</td>
<td>2.2 Mbps</td>
<td></td>
<td>E-PUSCH (SF1, 4slots)</td>
</tr>
<tr>
<td>Reference Measurement Channel</td>
<td>12.2 kbps</td>
<td>DPCH (2codes)</td>
<td>DPCH (SF8, 1code) or</td>
</tr>
<tr>
<td></td>
<td>64 kbps</td>
<td>DPCH (6codes)</td>
<td>DPCH (SF8, 1code)</td>
</tr>
<tr>
<td></td>
<td>144 kbps</td>
<td>DPCH (9codes, 2slots)</td>
<td>DPCH (SF1, 2slots)</td>
</tr>
<tr>
<td></td>
<td>384 kbps</td>
<td>DPCH (9codes, 4slots)</td>
<td>DPCH (SF2+SF16, 4slots)</td>
</tr>
<tr>
<td>Reference Measurement Channel (HSDPA)</td>
<td>1278.6 kbps</td>
<td>HS-PDSCH (12codes, 5slots)</td>
<td></td>
</tr>
<tr>
<td>Reference Measurement Channel (HSUPA)</td>
<td>56.4 kbps</td>
<td></td>
<td>E-PUSCH (SF4, 2slots)</td>
</tr>
<tr>
<td></td>
<td>515.6 kbps</td>
<td></td>
<td>E-PUSCH (SF2, 3slots)</td>
</tr>
</tbody>
</table>
3. Merits of Signalling Tester
Actual Mobile Network

Problems using actual base stations at TD-SCDMA UE R&D:

- Cannot change network parameters freely
- Difficult to perform detailed troubleshooting
- Difficult to perform TD-SCDMA and GSM InterRAT handovers
- Restricted test locations
Area Supported by MD8470A

Node B → RNC → Network

TD-SCDMA UE → Node B

C-Scenario

MD8470A Signalling Tester

TD-SCDMA UE
MD8470A Solves Every Issue

- Impossible to change network parameters freely
  - Set any network parameters at PHY, MAC and RLC layer
  - Send and receive any RRC and higher-layer messages

- Difficult to perform detailed troubleshooting
  - Powerful log sorting, searching, and filtering for monitoring communications between UE and tester
  - Difficult to perform TD-SCDMA and GSM InterRAT handovers
    - The all-in-one MD8470A supports 2-cell InterRAT tests with flexible scenario capabilities
  - Restricted test locations
    - Small footprint for crowded benchtops and easy portability
Set Any Network Parameters

Set any network parameters at each PHY, MAC and RLC layer with MD8470A

Verify various bearers

Scenario

PHY

RRC

Channel Setup

TrCHConfig

Channel type and number

CphyTrchConfigTds

(•••,
D_DPCH,0,
&CphyTrchConfigD_DPCH_AMR,
ACTIVATE_NOW,
•••);

Transport format structure

Activation time

TB size, CRC length, RM Att, ...

Discover What's Possible™
Send and Receive Any Messages

Send and receive any RRC and higher-layer messages with MD8470A

Various protocol testing conditions

Scenario

CALLPROC
ALERTING
CONNECT
CONNECT ACK

UE BTS

for(;;){
    RcvMessage (&BtsNo, &Frame, &Lo_Ch, &Lo_No, RcvData, NO_TIMEOUT);
    if ((Frame==RLC_AM_DATA_IND)&&(RcvData[0]==CC_SETUP)) break;
};

UCHAR SndData[] = {DOWNLINK_DIRECT_TRANSFER,CC_CALLPROC, ........ };
SndMessage(UNIT_BTS1,RLC_AM_DATA_REQ,D_DCCH,1,SndData,);

UCHAR SndData[] = {DOWNLINK_DIRECT_TRANSFER,CC_ALERT, ........ };;
SndMessage(UNIT_BTS1,RLC_AM_DATA_REQ,D_DCCH,1,SndData,);

UCHAR SndData[] = {DOWNLINK_DIRECT_TRANSFER,CC_CALLPROC, ........ };;
SndMessage(UNIT_BTS1,RLC_AM_DATA_REQ,D_DCCH,1,SndData,);

for(;;){
    RcvMessage (&BtsNo, &Frame, &Lo_Ch, &Lo_No, RcvData, NO_TIMEOUT);
    if ((Frame==RLC_AM_DATA_IND)&&(RcvData[0]==CC_CONNACK)) break;
};

Discover What’s Possible™
Message Coder

Message Coder is a protocol message encoder/decoder tool supporting RRC, NAS (RR, CC, MM, GMM, SM), SMS and SS (Supplementary Service).

Supports efficient creation of protocol messages for test scenarios.

Efficient creation of scenarios for verifying TD-SCDMA UEs.

Encode/Decode

00 23 35 73 81 52 97 69...
Trace Analysis

Powerful log sorting, searching, and filtering to monitor communications between UE and tester

Efficient TD-SCDMA UE development and verification

Sequence

Decode
Space Saving

The small footprint saves benchtop space and supports easy portability.

Efficient TD-SCDMA UE development and verification
The MD8470A — Ideal For ...

- TD-SCDMA UE chipset and protocol development
- TD-SCDMA UE development and verifications
- TD-SCDMA UE application development
- TD-SCDMA UE inter-operability tests
- TD-SCDMA acceptance tests
- TD-SCDMA UE inspection and functional tests for pre-production (as core system simulator)

MD8470A Signalling Tester

TD-SCDMA Options
4. Required Configuration
Units/Options/Software [1/2]

- **Main Frame**
  - MD8470A Signalling Tester

- **Hardware Options**
  - MU847040B  TD-SCDMA/HSPA Signalling Unit  New
  - MU847020B  GSM Signalling Unit
  - MD8470A-02 Second RF Option

- **Software Options**
  - MX847040B  TD-SCDMA/GSM Simulation Kit  New
  - MX847040B-13  TD-HSPA Software New
  - MX847010A-01  EGPRS Software

- **Software Support Contract**
  - MX847040B-SS110  MX847040B Support Service (1 year)  New
### Test Configurations

<table>
<thead>
<tr>
<th>Configurations</th>
<th>MD8470A</th>
<th>MD8470A-02</th>
<th>MU847040B</th>
<th>ML847040B</th>
<th>ML847020B</th>
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[Note]
- Order either English or Japanese Windows® XP when ordering the MD8470A.

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*Windows is a registered trademark of Microsoft Corporation in the USA and other countries.
5. Support Service Outline
Basic Policy
– 1-year support contract

Support Details
– Responses to enquiries
  – Dedicated mail address for enquiries
– Software version upgrades for duration of contract (web download)
– Maintenance releases (including bug fixes)

Please note the support contract is mandatory.