Getting Started Manual

will'tek

# 8100 Series General Purpose Receiver

boosting wireless efficiency

**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 Communications reserves the right to provide an addendum to this document with information not available at the time this document was created.





**Ordering information** This guide is issued as part of the **8100 Series General Purpose Receiver**. The ordering number for a published guide is M 295 006. The ordering number for the product depends on the exact model as follows:

**Table 1** Models from the 8100 series

| **Model** | **Order number** |
|---|---|
| 8101 General Purpose Receiver | M 100 601 |
| 8102 General Purpose Receiver | M 100 602 |
| 8103 General Purpose Receiver | M 100 603 |

# Table of Contents

# About This Guide

This section contains the following basic information:

## Purpose and scope

The purpose of this guide is to help you successfully use the 8100 General Purpose Receiver features and capabilities. This guide includes task-based instructions that describe how to install the 8100 General Purpose Receiver. Additionally, this guide provides a description of Willtek's warranty and repair services.

## Assumptions

This guide is intended for novice users who want to use the 8100 General Purpose Receiver 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 8100 General Purpose Receiver: user's guide, ordering number M 290 006

# Technical assistance

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

**Table 1** Technical support contacts

| Region | Phone number | Fax number |
|---|---|---|
| Europe, Middle East, Asia, Africa | +49 (0) 89 996 41 311 | +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** Symbol conventions

| | |
|---|---|
|  | This symbol represents a general hazard. |
|  | This symbol represents a risk of electrical shock. |
|  | NOTE<br>This symbol represents a Note indicating related information or tip. |

**Table 3** Safety definitions

| | |
|---|---|
|  | WARNING<br>Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. |
|  | CAUTION<br>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 8100 General Purpose Receiver. Topics discussed in this chapter include the following:

# Safety instructions

CAUTION

Exercise care when removing the instrument from its shipping container to ensure that no damage has occurred.

CAUTION

It is inadvisable to leave the receiver exposed to strong direct sunlight or low temperatures for long periods before making measurements. The receiver temperature may fall outside that given in the specification so causing the measurement accuracy and display response to be impaired.

CAUTION

Care must be taken not to operate the receiver continuously at very high volume, to prevent damage to the receiver circuits and loudspeaker.

CAUTION

The internal NiCd battery is connected to pins on the Auxiliary 1 and Auxiliary 2 connectors. A fire risk could result if these pins are shorted to the chassis of the receiver.

# Overview

1

This chapter provides a general description of the 8100 General Purpose Receiver. Topics discussed in this chapter include the following:

# About the 8100 General Purpose Receiver

In the increasingly crowded VHF/UHF frequency band the need for spectrum management has never been more important than today. The 8100 General Purpose Receiver series of receivers and associated software will allow sophisticated measurements and spectrum scanning to be conducted with ease and speed with no sacrifice in accuracy. The 8100 General Purpose Receiver series offers a portable solution to many measurement and monitoring problems.

The 8100 General Purpose Receiver series has gained acceptance throughout the world in many applications covering 100 kHz to 2.5 GHz. It is an ideal measuring tool for mobile communications network planning and maintenance. Together with integrated software packages also available from Willtek they can form the basis of comprehensive measurement systems for:

- Signal monitoring
- Signal surveys – pedestrian and vehicular
- Broadcast coverage
- Cellular performance
- Personal communications networks

The front panel display allows access to all parameters and features of the unit and it has variable contrast to facilitate use in all lighting conditions. A signal level can be displayed numerically in selected units. For trend indications a bar graph indicates the level over the 84 dB dynamic range of the receiver (130 dB using internal automatic RF and IF attenuator). All main parameters - tuned frequency, measurement bandwidth, RF detector and time constants - are displayed. The squelch threshold is indicated on the bar graph and can be conveniently set from the front panel.

The modulation level of speech transmissions can be measured dynamically under operational conditions. A direct reading of FM deviation or peak AM percentage is displayed. Two isolated,

squelch operated change-over relays are provided to allow for simple remote monitoring, such as tape recorder switching, without the need of a controller.

