

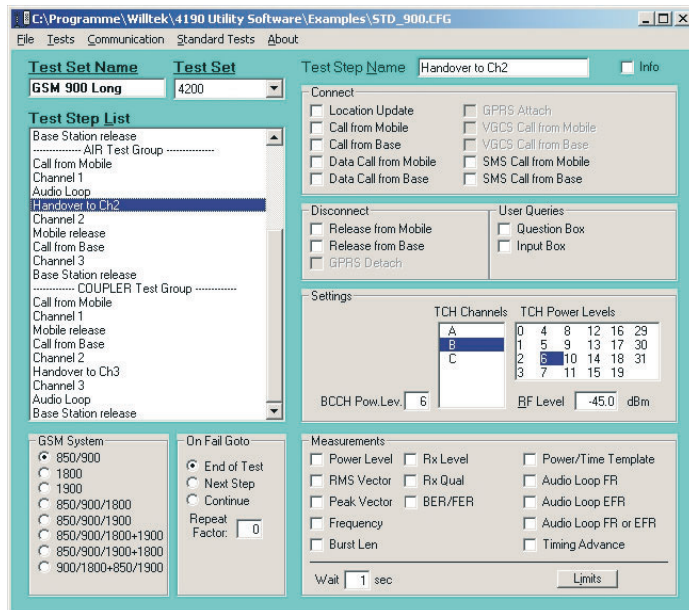
# will'tek

## Series

# Willtek 4X00

## 4190 Utility Software

for Windows 98/2000/XP  
suitable for all mobile phone testers of series 4100 & 4200



## User Guide



Manual Version: 0603-313-A

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Manual layout and text: Redaktion Interpreta, Munich, Germany

## Contents

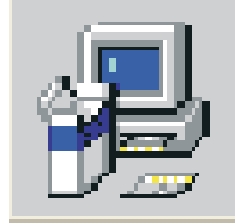
### INSTALL

<b>Purpose of the program</b> . . . . .	6
<b>Installation</b> . . . . .	7
System requirements . . . . .	7
Installing the program . . . . .	7
Font size adjustment . . . . .	8
Mouse and keyboard . . . . .	9
Using the mouse . . . . .	9
Using the keyboard . . . . .	9
Assignment of function keys . . . . .	9

### START

<b>Initial start</b> . . . . .	12
Loading the sample file. . . . .	13
<b>Configuring an AUTOTEST</b> . . . . .	14
Creating a new AUTOTEST . . . . .	14
1. Choosing a mobile phone tester. . . . .	14
2. Giving an AUTOTEST a name . . . . .	15
3. Selecting a mobile radio system. . . . .	16
4. Antenna or cable? . . . . .	17
Adding a header . . . . .	17
Deleting/moving headers . . . . .	18
Effect on the AUTOTEST . . . . .	18
Manual start (4100 with firmware < 3.30 only). . . . .	18
Start via MS TYPE menu . . . . .	19
5. Inserting a new test . . . . .	20
Deleting/moving tests . . . . .	21
6. Adapting a new test . . . . .	22
Renaming a test . . . . .	22
Defining a test . . . . .	23
Full tests and partial tests . . . . .	23
Processing a test . . . . .	24
Info. . . . .	26
Connect . . . . .	26
Disconnect. . . . .	29
Setting: RF Level . . . . .	30
Setting: BCCH Power Level . . . . .	31
Setting: Select BCCH . . . . .	31
Setting: TCH Channels . . . . .	32
Tests on multiband phones . . . . .	33
Setting: TCH Power Levels . . . . .	34

Measurements: Wait . . . . .	35
Measurements: Limits . . . . .	36
Measurements . . . . .	38
On Fail Goto . . . . .	41
Repeat Factor . . . . .	42
Question Box . . . . .	43
Input Box . . . . .	44
7. Saving an AUTOTEST. . . . .	45
8. Preparing for file transfer . . . . .	46
Connecting the cable . . . . .	46
Selecting a COM port . . . . .	46
Selecting the baud rate . . . . .	46
9. File transfer . . . . .	47
Multiple file transfer . . . . .	49
10. Archiving an AUTOTEST listing . . . . .	50
<b>4190 Utility Software – Timeline . . . . .</b>	<b>51</b>



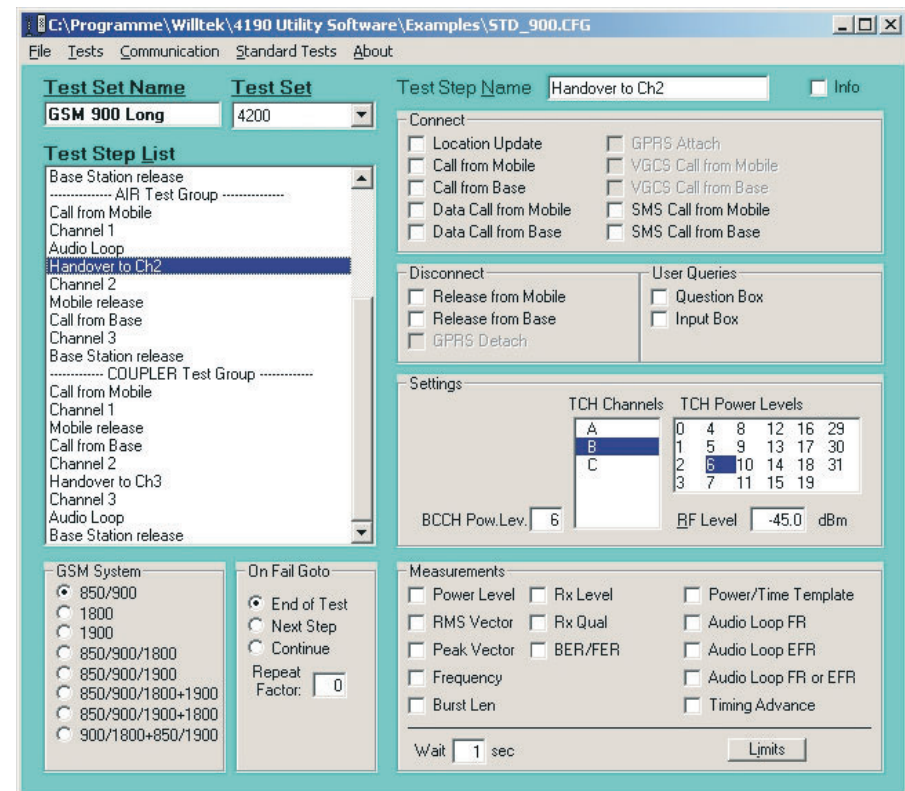
# INSTALL

## Purpose of the program

The utility software is an optional extra for use with Willtek 4X00 series of mobile phone testers (all models of Willtek 4100 and Willtek 4200 series). It enables you to:

- create user-defined AUTOTESTs for any model in the Willtek 4X00 series on a PC. In doing so, you have access to all test parameters, dialog texts and permitted tolerances for measuring values.
- upload user-defined AUTOTESTs from a PC to any model in the Willtek 4X00 series.

*This dialog box is the starting point for a user-defined AUTOTEST.*



# Installation

The utility software is installed on the PC in an interactive process of the kind normally used to install programs on a PC.

## ■ System requirements

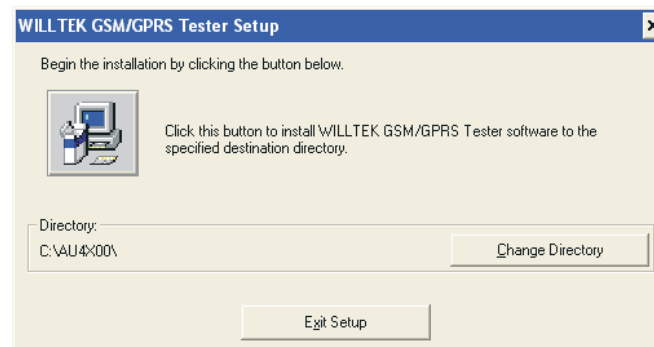
- 486 PC (or better) with a CD drive and a COM port that can be used for serial data communications.
- Windows 98/2000/XP operating system.
- 5 MB of free space on the hard disk.
- At least 4 MB of RAM.
- VGA or monochrome monitor with a resolution of at least 800 x 600 pixels.
- A mouse.

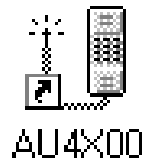
## ■ Installing the program

- 1 Close any applications you may have open (including the Microsoft Office task list).
- 2 Insert software CD delivered with the instrument, into the CD drive.
- 3 If the setup program does not start automatically, start Windows Explorer and double-click on the `SETUP.EXE` icon that can be found in root directory of the CD.

*Ex version 1.34 the utility software supports dual-band mobile phones, ex version 2.10 triple-band mobile phones.*

*Click on this button to start the installation routine.*





- 4 Now follow the instructions displayed by the installation program. You may change the folder name where the Utility Software will be installed (default folder is C:\Program files\Willtek\4190 Utility Software). You may select any directory you like. If the directory does not already exist, it will be created automatically.
  - ☞ Take care not to use special characters in directory names.
- 5 Now click on the button offered to start the installation routine.
- 6 Once the installation routine has finished, you can start the utility software by double-clicking on the icon shown here on the left, or from the Windows Start menu in the Programs/Willtek group.

