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Getting Started Manual

4400 Mobile Phone Tester Series

For serial numbers
0911001 and higher

boosting wireless efficiency

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Ordering information This guide is a product of Willtek Communications, issued as part of the Willtek 4400 Mobile Phone Tester Series. The ordering number for a published guide is M 295 011. The ordering number for the product depends on the exact model as follows:

Table 1 4400 Series models and ordering numbers

Model	Ordering number
4403 Mobile Phone Tester	M 101 105
4405 Mobile Phone Tester	M 101 104

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About This Guide

This section contains the following basic information:

- "Purpose and scope" on page vi
- "Assumptions" on page vi
- "Related information" on page vi
- "Technical assistance" on page vii
- "Conventions" on page viii

Purpose and scope

The purpose of this guide is to help you get acquainted with the 4400. This guide includes instructions that describe how to install, configure, use, and get help with the 4400.

Applicability

This guide, including the Declaration of EU Conformity, is applicable to the 4400 Series Mobile Phone Testers with a serial number in the 0911xxx range.

Assumptions

This guide is intended for novice users who want to use the 4400 effectively and efficiently. We are assuming that you have basic computer and are familiar with basic telecommunication concepts and terminology.

Related information

Use this guide in conjunction with the following information:

M 290 011: GSM System Option user's guide

M 293 016: GSM/GPRS System Option user's guide

M 292 010: CDMA2000 System Option user's guide

M 294 249: WCDMA Options user's guide

M 294 251: TD-SCDMA Option user's guide

Technical assistance

If you need assistance or have questions related to the use of this product call one of Willtek's technical assistance centers. You can also contact Willtek by e-mail at customer.support@willtek.com.

Table 1 Technical assistance centers

Region	Phone number	Fax number
Europe, Middle East, Asia, Africa	+49 (0) 89 996 41 386	+49 (0) 89 996 41 440
Americas	+1 973 386 9696	+1 973 386 9191
China	+86 21 5836 6669	+86 21 5835 5238

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 key strokes.	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.

Safety Notes

1

This chapter provides the safety notes for the 4400. Topics discussed in this chapter include the following:

- "Safety class" on page 2
- "Taking into account before startup" on page 2
- "Operating the 4400" on page 2
- "During maintenance and repair" on page 3
- "Shutdown when defective" on page 3
- "Declaration of EU Conformity" on page 4

Safety class

The 4400 is built and tested in line with DIN 57411 part 1 (protective measures for electronic test equipment). The instrument complies with safety class I; it left the factory in a perfectly safe condition for operation. To make sure it stays this way and can be operated without any risk, please note the following instructions, which are based on section 17 of DIN 57411 part 1 a.

Taking into account before startup

Before powering on, ensure that the operating voltage which is permitted for 4400 (90 to 140 V_{AC}, 200 to 250 V_{AC}) is the same as your power source. 4400 adjusts itself automatically to the applied (permissible) line voltage.

The power plug must only be inserted in an outlet with a ground contact. Do not endanger the unit by using an extension cable without a protective conductor.

Operating the 4400

Do not interrupt protective conductor!
Risk of electric shock

Any interruption of the protective conductor inside or outside the instrument may result in electric shock.

Do not attempt to service this product yourself!
Risk of electric shock

Opening or removing covers may expose you to dangerous, high voltage points and other hazards. Refer all servicing to qualified service personnel.

During maintenance and repair

Maintenance and repair is only allowed to specially trained service technicians. Opening a unit without permission causes loss of warranty.

Live parts can be exposed when you open covers or remove components. Connecting parts can also be live.

Capacitors in the power supply can still be charged, even though the instrument has been separated from all voltage sources.

Only use fuses with identical specifications to the replaced ones. You should never patch fuses or short the fuse holder.

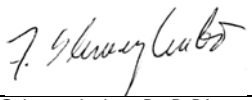
Shutdown when defective

If you think that it is unsafe to continue operating the 4400, shut it down immediately and contact your nearest Willtek service center.

In the following cases, safe operation is very likely to be no longer possible:

- if the instrument exhibits visible damage
- if the instrument will no longer work
- if stored under the wrong conditions
- following transport under adverse conditions

Declaration of EU Conformity

Manufacturer	Willtek Communications GmbH Gutenbergstr. 2 – 4 85737 Ismaning, Germany
Product designation	4400 Series
	The designated products conform to the following European directives:
Low voltage directive	**73/23/EEC**, has been superseded by the directive 93/68/EEC
EMC directive	**89/336/EEC**
	The conformity of these products to the above directives is demonstrated by application of the following standards:
EMC	**EN 61326** (Class A)
Safety	**EN 61010, Part 1**
Ismaning, January 30, 2003	 J. Schwarzhuber, R&D Director
	This declaration is not a guarantee of features. Pay attention to the safety instructions in the product documentation.

