WAVECOM Recorder

W-REC Manual V2.1.0

by WAVECOM ELEKTRONIK AG



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Printed: Wednesday, November 01, 2017

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General Information

Welcome

Thank you for choosing a WAVECOM product. The product that you have purchased includes the latest technology in data recording, together with the latest software release available at the time of shipment.

Please check our website at http://www.wavecom.ch for software updates.

Before you install the product, please also check the latest documentation on the installation DVD or on our website.

WAVECOM ELEKTRONIK AG develops and sells products for wireless (HF/VHF/VHF/SHF) data monitoring and decoding in all frequency bands.

Data monitoring and decoding product families are currently available:

- W-PCI and W-PCIe are decoder hardwares with two physically independent channels.

  W74PC is a hardware decoder with four physically independent channels.
- W-CODE is a stand-alone decoder with native host hardware, like the built-in soundcard or other audio devices.
- W-PCI-LAN and W-PCIe-LAN consist of hardware (W-PCI and W-PCIe respectively) and corresponding, integral software (no additional order of the software required).
- W-SPECTRA is a complete automatic online spectrum monitoring system with direct receiver (Software Defined Radio SDR) control, wideband signal recording, classification, decoding and database capturing.

Revisions

Version	Date	Changes
1.0.0	01-Oct-2015	Product release.
1.1.0	11-Feb-2016	The "Center Frequency" can be changed during recording on-the-fly.
2.0.0	20-Sept-2016	Extend the recording at 70 MHz IF input. Convenient to record satellite signals and standard 70 MHz IF signals. Acoustic monitoring function during recording. Power efficient implementation.
2.1.0	15-Nov-2017	Make a "Preset recording length" parameter, so that the recording can stop automatically.

Recommended WAVECOM Products and Services

W-BitView Tool

The highly sophisticated BitView Tool is an external off-line and stand-alone .NET application for analysis of unknown signals.

W-BitView has a number of features:

- Bit manipulation tools
- Bit display tools (text, graphics)

- Simultaneous processing of multiple analysis sessions
- Auto-update functionality
- Report generator (parameters, data, ASCII, XML)
- Drag and drop of functions
- Re-arrangement of functions in a tree view
- Nested docking
- Auto hide
- Drag and drop of windows
- Application and modification of alphabets
- Persistent-to-XML file (screen layout is restored at start-up time)
- .NET technology
- No installation required, just run the executable
- Data stream and data file import from W61PC/LAN, W-PCI, W-PCIe and W-CODE
- MatLab and C# user defined functions

W-Sat-email-Decoder

The W-Sat-email-Decoder takes as its input a session file and the corresponding text files, as produced by a WAVECOM decoder, or any text file from an external source containing emails. It does protocol decoding and decompression, the email(s) and possible attachment(s) are output as files. The following email systems will be recognized and decoded respectively.

Email system	Recognize	Decode
AMOS	Y	Y
Blast	Y	N
Dualog	Y	Y
GlobeWireless	Y	Y
GTMail	Y	Y
MS-RAS PPP	Y	Y
MS-RAS TCP/IP	Y	N
Rydex	Y	Y
se@comm	Y	Partially
SkyFile	Y	Y
UUCP	Y	Y
UUPlus	Y	Y
Xdatos	Y	Partially
ZModem	Y	Y

W-REC Setup

W-REC Hardware W-PCIe

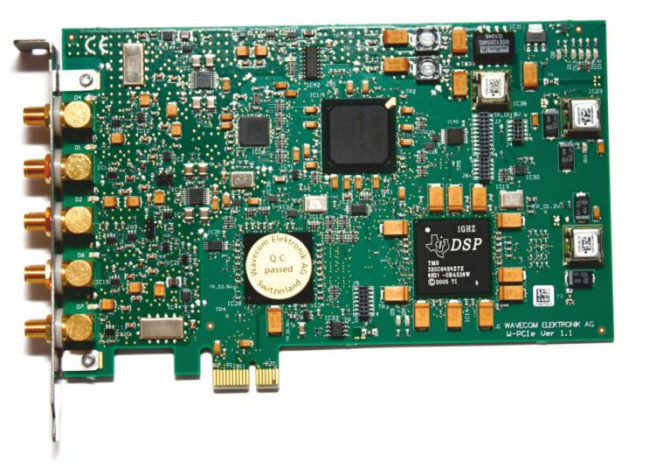
The WAVECOM W-PCIe card has two physically independent 16-bit A/D converters. There are five inputs in two groups: AFIF#1, IF70#1a and IF70#1b for the group#1 and AFIF#2 and IF70#2 for the group#2. W-REC application runs this card as a wideband signal recorder at all inputs AFIF#1, AFIF#2, IF70#1a, IF70#1b and IF70#2. The maximum recording bandwidth is 22 MHz, covers nearly the whole bandwidth of the AFIF input (25 MHz).