For direct field strength readings in dBmV/m the antenna factors are automatically added to the signal strength reading when standard antennas are used.

For measurements on the move it is critical to have fast transfer of calibrated signal strength data. The 8100 General Purpose Receiver series can sample at a rate of 200 per second allowing signal strengths to be captured accurately. These measurements can be transferred over RS-232 allowing measurements to be made at speeds of up to 100 km/h.

In their scanning mode the 8100 General Purpose Receiver can scan sequentially from any selected start frequency to any stop frequency within their range. The scan is automatically stopped on any frequency with a signal level above a specified threshold. Variable "dwell" and "hold" times can also be selected. Up to 100 frequencies can be locked out during scanning.

## Features and capabilities

Wide frequency range 100 kHz to 1 GHz, 1.7 to 2.5 GHz

High sensitifity and overload warnings

130 dB total dynamic range, over 80 dB instantanious

0.5 dB level accuracy

Light and truly portable

Full working day´s use on internal batteries

Wide application range

- Transmitter site surveys
- Interference tracing
- Voice monitoring
- Direction finding
- Tracing of "rusty bolt" effects
- Channel occupancy
- Band usage
- Remote monitoring
- Field checking of modulation

## Physical description

There are three different variants of the 8100 General Purpose Receiver:

**Table 4** 8100 models

| Model | Order number | Bandwidth |
|---|---|---|
| 8101 | M 100 601 | 7.5, 15, 120 kHz |
| 8102 | M 100 602 | 7.5, 20, 120 kHz |
| 8103 | M 100 603 | 7.5, 15, 20, 120 kHz |

Each 8100 model is shipped with the following accessories:

- Telescopic monitoring antenna with N connector
- Leather case
- Vehicle charging lead
- RS-232 cable
- Battery charger
- Manual pack GPR (including this manual)

# Options

The following options are available with the 8100 General Purpose Receivers:

**Table 5** 8100 options

| Description | Order number |
|---|---|
| 30 kHz channel spacing (instead of 50 kHz) | M 248 610 |
| 200 kHz channel spacing (instead of 50 kHz) | M 248 611 |
| 30 & 200 kHz channel spacing (instead of 10 and 50 kHz) | M 248 612 |
| 200 kHz IF bandwidth (instead of 120 kHz, option to 8103) | M 248 613 |
| 8181 GPR Down Converter (1.7 to 2.5 GHz) | M 248 618 |

# Installation

2

This chapter describes how to install the 8100 General Purpose Receiver. The topics discussed in this chapter are as follows:

## Unpacking the instrument

Examine the shipping carton for damage before unpacking the equipment. If the carton has been damaged, have the carrier's agent present when the equipment is removed from the carton. Retain the shipping carton and padding material for the carrier's inspection, if damage to the equipment is evident after it has been unpacked.

Note

Exercise care when removing the instrument from its shipping container to ensure that no damage is incurred.

See that the equipment is complete, as listed on the packing slip. Visually examine the equipment for any evidence of physical damage. If any damage is evident, or if the contents are not complete, immediately notify the carrier and also your local Willtek sales office. After completing the physical inspection, the initial power-on checks should be performed.

## Charging and maintaining the batteries

### Introduction

The receiver contains a pack of eight "D"-size nickel cadmium cells, giving at least eight hours use. This life is considerably increased if the loudspeaker is operated at a low volume.

For the cells to be charged a 13.8 $V_{DC}$ source of suitable current rating is required (the normal charging current for a receiver is 500 mA). The battery charger delivered with the 8100 General Purpose Receiver is designed for this purpose.

Because the current limiting required for the nickel cadmium cells is carried out within the receiver, other DC sources can be used (including the use of a 12 V vehicle battery).

The receiver contains potentially hazardous nickel cadmium batteries, the safe disposal of which must be carried out in line with local government regulations.

