

will'tek

Willtek 9190

Demo Signal Generator



user's guide

version 1.1

Notice	Every effort was made to ensure that the information in this document was accurate at the time of printing. However, information is subject to change without notice, and Willtek reserves the right to provide an addendum to this document with information not available at the time this document was created.
Copyright	© Copyright 2004 Willtek Communications GmbH. All rights reserved. Willtek and its logo are trademarks of Willtek Communications. All other trademarks and registered trademarks are the property of their respective owners. No part of this guide may be reproduced or transmitted electronically or otherwise without written permission of the publisher.
Trademarks	<p>Willtek is a trademark of Willtek Communications GmbH in Germany and other countries.</p> <p>Specifications, terms and conditions are subject to change without notice. All trademarks and registered trademarks are the property of their respective companies.</p>
Ordering information	This guide is issued as part of the 9190 Demo Signal Generator . The ordering number for a published guide is M 292 012. The ordering number for the 9190 Demo Signal Generator is M 860 289.

Table of Contents

About This Guide		v
	Purpose and scope.....	vi
	Assumptions.....	vi
	Related information.....	vi
	Technical assistance.....	vi
	Conventions.....	vii

Safety Notes		ix
---------------------	--	-----------

Chapter 1	Overview	1
	About the Demo Signal Generator.....	2
	Features and capabilities.....	2
	Physical description.....	3
	Specifications.....	3

Chapter 2	Operation	5
	Connecting the 9190 Demo Signal Generator.....	6
	Elements of the 9101 Handheld Spectrum Analyzer.....	7
	Demonstrating functions of the basic marker.....	8
	Demonstrating the multi-marker mode.....	10
	Demonstrating delta markers.....	11
	Demonstrating the zero span and the minimum hold function.....	12

Appendix A	Warranty and Repair	15
	Warranty information.....	16
	Equipment return instructions.....	17

Publication History

19

About This Guide

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

Purpose and scope

The purpose of this guide is to help you successfully use the Demo Signal Generator features and capabilities. This guide includes task-based instructions that describe how to install and use the Demo Signal Generator. Additionally, this guide provides repair information.

Assumptions

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

Related information

Use this guide in conjunction with the following information:

Willtek 9101 Handheld Spectrum Analyzer: user's guide, order number M 290 004.

Technical assistance

If you need assistance or have questions related to the use of this product or 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
UK	+44 (0) 20 8408 5720	+44 (0) 20 8397 6286
Europe, Middle East, Asia, Africa	+49 (0) 89 996 41 386 +49 (0) 89 996 41 227	+49 (0) 89 996 41 440
Americas	+1 317 595 2021 +1 866 WILLTEK	+1 317 595 2023

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.

Safety Notes

This chapter provides the safety notes for the Demo Signal Generator.



WARNING

Use the 9190 Demo Signal Generator only in conjunction with the power supply delivered with the 9100 Series Handheld Spectrum Analyzer. Using a different power supply may destroy the circuits of the Demo Signal Generator or the Handheld Spectrum Analyzer and the instruments may even catch fire.



HAZARD

Use the power supply adapter cable delivered with the 9190 Demo Signal Generator to ensure proper DC power supply for both the Demo Signal Generator and the Handheld Spectrum Analyzer.
Please also read section ["Connecting the 9190 Demo Signal Generator" on page 6](#) to learn how to set up the connections properly.

Overview

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

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

- ["About the Demo Signal Generator" on page 2](#)
- ["Features and capabilities" on page 2](#)
- ["Physical description" on page 3](#)
- ["Specifications" on page 3](#)

About the Demo Signal Generator

The purpose of the 9190 Demo Signal Generator is to provide training staff quick introductory help on how to best teach the functions of a spectrum analyzer. The 9190 is a an accessory for the 9100 Series Handheld Spectrum Analyzer and generates a periodic signal with a number of side waves that are suitable for demonstrating the effects of span selection and the usage of markers.