W-PCIe Hardware Installation

Before unpacking the W-PCIe card or installing it into your PC please make sure that you are attached to the electric ground to avoid damaging static sensitive components on the card or in the computer.

Power off your computer, unplug it from its power source and disconnect or turn off all peripherals. Carefully remove the cover of the computer and locate a free PCI express slot. Firmly insert the card into the slot. Close the computer cover and switch on the power.

WARNING: THE A/D CONVERTER ON THE W-PCIe CARD MAY DEVELOPE ENOUGH HEAT TO PRODUCE BURNS OR START A FIRE IF PLACED NEAR FLAMMABLE OBJECTS. WAVECOM WILL NOT BE RESPONSIBLE FOR ANY DAMAGES RESULTING FROM NON-COMPLIANCE WITH THIS WARNING.



W-PCIe card.

There are five SMA signal inputs on the W-PCIe card. The following table is a technical hardware specification.

Specification		
Card type	Half-size PCIe x1 card (PCI Express)	
Inputs	AFIF#1 and AFIF#2	IF70#1a, IF70#1b and IF70#2
Frequency range	50 Hz – 25 MHz	52.5 MHz – 87.5 MHz (SAW filter)
Signal level	2 mVrms – 0.5 Vrms	20 mVrms – 2.5 Vrms

Specification		
	20 mVrms – 2.5 Vrms (with 20 dB attenuator)	
Input impedance	> 1 kOhm	50 Ohm
Bandwidth	4.608 MHz – 23.04 MHz	
Frequency raster DDC	1.0 Hz	
Input max sampling rate	92.16 MHz	
Sampling rate jitter	1 ps	
Connector	SMA female	
Dimensions (LxWxH)	168x106x22 mm	
Weight	150 g	
Power requirement (typical values)	1.0 A @ +3.3 V, 0.4 A @ +12 V	
Bus interface	32-bit PCI, 3.3 V, 132 MB/sec (W-PCI) PCIe x 1, 250 MB/s (W-PCIe)	
Operating temperature range	0 °C to 50 °C	
Case temperature range	0 °C to 55 °C	
Storage temperature range	0 °C to 70 °C	
Relatively humidity (non-condensing)	10 to 90%	
A/D converter	16-bit	
Digital down converter (DDC)	FPGA	
License key	In-card license, no external license key necessary	
Conformity		

W-REC Software Setup

The W-REC application is designed to create high-bandwidth recordings in conjunction with the W-PCIe hardware. W-REC can record HF signals (3 – 25 MHz) directly from an antenna or IF signals from various IF outputs of a receiver (e.g., 455 kHz, 10.7 MHz or 21.4 MHz etc.) at the two inputs AFIF#1 and AFIF#2 of the card. It records satellite signals from the down converter at the three 70 MHz IF inputs IF70#1a, IF70#1b and IF70#2. The 70 MHz IF inputs can also be used to record signal from the standard 70 MHz IF receiver output.

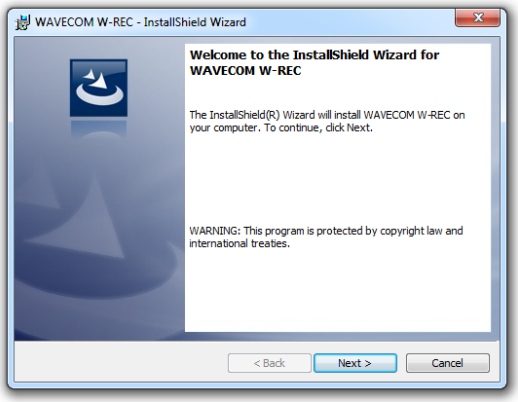
Software Installation W-REC

Insert the WAVECOM installation DVD in the drive. When requested, point the auto start wizard to the disc drive and start installation.

