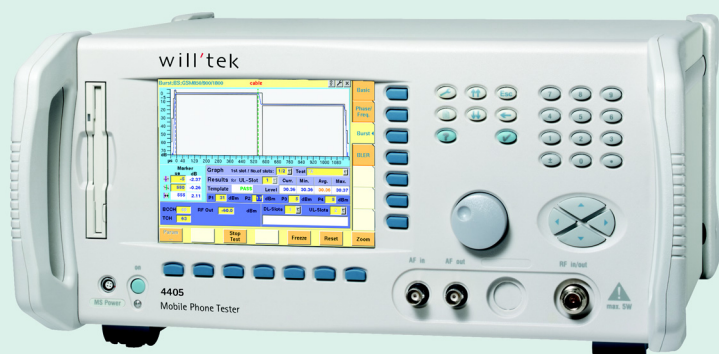


will'tek

Willtek 4400

Mobile Phone Tester



RAPID!
GSM Service Test Software
user's guide
version 1.40

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Ordering information	This guide is issued as part of the RAPID! GSM Service Test Software . The ordering number for a published guide is M 294 160. The ordering number for the product is M 897 160.

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About This Guide

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Purpose and scope

The purpose of this guide is to help you successfully use the RAPID! GSM Service Test Software features and capabilities. This guide includes task-based instructions that describe how to install, configure, use, and troubleshoot RAPID! GSM Service Test Software. Additionally, this guide provides a description of Willtek's warranty, services, and repair information.

Assumptions

This guide is intended for novice, intermediate, and experienced users who want to use RAPID! GSM Service Test Software effectively and efficiently. We are assuming that you have basic computer and mouse/track ball experience and are familiar with basic telecommunication concepts and terminology.

Related information

Use this guide in conjunction with the following information:

M 290 011, Willtek 4400 Mobile Phone Tester Series user's guide

Technical assistance

If you need assistance or have questions related to the use of this product, call or e-mail one of Willtek's technical assistance centers.

Table 1 Technical assistance centers

Region	Phone number	Fax number, email address
UK	+44 (0)20 8408 5720	+44 (0) 20 8397 6286 support.uk@willtek.com
Europe, Middle East, Asia, Africa	+49 (0)89 99641 386 +49 (0)89 99641 227	+49 (0)89 99641 440 support.eu@willtek.com
Americas	+1 317 595 2021	+1 317 595 2023 support.us@willtek.com

Conventions

This guide uses naming conventions and symbols, as described in the following tables.

Table 2 Typographical conventions

Description	Example
User interface actions appear in this typeface .	On the Status bar, click Start .
Buttons or switches that you press on a unit appear in this TYPEFACE .	Press the ON switch.
Code and output messages appear in this typeface .	All results okay
Text you must type exactly as shown appears in this typeface .	Type: a : \set.exe in the dialog box.
Variables appear in this <typeface> .	Type the new <hostname> .
Book references appear in this typeface .	Refer to Newton's Telecom Dictionary
A vertical bar means "or": only one option can appear in a single command.	platform [a b e]
Square brackets [] indicate an optional argument.	login [platform name]
Slanted brackets < > group required arguments.	<password>

Table 3 Keyboard and menu conventions

Description	Example
A plus sign + indicates simultaneous keystrokes.	Press Ctrl+s
A comma indicates consecutive keystrokes.	Press Alt+f,s
A slanted bracket indicates choosing a submenu from menu.	On the menu bar, click Start > Program Files .

Table 4 Symbol conventions






	This symbol represents a general hazard.
	This symbol represents a risk of electrical shock.
	NOTE This symbol represents a Note indicating related information or tip.

Table 5 Safety definitions

	WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	CAUTION Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

RAPID! GSM Service Test Software Overview

A green square containing the white number 1, indicating the chapter number.

This chapter provides a general description of the RAPID! GSM Service Test Software. Topics discussed in this chapter include the following:

- ["About RAPID! GSM Service Test Software" on page 2](#)
- ["What's new in version 1.40" on page 2](#)
- ["Features and capabilities" on page 2](#)
- ["Specifications" on page 2](#)

About RAPID! GSM Service Test Software

The product eases mobile phone testing in environments such as service, where comprehensive testing of all major components contributing to hardware quality are tested.

The software is based on the RAPID!, the software development and execution environment built into the Willtek 4400 Mobile Phone Tester Series.

Most of the software is delivered with the source code. This means that you can adopt and adapt the tests to your own needs if these are not fully covered by GSM Service Test Software.

What's new in version 1.40

RAPID! GSM Service Test Software can determine the coupling loss automatically with a "golden phone", store the values in files by mobile type (type approval code), and load them automatically if another mobile of this type is being tested.

The BCCH is now user definable as well.

When you enter a channel number, the input is checked for feasibility.

Features and capabilities

GSM Service Test Software provides automated tests of the mobile's transmitter and receiver quality in up to three different frequency bands and go/nogo tests of the audio and RS-232 remote control capabilities. Measurement results are compared to official (ETSI) limits.

Many of the test parameters are configurable, such as channel numbers, coupling loss and IMSI.

The results are summarized in a one-page results form which can be stored on the internal hard disk of the 4400 or printed on paper, using the 4400's Centronics printer connector.

Specifications

Signaling and setup

- Location update
- Mobile-originated call
- Mobile-terminated call
- Release from mobile
- Release from base station
- RF level of tester

RF power levels of the mobile (TCH)
Channel change
Full Rate / Enhanced Full Rate speech selection

Systems supported GSM 900, E-GSM, GSM-R, GSM 1800, GSM 1900, Dual Band, Triple Band

Implemented tests and features

- Power level
- Peak vector error
- RMS vector error
- Frequency error
- RX level
- RX qual
- Power/Time Template
- Receiver BER/FER
- Audio loop
- Output RF spectrum (spectrum due to modulation and due to switching)
- Automatic calibration of RF coupling loss by using a reference mobile phone
- Bar code reader support (attached to keyboard)
- Mobile phone control with AT commands via serial line

Installation

2

This chapter describes how to install RAPID! GSM Service Test Software. The topics discussed in this chapter are as follows:

- ["Software requirements" on page 6](#)
- ["Setting up the hardware" on page 6](#)
- ["Installing the software" on page 6](#)

Software requirements

GSM Service Test Software is based on the features of the Willtek 4400 Mobile Phone Tester Series, software version 3.00 or higher, with at least one of the GSM and the GSM/GPRS System Options. The GSM System Option is included with the 4400M and the 4400S. For GSM 1900 testing, Willtek recommends 4400 software version 3.11 or higher.

Setting up the hardware

Willtek recommends that you use a serial mouse (RS-232 interface) to operate RAPID! and GSM Service Test Software. This mouse should be connected to the COM1 port on the rear of the 4400.

If you want to control the mobile phone from the 4400 using a serial interface, the cable supplied by the manufacturer of the mobile phone should be used. Attach the 9-pin sub-D connector to the COM2 port on the rear of the 4400.

A standard printer (not a Windows GDI printer) can be connected to the Centronics interface on the rear of the 4400 to copy results to a printer.

Installing the software

Installing the software from floppy disks

GSM Service Test Software is delivered on a floppy disk. To install the product, please proceed as follows:

- ☞ Switch on the 4400.

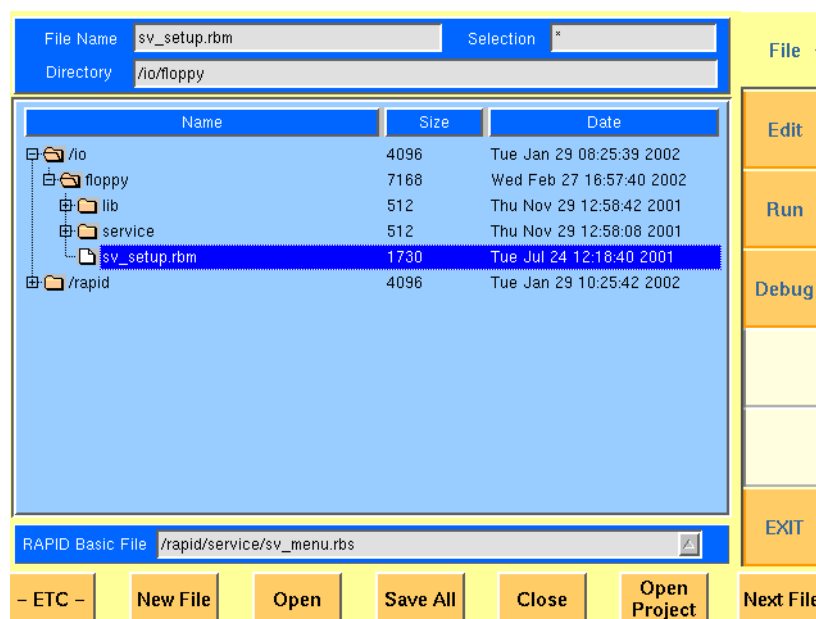
Result: The instrument powers up, the Welcome screen appears and the 4400 loads its internal software.

- ☞ Insert the floppy disk with GSM Service Test Software.
- ☞ Push the **TOOLS** button, then select **RAPID!**.

Result: The File menu of the RAPID! environment appears on the screen.