Features and capabilities

Generates a 19 MHz periodic signal

Generates harmonics that allow practical demonstrations of how to use a spectrum analyzer

Easy to use with the 9100 Series Handheld Spectrum Analyzer – no separate power supply required

Physical description

The 9190 Demo Signal Generator consists of a small box with an N-type connector to plug it into the RF socket of the 9100 Series. A power cable is provided to use the external power supply of the 9100 Series.

Specifications

Table 1 Specifications

Parameter	Specification
Output level	-12 dBm
Output frequency	19 MHz + harmonics
Power supply	9 to 15 V _{DC}
Current consumption	25 mA
Operating temperature	+10 to +40°C

Operation

2

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

- ["Connecting the 9190 Demo Signal Generator" on page 6](#)
- ["Elements of the 9101 Handheld Spectrum Analyzer" on page 7](#)
- ["Demonstrating functions of the basic marker" on page 8](#)
- ["Demonstrating the multi-marker mode" on page 10](#)
- ["Demonstrating delta markers" on page 11](#)
- ["Demonstrating the zero span and the minimum hold function" on page 12](#)

Connecting the 9190 Demo Signal Generator



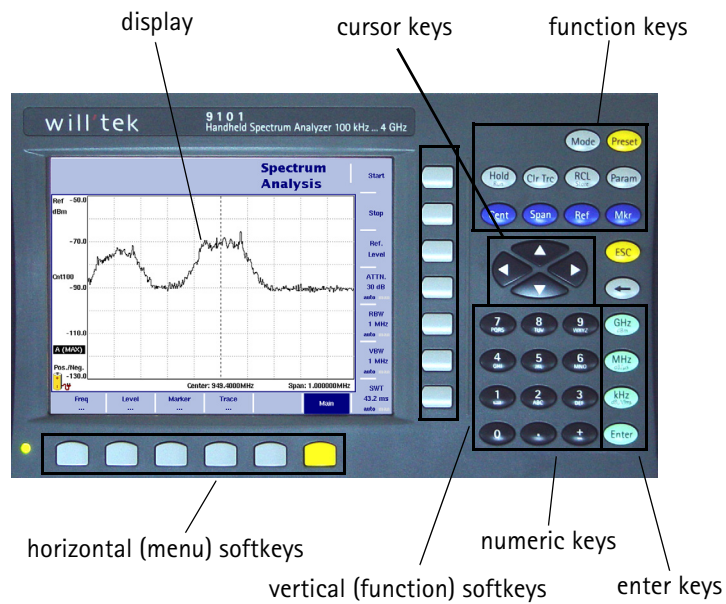
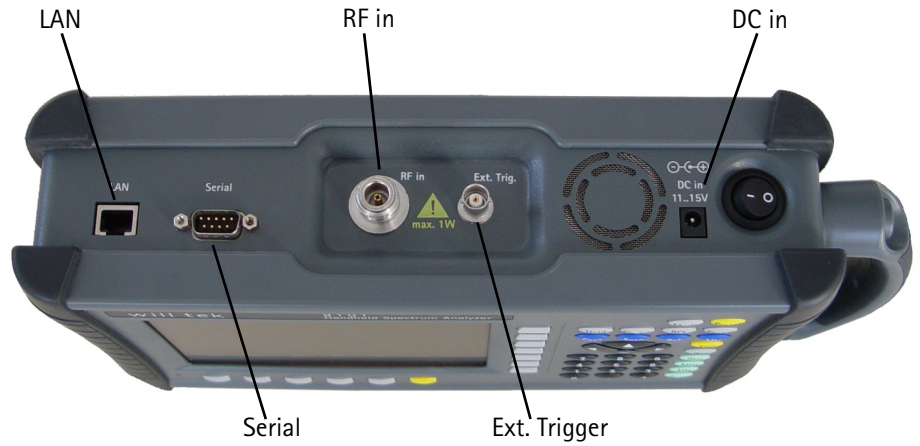
- 1 Screw the N-type connector of the Demo Signal Generator tightly to the 9100 Handheld Spectrum Analyzer.
- 2 Plug the DC connector of the power supply into the **DC** socket of the Demo Signal Generator.
- 3 Using the cable provided with the Demo Signal Generator, connect the open socket at the Demo Signal Generator with the **DC IN** socket of the 9100 Handheld Spectrum Analyzer.
- 4 Connect the mains plug of the power supply with a mains outlet.