#### ■ Font size adjustment

Under Windows 95/98/2000/XP the user interface of the configuration program may not be displayed correctly (e.g. the text "Release from Mobile" appearing in two lines instead of one). This has no effect on the program's performance. All texts will be displayed correctly if Windows is set to "Small Fonts", which can be selected under Control Panel > Display > Settings > [Further options] > "Font size" field.



## Mouse and keyboard

---


### ■ Using the mouse

Operations performed with the mouse follow standard conventions and do not require any special knowledge. "Check boxes" entail you clicking on a box so that a small tick ✓ appears in it, indicating that the associated entry is selected. Clicking the box a second time clears the option in question.

### ■ Using the keyboard

- To open a menu  + X, where X is the underlined letter in the menu name.
- To select a menu item Press the key on the keyboard which corresponds to the underlined letter in the menu item you want to select.
- To highlight a field/button Press the TAB key to get the cursor to jump forwards from field to field (or button to button). To move backwards, hold the SHIFT key down and then press TAB.
- To choose a button Press ENTER to choose a button that is already highlighted.
- To check a box Use the space bar to select/clear a check box entry.

### ■ Assignment of function keys

- Moves an entry in the **Test Step List** one position up.
- Moves an entry in the **Test Step List** one position down.
-  Try to ensure that you do not press a function key by mistake (your AUTOTEST might not work if you inadvertently relocate an entry).





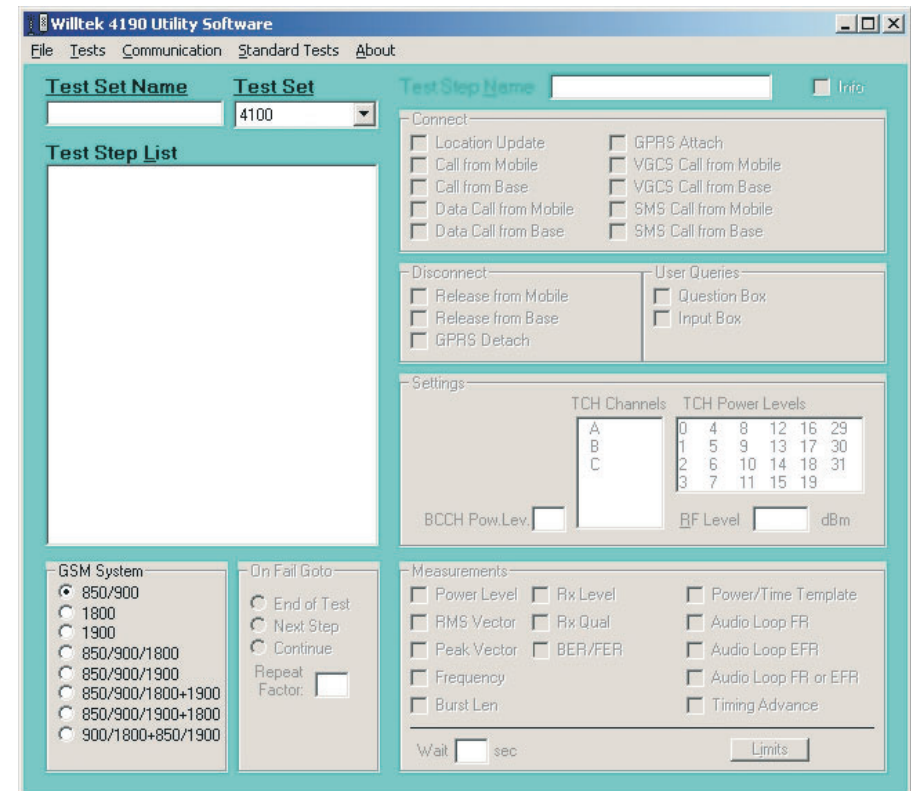
# START

## Initial start

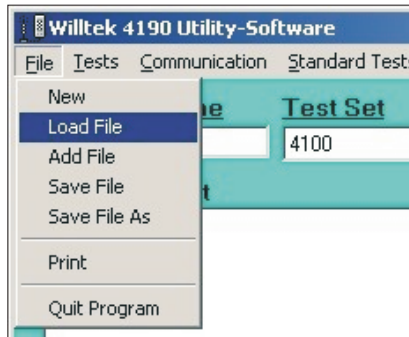
When the utility software launches, the cursor initially appears in the **Test Set Name** input field. You now have two options for configuring a user-defined AUTOTEST:

- Load an existing AUTOTEST and modify it to suit your requirements. This is the better option if your new AUTOTEST is to contain many elements which can be copied from an existing one. If you do not have an existing AUTOTEST from which to copy elements, you will have to load one of the sample files provided with the utility software.
- Configure a completely new AUTOTEST.

*This is the window you see when you start the utility software.*



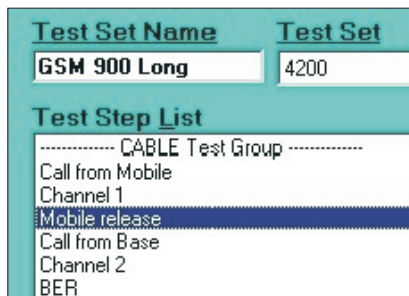
## Loading the sample file



The installation routine copied several sample AUTOTEST files onto your hard disk. These files can be used as templates for your own AUTOTESTS. You will find them in the `Examples` folder within the installation directory.

When you come to define your own AUTOTESTs, it is better to save them in this directory too, as this is the one displayed first when you want to load an AUTOTEST (no need to search through directories for files).

All AUTOTEST files have the suffix `CFG`.



When you run an AUTOTEST, the entries in the **Test Step List** are processed consecutively.

- 1 Open the **File** menu.
- 2 Click on the **Load File** menu item.
- 3 In the following menu box, double-click on the entry **STD\_900.cfg**.
- 4 In the program window, the name of the AUTOTEST appears under **Test Set Name**, while the **Test Step List** displays all the tests to be carried out in this AUTOTEST.
- 5 Click on any entry in the **Test Step List**. This will have an immediate effect on the as yet blank fields in the program window. These fields are now filled with the factory settings assigned to the test step you selected. Feel free to click on the individual fields and see what happens.
- 6 Close the program by opening the **File** menu and clicking on the **Quit Program** menu item. Choose **No** when the program asks you whether you want to save the file (changes are not saved).
- 7 Restart the program, then read the following pages to see how to configure your own AUTOTEST.

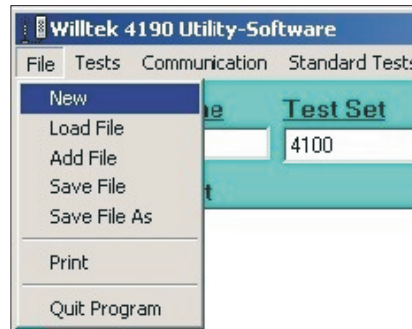
# Configuring an AUTOTEST

If you want to configure a completely new AUTOTEST without basing your work on an existing AUTOTEST, you must make sure that the **Test Step List** contains no entries. This is always the case when the program has just launched.

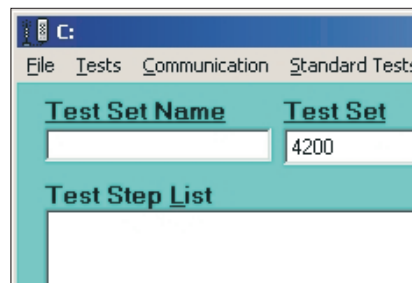
If the **Test Step List** does contain entries, you can delete them as follows:

## ■ Creating a new AUTOTEST


- 1 Open the **File** menu.
- 2 Click on the **New** menu item.
- 3 If you have not yet saved the most recently loaded AUTOTEST, you will be asked whether you want to do so now.



## 1. Choosing a mobile phone tester



- 1 From the **Test Set** pull-down menu, choose the model of the Willtek 4X00 series for which you want to configure the new AUTOTEST.

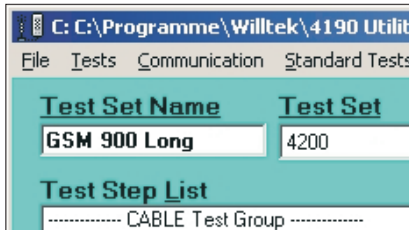
 The utility software will provide the functions that the model supports, depending on the choice you make. Functions that are illegal for the chosen model are greyed out and cannot be accessed.

You can change your choice of model later at any time, e.g. in order to convert a 4200S AUTOTEST to a 4100 AUTOTEST. Configuration settings that are illegal for the current model are automatically removed from the AUTOTEST. If, for example, the **Data Connect** check box has been selected and you change your choice of model to 4100, then the check box is greyed out (models in the 4100 series do not support a data connection). Configuration settings that are removed

automatically in this way have to be re-entered when such a change of model is cancelled.

- ☞ Before changing the choice of model for a largely configured AUTOTEST to try things out, you should always save the AUTOTEST.

## 2. Giving an AUTOTEST a name



- 1 Enter the name of the new AUTOTEST under **Test Set Name**.