- ☞ Using either the mouse or the Up, Down and Enter keys, place the cursor on the file `/io/floppy/sv_setup.rbm` (Figure 1).

Figure 1 Selecting the installation file



- ☞ Push the **Open** softkey.
- ☞ Push marker tab **Run**, followed by softkey **Run**.

Results: The installation program sv_setup.rbm is loaded and started. A text message appears:

```
please CLOSE every file in the file(manager)

press Enter to continue or ESC to leave the program
and close the files first.
```

- ☞ Push **Enter**.

Result: The installation program creates a new directory /rapid/service on the 4400 hard disk and copies the required files to this directory. The program displays the progress of the installation.

At the end of the installation, you are informed how to configure the 4400 so that GSM Service Test Software is loaded and started automatically each time you start RAPID!. This feature is called the Autostart capability.

Starting the tests automatically

Rather than loading and starting GSM Service Test Software manually, the 4400 can also be configured so that the software is started automatically each time you enter the RAPID! environment.



Loss of data

GSM Service Test Software comes with an automated installation procedure. This procedure overwrites an existing /rapid/AUTOSTART.bas file without any warning.

In order to protect your data in this file, make a copy of this file in a different directory or under a different file name.

The Autostart feature for GSM Service Test Software can be enabled as follows:

- ☞ Enter the File manager within the RAPID! environment by pushing the **File** marker tab.
- ☞ Select the file `/rapid/AUTOSTART.bas`.
- ☞ Push the **Open** softkey.
- ☞ Select the **Run** screen using the appropriate marker tab.
- ☞ Push the **Start File** softkey.

Result: GSM Service Test Software is started each time you enter the RAPID! environment until you leave RAPID! with AUTOSTART.bas being closed. In this case, GSM Service Test Software is not started automatically; but you can still load and run the file `/rapid/AUTOSTART.bas` manually.

Overwritten Autostart file

In case that the Autostart file for GSM Service Test Software is overwritten, you can find another copy in `/rapid/service/sv_autos.bas`.

Getting Started

3

This chapter describes the functionality of the instrument. Topics discussed in this chapter are as follows:

- ["Starting GSM Service Test Software" on page 10](#)
- ["Navigating the user interface" on page 11](#)
- ["Running a test" on page 12](#)
- ["Internal error reporting" on page 13](#)
- ["Leaving the RAPID! GSM Service Test Software" on page 14](#)

Starting GSM Service Test Software

Assumption: The Welcome screen of the 4400 is displayed.

- ☞ Push the **TOOLS** button, then select **RAPID!**.

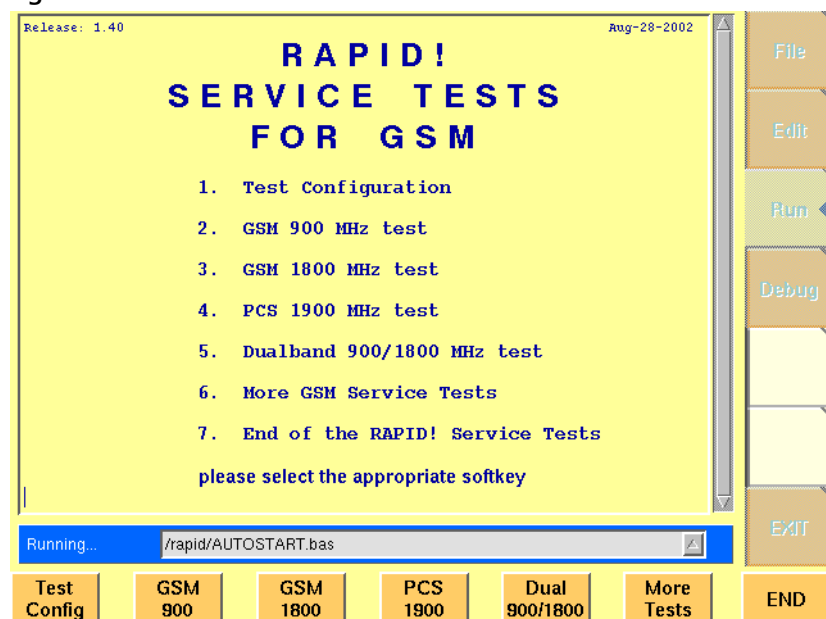
Result: The result depends on the previous settings when the RAPID! environment was closed on last time use.

- If GSM Service Test Software was loaded and still selected as the Autostart file, the start screen of GSM Service Test Software appears. The software is ready to use.
- If GSM Service Test Software was not loaded or not selected as the Autostart file, please ensure that the file contains the right software. The original software startup routine is included in the file `/rapid/service/sv_autos.bas`. You can then configure the 4400 so that it starts the tests automatically each time that RAPID! is started. This configuration is described in section ["Starting the tests automatically" on page 8](#).
- If GSM Service Test Software does not start automatically and you want to leave it like this, you can start the tests as follows:

- ☞ Push the **TOOLS** button, then select **RAPID!**.
- ☞ Select the file manager screen by pushing the **File** marker tab.
- ☞ Select the file `/rapid/service/sv_autos.bas`.
- ☞ Push the **Run** marker tab, followed by the **Run** softkey.

Result: GSM Service Test Software is loaded and started. The main screen looks as follows:

Figure 2 Main screen of GSM Service Test Software



Navigating the user interface

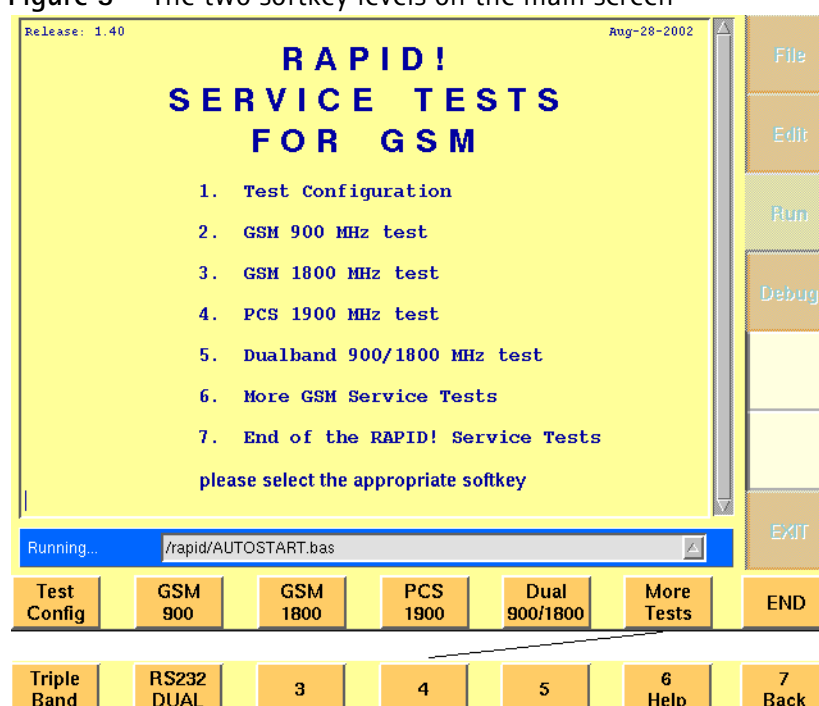
The test software comes with an easy-to-use user interface. Only few entries need to be made; most tests can be carried out immediately, without changing the configuration settings.

The different menus and choices are made using the softkeys. These are the seven fields and buttons at the bottom of or below the screen. The text in the list is repeated in short form above the button so that you can identify the corresponding softkey.

Instead of pushing one of the buttons to select a menu entry, you can also use the mouse to click on the appropriate field at the bottom of the screen instead.

The top menu level provides access to the configuration screens and to the tests.

Figure 3 The two softkey levels on the main screen



If a menu provides more selections than available softkeys, the additional menu entries and softkeys are available by pushing the **More** softkey.

Some menus allow you to change parameters, which requires that you enter text or numbers. You can either use the numerical buttons on the front panel and the marker tabs, or you can use an external keyboard if attached.

Running a test

GSM Service Test Software provides the following tests:

- GSM 900
- Dual band GSM 900/1800
- PCS 1900
- Triple band
- Dual-band GSM 900/1800 with RS-232 control (replacing manual operation of the mobile phone)

Starting a test

The startup screen displays a list of options, including some of the tests. More tests are shown after pushing the **More Tests** softkey. For each of the tests, a softkey is allocated. The following description explains how to start and run the tests.

- ☞ On the startup screen, push the appropriate softkey to start a test. If a test is not shown on the startup screen, push the **More Tests** button to find the test on the subsequent screen.

Following the test sequence

The tests feature a mobile originated call, at least one base station originated call, receiver and transmitter tests, and a go/nogo test of the audio transceiver. Tests without RS-232 control also check the numerical keypad of the phone.

Preparation

Ensure that the mobile phone is equipped with a SIM card. The international mobile subscriber identity (IMSI) on the SIM card and in the IMSI menu within the test configuration should be same; see section ["Changing the IMSI" on page 31](#).

The mobile should be connected to the 4400 either with a coaxial cable connection or using an antenna coupler. See section ["Defining the coupling loss factor location" on page 24](#) to learn how to set up GSM Service Test Software for use with these connections.