The Demo Signal Generator is now operating, transmitting a signal to the 9100 Handheld Spectrum Analyzer, which may now be switched on.



Elements of the 9101 Handheld Spectrum Analyzer

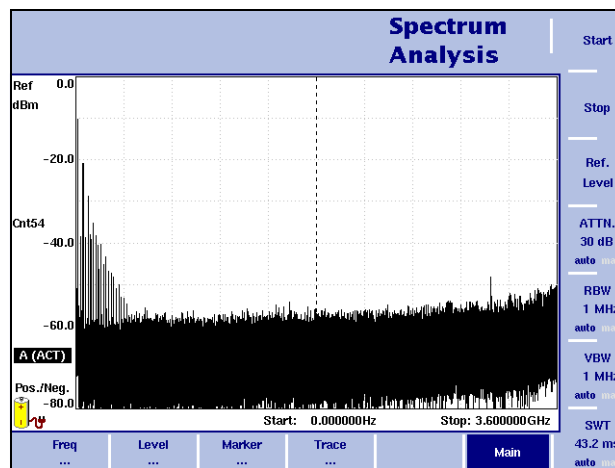
The following pictures explain the main elements to operate the 9100. For more detailed information, please refer to the 9100 Handheld Spectrum Analyzer user's guide.



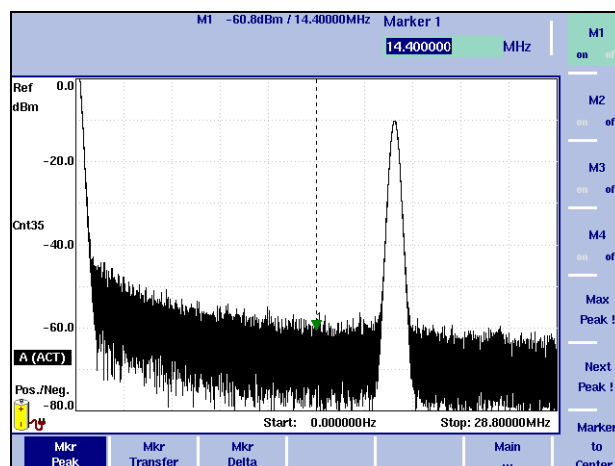
Demonstrating functions of the basic marker

The purpose of this exercise is to get acquainted with the Max Peak and Marker to Center functions.

- 1 Connect the 9190 Demo Signal Generator to the 9101 Handheld Spectrum Analyzer as explained in ["Connecting the 9190 Demo Signal Generator"](#) on page 6.
- 2 Push the **PRESET** function key to reset the 9101 to known (default) settings.
The 9101 shows a spectrum similar to the one below.



- 3 Push the **MKR** function key.
The Marker menu opens and marker 1 (M1) is automatically set to "Max Peak".
- 4 Push the **Marker to Center** function softkey to adjust the center frequency to the marker frequency.
The 9101 beeps and shows the display below:



Span reduced

The beep indicates that the span is being reduced. This is necessary because the analyzer changes the center frequency from 1800 MHz (setting after pre-set) to a value of about 15 MHz. With this new center frequency the span of 3600 MHz would lead to negative frequency values because the analyzer would still need to cover the frequency range of $15 \text{ MHz} \pm 1800 \text{ MHz}$. Negative frequencies do not make any sense, therefore the analyzer reduces the span so that the lowest frequency displayed is 0 Hz.

Signal on the left

The signal displayed at the left is the so-called "zero beep". This signal does not come from the demo generator; it is the carrier leakage of the first mixer. This is a normal situation on the 9101 and can also be observed on other analyzers.