### ■ Change in the program window

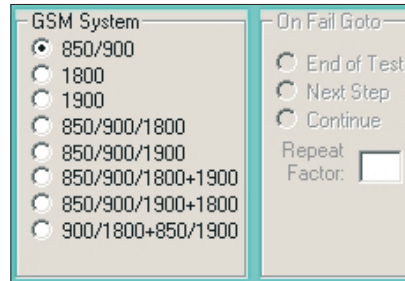
None.

### ■ Effect on the AUTOTEST

The name you choose will be displayed by the Willtek 4X00 in its *AUTOTEST* menu (menu for selecting available AUTOTESTs).

- ☞ The name you choose must not be longer than 20 characters if you want it to appear in full on the display of a Willtek 4X00.

### 3. Selecting a mobile radio system



**Example:**  
 850/900/1900+1800 = Combination of dual band 850/900/1900 and single band 1800

1 In the **GSM System** menu box, click on the mobile radio system for which the AUTOTEST is to be configured.

**Change in the program window**

A mobile radio system is selected. You may select a different system at any time. You should therefore ensure that you have not inadvertently selected the wrong system.

**Effect on the AUTOTEST**

Your choice of mobile radio system will be used by the Willtek 4X00 to set an appropriate transmit/receive frequency. It is therefore important that you select a system that is actually supported by the tester!

The individual models of the Willtek 4X00 series support the following radio systems:

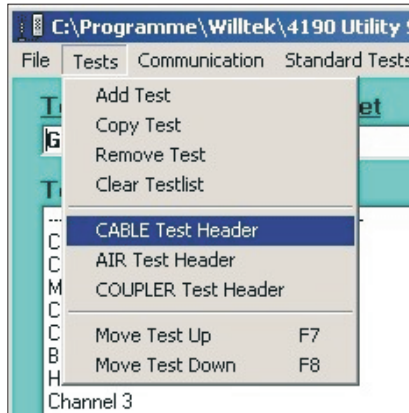
Modell	Mobile Radio System					
	850/900 GSM900	1800 GSM1800	1900 GSM1900	850/900/1800 850/900/1900 dual band	850/900/1800+1900 850/900/1900+1800 triple band	900/1800+850/1900 quad band
WAVETEK 4103(S) #	✓					
WAVETEK 4104(S) #		✓				
WAVETEK 4105(S) #			✓			
WAVETEK 4106(S) #	✓	✓	✓			
WAVETEK 4107light #	✓	✓	✓	✓		
Willtek 4107*	✓	✓	✓	✓	✓	
Willtek 4107S*	✓	✓	✓	✓	✓	
Willtek 4201S*	✓	✓	✓	✓	✓	
Willtek 4201A	✓	✓	✓	✓	✓	✓
Willtek 4202S*	✓	✓	✓	✓	✓	✓
Willtek 4202R*	✓	✓	✓	✓	✓	✓
Willtek 4208*	✓	✓	✓	✓	✓	✓

# Model no longer in production. \* Model also on the market with the older labels Wavetek and Acterna.  
 850 (GSM850) is an extra GSM-frequency band usable only with 420X testers (option required).

An AUTOTEST can be assigned one radio system only.



## 4. Antenna or cable?



By assigning so-called headers, you specify the connection options that the AUTOTEST will subsequently offer the user. You can allow all three types of connection (cable, antenna or universal antenna coupler) or just individual types. The headers have a branching function: Depending on the type of connection the user subsequently opts for, only those tests below the relevant header will be executed.

### ■ Adding a header

- 1 Does the **Test Step List** already contain any tests? If so, click on the topmost test to insert the header in front of this test.

☞ The **Test Step List** must always begin with a header!

- 2 Open the **Tests** menu.
- 3 Click on the header you require from those available:

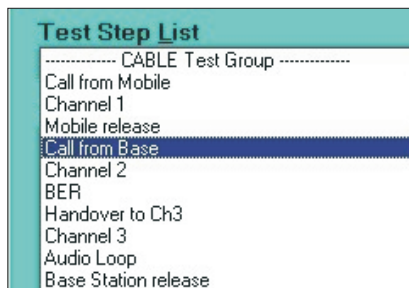
<b>CABLE</b>	Cable
<b>AIR</b>	Antenna
<b>COUPLER</b>	Universal antenna coupler

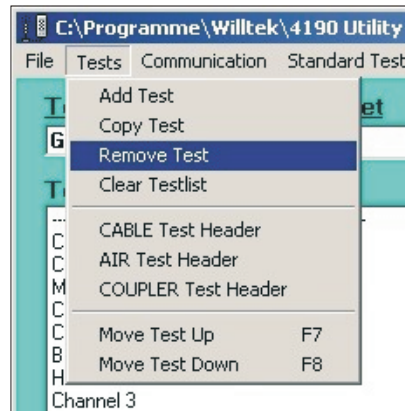
If the AUTOTEST is to offer the user more than one type of connection, open the menu again and click on a different header. You can move or delete any of the inserted headers at any time.

☞ Each header must appear only once in an AUTOTEST.

### ■ Change in the program window

The **Test Step List** acknowledges your choice of header by displaying the entries *CABLE Test Group*, *AIR Test Group* and *COUPLER Test Group*.





**Deleting/moving headers**

The **Tests** menu offers everything you need to process a header you have already inserted:

- Remove Test:** Deletes the selected header.
- Move Test Up:** Moves the selected header one position up (function key **[F7]** has the same effect).
- Move Test Down:** Moves the selected header one position down (function key **[F8]** has the same effect).

**Effect on the AUTOTEST**

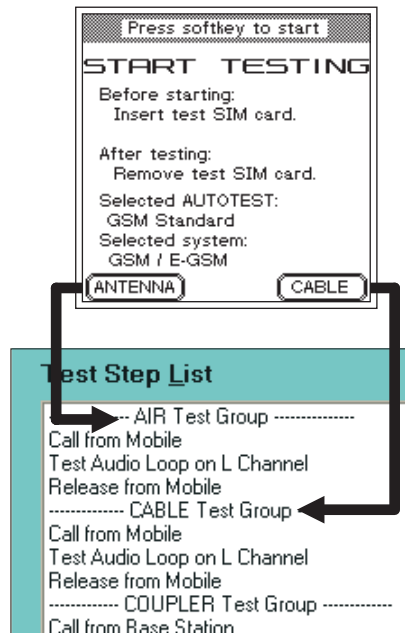
The headers within an AUTOTEST manifest themselves in different ways when the AUTOTEST is subsequently used.

**Manual start (4100 with firmware < 3.30 only)**

Depending on what headers the AUTOTEST contains, the tester displays the softkeys **(ANTENNA)**, **(CABLE)** or both in the *START TESTING* menu. If the AUTOTEST contains the header *COUPLER*, this cannot be accessed from a manual start; it can only be accessed when the AUTOTEST is started automatically.

As soon as the AUTOTEST is started using a softkey, the tester carries out the corresponding tests (those listed in the **Test Step List** window under *AIR Test Group* or *CABLE Test Group*) in sequence from top to bottom.

**Example:** This figure illustrates what happens when a softkey is pressed. If the user presses **(ANTENNA)**, the three tests located under the *AIR Test Group* header are executed, the AUTOTEST is terminated and a *PASSED/FAILED* result is assigned. **(CABLE)**, on the other hand has the following effect: The AUTOTEST ignores the *AIR Test Group*, executes the tests in the



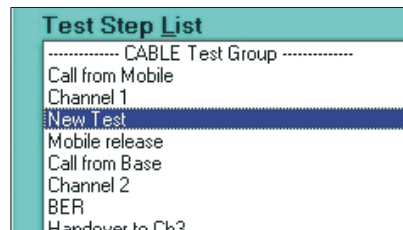
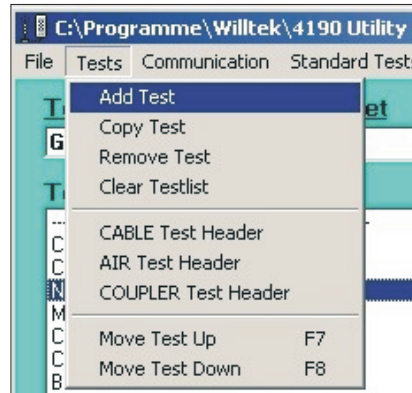
*CABLE Test Group* and assigns a *PASSED/FAILED* result on the basis of these tests.

#### ■ Start via MS TYPE menu

An AUTOTEST can only be started via the *MS TYPE* menu if the *MS TYPE* menu of the tester contains test parameter records. When entering these test parameters, the user must select the connection type required (see chapter 3 of the Willtek 4X00 User Guide). In contrast to a manual start (4100 with firmware < 3.30 only), the *COUPLER* connection type is also permitted. Depending on the choice of connection type (and the radio system selected previously), the tester then only offers those tests that contain a header which matches the one selected.

**Example:** An AUTOTEST contains the headers *AIR* and *CABLE*. During preparation of an test, the user enters the test parameters and selects eg the connection method *COUPLER* in the process. This means that the user will not be offered the AUTOTEST above during the next stage, since this AUTOTEST does not contain the header *COUPLER*.

