Test and Measurement
Division

Windows® Application CMUgo

(Version 1.70)

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1 Contents

2 Introduction

We are very pleased to present **CMUgo** to you. CMUgo offers comprehensive remote control programming capabilities for the **R&S CMU 200 Digital Radio Tester**. CMUgo offers versatile automatic test configurations for the various wireless networks, which are supported by the R&S CMU 200. Automatic test results are documented in an informative report, which can be stored and printed.

All brand names and product names in this manual are registered trademarks of the respective manufacturer.

2.1 First Steps with CMUgo

The best way to familiarize yourself with CMUgo, is learning by doing. New users of CMUgo are advised to carefully read this manual.

2.2 Basic Knowledge Required

Before using CMUgo, you should be familiar with the basic operation of Microsoft Windows™, IEEE-488 instrument control interface and/or the RS-232 serial interface. For more detailed information on Windows™ refer to the Microsoft Windows™ user manual.

2.3 Preconditions for System Use

CMUgo will operate under Windows™ 98, ME, 2000 or XP.

CMUgo is currently available in English and German. To ensure proper functioning of CMUgo, your computer should meet the following minimum requirements.

Platform:	Windows™ 98 / ME / 2000 / XP
Processor:	Pentium™ III and above
RAM:	256 Mbytes
Display:	SVGA 800x600 pixels[1]
Hard-disk storage:	100 Mbytes
Peripherals:	Mouse, one free serial interface or a National Instrument™ GPIB Bus card or Agilent GPIB card with an installed SICL driver.

Fig. 1 Preconditions for System Use

[1]For a more convenient use of CMUgo, particularly the presentation of measurement reports, the video graphics card should have a better resolution than 800x600.

To make full use CMUgo's capabilities, the CMU 200 firmware version should be 3.60 or higher. CMUgo requires the use of a remote controller. This can be either a National Instrument™ GPIB Interface card or a Agilent GPIB card with an installed SICL driver, which allows the benefit of high-speed execution of the automatic test sequences. Alternately a serial cable can be used to connect your PC to the R&S CMU 200. A suitable serial cable is described in the following section.

2.4 Suitable Serial Cable

CMUgo and the CMU 200 allow for various settings of the RS-232 interface.

Recommended settings that should be used:

Baud rate ***19200***
Data Bits ***8***
Stop bits ***1***
Parity ***none***
Handshake[1] ***CtsRts***

[1]Handshaking is the means that is used for devices to control the serial data flow. The CMU 200 allows **3** different selections for this function. ***none***, ***CtsRts***, and ***XonXoff***. Setting the Handshake to **none** is not recommended.

Pin	Designation
1	DCD (Data Carrier Detect)
2	RxD (Receive Data)
3	TxD (Transmit Data)
4	DTR (Data Terminal Ready)
5	GND (Ground)
6	DSR (Data Set Ready)
7	RTS (Request To Send)
8	CTS (Clear To Send)
9	RI (Ring Indicator)

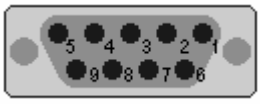
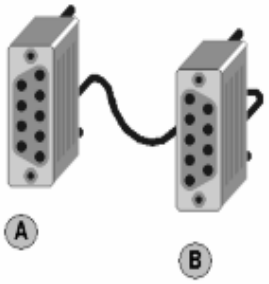


Fig. 2 Pin assignment of the RS-232-C interface

2.4.1 Cable for Hardware Protocol RTS/CTS

9 Pin RS-232 serial cable	
Cable end A	Cable end B
Pin 2 (RxD)	Pin 3 (TxD)
Pin 3 (TxD)	Pin 2 (RxD)
Pin 7 (RTS)	Pin 8 (CTS)
Pin 8 (CTS)	Pin 7 (RTS)
Pin 5 (GND)	Pin 5 (GND)



3 Installation

CMUgo can be downloaded from the Rohde & Schwarz web site,
"**http:\\www.rohde-schwarz.com**".

Typically it is compressed as a "ZIP" file. You will need the Windows XP internal uncompress tool or a version of "WinZip™" to uncompress the CMUgo setup files.
CMUgo on CD-ROM is around 16 Mbytes in total size. Due to this file size limitation it is not possible to store the files on a Floppy Disk and run the installation from Floppy Disks.
Use CD-Rs or CD-RWs for copies of the uncompressed files. Put all of the CMUgo files together in one directory on a CD-R or CD-RW disk. It is also possible to install the CMUgo files from a network drive.

3.1 Procedure

3.1.1 Step 1

Insert the CD-ROM into the drive and / or change to the directory, where the uncompressed files are stored.

3.1.2 Step 2

Click on **Setup** to begin installation of CMUgo.

Fig. 3 Installation Files

3.1.3 Step 3

Fig. 4 Setup Welcome Screen

The installation wizard will guide you step by step through the installation. After the welcome screen is displayed, press **Next** to proceed to the next step.

3.1.4 Step 4

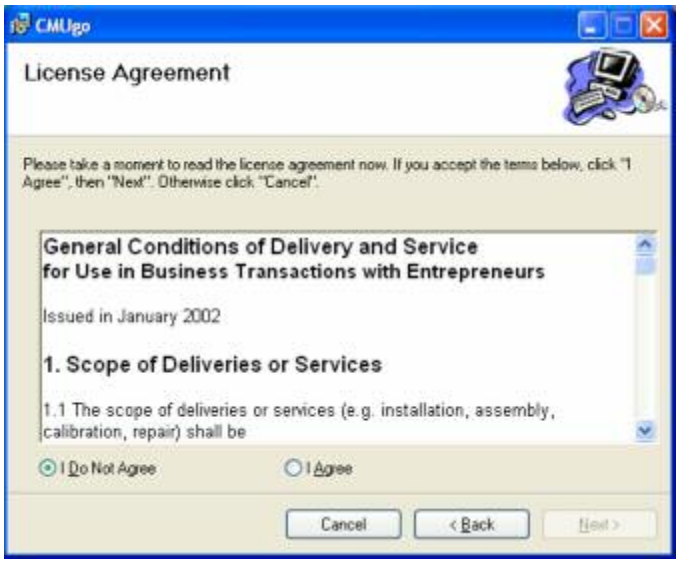


Fig. 5 Licence Agreement

Read the license agreement shown in this dialog carefully. Select **I Agree,** if you want to install this software package on your computer. Then enter **Next** to proceed or, **Back** to return to the previous step. Enter **Cancel**, if you desire to abort the installation.

3.1.5 Step 5

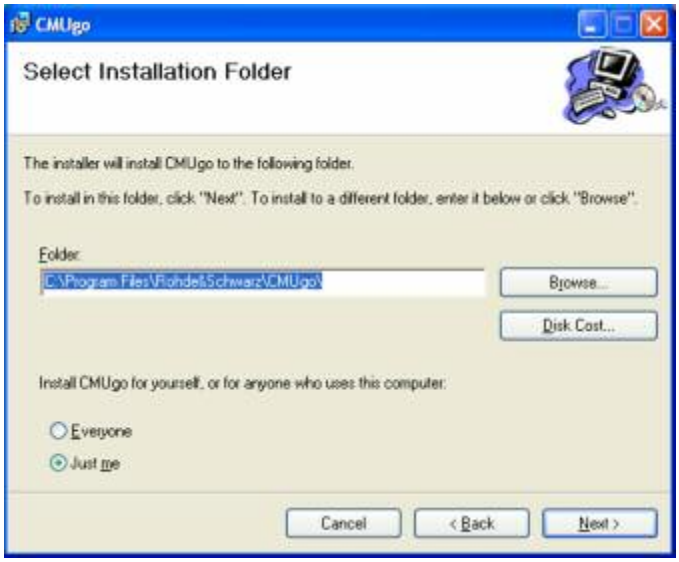


Fig. 6 Select Installation Folder

Select the path, where CMUgo should be installed. You may choose the shown default folder. The start menu of Windows is containing private and public entries. Select **Just Me** if CMUgo should only appear in your private start menu. Select **Everyone**, if CMUgo should also appear in the start menu, when another user is logged in on this computer.

3.1.6 Step 6

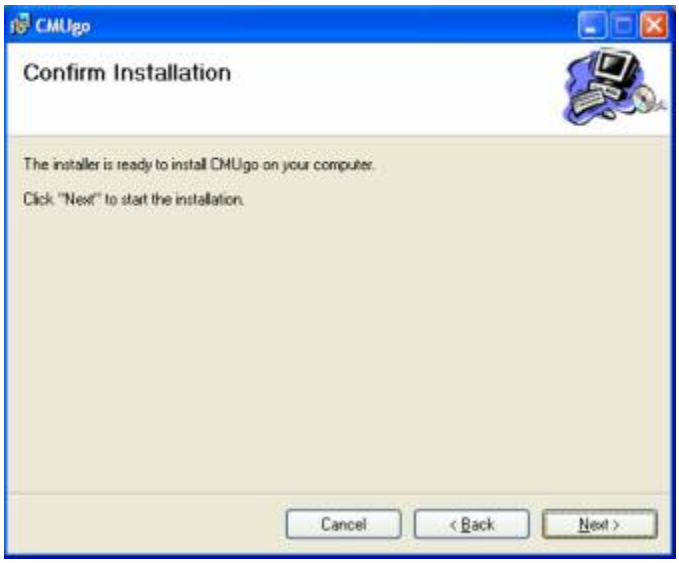


Fig. 7 Confirm installation

After the installation software preparations have been completed, press, **Back** if you wish to make further changes, otherwise press, **Next**.

3.1.7 Step 7

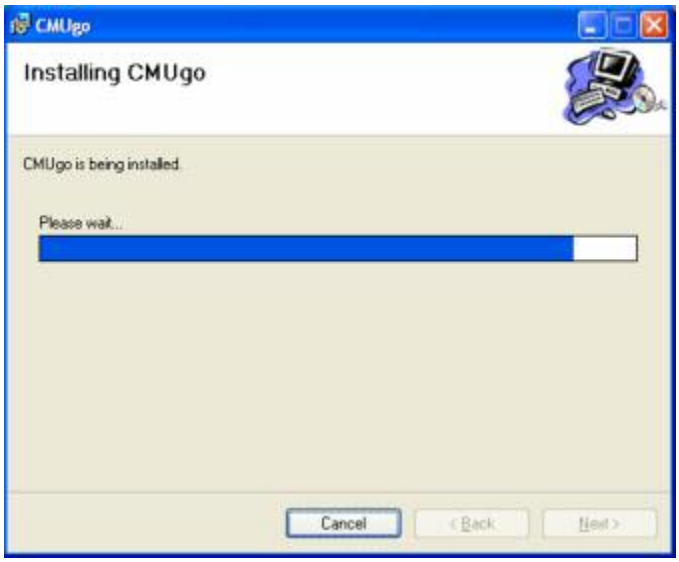


Fig. 8 Installing CMUgo

The installation software now starts to copy the software components. If desired, the installation procedure can be terminated before completion with **Cancel**. A progress bar informs you on the current installation state.

3.1.8 Step 9

The installation was successfully completed. Press the **Close** button now.

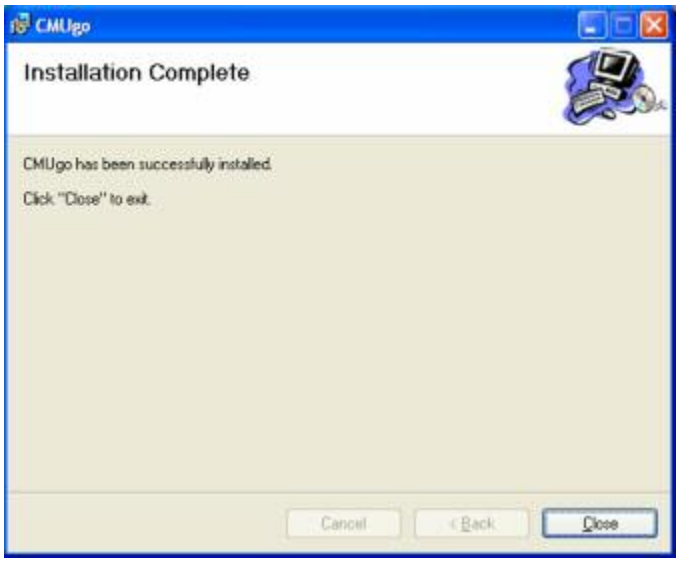


Fig. 9 Installation Complete

4 Software Components

The installation program installs the following components. To simplify the removal of the program, the components should not be copied into the Windows™ directory. Some files are copied to the Windows™ system directory. These files are the runtime libraries below; they are possibly used by other Windows™ applications as well. CMUgo consists of a main program and test item DLLs. The number of test items, which are available for CMUgo will increase in future.

4.1 Installation Standard Components

Directory (example)	Component	Function
C:\CMUGO\	CMUGO.EXE	Program
C:\CMUGO\	CMUGO.INI	Initialization file

4.2 Runtime Libraries

To simplify removal of the program, the components should preferably not be copied into the Windows™ directory. If further applications are to be used and copied to the Windows™ system directory by the runtime libraries below, these libraries may be cleared from the installation directory. This should only be done if problems occur with the remaining hard disk memory.

Directory (example)	Component	Function
C:\CMUGO\	MFC42D.DLL	32-bit runtime library
C:\CMUGO\	MFCO42D.DLL	32-bit runtime library
C:\CMUGO\	MSVCRTD.DLL	32-bit runtime library
C:\CMUGO\	MSVCIRTD.DLL	32-bit runtime library

4.3 Installed Common Test Items

Test functions are contained in DLLs, which are loaded, when starting CMUgo. Some of these DLLs are used for common functions, like user actions, and to control the behavior of the test sequencer.

Directory (example)	Component	Function
C:\CMUGO\	BasicInitializing.DLL	First test Item of every sequence
C:\CMUGO\	BinaryRS232AUX.DLL	User-specific binary data transfer to the auxiliary RS-232 device.
C:\CMUGO\	BTSSearch.DLL	Search for occupied channels in all GSM bands
C:\CMUGO\	CompareIMEI2Scanner.DLL	Compare the IMEI query from the call setup to the input of barcode reader when starting the sequencer. (TAC+SNR+CD)
C:\CMUGO\	Delay.DLL	Sets a delay between test items.
C:\CMUGO\	DirectCommand.DLL	User-specific command transfer to CMU200
C:\CMUGO\	DirectGPIBAUX1.DLL	User-specific command transfer to the auxiliary GPIB device 1.
C:\CMUGO\	DirectGPIBAUX2.DLL	User-specific command transfer to the auxiliary GPIB device 2.
C:\CMUGO\	DirectRS232AUX.DLL	User-specific command transfer to the auxiliary RS-232 device.
C:\CMUGO\	GetTimeStamp.DLL	Display timestamps in the report
C:\CMUGO\	LoopEnd.DLL	Defines loops in combination with LoopStart
C:\CMUGO\	LoopStart.DLL	Defines loops in combination with LoopEnd
C:\CMUGO\	OverwriteReportSettings.DLL	Change the report settings of CMUgo like in the report configuration dialog
C:\CMUGO\	OverwriteSeqAtt.DLL	Change the attenuation settings for a sequence. The values are taken from a user specific initialization file.
C:\CMUGO\	Remarks.DLL	User remarks in test report
C:\CMUGO\	RS232AUXMobileInfo.DLL	Query mobile capabilities using AT commands.
C:\CMUGO\	ShowHint.DLL	Displaying Pop-up windows
C:\CMUGO\	TestEnd.DLL	Generating test report.
C:\CMUGO\	ToggleRFPort.DLL	Toggle between CMU200 port RF1 and RF2 to support CMU-B99
C:\CMUGO\	UserDefinedTest.DLL	User definable test with limit check
C:\CMUGO\	Z10CloseLid.DLL	Displays Z10 and requests to close the lid of the antenna coupler.

4.4 Installed Network Dependent Test Items

Other DLLs are network dependent. To be able to use them your R&S CMU 200 must have the recommended firmware and hardware options installed.

Directory (example)	Component	Function
C:\CMUGO\	1xEVDOxx.DLL	1xEVDO test Items
C:\CMUGO\	AMPSxxxx.DLL	AMPS test Items
C:\CMUGO\	AUDIOxxx.DLL	AUDIO test Items
C:\CMUGO\	BTxxxxxxx.DLL	Bluetooth test items.
C:\CMUGO\	CDMA2Kxx.DLL	CDMA2000 test items (CMU option B83)
C:\CMUGO\	CDMAxxxx.DLL	CDMAone test items (CMU option B81)
C:\CMUGO\	GPRSxxxx.DLL	GPRS test items
C:\CMUGO\	GSMxxxxx.DLL	GSM test items
C:\CMUGO\	HSDPAxxx.DLL	HSDPA test items
C:\CMUGO\	TDMAxxxx.DLL	TDMA IS 136 test items
C:\CMUGO\	WCDMAxx.DLL	WCDMA test items
C:\CMUGO\	WLANxxxx.DLL	WLAN test items (using RF Non-Signaling)

4.5 Other Components

CMUgo test sequences can be stored and recalled again. This allows tests and test limits to be specified for the different types of mobile phones. Test results can also be stored. These components will not be deleted, when removing CMUgo. Therefore you have to delete them manually.

Directory	Component	Function
Any	*.MRP	Measurement reports
Any	*.SEQ	Saved test sequences

4.6 Pictures of predefined sequences

Some sequences of CMUgo are using the Show Hint test item to display information to the user. These pictures are stored in a subdirectory of CMUgo

Directory	Component	Function
C:\CMUGO\PICTURES	*.BMP	Hints to the user

4.7 TAC dependent attenuation settings

The TAC dependent attenuation is using a text file string the data and bitmap files, which are stored in the same directory. This database is not part of the standard installation. An extra setup for this database is available.

Directory	Component	Function
C:\CMUGO\KNOWNTAC	DEFAULT.TXT	Default attenuation values before mobile registration has been finished. This file will not be overwriten during the installation.
C:\CMUGO\KNOWNTAC	PATHLOSS._XT	Database of all known TAC numbers. This file will be installed during the setup and replicated with the existing file PATHLOSS.TXT
C:\CMUGO\KNOWNTAC	PATHLOSS.TXT	Database of all known TAC numbers. The stored data will not be overwriten by PATHLOSS._XT. Only new entries will be appended uring the automatic replication process.
C:\CMUGO\KNOWNTAC	xxx.BMP	Picture of stored mobiles
C:\CMUGO\KNOWNTAC	POS_xxx.BMP	Picture of stored mobiles, showing the way, how to place the phone at the reference position.

5 Removal of CMUgo

Removal is basically automatic on all platforms. The automatic program removal clears all files that have been stored in the computer during the installation. Other files like configuration files or measurement reports are not cleared. If required, these files must be manually removed.

5.1 Removal under Windows™ 98 / ME / 2000 / XP

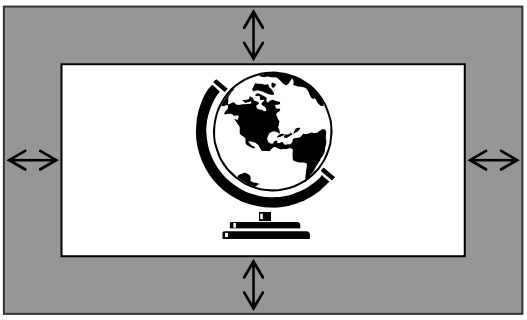
To remove CMUgo, go to the Windows™ system control panel and click on “Add/Remove Programs”. A list of the software will be displayed that can be removed. The list contains the entry “CMUgo“. Select this entry and then press the “Add/Remove” button.

6 Getting Familiar with CMUgo

6.1 Starting the program

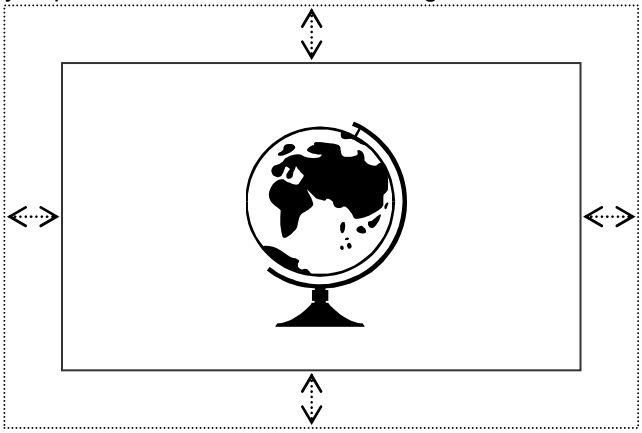
Fig. 10 CMUgo Main Window

After the start, the client window of the CMUgo program displays a startup picture. This picture can be changed according to your individual wishes. It is based on a file “Startpic.BMP”, which is located in the same directory as the executable file.The optimum depends on the configuration of your Windows™ system.



In the case that the picture is greater than the client area of CMUgo, only a part of the picture is displayed. The margins of the picture will be outside the visible area and not be displayed.

The picture is not resized to fit into the client window of CMUgo. Therefore the center of the startup picture is centered to the client window. In the case, that the window is smaller than the client area, CMUgo places a white border around the picture. For an optimum design you picture should use a white background



Good results can be obtained with graphics files with the following characteristics:

- Width: 640 pixels
- Height: 480 pixels
- 24 Bit per pixel (65 million colors)
- Format: Windows™ bitmap (BMP)
- White background

Or

- Width: 800 pixels
- Height: 600 pixels
- 24 Bit per pixel (65 million colors)
- Format: Windows™ bitmap (BMP)

In a next step you should configure your test sequence or load an existing test sequence. Please have also a look on the description for an example of a GSM Autotest sequence at the end of this document. Other demo test sequences can be found as part of the installation.

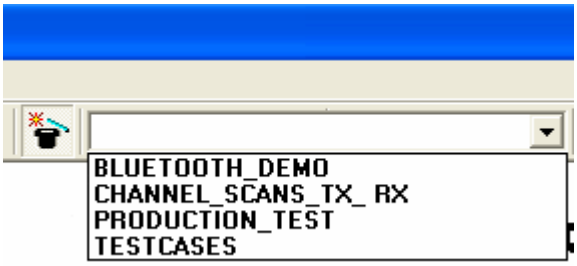


Fig. 11 Sequence Drop Down List Box

Click on the arrow of the drop down list box at the title bar of the program to see the predefined test sequences. Select one of them, for example the “BLUETOOTH_DEMO” sequence. By default the sequences are stored in the directory, where CMUgo had been installed. The path for this directory can be changed by the user.

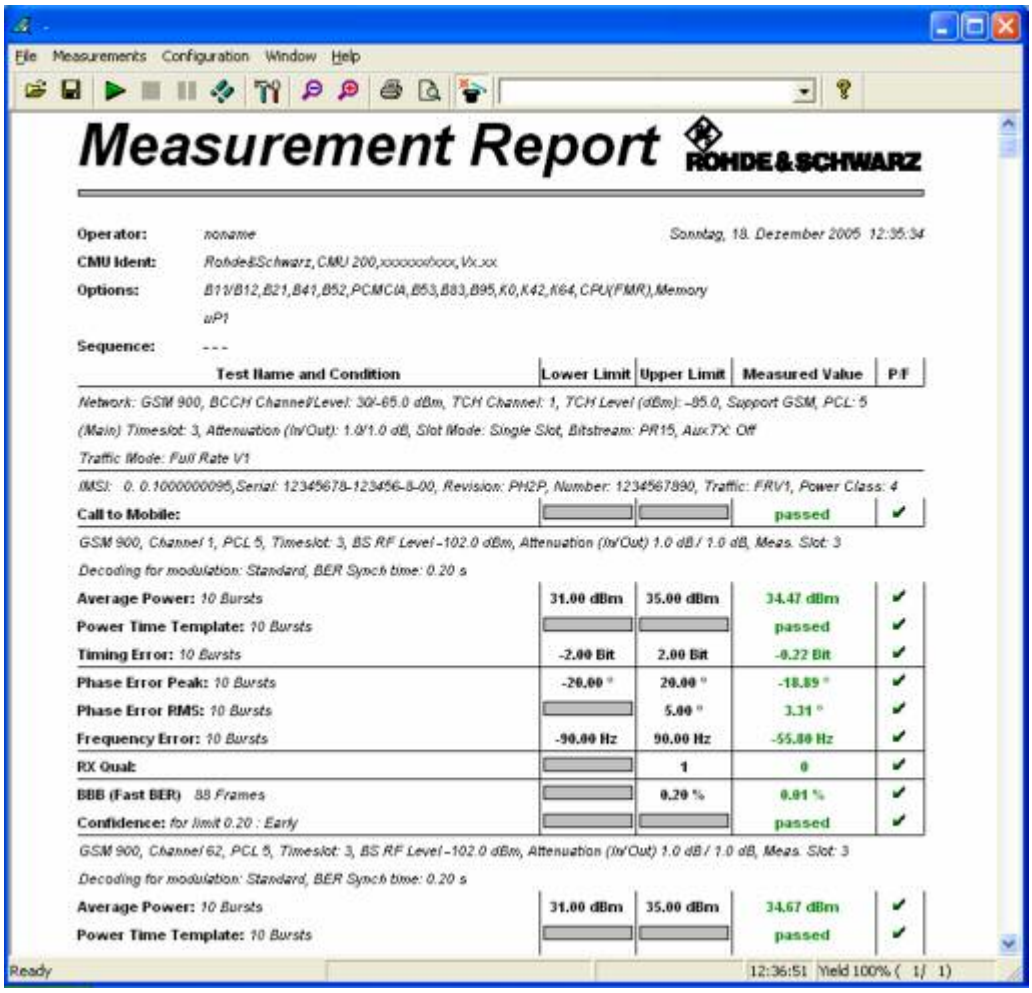


Fig. 12 Measurement Report Window

After starting the measurements or loading a stored measurement report CMUgo displays the report in the client area. Dependent on the program configuration **on the fly update** of the measurement report configuration the measurement report might not be updated during the test run. But the status bar displays the interim result, like shown below.

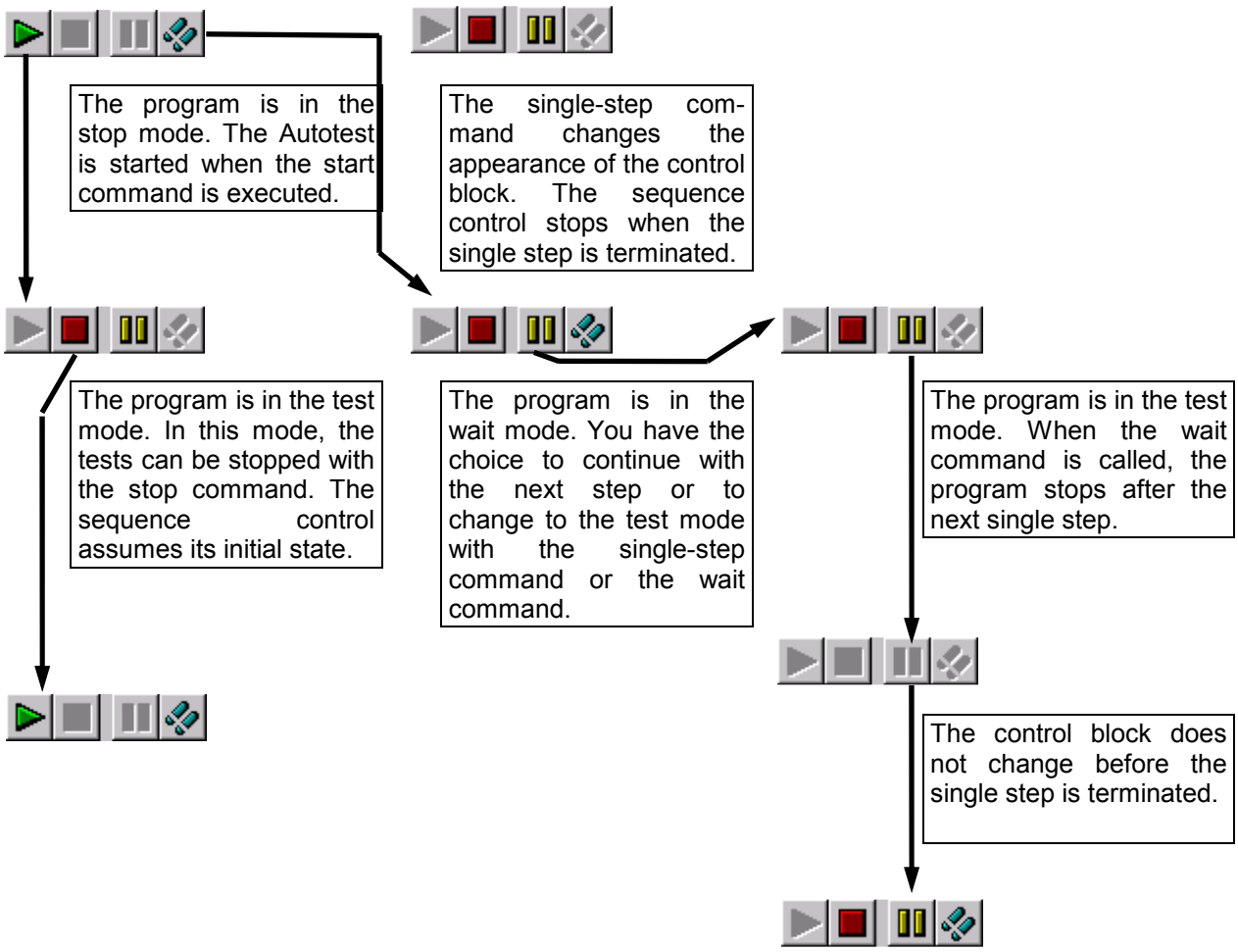
Fig. 13 Status Bar

After the tests have been finished the report with all results is updated. An update of the test results can be forced during test run, when you scroll through the report.

Note:
Only one measurement report can be displayed at a time.

6.1.1 Sequence Control of CMUgo

With the CMUgo program, Autotest functionality is available. The sequence control is in the stop mode so that you can perform the configurations that are still needed. In this mode, you may choose between the following possibilities:



Observe the appearance of the described block in the toolbar during Autotest control.

Note:
Some of the commands of the menu bar can only be called in stop mode. After the change to the stop mode, the sequence control is reset. Restarting the sequence control restarts the Autotest.

The status bar displays the current test item and the current test step inside this test item. Using the stepping mode of the sequence control, CMUgo stops after each step. A single step must not include a remote command transmission.

Fig. 14 Test result indication in the status bar

7 Program Menus

This section describes the commands available in the CMUgo menus. If a command can also be called via the toolbar, its icon is displayed below the headline.

7.1 File Menu

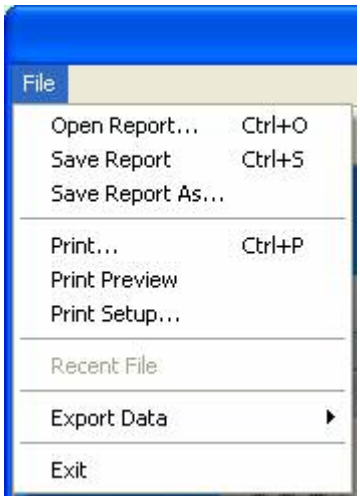


Fig. 15 File Menu

7.1.1 Open Report

Fig. 16 Toolbar Open Report

With this command, a stored measurement report is opened. A dialog is displayed where the desired file can be selected. You may have to change the directory in this dialog window. After the selection of a measurement report, the program changes to the report display mode. Measurement reports are normally stored in files with the extension .MRP on the hard disk or any other storage medium. The short cut “Ctrl”+”O” can be used to execute this open report command, when the CMUgo client window is the currently active window on the desktop of your PC.