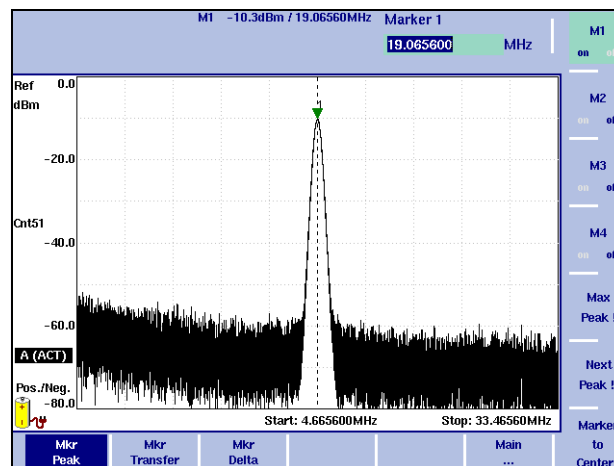
Peak not centered after "Marker to Center"

Often, after selecting **Marker to Center**, the signal is not centered on the display. This is normal and a result of the limited resolution of the markers. The example started with a span of 3600 MHz. This means each of the 500 pixels in the horizontal direction represented a frequency range of $3600/500 = 7.2 \text{ MHz}$. This means that the marker frequency value could be wrong by 7.2 MHz in the worst case. Marker frequency values become much more accurate after reducing the span.

5 Push **Max Peak** > **Marker to Center** > **Max Peak**.

The fundamental of the signal appears in the center and the marker is on the top of the peak.

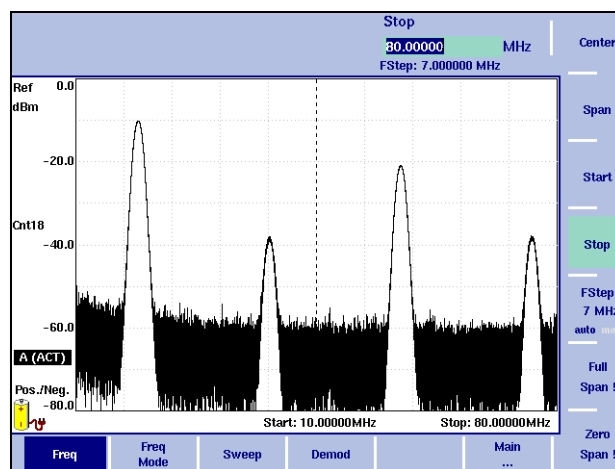
The marker readout shows the actual level and frequency.



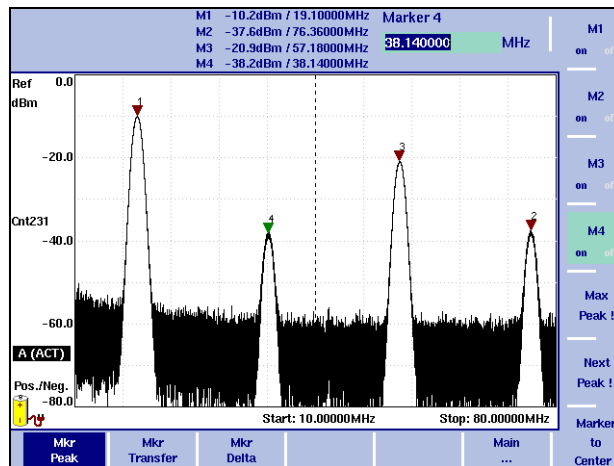
Demonstrating the multi-marker mode

This section shows you how to set up the 9101 Handheld Spectrum Analyzer so that you can read the absolute frequency and level for multiple peaks.

- 1 Push the **PRESET** function key to reset the 9101 to known (default) settings.
- 2 Push **CENT** hardkey, enter **19**, and close the entry field by pushing **MHZ**. The center frequency is set to 19 MHz.
- 3 Select 10 MHz as the start frequency: Push **Start**, enter **10**, and push **MHZ**.
- 4 Select 80 MHz as the stop frequency: Push **Stop**, enter **80**, and push **MHZ**. These settings result in a screen like the one below:



- 5 Push **MKR** to turn marker M1 on. The marker is automatically set to the highest peak.
- 6 Push **M2 on off > Next Peak > Next Peak**. Marker M2 is turned on and moved to the third highest peak.
- 7 Push **M3 on off > Next Peak**. Marker M3 is turned on and moved to the second highest peak.
- 8 Push **M4 on off > Next Peak > Next Peak > Next Peak**. Marker M4 is turned on and moved to the fourth highest peak. The result looks as follows:

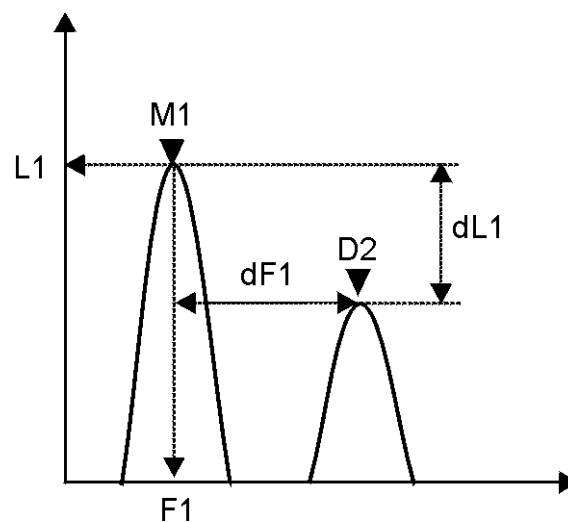


You can now view the frequency and level values of the four peaks in the marker readout field.

Demonstrating delta markers

This section shows you how you can compare the frequencies and levels of multiple peaks.

Marker M1 is always the reference point, i.e. this level and frequency reading is always given as absolute values (L1, F1 in the below figure). All delta marker results are relative to M1 (dL1, dF1).

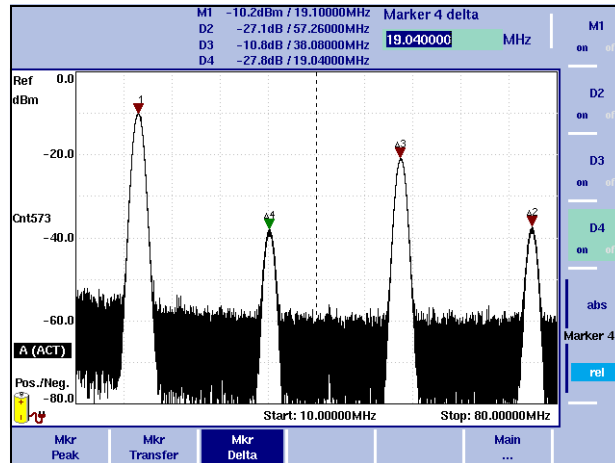


It is assumed that the steps in the previous section have been carried out beforehand. Markers M2 to M4 will be redefined as delta markers to obtain measurement results relative to M1.

- 1 Select **Mkr Delta**, activate M2 by pushing **M2 on off**, and change the M2 function to delta marker by pushing **(Marker 2) rel**.
 In both the marker readout field and the description of the function soft-

keys, M2 changes to D2 to indicate that this marker is a delta marker now. Frequency and level for D2 are relative to the values of M1, therefore the level is shown in dB rather than dBm.

- 2 Activate M3 by pushing **M3 on off**, and change the M3 function to delta marker by pushing **(Marker 3) rel.**
Marker M3 turns into delta marker D3.
- 3 Activate M4 by pushing **M4 on off**, and change the M4 function to delta marker by pushing **(Marker 4) rel.**
Marker M4 turns into delta marker D4. See figure below for an example.