## Charging the batteries

1 Connect the 15-bin connector on the battery charger to the Auxiliary 1 socket (15-pin compact D socket, male) located on the side panel.

2 Connect the power cable on the battery charger to a mains outlet.

The 8100 can be left on charge indefinitely, without any harm to the cells. The receiver can also be left on charge whilst it is in use (the batteries will be recharged, but at a reduced rate).

## Battery failure

There is no simple rule about the life of nickel cadmium cells because there are so many factors affecting their life, e.g. the number of charge/discharge cycles, the depth of discharges, the temperature, etc.

There are three main failure modes:

- Gradual loss of capacity
- Short-circuit
- Inability to accept charge

After several hundred charge/discharge cycles, a reduction in the order of 20% of original capacity will be experienced.

## Battery care

To prolong cell life it is good practice to occasionally run the batteries down so the battery warning is left sounding for several minutes. If the receiver is not going to be used for a long period of time, it should be stored with the cells in a fully charged condition.

It is inadvisable to leave the receiver on for a long time after the low battery warning operates, as one or more of the cells may become reverse polarized. When this happens, it is common for the cell not to accept any more charge.

When the cells are coming to the end of their charge/discharge life, it is possible for a sudden short-circuit in one of the cells to occur. If it is suspected that one or more of the cells is defective, or the capacity of the cells is below normal, the whole set of cells should be replaced.

In the interest of reliability, it is recommended that the cell pack be replaced every three years.

### Battery replacement

To remove the set of battery cells, remove the receiver from its leather case and remove the 8 screws around the bottom of the receiver to release the battery cover.

CAUTION

Do not incinerate or short-circuit old cells!

CAUTION

Do not operate the receiver with the battery charger connected and the batteries removed!

## Initial power-on checks

Carry out the initial power-on checks as follows:

1. Ensure that no external equipment is connected via the RS-232 interface.
2. Switch ON the equipment according to section "Powering the unit" on page 14 and check if the correct power-up indications result.

Lack of power available may be due to discharged batteries.

It is now recommended to get to know all the equipment functions by reading the rest of this getting started guide and also the user's guide and carrying out typical operations. A check of each operational function should be made as soon as possible after obtaining the equipment.

# Operation

3

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

# Powering the unit

CAUTION

It is inadvisable to leave the receiver exposed to direct strong sunlight or low temperatures for long periods before making measurements. The receiver temperature may fall outside that given in the specification so causing the measurement accuracy and display response to be impaired.

1 Make sure that the VOLUME control is turned down (fully counterclockwise).

2 Check that the DISPLAY control is turned up to approximately three-quarters of maximum (clockwise).

3 Press the ON/OFF switch on the left hand side of the receiver to ON.

4 Check that the display shows the receiver type, the version of the software and the date of issue; if not, take action as appropriate:

- Suspected discharged batteries. If discharged batteries are suspected, carry out battery charging as detailed in section "Charging the batteries" on page 9.
- Corrupted display readout. When this problem occurs, switch OFF the receiver, wait a few seconds, and then switch it back ON again.

Note

It may be necessary to readjust the DISPLAY control for the best contrast and viewing angle.

The receiver should now start calibrating, with the display reading "CALIBRATING" along with a signal level readout and bargraph. This takes about 10 seconds.

If dBµVm had previously been selected, the warning message "CHECK TYPE OF ANTENNA" should appear for 3 seconds, and a series of beeps should sound in the loudspeaker or headphones.

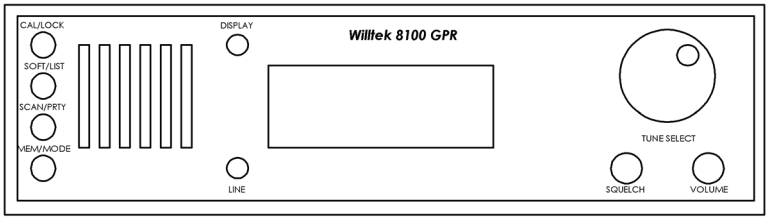
The receiver is now ready for use with the same status setup as when it was last switched OFF.

