Products: CMU200, CRTC, CRTU-G

Testing Network Registering for GSM/IS136 Multi-mode Mobile Phones

Application Note

This Application tests whether a multi-mode mobile phone supporting both GSM and IS136 has registered onto a GSM network, or an 136 network. The test set-up requires a CRTx to provide the GSM BCCH carrier, and a CMU200 to provide the IS136 DCCH carrier.

ROHDE&SCHWARZ

Subject to change – Gerd Huber 05.01 - 1CM31_0E

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1 Overview

This Application is primarily intended for anyone testing mobile phones for the US market where both GSM and IS136 networks exist in parallel. The Application polls a multi-mode mobile phone supporting both GSM and IS136 to test whether the mobile phone has registered onto a GSM network or an IS136 network. The test set-up requires a CRTx to provide the GSM BCCH carrier, and a CMU200 to provide the IS136 DCCH carrier.

2 Test Set-up

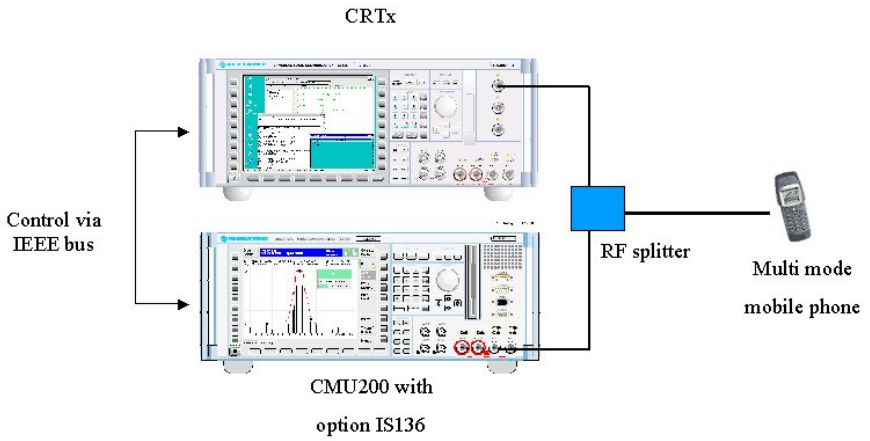
The test set-up consists of a CRTx and CMU200 with IS136 option, connected to each other via the IEEE bus in a master-slave combination with the CRTx as the master. The CRTx provides the GSM signal, the CMU200 the IS136 signal. The mobile phone under test is connected to the RF inputs of both devices using an RF splitter/combiner to combine the signal paths (see diagram). The RF connection are:

CRTx connections:

- RF IN/OUT SOCKET
- CRTU-G RF 2

CMU200 connection:

- RF 2 SOCKET



CRTx: GSM Signals and Controller

The CRTx supplies the GSM signal and also controls the CMU200. Initialise the CRTx by calling the functions “InitialiseCrtx(..)” and “TestInit(..)”. Only one of the CRTx’s two channels is used.

The Layer 1 and the frequency required for the Broadcast Control Channel (BCCH) carrier are provided by the CRTx’s Physical Device 1. All the RF characteristics such as system information, ARFCN, or neighbour cell description, are specified in the common configuration file **“t:\common\cfg\xxx\chcomb4.cfg”.** This may be a GSM900, GSM1800 or GSM1900 file, depending on the CRTx hardware configuration - xxx indicates GSM, PCN or PCS.

The Analogue Unit is set so that the RF output level of the BCCH carrier will be at –50 dBm. The expected input level equating to Power Control Level of the mobile under test (see. GSM 05.05) will be at 10 for the BCCH carrier. To change the output level of the BCCH carrier or Power Control Level, it is necessary to edit the source code, see the Application Developers Guide for details.