## 5. Inserting a new test




- 1 In the **Test Step List**, click on the test after which you want the new test to be inserted. If the list does not contain any tests, click on the test group to which you want to assign the new test.
- 2 Open the **Tests** menu.
- 3 Click on the **Add Test** menu item.

### Change in the program window

A test called **New Test** is inserted in the specified position in the **Test Step List**. At the same time, the menu boxes in the program window display all the factory settings assigned to this test. You are free to modify these settings any way you like.

### Effect on the AUTOTEST

The test will be performed by a Willtek 4X00 at precisely the point at which it was inserted in the **Test Step List**.

 Be very careful to position each test correctly in the **Test Step List**.

The AUTOTEST might not work properly if the test steps appear in the wrong sequence. This is why, when you come to upload files from the PC to the tester at a later date, the compiler runs a plausibility check on the AUTOTEST and outputs any errors to the screen. For example, a reconnect will produce an error message if it is not preceded by a disconnect.

### ■ Deleting/moving tests

The **Tests** menu offers everything you need to process a test you have already inserted:

- Remove Test:** Deletes the selected test.
- Move Test Up:** Moves the selected test one position up (function key **F7** has the same effect).
- Move Test Down:** Moves the selected test one position down (function key **F8** has the same effect).
- Clear Testlist:** Deletes all tests in the **Test Step List**.

## 6. Adapting a new test

It is unlikely that a newly inserted **New Test** with its factory settings will meet your requirements. No problem: you are free to rename the test, and to arrange settings and configure measurements to suit your own needs.

### Renaming a test

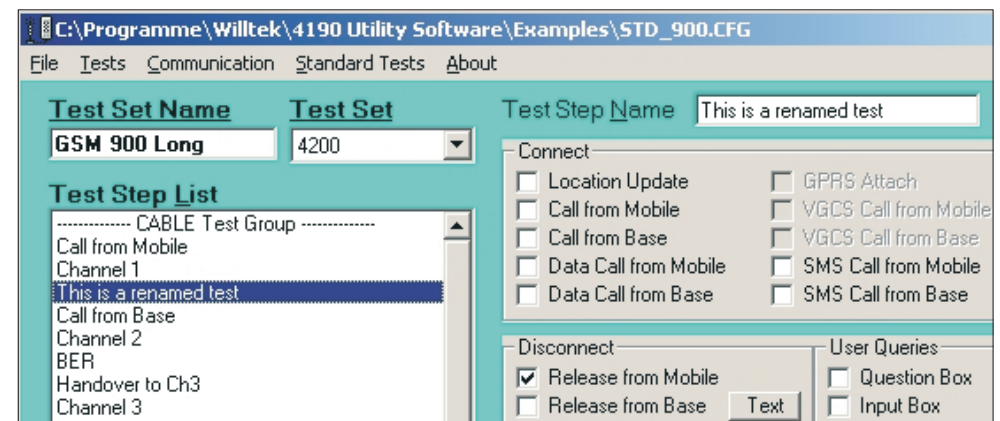
- 1 In the **Test Step List**, click on the test you want to rename. This copies the test's name into the **Test Step Name** field.
- 2 Now click on the **Test Step Name** field and alter the name appropriately.

#### Change in the program window

The new name appears immediately in the **Test Step List**.

#### Effect on the AUTOTEST

None. The names of individual tests serve only as an aid to orientation when you are configuring AUTOTESTs.




## Defining a test

Defining individual tests is the central task when configuring an AUTOTEST. It requires both a knowledge of GSM communications measuring equipment, and a good deal of care. Errors produced here can be harmless (increasing the length of a test unnecessarily), but they can also have serious consequences, such as falsifying *PASSED/FAILED* results.

You define a test by making appropriate entries in the following menu boxes:

- **Connect**
- **Disconnect**
- **User Queries**
- **Settings**
- **On Fail Goto**
- **Measurements**

 The entries you make in these menu boxes apply solely to the test that is currently highlighted in the **Test Step List**.

### ■ Full tests and partial tests

A single test can be assigned any number of entries via these menu boxes. For example, you might want to enter just one large test in the **Test Step List** and then assign that test all manner of conceivable tests and measurements in the boxes.

It can, however, make much more sense to have a string of partial tests rather than a single complete one. In this case, you can use the **On Fail Goto** menu box to specify separately for each test how the AUTOTEST should react to a problem reported in that partial test. This approach can reduce the length of an overall test considerably, say when a partial test reports a serious error which renders all further individual tests meaningless.

### ■ Processing a test

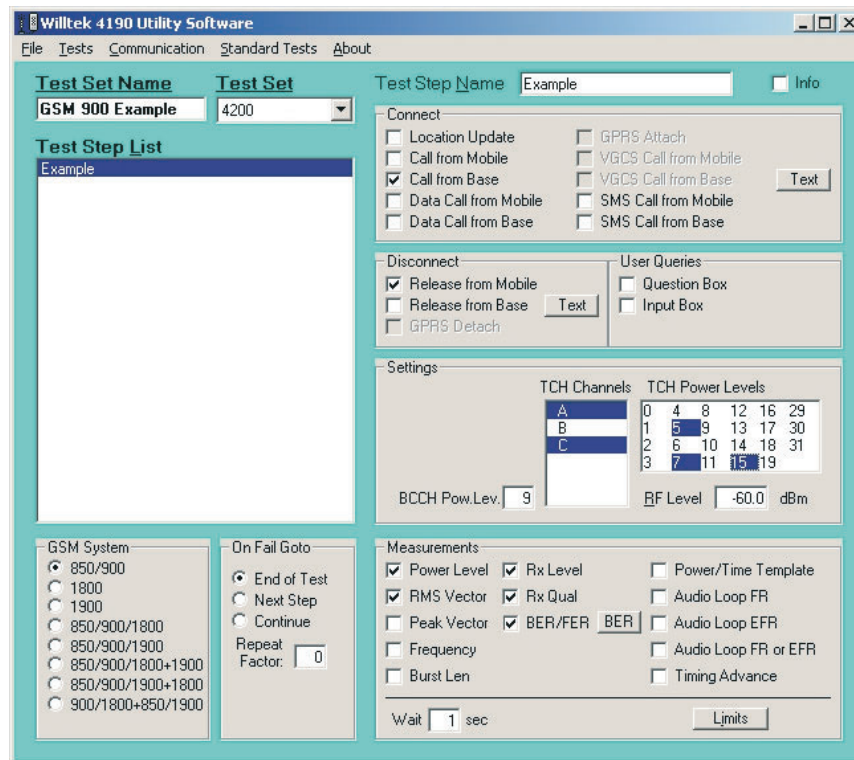
An Willtek 4X00 always processes a test in the same sequence:

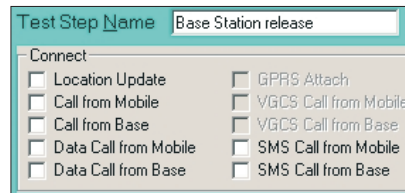
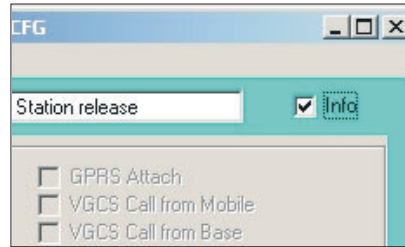
- 1 **Connect:** If one of the **Call...** check boxes is selected under **Connect**, then an attempt is made to establish a connection using the values defined under **Settings**.  
Connection successful: Continue at step 2.  
Connection unsuccessful: Continue at step 3.  
If no **Call...** check box is selected under **Connect**, then the test starts with step 2.
- 2 **Settings:** The tester sets the RF parameters entered in the various fields. If more than one channel is highlighted under **TCH Channels**, the test always runs from **A** to **C**. For each highlighted TCH in turn, the tester then sets the values highlighted under **TCH Power Levels**, beginning with the power level which represents the highest value (note the relationship between level value and power level). At each highlighted power level, the tester then performs the measurements checked under **Measurements**.
- 3 If an error is reported for a particular signalling or measurement, the entry in the **On Fail Goto** menu box determines how the tester will react (Abort/Continue).
- 4 **Disconnect:** Once all the measurements have been completed for all the highlighted TCHs at all the selected power levels, the tester sees whether a box is checked under **Disconnect**. If so, the appropriate signalling is transmitted.
- 5 The tester now checks whether another test is pending in the **Test Step List**. If so, this test is also processed in the manner described above. If not, *PASS/FAIL* evaluation of the individual signalings/measurements begins, and the results are output to the tester's display.



**Example:** The GSM test *Example* (see illustration) is processed as follows:

- 1 Connect with **Call from Base** (RF Level = -60 dBm; Preatt = 1.5 dB; BCCH Power Level = 9).
- 2 The tester switches the mobile phone to TCH A (the user must enter the precise channel number on the Willtek 4X00), and sets **TCH Power Levels 5**.
- 3 All the measurements checked in the **Measurements** box are performed.
- 4 The same measurements are repeated at **TCH Power Levels 7 and 15**.
- 5 The tester switches to TCH C. The same measurements are repeated at **TCH Power Levels 5, 7 and 15**.
- 6 If an error is reported for a particular signalling or measurement, the routine jumps to the end of the *Example* test (see the **On Fail Goto** menu box).
- 7 Disconnect with **Release from Base**.