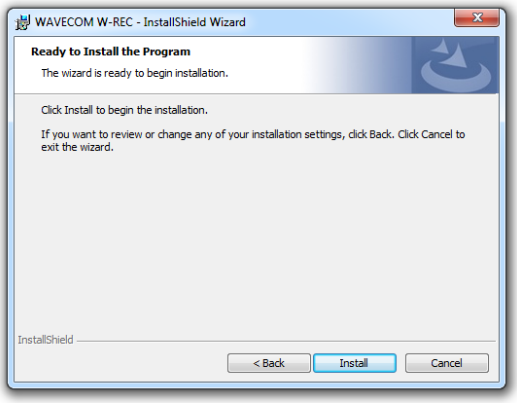
Note: After installation, you can run the corresponding application W-REC if you are a member of the **Administrators**, **Power Users** or **Users** group.

Before the installation of a software update, the old version must be uninstalled (see "Software Uninstall W-REC"). After uninstallation has completed, insert the WAVECOM installation disc in the drive; the installer will start automatically. Otherwise, it can be started with **Windows Explorer** by double-clicking **Installation.exe**.

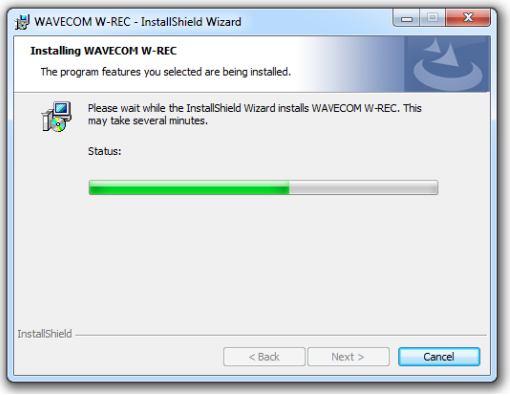
The selection dialogue of the installation program is displayed:



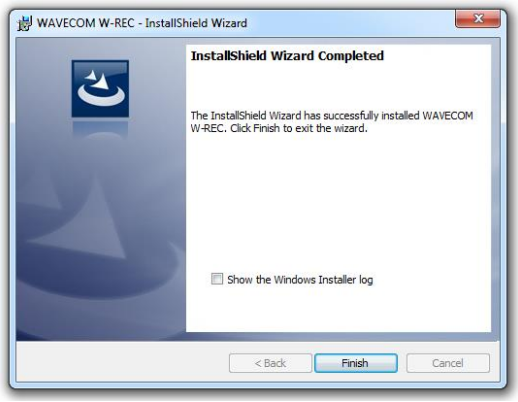
First, you will see the welcome screen. Click "Next" to continue the installation.



Click "Install" to continue the installation.



Wait until the installation is finished.



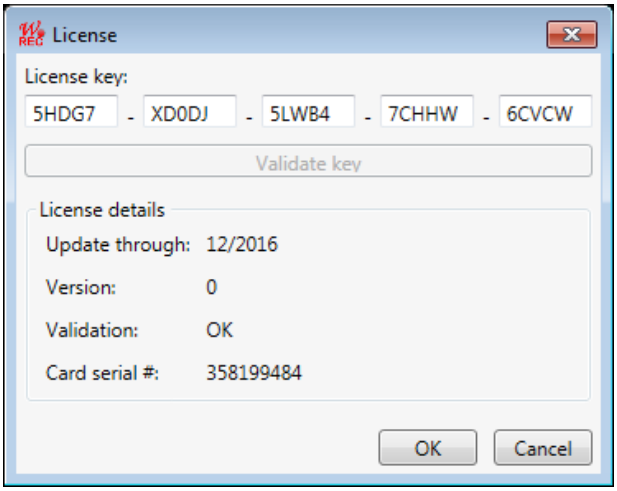
If the installation was successful, click **Finish** to complete the process.

Note: Check for hidden windows if the installation process seems to "hang" (this can be done by pressing the Alt+Tab keys). Sometimes windows in the background are waiting for a button to be pressed to allow the installation to proceed.

Software Activation

W-REC requires a 25-alphadigit key to activate on a W-PCIe card. The key is provided at the time of purchase. After the W-REC application is installed, the key can be entered using:

- The W-REC GUI (**Configuration | License...**) screen.