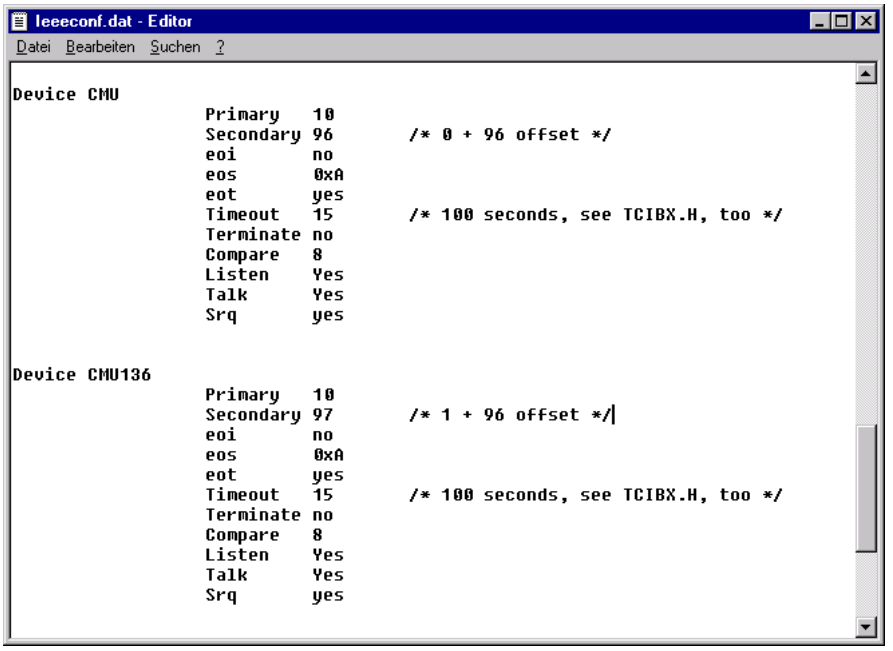
CMU200: IS136 Signals

The CMU200 (with IS136 option) supplies the IS136 signal. As the CMU200 is remote controlled from the CRTx via the IEEE (GPIB) bus, it has to be defined to the CRTx, the IEEE bus controller, as an external device.

All external devices are defined in the CRTx file "**c:\config\ieeeconf.dat**". Two CMU-specific devices are defined, "CMU" and "CMU136":

- Both devices have the same Primary GPIB Address (PAD) of **10**.
- The Secondary GPIB Address (SAD) for the "CMU"- device is **96**
- The SAD for the "CMU136"-device is **97**

The entries in ieeeconf.dat are:



The test software initialises the devices "CMU" and "CMU136" by sending the CMU-specific initialisation strings from the CRTx to the CMU200.

The CMU200 is set so that the RF output level of the DCCH carrier is –50 dBm at channel number 716.

The carrier signals are mixed together by the RF splitter/combiner and sent to the mobile under test.

3 Additional CMU200 Software Settings

There are two code numbers to be set on the CMU200:

- The System Identity (SID), pre-set from the CRTx to **47**.
- The Mobile Country Code (MCC).

Depending on the Mobile used in the test:

- change the SID in the application source code
- change the MCC directly on the CMU200 with the softkey menu.

4 Installing and Compiling the Program

All CRTx's have a test environment at:

C:\user\applics.p2p

From Applics version 1v15, the following files are already installed. If you are using an earlier version, download the files supplied in the archive with this Application as necessary:

DOS-based CRTx:

Appl9dm.prj --> c:\user\applics.p2p\appl9

Appl9.c --> c:\user\applics.p2p\appl9

Appl9d.bat --> c:\user\applics.p2p\appl9

Ieeeconf.dat --> c:\config

Windows-based CRTx:

Appl9dm.dsp --> c:\user\applics.p2p\appl9

Appl9d.c --> c:\user\applics.p2p\appl9

Appl9d.bat --> c:\user\applics.p2p\appl9

Ieeeconf.dat --> c:\config

To generate the executables for this Application, compile and link:

- **DOS:** Borland C++ Project *.prj
- **Windows**: Visual C++ Project *.dsp

5 Running the Program

You can run the program either by installing the Message Controller and DSP operating system, or by configuring the R&S Sequencer. See the Software Manual for Operational Software CR02P2P for furhter details.

Installing the Message Controller

From the DOS prompt:

1. Select the application test environment by entering:

   c:\user
   testenv_applics.p2p

   The path to the test environment is mapped to the drive T

2. To install the Message Controller (providing system control and Layer 2 functions) and the DSP operating software enter:

   i

   This is a doskey used to call „initcrts.bat“

3. Change directory to the subdirectory \APPL9 and start the program by entering:

   Appl9d

The program performs the initialisation and configuration described above, and stops with the prompt:

“Power cycle MS and wait for registering"

Note: *Once the test session for mobile phone registration is complete, the Message Controller is still active and blocks space in main memory. To remoce the Message Controller from DOS, at the DOS prompt enter:*

x

This is a doskey used to call „exitcrts.bat“

Configure the Sequencer

Before you can run the Application from the R&S – Sequencer you have to configure it. Especially the file "Version.dat" has to be modified. See the “Software Manual for Operational Software CR02P2P” for details.