7.1.2 Save Report

Fig. 17 Toolbar Save Report

This command can be used to store a measurement report. A dialog window is opened where the directory can be selected and the report stored under the desired name. The short cut “Ctrl”+”S” can be used to execute this open report command, when the CMUgo client window is the currently active window on the desktop of your PC.

7.1.3 Save Report As

This command is similar to the Save command. It allows a saved report to be stored under another name.

7.1.4 Print...

Fig. 18 Toolbar Print

In the report display mode, the measurement report can be output to a printer. A dialog is opened where the user can select the printer to be used, the pages to be printed and the number of copies to be made. Use the print preview command to view the pages to be printed.

7.1.5 Print Preview

Fig. 19 Toolbar Print Preview

This command is used to open the print preview dialog window in the report display. In this window, the measurement report is displayed in hardcopy format. Use the arrow keys to scroll between the pages. Icons are provided for switchover between single-page and double-page display. The displayed pages are indicated in the field to the right of the icons. Printing is started by a click on the respective icon. Click on Close to close the dialog and return to the report display mode.

7.1.6 Print Setup

This command opens a dialog window at the system control level of your PC where a printer can be installed. Refer to the Windows™ manual for more information.

7.1.7 Export Data

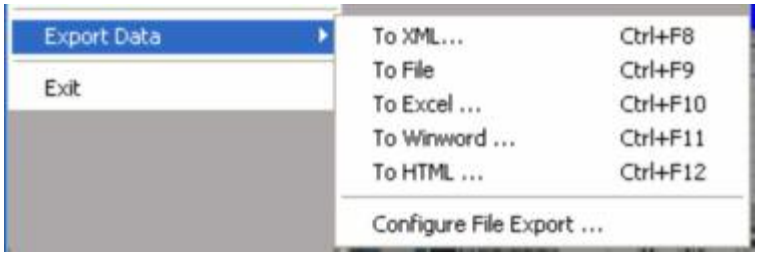


Fig. 20 Sub Menu Export Data

The user may want to work with a measurement report in another Windows™ application.
This submenu gives you the possibility to export a measurement report to various applications.

7.1.7.1 Export to XML

Select this command to open a dialog window where the desired directory can be selected and the file assigned a new name. The standard extension of export data is ".XML". The XML format is a widespreaded base to process the data in databases. The short cut “Ctrl”+”F8” can be used to execute this export to XML command, when the CMUgo client window is the currently active window on the desktop of your PC.

7.1.7.2 Export to File

Select this command to open a dialog window where the desired directory can be selected and the file assigned a new name. The standard extension of export data is ".TXT". Data are stored in tabulated

form. A tabulator separates columns; rows are separated by carriage returns (CR). Since the number format may differ from country to country, numerals are stored in the format selected in your operating system. The measurement reports can thus be read as a word file but also by spreadsheet programs or databases. The short cut “Ctrl”+”F9” can be used to execute this export to file command, when the CMUgo client window is the currently active window on the desktop of your PC.

Note:
If the number format is set incorrectly in the system control, problems may occur when data are imported. In this case, decimal points are interpreted as commas at 1000s digits. So, measured values will be incorrect by several orders of magnitude. This should be borne in mind particularly when transferring data from German-speaking to English-speaking countries.

7.1.7.3 Export to Excel

Select this command to start Microsoft Excel via Active X. The data of the measurement report will be stored in a new work sheet. You must have Microsoft Excel installed on the computer, to use this functionality. The short cut “Ctrl”+”F10” can be used to execute this export to Excel command, when the CMUgo client window is the currently active window on the desktop of your PC.

7.1.7.4 Export to WinWord

Select this command to start Microsoft Word via Active X. The data of the measurement report will be stored in a document. You must have Microsoft Word installed on the computer, to use this functionality. The short cut “Ctrl”+”F11” can be used to execute this export to WinWord command, when the CMUgo client window is the currently active window on the desktop of your PC.

7.1.7.5 Export to HTML

Select this command to open a dialog window where the desired directory can be selected and the file assigned a new name. The standard extension of export data is ".HTM". The HTML can be displayed with any web browser on the market, i.e the Microsoft Internet Explorer .. The short cut “Ctrl”+”F12” can be used to execute this export to HTML command, when the CMUgo client window is the currently active window on the desktop of your PC.

7.1.8 Configure Text Export

This command opens the following dialog window:

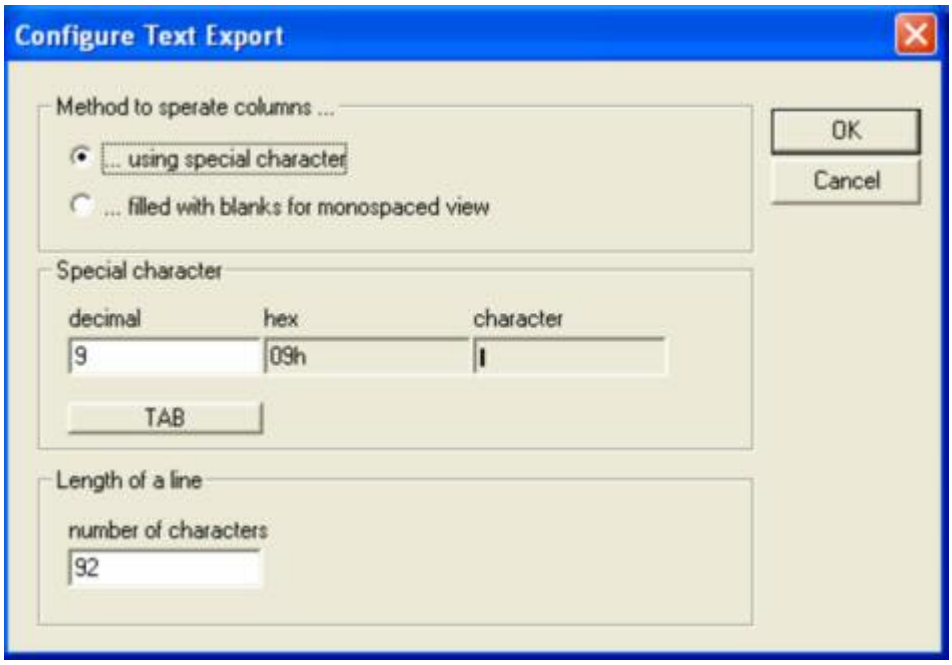


Fig. 21 Text Export Configuration

The format of the text export can be changed. The separation of columns can either **use a special character** or can be done with **filling the column with blanks**, so that a each column has a fixed number of characters. The special character can be defined with entering the **decimal** index number of the specified character. By default the tabulator character is used as a separator between the columns. The maximum length of a single line can also be defined. The tabulator character will be selected after pressing the **TAB** button.

An example for the monospaced is shown below. If the description of the test item is longer than the column space, the limits and the measurement value are written in the next line.

```
Frequency Drift Minimum              -25.00      25.00         1.35 kHz  Passed
Frequency Drift Maximum              -25.00      25.00       -17.75 kHz  Passed
Maximum Drift Rate Average ( / 50 us)
                                     -20.00      20.00        17.85 kHz  Passed
Maximum Drift Rate Minimum ( / 50 us)
                                     -20.00      20.00       -10.23 kHz  Passed
```

Fig. 22 Monospaced Text Export

Note:
Viewing a monospaced text file properly requires to use a monospaced font like “Courier New” in Microsoft Windows™.

7.1.9 Exit

This command is used to terminate the CMUgo program.

7.2 Measurement Menus

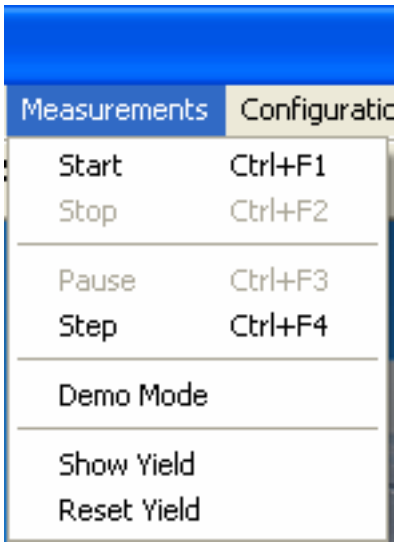


Fig. 23 Measurement Menu

7.2.1 Start

Fig. 24 Toolbar Start

The Start command is used to start a new measurement. The short cut “Ctrl”+”F1” can be used to execute this start command, when the CMUgo client window is the currently active window on the desktop of your PC.

7.2.2 Stop

Fig. 25 Toolbar Stop

The Stop command is used to stop the current measurement. The program returns to the beginning of the Autotest. The previously performed test is not output. All obtained measurement results are lost. The short cut “Ctrl”+”F2” can be used to execute this stop command, when the CMUgo client window is the currently active window on the desktop of your PC.

7.2.3 Pause

Fig. 26 Toolbar Pause

The Pause command permits to interrupt the program run. The currently performed step of the Autotest is completed before the sequence control stops the test. Another click on Pause continues the measurement. The short cut “Ctrl”+”F3” can be used to execute this pause command, when the CMUgo client window is the currently active window on the desktop of your PC.

7.2.4 Step

Fig. 27 Toolbar Step

This command permits to check the sequence control of the Autotest step by step. After each single step, the program automatically goes to the pause mode. The short cut “Ctrl”+”F4” can be used to execute this step command, when the CMUgo client window is the currently active window on the desktop of your PC.

7.2.5 Demo Mode

Fig. 28 Toolbar Demo Mode

Fig. 29 Demo Mode Command List

This command switches the demo mode on and off. Running CMUgo in the demo mode gives you the possibility to generate a report, filled with random data and to show the remote sequence in a popup window. This popup window shows all command, which would be used to run this sequence. Pressing the button **Copy command list to clipboard** gives you the possibility to use this command sequence in any other Windows™ application, where data can be inserted from the Windows™ clipboard. CMUgo test item DLLs sometimes query the current status of the instrument to optimize the sequence or to decide which kind of measurement should be used. This happens during runtime. In that case the demo sequence is not the optimum sequence. But it gives you some ideas, how to program an R&S CMU 200, when starting your work with the instrument.

Note:

CMUgo uses only one GPIB address to communicate with the instrument, which is the base address. Every function group of the instrument is called on this address, starting the command with a numeric

expression. I.e. sending a command “1;SENS:CORR:LOSS:INP2 0.0” to address 0, has the same effect as sending a command “SENS:CORR:LOSS:INP2 0.0” to the secondary address 1.

7.2.6 Show Yield

The yield is the relation between the number of passed test runs and the total number of test runs.
In other words, if for example four test runs have been executed and one of these test runs was including failed tests a yield of 75% will be displayed.

Fig. 30 Yield indication in the status bar

It is possible to show the yield in the status bar. Execute this command another time, if the yield indication should be hidden again.

The calculation starts new, after a new configuration file has been loaded or executing the reset yield command.

7.2.7 Reset Yield

This command is used to reset the yield calculation.

7.3 Configuration Menu

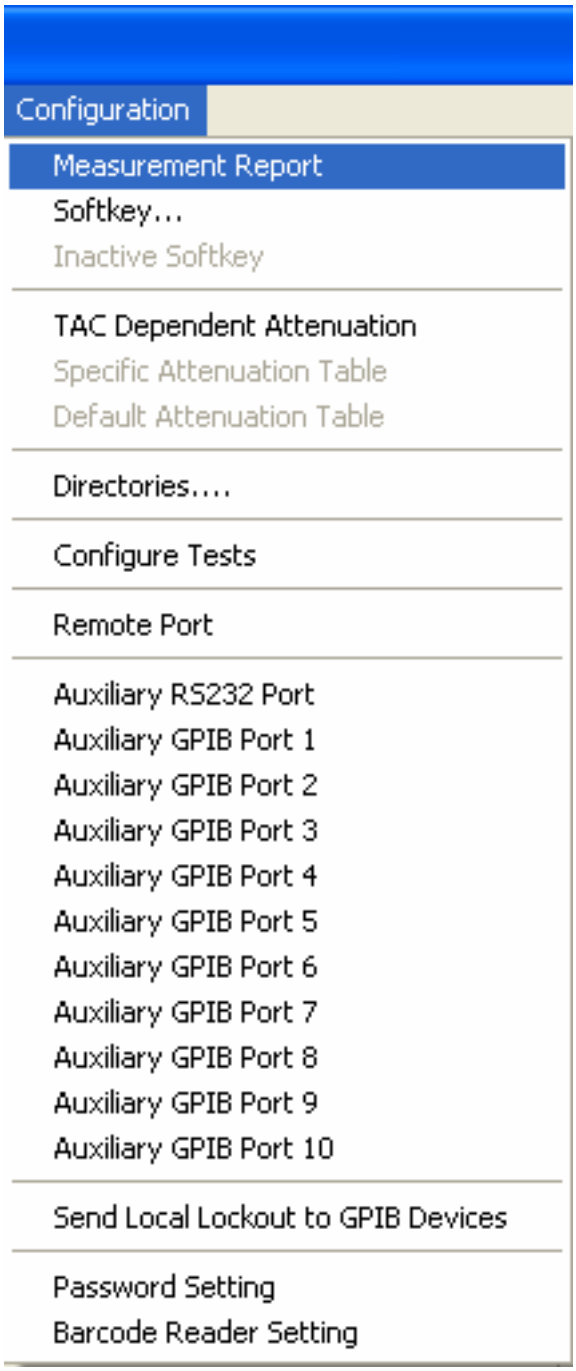


Fig. 31 Configuration Menu

7.3.1 Measurement Report

This command opens the following dialog window:

Fig. 32 Configure Report Settings Dialog

Enter the **operator** name in the first input field. The name will be stored and displayed in the header of the measurement report. A **comment** can be optionally included in the measurement report. It can be entered in the second input field. The test report can be automatically stored, when the measurement is terminated. Enter the path for automatic storage of measurement reports in the associated input field. During program installation, the subdirectory "**AUTOSAVE**" is created as standard.
By default the measurement report will store reports with consecutive numbers "P_00000001.MRP" "P_00000002.MRP" etc. The leading "P_" stands for all test passed. A leading "F_" means, that some of the tests have been failed. Instead of storing consecutive numbers, the serial number or the subscriber number can be part of the filename. Select one of the checkboxes, if desired. In this case the filename starts again with "P_" or "F_" followed by the serial or subscriber number and a consecutive number, if this mobile was tested more than once.

After a test sequence has been finished, the test item **Test End** could start some AutoSave procedures. These AutoSave procedures can include storing the report and printing the report at the installed Windows™ standard printer.
Check **Autosave File** if the report should be stored automatically. Select whether the report should be stored as **report file** (MRP), **text file**, XML File or as **HTML** file. The file formats correspond to the **Save Report**, **Export to file**, **Export to XML** or **Export to HTML** functions in the **File** menu.
Check **Print the generated report** if the report should be printed automatically. Select the format of the printout by selecting the corresponding option box. It is possible to select, if the report should be printed out completely, as a summary only, including only the failed test items or without the graphical annex.

Stop tests, if one test item fails could be chosen, if you are only interested in stopping the complete test sequence at a point, when one of the tests was out of the limits.

A graph is displayed at the right in the header of the measurement report. You may use the logo of your company instead of the Rohde & Schwarz logo. Within certain limits, the program tries to adapt your logo to the header of the measurement report. Optimum results can be obtained with graphics files with the following characteristics:

- Width: 900 pixels
- Height: 220 pixels
- Black/white
- Format: Windows™ bit map (BMP)

A file is selected in the dialog window opened with **Browse Icon**. The **User-defined Bit Map** box is checked and the graph is displayed in the preview field above.

Important:
To keep the measurement report file as small as possible, the picture file is not stored in the report but merely its name. Depending on the directory in which the picture file has been stored, the file name is stored independently or with reference to the CMUgo directory. For copying measurement report files from one computer (A) to another (B), the following examples should be observed.

Storage using a relative path:

The path of the picture file is considered relative when the file is stored in the current directory or in a subdirectory of CMUgo.

Example:
The measurement report is stored in computer A:

Current directory: C:\CMUGO\
Picture file: C:\CMUGO\BITMAPS\USER.BMP

To display the measurement report on Computer B:

Current directory: C:\MYWORKS\CMUGO\
Picture file: C:\MYWORKS\CMUGO\BITMAPS\USER.BMP

Storage using an absolute path:

The path of the picture file is considered absolute when the current directory of CMUgo is not part of the picture file path.

Example:
The measurement report is stored in computer A:

Current directory: C:\CMUGO\
Picture file: C:\BITMAPS\USER.BMP

To display the measurement report on computer B:

Current directory: C:\MYWORKS\CMUGO\
Picture file: C:\BITMAPS\USER.BMP

The sequence can be stopped in the case, that one of the testitems fails the limits.
CMUgo will **stop** the execution of the test sequence, if the connection to the device under test (DUT) gets lost. To generate a summary of the test results and to start the autosave procedures, it is helpful to call test test end routine before stopping the sequence. In this case mark the checkbox **Call Test End if the sequence is interrupted**. The test report can be updated "**on the fly**" during test run. This may reduce the test speed a little bit. If CMUgo should perform the test sequence with the maximum performance, deselect this **on the fly update of the measurement report** option. Also don't forget to disable the option **Show CMU 200 Report Screen** from the first test item **Basic Initializing** of the test sequence.
The already described name convention for the autosave files can be changed. Press the **Options** button to open the following dialog.

Fig. 33 Additional Report Settings Dialog

The Prefix of the filename can be defined for passed and failed text. Leave the edit fields empty, if you don't like to use any prefix. The second option decides if the DUT serial number should include separators. The IMEI for example uses bars between type approval code (TAC), serial number and the check digit. When a mobile is tested more then once, a suffix is generated. Alternatively the existing report can be overwritten.

7.3.2 Softkey…

The softkey can be defined to easily change between different operation modes of CMUgo.

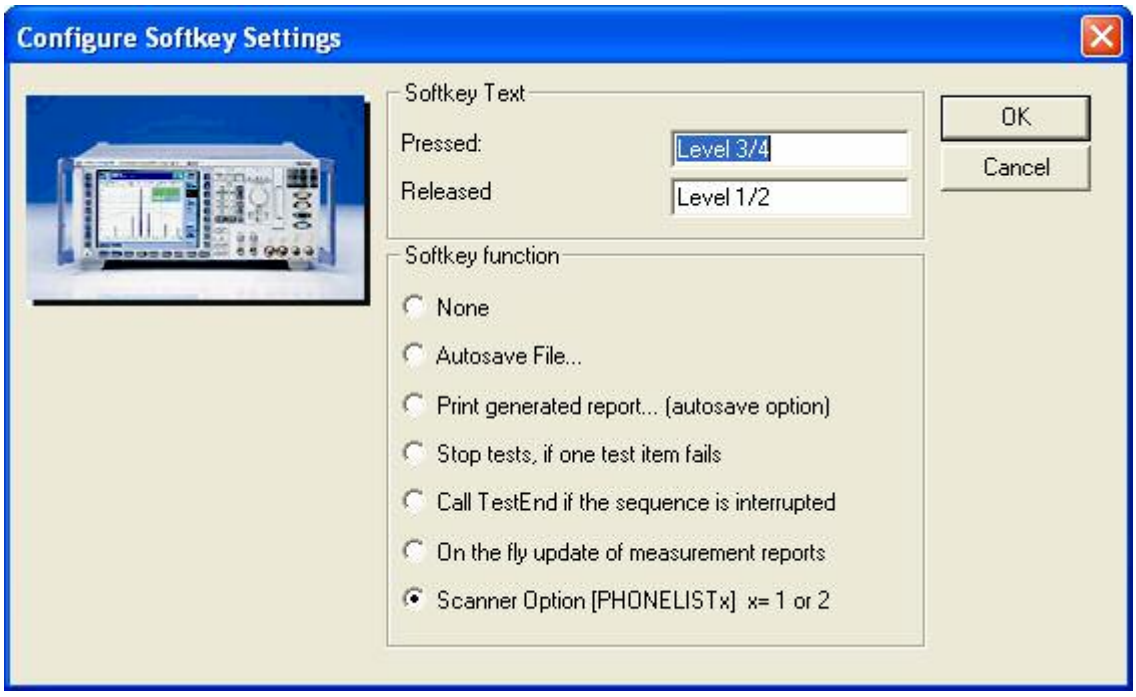


Fig. 34 Configure Softkey Dialog

For example the softkey can be used to activate or de-activate the **Autsave File** option.
Other available options are the **Print generated report** option, the **Stop tests, if one test item fails** option, the **Call TestEnd if the sequence is interrupted** option ,the **On the fly** update of the measurement report option or the selection between section [Phonelist1] and [Phonelist2] of the sequence.ini file of the **Scanner Option**. Select **none**, if no softkey feature should be activated.
It is possible to define a softkey text for the pressed state and a different text for the released state of the softkey. If a softkey option is activated the softkey appears a a checkbox in the toolbar of the program. The checkbox is marked, if the option is activated. The text next to the checkbox is the previously user defined text, depending of the pressed or released state of the softkey.

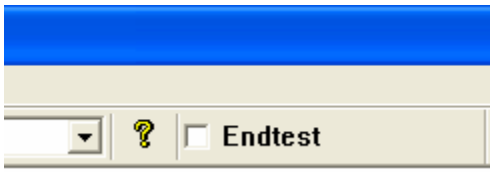


Fig. 35 Softkey at the toolbar

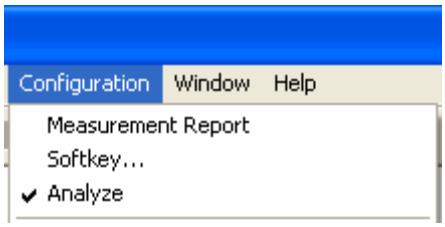


Fig. 36 Softkey at the menu (Pressed State)

Corresponding to the softkey state, the text is also shown in the configuration menu of CMUgo

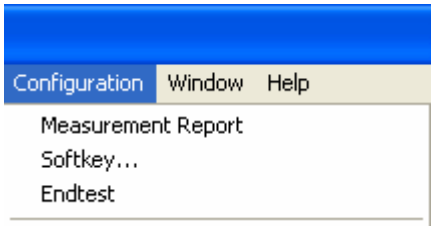


Fig. 37 Softkey at the menu (Released State)

7.3.3 TAC Dependent Attenuation

If CMUgo is used together with the antenna coupler Z10, it is possible to make the attenuation settings dependent on the type approval code (TAC) of the mobile phone. This feature is available for GSM and WCDMA testplans. CMUgo uses the default attenuation table for the registration process of the mobile phone. Part of the registration process is the query for the international mobile equipment identifier (IMEI). The type approval code is a part of this IMEI. If the TAC is known, device specific attenuation values are used. Otherwise a “teach in” pop up dialog appears and the parameter of the detected phone can be entered.

7.3.4 Specific Attenuation Table

This command opens dialog window where all known phones and their Input and Output Attenuation factors are defined.

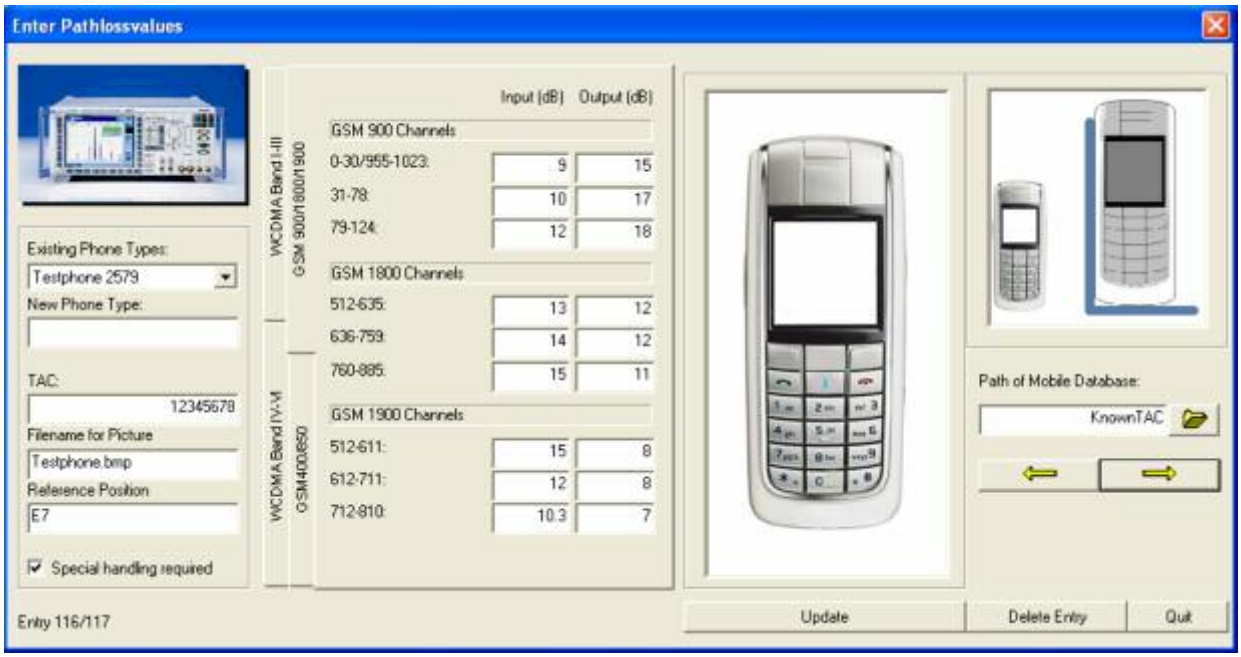


Fig. 38 Specific Attenuation Table Dialog

The attenuation factors can be entered for GSM400, GSM850, GSM900, GSM1800 and GSM1900 bands. As well for the WCDMA bands I to VI. Every band uses 2 to 3 different attenuation values for given channel numbers corresponding to typical testplans, which are designed for tests of a low, middle and a high channel per band.
Enter the attenuation values for all bands, which are supported by the mobile type. Enter the name of the phone in the edit field **New PhoneType** and the type approval code (**TAC**) of the mobile phone.
A photo of the phone can be displayed, if you enter the filename of this bitmap file at **Filename for the Picture**.
Optimum results can be obtained with graphics files with the following characteristics:

- Width: 150 pixels
- Height: 300 pixels
- 24 bit color
- Format: Windows™ bit map (BMP)

A second picture should display the position of the mobile in the antenna coupler.
The filename of this file should be the same as for the photo, but starts with a leading string “POS_“
Optimum results can be obtained with graphics files with the following characteristics:

- Width: 320 pixels
- Height: 320 pixels
- Black/white
- Format: Windows™ bit map (BMP)

Both files should be stored in the same directory. The shown dialog displays a phone “Testphone 2579”. The graphic files “Testphone.bmp” and “Pos_Testphone.bmp” are stored in the subdiretory “**KnownTAC**”.
Enter the path for attenuation data base and the location of the graphic files in the associated input field. During program installation, the subdirectory “**KnownTAC**” is created as standard.
A reference position can be entered for each phone, which corresponds to the optimum position in the antenna coupler.
The new entry will be stored to the data base, after pressing the **Update** button.
The parameter of a phone, which already exists in the data base will be updated after pressing the **Update** button, if the edit field **New PhoneType** and the edit field **TAC** is left blank.

Before storing the Data following dialog is shown for confirmation. Press the **Cancel** Button to undo the changes.

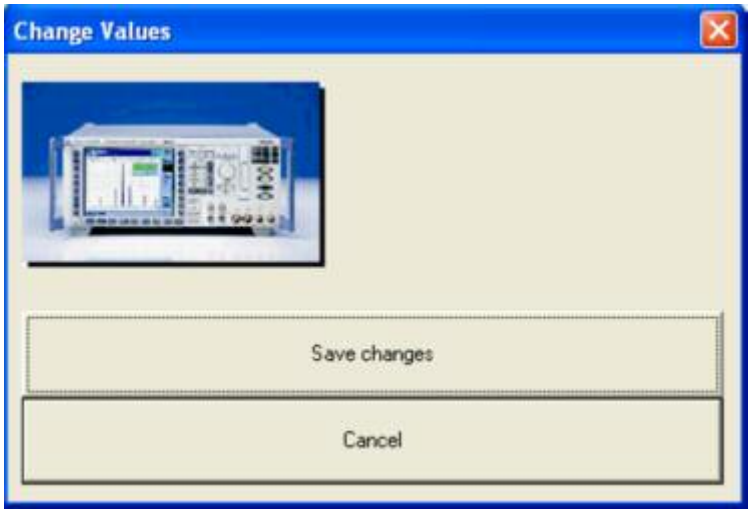


Fig. 39 Change Values Confirmation Dialog (Single TAC entry)

The same phone type could have more than one valid type approval code (TAC) . After changing attenuation values for an existing mobile type, which was stored with a multiple numbers of TAC values a modified dialog for the update confirmation appears.

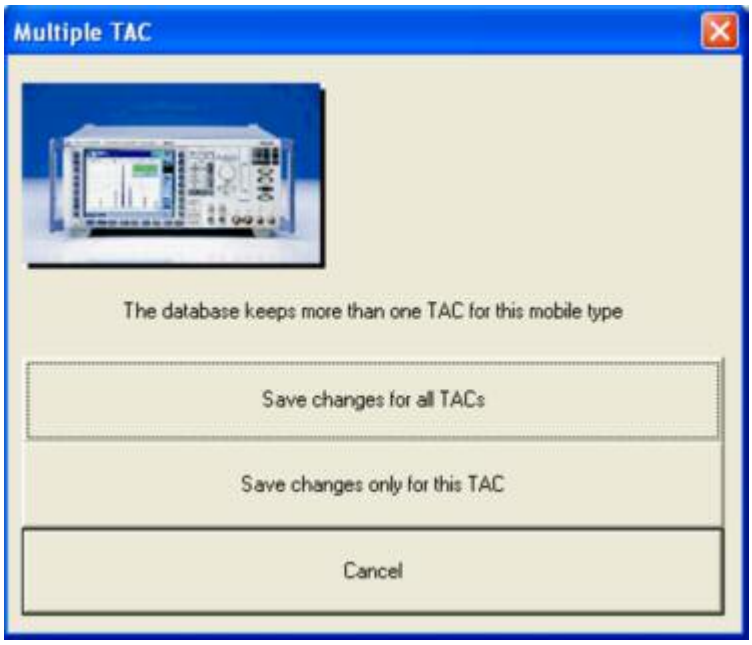


Fig. 40 Change Values Confirmation Dialog (Multiple TAC entries)

It is possible to store the changes only for this TAC entry in the database, but it is also possible to store the updated values for all TAC entries of this mobile type. Press the **Cancel** Button to undo the changes.

To enter a new TAC for an **existing mobile type** select this mobile type and enter a new TAC number. Press the **Update** button afterwards.

Use the arrow buttons to change between the different phone types quickly. Here the different TAC numbers of the same phone type are skipped. Mark the checkbox **Special handling required,** if after the phone registration a pop up window should display the optimum position for the given mobile phone type.