Test sequence

From the user's perspective, most tests have the following sequence:

After starting the test, the 4400 prompts you to switch on the mobile phone, wait for the phone to find the network and to dial a number.

- ☞ Switch on the mobile phone.

Result: After switching on the mobile phone, the mobile phone scans through the various channels to find a suitable network carrier. When it finds the carrier transmitted by the 4400, it should lock to this network and display the network's country and network code, e.g. "MCC 001, MNC 01".

- ☞ Dial the number **1234567890** and push the **Send** button on the mobile phone.

Result: The mobile phone initiates a call with the 4400. The 4400 checks whether the number has been received correctly; this is part of the keypad test.

The 4400 then asks you to check whether the audio loopback is working correctly.

- ☞ Talk into the microphone and check whether you can hear your voice in the phone's earset after a delay of one to two seconds.
If you find it difficult to carry out the test with the mobile phone on the antenna coupler, you can remove the phone and return it to the coupler after the test. Do not walk away with the phone since the RF connection could be lost; the test is failed then!
- ☞ If you could hear your voice in the earset properly, push the **Yes** button to acknowledge; push **No** otherwise.

Result: The 4400 continues testing.

In the next step, the 4400 prompts you to disconnect the call.

- ☞ Push the **Disconnect** button on the mobile phone. (Some phones refer to this as the "No" or "hang up" button.)

Result: The call ends. The 4400 prompts you to "establish call by BS". The phone starts ringing.

- ☞ Answer the call by pushing the **Send** or "Yes" button on the phone.

Result: The call is established and the 4400 continues testing the mobile's transmitter and receiver.

At the end, the 4400 concludes the call and shows a short test protocol including a pass/fail verdict and error messages if applicable. The full protocol can be printed or stored (see below).

Internal error reporting

If an internal error occurs, an error message is written to the screen and also to a file. Such error messages can be found in file `/rapid/log/rapidlog.txt`. This file may be helpful when requesting support from the TAC (see [Table 1 on page vii](#)).

Leaving the RAPID! GSM Service Test Software

If you are done with configuration and tests, proceed as follows:

- ☞ Go back to the startup screen menu level by pushing the **Back** softkey.
- ☞ On the startup screen menu level, push the **END** softkey to quit GSM Service Test Software.
- ☞ Push the **EXIT** marker tab to leave RAPID! and return to the Welcome screen.

Configuration

4

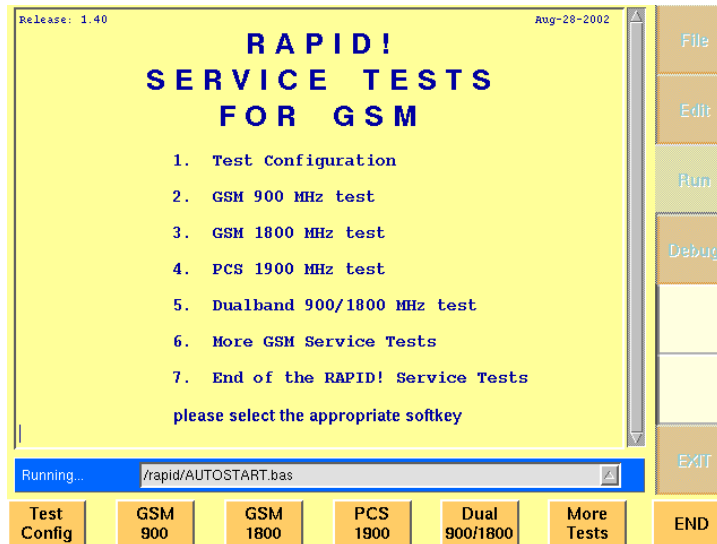
This chapter provides task-based instructions for setting up the RAPID! GSM Service Test Software features. Topics discussed in this chapter are as follows:

- ["Accessing configuration screens" on page 16](#)
- ["Setting up channels" on page 17](#)
- ["Defining the coupling loss factor location" on page 18](#)
- ["Entering coupling loss values by hand" on page 20](#)
- ["Deriving reference coupling loss values" on page 22](#)
- ["Recording automatic coupling values" on page 23](#)
- ["Changing the IMSI" on page 25](#)
- ["Affecting the output destination" on page 26](#)
- ["Administering the results archive" on page 29](#)

Accessing configuration screens

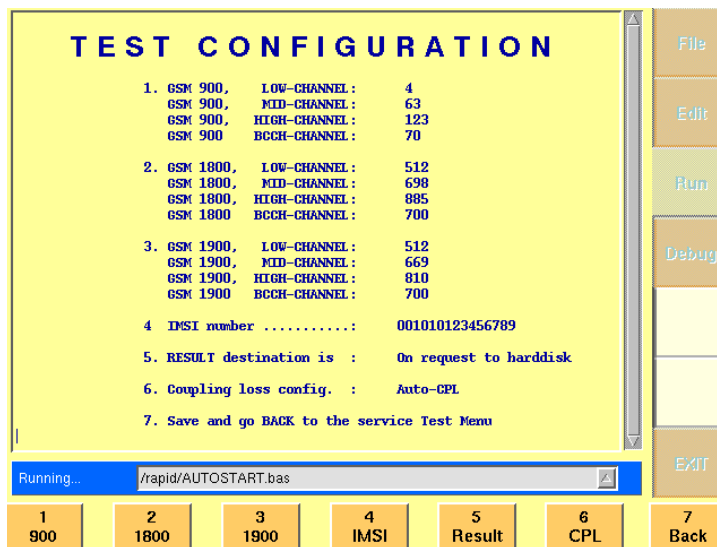
You can modify many parameters according to your needs from the configuration screens. These are accessible by selecting **Test Config** from the startup menu (see figure below).

Figure 4 Accessing the test configuration screens



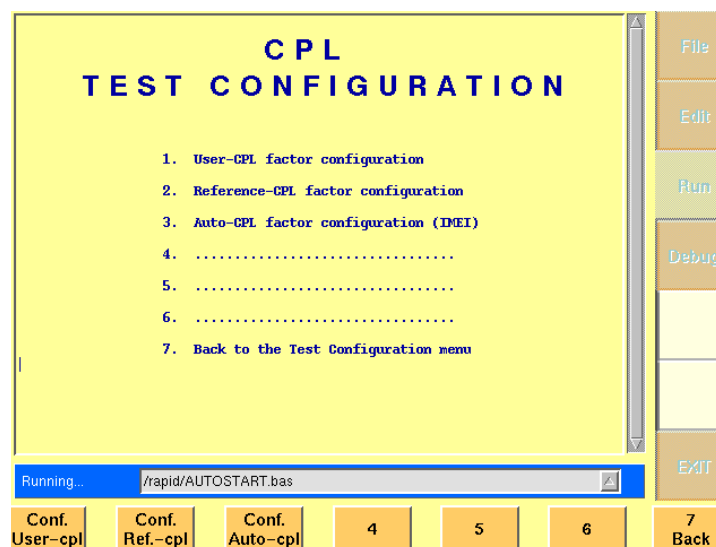
This is the main configuration screen that appears:

Figure 5 Main test configuration screen



Select **CPL** to change the coupling loss parameters:

Figure 6 More test configuration parameters



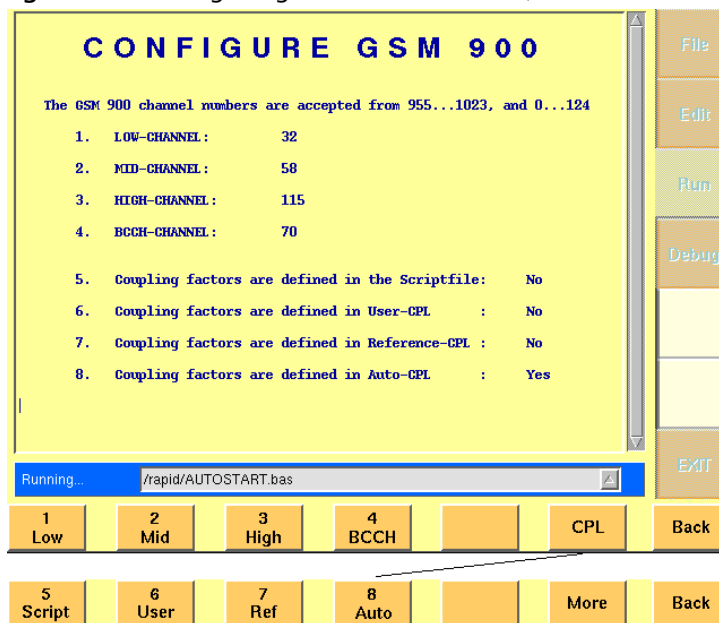
Setting up channels

GSM Service Test Software takes measurements on three channels per band – one at the low end, one at the high end and one in the middle of the band. In addition, a base channel (BCCH carrier) is required. The default settings include pre-defined channel numbers for each of the bands (GSM 900, GSM 1800, GSM 1900). If you have specific requirements regarding the channel numbers, you can change them from the menus.

- ☞ From the Test Configuration screen, push the button related to the frequency band for which to change the channels.

Result: The Configure screen for the selected band appears (see example below).

Figure 7 Configuring channel numbers (GSM 900 example)



- ☞ Push the softkey associated with the channel number to be modified: **1** for the lower end channel, **2** for the middle channel, or **3** for the higher end channel, or **4** to change the base channel (BCCH carrier) number.