**Info**

The name of a test in the **Test Step List** can also be displayed on the Willtek 4X00 (info display) when the AUTOTEST is subsequently executed. The user can call up this info display, for example to find out what test the tester is currently executing. The **Info** check box allows you to decide for each individual test whether the name of the test is to be displayed (box checked) or not (box not checked) on the Willtek 4X00 display.

**Connect**

The following check boxes are available to control connection setup at the beginning of an AUTOTEST.

**Location Update**

This forces a location update of the mobile phone (meaningful when the unit to be tested does not feature the test SIM but another SIM). If you also select one of the **Call...** check boxes, the location update is carried out first and the connection is set up afterwards.

**Call from Mobile**

This sets up a connection from the mobile phone.

**Call from Base**

This sets up a connection from the tester.

**Data Call from Mobile**

This sets up a data connection from the mobile phone (or wireless device).

**Data Call from Base**

This sets up a data connection from the tester

**GPRS Attach**

Prepare the tester to receive an attach request from the mobile phone (the check box is only available if you have selected a 4202-GPRS model with the **Test Set** pull-down menu).

<b>VGCS Call f. Mobile</b>	The tester waits for a GSM-R group call initiated by the mobile phone.
<b>VGCS Call f. Base</b>	Initiates a GSM-R group call from the tester. Both VGCS check boxes are only available if you have selected the 4200R model with the <b>Test Set</b> pull-down menu.
<b>SMS Call f. Mobile</b>	Prompts the user to send a short message with a specified text.
<b>SMS Call f. Base</b>	Tester transmits a shot message to the mobile phone.

The **[Text]** button appears the moment you place a check in one of the **Call...** boxes. Clicking this button opens another box containing two input fields. The content of these fields is displayed by the Willtek 4X00 when the connection is set up:

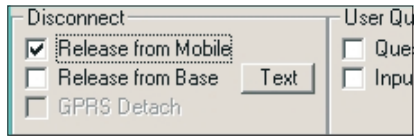
**Subject:** Message header.  
**Enter Text...:** Message.

One of **Call...** boxes must be checked if you are configuring a full test (the only test in the **Test Step List**).

If you configure a partial test and another partial test above the current one in the **Test Step List** already triggers connection setup, no renewed connection setup must be defined in the current test.

**Error messages:** During the compilation process of an AUTOTEST (see page 47) the program checks the connecting configurations and reports inadmissible settings with error messages. Inadmissible settings are e.g. the following configurations:

- Renewed connection setup without prior release of an established connection.
- Location update without prior release of an established connection.
- Instruction of an audio loop test with prior established data connection (no voice connection).



### ■ Disconnect

You define how the connection is to be cleared down at the end of an AUTOTEST by setting a tick in one of the check boxes. **GPRS Detach** is only available if you have selected a 4202-GPRS model with the **Test Set** pull-down menu.

The **[Text]** button appears the moment you place a check in the **Release from Mobile** box. Clicking this button opens another box containing two input fields. The content of these fields is displayed by the Willtek 4X00 when the connection is cleared down:

**Subject:** Message header.

**Enter Text...:** Message.

One of the two boxes must be checked if you are configuring a full test (the only test in the **Test Step List**).

Both boxes may remain unchecked if you are configuring a partial test which is not the very last (bottom) test in the **Test Step List**.

TCH Channels	TCH Power Levels					
A	0	4	8	12	16	29
B	1	5	9	13	17	30
C	2	6	10	14	18	31
	3	7	11	15	19	


RF Level  dBm

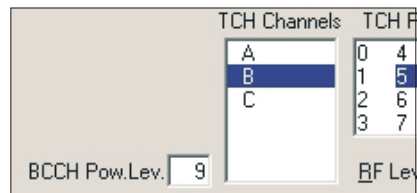
### Setting: RF Level

The value in this box defines the RF output level at which a Willtek 4X00 transmits signals to the mobile phone.

4100: Permitted values for RF Level	
GSM 900/E-GSM	-110 dBm through -45 dBm
GSM 1800/1900	-110 dBm through -50 dBm
4200S: Permitted values for RF Level	
GSM 900/E-GSM	-117 dBm through -38 dBm
GSM 1800/1900	-117 dBm through -44 dBm

A value must always be entered here, irrespective of whether you are configuring a full test or a partial test.


-  When configuring a series of partial tests, make sure that you do not enter different values for **RF Level** by mistake, as this might falsify the *PASSED/FAILED* result.



### ■ Setting: BCCH Power Level

The value in this field determines the power level at which the mobile phone transmits the RF signal on the BCCH channel. The input field accepts integer values from 0 through 19 (please check the permitted power levels for your mobile phone).


A value for the RF power level must always be entered, irrespective of whether you are configuring a full test or a partial test.

 When configuring a series of partial tests, make sure that you do not enter different values for **BCCH Power Level** by mistake, as this might falsify the *PASSED/FAILED* result.

### ■ Setting: Select BCCH

After selecting any call type in the **Connect** section, the check boxes for selecting the BCCH frequency band depend on the radio system selected in the **GSM System** section.

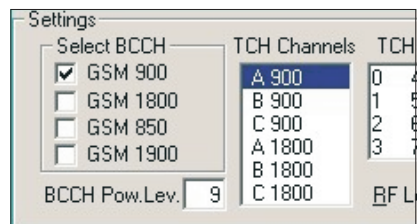
Depending on the selected system (dual, triple or quad band), two, three or four check boxes are offered to select the BCCH frequency band.

 **Triple band and quad band:** Multiband phones only support certain combinations of BCCH and TCH.

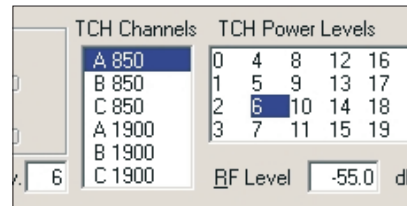
BCCH in the 850 MHz band: TCH can only be selected within the 850 and 1900 MHz bands.

BCCH in the 900 MHz band: TCH can only be selected within the 900 and 180 MHz bands.

By checking one of the boxes, you can now decide in which frequency band the BCCH connection is to be set up. For instance, the connection can be set up in the GSM 900 band, while TCH tests following immediately afterwards are carried out exclusively in the GSM 1800 band.



**Setting: TCH Channels**



The three settings in this box (dual-band systems: 2 x 3 settings) enable you to define the number of traffic channels (up to 3 per band) on which the current test will subsequently be run (see also the note on page 31). You can tell when a channel is selected by way of its color highlighting. The options here correspond to the following channels displayed on a Willtek 4X00:


At least one of the channels must always be selected, irrespective of whether you are configuring a full test or a partial test (see page 23).

**Special note on the Willtek 4100**

In an AUTOTEST, you can specify any number of channel changes between the three channels A, B and C and between the individual bands in multiband systems. However, the Willtek 4100 only has 15 lines available for outputting the results (as of firmware 3.30). Consequently, the results under *1. Channel* through *14. Channel* (which correspond to the first 13 channel changes) can still be assigned uniquely to the channel numbers (see figure). If, however, the AUTOTEST includes more channel changes, the test results for the 14th channel change onwards are grouped together under *Following Channels*. As of this point, it is not possible to assign a test result to a channel number. Although the tester shows exactly what tests failed in the detailed view, it displays a star instead of the channel number. The message *PASS* or *FAILED* next to *Following Channels* indicates that all tests as of the 14th channel change were successful or that at least one of these tests failed.





-  The test results are not grouped together in a test log which is printed or transferred to a PC. In such test logs, the result can always be assigned uniquely to a channel number. The Willtek 4200S does not group test results on the display.

#### ■ Tests on multiband phones

It is in principle possible to test a multiband (triple band or quad band) phone on all bands in sequence by simply selecting the required band when selecting the radio system. It is, however, better to immediately select the appropriate multiband since the time-consuming process of signing off and on again is then unnecessary (although not always). As channel numbers in the 1800 and 1900 bands are assigned twice, however, you should note the following:

- Channel changes between the 900 and 1900 bands and between the 1800 and 1900 bands are not possible for multiband phones.
- If the mobile phone does not always handle the process of switching between bands automatically, this must be done manually. Make sure you provide an appropriate message text for the user (see page 43).

Each switch between the 900/1800 bands and the 850/1900 band requires the following settings to be made in the corresponding test step:

- 1 Release the current connection (**Release...**).
- 2 Specify a new connection setup in the **Connect** menu box.
- 3 Choose the new band under **Select BCCH**.
- 4 Choose the traffic channels on which tests are to be performed under **TCH Channels**.