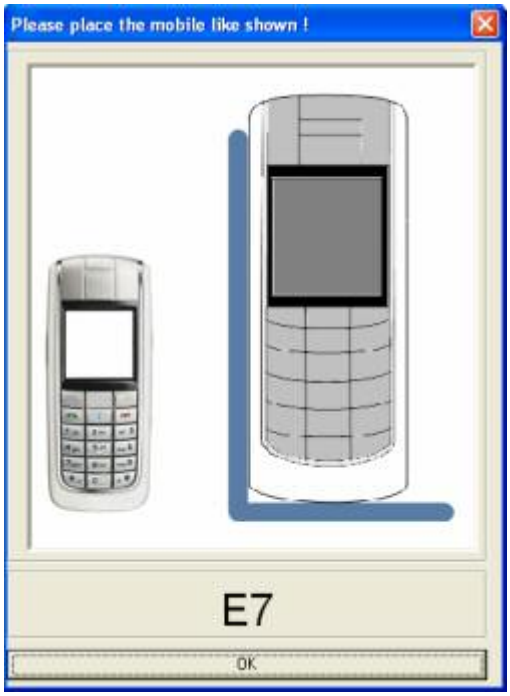


Fig. 41 Dialog TAC Dependent Position

7.3.5 Default Attenuation Table

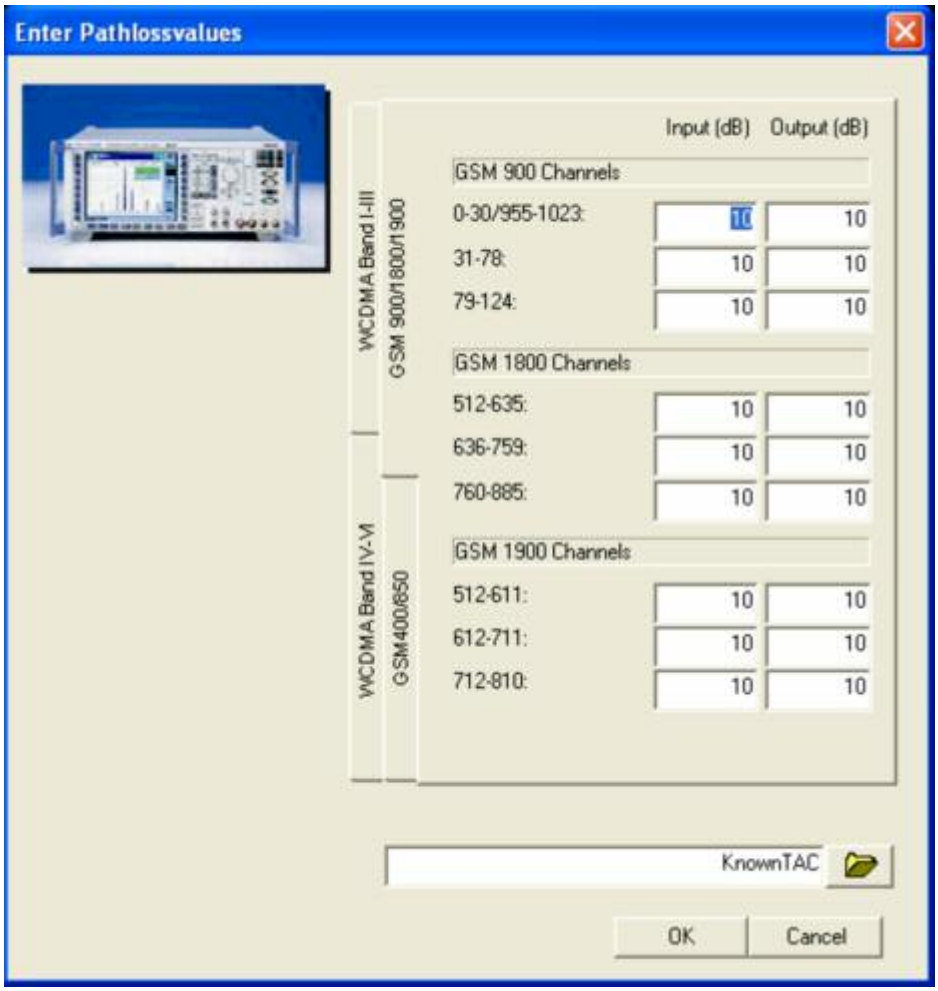


Fig. 42 Default Attenuation Table Dialog

Before the registration of the mobile is finished and the optimum position of the mobile phone in the antenna coupler is known default attenuation values are used. The attenuation factors can be entered for GSM400, GSM850, GSM900, GSM1800 and GSM1900 bands. As well for the WCDMA bands I to VI. Enter the path for attenuation data base and the location of the graphic files in the associated input field. During program installation, the subdirectory "**KnownTAC**" is created as standard.

7.3.6 Directories

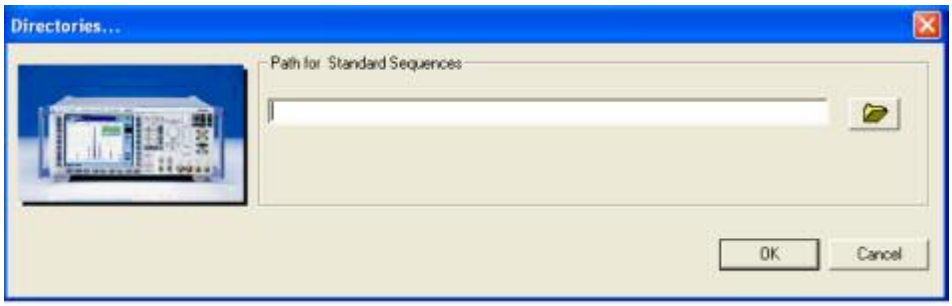


Fig. 43 Directories Dialog

This configuration dialog can be used to change the default directory of the sequences. That can be useful, if several copies of CMUgo are using one unique directory of a network drive were sequences are stored globally.

7.3.7 Configure Tests

Fig. 44 Toolbar Configure Tests

This command opens the dialog window of the next figure.
The first list box **Available** shows all test items, which are available. Each test item is realized in a separate DLL. Select one of these test items and keep the left mouse button pressed, while moving to the second list box **Selected**. The second list box shows you the test sequence. A test sequence should always start with **Basic Initializing** and should always end with **Test End**. Select one of the test items in the list box **Selected**. The line of this test item is highlighted with a blue background. Select the button **Properties** or double click on this test item with the mouse. The configuration dialog of this test item appears. With this dialog you can select the test conditions, like the channel and the master power configurations, also which tests inside this test item should be performed. As a part of the configuration you can define the measurement limits, which decide during the test run, if a test has passed or failed. You may have a test item listed more than one time in the **Selected Box**. Please keep in mind, that the test limits and all other configuration are stored for each test idem individually.

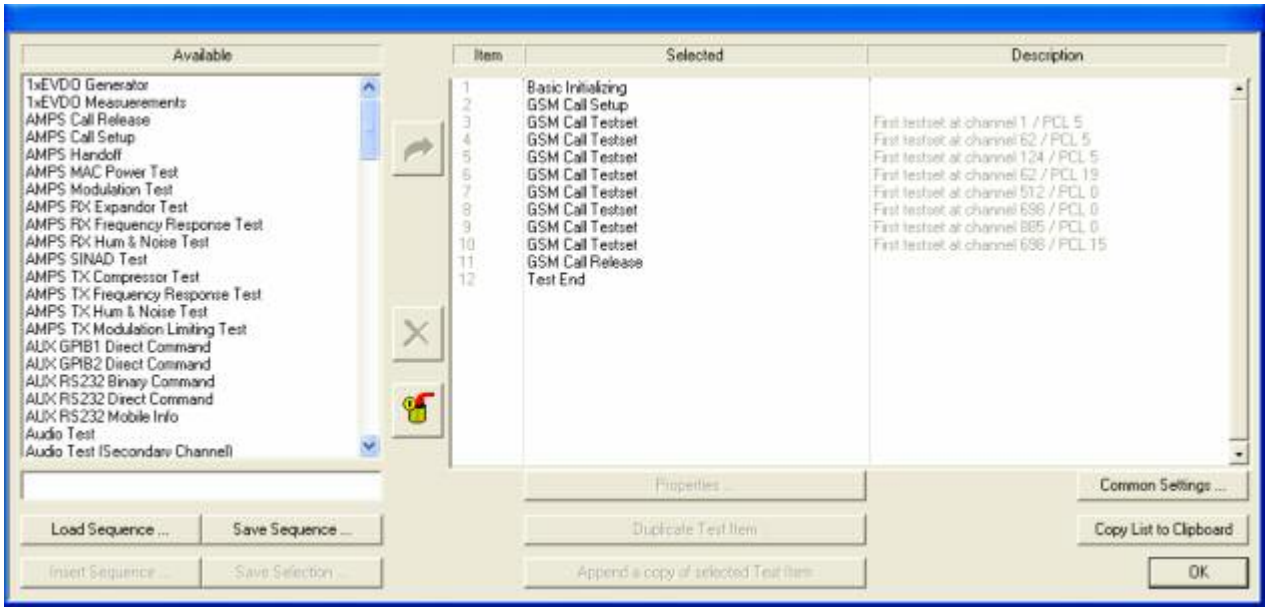


Fig. 45 Configure Tests Dialog

Following picture shows an example for these configuration dialogs.

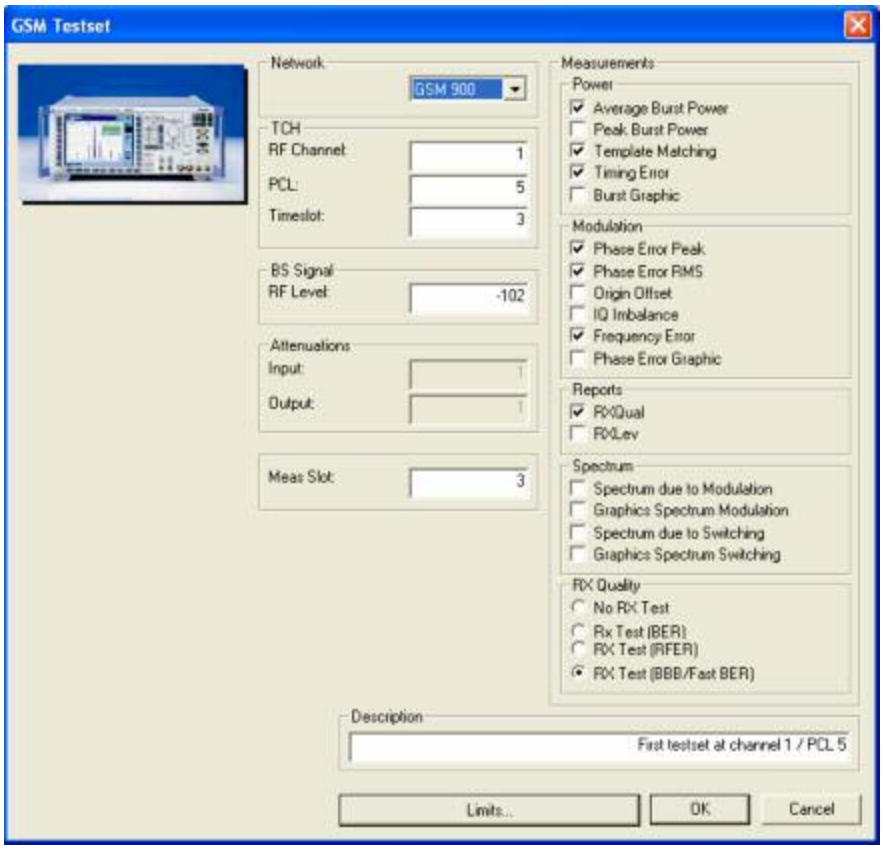


Fig. 46 Test Item Configuration

Other actions for selected test items in the **Selected** list box are possible. You may delete a test item by pressing the **Remove** button, which appears as “x” in the dialog Also all test items can be removed by pressing the corresponding button, which looks like a trashcan. It is possible to duplicate test items directly after the selected test item. In this case a new test item is added and all the configuration settings are taken from the origin test item and copied to the duplicated one. Similar to this a duplicated test item can be appended to the sequence end.

Pressing common setting will show following dialog window.

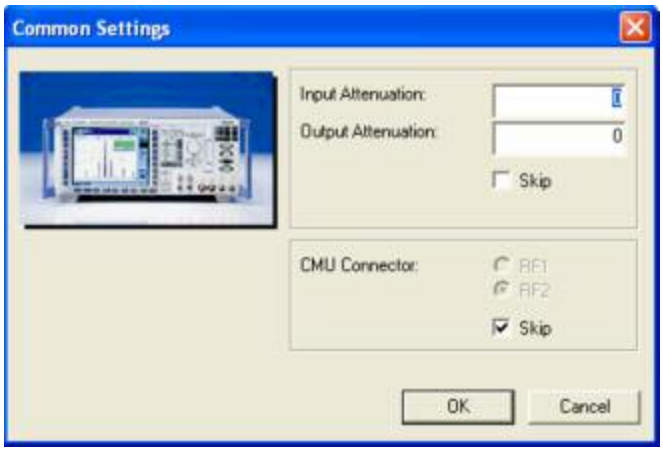


Fig. 47 Common Settings Dialog

With this dialog you can define Attenuation values for all test items. Additionally you can select the used RF connector of the R&S CMU 200. If one of both configurations should not be included, mark on of the check boxes **Skip**.

The button **Copy List to Clipboard** can be used to insert a list of the testitems of the sequence to the Windows™ clipboard. This feature can be used by any other Windows™ application, where data can be pasted from the Windows™ clipboard.

All set configurations can be saved for subsequent use. With the **Load Sequence** saved sequence files can be loaded. Configuration files are assigned the extention ".SEQ". The filename of the configuration without the extension will be shown in the combo box of the toolbar of the main window, if the file was stored into the standard directory of CMUgo.

Save Sequence saves the set configuration. A dialog window is opened where the directory can be selected and the configuration stored under the desired file name.

Any stored sequence can be inserted below the current marked test item of the list box **Selected** by entering the button **Insert Sequence**.

The marked test items of the list box **Selected** can be stored as a sequence file. Mark the first test item of your selection, then press the "Shift" key on the keyboard and mark the last test item of your selection. The selected test items appear highlighted. Enter the button **Save Selection**. A dialog window is opened where the directory can be selected and the configuration stored under the desired file name.

The **Save Selection** in combination with the **Insert Sequence** feature can be used to define sub sequences of possible tests. By inserting these predefined sub sequences complex test plans can be created more easily and flexible.

7.3.8 Remote Port

To ensure error-free functioning of the CMUgo software, the settings made for the remote control interface should match the settings on the R&S CMU 200.There is the possibility to control the CMU 200 via the GPIB bus, using a National Instrument GPIB controller or Agilent GPIB controller.

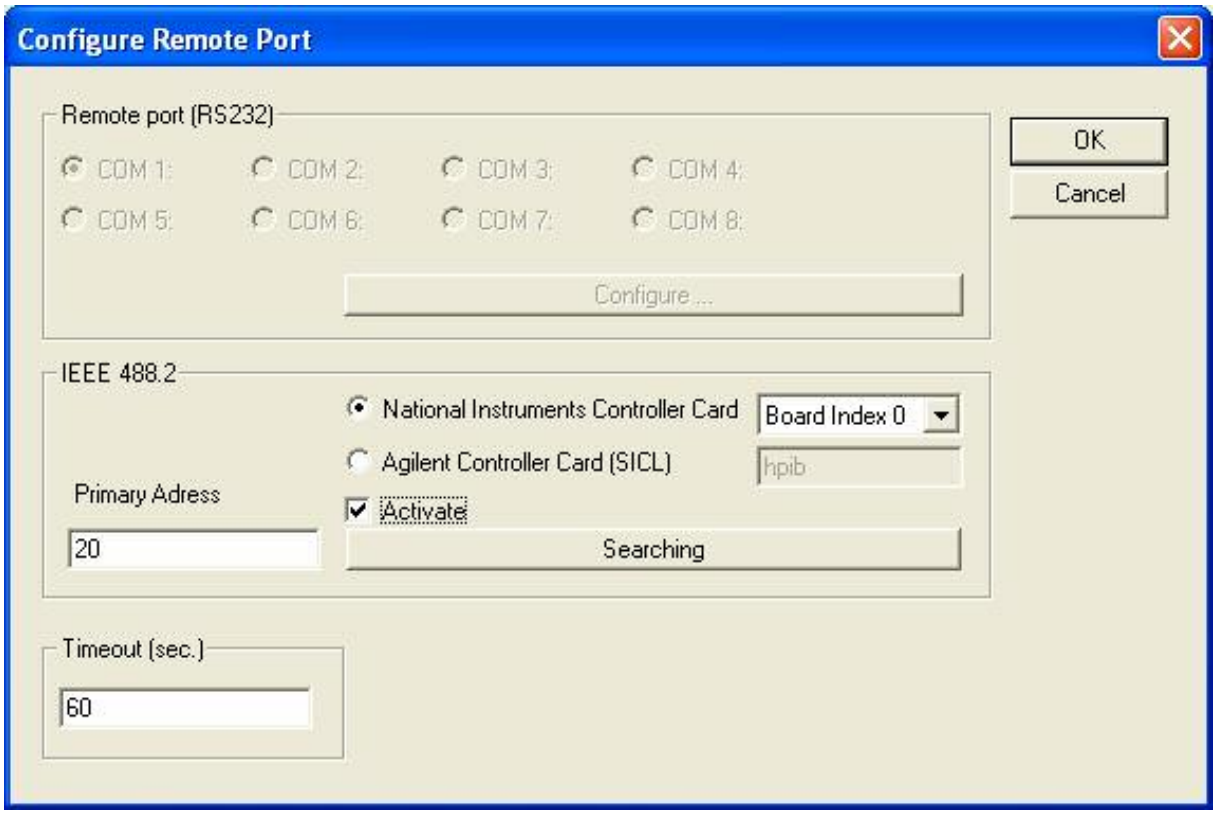


Fig. 48 Configure Remote Port Dialog

Mark the check box **Activate** for this mode. Select the used controller type. Enter the base address of the R&S CMU 200 in the input field. It is possible to search for a connected R&S CMU 200 by pressing **Searching**. This feature is only available on a National Instruments GPIB controller. Enter the timeout value for the remote actions in the corresponding entry field. The timeout setting is valid for both, the GPIB bus and the serial interface.
If the check box **Activate** is not marked, the serial interface RS232 is used to control the R&S CMU200.
Select one free serial interface of your computer **COM1** to **COM8** and configure the port settings with the button **Configure**. The parameters of the serial interface such as baud rate, data bits used, stop bits, parity used can be selected on the R&S CMU200. Adapt the settings of CMUgo to those of R&S CMU 200 by checking the respective box.

Note:
Typically used parameters of the serial interface are set as follows:

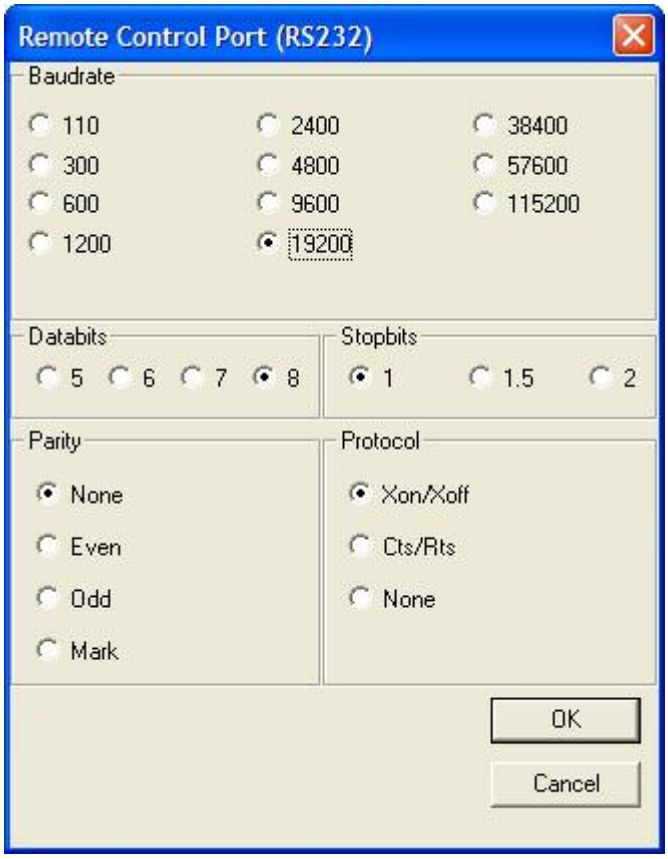


Fig. 49 Remote Control Port (RS232) Dialog

- Baud rate 19200
- 8 data bits
- 1 stop bit
- Parity None
- Protocol CTS/RTS

It is possible to use the program with National instrument GPIB cards or with Agilent GPIB cards.
Select the card type, which is installed in your computer system. The default setting of CMUgo is the usage of a National instrument GPIB controller addressed as **Board Index 0**. If more than one National Intruments GPIB controller is installed, it is possible to select which controller is used to communicate with the R&S CMU 200. The combo box for the board index is used for the selection between **Board Index 0**, **Board Index 1**, **Board Index 2** and **Board Index 3**.
If an Agilent GPIB controller is used in your computer system, this card will be addressed via a SICL driver. There is also the possibility to install more than one of these controllers in the computer system. The selection, which controller is used to communicate with the R&S CMU 200 is done with a device name. This device name can be entered in the respective input field.

7.3.9 Auxiliary RS232 Port

It is possible to control other devices in combination with an R&S CMU 200 and CMUgo. CMUgo supports one additional device at a serial RS232 interface and two additional devices on the GPIB bus.

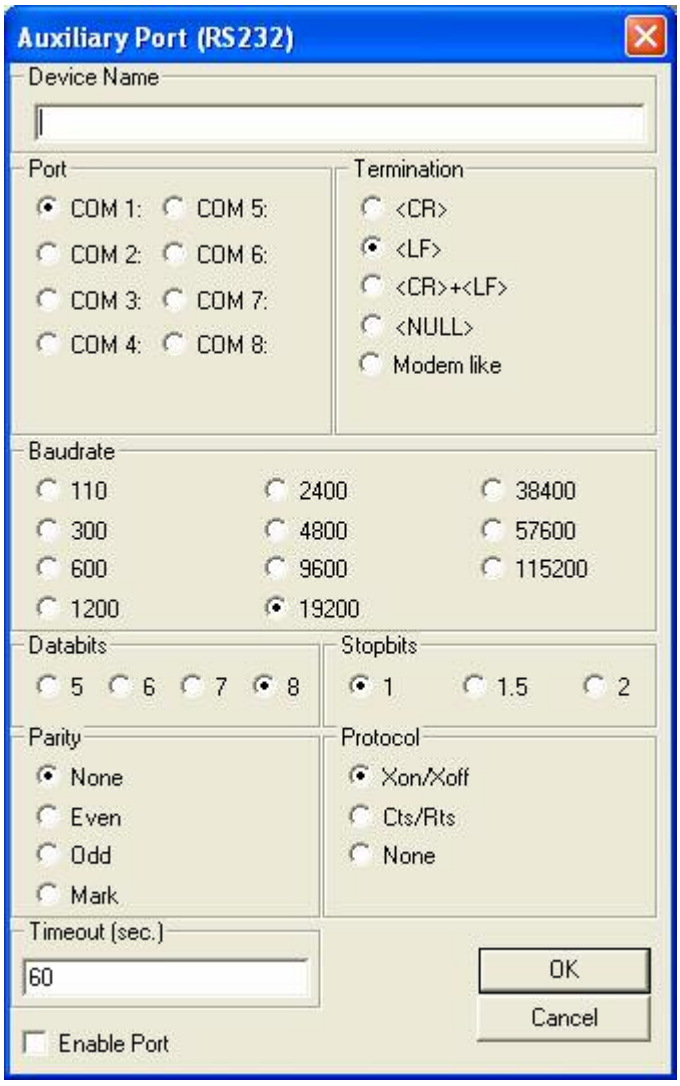


Fig. 50 Auxiliary Port (RS232) Dialog

Specific test items can control these auxiliary devices. Configure the auxiliary port according to the device settings. Do not forget to enable the port by activating the checkbox. The device name is a mandatory parameter, shown in the Menu of CMUgo. This name must be equal to the device name used defined in the test item, which controls this auxiliary device.
Also do not forget to enter the termination character, which is used by the device. These characters should be used to sign the end of data transmission.

The termination mode **Modem like** is searching for following substrings to terminate a read action:

- “OK”
- “ERROR”
- “CONNECT 110”
- “CONNECT 300”
- “CONNECT 600”
- “CONNECT 1200”
- “CONNECT 2400”
- “CONNECT 4800”
- “CONNECT 9600”
- “CONNECT 14400”
- “CONNECT 19200”
- “CONNECT 28800”
- “CONNECT 38400”
- “CONNECT 57600”
- “CONNECT 115200”
- “NO CARRIER”

The Protocol setting must fit to the used cable and to the settings of the auxiliary device. In the protocol mode “None” there is no protection against buffer overflows on the serial interface.

7.3.10 Auxiliary GPIB1 Port

It is possible to control other devices in combination with an R&S CMU 200 and CMUgo. CMUgo supports one additional device at a serial RS232 interface and up to ten additional devices on the GPIB bus.

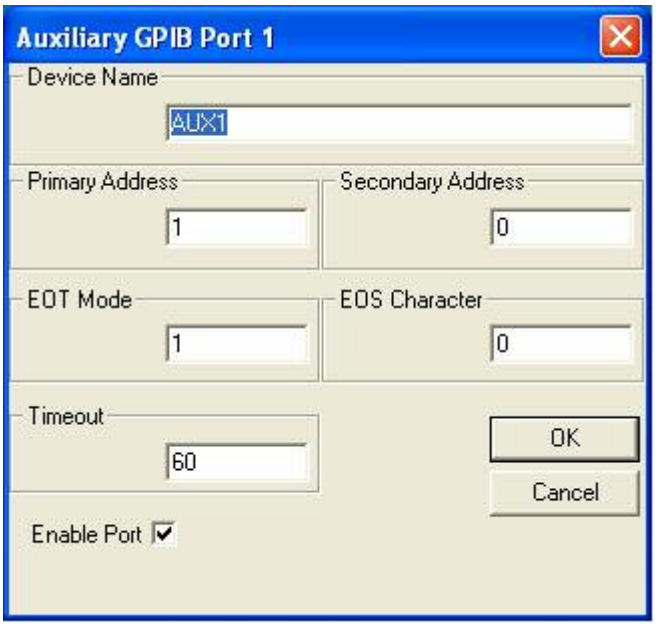


Fig. 51 Auxiliary GPIB Port 1 Dialog

Specific test items can control these auxiliary devices. Configure the auxiliary port according to the device settings.

Do not forget to enable the port by activating the checkbox. The device name is a mandatory parameter, shown in the Menu of CMUgo. This name must be equal to the device name used defined in the test item, which controls this auxiliary device.

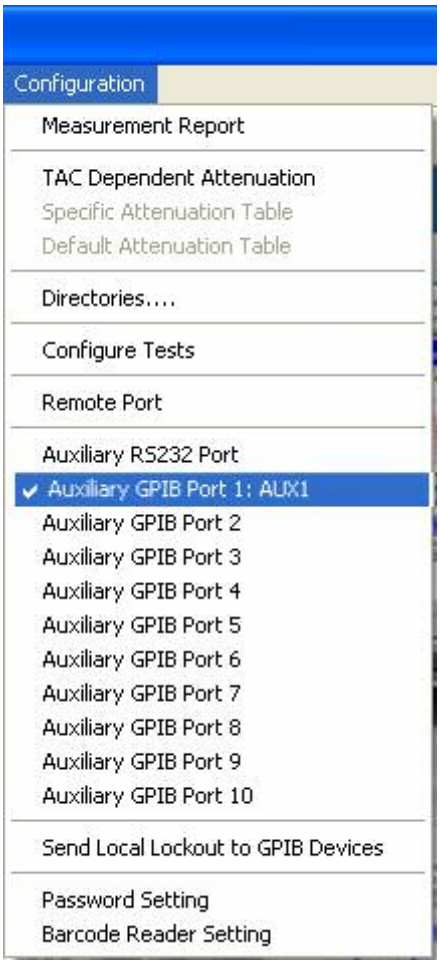


Fig. 52 Auxiliary Devices Menu Entries

7.3.11 Auxiliary GPIB2 Port

It is possible to control other devices in combination with an R&S CMU 200 and CMUgo. CMUgo supports one additional device at a serial RS232 interface and up to ten additional devices on the GPIB bus. Specific test items can control these auxiliary devices. Configure the auxiliary port according to the device settings. Do not forget to enable the port by activating the checkbox. The device name is a mandatory parameter, shown in the Menu of CMUgo. This name must be equal to the device name used defined in the test item, which controls this auxiliary device.

The following example of the next figure uses a R&S spectrum analyzer for TX Spurious emission measurements in CDMA 2000. The **Auxiliary Device Name** was defined with "**FSx**"

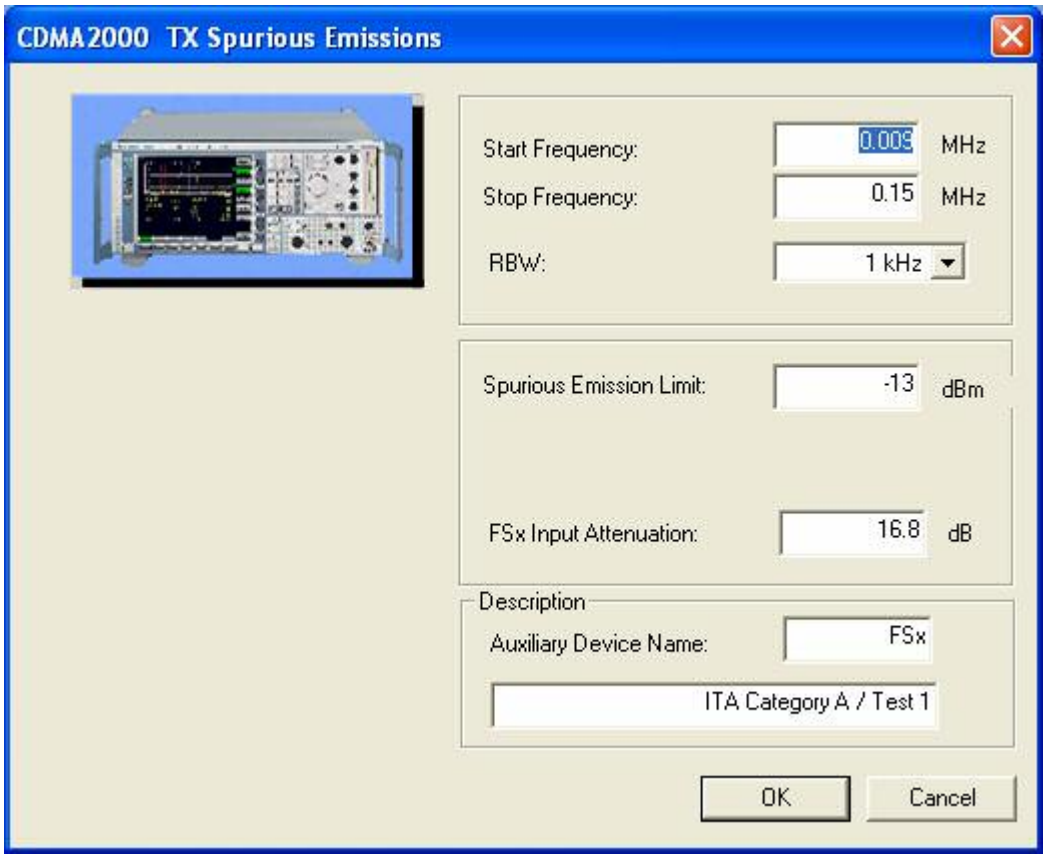


Fig. 53 Test Item using Auxiliary Device Name "FSx"

The used spectrum analyzer uses the **Primary Address** 6 for the communication on the GPIB bus. Analogue to the settings in the test item the **Device Name** is specified with "**FSx**" and the port is enabled.