Result: An additional line at the bottom invites you to enter the desired channel number.

- ☞ Enter the channel number (either on numerical keypad of the front panel or on the external keyboard). The range of valid channel numbers is indicated on the screen below the header line.
- ☞ Confirm with the **Enter** key.

Result: If the input is valid, the screen displays the new channel numbers for low, middle and high frequencies. You can now modify more channel numbers or go back to the main screen.

Defining the coupling loss factor location

The mobile phone may be connected to the 4400 either via a cable connection or an antenna (for instance the Willtek Universal Antenna Coupler). Using an antenna or a coupler, there is always a power loss associated with the specific antenna being used; even a cable can produce a significant power loss if it is relatively long. Moreover, the coupling loss is usually frequency-dependent, that means the coupling loss values vary with channel numbers and transmit direction. – In this section you can learn four different methods how to set up the coupling loss. The subsequent sections, [“Entering coupling loss values by hand” on page 20](#) and [“Deriving reference coupling loss values” on page 22](#), explain how to define the values.

- a The coupling loss may be taken directly from the software (a script file). The script files contain pre-defined values (which may or may not apply to your specific phone and antenna coupler). This method is not recommended for high-accuracy measurements.
- b The coupling loss values may be entered directly in a menu provided by GSM Service Test Software. This can be a useful method if you test many samples of the same mobile phone model in a row. In RAPID! GSM Service Test Software, this method is called "user cpl" (cpl = coupling loss).
- c GSM Service Test Software also allows you to record the coupling loss with a reference configuration, using a so-called 'golden mobile'. Again, this method is useful when testing many samples of the same mobile phone model in a sequence. In RAPID! GSM Service Test Software, this method is called "reference cpl" (cpl = coupling loss).
- d A convenient method for tests on different types of mobile phones is to let RAPID! GSM Service Test Software determine the coupling loss factors based on the phone's IMEI. The IMEI (International Mobile Equipment Identity) is the serial number of the phone; it is reported to the 4400 during the location update procedure. The IMEI includes a six-digit type approval code; the phones from a mobile phone series usually have the same type approval code, or there are only a few different codes for a large series.
Record the coupling loss values for each phone model once, so that the software can use the data automatically when any of these models is tested. RAPID! GSM Service Test Software calls this method the "auto cpl" mode.

Frequency band-specific factors and locations

The coupling loss definition may be different for each band, for instance if you test a dual-band mobile phone, the GSM 900 coupling loss factors may be derived from a reference configuration with a golden mobile, whereas the factors for GSM 1800 may be entered directly in the respective menu.

Auto cpl file not available

If you try to test a mobile in auto cpl mode and if there is no coupling loss data previously recorded for this phone model, an error message occurs. An error message may even occur if you recorded the coupling loss for the same model but with a different type approval code.

In order to select the coupling loss definition for a given frequency band, proceed as follows:

- ☞ On the Test Configuration screen, select the frequency band for which you want to define the coupling loss factors.
- ☞ Select **CPL** to get access to the softkeys that allow you to change the coupling loss definition.
- ☞ Select the location for the coupling loss factors by pushing the appropriate softkey:
 - 5 for values pre-defined within the software,
 - 6 for coupling loss values entered directly,
 - 7 for values derived with a reference mobile,
 - or 8 for values derived from a list of cpl files, based on the IMEI (auto cpl).

Result: The Configure screen for the respective band shows 'Yes' behind the new selection and 'No' behind the other selections.

Entering coupling loss values by hand

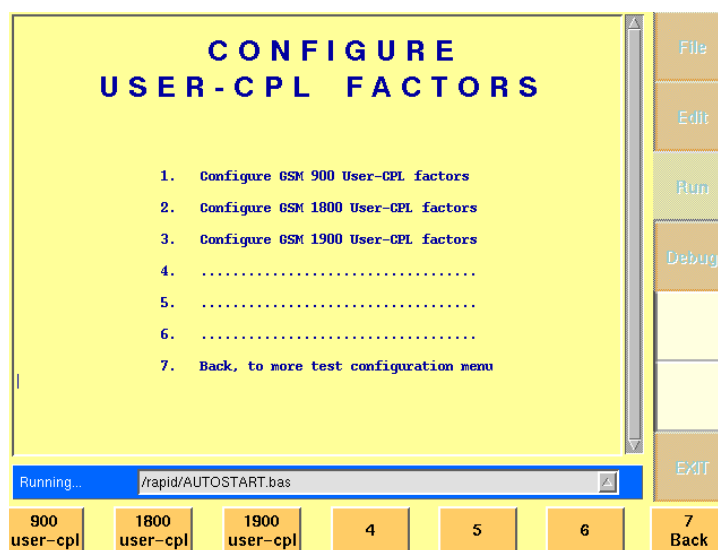
Coupling loss (or cable attenuation) values can be entered manually for each frequency band. Within each band, values can be individually defined for the uplink and downlink on the low, middle and high channels. The coupling loss (or attenuation) is expressed in dB.

Follow the procedure below if you have the cable loss (coupling loss or attenuation) at hand.

- ☞ On the Test Configuration screen, select **CPL**.
- ☞ On the subsequent 'CPL Test Configuration' screen, push the softkey for 'User-CPL factor configuration'.

Result: A new screen appears, inviting you to select the frequency band for which you want to define the coupling loss.

Figure 8 Configuration screen for user-definable coupling loss factors



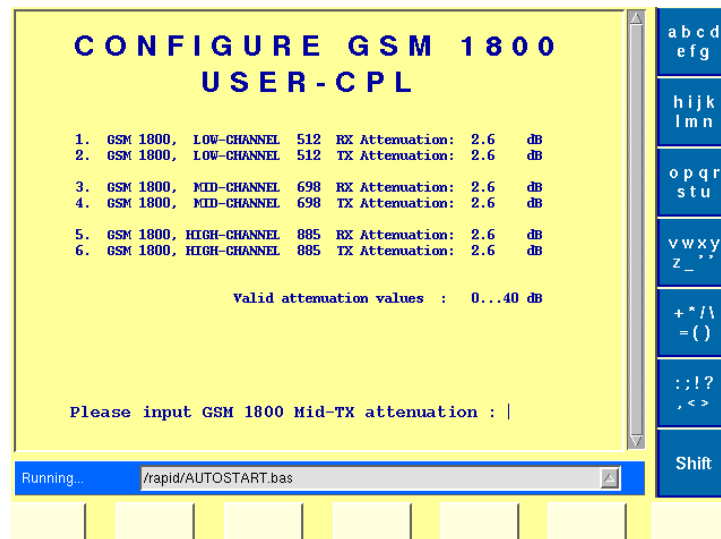
- ☞ Select the desired frequency band using the appropriate softkey.
- ☞ Using the softkeys, select the channel number and the direction for which you want to enter a new coupling loss value.

Result: Another screen appears, showing the present values for lower, middle and upper frequencies within the selected band. There are separate values for each direction.

RX refers to receiver (with respect to the mobile phone under test), this means the receive frequency of the phone or the downlink direction.

TX refers to transmitter (from the mobile phone's view). The transmit frequency of the phone appears in the uplink direction.

Figure 9 Entry of user-definable coupling loss factors (GSM 1800 example)



- ☞ Enter the desired attenuation or coupling loss factor, in dB, in the range 0.0 to 40.0. Do not enter the unit dB.
- ☞ Confirm the new value by pushing **Enter**.
- ☞ Repeat the procedure for the other channels and directions until all the coupling loss values fit your needs.

Result: The new coupling loss values for each of the bands and the respective direction are shown.

- ☞ Push the **Back** button to go back to the Configuration menu.

Storage location for user-defined coupling loss values

The current user cpl values are stored in the following location: `/rapid/cpl/user_cpl`. If you enter new values for any frequency band, the old ones for that band will be overwritten and will not be accessible anymore.

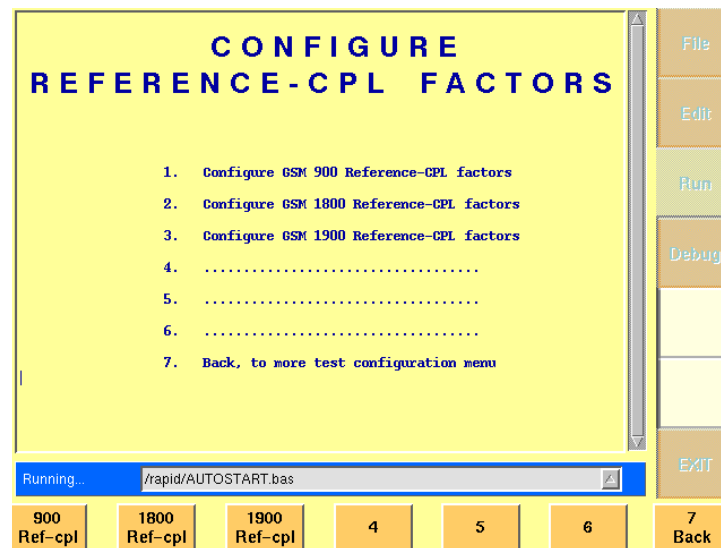
Deriving reference coupling loss values

The 4400 can also measure the coupling loss (or cable attenuation) values for each frequency band. The values should be recorded for a reference configuration (using a 'golden mobile').