- Enter the key in the **Key** fields and press the **Validate key** or **OK** button.

Software Updates

The software update period is defined in the key "Update through:". During this period the user can get all W-REC releases free of charge.

Software Uninstall W-REC

In certain situations, e.g., when updating the application, it is necessary to uninstall the software. Use the following commands:

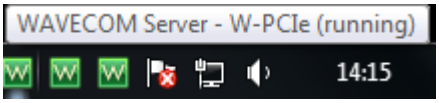
VISTA	XP	Windows 7
➢ Click on **Start,** go to the **Computers** menu and click the **Uninstall or change a program** button ➢ Select **WAVECOM W-REC** from the list ➢ Click **Uninstall**	➢ Click on **Start,** go to the **Settings** menu and open **Control Panel** ➢ Select the **Add/Remove Programs** icon ➢ Select **Install/Uninstall** ➢ Choose **WAVECOM W-REC** from the list ➢ Click **Add/Remove**	➢ Click on **Start** and open the **Control Panel** ➢ Select the **Programs** icon ➢ Select **Programs and Features** ➢ Choose **WAVECOM W-REC** from the list ➢ Click **Uninstall** in the menu

The application has now been removed from the PC. It is possible, however, that the shortcut icons may have to be removed manually.

W-REC Operation

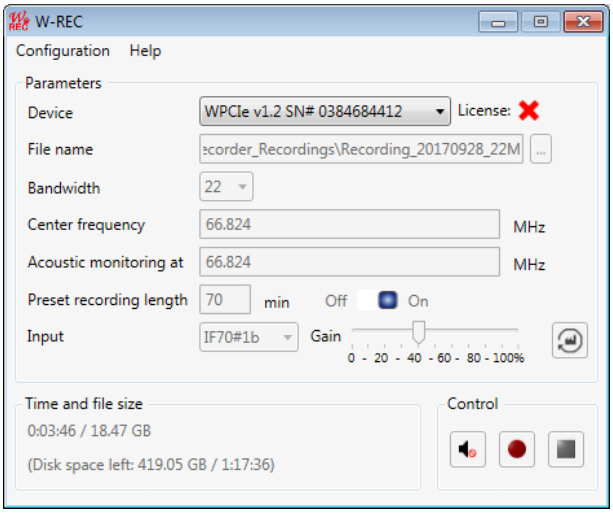
W-PCIe hardware device must run in W-REC in an exclusive way. Before the W-REC application can be started the user should

- stop the W-PCIe decoder application. Just right click the tray icon "WAVECOM Server – W-PCIe" in the Windows taskbar and choose "Stop".

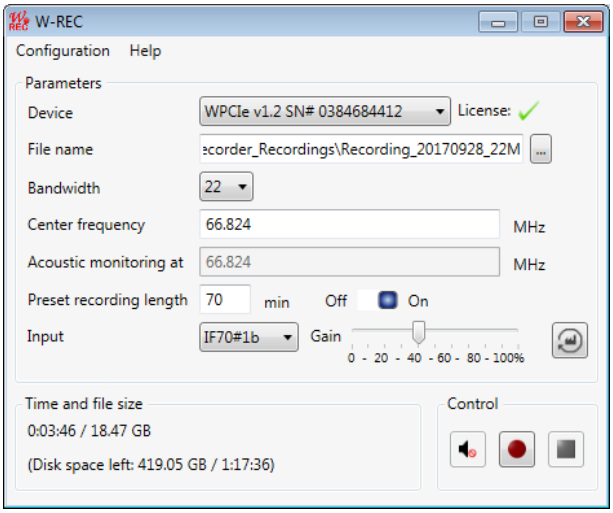


- stop the W-CLOUD server. Right click the tray icon "W-Cloud" and choose "Stop server" and
- stop the W-SPECTRA application, if it is running.

Select the "W-Recorder" icon on the desktop, the GUI will display the first W-PCIe device available as well as the license status. Without a valid license key the GUI is disabled. Please see the **Software Activation** section on how to set the key.



Once a correct license key is set, the GUI will be accessable.