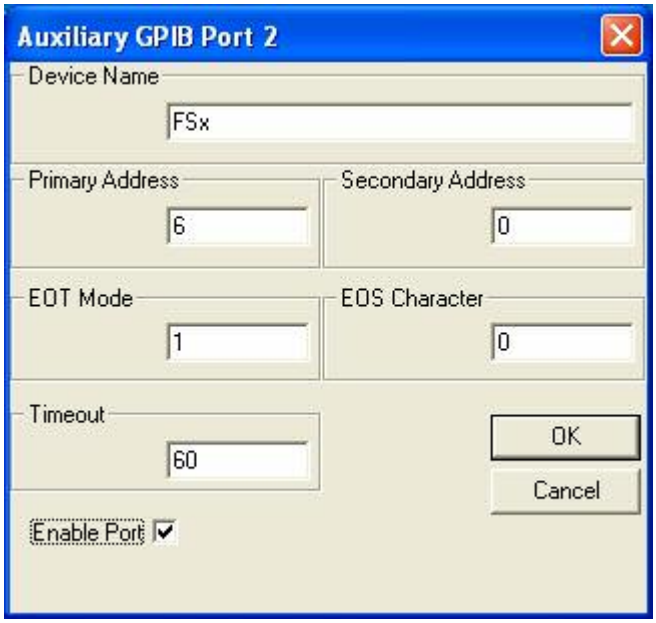


Fig. 54 Auxiliary GPIB Port 2 Dialog

7.3.12 Auxiliary GPIB3 Port

It is possible to control other devices in combination with an R&S CMU 200 and CMUgo. CMUgo supports one additional device at a serial RS232 interface and up to ten additional devices on the GPIB bus. Specific test items can control these auxiliary devices. Configure the auxiliary port according to the device settings. Do not forget to enable the port by activating the checkbox. The device name is a mandatory parameter, shown in the Menu of CMUgo. This name must be equal to the device name used defined in the test item, which controls this auxiliary device.

7.3.13 Auxiliary GPIB4 Port

It is possible to control other devices in combination with an R&S CMU 200 and CMUgo. CMUgo supports one additional device at a serial RS232 interface and up to ten additional devices on the GPIB bus. Specific test items can control these auxiliary devices. Configure the auxiliary port according to the device settings. Do not forget to enable the port by activating the checkbox. The device name is a mandatory parameter, shown in the Menu of CMUgo. This name must be equal to the device name used defined in the test item, which controls this auxiliary device.

7.3.14 Auxiliary GPIB5 Port

It is possible to control other devices in combination with an R&S CMU 200 and CMUgo. CMUgo supports one additional device at a serial RS232 interface and up to ten additional devices on the GPIB bus. Specific test items can control these auxiliary devices. Configure the auxiliary port according to the device settings. Do not forget to enable the port by activating the checkbox. The device name is a mandatory parameter, shown in the Menu of CMUgo. This name must be equal to the device name used defined in the test item, which controls this auxiliary device.

7.3.15 Auxiliary GPIB6 Port

It is possible to control other devices in combination with an R&S CMU 200 and CMUgo. CMUgo supports one additional device at a serial RS232 interface and up to ten additional devices on the GPIB bus. Specific test items can control these auxiliary devices. Configure the auxiliary port according to the device settings. Do not forget to enable the port by activating the checkbox. The device name is a mandatory parameter, shown in the Menu of CMUgo. This name must be equal to the device name used defined in the test item, which controls this auxiliary device.
.

7.3.16 Auxiliary GPIB7 Port

It is possible to control other devices in combination with an R&S CMU 200 and CMUgo. CMUgo supports one additional device at a serial RS232 interface and up to ten additional devices on the GPIB bus. Specific test items can control these auxiliary devices. Configure the auxiliary port according to the device settings. Do not forget to enable the port by activating the checkbox. The device name is a mandatory parameter, shown in the Menu of CMUgo. This name must be equal to the device name used defined in the test item, which controls this auxiliary device.
.

7.3.17 Auxiliary GPIB8 Port

It is possible to control other devices in combination with an R&S CMU 200 and CMUgo. CMUgo supports one additional device at a serial RS232 interface and up to ten additional devices on the GPIB bus. Specific test items can control these auxiliary devices. Configure the auxiliary port according to the device settings. Do not forget to enable the port by activating the checkbox. The device name is a mandatory parameter, shown in the Menu of CMUgo. This name must be equal to the device name used defined in the test item, which controls this auxiliary device.

7.3.18 Auxiliary GPIB9 Port

It is possible to control other devices in combination with an R&S CMU 200 and CMUgo. CMUgo supports one additional device at a serial RS232 interface and up to ten additional devices on the GPIB bus. Specific test items can control these auxiliary devices. Configure the auxiliary port according to the device settings. Do not forget to enable the port by activating the checkbox. The device name is a mandatory parameter, shown in the Menu of CMUgo. This name must be equal to the device name used defined in the test item, which controls this auxiliary device.
.

7.3.19 Auxiliary GPIB10 Port

It is possible to control other devices in combination with an R&S CMU 200 and CMUgo. CMUgo supports one additional device at a serial RS232 interface and up to ten additional devices on the GPIB bus. Specific test items can control these auxiliary devices. Configure the auxiliary port according to the device settings. Do not forget to enable the port by activating the checkbox The device name is a mandatory parameter, shown in the Menu of CMUgo. This name must be equal to the device name used defined in the test item, which controls this auxiliary device.

7.3.20 Send Local Lockout to GPIB Devices

It is possible to lock GPIB devices, when they are controlled remotely. This should prevent the devices from wrong user inputs during test runs. Activate this menu entry, if you want to lock the GPIB devices, while running test sequences.

7.3.21 Password Setting

Your configuration can be protected against unauthorized changes. To this end, enter a password in the first field and repeat it in the next. Selecting the **Activate** box activates the password function.

Fig. 55 Configure Password Dialog

Each time a configuration command of the program menus is selected; you will then be prompted to enter this password. After entering a correct password, changes can be made in the configuration until the sequence control of the program is started. While the administrator enters the password, it is possible to keep CMUgo password protected by marking the checkbox.

Fig. 56 Enter Password Dialog

The password mainly serves for preventing inadvertent changes being made to your data and does not provide 100% protection. In case you have forgotten the password, clear the entry in the initialization file ”CMUGO.INI“

After program installation CMUgo works in the administration mode without this password protection.

If CMUgo is used in the password protected user and in the TAC dependent attenuation mode the “teach in” process for unknown Type Approval Codes (TACs) is also protected against changes.
In this case following dialog is displayed

Fig. 57 Call administrator dialog

The user is given the choice to call the administrator for entering new attenuation values for this new mobile or to stop the test and to proceed with the next phone.

7.3.22 Barcode Reader Setting

It is possible to use a barcode reader to control the program. Barcode are reader are typically translating the bar code to key strokes and putting the data into the keyboard queue of the operating system, which interpretes the data as text string.

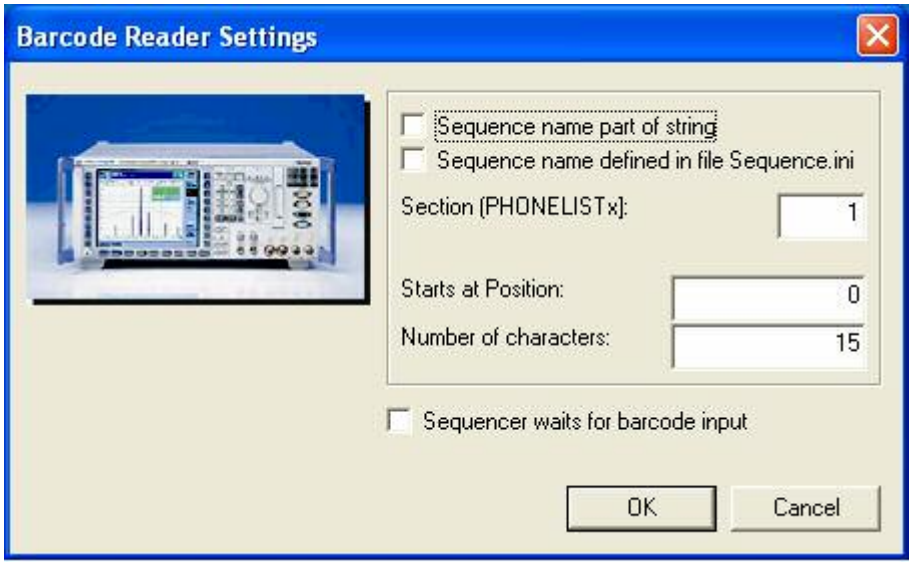


Fig. 58 Barcode Reader Setting Dialog

It is possible to enable this feature with the checkbox **Sequencer waits for barcode input**. After starting the program a dialog window appears, which waits for the keycode.

Fig. 59 Scanner Code Input Dialog

As the keycode could keep also additional information, it is possible to define the **Number of characters** and the startposition of the text string (**Starts at Position**), which is taken into account to select the sequence.
This text string could either be the sequence name itself or a index to the sequence file name, which is defined in a file Sequence.ini
An example for the Sequence.ini is given in the next figure. The text string of the barcode reader is the index to a given file name of the sequence. It is possible to define more then one index in different section. The section always starts with “PHONELIST” and an appended number. The **Section (PHONELISTx)**, which will be used, is also defined in the barcode reader settings dialog.

```
[PHONELIST1]
198532 = BLUETOOTH_SHORT_TEST1
376423 = BLUETOOTH_SHORT_TEST2
[PHONELIST2]
198532 = BLUETOOTH_FULL_TEST1
376423 = BLUETOOTH_FULL_TEST2
```

Fig. 60 Sequence.ini

CMUgo shares this barcode reader feature with CTSgo. This makes it possible to define one list for both programs. The “sequence.ini” file must be stored in the default directory of the sequences.
The last character of the keycode is typically emulating the ENTER key. In this case the program CMUgo will load the corresponding sequence file and will automatically start the tests. The **Scanner Code Input Dialog** will appear again, after the tests have been finished.

7.4 Window Menu

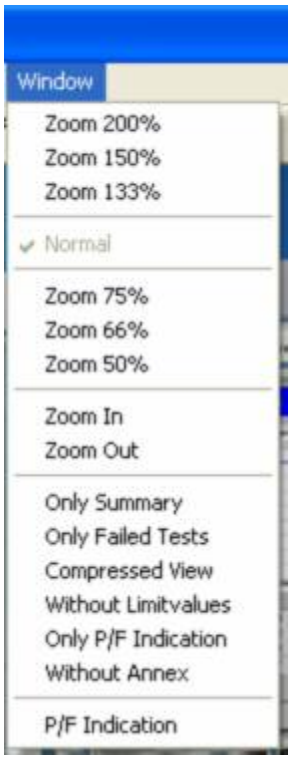


Fig. 61 Window Menu

The Windows™ menu is only active in the report display mode. In this window, the display can be adapted to your requirements. The current size of the display is indicated in the status bar.

7.4.1 Zoom 200%

This command expands the result display to 200% of the standard size.

7.4.2 Zoom 150%

This command expands the result display to 150% of the standard size.

7.4.3 Zoom 133%

This command expands the result display to 133% of the standard size.

7.4.4 Normal

With this command, the result window is displayed in its normal size (100%).

7.4.5 Zoom 75%

This command reduces the result display to 75% of the standard size.

7.4.6 Zoom 66%

This command reduces the result display to 66% of the standard size.

7.4.7 Zoom 50%

This command reduces the result display to 50% of the standard size.

7.4.8 Zoom In

Fig. 62 Toolbar Zoom In

With this command, the size of the current result display is expanded by 10%.

7.4.9 Zoom out

Fig. 63 Toolbar Zoom Out

With this command, the current result display is reduced by 10%.

7.4.10 Only Summary

With this command, the shown report includes only the header and the test summary. Press the command again to show the report in the standard view.

7.4.11 Only Failed Tests

With this command shown report is reduced to show only the failed tests. All passed tests are not shown. Press the command again to show the report in the standard view.

7.4.12 Compressed View

With this command shown report is reduced to show the test name, the limits and results. The detailed test description like channel configuration, RF level etc. are not visible in this mode. Press the command again to show the report in the standard view.

7.4.13 Without Limit Values

With this command shown report is not including the upper and lower limit row. Press the command again to show the report in the standard view.

7.4.14 Only P/F Indication

With this command shown report is not including the upper and lower limit row and the scalar test results. The report only informs about the test state passed or failed. Press the command again to show the report in the standard view.

7.4.15 Without Annex

With this command the graphics inside the report are not shown. Press the command again to show the report in the standard view. In the standard view graphics are shown after the test result summary.

7.4.16 P/F Indication

With this command the graphic of the passed / failed indication can be changed.

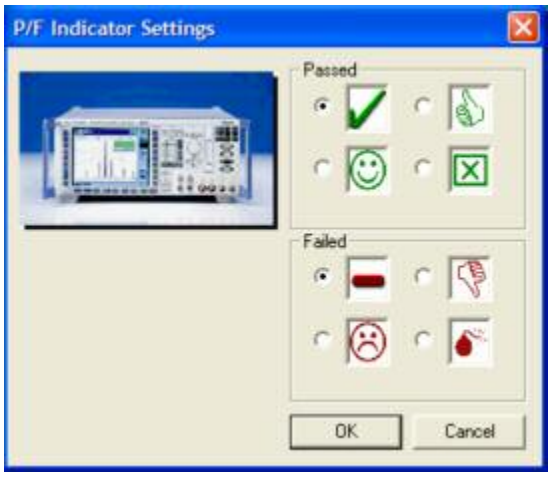


Fig. 64 P/F Indication Dialog

7.5 Help Menu

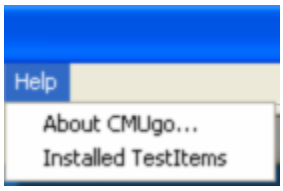


Fig. 65 Help Menu

7.5.1 About CMUgo

Fig. 66 Toolbar Help

This command opens a small dialog window where the current CMUgo version is displayed. The platform-specific version of the program is also indicated.

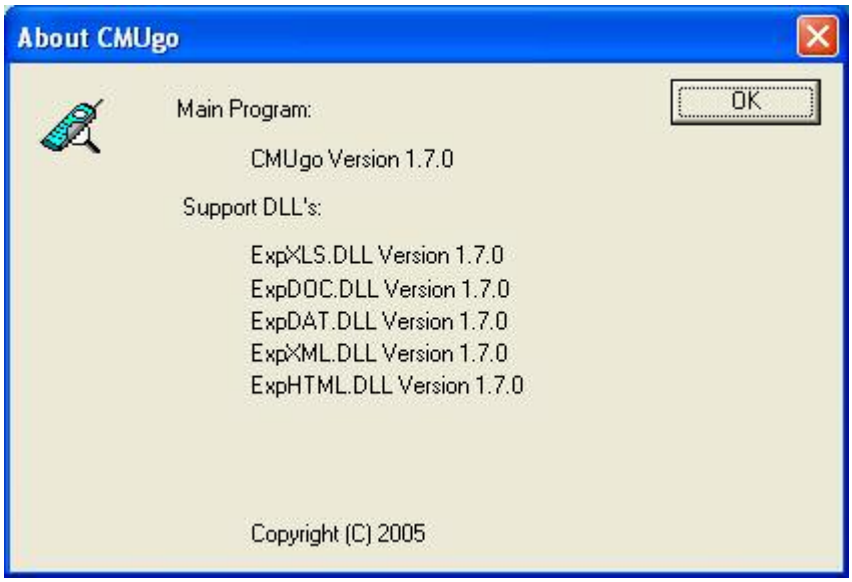


Fig. 67 About CMUgo Dialog

7.5.2 Installed Test Items

This command opens dialog window where the loaded test item DLLs are shown. I.e. to inform somebody about the installed DLLs the button **Copy test item DLL list to clipboard** can be used.
In case of problems with CMUgo use this information to make debugging of the program possible.

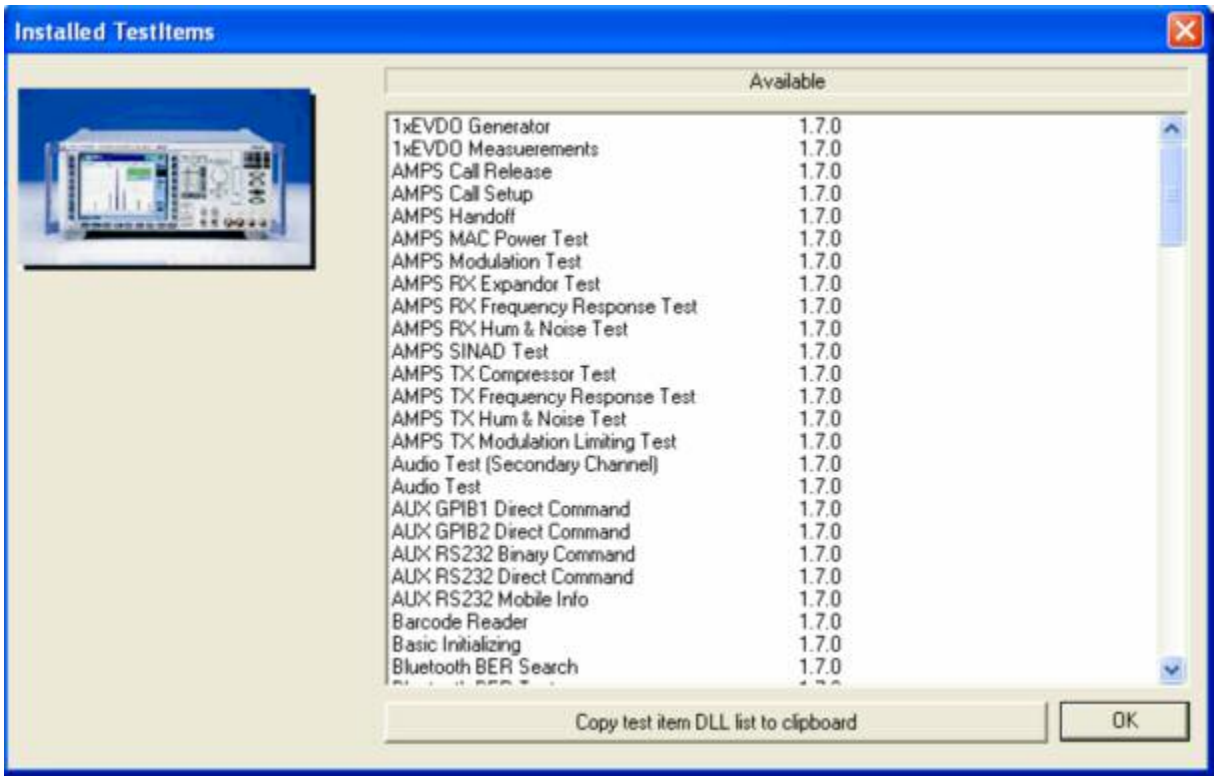


Fig. 68 Installed Test Items Dialog

8 Other Features

8.1 Debugging

CMUgo can prepare a protocol for all the data transferred via GPIB bus or the serial interface. To enable this feature, change to the directory, where CMUGO.EXE was installed. Open the initialization file “CMUGO.INI”.

Search for the section “[Remote]” and add a line in this section “Debug=1” like shown below.

The standard installation of CMUgo already sets this parameter of “CMUGO.INI” to “1”.

```
[Remote]
Serial Port=1
Baudrate=19200
Databits=8
Stopbits=1
Parity=0
Protocol=1
Termination Character=10
Timeout=60
IEEE488 Address=20
IEEE488 Active=1
IEEE488 UsePolling=1
Debug=1
```

8.2 Demo Feature

CMUgo can simulate a measurement without an R&S CMU 200 being connected. Measured values are generated in a random generator.

Search for the section “[Remote]” and add a line in this section “Demo=1” like shown below.

This setting corresponds to the “Demo Mode” of the main menu of CMUgo.

```
[Remote]
Demo=1
```

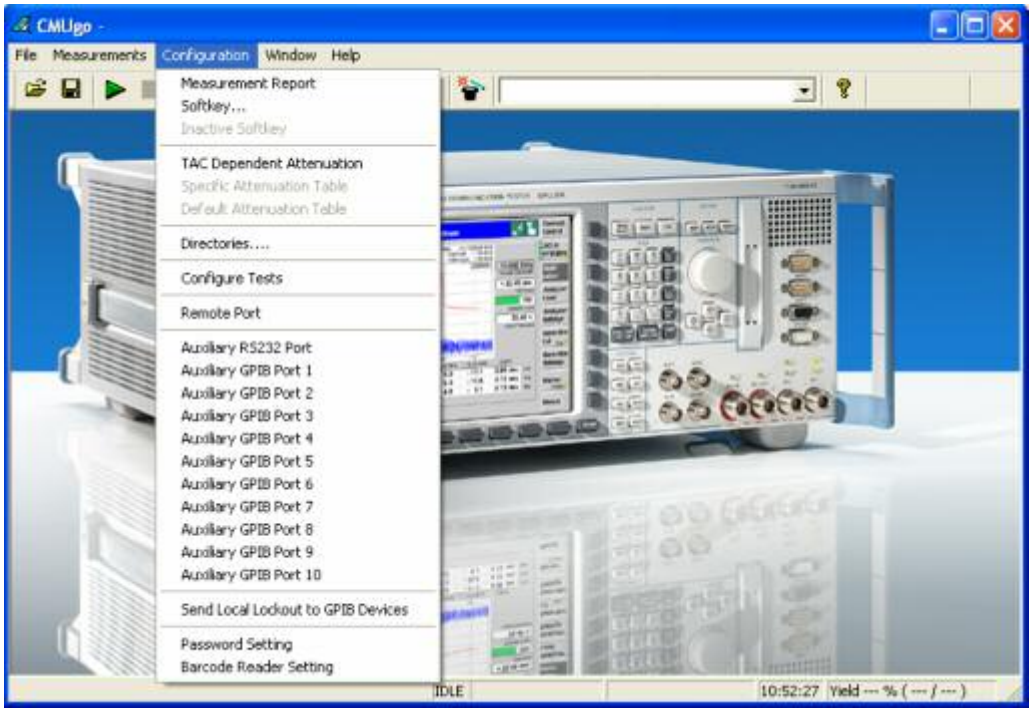
8.3 Language Feature

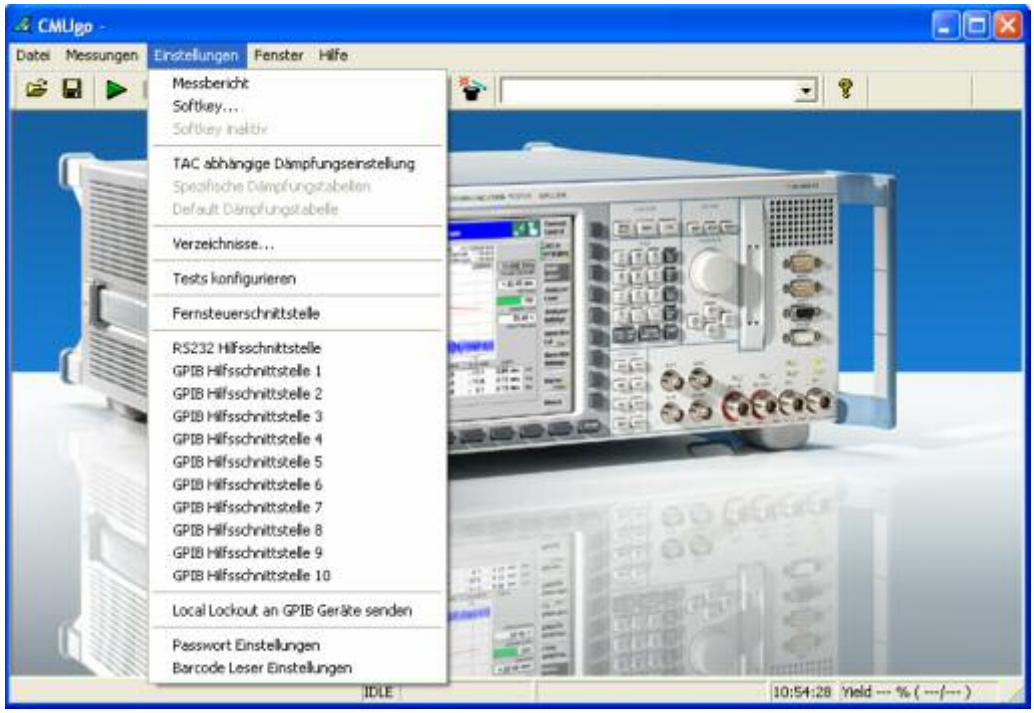
CMUgo comes as a multi language application. Depending on the installed operating system and its language, CMUgo uses a German or English user interface. You can force to change the language to German or English. This feature is only available under Windows™ NT, Windows™ 2000 and Windows™ XP.

Search for the section “[Application Settings]” and change parameter at the “Language” entry, like shown below.

```
[Application Settings]
Language=1
```

Use “0” for the automatic setting, “1” for an English and “2” for a German user interface.





8.4 Load & Save Sequence in the main menu

By default the functions **load sequences** and **save sequences** are only available in the configure test dialog of the configuration menu, because there already exists a load and save command for the reports.

It is possible to include these functions **load sequences** and **save sequences** in the **File** menu.

Search for the section “[Application Settings]” in the file “CMUGO.INI” and change the parameter at the “Options” entry, like shown below.

```
[Application Settings]
Options=4
```

The visibility of the commands corresponds to Bit 2 of the Options settings. That means an existing entry 0 has to be changed to 4. An existing entry 2 has to be changed to 6.

9 Basic CMUgo Test Sequence

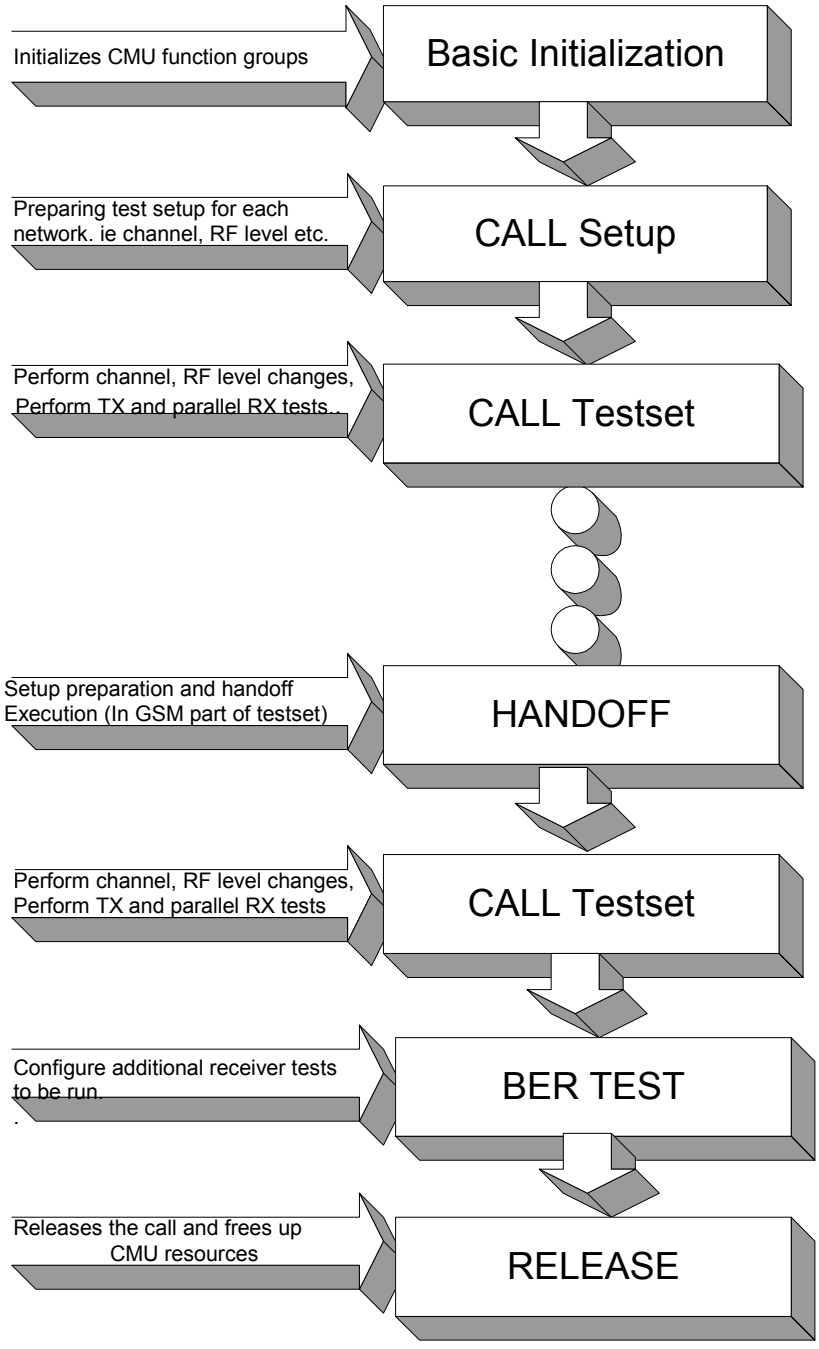


Fig. 69 Shematic Test Sequence

10 Common Test Items

This chapter describes the functionality of the common test items. Descriptions of network specific test items can be found as application notes at the download area of the Rohde & Schwarz homepage **http://www.rohde-schwarz.com**.