- ☞ Preparation: Connect a mobile with known quality to the 4400, just as you intend to do it in subsequent tests.
- ☞ On the Test Configuration screen, select **CPL**.
- ☞ On the subsequent 'CPL Test Configuration' screen, push the softkey for 'Reference-CPL factor configuration'.

Result: A new screen appears, inviting you to select the frequency band for which you want to have the coupling loss measured.

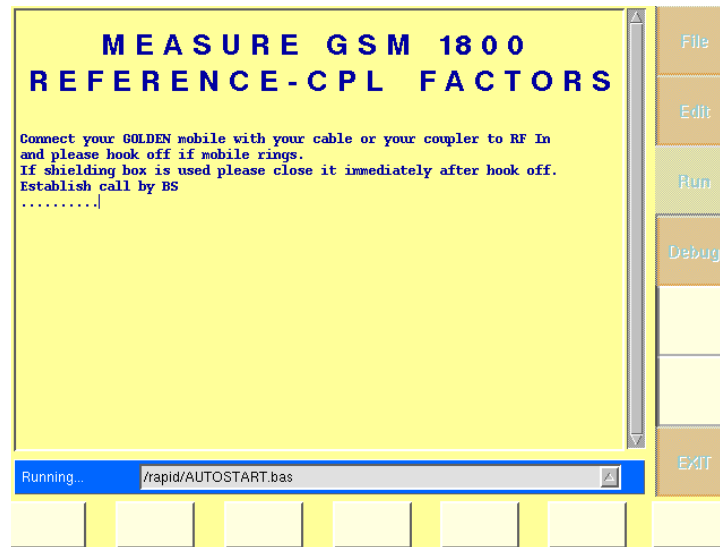
Figure 10 Configuration of the reference coupling loss



- ☞ Select the desired frequency band using the appropriate softkey.

Result: Another screen appears, guiding you through the procedure to record reference values for the selected frequency band.

Figure 11 Starting a reference measurement.



— The procedure measures the actual transmit and receive power levels and compares them with the nominal power levels. The difference is considered as the coupling loss and is stored in a file.

— In the downlink direction, the power level received by the mobile phone is reported back to the 4400. The measurement resolution is 1 dB and the measurement accuracy depends on the accuracy of the received signal strength indicator (RSSI) within the mobile phone.

Result: The measured reference coupling loss values are shown on the screen.

- ☞ Return to the 'Configure reference-cpl factors' screen to record the coupling loss values for another frequency band.
- ☞ Return to the main (configuration) screen by pushing the **Back** softkey when you are done.

— **Storage location for reference coupling loss values**

The current reference coupling loss values are stored in the following location: /rapid/cpl/ref_cpl. If you have the software determine new reference values for a frequency band, the old ones for that band will be overwritten and will not be accessible anymore.

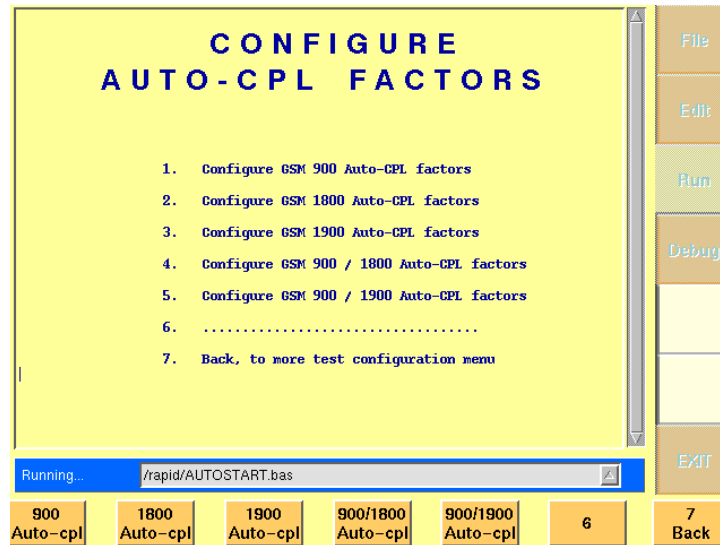
Recording automatic coupling values

The 4400 can also measure, store and automatically recall the coupling loss (or cable attenuation) values for a specific type of mobile phone. The values should be recorded for automatic configuration (using a 'golden mobile').

- ☞ Preparation: Connect a mobile with known quality to the 4400, just as you intend to do it in subsequent tests.
- ☞ On the Test Configuration screen, select **CPL**.
- ☞ On the subsequent 'CPL Test Configuration' screen, push the softkey for 'Auto-CPL factor configuration'.

Result: A new screen appears, inviting you to select the frequency band for which you want to have the coupling loss measured.

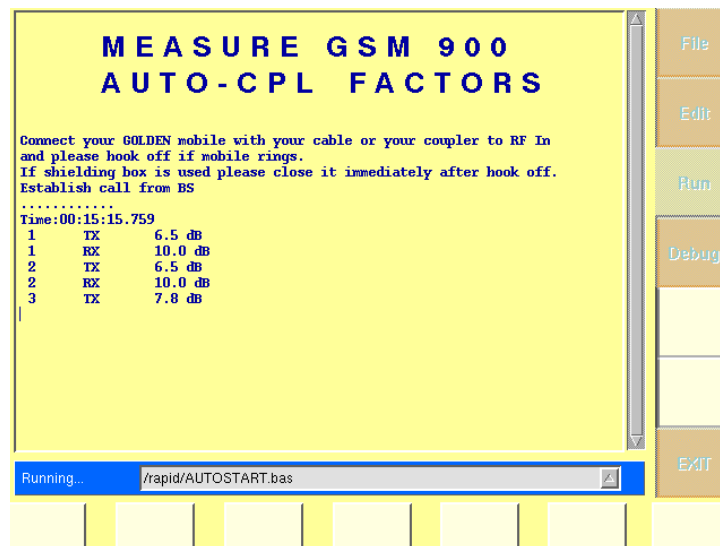
Figure 12 Configuration of the reference coupling loss



Select the band or band combination supported by the mobile phone.

Result: Another screen appears, guiding you through the procedure to record reference values for the selected frequency band.

Figure 13 Starting a reference measurement.



- The procedure measures the actual transmit and receive power levels and compares them with the nominal power levels. The difference is considered as the coupling loss and is stored in a file.
- In the downlink direction, the power level received by the mobile phone is reported back to the 4400. The measurement resolution is 1 dB and the measurement accuracy depends on the accuracy of the received signal strength indicator (RSSI) within the mobile phone.

Result: The measured auto coupling loss values are shown on the screen.

- ☞ Return to the main configuration screen by pushing the **Back** softkey three times when you are done.

Storage location for auto coupling loss values

The automatic coupling loss values are stored in individual files, one for each type of mobile phone, in the following location: `/rapid/service/tac_cpl`. In this directory, a sub-directories are created to group the coupling loss files. The sub-directory is named according to the first two digits of the IMEI. The coupling loss files are named according to the first six digits of the IMEI, which give the type approval code (TAC).

Mobile phones which are manufactured by the millions may have more than one type approval code. Rather than re-recording the coupling loss values for a phone with different TAC, you can copy the existing coupling loss file to a new file with the other type approval code.

Changing the IMSI

The international mobile subscriber identity (IMSI) is stored on the SIM card. A few procedures of the GSM Service Test Software need to know the IMSI of the mobile under test before the test is started, for example when the reference coupling loss is recorded.

Most tests work even with a wrong IMSI setting. These tests start with a mobile originated call, so the mobile under test informs the 4400 of its IMSI and the 4400 can use this number throughout the remaining tests.

Therefore, the IMSI is only required when the test starts with a BS call (mobile terminated call).

The pre-defined IMSI can be changed as follows:

- ☞ On the main Test Configuration screen, select **IMSI**.

Result: The 'Change IMSI' screen appears (see figure below). The presently selected IMSI is displayed.

Figure 14 Changing the IMSI



The screen provides you with following choices:

- 1 Change the SIM. This selection allows you to enter another IMSI. The number must be 15 digits long and can be entered either using the keypad on the front panel or an external keyboard.
- 2 Set to Willtek SIM card. With this selection, the IMSI stored on Willtek's Test SIM is selected. The IMSI is 001010123456789.

- ☞ Make your selection of the SIM card, or leave the current setting unchanged.
- ☞ Select softkey **Back** to return to the main Test Configuration screen.

Affecting the output destination

GSM Service Test Software can generate a test report and print it on an attached printer or save it on the 4400's hard disk. Both methods can be performed automatically or on request. This section details how to configure the software with respect to test report delivery.

Willtek has made efforts to keep the results format comprehensive and limited to one or two pages. The depth of the results survey depends on the number of tests. The test report format is text and the contents are the same between printed and stored versions.

Printing results

The test results can be printed to an attached printer, either automatically or on request.

- If you select automatic printouts, the results will be sent to a printer as soon as the end of the test has been reached.

- Printing on request means that GSM Service Test Software asks you at the end of the test if you want to print the results, after showing a brief summary. This allows you, as an example, to print the results for failed tests only.