Note

On first switch on after delivery, the receiver status will be at the standard factory settings.

## Using the front panel

This section only serves as an overview. More details can be found in "Manually controlling the 8100 General Purpose Receiver" on page 16.




**CAL/LOCK —** Used to calibrate the receiver or to lock the controls.

**SOFT/LIST —** Invokes a list of functions or a memory list. Inside the list, the entries can be changed with this button.

**SCAN/PRTY —** Starts/stops scanning, or starts and stops sampling of a priority channel.

**MEM/MODE —** Enters the receiver status into a memory, or changes from frequency mode to memory mode.

**DISPLAY —** Knob to adjust the contrast of the liquid crystal display.

**LINE —** Knob to adjust the level at the 600 Ω audio output on the side panel.

**Liquid crystal display —** The output device for user interaction.

**TUNE SELECT —** Depending on the instrument mode, tunes through the receiver's frequency range; tunes through the memories, resumes memory scan, resumes limit scan, resumes priority channel, scrolls through memory, or scrolls through function list.

**SQUELCH —** Adjusts the squelch threshold.

**VOLUME —** Adjusts the volume to the loudspeaker and the external speaker socket on the side panel.

## Using the side panel

**Headphones/Speaker. —** This socket provides a nominal output of 1 W to 3 $W_{rms}$ into 8 Ω (dependent upon battery state).

**Line. —** This socket provides a low level audio output, variable using front panel LINE rotary control but nominally 0 dBm (into 600 Ω).

**RS-232-C —** 9-pin D socket, male, for serial interfacing with the 8100. See the user's guide for more details.

**Auxiliary 1 —** 15-pin compact D socket, male, for DC power and remote on/off control. See the user's guide for more details.

**Auxiliary 2 —** 15-pin D socket, female, to connect an external speaker and for various control purposes. See the user's guide for more details.

## Manually controlling the 8100 General Purpose Receiver

### Introduction

This section details the display and control features of the front panel. Example LCD display readouts are illustrated and described, along with the function of each control.

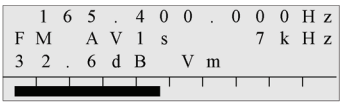
The control firmware of the receiver allows complex functions to be easily obtained and monitored; a single push-button enables more than 40 individual parameters to be set up and stored in non-volatile memory.

## Display features

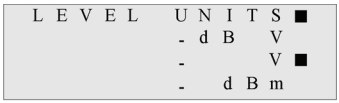
The receiver has a dot matrix LCD display. Either four lines of alphanumeric characters, or three lines of alphanumeric characters plus a bargraph along the bottom, can be shown.

The display has an adjustable viewing angle, controlled by the DISPLAY rotary control. The numeric readout of data facilitates greater resolution than the bargraph, however trends in signal level changes are more easily seen on the bargraph.

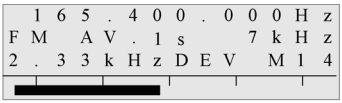

Display 1:
Function list



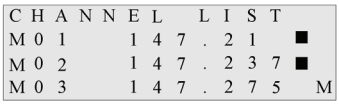

Display 4:
Field strength measurement



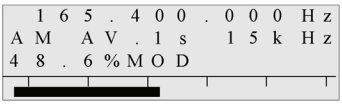

Display 2:
Selection 'FLAG'




Display 5:
Peak FM deviation




Display 3:
Memory list




Display 6:
Peak AM percentage

**Basic display features**

As there are many possible permutations of functions, it is not practical to show all possible displays, and the above figure is only intended to show the basic display features. A description of typical operating procedures performed to produce these displays is given in the full user's guide.

**Soft function display abbreviations**

The soft function is initiated by use of the SOFT/LIST push-button control (described later in this section). Table 6 details the abbreviations which may appear on the display, and their meaning.