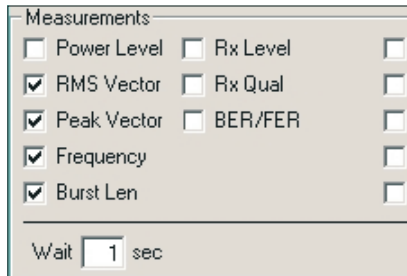
TCH Channels	TCH Power Levels					
A 850	0	4	8	12	16	29
B 850	1	5	9	13	17	30
C 850	2	6	10	14	18	31
A 1900	3	7	11	15	19	
B 1900						
C 1900						

RF Level  dBm

### ■ Setting: TCH Power Levels

The settings in this box enable you to define the RF power level at which the mobile phone is to transmit data on the TCH (traffic channel). You can select any of the 23 different settings, irrespective of whether you are creating a full test or a partial test. But you must always set at least one (please check the permitted power levels for your mobile phone). During the compilation process, inadmissible power levels are recognised and reported (see page 47).

When an Willtek 4X00 processes the test, the selected RF power levels are set on the mobile phone one after the other (starting with the highest power level), and the measurements selected under **Measurements** carried out at each level. The limit values assigned to each individual power level are used to assess the measurement values. This limits are accessible through the [**Limits**] button in the **Measurements** section.



Measurements

<input type="checkbox"/> Power Level	<input type="checkbox"/> Rx Level	<input type="checkbox"/>
<input checked="" type="checkbox"/> RMS Vector	<input type="checkbox"/> Rx Qual	<input type="checkbox"/>
<input checked="" type="checkbox"/> Peak Vector	<input type="checkbox"/> BER/FER	<input type="checkbox"/>
<input checked="" type="checkbox"/> Frequency		<input type="checkbox"/>
<input checked="" type="checkbox"/> Burst Len		<input type="checkbox"/>

Wait  sec

### ■ Measurements: Wait

The time taken by a mobile phone to fully execute an instruction (e.g. change channels) varies depending on the switching concept used. It is also the case that inaccurate *PASSED/FAILED* results are produced if a tester begins carrying out measurements too soon after an instruction has been issued. To this end, the **Wait** option enables you to selectively delay the start of measuring (the input field accepts integer values from 0 through 10 secs.).

When should a Wait be inserted?

- Once, just before the measurements listed under **Measurements** are carried out (that is, not before each individual measurement, but once at the start of the group of measurements).
- Once, prior to each individual **BER/FER** measurement (this measurement can be performed separately with up to eight different RF level values; see page 38).

**Measurements: Limits**

The [**Limits**] button opens a box in which you can specify tolerances governing *PASS/FAIL* results for the measurements you entered under **Measurements**.



**Limits Power Level** Here, you can enter specific tolerances for each individual RF power level. Relevant power levels previously selected under **TCH Power Levels** are highlighted. Configured tolerances apply to the **Power Level** measurement, provided this was set under **Measurements**.

**Limits Measurements** Here, you can enter additional tolerances for measurements you have set first under **Measurements**:

Limits Measurements		
Peak Vector	22.5	deg
RMS Vector	7.5	deg
Frequency	115	Hz
Burst Len +/-	10	µs
Rx-Level +/-	5	dB
Rx-Quality <=	4	
Tim.Adv. +/-	3.69	µs
Avg. Count	10	

When specifying tolerances, you should also take the measurement tolerances of an Willtek 4X00 into account (see Willtek 4X00 User Guide, chapter 3). Doing so will prevent a mobile phone that is otherwise in full working order from failing a test (result: *FAILED*) owing to the fact that tolerances have been set too stringently. For example, if you want to test a mobile phone according to GSM specifications, you should add the measuring tolerances to the specified GSM tolerances.

**Example:** The GSM specification permits a maximum frequency error of  $\pm 180$  Hz for a GSM 1800/1900 mobile phone. Adding this figure to the measurement tolerance of e.g.  $\pm 50$  Hz (4100) gives us an overall tolerance value of  $\pm 230$  Hz. If you keep to this figure, you can rest assured that a false *FAILED* result will not occur.

**Avg. Count** In order to ensure that random fluctuations in measured values do not lead to false *PASS/FAIL* results, we recommend you to take several measurements in succession and then derive an average on this basis. The value shown in the **Avg. Count** field determines the number of measurements that will be used to calculate this average. Only this average is of significance as far as the *PASS/FAIL* result is concerned. The higher the value in the **Avg. Count** box, the more negligible will be the effect on the end result of individual measurements exceeding the tolerances. However, as the number of measurements increases, so does the length of the test (recommended value: 10). The value in the **Avg. Count** box applies to all measurements whose tolerances are displayed under **[Limits]**.

### ■ Measurements

You use the check boxes under **Measurements** to define which measurements are to be performed during the current test. You may configure any number of measurements, but should make sure that every measurement you select has also been assigned correct tolerances under **[Limits]**. The exceptions to this rule are the tolerances for the **BER/FER** measurements, which are declared under **[BER]**.

*No tolerance limit can be assigned to **Power/Time Template. Audio Loop...** triggers a voice test that the user has to assess acoustically (no tolerance limits).*

**Timing Advance** If you select the measurement **Timing Advance (TA)**, you can enter the number of the TA bits (degree of the transmission delay compensation of the RF signal). Valid range: 0 to 63 bits.

The measurement of the timing advance is only possible with 420XS models (firmware version  $\geq 2.20$ ).

In the **[Limits]** box the limit for the timing advance measurement result is set to  $\mu\text{s}$ . Default value: 3.69  $\mu\text{s}$  (for more information see Willtek 4200S user guide, version  $\geq 0201-220-A$ , chapter 4).

**BER/FER** The moment you check the **BER/FER** box, the **[BER]** button appears. Choosing this button opens a box in which you can enter the RF output level of the tester, and the *PASS/FAIL* limit for the BER measurement. The box enables you to specify up to eight different levels and limits. If a BER measurement value exceeds the level entered in **RF-Level-x** by the amount specified in the associated **BER-Err-x** box and **FER-Err-x** box, the measurement will produce a *FAIL* result.

RF-Level-x	dBm	BER-Err-x	%	FER-Err-x	%
RF-Level-1	-96.0	0.30	%		%
RF-Level-2	-102.0	2.44	%		%
RF-Level-3			%		%
RF-Level-4			%		%
RF-Level-5			%		%
RF-Level-6			%		%
RF-Level-7			%		%
RF-Level-8			%		%

Samples: 1000

OK Cancel

With the entry in the field **Samples** you can decide individually about the number of bits used by the test pattern of the BER/FER measurement. Valid range: 500 to 100 000 bits. If you leave the fields empty, the measurement will use the default value of 500 bits for BER and FER.

The value you selected for the output level under **RF Level** (menu box: **Settings**) is deactivated for the duration of a BER measurement.

**Audio Loop** The following check boxes are available for the acoustic audio loop voice test (no voice tests if the **Data Connect** check box is selected under **Connect**):

Rx Level	<input type="checkbox"/> Power/Time Template
Rx Qual	<input checked="" type="checkbox"/> Audio Loop FR <span style="float: right;">Text</span>
BER/FER	<input type="checkbox"/> Audio Loop EFR
	<input type="checkbox"/> Audio Loop FR or EFR
	<input type="checkbox"/> Timing Advance

**Audio Loop FR** The mobile phone's voice codec is set to Full Rate (FR) mode for the voice test.

**Audio Loop EFR** The voice codec is set to Enhanced Full Rate (EFR) mode. If the mobile phone does not support EFR, this voice test is skipped in the AUTOTEST without any error message being output.

**Audio Loop FR or EFR** The voice codec is automatically set to the better EFR mode if the mobile phone supports this. Otherwise the test is carried out in FR mode.

**Audio Loopback** x

---

**Subject**  OK

**Enter Text for Audio Loop Procedure** Cancel

Speak into MIC  
listen to Loudspeaker.  
Press PASS or FAIL

**Text Softkeys**

**F1: FAIL** **F3: PASS**

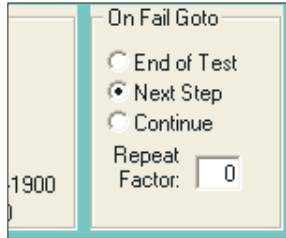
If you check an **Audio Loop** box, the **[Text]** button appears. Clicking on this button opens a dialog box containing further fields, the contents of which are displayed by the Willtek 4X00 during the speech test:

**Subject:** Message header.

**Enter Text...:** Message.

**Text Softkeys:** Name of softkeys with which the user can evaluate the speech test and also quit the test.





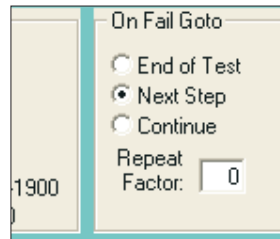
### ■ On Fail Goto

The boxes in the **On Fail Goto** menu allow you to define how the current test is to react in the event of a measured value producing a *FAIL* result (in order to avoid further unnecessary measurements taking place).

**End of Test** Both the current test and the complete AUTOTEST are aborted if the latter consists of several partial tests. This option is recommended in the event of serious errors which affect other measurements or impair the accuracy of their values.

**Next Step** The current test is aborted and the next test in the **Test Step List** is called. This option is recommended in the event of less serious errors which do not necessarily affect other measurements.

**Continue** No tests are aborted. All tests in the **Test Step List** are completed. Select this option if you want to see what effect a specific error will have on other measuring values.



### Repeat Factor

In the event of a problem during connection setup or cleardown, the entry in the **Repeat Factor** will cause the appropriate signalling to be retransmitted the given number of times. The **Repeat Factor** has no effect whatsoever on any other signalling and measurement.