4400 Overview

2

This chapter provides a general description of the 4400. Topics discussed in this chapter include the following:

- "About the 4400" on page 6
- "Features and capabilities" on page 6
- "Options" on page 6
- "Physical description" on page 7

About the 4400

The instruments from the Willtek 4400 series are high-precision RF communication testers for transmitter and receiver testing. The 4400's capabilities can be extended by options for audio testing, spectrum measurements and many more.

This manual refers to the 4403 and 4405 variants of the Willtek 4400 Mobile Phone Tester series. Throughout this manual, all members of the Willtek 4400 series are simply referenced as the 4400.

Features and capabilities

The 4400 is a modular mobile phone tester for digital radio communication systems. The respective system option determines the radio test features. Typical features include:

- Transmitter measurements of the RF power and modulation characteristics
- Receiver tests based upon bit error rate measurements
- Spectrum measurements
- Remote control via GPIB or USB, based on SCPI commands
- Integrated programming environment RAPID!

Options

With additional hardware and software options you can extend your 4400's application range to provide audio signals and measurements or measure the current consumption of the mobile. Available options include, but are not restricted to, the following items:

- Options and system options for the cellular standards GSM, GPRS, EDGE, WCDMA (UMTS FDD), CDMA2000 including
- Audio Generator/Analyzer, Codec Options
- MS Power Supply Option, Current Measurement Option
- ACPM (ORFS) Option for GSM and GSM/GPRS

Physical description

When unpacking the 4400, ensure that you do not miss any of the items listed in section "Standard delivery" on page 10.

The user-accessible parts of the 4400 can be broken down into several sections:

- Front panel with screen, softkeys, numerical, cursor and function keys; RF, audio, MS power and USB connectors
- Rear panel with connectors for mains power, synchronization, printer, external monitor and control (USB, GPIB, RS-232)

First-Time Use

3

This chapter describes how to set up the 4400. The topics discussed in this chapter are as follows:

- "Standard delivery" on page 10
- "Power connector" on page 10

Standard delivery

The standard delivery includes:

- an instrument from the 4400 series (4403 or 4405)
- the manual pack including this getting started manual
- the calibration report
- a power cable

Options

If you ordered the 4400 together with options, these options are already installed and ready for use when you switch on the instrument.

Cardboard box

Keep the cardboard box for shipping the 4400 back to Willtek e.g. for factory calibration or a model upgrade.

Power connector

Supply voltage

Before powering on, ensure that the operating voltage at your location is permitted for 4400 (90 to 140 V_{AC} or 200 to 250 V_{AC}).

The 4400 adjusts itself automatically to the applied (permissible) line voltage.

Connect the supplied power cable to the line socket of the power supply module (rear of 4400) and then to a power outlet with a ground contact.

Switch on the 4400. The power switch is located on the rear of the 4400, above the socket of the power cable. The 4400 is in stand-by mode now.

Operation

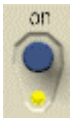
4

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

- "Powering the unit" on page 12
- "Navigating the user interface" on page 13
- "Using the online help" on page 15
- "Connecting the RF" on page 16
- "Connecting the audio parts" on page 18
- "Performing radio frequency (RF) measurements" on page 19

Powering the unit

Ensure that the 4400 is switched on. The power switch is located on the rear of the 4400, above the socket of the power cable. When switched on, the 4400 is in stand-by mode; the light below the stand-by button on the front panel lights yellow.



Push the stand-by button to put the 4400 into operation mode. The stand-by light turns green.

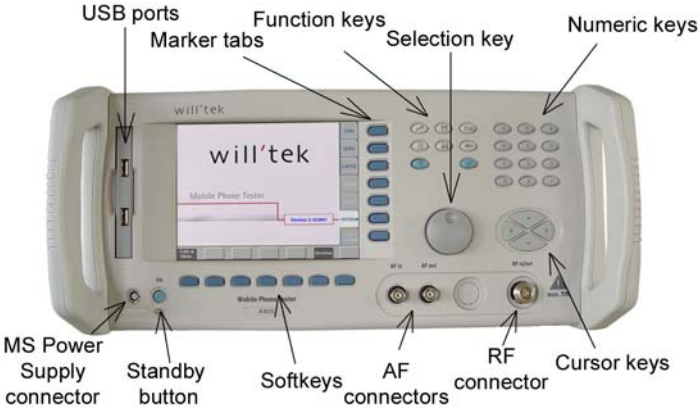
The display of the 4400 shows the text "`Loading...`". After this startup sequence, the start or Welcome screen appears.

In the Welcome screen, you can immediately start testing GSM mobiles in call mode by pressing the **Calls & Meas.** softkey below the TFT display.

Other sytems can be selected using the marker tabs on the right side of the TFT display, provided the options are installed.

Navigating the user interface

This is a short description of the front panel of the 4400. You will find a detailed description of the front panel in the online help.