10.1 Basic Initializing

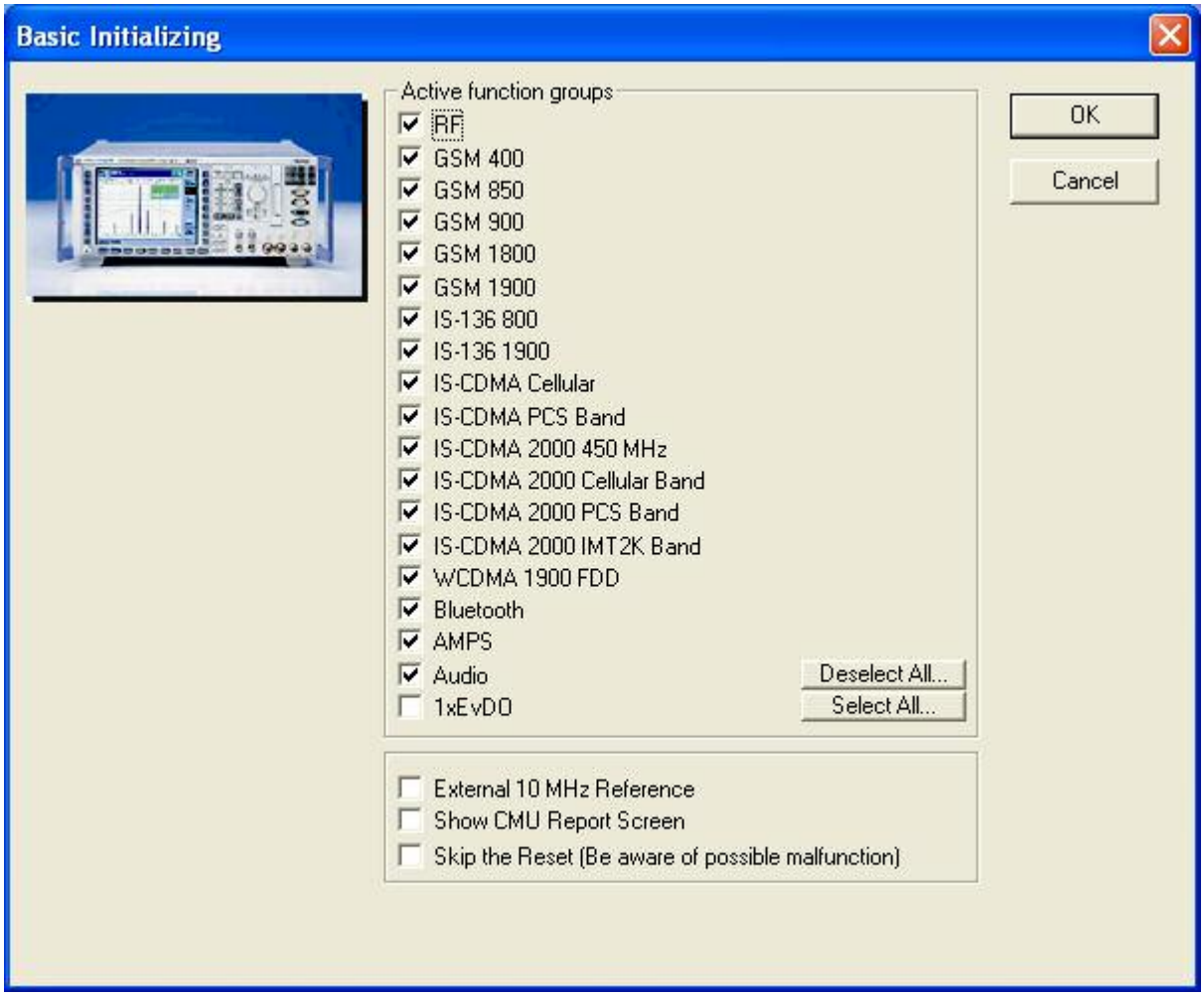


Fig. 70 Basic Initialization Dialog

"Basic Initializing" is always at the beginning of a remote-control sequence. In this test item the available R&S CMU 200 options are queried and "address mapping" (i.e. the assignment of the individual secondary addresses to the respective function groups) is performed.
To minimize the time required for the initialization routine, all function groups which are not involved should be deactivated.
In the bottom block it is possible to select whether an external reference frequency is to be used. You can also choose whether the CMU screen is to show the remote-control sequences.
To save time, it is also possible to disable the "Reset" (i.e. the function used to reset the R&S CMU200 to its default state). However, you must know the precise state of the instrument prior to resetting since in test functions CMUgo does not usually send settings to the instrument unless these settings differ from the default instrument state.
The individual items when executing this test item are:

- Query the CMU and the installed firmware versions.
- Query the CMU options.
- Set the secondary address 0 if the serial interface is used.

- Reset the instrument to its initial state.
- Prevent the instrument from losing the connection in the case of “Local/Remote” transitions.

```
*IDN?
*OPT?
*SEC 0
SYST:NONV:DIS
*CLS;*RST;*OPC?
SYST:GTRM:COMP OFF
```

- Display the received remote-control commands and sent measured values on the CMU screen. The default setting is OFF.
- Use the internal reference frequency.

```
TRAC:REM:MODE:DISP OFF
CONF:SYNC:FREQ:REF:MODE INT
```

- Reset the status byte to “0”.
- Assign the secondary address 1 for the function group “GSM 900 Signalling”.
- Assign the secondary address 2 for the function group “GSM 900 Non-Signalling”.
- Query whether the assignment of the secondary addresses has caused an error. Generally speaking, it is possible to determine whether the “K41” software option has been installed by querying the options described above. However, GSM 900 could also be available as a result of the “K0” demo option. In addition to this, it is also possible to deactivate individual function groups although the software option has been installed. GSM 900 function groups are therefore simply addressed by trial and error. In the case of an error, the status byte query will not return “0” but rather “4” to indicate that the error flag of the status byte has been set.

```
*CLS;SYST:REM:ADDR:SEC 1,"GSM900MS_Sig"
SYST:REM:ADDR:SEC 2,"GSM900MS_NSig"
*STB?
```

An error message is output during the test if the GSM 900 option has been deselected or the K41 software option has not been installed on the R&S CMU200.

Fig. 71 Error Message "Option not installed"

Remember that CMUgo handles the sub addresses dynamically. The sub address may therefore change depending on the number of found software options. In the majority of remote-control sequences described in this application note, the sub address for the function group “GSM 900 Signaling” is sub address 1.

10.1.1 Secondary addressing of the R&S CMU200

In examples which deal with the use of 2 function groups (e.g. “handoff” or “fallback” procedures), the instrument is addressed by means of three independent sub addresses. The first sub address refers to the R&S CMU200 base system and always has a fixed address assignment to the sub address 0. The second sub address is the original network, e.g. “cdma2000 Cellular Signaling”, and the third sub address is the secondary address of the target network (in our case the function group “AMPS Signaling”). The CMU can be addressed in two different ways, described in the following two paragraphs.

10.1.2 Using a dedicated “handle” for each secondary address

Before you can address an instrument on the GPIB bus, you must obtain a “handle” for this instrument. How to do this varies depending on the driver of the used GPIB controller card. With GPIB controller cards from National Instruments, the necessary function is called “ibdev” or “ibfind”.

```
int h_BASE;
// GPIB board index
#define BdIndx 0
// Primary address
#define pad 20
// Secondary address for Base Definition (National Instruments specific)
#define sad 96
// Timeout
#define tmo T_30s
// EOT
#define eot (int) 1
// EOS
#define eos (int) 0

h_Base = ibdev (BdIndx, pad, sad, tmo, eot, eos);
```

The example in “C” generates a “handle” for accessing the R&S CMU200 base system. The primary address 20 (pad) and the secondary address 0 (sad) are used together with the appropriate timeout and terminator. With controllers from National Instruments, an integer value of 96 is given for a secondary address 0, an integer value of 97 for a secondary address 1, and so on. This offset of 96 is not used for GPIB bus controllers from other manufacturers. With controllers from other manufacturers, the primary address and secondary address are frequently combined in one integer value, i.e. “2000” for primary address “20” and secondary address “00”, “2001” for primary address “20” and secondary address “01”, and so on.
If you now want to address another function group of the R&S CMU200, you can generate another handle to this function group.

```
int h_AMPS_Sig;
#define sad_amps  sad+1

h_AMPS_Sig = ibdev (BdIndx, pad, sad, tmo, eot, eos);
```

The function group “AMPS MS Signaling” now has its own “handle”. If you write a command to the base address of the R&S CMU200, the associated “handle” is used, as is the case for the identification code “*IDN?” in this example.

```
ibwrt(h_Base, "*IDN?", 5);
```

However, if you then want to address the function group “AMPS MS Signaling”, you use the “AMPS Handle”, as shown here for setting the auto ranging mode.

```
ibwrt(h_AMPS_Sig, "LEV:MODE AUT", 12);
```

However, before doing this, do not forget to define the “address mapping” of the R&S CMU200, e.g. with the following command which is sent to the base address.

```
SYST:REM:ADDR:SEC 1,"AMPSMS_Sig"
```

10.1.3 Using only one handle

Another possibility is to use only one handle, i.e. the handle of the function group “Base” (the base system). Here a number followed by a semicolon is placed in front of the command. The command for the function group “AMPS MS Signaling” described above then has the following appearance.

```
ibwrt(h_Base, "1;LEV:MODE AUT", 14);
```

This “remapping” mode of the R&S CMU200 is used with CMUgo. The sequences shown are all based on this mode.
Once again, before doing this, do not forget to define the “address mapping” of the R&S CMU200, e.g. with the following command which is sent to the base address.

```
SYST:REM:ADDR:SEC 1,"AMPSMS_Sig"
```

10.2 Overwrite Report Settings

Fig. 72 Overwrite Report Settings Configuration

The Report Settings of CMUgo can be changed inside a remote sequence. Check **Autosave File** if the report should be stored automatically. Select whether the report should be stored as **report file** (MRP), **text file**, XML File or as **HTML** file. The file formats correspond to the **Save Report**, **Export to file**, **Export to XML** or **Export to HTML** functions in the **File** menu.
Check **Print the generated report** if the report should be printed automatically. Select the format of the printout by selecting the corresponding option box. It is possible to select, if the report should be printed out completely, as a summary only, including only the failed test items or without the graphical annex.

Stop tests, if one test item fails could be chosen, if you are only interested in stopping the complete test sequence at a point, when one of the tests was out of the limits.

10.3 Overwrite Sequence Attenuation Settings

The Attenuation Values of a Sequence can be changed dynamically after starting the sequence. This test item takes attenuation values out of an initialization file, which has the same name as the sequence file, but which ends with ".INI" instead of ".SEQ". This initialization file could contain more than one section. A section is valid for one CMU serial number. This makes it possible to define one initialization file for several test stations using different R&S CMU200 and to store this initialization file together with the sequence file on a common path in the network. The following example describes the content of the initialization file. Each entry of the initialization file starts with a number followed by "_AttIn" or "_Attout". The number represents one test item of the sequence. "3_AttIn = 2.0" means the input attenuation of test item number 3 is changed to 2.0 dB.

```
[12345/123]
2_AttIn = 2.0
2_AttOut = 2.1
3_AttIn = 2.0
3_AttOut = 2.1
4_AttIn = 3.7
4_AttOut = 3.3
4_AttIn = 3.7
4_AttOut = 3.3

[987654/987]
2_AttIn = 1.9
2_AttOut = 1.8
3_AttIn = 1.9
3_AttOut = 1.8
4_AttIn = 3.5
4_AttOut = 3.1
4_AttIn = 3.5
4_AttOut = 3.1
```

Fig. 73 INI-File for Overwrite Attenuation Settings Function

The shown dialog is used to edit the initialization file only. Enter the **CMU serial number** to define the section of the initialization file. Also enter the **Sequence name** without extension.
Press the **Set…** button after defining the **Test step** number, the **Input Attenuation** and **Output Attenuation** values to store the data.

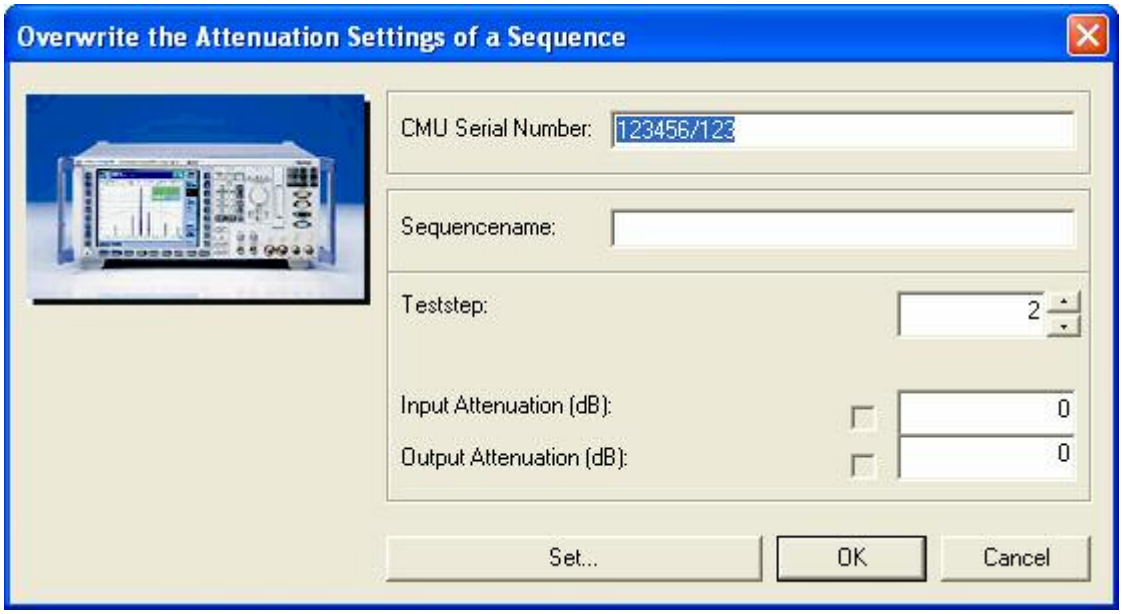


Fig. 74 Overwrite the Attenuation Settings of a Sequence Dialog

10.4 Remark

The test item Remark can be used in three different ways

- Show a dialog to the user. The user can enter a remark and then proceed with testing
- Show the entered text as a header in the generated report file
- Show the entered text behind the header remark

The first option gives the user the possibility to enter remarks, which are shown in the report.

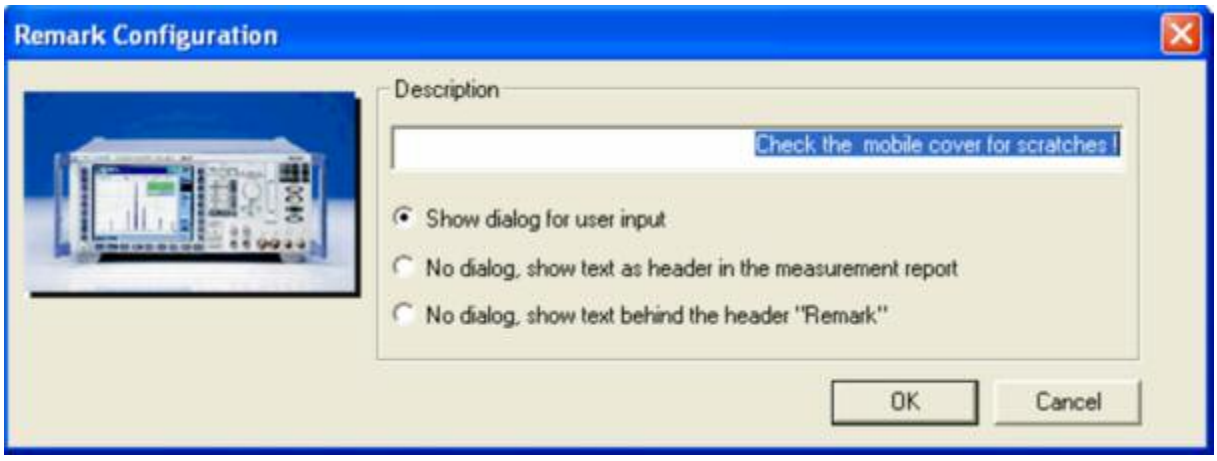


Fig. 75 Remark Configuration for User Dialog

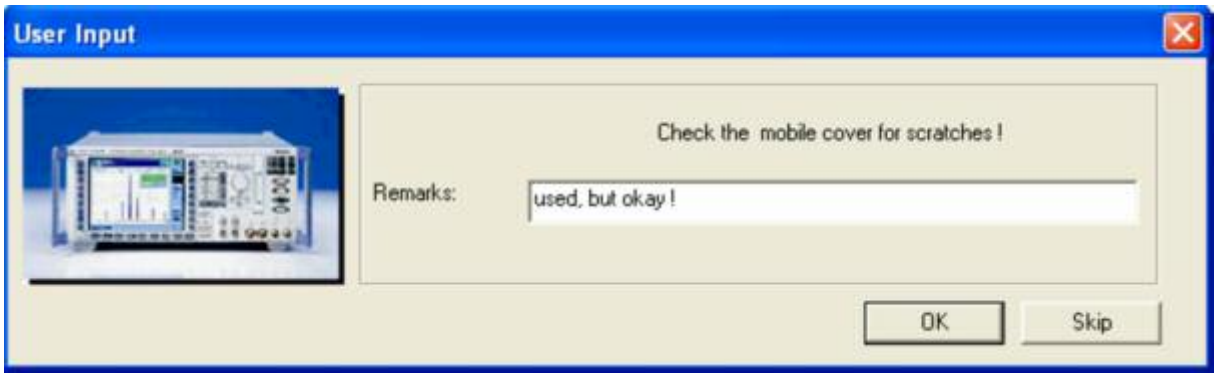


Fig. 76 User Input Dialog (Remark)

Fig. 77 Report for Remark User Input

The second option can be used to separate different sections inside the report

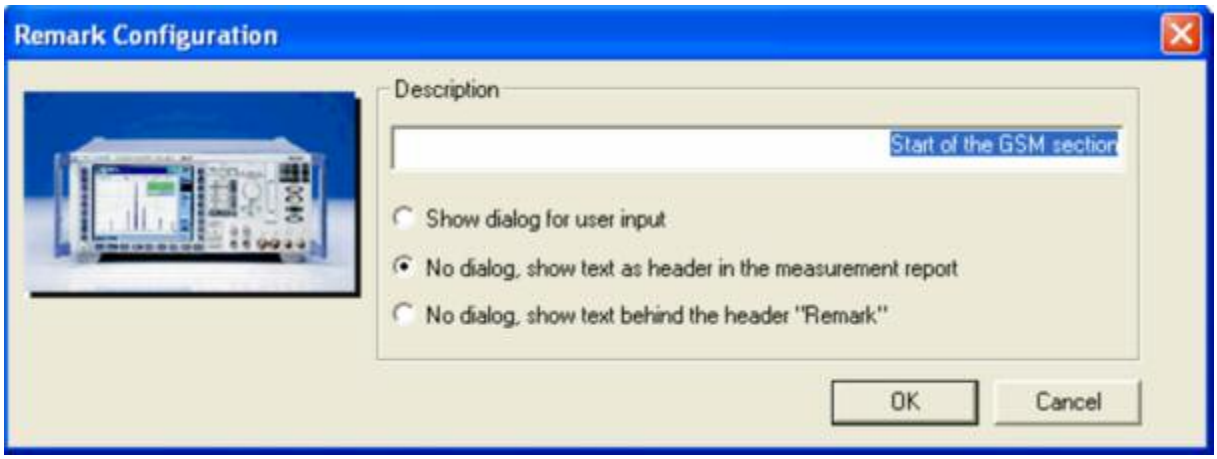


Fig. 78 Remark Configuration for Report Header

Fig. 79 Remark Report Header

The third option should mainly be used to add sequence specific remarks to the header of the XML export.

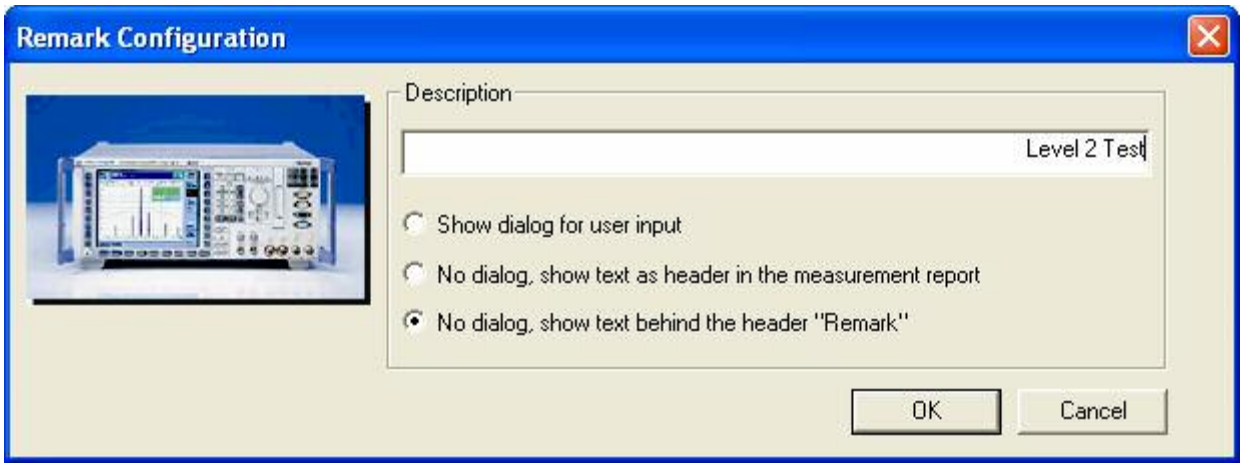


Fig. 80 Remark Configuration for Text behind Header Remark

Fig. 81 Remark Text in Report

10.5 Show Hint

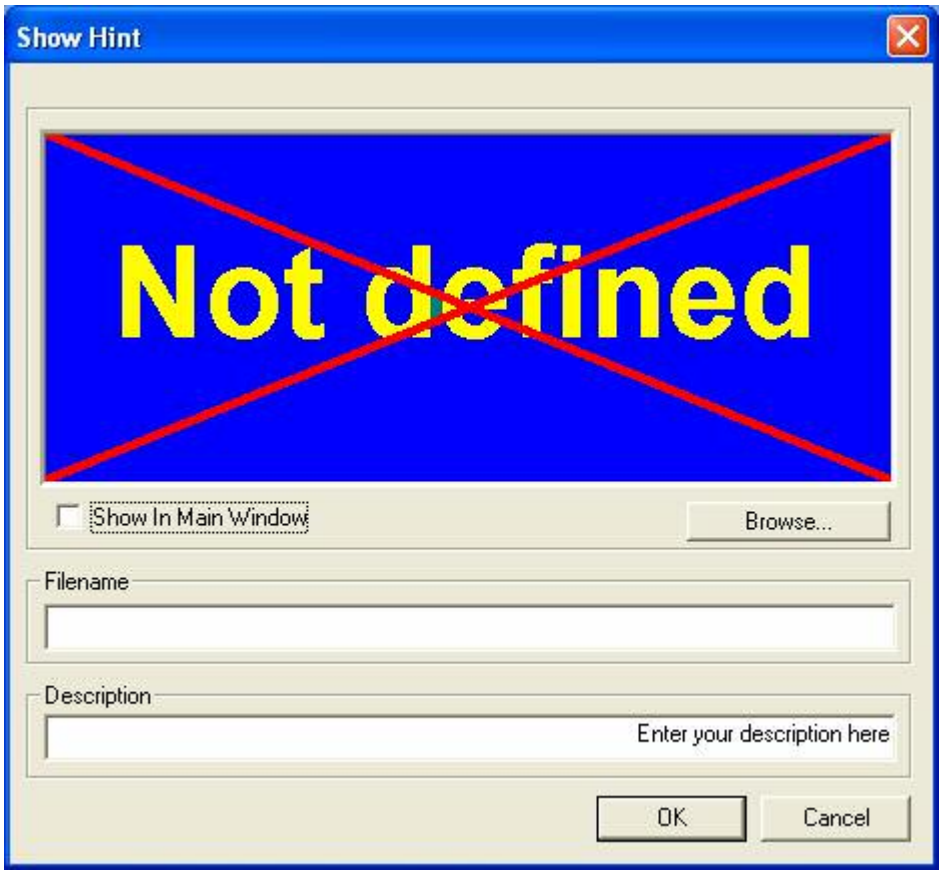


Fig. 82 Show Hint Configuration Dialog

The Show Hint test item can be used to display a popup window containing a bitmap. The bitmap is defined in the **Filename** edit field. Check **Show in Main Window**, if the bitmap should be shown in a popup window or in the client window area of CMUgo. The bitmap is shown until the next Show Hint test item in the sequence.
To remove the popup window from the desktop or to clear the client window of CMUgo call Show Hint without entering a **Filename**.

For bitmap graphics shown inside the popup window, the bitmap should not be too big.
Good results can be obtained with graphics files with the following characteristics:

- Width: 400 pixels
- Height: 200 pixels
- 24 Bit per pixel (65 million colors)
- Format: Windows™ bitmap (BMP)

For bitmap graphics shown in the client window of CMUGo the graphic size can be greater than at the popup window. Good results can be obtained with graphics files with the following characteristics:

- Width: 640 pixels
- Height: 480 pixels
- 24 Bit per pixel (65 million colors)
- Format: Windows™ bitmap (BMP)
- White background

Or

- Width: 800 pixels
- Height: 600 pixels
- 24 Bit per pixel (65 million colors)
- Format: Windows™ bitmap (BMP)

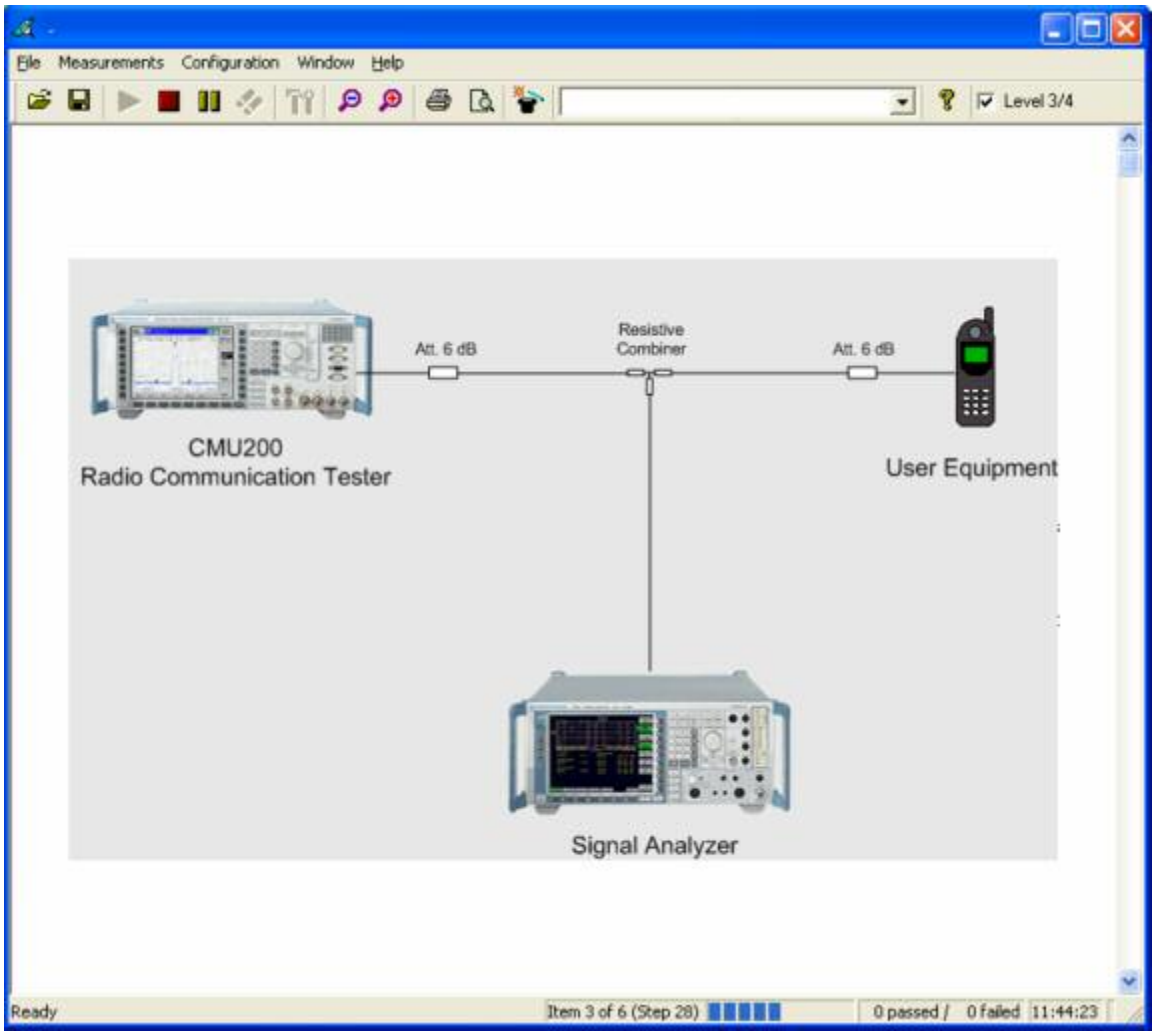


Fig. 83 Show Hint at the Client Window of CMUgo

10.6 Direct Command

The test item Direct Command can be used to send **Remote Commands** directly to the CMU200. That includes also the possibility to change parameters of the R&S CMU200, which are not handled by CMUgo.

If the **Remote Command** sequence includes a query, this query must be placed at the end of the command sequence.
By default the **Remote Commands** are send to the currently active function group. But it is also possible to send the commands to any other function group of the R&S CMU200.
A **Description** can be entered and optionally shown in the report.

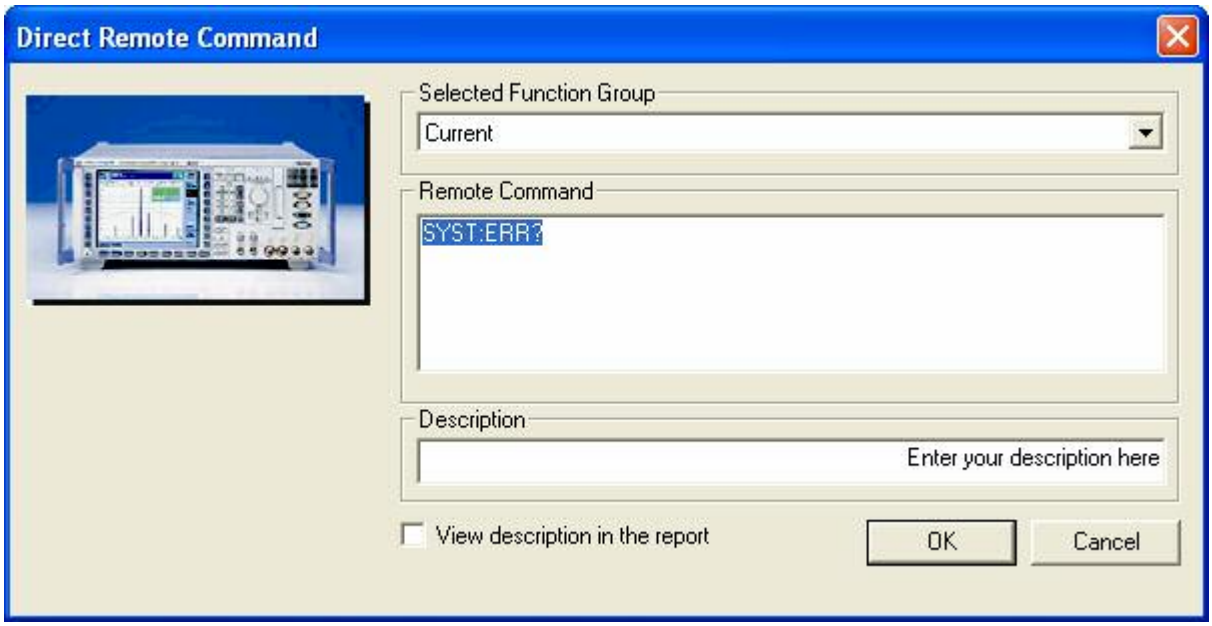


Fig. 84 Direct Remote Command Configuration Dialog

In Addition to the R&S CMU200 other remote devices can be controlled by CMUgo.

Fig. 85 Auxiliary Device Direct Remote Command Configuration Dialog

Direct Commands can also be send to this auxiliary device, which has to use the same **Auxiliary Device Name** as defined in one of the ten auxiliary device port configurations of CMUgo. Do not forget to enable the port in the auxiliary port setting dialog, before using it.
If the **Remote Command** sequence includes a query, this query must be placed at the end of the command sequence.
A **Description** can be entered and optionally shown in the report.
There also exists a test item AUX RS232 Direct Command. This test item supports an auxiliary device connected to a serial interface transferring text strings.
For binary data transmission on the auxiliary RS232 port another test item can be chosen, which is named Aux RS232 Binary Command.