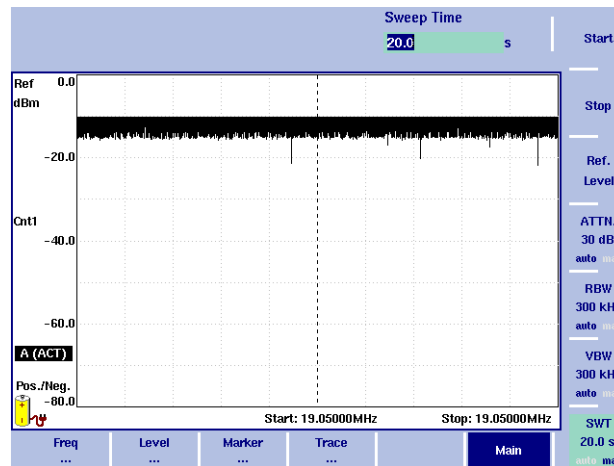


Demonstrating the zero span and the minimum hold function

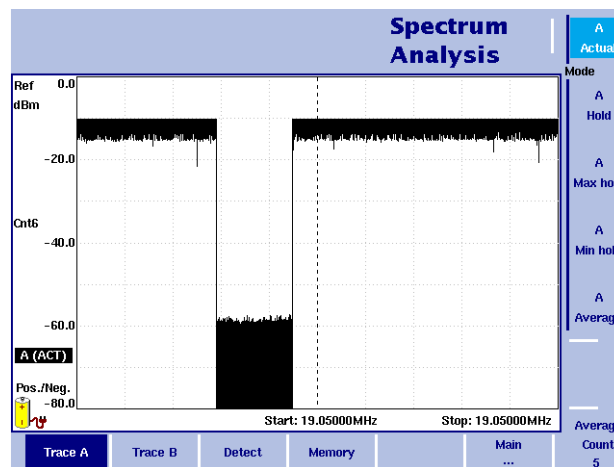
The minimum hold function allows you to detect intermittent drops of the RF signal level.

- 1 Push **PRESET > CENT**, type in **19.05**, and close the input field with **MHz**.
- 2 Push **Span**, type in **20**, and select **MHz**.
- 3 Push **Span**, type in **0**, and push **ENTER**.
The 9100 now displays the 19.05 MHz signal in the time domain and converted to baseband. The measurement bandwidth is 300 kHz. The result is a horizontal line.
- 4 Push **Main** to go back to the main menu.

- 5 Push **SWT**, type in **20**, and close the entry field with **ENTER**.
 The sweep time is 20 s now.

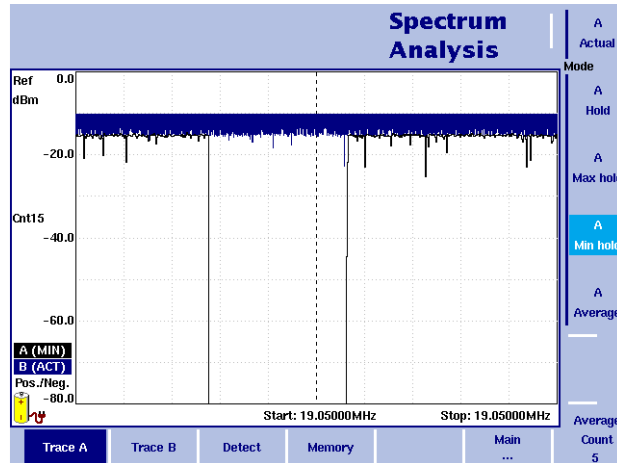


- 6 Disconnect the 9190 Demo Signal Generator from the 9100 for a few seconds, then connect it again.
 The power displayed on the screen goes down as expected, and up again. The proof of the effect disappears as the next sweep starts, i.e. you would have to observe the screen all time to discover the power drop. This can be overcome by enabling the minimum hold mode as follows.



- 7 Push **Trace > A Min Hold**.
 The trace is in minimum hold mode now.
- 8 Disconnect and connect the Demo Signal Generator again for some time.
 On the screen you can observe that the measurement result line drops. The difference to the previous try is that the minimum level values of the signal are not erased. With this an automatic detection of a drop in level of an RF signal is detected and kept on screen. Nobody needs to observe the display all time to detect level drops. You can still see the time for which the level was down unless the effect occurred more than once or if the level was down for more than the sweep time.
- 9 Switch back from minimum hold to actual measurements by pushing **Trace... > A actual**.

- 10 Push **Trace B > B Actual** to activate the second trace curve.
The 9100 now displays "Trace: A (act) B (act)" in the upper left corner.
- 11 Push **Trace A > A Min hold**.
- 12 Disconnect and connect again the Demo Signal Generator after a few seconds.
You can now observe both the current level (actual trace B, in blue) and the previous level drop (minimum hold curve in trace A, in black).