The test results form is sent to the Centronics port on the back panel of the 4400. The software assumes that a printer is connected which is capable of receiving and printing ASCII text. For the purposes of these result forms, the selection of the printing device (under Tools > Configure > I/O) is ignored.

Windows printers not supported

Most printers can receive and print pure ASCII text. Some printers, however, leave the processing to the Microsoft Windows GDI drivers. These printers are called Windows printers; such printers are not supported by the 4400.

Saving results to a file

Instead of printing the results on paper, you can save the results to a file. A new file is created for each new test. The files are stored on the local hard disk. You have the choice between the following possibilities:

- If you select automatic file saving, the results will be stored on the hard disk as soon as the end of the test has been reached. The files will be named automatically (see below for more details).
- Saving on request means that GSM Service Test Software asks you at the end of the test if you want to save the results, after showing a brief summary. This allows you, as an example, to save the results for failed tests only. The files will be named automatically (see below for more details).
- Alternatively, you can select that you determine the individual file name, or abort saving the results.

The files are stored according to the date, the type of test, and the serial number of the mobile phone under test. An example directory structure is given below:

`/rapid/sv_result/feb-08-2` contains sub-directories with test result files created on February 8, 2002. The possible sub-directories are:

- `gsm` for GSM 900 tests
- `dual` for dual-band GSM 900 and GSM 1800 tests
- `pcs` for GSM 1900 tests
- `triple` for triple-band tests in the GSM 900, GSM 1800 and GSM 1900 bands
- `RS232-dual` for dual-band tests using remote control of the mobile phone via RS-232 interface.

An automatically created file name consists of the last eight digits of the IMEI, followed by '.txt'. The IMEI is the international mobile equipment identity, also referred to as the GSM serial number.

Example: You conducted a dual-band test on March 31, 2002, on the phone with IMEI 520392712283850. The result file is automatically stored in `/rapid/sv_result/mar-31-2/dual/12283850.txt` on the internal hard disk.

The result files can be loaded and viewed using the RAPID! file manager and the RAPID! text editor. They can also be copied or moved to a floppy disk using the RAPID! file manager, so that you can transfer the files to a PC for archiving purposes.



Loss of results data

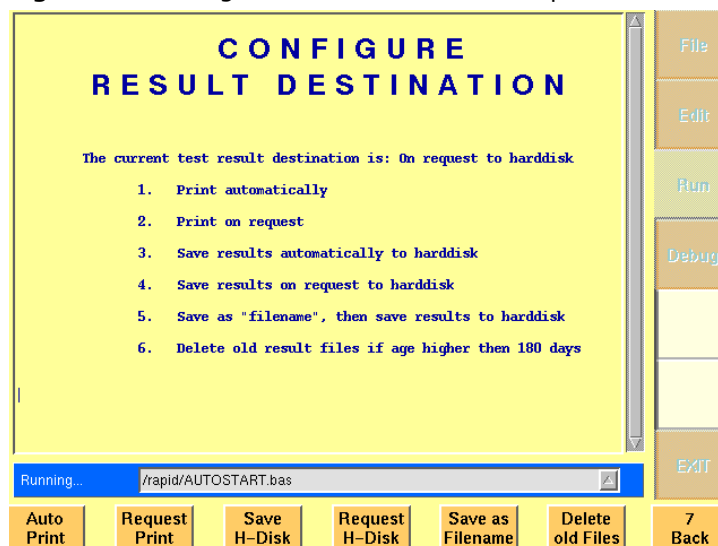
If the same test is performed multiple times on the same mobile and on the same day, the previous results file is overwritten without a warning. Only the last results are accessible.

Procedure Now that you know the different methods how the result forms can be saved or printed, this is how you select the method that is most appropriate for your use:

- ☞ On the main screen, push the **Result** softkey.
- ☞ On the new screen 'Configure Result Destination', select your choice:
 - 1 **Auto Print** for an automatic results sheet printout
 - 2 **Request Print** for printing on demand
 - 3 **Save H-Disk** to store each results sheet automatically on the hard disk with the default file name and location
 - 4 **Request H-Disk** to save results on the hard disk on request with the default file name and location
 - 5 **Save as Filename** to archive the results in a user-definable file

Result: The new selection is indicated below the header line of the screen Configure Result Destination screen.

Figure 15 Configuration of the results output device



Administering the results archive

If you save the results to the hard disk frequently, the number of result files and directories increases over time, and it may be cumbersome finding newer results within all the old directories. Therefore Willtek recommends two methods to keep your results directories in good order:

- If you need the results for an extended period of time, back up your files to floppy disks frequently and copy them to a PC.
- Delete older files which you do not need on the hard disk anymore.

In order to help you keep the directory in order, GSM Service Test Software offers the possibility to delete old result files and directories automatically. By default, GSM Service Test Software deletes them after a period of 180 days (about half a year). Each time you load this RAPID! software, GSM Service Test Software first checks for old result directories and deletes them.

You can select a different interval or disable this feature as follows:

- ☞ On the main screen, select **Test Config > Result**.
- ☞ Select **Delete old Files**.

Result: GSM Service Test Software asks you for the period of time for which it shall archive the result files before it deletes them.

- ☞ Enter the archive period in days, or enter **0** to prevent the software from deleting old directories and files.
- ☞ Confirm your choice by pushing **Enter**.

Result: If a number greater than 0 has been entered, the files are deleted on next startup of GSM Service Test Software.

Test Results

5

This chapter describes the test results that you gather when running a test. Test results described in this chapter are as follows:

- ["General format" on page 32](#)
- ["GSM 900 test results" on page 33](#)
- ["Dual-band test results" on page 34](#)
- ["PCS 1900 test results" on page 35](#)
- ["Triple-band test results" on page 36](#)
- ["Results for dual-band tests with RS-232 control" on page 38](#)

General format

The test results are summarized in a text file or can be printed on paper. On most printers, the test results fit on one A4 page with the exception of those from the triple-band test. Refer to ["Affecting the output destination" on page 33](#) to learn how you can select the way the test results are presented.

In the header of the test results form, information about environment is included, such as the unit under test (its serial number or IMEI), the test equipment, the source of coupling loss factors and date and time when the test has been performed.

The subsequent sections detail the transmitter and receiver measurement results versus the limits, and the individual conditions under which the tests have been conducted (channel and power level).

The limits and results columns are marked as LL (for lower limit), UL (for upper limit) and MV (for measurement value), respectively. A pass/fail verdict with respect to the measurement value versus the limits is indicated at the end of each line representing a test.

The following sections provide an example result form for each of the test types.

GSM 900 test results

Willtek Service Test: GSM 900 MHz Date: Feb-05-2002
 Test Equipment : WILLTEK 4400 TIME: 10:50:58
 Broadcast Channel: 63 IMEI: "520392712283850"
 Coupling loss : Scriptfile

Dialed No.: "1234567890" Pass
 Speech Test: Pass

```
-----
TX-ALL, BS:-102.0dBm,MS:15,TCH:63  LL      UL      MV
Phase Error RMS ...: deg   -05.0   +05.0   +01.52  Pass
Frequency Error ...: Hz    -90.0   +90.0   -039.11 Pass
TX-Power .....: dBm   +10.0   +16.0   +14.54  Pass
Timing Advance ....: us    -3.69   +3.69   -0.14   Pass
Template Check ....: stat    +0       +0       +0       Pass
RBER,BS:-102.0dBm,MS:15,TCH:63
Class II error ....: %     +00.0   +2.439   +0.051  Pass
Class Ib error ....: %     +00.0   +00.41   +00.00  Pass
Frame Erasure Rate : %     +00.0   +0.122   +0.000  Pass
RX, BS:-102.0dBm,MS:15,TCH:63
RX Level .....: dBm   -106    -98     -101    Pass
RX Qual .....: code    +0       +3       +0       Pass
TX-ALL, BS:-102.0dBm,MS:5,TCH:4
Phase Error RMS ...: deg   -05.0   +05.0   +01.91  Pass
Frequency Error ...: Hz    -90.0   +90.0   -072.94 Pass
TX-Power .....: dBm   +31.0   +35.0   +32.25  Pass
Timing Advance ....: us    -3.69   +3.69   -0.08   Pass
Template Check ....: stat    +0       +0       +0       Pass
RBER,BS:-102.0dBm,MS:5,TCH:4
Class II error ....: %     +00.0   +2.439   +0.051  Pass
Class Ib error ....: %     +00.0   +00.41   +00.00  Pass
Frame Erasure Rate : %     +00.0   +0.122   +0.000  Pass
RX, BS:-102.0dBm,MS:5,TCH:4
RX Level .....: dBm   -106    -98     -101    Pass
RX Qual .....: code    +0       +3       +0       Pass
TX-ALL, BS:-102.0dBm,MS:10,TCH:123
Phase Error RMS ...: deg   -05.0   +05.0   +03.86  Pass
Frequency Error ...: Hz    -90.0   +90.0   -049.43 Pass
TX-Power .....: dBm   +20.0   +26.0   +24.68  Pass
Timing Advance ....: us    -3.69   +3.69   -0.05   Pass
Template Check ....: stat    +0       +0       +0       Pass
RBER,BS:-102.0dBm,MS:10,TCH:123
Class II error ....: %     +00.0   +2.439   +0.000  Pass
Class Ib error ....: %     +00.0   +00.41   +00.00  Pass
Frame Erasure Rate : %     +00.0   +0.122   +0.000  Pass
RX, BS:-102.0dBm,MS:10,TCH:123
RX Level .....: dBm   -106    -98     -101    Pass
RX Qual .....: code    +0       +3       +1       Pass

Measurement time: 00:00:06.5 TEST: PASSED
Test time       : 00:00:25.9
```