Since the **Repeat Factor** is only ever activated in the event of a problem, it can be inserted without limitation in all Connect and Disconnect tests (**Call from Mobile/Base** and **Release from Mobile/Base**). This will prevent sporadic problems during connects and disconnects from automatically producing a *FAIL* result.

**Description of function** If a *FAIL* occurs during a connect or disconnect, the signalling is repeated the number of times specified in **Repeat Factor** (0 = no repeat). If one of these repeat attempts then produces a *PASS* result, the AUTOTEST leaves the program loop and – depending on the configuration – either begins with the measurements or starts processing the next partial test. In this case, the Connect/Disconnect test will produce a *PASS* result (even if it was preceded by one or more *FAILs*).

When an AUTOTEST reaches the end of the program loop following a string of *FAILs*, it proceeds to the **On Fail Goto** branch. Since a serious error will obviously have occurred, it would be wise for you to have selected the **End of Test** box there.

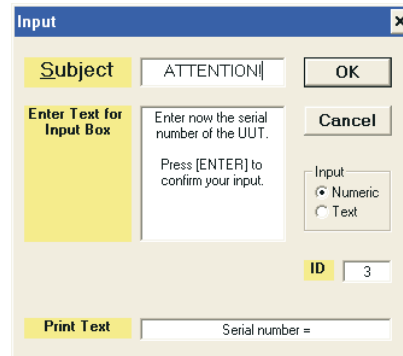
If you require several connects and disconnects in the course of an AUTOTEST, you can assign a separate **Repeat Factor** to each of these.

### ■ Question Box

By clicking on the **Question Box** button, you assign the entry currently selected in the **Test Step List** to a so-called "question box". At the same time, the **[Text]** button is displayed, allowing you to open the box. In the box, it is possible to define a dialog (message text and softkeys for acknowledging the message). This dialog is subsequently shown on the display of the Willtek 4X00 immediately before the relevant test is executed. You can assign a special dialog to each entry in the **Test Step List** (test and header).

The Question box contains the following input fields:

<b>Subject</b>	Title of the message.
<b>Enter Text...</b>	Message text, for instance an instruction to the user.
<b>Text Softkeys</b>	Name of the softkeys (F1 and F3) the user is to use to acknowledge the message. If the user presses F3, the Test Step List will continue to be executed. F1 has the effect of executing the steps declared under On Fail Goto.
<b>ID</b>	Identification number of the question box (optional input). The ID is useful if AUTOTEST logs are subsequently to be loaded into a PC (see chapter 6 of the Willtek 4X00 User Guide). Identifier A42 then indicates the ID, the softkey pressed (PASS/FAIL) and the log text (print text).
<b>Print Text</b>	The text entered here (short version of the message text) is included in the printed test log along with the PASS/FAIL name of the softkey pressed.



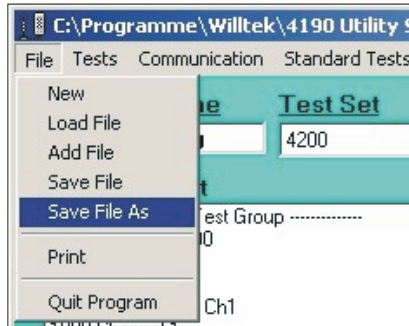
**Input Box**

The **Input Box** allows you to prompt the user to make an entry at any point during an AUTOTEST (e.g. the name of the tester or the serial number of the test unit). In the same way as the **Question box**, the **Input Box** shows a freely-definable message on the Willtek 4X00 display. Unlike the more significant **Question Box**, however, which allows the user to deliberately abort an AUTOTEST, for instance, the **Input Box** simply serves to enter the response made by the user in black and white in the test results.

Since the **Input Box** generally has nothing to do with measurements, it is permissible to use **Add Test** to make a new entry at the required position in the **Test Step List** and to assign only the **Input Box** to this entry. (Do this by checking **Input Box** and calling the input fields for the input box with the **[Text]** button).

<b>Subject</b>	Title of the message.
<b>Enter Text...</b>	Message text (prompt) for the user.
<b>Input</b>	Numeric: The user can only enter numbers (allows rapid entry, as the numeric keypad of the tester does not also have letters assigned to it).  Text: User can enter letters and numbers (numeric keypad has letters and numbers assigned to it as usual).
<b>ID</b>	Identification number of the input box (optional input). The ID is useful if AUTOTEST logs are subsequently to be loaded into a PC (see chapter 6 of the Willtek 4X00 User Guide). Identifier A43 then indicates the ID, the entry for "Print Text" and the response entered by the user.
<b>Print Text</b>	The text entered here (short version of the message text) is included in the printed test log along with the response entered by the user.

## 7. Saving an AUTOTEST

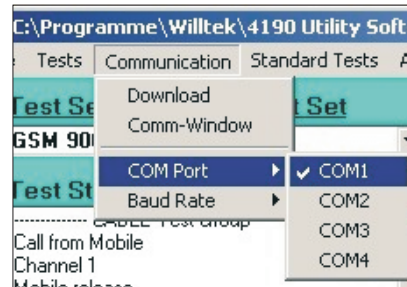


It is important that you save the AUTOTEST you are working on at frequent intervals while you are designing it. The first time you save an AUTOTEST, you will be asked to give it a name (**Save File As**). Thereafter, you can save the file and will not be prompted to enter a name.

- 1 Open the **File** menu.
- 2 Click on the **Save File As** menu item. This opens a standard Windows dialog box.
- 3 Double-click on the entry under **File Name** (title of box varies according to Windows version). The moment the entry is highlighted, you can either delete it or enter a new file name. You do not have to type in the ending *CFG*.
- 4 Save the AUTOTEST by clicking on the **[OK]** button in the dialog box.

## 8. Preparing for file transfer

The utility software allows you to compile a finished AUTOTEST and then load the resulting file into an Willtek 4X00.

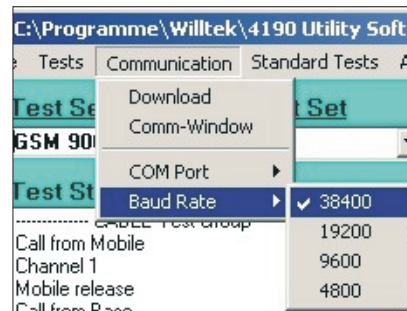


### ■ Connecting the cable

- 1 Connect a free data communications port (COM port) on your PC with the serial input port (RS-232-C) on the Willtek 4X00.

### ■ Selecting a COM port

- 2 Open the **Communication** menu.
- 3 Move the mouse pointer to the **COM Port** menu item. This opens a choice list.
- 4 In the choice list, click on the COM port you use for data communications.



### ■ Selecting the baud rate

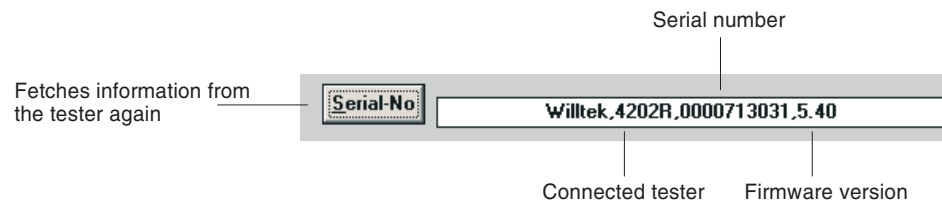
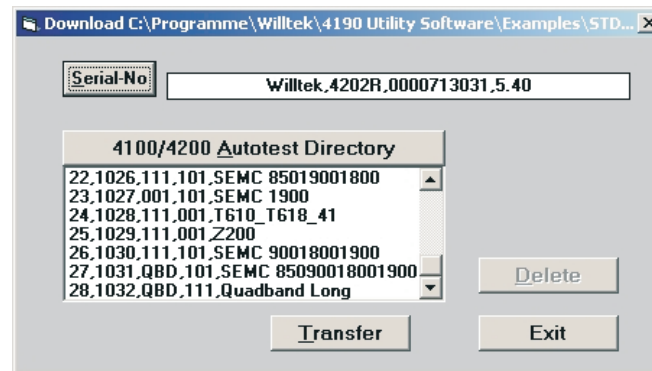
- 5 Open the **Communication** menu.
- 6 Move the mouse pointer to the **Baud Rate** menu item. This opens a choice list.
- 7 In the choice list, click on the desired baud rate.
- 8 Open the *SERIAL PORT* menu on the Willtek 4X00, and then select the same baud rate there as the one you set in the utility software.

## 9. File transfer



The Willtek 4X00 must not be connected to a mobile phone during a file transfer.

- 1 Open the **Communication** menu.
- 2 Click on the **Download** menu item. This starts the compilation process. The program now checks all the tests in the **Test Step List** for obvious errors (e.g. test not assigned to either Cable or Air test group, etc.). If an error is detected, the program will report the cause and refuse to compile the AUTOTEST.
- 3 If the AUTOTEST is free of errors, the program will compile it and then ask you whether it should start the download to the Willtek 4X00. If you respond with **Yes** to this prompt, the **Communication** dialog box appears. The window displays information on the connected Willtek 4X00 and the user-defined AUTOTESTs already stored in the tester.