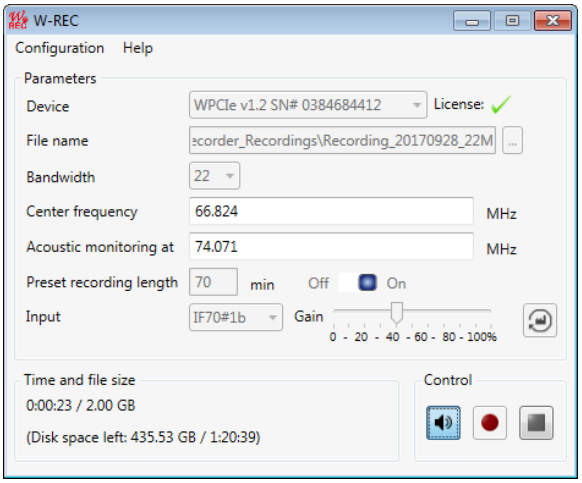


The interface allows the selection of recording parameters.

Parameter	Value
Device	The user can select a device for recording.
File name	Can record to WAV or PxGF format. IQ format, 16 bits each I and Q. The file should preferably locate on a separate disk other than the system hard disk c:\
Bandwidth	4, 8, 11, 15 or 22 MHz.
Center frequency	Center frequency of the recording. It depends on the selected bandwidth, so that it sits in the AFIF#1 and AFIF#2 input bandwidth 50 Hz – 25 MHz and 70 MHz input bandwidth 52.5 MHz – 87.5 MHz.
Acoustic monitoring at	Frequency where the signal is output to the speaker for monitoring purpose during recording. This is helpful to find out whether the input is properly connected.
Preset recording length	The user can set how long (in minutes) the recording should be. After the preset length is reached the recording stops automatically. This feature can be turned on and off by the toggle switch beside.
Input	AFIF#1 and AFIF#2 to record HF signals from an antenna or IF output from a receiver. IF70#1a, IF70#1b and IF70#2 to record satellite signals from the 70 MHz IF output of a down-converter or signals from a receiver with standard 70 MHz IF output.
Gain	Adjust signal level. A "Load factory default" button can be used to restore the default gain values.

Once the parameters are set the red record button can be pressed to start the recording. During the recording the user can change the "Center Frequency". This will take effect immediately and be written into the file on-the-fly. The current time elapse, as well as the file size and the remaining disk space (in size and in time) will be displayed during the recording.

The user can input a frequency for acoustic monitoring purpose and turn on the speaker button. This is useful to check if the signal wiring is correct. The acoustic monitoring frequency must not necessarily be the same to the "Center frequency". It must be in the bandwidth of the center frequency.



W-REC makes a recording in two file formats: WAV format and PxGF format.

WAV is the most popular and easy-to-understand format. The length in the header is max. 4 GB, but the actual recording can go on and the resulting file can be bigger than 4 GB in size.

PxGF format writes various side-information (e.g., center frequency, recording bandwidth and timestamp) during the recording on-the-fly. There is no limit on the recording length. This "on-the-fly" side-information allows the instantanuous recovery of important recording parameters and it also allows a huge recording file to be divided into several small files for easy processing.

A PxGF recording can be processed by all Wavecom decoders and monitoring tools (W-CODE and W-SPECTRA, etc.). It can also be easily processed by the spectrum editing tool W-SPEED.

System Requirements

W-REC is a wideband high resolution signal recorder. This requires a "fast" PC with high speed disk access. The (minimum) system requirements are:

- PC with Intel Core i7 CPU.
- 8 GB RAM.
- Windows 7.
- Dedicated (separate) solid state disk (SSD), min. 1000 GB as data disk for recordings. Conventional harddisk can be too slow to record signals at high bandwidth (e.g., 15 MHz or 22 MHz). The W-REC application should run on the separate system disk c:\.

Questions & Answers

I get the error message "Please stop W-PCIe as a decoder before running this device as a recorder. Stop via the tray icon "WAVECOM Server – W-PCIe"." Why does this happen?

The recording device W-PCIe can either be used as a decoder (running the decoder software W-PCIe) or a recorder (running the W-REC) at one time. Just stop the decoder software W-PCIe as the message suggests.

I get the following warning message "Less than 75% of buffers have been allocated. Performance at high bandwidth may suffer.". What is this and what influence will it have on the recording?

I/O Buffers are allocated in memory when a recording is initiated. These buffers ensure that should any other disk activity take place during the recording, the application will still be able to store the information in a timely manner. This warning indicates that the buffer space is less than optimal and hence that recording may loosing samples when running at high bandwidths such as 15 MHz and 22 MHz. Trying to free some memory will hopefully allieviate the situation.