**Table 6** Soft function display abbreviations

| Abbreviation | Meaning |
|---|---|
| ACD | Automatic calibration deselected (off) |
| ACS | Automatic calibration selected (on) |
| AFD | Automatic filter deselected (out) |
| AFS | Automatic filter selected (in) |
| ATD | Attenuator deselected (out) |
| ATS | Attenuator selected (in) |
| LEV | Readout displays signal level |
| LOD | Lockout deselected (off) |
| LOS | Lockout selected (on) |
| LUS | Level units soft-selectable |
| MOD | Modulation, readout displays AM percentage or FM deviation |
| RLD | Relative level deselected (off) |
| RLS | Relative level selected (on) |
| TS1 | Tuning steps 500 Hz |
| TS2 | Tuning steps 1 kHz |
| TS3 | Tuning steps 5 kHz |

**Table 6** Soft function display abbreviations

| Abbreviation | Meaning |
|---|---|
| TS4 | Tuning steps 6.25 kHz |
| TS5 | Tuning steps 10 kHz |
| TS6 | Tuning steps 12.5 kHz |
| TS7 | Tuning steps 20 kHz |
| TS8 | Tuning steps 25 kHz |
| TS9 | Tuning steps 50 kHz[a] |
| VAD | Variable averaging deselected (off) |
| VAS | Variable averaging selected (on) |

a. Options M 248 610 and M 248 611 have tuning steps 30 kHz and 200 kHz respectively for soft function TS9.

## Rotary controls

The receiver has five rotary controls mounted on the front panel as shown in Table 6. The following paragraphs detail the functions of these controls.

**Display control** This control sets the contrast and viewing angle of the display, and it should be adjusted for best readability.

**LINE control** This control adjusts the level of the 600 Ω audio line output.

**SQUELCH control** This control varies the threshold level at which the squelch (mute) opens. A visual indication of the threshold level is shown on the level bargraph scale, and the level can be varied with this control over the whole range of the bargraph.

The squelch level is part of the receiver status, and is stored in the memories and the priority channel. Moving the squelch control at any time when a memory or the priority channel is in operation, will change the level that is stored.

**VOLUME control** This control adjusts the level to the speaker and headphone output.

**TUNE/SELECT control** This is a multifunction rotary control:

- **Normal operation, frequency mode.** The control functions as a tuning control, and increments the frequency by one selected increment per click (frequency increments are selected using the function list, explained later).
  A speed up mechanism is incorporated, whereby the rate of incrementation increases when the control is turned more than one revolution per second, reaching maximum speed at three revolutions or more per second.
- **Normal operation, memory mode.** The control increments through the active memories at the rate of one memory per click (if turned slowly).
- **LIST selected.** When LIST is selected (see SOFT/LIST push-button) the control scrolls the list, and enables different functions to be selected. The functions of REL, VARIABLE AVE, LIMIT SCAN, SCAN DELAY and PRIORITY CHANNELS, plus, for VHF/UHF receivers only, ATTENUATION, have variable parameters which can be altered with this control.
- **Receiver scanning.** When the receiver is scanning in either frequency or memory modes, the control alters the direction of scan, and is used to resume scan (see SCAN/PRTY push-button).

## Push-button controls

The receiver has four multipurpose push-button controls. All push-buttons are of the non-locking type and the function selected depends upon the time that the push-button is pressed, and the receiver functions already in operation.

The push-buttons are operated in one of two ways:

- **A momentary press.** The push-button is pressed for less than half a second and a single "beep" is produced by the receiver.
- **A one-second press.** The push-button is pressed until a double "beep" is produced by the receiver, after one second.

**CAL/LOCK push-button**

This push-button is not functional when LIST is displayed.

**Functions whilst receiver is not scanning**

**CAL —** Receiver calibration (momentary press). The receiver will automatically calibrate itself with its built-in reference oscillator.