Standby button This button switches the 4400 from stand-by mode to operating mode. The light below the button lights yellow in stand-by mode and green in operating mode.

MS Power Supply connector This connector can be used to feed the supply voltage to a mobile under test. It requires the MS Power Supply Option to be installed.

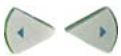
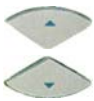
Numeric keys Used for entering numerical values into entry fields.

Function keys

With these important keys you get general control of the 4400.

	Shows the 4400 tools menu. Here you can start any 4400 tool such as the spectrum analyzer, RAPID! etc.
	Selects the first entry field of the previous/next group. In help mode they load the previous/next page of a menu of the online help.
	This key brings you one menu level up. If this causes a parameter change then you will be prompted to confirm or cancel the level change.
	Deletes the value left of the cursor in an entry field.
	Accepts a newly entered value in an entry field.
	Starts the online help. If the help key is used while in the online help, the "Help on help" is shown.
	Prints the screen contents on paper or stores it in a bmp file on floppy disk, depending on the printer setting under **Tools > Config > I/O**.

Cursor keys

	To get from one entry field to the previous or next one.
	To change the value of a numeric field or the setting of a selection field (scroll variable).

Selection key

Turning the selection key changes values in entry fields or scrolls through a page of the online help.

Softkeys The softkeys are the keys below the screen. Their individual functions depend on the state of the software and are described by the text at the lower end of the screen.

From the Welcome screen, use the softkeys to select one of the available test modes (e.g. Calls & Measurements), start the different tests and navigate through the online help.

Marker tabs Press a marker tab to select the communication system (e.g. GSM or GSM/GPRS) or to jump from one test menu to another. The function of the marker tab is shown on the TFT display next to the buttons. It will change on every new entered level. When in the online help, it lets you jump to another help topic.

RF socket (RF in/ out) Connect your mobile to this N-type socket.

Using the online help

You can start the online help from every menu by pressing the key.

The online help is the detailed operating manual of the 4400. It is a fully linked hypertext manual.

Connecting the RF

There are two ways of connecting a mobile to a tester:

- Cable connection
- Off-air connection

Both have their advantages and disadvantages.

Cable connection

With a cable connection, the RF socket of the tester is connected to the RF socket of the mobile (typically an antenna connector, e.g. for car-mount adapters). A shielded cable contributes to very accurate measurements.

However, if you need to test many different types of mobile phones, you will need many different cables or adapters, which increases test costs. Also, many new types of mobile phones do not have an RF socket anymore.

Off-air connection

With an off-air connection, the RF socket of the tester is connected to Willtek's Universal Antenna Coupler. This makes testing easy and fast. The mobile transmits via the antenna. No further test adapters are needed.

The coupling loss depends on factors such as orientation, distance and frequency. To a certain extent, this can be compensated with a coupling loss table.

Connecting the audio parts

Requires Audio Option

Any audio tests with the Willtek 4400 require the Audio Option to be installed.

The audio connection is used for testing the mobile's audio quality. The signal follows the path shown below: the analog audio signal from the mobile phone is fed to the AF in connector of the 4400; the analog audio signal from the AF out connector of the 4400 can be fed to the microphone input of the mobile phone. For best performance you will want to use shielded coax cables.

One example of an audio signal path is a sine wave generated by the 4400 which is fed to the headset connector of the phone, passes through both the encoder and decoder of the mobile and leaves the earphone.

The speech quality can be evaluated by comparing the two signals, either by ear, or in a more quantitative approach by the audio analyzer.

Performing radio frequency (RF) measurements

RF measurements can be divided into measurements on the transmitter and on the receiver.

Transmitter measurements

A transmitter test is carried out to evaluate the performance of the mobile's transmitter. These measurements can be divided into two main groups:

- **Power measurements:** Here the focus is on transmit power levels and level changes. In GSM, for example, the peak power measurement and the power/time template check are common examples.
- **Modulation quality checks:** In these measurements, the focus lies on the modulator. In GSM, phase and frequency error are measured.

Receiver measurements

Receiver measurements are also referred to as RX tests. In order to transfer speech and data correctly, the received bits must be detected properly. The common method in radio communication systems to test the receiver performance is the bit error rate measurement, often based on a signal loopback.

An additional method is to look at the mobile's internally generated evaluation of its received signal strength and quality. In many systems, the mobile reports these data to the network and hence can be displayed by the 4400 when it simulates a network to the mobile phone.

Publication History

Revision	Changes
9907-263-B	Initial revision.
0005-100-A	Power LED became yellow.
0101-100-B	Formal changes.
0112-110-A	MS Power Supply connector added. New Welcome screen.
0201-110-A	Blank page 18.
0208-120-A	New company name and layout.
0302-130-A	New declaration of EU conformity.
0603-090-A	New interfaces.

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Manual ident no.
M 295 011

Manual version
0603-090-A

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