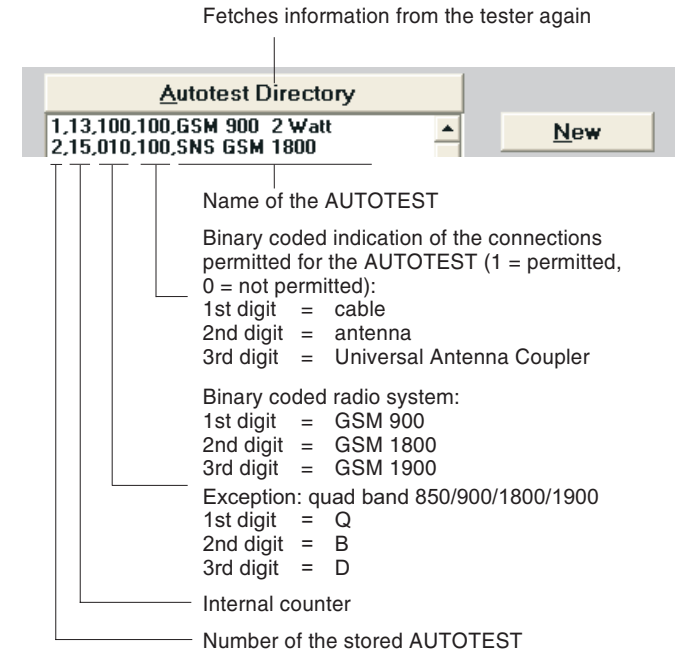


**Incorrect display?**

If the AUTOTEST directory does not show all the entries or if some of the entries are corrupted, transmission errors occurred when the information was queried. If this happens, you should reduce the baud rate (see page 46).

If you are working under Windows 95/98 or Windows 2000, you should also activate the FIFO buffer and choose the standard settings:

- Control panel
- System
- Device Manager
- Ports
- Communication Port x
- [Properties]
- Port Settings tab
- [Advanced]



- 4 If you want to overwrite an existing AUTOTEST, select it in the list displayed and then click on the **[Replace]** button.

If you want to upload a current AUTOTEST into the Willtek 4X00 for the first time, click on the **[New]** button.

To delete an AUTOTEST from the memory of an Willtek 4X00, first select the AUTOTEST in the list and then click on the **[Delete]** button.



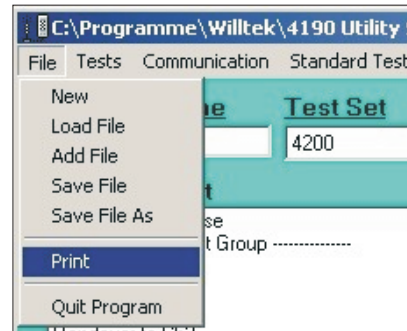
## Multiple file transfer

Once an AUTOTEST has been successfully compiled (see page 47), the configuration program automatically saves the compiled AUTOTEST (this function is locked in the trial version of the Utility Software). The name and directory are taken from the uncompiled AUTOTEST (\*.CFG), with the filename extension being replaced by \*.DLD (download data).

The DLD file is useful if you want to read the AUTOTEST into several Willtek 4X00 testers without changes. This avoids unnecessary recompilation.

- 1 Compile the AUTOTEST (if you have not already done so) by clicking **Download** in the **Communication** menu.
- 2 Respond to the query whether the download is to be started with **No**.
- 3 Call the **Communication** dialog box directly by clicking **Comm-Window** in the **Communication** menu.
- 4 Click at first on the **[4X00 Autotest Directory]** button then on the **[Transfer]** button and select the required AUTOTEST (with the extension *DLD*) in the new dialog box. Confirm your choice with **[OK]**.
- 5 The Communication dialog box is redisplayed (the title bar shows the name of the loaded DLD file). In this box, start the download (as described above) with **[Replace]** or **[New]**.
- 6 Close the dialog box with **[Exit]**, connect the next Willtek 4X00 and check that the data transfer settings are correct.
- 7 Repeat steps 3 through 6.

## 10. Archiving an AUTOTEST listing



You can store an AUTOTEST in the form of a listing for archiving purposes. The listing is a text file (ANSI format) in which you can read all the entries in the Test Step List and all the parameters set for a test.

- 1 Load the AUTOTEST you want to archive.
- 2 Open the **File** menu.
- 3 Click the **Print** command. The program then saves the text file. The file name and the directory are taken from the name of the AUTOTEST (\*.CFG). The filename extension is, however, changed to \*.TXT. When the file has been stored, the program starts the Windows Notepad and displays the listing on screen. You can now add further comments to the listing or print it as required.

*Extract from the listing of the AUTOTEST example.cfg*

```
Willtek 4X00 GSM/PCN/PCS Tester Version 1.21 Copyright
2001 Willtek Communications GmbH File Name: C:\4X00\EXAMPLE.CFG
*****
TEST SET NAME: GSM900 Example: CABLE Test
*****
Network Type is GSM
=== Test Step Name: Call from Mobile =====
Pre Attenuation: 2.0 dB   RF Power: -60.0 dBm   Setup BCCH Power Level:
9, Traffic Channel: A, TCH Power Level: 9 *** CALL from MOBILE:
,'CALL','Dial 123456 on Mobile and press SEND','','' *****
=== Test Step Name: Test Audio Loop on L Channel =====
AUDIO LOOP: ,'AUDIO','Audio Loop Procedure Speak a test message into
the phone and check for echo!','FAIL','PASS'
=== Test Step Name: Release from Mobile =====
+++ RELEASE from MOBILE: ,'RELEASE','Press the Disconnect Button on
Mobile','',''
=== Test Step Name: Call from Base Station =====
Setup BCCH Power Level: 9, Traffic Channel: A, TCH Power Level: 9 ***
CALL from BASESTATION: ,'CALL','Wait until Mobile is ringing and press
SEND','',''
```

# 4190 Utility Software – Timeline

The chronological Timeline tells you what modifications have been made to the firmware (SW) and the operating instructions. After a software update the Timeline helps you to find out quickly about all major changes (see code) in the updated operating instructions.

SW	Manual Version	Code: C = Correction I = Important Note N = New Feature M = Modified	
			Comment
1.00	9705-100-A	–	First edition of the manual
1.02	9708-102-A	C	Bug fixes
1.12	9712-112-A	N	8 input fields for FER limits
		N	New header COUPLER
		N	Question box for interactive dialogs before a test
		N	Print command for archiving AUTOTESTs
		N	Large Comm Window for more than 10 AUTOTESTs
		N	New command for easy starting a new AUTOTEST
		C	Bug fixes
		I	No download to a tester is permissible if the unit has established a connection to a mobile
		I	If TCH is changed more than 3 times, the 4X00 shows a summary under 3rd Channel
1.21	9805-121-A	N	Input box for user entries (eg serial number of unit under test)
		N	Field "Info" gives possibility to show or hide test step list on 4X00 display
		C	Bug fixes
		M	Communication window shows in the header the name of the actual DLD file (down load data)
		M	TCH method of indication changed from Low, Mid, High to A, B, C
1.22	9806-122-A	C	Bug fixes
1.32	9903-134-A	N	Program offers capabilities for testing dual-band mobile phones
1.33	9903-134-A	C	Bug fixes; setting item "Select CCCH" changed to "Select BCCH"
1.34	9903-134-A	C	Bug fixes
	9908-134-A	M	User Guide modified from 4100 to 4X00 (now valid for both, 4100 and 4200S series)
2.00	0007-201-A	N	Pull down menu to select type of tester
		N	Additionally connect settings for location update and data connect
		M	Unnecessary configuration settings E-GSM and pre-attenuation were eliminated
		N	At audio loop tests it is now possible to select FR and/or EFR mode (enhanced full rate)
2.01	0007-201-A	C	Bug fixes
	0007-201-B	M	Renaming of the program files (EXE, INI). Only one audio loop test selectable
2.10	0104-210-A	N	Program offers capabilities for testing triple-band mobile phones
		M	Changed description for the case of many TCH channel changes

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SW	Manual Version	Code: C = Correction I = Important Note N = New Feature M = Modified	Comment
2.10	0108-210-A	M	Brand naming changed from Wavetek to Acterna
		M	Selection of "Test Set name" now enforced
		C	Triple band: selected TCHs stay visible in case of BCCH changes
		C	Location update: BCCH entry possible; Handovers no more executed
		M	If field "Print text" is empty, text from "Input box" or "Question box" will be inserted
	0110-210-A	M	Internal modifications only
2.20	0207-220-A	M	Brand naming changed from Acterna to Willtek
		N	New measurement Timing Advance for 420XS models
		N	Individual setting of bit pattern length for BER/FER measurement (420XS models)
		M	Now GSM850 supported (option for 420XS models)
3.00	0407-300-A	N	Support for GPRS and VGCS (option of 420XS models)
3.13	0603-313-A	N	Supports quad band tests
		N	Allows definition of AUTOTESTs with sending and receiving SMS
		N	Adaptation to 32-bit operating system
		C	Bug fixes



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