**LOCK —** Function lock (one-second press). The receiver will be "locked", inhibiting the use of a number of controls.

**Function whilst receiver is frequency-limit scanning**

A one second press (double beep), will make the present frequency dormant. This causes the frequency to be ignored during future scans.

**Function whilst receiver is memory scanning**

A one second press (double beep), will enter the present frequency into the lockout list. This causes the frequency to be ignored during future scans if the lockout is on.

**CAL function**

When the CAL function is initiated (momentary press), the word "CALIBRATING" will appear on the display, and the level of the calibration signal will be seen on the bargraph. The time taken to calibrate is about one second. If, due to a fault, the receiver fails to calibrate after three seconds, the word "UNCAL" will be shown in place of the level readout. The receiver can still be used to monitor signals, and it may still be possible that calibration might be achieved on other frequencies or bandwidths.

For maximum accuracy when making level measurements, the receiver should be recalibrated whenever a change of frequency or bandwidth is made. It is possible for this to be done automatically (see AUTO CAL in the full user's guide).

### Lock function

When the lock function is initiated (one second press) the following controls are inhibited:

- SOFT/LIST push-button
- SCAN/PRTY push-button
- MEM/MODE push-button
- TUNE/SELECT rotary control

Another one second press will return the operation of all these controls to normal.

To indicate that the receiver is in the 'locked' condition, the word "LOCKED" will alternatively flash with the displayed frequency. The receiver can still be calibrated whilst it is in the locked condition.

**SOFT/LIST push-button**

This push-button provides the following functions:

**SOFT —** Programmed function change (momentary press). Each momentary press of this button will step through, or switch ON or OFF, a preprogrammed function; a single beep occurring on every press.

**LIST FUNCTION, or MEMORY STATUS LIST, or PRIORITY CHANNEL STATUS (one-second press). —** Information on the operation these functions is given in the "List functions" section below.

### Soft function

By use of the function list, this button can be programmed to change the parameter of, or switch ON or OFF, almost any receiver function without going out of normal operation. The Soft function display abbreviations are listed in Table 6 on page 18.

### List functions

The list function provides different facilities depending on the current receiver status:

- Signal holding receiver on priority channel frequency: With priority channel operation selected (SCAN/PRTY push-button) and a signal holding the receiver on a priority channel frequency, the priority status list will be displayed. Using the TUNE/SELECT rotary control to scroll through the list, a momentary press will select the required functions.
- At all other times during normal operation: Either the function list or the memory status list is displayed, depending upon which mode has been selected (using the MEM/MODE push-button). Details for changing either of the above lists are given in the full user's guide.

In either of the above cases, a further one second press of the push-button will return the receiver to normal operation.

**SCAN/PRTY push-button**

This push-button is not functional when LIST is displayed.

The SCAN/PRTY push-button provides the following functions:

**SCAN —** Frequency scanning ON/OFF (momentary press). A momentary press of this button will start either frequency mode frequency scanning, or memory mode frequency and receiver status scanning, dependent upon the mode in use. A further momentary press will stop scanning.

**PRTY —** Priority channel operation (one second press). Selects or deselects priority channel operation.

### SCAN function

Scanning is available in both frequency mode and memory mode.

**Frequency mode:** In frequency mode, a momentary press will start the receiver scanning from the present frequency (if inside the limits) to the highest limit frequency in the frequency steps selected in the function list. If the TUNE/SELECT rotary control is turned one click or more counterclockwise, it will reverse the direc-

tion of scan (i.e. from the present frequency downwards). A clockwise turn on the TUNE/SELECT rotary control will again reverse the direction of scan. Setting the upper and lower scan limits is done using the function list.

**Memory mode:** Initiating the scan function in memory mode will cause the receiver to scan through the active memories. A clockwise or counterclockwise movement of the TUNE/SELECT rotary control will reverse the direction of scan as in frequency mode. The setting of the active and dormant memories is carried out in using the memory list function (see user's guide).