Warranty and Repair



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

- ["Warranty information" on page 16](#)
- ["Equipment return instructions" on page 17](#)

Warranty information

Willtek warrants that all of its products conform to Willtek's published specifications and are free from defects in materials and workmanship for a period of one year from the date of delivery to the original buyer, when used under normal operating conditions and within the service conditions for which they were designed. This warranty is not transferable and does not apply to used or demonstration products.

In case of a warranty claim, Willtek's obligation shall be limited to repairing, or at its option, replacing without charge, any assembly or component (except batteries) which in Willtek's sole opinion proves to be defective within the scope of the warranty. In the event Willtek is not able to modify, repair or replace nonconforming defective parts or components to a condition as warranted within a reasonable time after receipt thereof, the buyer shall receive credit in the amount of the original invoiced price of the product.

It is the buyer's responsibility to notify Willtek in writing of the defect or nonconformity within the warranty period and to return the affected product to Willtek's factory, designated service provider, or authorized service center within thirty (30) days after discovery of such defect or nonconformity. The buyer shall prepay shipping charges and insurance for products returned to Willtek or its designated service provider for warranty service. Willtek or its designated service provider shall pay costs for return of products to the buyer.

Willtek's obligation and the customer's sole remedy under this hardware warranty is limited to the repair or replacement, at Willtek's option, of the defective product. Willtek shall have no obligation to remedy any such defect if it can be shown: (a) that the product was altered, repaired, or reworked by any party other than Willtek without Willtek's written consent; (b) that such defects were the result of customer's improper storage, mishandling, abuse, or misuse of the product; (c) that such defects were the result of customer's use of the product in conjunction with equipment electronically or mechanically incompatible or of an inferior quality; or (d) that the defect was the result of damage by fire, explosion, power failure, or any act of nature.

The warranty described above is the buyer's sole and exclusive remedy and no other warranty, whether written or oral, expressed or implied by statute or course of dealing shall apply. Willtek specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. No statement, representation, agreement, or understanding, oral or written, made by an agent, distributor, or employee of Willtek, which is not contained in the foregoing warranty will be binding upon Willtek, unless made in writing and executed by an authorized representative of Willtek. Under no circumstances shall Willtek be liable for any direct, indirect, special, incidental, or consequential damages, expenses, or losses, including loss of profits, based on contract, tort, or any other legal theory.

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.
- Serial number, product type, and model.
- Warranty status. (If you are unsure of the warranty status of your instrument, include a copy of the invoice or delivery note.)
- Detailed description of the problem or service requested.
- Name and telephone number of the person to contact regarding questions about the repair.
- Return authorization (RA) number or reference number.

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.

Publication History

Revision	Comment
0307-100-A	First version.
0401-110-A	Adapted to new 9101 user interface. New Willtek contact details.

Willtek and its logo are trademarks of Willtek Communications GmbH. All other trademarks and registered trademarks are the property of their respective owners.

Specifications, terms and conditions are subject to change without notice.

© Copyright 2004 Willtek Communications GmbH. All rights reserved.

No part of this manual may be reproduced or transmitted in any form or by any means (printing, photocopying or any other method) without the express written permission of Willtek Communications GmbH.

Willtek Worldwide Offices

West Europe/Middle East/Africa

Willtek Communications GmbH
Gutenbergstr. 2 – 4
85737 Ismaning
Germany

info@willtek.com

Willtek Communications SARL
Aéroport – Bâtiment Aéronef
Rue de Copenhague – BP 9001
95728 Roissy CDG Cédex
France

willtek.fr@willtek.com

Willtek Communications Ltd.
Roebuck Place, Roebuck Road
Chessington
Surrey KT9 1EU
United Kingdom

willtek.uk@willtek.com

North America/Latin America

Willtek Communications Inc.
7369 Shadeland Station Way, Suite 200
Indianapolis, IN 46256
USA

willtek.us@willtek.com

Asia Pacific

Willtek Communications
22, Malacca Street
#09-00, Royal Brothers Building
Raffles Place
Singapore 048980

willtek.ap@willtek.com