Dual-band test results

```

Willtek Service Test: Dual 900/1800          Date: Feb-05-2002
Test Equipment   : WILLTEK 4400             TIME:    10:52:04
Broadcast Channel: 63                       IMEI: "520392712283850"
Coupling loss    : Scriptfile
Dialed No.       : "1234567890"           Pass
Speech Test      : "1234567890"           Pass
-----
TX-ALL, BS:-102.0dBm,MS:15,TCH:63  LL      UL      MV
Phase Error RMS ...: deg   -05.0   +05.0   +01.52  Pass
Frequency Error ...: Hz    -90.0   +90.0   +010.04 Pass
TX-Power           : dBm   +10.0   +16.0   +14.49  Pass
Timing Advance     : us    -3.69  +3.69   +0.12   Pass
Template Check     : stat   +0      +0      +0      Pass
TX-ALL, BS:-102.0dBm,MS:5,TCH:4
Phase Error RMS ...: deg   -05.0   +05.0   +02.12  Pass
Frequency Error ...: Hz    -90.0   +90.0   -011.17 Pass
TX-Power           : dBm   +31.0   +35.0   +32.25  Pass
Timing Advance     : us    -3.69  +3.69   +0.05   Pass
Template Check     : stat   +0      +0      +0      Pass
RBER, BS:-102.0dBm,MS:5,TCH:4
Class II error     : %     +00.0   +2.439  +0.051  Pass
Class Ib error     : %     +00.0   +00.41  +00.00  Pass
Frame Erasure Rate : %     +00.0   +0.122  +0.000  Pass
RX, BS:-102.0dBm,MS:5,TCH:4
RX Level           : dBm   -106    -98     -101    Pass
RX Qual            : code   +0      +3      +0      Pass
TX-ALL, BS:-102.0dBm,MS:10,TCH:123
Phase Error RMS ...: deg   -05.0   +05.0   +03.15  Pass
Frequency Error ...: Hz    -90.0   +90.0   -023.03 Pass
TX-Power           : dBm   +20.0   +26.0   +24.65  Pass
Timing Advance     : us    -3.69  +3.69   -0.05   Pass
Template Check     : stat   +0      +0      +0      Pass
TX-ALL, BS:-100.0dBm,MS:0,TCH:512
Phase Error RMS ...: deg   -05.0   +05.0   +01.22  Pass
Frequency Error ...: Hz   -180.0  +180.0  -058.51 Pass
TX-Power           : dBm   +28.0   +32.0   +30.40  Pass
Timing Advance     : us    -3.69  +3.69   +1.04   Pass
Template Check     : stat   +0      +0      +0      Pass
RBER, BS:-100.0dBm,MS:0,TCH:512
Class II error     : %     +00.0   +2.439  +0.051  Pass
Class Ib error     : %     +00.0   +00.41  +00.00  Pass
Frame Erasure Rate : %     +00.0   +0.122  +0.000  Pass
RX, BS:-100.0dBm,MS:0,TCH:512
RX Level           : dBm   -104    -96     -100    Pass
RX Qual            : code   +0      +3      +0      Pass
TX-ALL, BS:-100.0dBm,MS:10,TCH:698
Phase Error RMS ...: deg   -05.0   +05.0   +02.10  Pass
Frequency Error ...: Hz   -180.0  +180.0  -034.27 Pass
TX-Power           : dBm   +06.0   +14.0   +09.82  Pass
Timing Advance     : us    -3.69  +3.69   +1.07   Pass
Template Check     : stat   +0      +0      +0      Pass
TX-ALL, BS:-100.0dBm,MS:15,TCH:885
Phase Error RMS ...: deg   -05.0   +05.0   +01.34  Pass
Frequency Error ...: Hz   -180.0  +180.0  -057.07 Pass
TX-Power           : dBm   -05.0   +05.0   +03.01  Pass
Timing Advance     : us    -3.69  +3.69   +1.06   Pass
Template Check     : stat   +0      +0      +0      Pass

Measurement time:  00:00:07.7          TEST: PASSED
Test time         :  00:00:28.9

```


Triple-band test results

Willtek Service Test: Tripleband Date: Feb-05-2002
 Test Equipment : WILLTEK 4400 TIME: 11:12:43
 Broadcast Channel: 669 IMEI: "520392712283850"
 Coupling loss : Ref.-cpl

Dialed No.: "1234567890" Pass
 Speech Test: Pass

 TX-ALL, BS:-102.0dBm,MS:15,TCH:63 LL UL MV
 Phase Error RMS ...: deg -05.0 +05.0 +01.51 Pass
 Frequency Error ...: Hz -90.0 +90.0 -015.17 Pass
 TX-Power: dBm +10.0 +16.0 +13.21 Pass
 Timing Advance: us -3.69 +3.69 -0.83 Pass
 Template Check: stat +0 +0 +0 Pass

TX-ALL, BS:-102.0dBm,MS:5,TCH:4
 Phase Error RMS ...: deg -05.0 +05.0 +01.97 Pass
 Frequency Error ...: Hz -90.0 +90.0 -027.59 Pass
 TX-Power: dBm +31.0 +35.0 +31.93 Pass
 Timing Advance: us -3.69 +3.69 -0.88 Pass
 Template Check: stat +0 +0 +0 Pass

RBBER,BS:-102.0dBm,MS:5,TCH:4
 Class II error: % +00.0 +2.439 +0.051 Pass
 Class Ib error: % +00.0 +00.41 +00.00 Pass
 Frame Erasure Rate : % +00.0 +0.122 +0.000 Pass

RX, BS:-102.0dBm,MS:5,TCH:4
 RX Level: dBm -106 -98 -102 Pass
 RX Qual: code +0 +3 +0 Pass

TX-ALL, BS:-102.0dBm,MS:10,TCH:123
 Phase Error RMS ...: deg -05.0 +05.0 +03.25 Pass
 Frequency Error ...: Hz -90.0 +90.0 +017.46 Pass
 TX-Power: dBm +20.0 +26.0 +23.54 Pass
 Timing Advance: us -3.69 +3.69 -0.04 Pass
 Template Check: stat +0 +0 +0 Pass

TX-ALL, BS:-100.0dBm,MS:0,TCH:512
 Phase Error RMS ...: deg -05.0 +05.0 +01.44 Pass
 Frequency Error ...: Hz -180.0 +180.0 +016.07 Pass
 TX-Power: dBm +28.0 +32.0 +29.93 Pass
 Timing Advance: us -3.69 +3.69 +1.01 Pass
 Template Check: stat +0 +0 +0 Pass

RBBER,BS:-100.0dBm,MS:0,TCH:512
 Class II error: % +00.0 +2.439 +0.000 Pass
 Class Ib error: % +00.0 +00.41 +00.00 Pass
 Frame Erasure Rate : % +00.0 +0.122 +0.000 Pass

RX, BS:-100.0dBm,MS:0,TCH:512
 RX Level: dBm -104 -96 -102 Pass
 RX Qual: code +0 +3 +0 Pass

TX-ALL, BS:-100.0dBm,MS:10,TCH:698
 Phase Error RMS ...: deg -05.0 +05.0 +01.91 Pass
 Frequency Error ...: Hz -180.0 +180.0 +019.26 Pass
 TX-Power: dBm +06.0 +14.0 +09.11 Pass
 Timing Advance: us -3.69 +3.69 +0.97 Pass
 Template Check: stat +0 +0 +0 Pass