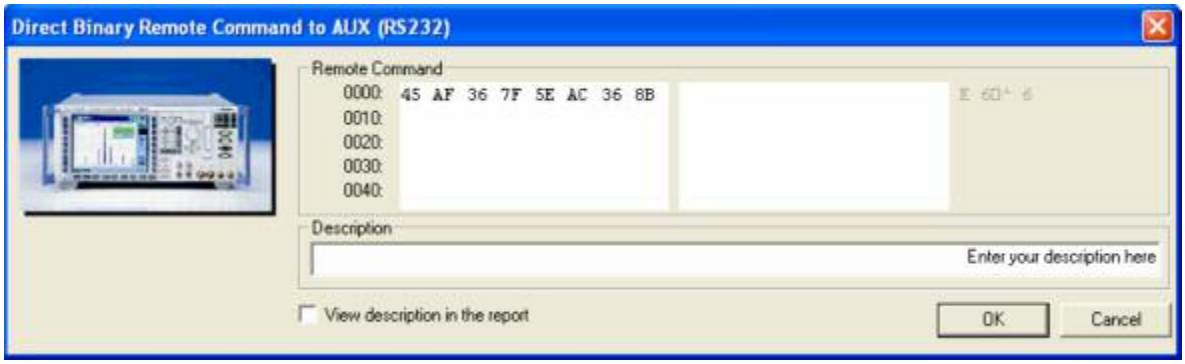


Fig. 86 Binary Remote Command for Auxiliary RS232 Device

Aux RS2 Binary Command can not be used for instrument queries. It only transfers the given binary Remote **Command** data to the connected RS232 instrument

10.7 User Defined Test

This test item can be used to define a user defined remote sequence including a query at the end of the remote sequence. That includes the possibility to integrate measurements, which are possible on the R&S CMU200, but which are not handled by CMUgo.
The **Remote Command** sequence must include a query, placed at the end of the command sequence. By default the **Remote Commands** are send to the currently active function group. But it is also possible to send the commands to any other function group of the R&S CMU200.
The response of the R&S CMU 200 can either be a **Numeric Value** or a **Return String**. A **Numeric Value** can be checked against **Low Limits** or/and **High Limits**. To activate the given limit activate the checkbox next to **Low Limits** or **High Limits**. **Test Return String** will compare the response of the tester R&S CMU 200 against the given **Expression**. If both strings are equal, the test passes, otherwise it fails.
Very often the return string of the R&S CMU200 contains more than one value. Each value will be separated with commas or semicolons. **Return Value at Position** defines which value is checked or compared against limits.
The user defined Test can also be used to include a user dialog, which asks for test passed or test failed, if **User Input (Yes/No)** is selected

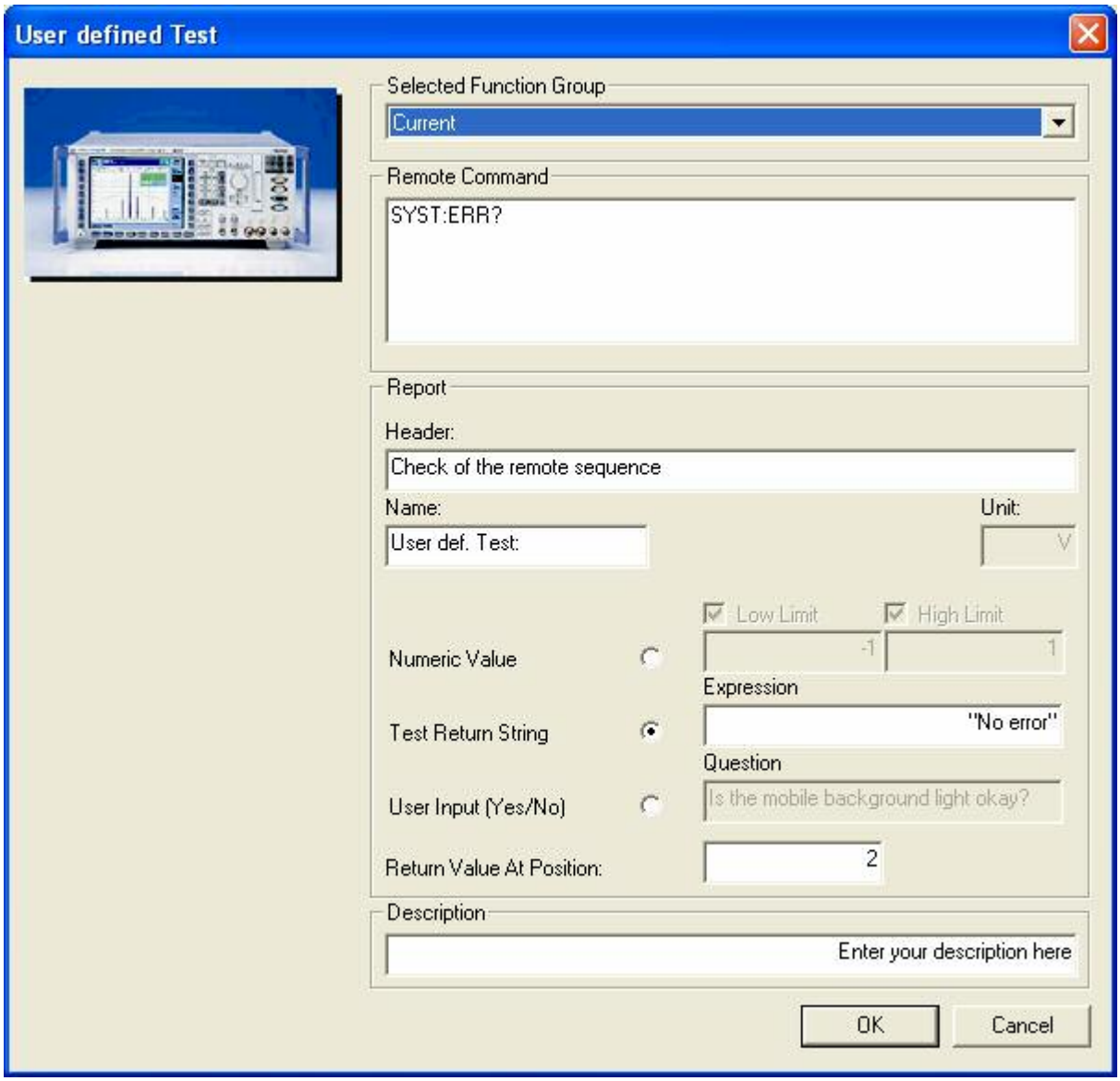


Fig. 87 User Defined Test Configuration

The report of this test item can be defined individually. Define the Report **Header**, the **Name** of the test item and the **Unit** of the values.

10.8 Toggle RF Port

This test item is designed for units R&S CMU 200, which are equipped with the option B99. This gives the benefit of having the same level ranges for port RF1 and port RF2 at the CMU 200.
One phone can be connected to RF port 1 and be tested, while another phone is prepared for the next test run. The next test will use the port RF 2 then. You can define how the port configuration is changed:

- For the previous test items.
- For the next test items.
- For all test items.

Fig. 88 Toggle RF Port Configuration

10.9 Delay

This test item can be used to define a delay the sequence at a certain step. Check **Go to Pause**, if the sequence should be halted at this test step.

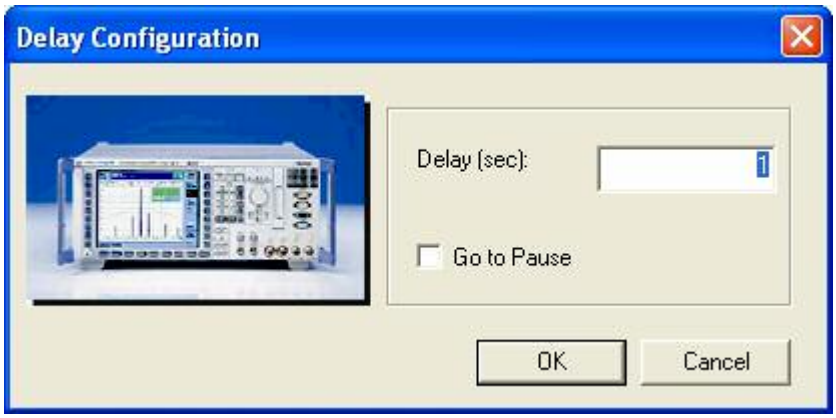


Fig. 89 Delay Configuration Dialog

10.10 Loop Start and Loop End

A test sequence can be looped. For these loops the test items Loop Start and Loop End have to be included in the test sequence. Loop End will jump back to the position of Loop Start. The Report will be cleared at this time. Including the test item Test End just before Loop End and activating autosave procedures makes it possible to save the test report including the test results of this test run.

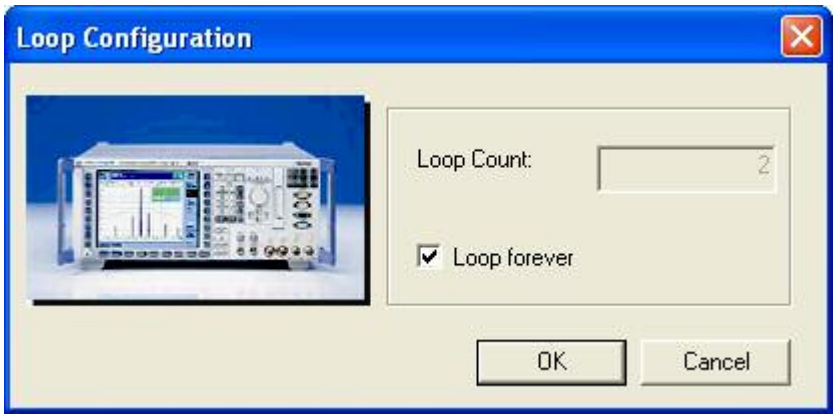


Fig. 90 Loop Configuration Dialog

The loop can either be defined for a specific amount of **Loop counts** or to **Loop forever**.

10.11 Search for Occupied GSM Channels

This test item can be used to connect an antenna to the CMU RF port 4 and to search for occupied GSM channels. This test can be used to prepare GSM test sequences and to avoid interference problems with the existing network.

Define the bandwidth of the power measurement. The sensitivity of this measurement can be increased, when selecting a narrow filter bandwidth. **Select** the GSM **Bands** you want to evaluate.
The **Threshold** defines which GSM channels are listed, when exceeding this RF level.

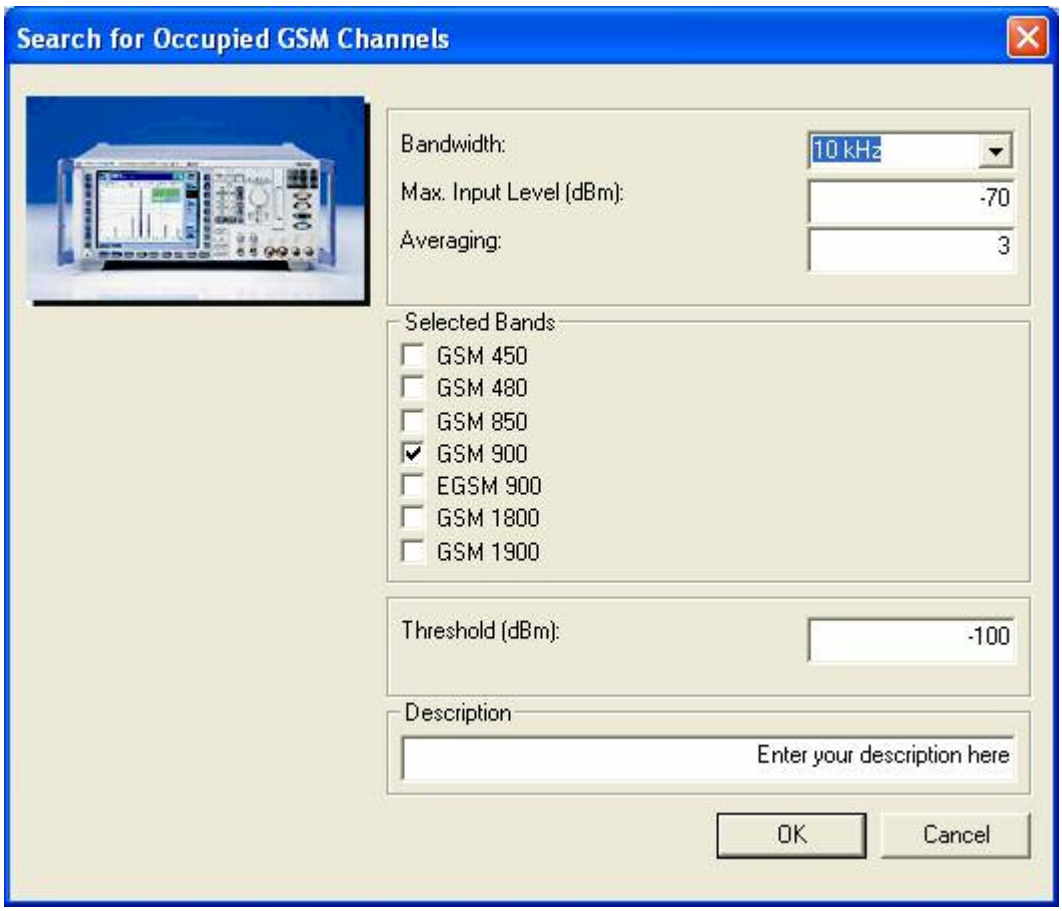


Fig. 91 Search for Occupied GSM Channels Configuration

10.12 Compare IMEI to Scanner

The barcode reader option can be used to read the IMEI of a mobile phone. This test item checks, if this IMEI is equal to the reported IMEI during the call setup. The call setup must be placed in the sequence, before this test item is executed.

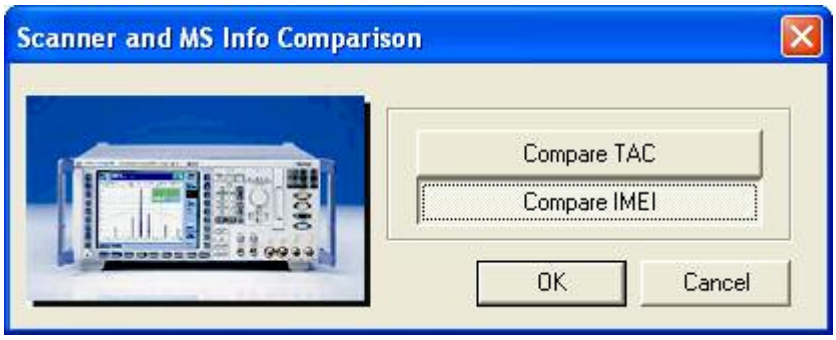


Fig. 92 Scanner and MS Info Comparison Configuration Dialog

It is possible to reduce the comparison to the type approval code (TAC) , which is part of the IMEI.

10.13 Test End

Test End will show the summary of the test results.
It will **Start Autosave Procedures** when the according check box is marked. The user dialog can be closed automatically after the given period.
Tests, which returned NAN, can be included as failed tests in the test report summary.

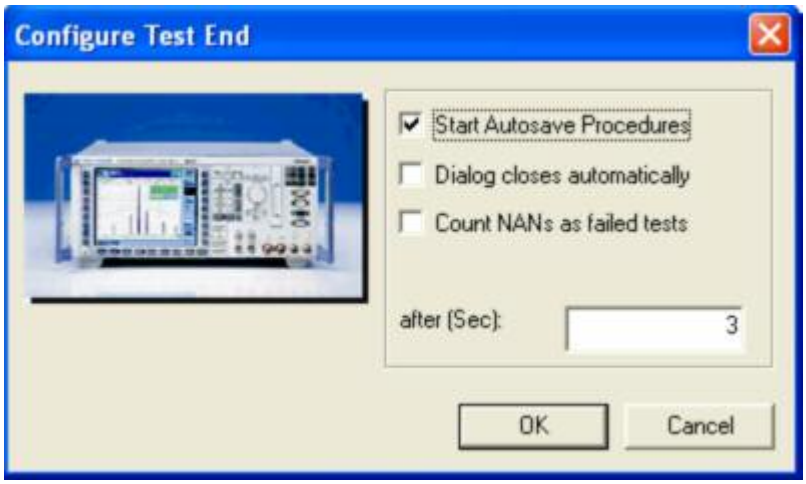


Fig. 93 Configure Test End Dialog

11 Basic Initializing and CMU Options

The **Basic Initializing** routine tries to activate as many function groups as possible for the connected CMU. It is possible to de-select function groups, which are not part of the test script. Each function group corresponds to the illustrated CMU hardware and software options.

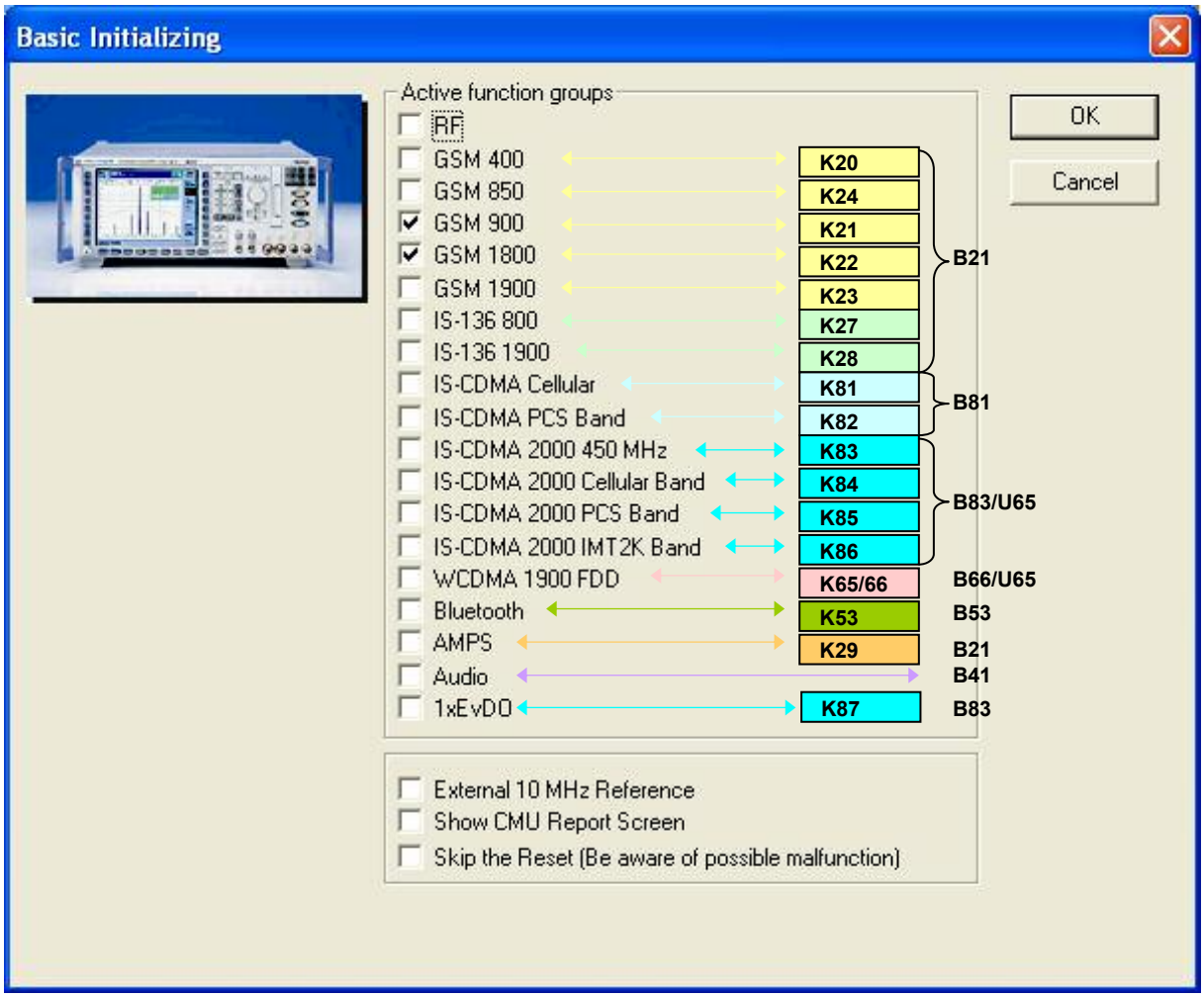


Fig. 94 Basic Initializing and corresponding CMU options

12 Example

12.1 A simple GSM example

In our example, a test of a GSM900/GSM1800 dual band mobile is to be performed. After a first call has been set up by CMU 200, we test the power, the modulation and the bit error on PCL 5. This test will be performed on the channels 1, 62 and 124. After these tests a test of the power mask will be performed on channel 62 and PCL 19. Then a dualband handover will be performed and the same kind of tests will be done on the channel 512, 698 and 885 at PCL 0, with one additional power test on channel 698 and PCL 15. The statistical averaging over several modulation tests should use a factor of 10. The bit error measurement should be done as „burst by burst“ test with an averaging factor of 88. The power mask verification at the lowest PCL will be performed as a measurement over a single burst. The mobile is connected to the CMU by means of an RF cable taken from a vehicle installation set; the cable loss is 1.0 dB for the GSM900 channels and 2.0 dB for the GSM1800 channels. The output level of the CMU200 is related to the bit error rate measurements. This means –102 dBm for the GSM900 band and –100 dBm for the GSM1800 band. It is recommended to use a shielded box for these measurements.

12.2 Block diagram of the test

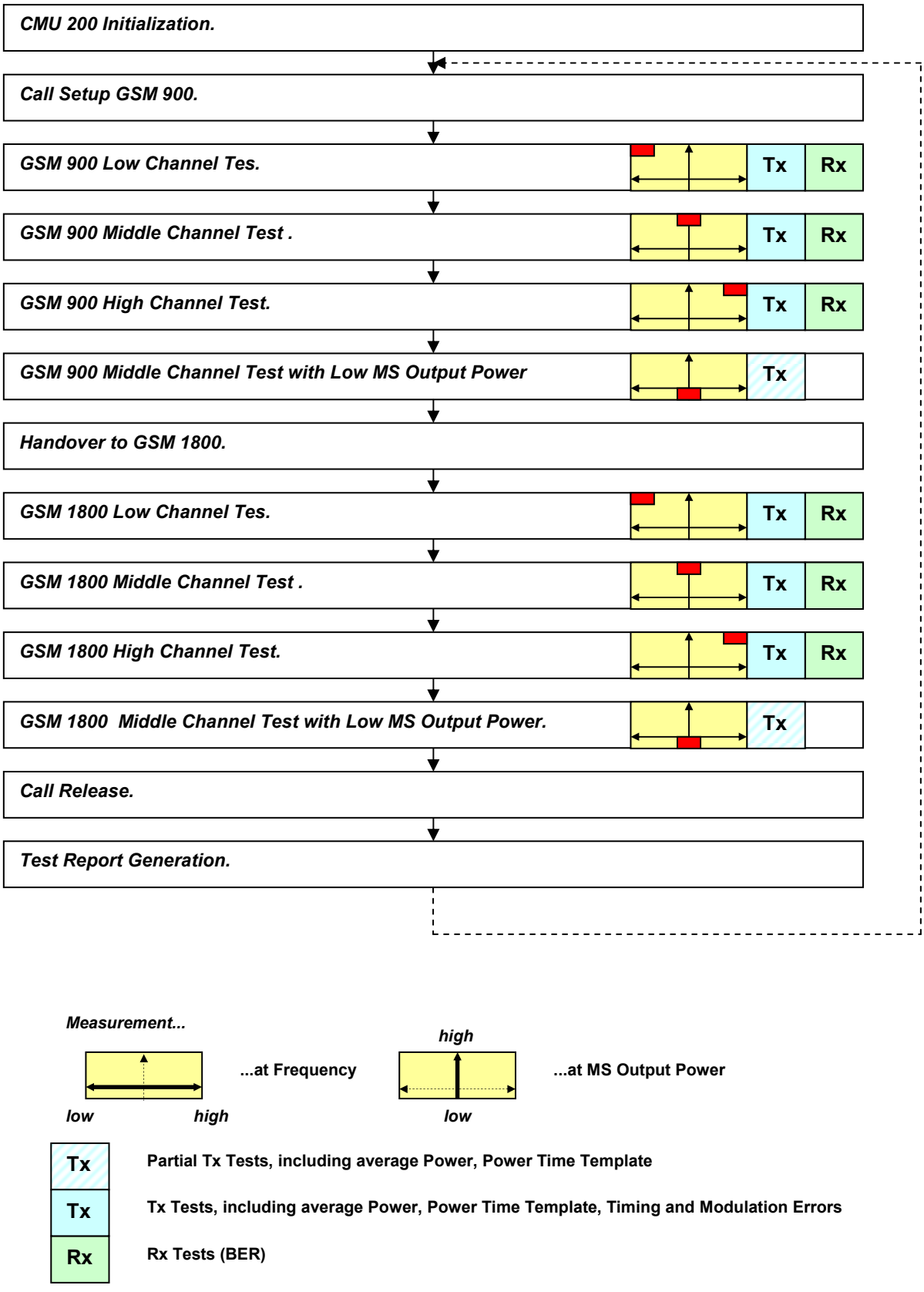


Fig. 95 Test Block Diagram

12.3 Configuration of the test

Open the Configuration menu and select Configure Tests or press following button at the toolbar.

The dialog window "**Configure Test Items**" appears. Double click on the entry **Basic Initializing** at the first listbox **Available**. Then double click on the test items **GSM Call Setup** and **GSM Call Testset**. The dialog box should look like this now.

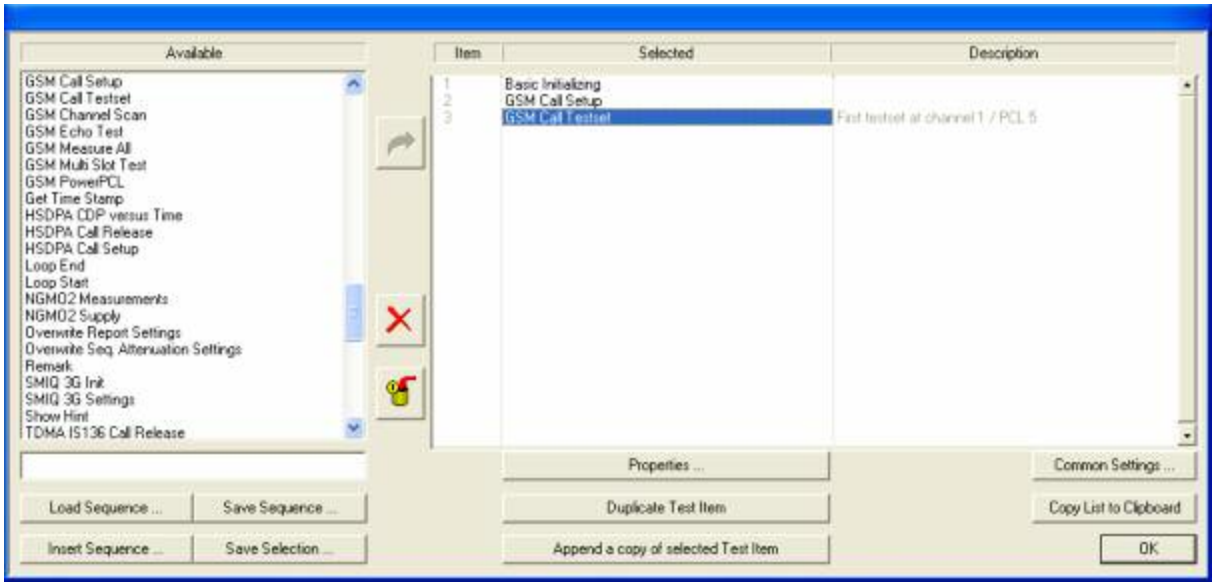
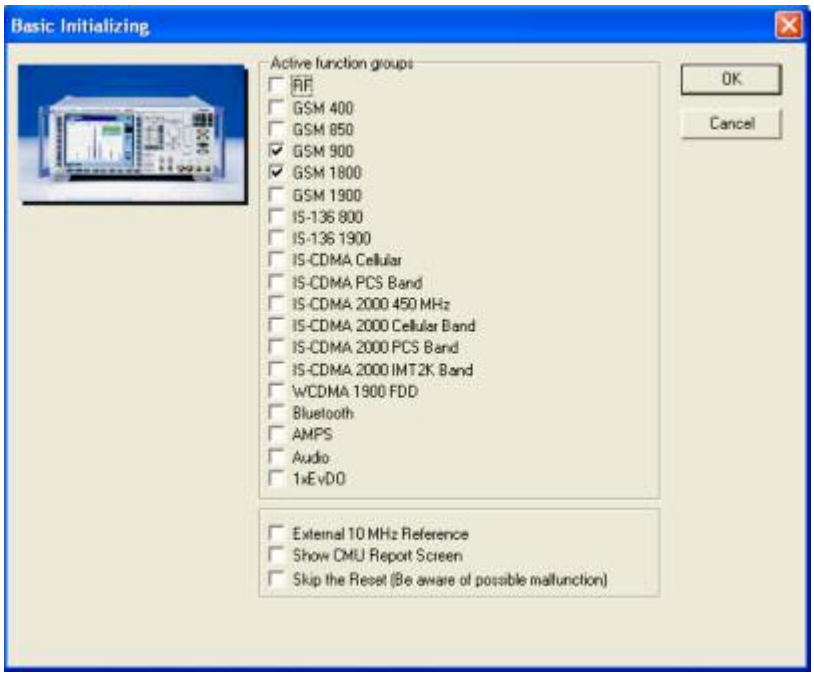


Fig. 96 Test Configuration, Steps 1 to 3

Double click on the test item **Basic Initializing** at the list box **Selected**. Following dialog window appears.



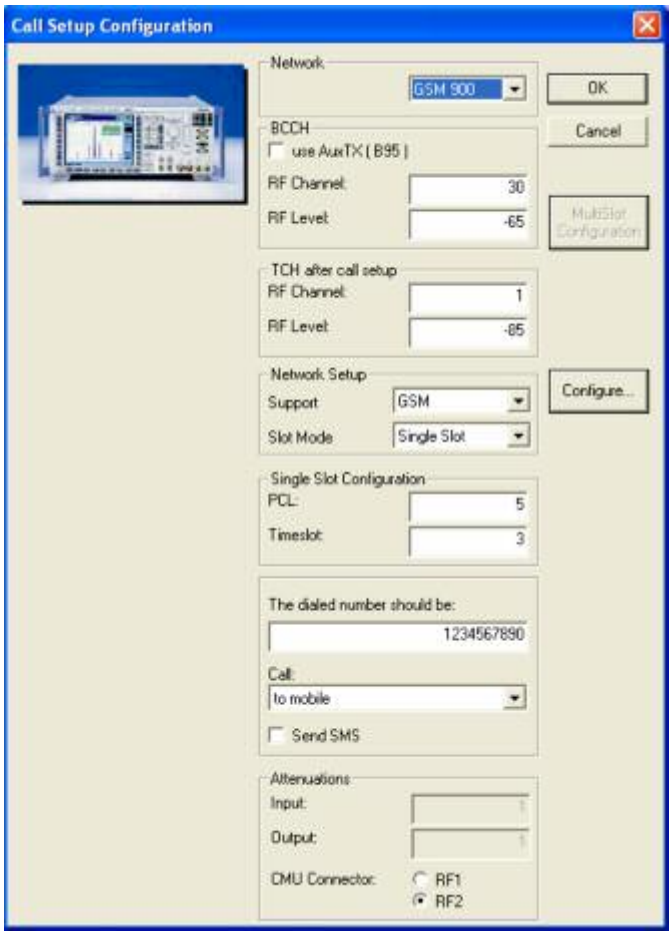
Test Plan Step ...

- ***Setup GSM Signalling Function Group for GSM 900 and GSM 1800.***

Fig. 97 Test Configuration, Step 1, Basic Initializing

Disable all function groups, which are not used for this test, like the function groups for “GSM1900”. After this, press the “OK” button.