What does the error "Insufficient memory for buffer allocation." mean?

This a more extreme case of the previous warning. This can occur even when the operating system reports available memory. This is due the fact the I/O buffers must be allocated as continuous blocks. As above, freeing some memory will usually allieviate the problem.

How do I fix the "Hardware does not support more than 4GB of RAM on 64-bit Windows" error?

This indicates that that your firmware does not support more that 4GB of RAM if running a 64-bit version of Windows. You can either reduce the physical memory of your system or contact WAVECOM to upgrade the W-PCIe card.

The filesize does not match the recording time and/or the recording shows periodic loss of data?

W-REC is a very demanding application in terms of I/O bandwidth. Recording at 22 MHz requires a disk capacity of writing at 93 MB/s. Data loss can mean insufficient memory, slow disk drives or intensive disk access by other programs. For optimal performance we recommend recording to a dedicated (i.e. does not contain the Windows OS) SSD.

What should I do if a decoder card needs repair?

There is no parts on the card which can be replaced by the customer. Contact your local distributor to arrange the return of your card for repair.

Signal Interference

General

All microprocessors and personal computers emit strong broadband noise signals which propagate along the control and data lines. Strong noise signals are also often produced by printers without noise reduction features. Common noise sources include the unshielded cables for printer, monitor and mouse.

Antenna Installation

The antenna is the main factor when it comes to fighting noise. A well-designed long-wire antenna, with a proper impedance matching feeder, installed well clear of any obstructions, seldom exhibits interference problems. In very simple installations where for instance an active antenna is deployed in very close proximity to the decoder or monitor, interference is bound to be present, especially in the 3 - 10 MHz range. Active antennas must always be mounted at least two meters away from any building part to be clear of the noise field which surrounds a building. It is equally important to provide a high quality grounding of the antenna mast (cold water mains).

Receiver

Receivers are often not sufficiently shielded or de-coupled, resulting in noise signals directly entering the receiver. Since many receiver types require an antenna impedance of 50 Ohm for correct matching, any deviation from this impedance results in a large increase in interference levels due to mismatching. This situation may be remedied by inserting an antenna tuner (matching device) between antenna and receiver.

HF Cabling

All HF cable plant inside the building must use shielded HF cables.

Grounding

The best grounding is provided by the cold water mains. Hot water or heating pipes are not necessarily grounded. Good quality, effective grounding of the receiving equipment is highly recommended - also for your personal safety.

Location of Recorder

Despite multi-layer metallic shielding of the receiver, the PC may still radiate into the receiver if placed in close proximity. This problem may be solved by moving the PC or the receiver or both.

PCs and Peripherals

PCs, printers, keyboards etc. can all be sources of heavy interference and noise if placed close to a receiver or an antenna. If possible ground the equipment and place ferrite loads on the cabling connecting the equipment.

Video Monitor

If at all possible, use a monitor which conforms to the latest Swedish MPR-II radiation standards or even better to the TCO-92 standards. The improvement in noise reduction offered by such equipment is significant and interference originating from these monitors can be expected to be negligible.

Local Area Network (LAN)

Computer networks using coaxial cabling with BNC plugs produce very high noise radiation. To combat this noise, install your antenna at least 5 m away from the building.

Commercials

Conditions of Sale

General

These general conditions of sales are binding if no other conditions have been declared as applicable in the quotation or the order confirmation of WAVECOM ELEKTRONIK AG.

Customer orders are binding only if WAVECOM ELEKTRONIK AG has confirmed them in writing.

Prices

The list prices are net, and exclude VAT, shipping and packing costs, unless otherwise agreed. WAVECOM ELEKTRONIK AG reserves the right to adapt its prices to offset cost increases, e.g., salaries, material costs, and exchange rate fluctuations.

Delivery time

The delivery time is specified in the confirmation of order/contract. The delivery time may be extended due to unforeseen circumstances such as acts of God (epidemics, earthquake, etc), war, as well as delivery delays from our material suppliers.

Dispatch

The method of dispatch may be selected by the customer. Without specific shipping instructions from the customer, we reserve us the right to arrange the dispatch by any forwarder/courier of our choice. Any complaints regarding damage, delays or loss must be forwarded to WAVECOM ELEKTRONIK AG in written form within 48h from the receipt of the goods. Complaints of suspected bad packing must be forwarded to WAVECOM on the date of receipt.