If the receiver stops on a signal (in either mode), scanning can be resumed by moving the TUNE/SELECT rotary control clockwise or counterclockwise, depending on the direction of scan required.

A resume time can also be set using the function list or memory list function, as appropriate. This will cause scanning to continue after the preset time has elapsed.

**PRTY function**

Up to two frequencies can be selected for priority channel operation by use of the SOFT/LIST push-button, as detailed under Function List in section 5 of the user's guide. A one second press of the SCAN/PRTY push-button will cause the priority channel or channels to be sampled at the rate set on the function list.

A further one-second press of the push-button will stop the priority channel sampling function.

Priority channel sampling is temporarily stopped when a list is displayed.

**MEM/MODE push-button**

This push-button provides the following functions:

**MEM —** Memorize receiver status (momentary press). Enters the current frequency and current receiver status into one of forty memories, and causes that memory to become active.

**MODE —** Select frequency or memory mode (one-second press). Each one second press changes the receiver to the other mode of operation.

### MEM function

As previously described, this function enables the current frequency and receiver status to be stored and causes the memory used to become active.

There are forty memories available, numbered M01 to M40. If when attempting to store frequency and receiver status details, all of the memories are full, the words "MEMORIES FULL" will momentarily appear on the display and four beeps will sound. To store another receiver frequency and status, some of the memories will have to be deleted using the memory list function (detailed in the user's guide).

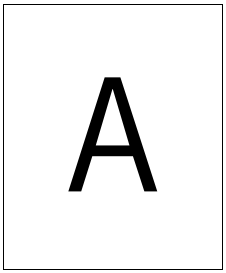
### MODE function

A one second press on the MEM/MODE push-button will change the mode of operation from frequency mode to memory mode (or vice versa).

When going from frequency mode to memory mode, the first memory recalled will be the last frequency and receiver status entered, or if in the meantime that memory has been deleted or made dormant, the memory recalled will be the next lowest number of active memory.

If when changing to memory mode, all the memories are either clear or dormant, the message ALL MEMORIES CLEAR or ALL MEMORIES DORMANT will appear as appropriate, and the receiver will maintain its frequency mode status in memory mode (given the memory number M00). This is only to indicate that the receiver is now in memory mode; M00 will not appear on the memory channel list, and this reference will disappear as soon as there is an available active memory.

# Warranty and Repair




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

# 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 (US customers), or reference number (European customers).

If possible, return the equipment using the original shipping container and material. Additional Willtek shipping containers are available from Willtek on request. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit. Willtek is not liable for any damage that may occur during

shipping. The customer should clearly mark the Willtek-issued RA or reference number on the outside of the package and ship it prepaid and insured to Willtek.

# Publication History

| Revision | Changes |
|---|---|
| 0304-100-A | First revision, for serial numbers 0506nnn. |
| 0710-100-A | New contact details, new layout. |

Manual ident no.
M 295 006

Manual version
0710-100-A

English

Willtek Communications GmbH
85737 Ismaning
Germany
Tel: +49 (0) 89 996 41-0
Fax: +49 (0) 89 996 41-440
info@willtek.com

Willtek Communications UK
Cheadle Hulme
United Kingdom
Tel: +44 (0) 161 486 3353
Fax: +44 (0) 161 486 3354
willtek.uk@willtek.com

Willtek Communications SARL
Roissy
France
Tel: +33 (0) 1 72 02 30 30
Fax: +33 (0) 1 49 38 01 06
willtek.fr@willtek.com

Willtek Communications Inc.
Parsippany
USA
Tel: +1 973 386 9696
Fax: +1 973 386 9191
willtek.cala@willtek.com
sales.us@willtek.com

Willtek Communications
Singapore
Asia Pacific
Tel: +65 6827 9670
Fax: +65 6827 9601
willtek.ap@willtek.com

Willtek Communications Ltd.
Shanghai
China
Tel: +86 21 5835 8039
Fax: +86 21 5835 5238
willtek.cn@willtek.com



will'tek