Now double click on the test item “**GSM Call Setup**” at the list box “**Selected**” and the “Call Setup Configuration” dialog window appears. Change the TCH channel to 1, TCH Rf level to –85.0 dBm, the PCL to 5 and the attenuation factors to 1. The Call Setup Configuration should appear as illustrated.



Test Plan Step ...

- ***Call Setup GSM 900***

Network & RF Parameter ...

- *GSM 900 Band*
- *BCCH Channel 30.*
- *BCCH Level –65 dBm*
- *TCH Channel 1.*
- *TCH Timeslot 3.*
- *TCH PCL 5.*
- *TCH Level -85.0 dBm*

Test Condition ...

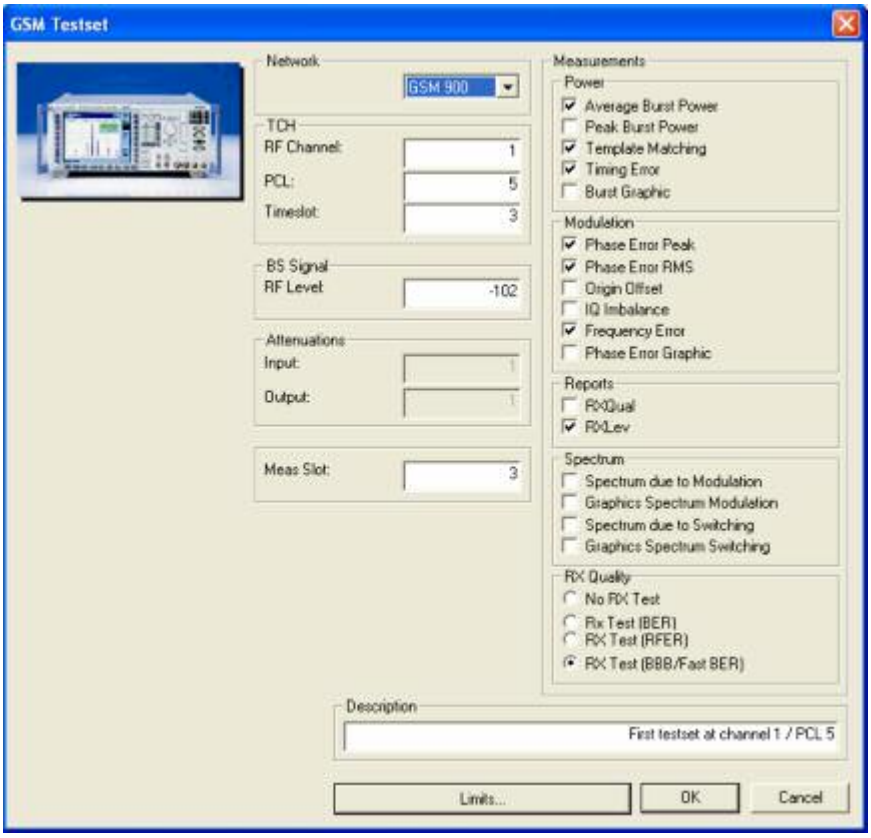
- *RF cable compensation 1.0 dB*

Fig. 98 Test Configuration, Step 2, Call Setup

Press “OK” to come back to the previous dialog window.

In a third step configure the “**GSM Call Testset**”. Refer to the shown dialog for the necessary changes. These are the channel, the PCL, the Rf level of the CMU, the input and output attenuation.

Mark only those checkboxes, which are necessary for our first testset.



Test Plan Step ...

- ***GSM 900 Low Channel Test***

Network & RF Parameter.

- *GSM 900 Band*
- *TCH Channel 1.*
- *TCH Timeslot 3.*
- *TCH PCL 5.*
- *TCH Level -102.0 dBm*

Test Condition ...

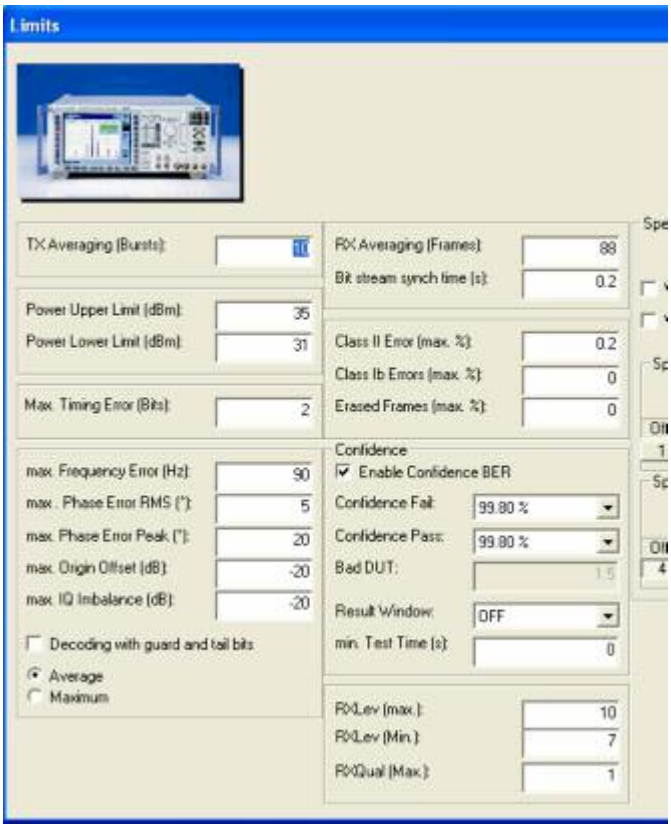
- *RF cable compensation 1.0 dB*

Measurements ...

- *Power Measurement with Template and Timing Error Check.*
- *Modulation Measurement (Phase/Frequency Error).*
- *Fast Bit Error Measurement (Burst by Burst Mode).*
- *RXLev*

Fig. 99 Test Configuration, Step 3, GSM Testset GSM900 Low Channel

Press the "**Limits...**" button to verify the settings for the measurements. Especially you should verify the settings for the averaging of the measurements and the upper and lower limits for the power measurement.



Test Plan Step Limits...

- ***GSM 900 Low Channel Test***

Averaging.

- *TX Measurements 10 Bursts.*
- *Fast BER with 88 Frames (equal 10kBit Class II).*

Limits ...

- *Power 33 dBm ± 2 dB*
- *Timing Error . ± 2 Symbols*
- *Frequency Error ± 90 Hz*
- *Phase Error RMS 5°*
- *Phase Error Peak ± 20°*
- *BER ≤ 0.2%*
- *RXLev 7..10*

Limits are checked against average values.

Fig. 100 Test Configuration, Step 3, GSM Testset GSM900 Low Channel Limits

After completing all changes leave the "GSM Testset" dialogs to return to the "**ConfigureTest Items**" dialog window. Mark the test item "**GSM Call Testset**" in the "**Selected**" list box and press the "**Duplicate Test Item**" button three times. Now you have three copies of this test item, all parameters are copies of the origin test item. Double click on the test item "4" and change the channel from 1 to 62 and change the test description.

Test Plan Step ...

- ***GSM 900 Middle Channel Test***

Network & RF Parameter ...

- *GSM 900 Band*
- *TCH Channel 62.*
- *TCH Timeslot 3.*
- *TCH PCL 5.*
- *TCH Level -102.0 dBm*

Test Condition ...

- *RF cable compensation 1.0 dB*

Measurements ...

- *Power Measurement with Template and Timing Error Check.*
- *Modulation Measurement (Phase/Frequency Error).*
- *Fast Bit Error Measurement (Burst by Burst Mode).*
- *RXLev*

Fig. 101 Test Configuration, Step 4, GSM Testset GSM Middle Channel

Test Plan Step Limits...
- ***GSM 900 Middle Channel Test***

Averaging.
- *TX Measurements 10 Bursts.*
- *Fast BER with 88 Frames (equal 10kBit Class II).*

Limits ...
- *Power 33 dBm ± 2 dB*
- *Timing Error. ± 2 Symbols*
- *Frequency Error ± 90 Hz*
- *Phase Error RMS 5°*
- *Phase Error Peak ± 20°*
- *BER ≤ 0.2%*
- *RXLev 7..10*

Limits are checked against average values.

Fig. 102 Test Configuration, Step 4, GSM Testset GSM Middle Channel Limits

Repeat this with the test item “5” and change the channel from 1 to 124. Do not forget to change the description here as well.

Test Plan Step ...
- ***GSM 900 High Channel Test***

Network & RF Parameter ...
- *GSM 900 Band*
- *TCH Channel 124.*
- *TCH Timeslot 3.*
- *TCH PCL 5.*
- *TCH Level -102.0 dBm*

Test Condition ...
- *RF cable compensation 1.0 dB*

Measurements ...
- *Power Measurement with Template and Timing Error Check.*
- *Modulation Measurement (Phase/Frequency Error).*
- *Fast Bit Error Measurement (Burst by Burst Mode).*
- *RXLev*

Fig. 103 Test Configuration, Step 5, GSM Testset GSM High Channel

Test Plan Step Limits...
- ***GSM 900 High Channel Test***

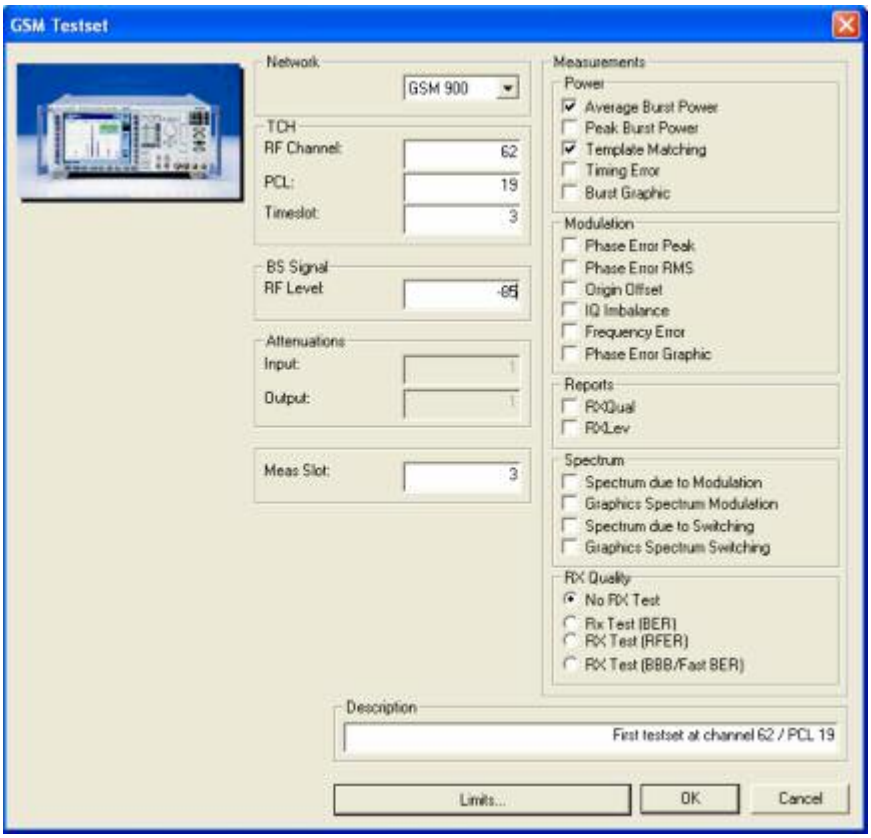
Averaging.
- *TX Measurements 10 Bursts.*
- *Fast BER with 88 Frames (equal 10kBit Class II).*

Limits ...
- *Power 33 dBm ± 2 dB*
- *Timing Error . ± 2 Symbols*
- *Frequency Error ± 90 Hz*
- *Phase Error RMS 5°*
- *Phase Error Peak ± 20°*
- *BER ≤ 0.2%*
- *RXLev 7..10*

Limits are checked against average values.

Fig. 104 Test Configuration, Step 5, GSM Testset GSM High Channel Limits

Open the test item “6” and deselect all tests except of the average power test and the template check. Change the RX Quality section to have “**No RX tests**” active. Change the channel to 62 and the PCL to 19. Look on the shown dialog window.



Test Plan Step ...

- ***GSM 900 Middle Channel Test with Low MS Output Power.***

Network & RF Parameter

- *GSM 900 Band*
- *TCH Channel 62.*
- *TCH Timeslot 3.*
- *TCH PCL 19.*
- *TCH Level -85.0 dBm*

Test Condition ...

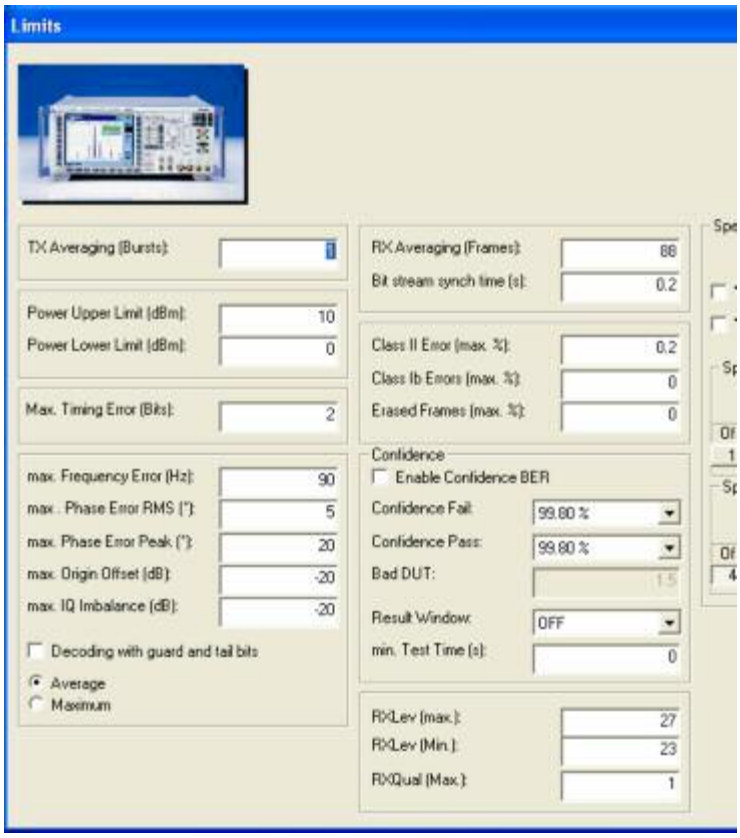
- *RF cable compensation 1.0 dB*

Measurements ...

- *Power Measurement with Template Check.*

Fig. 105 Test Configuration, Step 6, GSM Testset GSM900 Middle Channel, Low Power

Do not forget to change the limits for the power measurement and the averaging factor for this measurement.



Test Plan Step Limits...

- ***GSM 900 Middle Channel Test 2***

Averaging.

- *TX Measurements 1 Burst.*

Limits ...

- *Power 5 dBm ± 5 dB*

Fig. 106 Test Configuration, Step 6, GSM Testset GSM900 Middle Channel, Low Power Limits

Return to the “ConfigureTest Items” dialog window. It should look like this now.

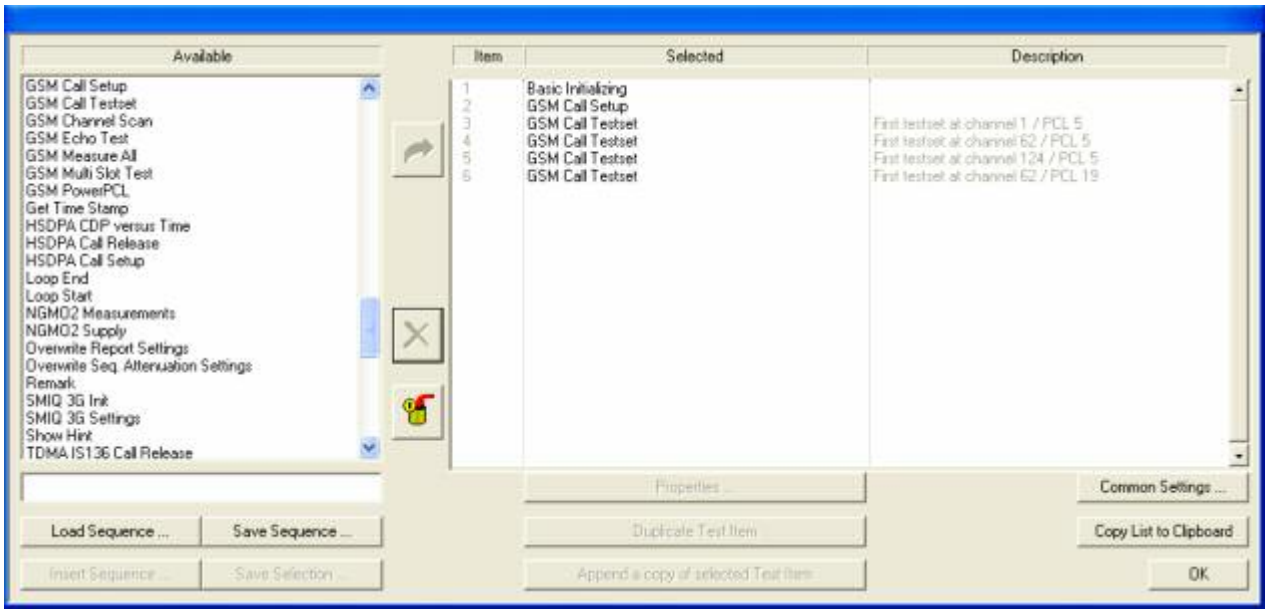
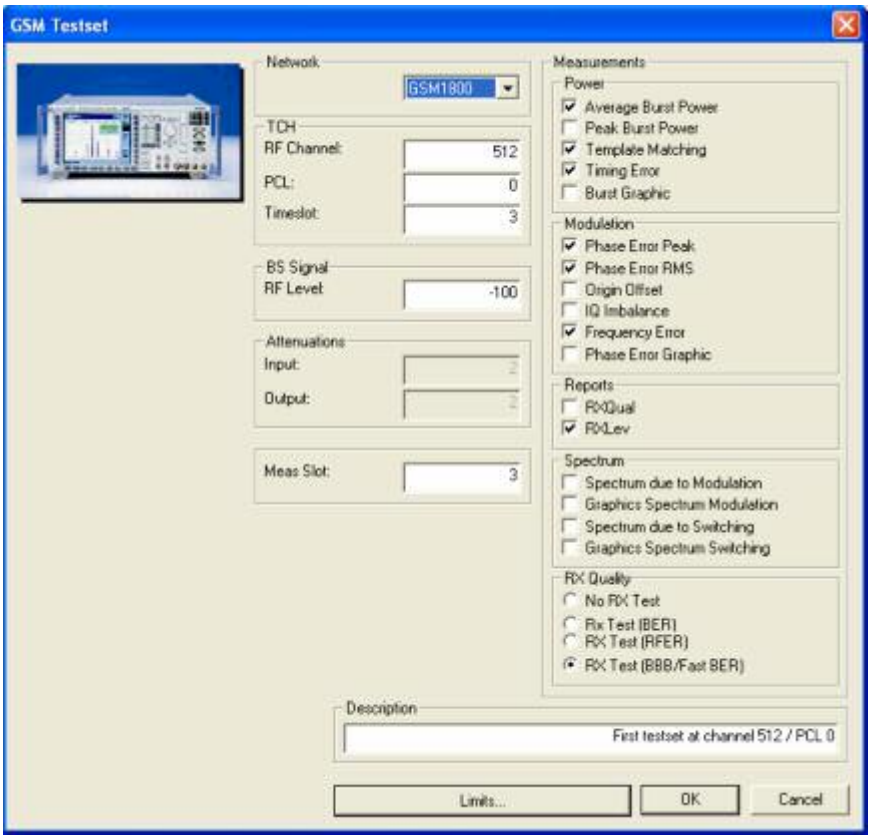


Fig. 107 Test Configuration, Steps 1 to 6

Select test item 3 and press the button “**Append a copy of this test item**”. A copy will be created as test item 7 Double click on this test item 7 now. Change the network to GSM1800, the RF channel to

512, the PCL to 0 the RF level of the BS signal to –100 dBm and the input and output attenuation to 2 dB.



Test Plan Steps ...

- ***Handover to GSM 1800***
- ***GSM 1800 Low Channel Tests***

Network & RF Parameter

- *GSM 1800 Band*
- *TCH Channel 512.*
- *TCH Timeslot 3.*
- *TCH PCL 0.*
- *TCH Level -100.0 dBm*

Test Condition ...

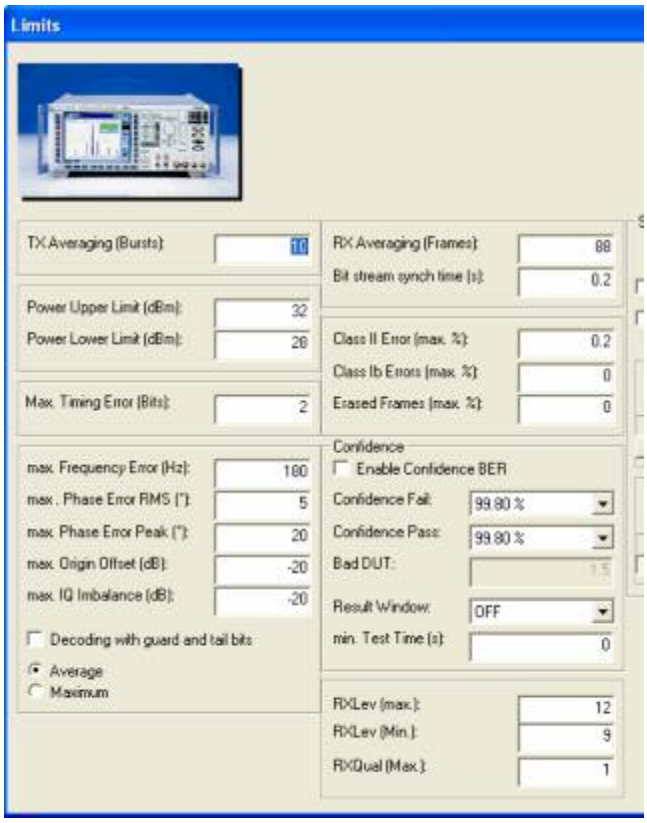
- *RF cable compensation 2.0 dB*

Measurements ...

- *Power Measurement with Template and Timing Error Check.*
- *Modulation Measurement (Phase/Frequency Error).*
- *Fast Bit Error Measurement (Burst by Burst Mode).*
- *RxLev*

Fig. 108 Test Configuration, Step 7, GSM Testset GSM1800 Low Channel

Press the "**Limits...**" button and change the limits for the average burst power measurement to 32 dBm for the upper limit and 28 dBm for the lower limit.



Test Plan Step Limits...

- ***GSM 1800 Low Channel Test***

Averaging.

- *TX Measurements 10 Bursts.*
- *Fast BER with 88 Frames (equal 10kBit Class II).*

Limits ...

- *Power 30 dBm ± 2 dB*
- *Frequency Error ± 180 Hz*
- *Timing Error. ± 2 Symbols*
- *Phase Error RMS 5°*
- *Phase Error Peak ± 20°*
- *BER ≤ 0.2%*
- *RXLev 9..12*

Limits are checked against average values.

Fig. 109 Test Configuration, Step 7, GSM Testset GSM1800 Low Channel Limits

Similar to the tests in GSM900, you should create three copies of this GSM1800 testset now. Change the channel and the description of test item no. 8. The channel should be 698 now.

Test Plan Step ...

- ***GSM 1800 Middle Channel Test***

Network & RF Parameter ...

- *GSM 1800 Band*
- *TCH Channel 698.*
- *TCH Timeslot 3.*
- *TCH PCL 0.*
- *TCH Level -100.0 dBm*

Test Condition ...

- *RF cable compensation 2.0 dB*

Measurements ...

- *Power Measurement with Template and Timing Error Check.*
- *Modulation Measurement (Phase/Frequency Error).*
- *Fast Bit Error Measurement (Burst by Burst Mode).*
- *RxXLev*

Fig. 110 Test Configuration, Step 8, GSM Testset GSM1800 Middle Channel

Test Plan Step Limits...
- ***GSM 1800 Middle Channel Test***

Averaging.
- *TX Measurements 10 Bursts.*
- *Fast BER with 88 Frames (equal 10kBit Class II).*

Limits ...
- *Power 30 dBm ± 2 dB*
- *Frequency Error ± 180 Hz*
- *Timing Error. ± 2 Symbols*
- *Phase Error RMS 5°*
- *Phase Error Peak ± 20°*
- *BER ≤ 0.2%*
- *RXLev 9..12*

Limits are checked against average values.

Fig. 111 Test Configuration, Step 8, GSM Testset GSM1800 Middle Channel Limits

Change the channel of test item no 9 to 885 and change the description of this test item as well.

Test Plan Step ...
- ***GSM 1800 High Channel Test***

Network & RF Parameter ...
- *GSM 1800 Band*
- *TCH Channel 885.*
- *TCH Timeslot 3.*
- *TCH PCL 0.*
- *TCH Level -100.0 dBm*

Test Condition ...
- *RF cable compensation 2.0 dB*

Measurements ...
- *Power Measurement with Template and Timing Error Check.*
- *Modulation Measurement (Phase/Frequency Error).*
- *Fast Bit Error Measurement (Burst by Burst Mode).*
- *RXLev*

Fig. 112 Test Configuration, Step 9, GSM Testset GSM1800 High Channel Limits

Test Plan Step Limits...
- ***GSM 1800 High Channel Test***

Averaging.
- *TX Measurements 10 Bursts.*
- *Fast BER with 88 Frames (equal 10kBit Class II).*

Limits ...
- *Power 30 dBm ± 2 dB*
- *Frequency Error ± 180 Hz*
- *Timing Error. ± 2 Symbols*
- *Phase Error RMS 5°*
- *Phase Error Peak ± 20°*
- *BER ≤ 0.2%*
- *RXLev 9..12*

Limits are checked against average values.

Fig. 113 Test Configuration, Step 9, GSM Testset GSM1800 High Channel Limits

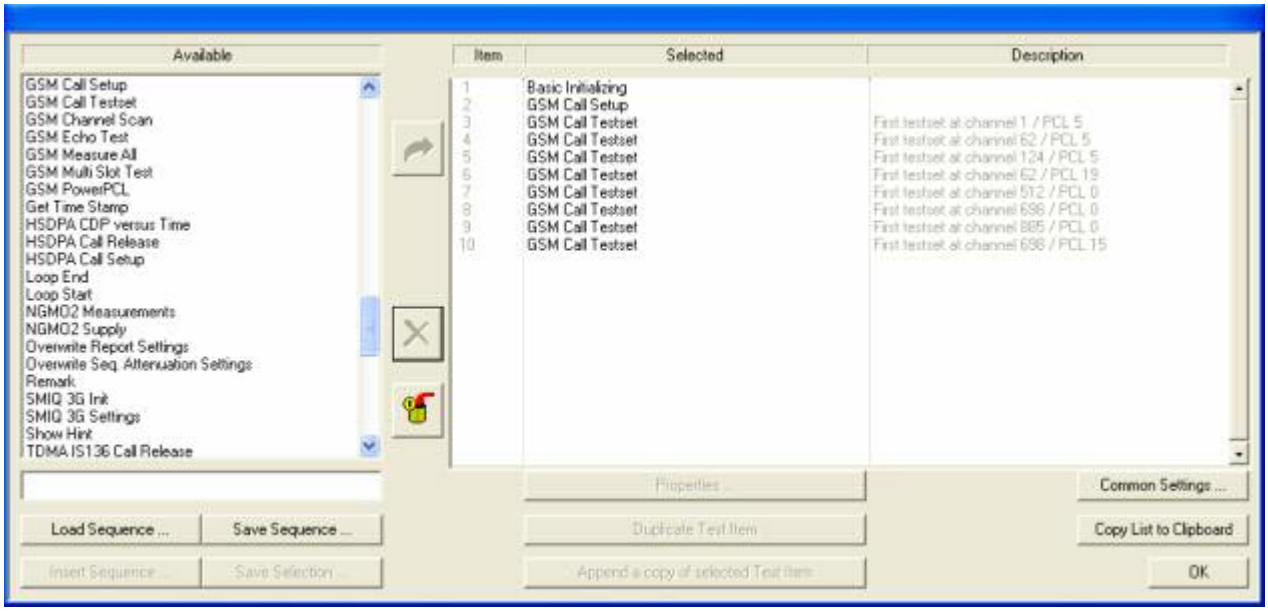
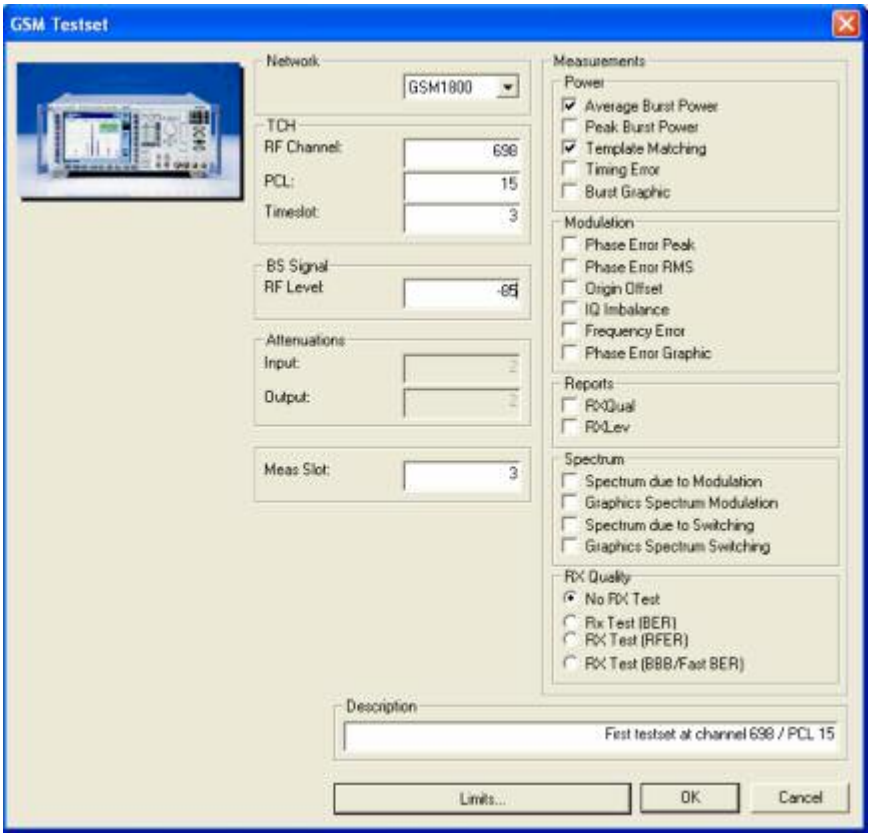


Fig. 114 Test Configuration, Steps 1 to 10

The configuration of test item no 10 should look like shown in the next two dialogs



Test Plan Step ...