To run this Application from the R&S - Sequencer:

1. To start the Sequencer, at the DOS prompt enter:

   seq

2. Run the Application by highlighting and entering the following line in the Sequencer. Initialising of the Message Controller as well as the DSP software is started automatically:

   APPL9DM

3. The program will perform the initialisation and configuration, described above, and stop with the prompt:

   “**Power cycle MS and wait for registering**"

Testing Mobile Registration

With the program already prepared and the following message on the screen, the test set-up is complete:

"**Power cycle MS and wait for registering**"

Switch the mobile under test on. The following results are possible:

• The Mobile registers for GSM, the following text appears on the CRTx screen: „mobile is GSM registered“	The Application is finished
• The Mobile registers for IS136, the following text appears on the CRTx screen: „mobile is IS136 registered“	The Application is finished
• The Mobile does not register No action on the screen, the program does not time out.	Press ESC key to abort

6 Signalling Messages

As for all tests on a CRTx, a log file is generated containing all the messages between the CRTx and the mobile, but omitting messages between the CMU200 and the mobile. The following signalling messages in the log file confirm successful registration.

GSM Signalling on CRTx

The GSM signalling output is based on the content of the configuration file ChComb4.cfg located in "t:\common\cfg\xxx" (where xxx indicates GSM, PCN or PCS) as documented in the Application Developer's Guide. This file contains the information to be transported on the Channel Type BCCH.

The message to be looking for from the mobile is the Channel Request (see below). It indicates that the Mobile wants to register on the GSM net.

	Dir	Channel	Message	Primitive name
1	UL	RACH	CHANNEL REQUEST	DL_RA_IND

Note: *UL indicates UpLink (MS to CRTx).*

IS136 Signalling on CMU200

The IS136 signalling output on CMU200 is completely handled from the CMU200. The only parameters CMU200 gets from the remote controlling CRTx are the Channel Number (pre-set 716), the Output Level (pre-set –50 dBm) and the System Identity (SID) (pre-set **47)**.

7 Program Debugging

If the test runs correctly and the mobile under test registers under GSM, the message from the GSM signal Channel Request above should be found in the signalling log. If problems occur, check for the message. Note that if the mobile registers under IS136, there is no equivalent entry in the CRTx signalling log.

If the mobile performs an action that is unexpected, receipt of the unexpected message invokes the default 'Discard Handler' set-up during the initialisation phase, messages are written to the file D:\APPL.DIS.

To decode this file use the tool DECODE.EXE provided with the CRTx operational software (see details in the Software Manual of CR02P2P).

Call:

```
decode appl.dis /o
```

This will result in the decoded text being written to a file 'appl.lst', which can be reviewed by any ASCII editor.

Note: *For additional information on the switches available with this tool, run* ***decode*** *with no parameters.*

The content of the log will be archived to disk by the following function call:

```
savelog appl9d.log
```

8 Program Architecture

This Application relies on the following layout and files at runtime:

- T:\APPL9\APPL9D.EXE
- T:\COMMON\CFG\GSM\CHCOMB4.CFG (WHEN CRTX IN GSM900 MODE)
- T:\COMMON\CFG\PCN\CHCOMB4.CFG (WHEN CRTX IN GSM1800 MODE)
- T:\COMMON\CFG\PCS\CHCOMB4.CFG (WHEN CRTX IN GSM1900 MODE)
- C:\CONFIG\IEEECONF.DAT (CMU- AND CMU136 DEVICE SPEC.)

The source file APPL9D.C uses functions of the Applications Common Code (reference Application Developer's Guide).

9 Literature

The following documents are referenced:

GSM 05.01	Physical layer on the radio path (general description)
GSM 05.02	Multiplexing and multiple access on the radio path
GSM 05.05	Radio transmission and reception
GSM 05.08	Radio subsystem link control
GSM 04.06	MS-BSS interface data link layer - specification
GSM 04.08	Mobile radio interface layer 3 - specification
Rohde & Schwarz	Applications Developer's Guide
Rohde & Schwarz	Software Manual for Operational Software CR02P2P

10 Ordering Information

CMU 200		1100.0008.02
	CMU-B21	1100.5200.02
	CMU-K27	1115.6607.02
	CMU-K28	1115.6707.02
CRTC		1081.6000.02
CRTU - G		1140.0009.02

ROHDE & SCHWARZ GmbH & Co. KG · Mühldorfstraße 15 · D-81671 München · P.O.B. 80 14 69 · D-81614 München ·
Telephone +49 89 4129 - 0 · Fax +49 89 4129 - 13777 · Internet: http://www.rohde-schwarz.com

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