TX-ALL, BS:-100.0dBm,MS:15,TCH:885

Phase Error RMS	deg	-05.0	+05.0	+00.89	Pass
Frequency Error	Hz	-180.0	+180.0	+018.40	Pass
TX-Power	dBm	-05.0	+05.0	+01.50	Pass
Timing Advance	us	-3.69	+3.69	+0.91	Pass
Template Check	stat	+0	+0	+0	Pass
GSM 1900 MHz BAND					
TX-ALL, BS:-100.0dBm,MS:15,TCH:669					
Phase Error RMS	deg	-05.0	+05.0	+01.59	Pass
Frequency Error	Hz	-180.0	+180.0	-113.50	Pass
TX-Power	dBm	-05.0	+05.0	-00.69	Pass
Timing Advance	us	-3.69	+3.69	+1.06	Pass
Template Check	stat	+0	+0	+0	Pass
RBER,BS:-100.0dBm,MS:15,TCH:669					
Class II error	%	+00.0	+2.439	+0.354	Pass
Class Ib error	%	+00.0	+00.41	+00.00	Pass
Frame Erasure Rate :	%	+00.0	+0.122	+0.000	Pass
RX, BS:-100.0dBm,MS:15,TCH:669					
RX Level	dBm	-104	-96	-101	Pass
RX Qual	code	+0	+3	+1	Pass
TX-ALL, BS:-100.0dBm,MS:0,TCH:512					
Phase Error RMS	deg	-05.0	+05.0	+01.56	Pass
Frequency Error	Hz	-180.0	+180.0	-083.59	Pass
TX-Power	dBm	+28.0	+32.0	+28.42	Pass
Timing Advance	us	-3.69	+3.69	+1.17	Pass
Template Check	stat	+0	+0	+0	Pass
RBER,BS:-100.0dBm,MS:0,TCH:512					
Class II error	%	+00.0	+2.439	+0.657	Pass
Class Ib error	%	+00.0	+00.41	+00.00	Pass
Frame Erasure Rate :	%	+00.0	+0.122	+0.000	Pass
RX, BS:-100.0dBm,MS:0,TCH:512					
RX Level	dBm	-104	-96	-101	Pass
RX Qual	code	+0	+3	+2	Pass
TX-ALL, BS:-100.0dBm,MS:10,TCH:810					
Phase Error RMS	deg	-05.0	+05.0	+01.56	Pass
Frequency Error	Hz	-180.0	+180.0	-080.29	Pass
TX-Power	dBm	+06.0	+14.0	+09.32	Pass
Timing Advance	us	-3.69	+3.69	+1.11	Pass
Template Check	stat	+0	+0	+0	Pass
RBER,BS:-100.0dBm,MS:10,TCH:810					
Class II error	%	+00.0	+2.439	+0.354	Pass
Class Ib error	%	+00.0	+00.41	+00.00	Pass
Frame Erasure Rate :	%	+00.0	+0.122	+0.000	Pass
RX, BS:-100.0dBm,MS:10,TCH:810					
RX Level	dBm	-104	-96	-101	Pass
RX Qual	code	+0	+3	+2	Pass
Measurement time: 00:00:14.3				TEST: PASSED	
Test time : 00:01:29.1					

Results for dual-band tests with RS-232 control

Willtek Service Test: RS-232 Dualband Date: Feb-05-2002
 Test Equipment : WILLTEK 4400 TIME: 11:24:29
 Broadcast Channel: 63 IMEI: "449197516468280"
 Coupling loss : Ref.-cpl
 Dialed No. : "1234567890" Pass

 TX-ALL, BS:-102.0dBm,MS:15,TCH:63 LL UL MV
 Phase Error RMS ...: deg -05.0 +05.0 +02.19 Pass
 Frequency Error ...: Hz -90.0 +90.0 +031.06 Pass
 TX-Power ...: dBm +10.0 +16.0 +12.51 Pass
 Timing Advance ...: us -3.69 +3.69 -1.25 Pass
 Template Check ...: stat +0 +0 +0 Pass

TX-ALL, BS:-102.0dBm,MS:5,TCH:4
 Phase Error RMS ...: deg -05.0 +05.0 +02.56 Pass
 Frequency Error ...: Hz -90.0 +90.0 +014.41 Pass
 TX-Power ...: dBm +31.0 +35.0 +32.20 Pass
 Timing Advance ...: us -3.69 +3.69 -1.28 Pass
 Template Check ...: stat +0 +0 +0 Pass

RBBER, BS:-102.0dBm,MS:5,TCH:4
 Class II error ...: % +00.0 +2.439 +0.051 Pass
 Class Ib error ...: % +00.0 +00.41 +00.00 Pass
 Frame Erasure Rate : % +00.0 +0.122 +0.000 Pass

RX, BS:-102.0dBm,MS:5,TCH:4
 RX Level ...: dBm -106 -98 -101 Pass
 RX Qual ...: code +0 +3 +0 Pass

TX-ALL, BS:-102.0dBm,MS:10,TCH:123
 Phase Error RMS ...: deg -05.0 +05.0 +02.61 Pass
 Frequency Error ...: Hz -90.0 +90.0 +031.52 Pass
 TX-Power ...: dBm +20.0 +26.0 +22.40 Pass
 Timing Advance ...: us -3.69 +3.69 -1.28 Pass
 Template Check ...: stat +0 +0 +0 Pass

TX-ALL, BS:-100.0dBm,MS:0,TCH:512
 Phase Error RMS ...: deg -05.0 +05.0 +02.30 Pass
 Frequency Error ...: Hz -180.0 +180.0 +046.88 Pass
 TX-Power ...: dBm +28.0 +32.0 +29.75 Pass
 Timing Advance ...: us -3.69 +3.69 -1.31 Pass
 Template Check ...: stat +0 +0 +0 Pass

RBBER, BS:-100.0dBm,MS:0,TCH:512
 Class II error ...: % +00.0 +2.439 +0.000 Pass
 Class Ib error ...: % +00.0 +00.41 +00.00 Pass
 Frame Erasure Rate : % +00.0 +0.122 +0.000 Pass

RX, BS:-100.0dBm,MS:0,TCH:512
 RX Level ...: dBm -104 -96 -101 Pass
 RX Qual ...: code +0 +3 +3 Pass

TX-ALL, BS:-100.0dBm,MS:10,TCH:698
 Phase Error RMS ...: deg -05.0 +05.0 +02.21 Pass
 Frequency Error ...: Hz -180.0 +180.0 +006.13 Pass
 TX-Power ...: dBm +06.0 +14.0 +10.87 Pass
 Timing Advance ...: us -3.69 +3.69 -1.31 Pass
 Template Check ...: stat +0 +0 +0 Pass

TX-ALL, BS:-100.0dBm,MS:15,TCH:885
 Phase Error RMS ...: deg -05.0 +05.0 +03.22 Pass
 Frequency Error ...: Hz -180.0 +180.0 +001.91 Pass
 TX-Power ...: dBm -05.0 +05.0 +00.95 Pass
 Timing Advance ...: us -3.69 +3.69 -1.35 Pass
 Template Check ...: stat +0 +0 +0 Pass

Measurement time: 00:00:07.4 TEST: PASSED
 Test time : 00:00:23.6

Chapter 5 Test Results

Results for dual-band tests with RS-232 control

Customer Services



This chapter describes the customer services available through Willtek. Topics discussed in this chapter include the following:

- ["Instrument repair" on page 42](#)
- ["Equipment return instructions" on page 42](#)
- ["Warranty information" on page 43](#)

Instrument repair

Our service centers provide repair, calibration and upgrade services for under warranty equipment. Willtek understands the impact of equipment down time on operations and is staffed to ensure a quick turnaround. Available services include the following:

Product Repair — All equipment returned for service is tested to the same rigorous standards as newly manufactured equipment. This ensures products meet all published specifications, including any applicable product updates.

Calibration — Willtek's calibration methods are based on national standards.

Factory Upgrades — Any unit returned for a hardware feature enhancement will also receive applicable product updates and will be thoroughly tested, ensuring peak performance of the complete feature set.

Equipment return instructions

Please contact your local service center for Willtek products via telephone or web site for return or reference authorization to accompany your equipment. For each piece of equipment returned for repair, attach a tag that includes the following information:

- Owner's name, address, and telephone number.
- The serial number, product type, and model.
- Warranty status. (If you are unsure of the warranty status of your instrument, include a copy of the purchase order.)
- A detailed description of the problem or service requested.
- The name and telephone number of the person to contact regarding questions about the repair.
- The return authorization (RA) number (US customers), or reference number (European customers).

If possible, return the equipment using the original shipping container and material. Additional Willtek shipping containers are available from Willtek on request. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit. Willtek is not liable for any damage that may occur during shipping. The customer should clearly mark the Willtek-issued RA or reference number on the outside of the package and ship it prepaid and insured to Willtek.

Warranty information

Hardware Willtek warrants its hardware products to be free from defects in workmanship and materials, under normal use and service, for one year from the date of purchase from Willtek or its authorized agent. Willtek certifies that all instruments are tested and inspected to comply with the published specifications originating from the company.

If a product does not operate as warranted during the warranty period, Willtek shall, at its option, repair the defective product or part (except batteries), deliver an equivalent product or part to replace the defective item, or refund the purchase price paid for the defective product. Transportation of the defective product or part to the factory or service centre is to be pre-paid by the customer. All products that are replaced will become the property of Willtek. Any replaced or repaired product or part has a ninety-(90) day warranty or the remainder of the initial warranty period, whichever is longer.

Software Willtek warrants that the software programs licensed from it will perform in substantial conformance to the program specifications for a period of one year from the date of purchase from Willtek or its authorized agent. Willtek warrants the magnetic media containing software against failure during the warranty period. Sole obligation hereunder shall be (at Willtek discretion) to refund the purchase price paid for any defective software products, or to replace any defective media with software which substantially conforms to applicable published specifications. Willtek makes no warranty that its software products will work in combination with any hardware or applications software products provided by third parties, that the operation of the software products will be uninterrupted or error free, or that all defects in the software products will be corrected. Willtek will make reasonable efforts to provide compatibility, except where the non-compatibility is caused by a defect in the third party's product.

All information in this manual is given in good faith. However, Willtek Communications shall not be liable for any loss or damage whatsoever arising from the use of this manual, the product described in it or any errors or omissions in either.

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Publication History

Revision	Comment
0203-120-A	First release.
0209-140-A	Automatic coupling loss detection based on the type approval code (if data available). BCCH carrier can be defined.

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Manual ident no. M 294 160
Manual version 0209-140-A
English

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