- ***GSM 1800 Middle Channel Test with Low MS Outpuut Power***

Network & RF Parameter

- *GSM 900 Band*
- *TCH Channel 698.*
- *TCH Timeslot 3.*
- *TCH PCL 15.*
- *TCH Level -85.0 dBm*

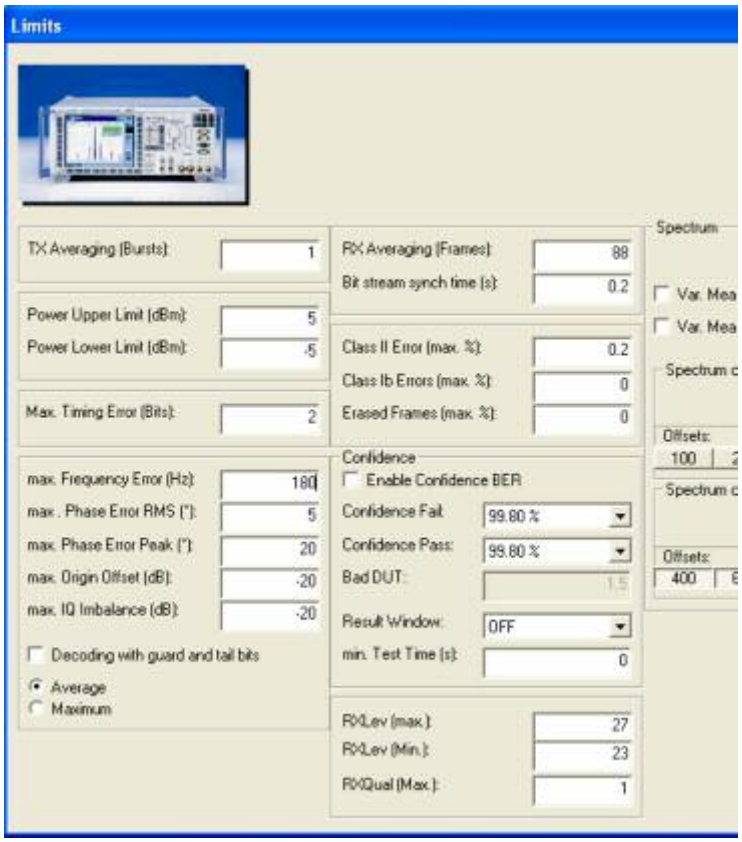
Test Condition ...

- *RF cable compensation 2.0 dB*

Measurements ...

- *Power Measurement with Template Check.*

Fig. 115 Test Configuration, Step 10, GSM Testset GSM1800 Middle Channel, Low Power



Test Plan Step Limits...

- ***GSM 1800 Middle Channel Test 2***

Averaging.

- *TX Measurements 1 Burst..*

Limits ...

- *Power 0 dBm ± 5 dB*

Fig. 116 Test Configuration, Step 10, GSM Testset GSM1800 Middle Channel, Low Power Limits

Therefore it is necessary to change the channel number, the PCL value, to remove selected tests and to choose "**No Rx Test**" again. Do not forget to change the limits for the power measurement and the averaging factor. Return to the "ConfigureTest Items" dialog window and move to the list box "**Available**" and double click on "**GSM Call Release**" and "**Test End**".

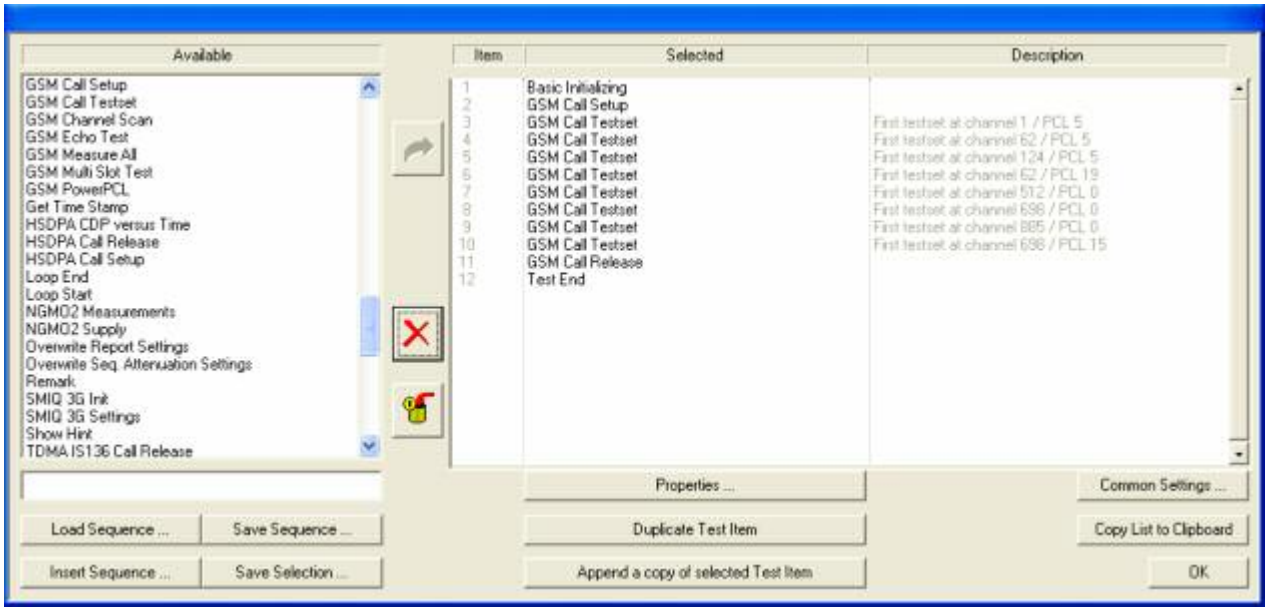
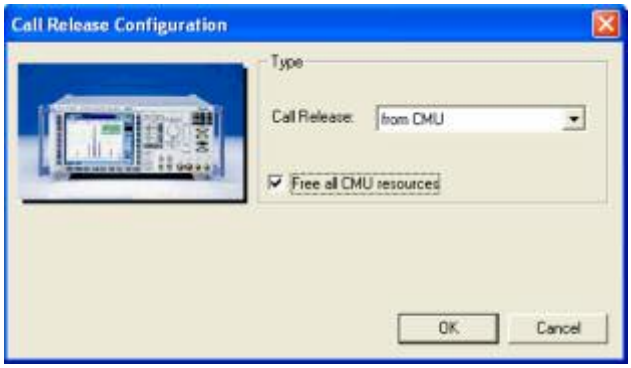


Fig. 117 Test Configuration, Steps 1 to 12

Double click on "**GSM Call Release**" and activate the check box "**Free all CMU Resources**". This means, that the test item switches of the CMU signalling generator after the call has been finished.



Test Plan Step ...
- ***Call Release.***

Fig. 118 Test Configuration, Step 11, Call Release

Double click on the "**Test End**" test item in the list box "**Selected**" and following dialog window appears.

Test Plan Step ...
- ***Test Report Generation.***

Fig. 119 Test Configuration, Step 12, Test End

The checkbox "**Start Autosave Procedures**" should be activated to enable the automatic storage of measurement reports or automatic printouts. For further information according autosave procedures look at the description for the command "**Measurement Report**" in the "**Measurement**" menu.

After every test run a Info Dialog (next figure) displays the test summary. It is possible to close dialog automatically after a given time period (**Dialog closes automatically**).

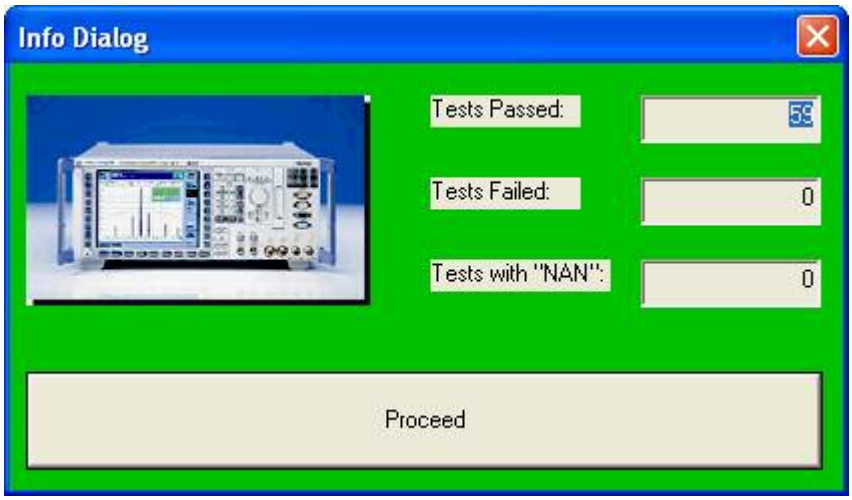


Fig. 120 Test Result Info Dialog

After all these configurations press "OK" in the dialog window "**Configure Test Items**" and store the sequence in the with the command "**Save Sequence**" in the "File" menu.

12.4 Extend the GSM example

Now we will take the example from the last chapter. Move the mouse pointer to the list box "**Available**" and select the test item "**Loop Start**". Keep the right mouse button pressed, while moving the mouse pointer to the second position of the list box "**Selected**". Release the right mouse button now. Additionally double click at the test item "**Loop End**" at the list box "**Selected**". The dialog window "**Configure Test Items**" should look like this now.

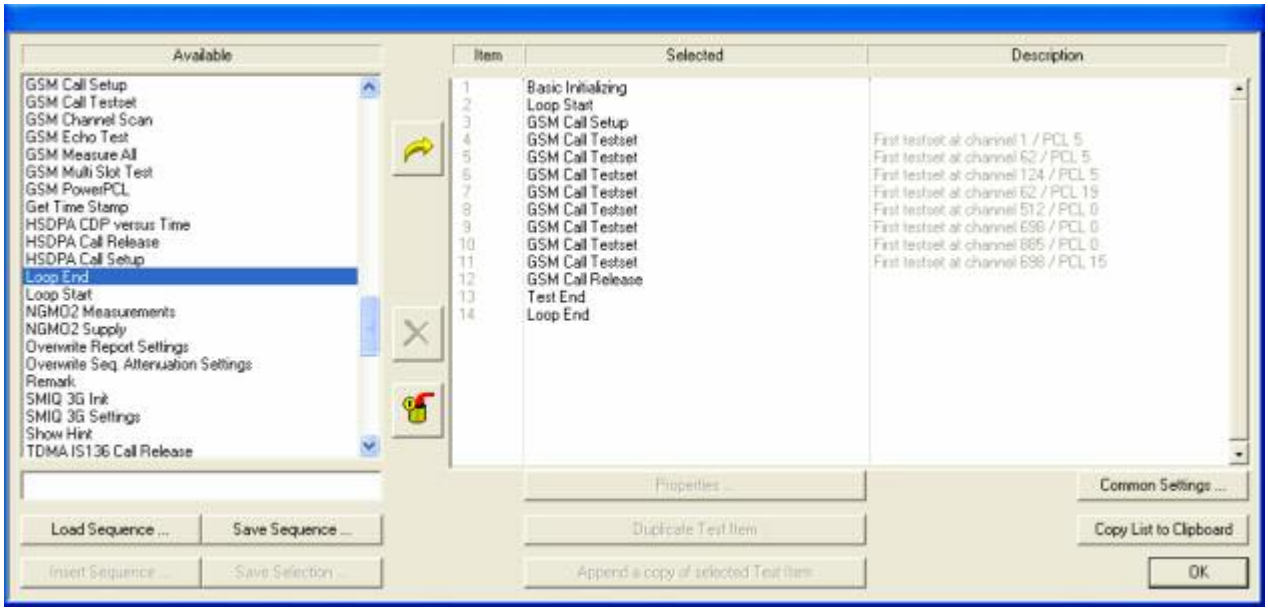


Fig. 121 Extended Test Configuration, Extra Steps

Double click on the test item "**Loop End**" in the list box "**Selected**" to open the dialog window "**Loop Configuration**". Select the check box "**Loop Forever**".

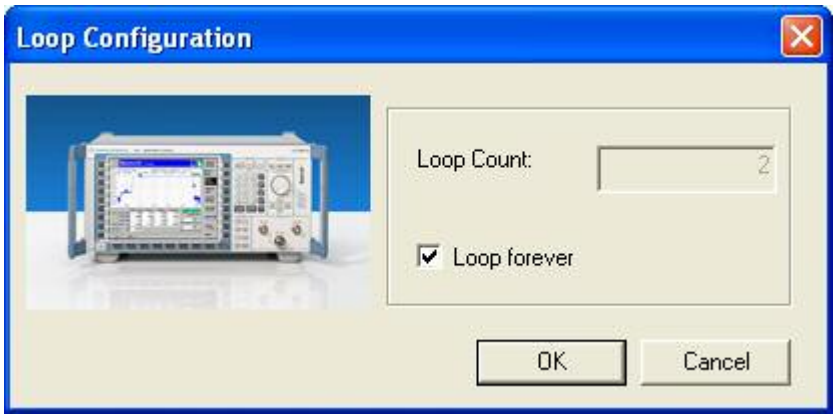


Fig. 122 Extended Test Configuration, Loop End

Inside the test sequence, "**Loop End**" jumps back to the position of "**Loop Start**". The total numbers of failed or passed tests are set to 0 and the old measurement results inside this block are deleted. Typically the test item "**Test End**" is placed in front of "**Loop End**". You should use an Autosave procedure inside the test item "**Test End**" to store the results of the tests.

12.5 Tests with the antenna coupler Z10

Take the GSM Example from the previous chapter and adapt the limit values to meanful values for the radiated test condition.

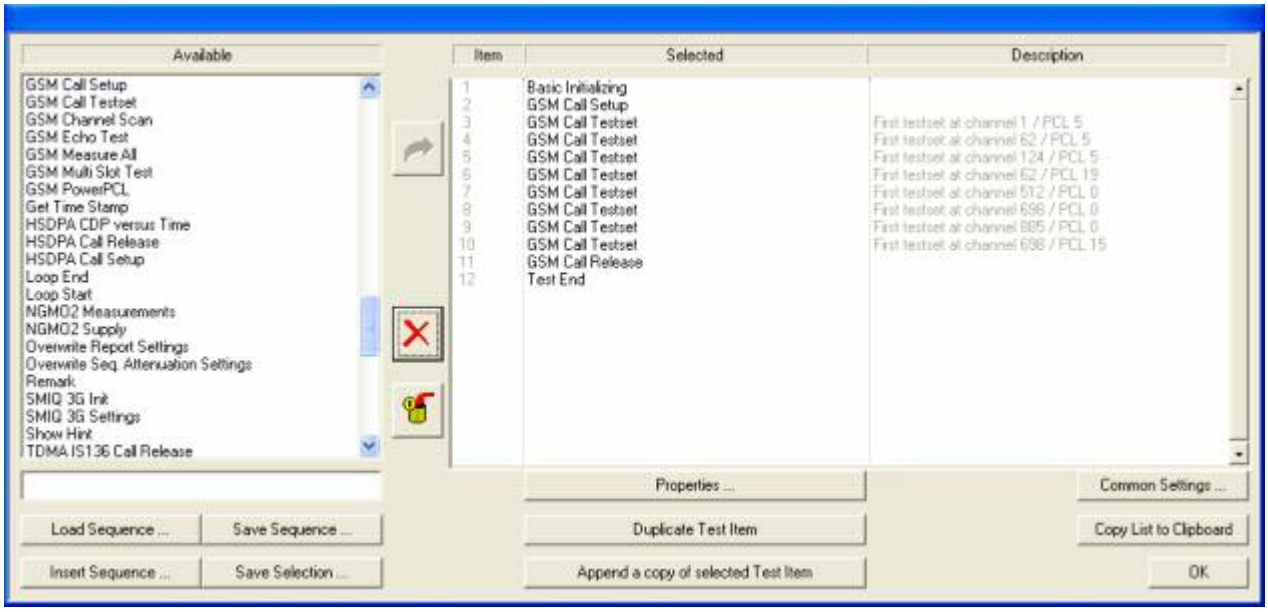


Fig. 123 Z10 Test Configuration

Behind the **GSM Call Setup** an additional test item **Z10 Close Lid** should be included.

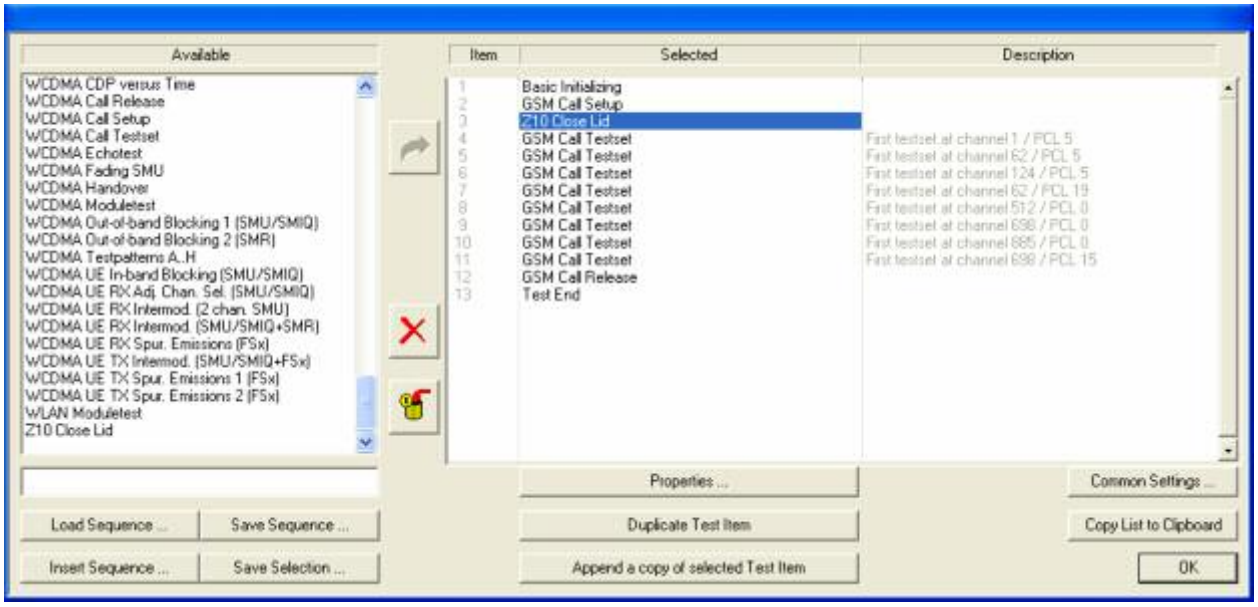


Fig. 124 Z10 Test Configuration including Close Lid test item

This test step shows a graphic to requests closing the lid of the antenna coupler Z10 and confirm this by entering **OK** at the shown dialog.

Fig. 125 Close Z10 Lid dialog

Select the test item 4, **GSM Call Testset** and open the configuration dialog.

Test Plan Step ...
- ***GSM 900 Low Channel Test***

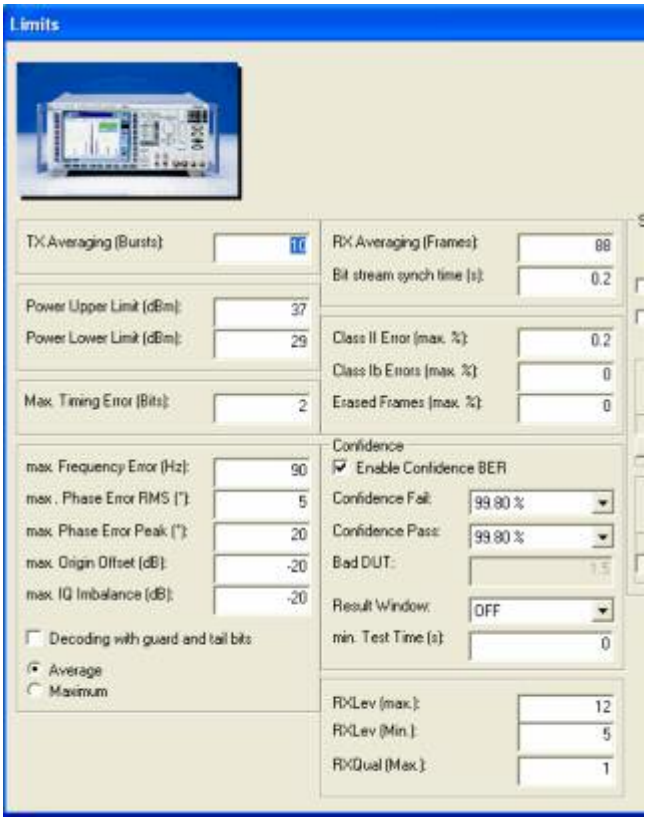
Network & RF Parameter ...
- *GSM 900 Band*
- *TCH Channel 1.*
- *TCH Timeslot 3.*
- *TCH PCL 5.*
- *TCH Level -102.0 dBm*

Test Condition ...
- *RF path loss compensation (TAC dependent)*

Measurements ...
- *Power Measurement with Template and Timing Error Check.*
- *Modulation Measurement (Phase/Frequency Error).*
- *Fast Bit Error Measurement (Burst by Burst Mode).*
- *RXLev*

Fig. 126 Test Configuration, Step 4, GSM Testset GSM900 Low Channel

Press the "**Limits...**" button to verify the settings for the measurements. Especially you should verify the settings for the averaging of the measurements and the upper and lower limits for the power measurement and the RXLev limits.



Test Plan Step Limits...

- ***GSM 900 Low Channel Test***

Averaging.

- *TX Measurements 10 Bursts.*
- *Fast BER with 88 Frames (equal 10kBit Class II).*

Limits ...

- *Power 33 dBm ± 4 dB*
- *Timing Error. ± 2 Symbols*
- *Frequency Error ± 90 Hz*
- *Phase Error RMS 5°*
- *Phase Error Peak ± 20°*
- *BER ≤ 0.2%*
- *RXLev 5..12*

Limits are checked against average values.

Fig. 127 Test Configuration, Step 4, GSM Testset GSM900 Low Channel Limits

Perform the same changes for the middle channel and the low channel test configurations.

Test Plan Step ...

- ***GSM 900 Middle Channel Test***

Network & RF Parameter ...

- *GSM 900 Band*
- *TCH Channel 62.*
- *TCH Timeslot 3.*
- *TCH PCL 5.*
- *TCH Level -102.0 dBm*

Test Condition ...

- *RF path loss compensation (TAC dependent)*

Measurements ...

- *Power Measurement with Template and Timing Error Check.*
- *Modulation Measurement (Phase/Frequency Error).*
- *Fast Bit Error Measurement (Burst by Burst Mode).*
- *RXLev*

Fig. 128 Test Configuration, Step 5, GSM Testset GSM Middle Channel

Test Plan Step Limits...
- ***GSM 900 Middle Channel Test***

Averaging.
- *TX Measurements 10 Bursts.*
- *Fast BER with 88 Frames (equal 10kBit Class II).*

Limits ...
- *Power 33 dBm ± 4 dB*
- *Timing Error. ± 2 Symbols*
- *Frequency Error ± 90 Hz*
- *Phase Error RMS 5°*
- *Phase Error Peak ± 20°*
- *BER ≤ 0.2%*
- *RXLev 5..12*

Limits are checked against average values.

Fig. 129 Test Configuration, Step 5, GSM Testset GSM Middle Channel Limits

Test Plan Step ...
- ***GSM 900 High Channel Test***

Network & RF Parameter ...
- *GSM 900 Band*
- *TCH Channel 124.*
- *TCH Timeslot 3.*
- *TCH PCL 5.*
- *TCH Level -102.0 dBm*

Test Condition ...
- *RF path loss compensation (TAC dependent)*

Measurements ...
- *Power Measurement with Template and Timing Error Check.*
- *Modulation Measurement (Phase/Frequency Error).*
- *Fast Bit Error Measurement (Burst by Burst Mode).*
- *RXLev*

Fig. 130 Test Configuration, Step 6, GSM Testset GSM High Channel

Test Plan Step Limits...
- ***GSM 900 High Channel Test***

Averaging.
- *TX Measurements 10 Bursts.*
- *Fast BER with 88 Frames (equal 10kBit Class II).*

Limits ...
- *Power 33 dBm ± 4 dB*
- *Timing Error. ± 2 Symbols*
- *Frequency Error ± 90 Hz*
- *Phase Error RMS 5°*
- *Phase Error Peak ± 20°*
- *BER ≤ 0.2%*
- *RXLev 5..12*

Limits are checked against average values.

Fig. 131 Test Configuration, Step 6, GSM Testset GSM High Channel Limits

Change the power limits for the middle channel at GSM900 PCL 19 as well.

Test Plan Step ...
- ***GSM 900 Middle Channel Test with Low MS Output Power.***

Network & RF Parameter
- *GSM 900 Band*
- *TCH Channel 62.*
- *TCH Timeslot 3.*
- *TCH PCL 19.*
- *TCH Level -85.0 dBm*

Test Condition ...
- *RF path loss compensation (TAC dependent)*

Measurements ...
- *Power Measurement with Template Check.*

Fig. 132 Test Configuration, Step 7, GSM Testset GSM900 Middle Channel, Low Power

Test Plan Step Limits...
- ***GSM 900 Middle Channel Test 2***

Averaging.
- *TX Measurements 1 Burst.*

Limits ...
- *Power 5 dBm ± 5 dB*

Fig. 133 Test Configuration, Step 7, GSM Testset GSM900 Middle Channel, Low Power Limits

Similar like in the GSM 900 band, the limits have also to be changed in the GSM 1800 band.

Select the test item 7, **GSM Call Testset** and open the configuration dialog

Test Plan Steps ...
- ***Handover to GSM 1800***
- ***GSM 1800 Low Channel Tests***

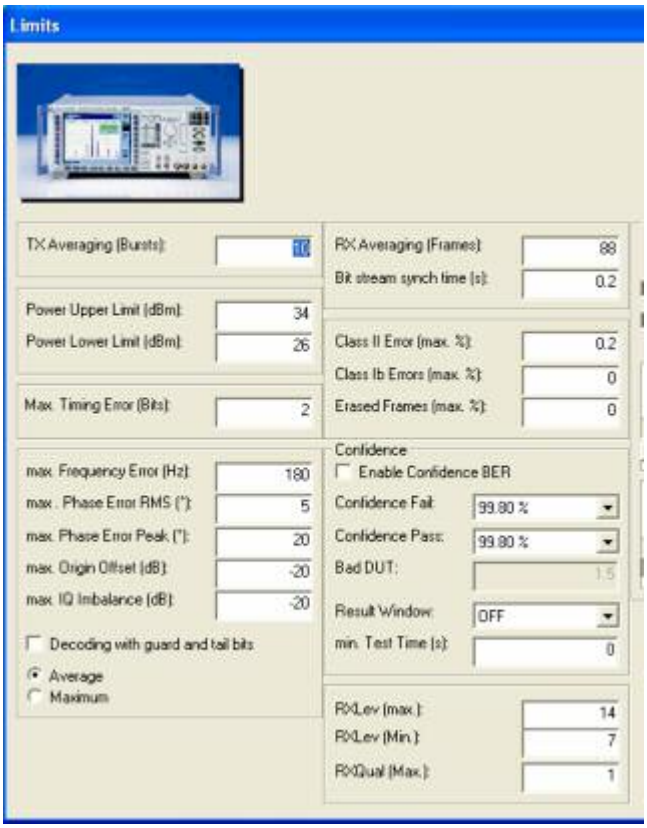
Network & RF Parameter
- *GSM 1800 Band*
- *TCH Channel 512.*
- *TCH Timeslot 3.*
- *TCH PCL 0.*
- *TCH Level -100.0 dBm*

Test Condition ...
- *RF path loss compensation (TAC dependent)*

Measurements ...
- *Power Measurement with Template and Timing Error Check.*
- *Modulation Measurement (Phase/Frequency Error).*
- *Fast Bit Error Measurement (Burst by Burst Mode).*
- *RxLev*

Fig. 134 Test Configuration, Step 8, GSM Testset GSM1800 Low Channel

Press the "**Limits...**" button and change the limits for the average burst power measurement to 34 dBm for the upper limit and 26 dBm for the lower limit.



Test Plan Step Limits...

- ***GSM 1800 Low Channel Test***

Averaging.

- *TX Measurements 10 Bursts.*
- *Fast BER with 88 Frames (equal 10kBit Class II).*

Limits ...

- *Power 30 dBm ± 4 dB*
- *Frequency Error ± 180 Hz*
- *Timing Error . ± 2 Symbols*
- *Phase Error RMS 5°*
- *Phase Error Peak ± 20°*
- *BER ≤ 0.2%*
- *RXLev 7..14*

Limits are checked against average values.

Fig. 135 Test Configuration, Step 8, GSM Testset GSM1800 Low Channel Limits

Proceed to make the changes for the rest of the test items.

Test Plan Step ...

- ***GSM 1800 Middle Channel Test***

Network & RF Parameter ...

- *GSM 1800 Band*
- *TCH Channel 698.*
- *TCH Timeslot 3.*
- *TCH PCL 0.*
- *TCH Level -100.0 dBm*

Test Condition ...

- *RF path loss compensation (TAC dependent)*

Measurements ...

- *Power Measurement with Template and Timing Error Check.*
- *Modulation Measurement (Phase/Frequency Error).*
- *Fast Bit Error Measurement (Burst by Burst Mode).*
- *RxXLev*

Fig. 136 Test Configuration, Step 9, GSM Testset GSM1800 Middle Channel

Test Plan Step Limits...
- ***GSM 1800 Middle Channel Test***

Averaging.
- *TX Measurements 10 Bursts.*
- *Fast BER with 88 Frames (equal 10kBit Class II).*

Limits ...
- *Power 30 dBm ±4 dB*
- *Frequency Error ± 180 Hz*
- *Timing Error . ± 2 Symbols*
- *Phase Error RMS 5°*
- *Phase Error Peak ± 20°*
- *BER ≤ 0.2%*
- *RXLev 7..14*

Limits are checked against average values.

Fig. 137 Test Configuration, Step 9, GSM Testset GSM1800 Middle Channel Limits

Test Plan Step ...
- ***GSM 1800 High Channel Test***

Network & RF Parameter ...
- *GSM 1800 Band*
- *TCH Channel 885.*
- *TCH Timeslot 3.*
- *TCH PCL 0.*
- *TCH Level -100.0 dBm*

Test Condition ...
- *RF path loss compensation (TAC dependent)*

Measurements ...
- *Power Measurement with Template and Timing Error Check.*
- *Modulation Measurement (Phase/Frequency Error).*
- *Fast Bit Error Measurement (Burst by Burst Mode).*
- *RXLev*

Fig. 138 Test Configuration, Step 10, GSM Testset GSM1800 High Channel Limits

Test Plan Step Limits...
- ***GSM 1800 High Channel Test***

Averaging.
- *TX Measurements 10 Bursts.*
- *Fast BER with 88 Frames (equal 10kBit Class II).*

Limits ...
- *Power 30 dBm ± 2 dB*
- *Frequency Error ± 180 Hz*
- *Timing Error. ± 2 Symbols*
- *Phase Error RMS 5°*
- *Phase Error Peak ± 20°*
- *BER ≤ 0.2%*
- *RXLev 7..14*

Limits are checked against average values.

Fig. 139 Test Configuration, Step 10, GSM Testset GSM1800 High Channel Limits

Test Plan Step ...
- ***GSM 1800 Middle Channel Test with Low MS Output Power***

Network & RF Parameter
- *GSM 900 Band*
- *TCH Channel 698.*
- *TCH Timeslot 3.*
- *TCH PCL 15.*
- *TCH Level -85.0 dBm*

Test Condition ...
- *RF path loss compensation (TAC dependent)*

Measurements ...
- *Power Measurement with Template Check.*

Fig. 140 Test Configuration, Step 11, GSM Testset GSM1800 Middle Channel, Low Power

Test Plan Step Limits...
- ***GSM 1800 Middle Channel Test 2***

Averaging.
- *TX Measurements 1 Burst..*

Limits ...
- *Power 0 dBm ± 6 dB*

Fig. 141 Test Configuration, Step 11, GSM Testset GSM1800 Middle Channel, Low Power Limits

After all these configurations press “OK” in the dialog window “**Configure Test Items**” and store the sequence in the with the command “**Save Sequence**” in the “File” menu.

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