Return of goods

The return of defect goods requires written approval of WAVECOM ELEKTRONIK AG before the dispatch. For a return during the warranty period, the costs of the shipping the item(s) back to the customer will be paid by WAVECOM ELEKTRONIK AG. The charges for the shipping the item(s) to WAVECOM ELEKTRONIK AG must be paid by the customer. For goods returned after the warranty period, the shipping costs for both ways must be fully paid by the customer.

Please, take great care when returning your goods to us. The customer is responsible for returning the goods to the supplier without damage. We recommend that you use the package material that was used for the delivery. Our decoding cards require "HIGHSHIELD ELECTROSTATIC SHIELDING". Observe precautions for handling electrostatic discharge sensitive devices! Protect the card against mechanical stress.

Insure your returned goods.

Payment

Customer orders can only be accepted against advance payment by bank transfer, postal money order, letter of credit, check or credit card. For letter of credit payments, we charge an additional administration fee.

Reservation of ownership

The delivered goods remain the property of WAVECOM ELEKTRONIK AG until the invoice in total is fully paid.

Cancellation

Cancellations of orders must be made in writing and have to be confirmed by WAVECOM ELEKTRONIK AG. Any additional administrative costs already incurred by WAVECOM ELEKTRONIK AG, must be paid by the customer.

Changes of order quantities

Changes in the quantities of an order already placed may result in a change of the applicable discount. The unit cost may be adjusted to reflect this change.

Legal domicile

The Legal domicile of WAVECOM ELEKTRONIK AG is Buelach, Switzerland. The buyer declares that for any legal claim against WAVECOM ELEKTRONIK AG, he waivers his legal domicile, and hereby accepts the legal domicile of Buelach. This contract is based on Swiss law.

Warranty

Despite careful testing of our equipment, component or functional failures may occur. WAVECOM ELEKTRONIK AG grants you a warranty for a period of 24 months from date of delivery. Defective components will be replaced or repaired free of charge. No liability is taken for any other claims which may arise due to consequential damage arising from the use of this product. Damage resulting from non-authorized modifications to this equipment by third parties is hereby disclaimed.

Shipping costs for equipment returned to WAVECOM ELEKTRONIK AG will be paid by the customer. In case of repairs within the warranty period, WAVECOM ELEKTRONIK AG will carry the costs of return shipping to the customer.

Obligation

The products of WAVECOM ELEKTRONIK AG are sold on the basis of technical specifications valid at the time of sale. WAVECOM ELEKTRONIK AG has no obligations to update or modify equipment already sold.

Copyright

The software of all versions of WAVECOM decoders is the intellectual property of WAVECOM ELEKTRONIK AG and protected by international copyright law. Any copying of the software is prohibited without the express and prior consent in writing of WAVECOM ELEKTRONIK AG and punishable by law. In addition all warranty claims will become void.

Liability

Information contained on this publication may be changed at any time without prior notice. Despite careful preparation, this publication may contain errors or omissions and WAVECOM ELEKTRONIK AG is not liable for any resulting losses or damages.

Laws and regulations

Before using our equipment, take note of the laws and regulations of telecommunications authorities in your country. It is the responsibility of the users of the equipment to determine whether the reception of the transmissions which may be decoded, is permitted or not. The manufacturer or vendor is not liable for violations of law of copyright or telecommunication regulations.

License Terms

1. Wavecom decoder software and other relevant products are license protected, e.g., WIBU CodeMeter dongle.
2. The license must be legally acquired. The protected software or the product itself can only be operated simultaneously up to the amount of acquired licenses. This means that a double license allows the user to operate the product simultaneously in two instances maximum.

3. Any manipulation of the license, e.g., the amount, validity or to circumvent the license is prohibited. Wavecom cannot fix the occurred damages, e.g., automatic annulations of the license or physical change of hardware component. In these cases the product must be newly acquired at its full price.
4. Any manipulation to Wavecom software, especially hacking and reverse-engineering of the product is prohibited. The damage occurred thereby will be passed on to the user, as pointed out in article (3) of these License Terms.
5. Any Wavecom software may not be copied without the consent of Wavecom.

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