

ELAD FDM-S2



USER MANUAL

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1 Overview

1.1 Sampler exploit

FDM-S2 is the second born device in our ELAD SDR SAMPLER line. This product line is developed to give the user the possibility to exploit and study the capability of Sampling technique.

With 122.88MHz sampling frequency FDM-S2 can offer the possibility to be a good HF and 6m receiver, but also allow to receive FM Band and part of VHF Band simply adding appropriate pre-selection filters in the front-end of ADC.

Some users of FDM-S2 already exploit the under-sampling technique to use it as pan adapter tuning it at IF frequencies of 68-70 MHz of their transceivers, while others use it to monitor the spectrum of a particular known frequency.

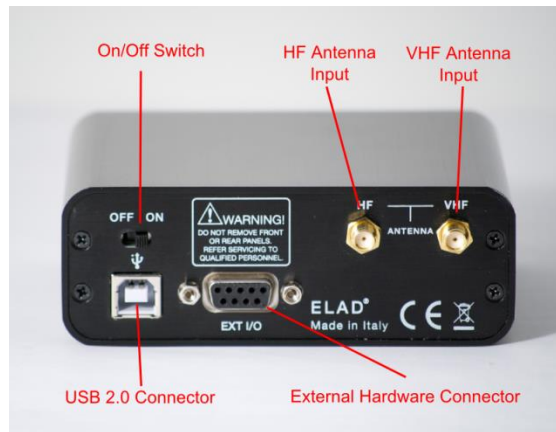
1.2 Front panel description



Power Led : turns on when the receiver is connected to a USB port of the PC and it is switched on.

Communication Led : shows the communication between the receiver and the PC.

1.3 Rear panel description



USB 2.0 Connector : connection with the PC. Please use the supplied cable.

On/Off Switch : turn On/Off the FDM-S2.

HF Antenna Input : SMA 50Ω input connector for HF band, +20dBm max.

VHF Antenna Input : SMA 50Ω input connector for VHF band, +20dBm max.

External Hardware Connector : DB9 connector for external hardware (e.g. pre-selector filters board).

This is NOT a serial port.

2 FDM-SW2 Software Installation

2.1 First-time install

Download from the ELAD website <http://sdr.eladit.com/FDM-sw2 Software/Current release/> the latest **Complete** version. Double-click on the file “setup.exe” inside the folder and follow the instructions. Windows Installer will first install the prerequisites “Microsoft VC++ 2010 Runtime Libraries” and “Microsoft .NET Framework 4.0” and then the FDM-SW2 software.

2.2 Update an existing version

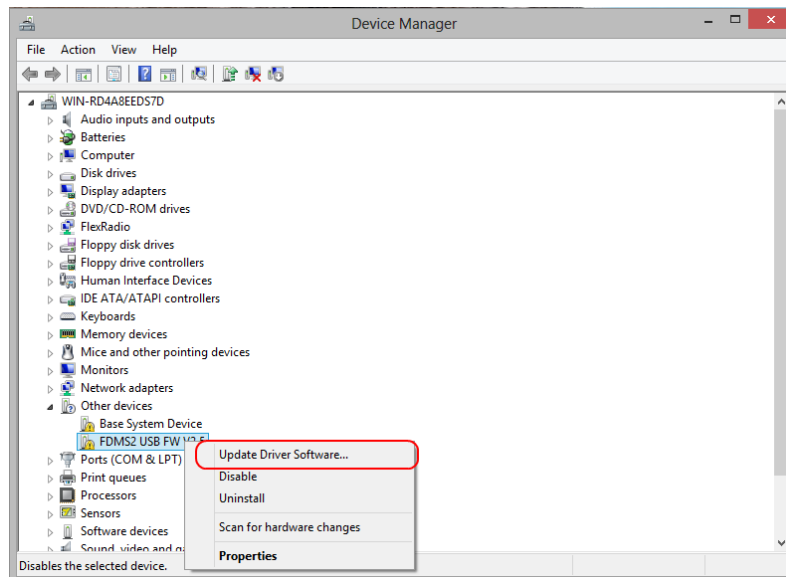
Download from the ELAD website <http://sdr.eladit.com/FDM-sw2 Software/Current release/> the latest **Only Installer** version. Double click on file “ELAD_FDMSW2Setup_v_x.y.msi” included in the update and follow the instructions.

3 USB Driver

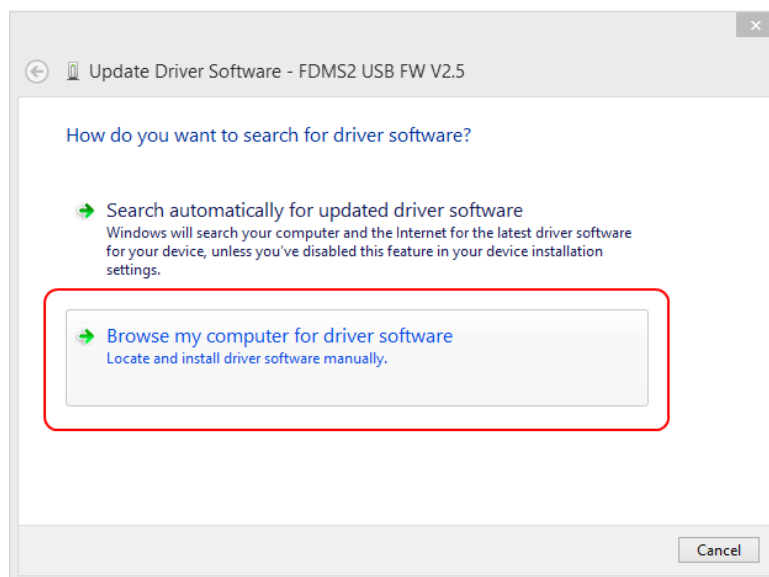
3.1 First driver installation

To install the USB driver, connect the USB port of the FDM-S2 to a USB port of your computer and power on the FDM-S2. When Windows detects the new hardware, follow the steps listed below to install the driver correctly.

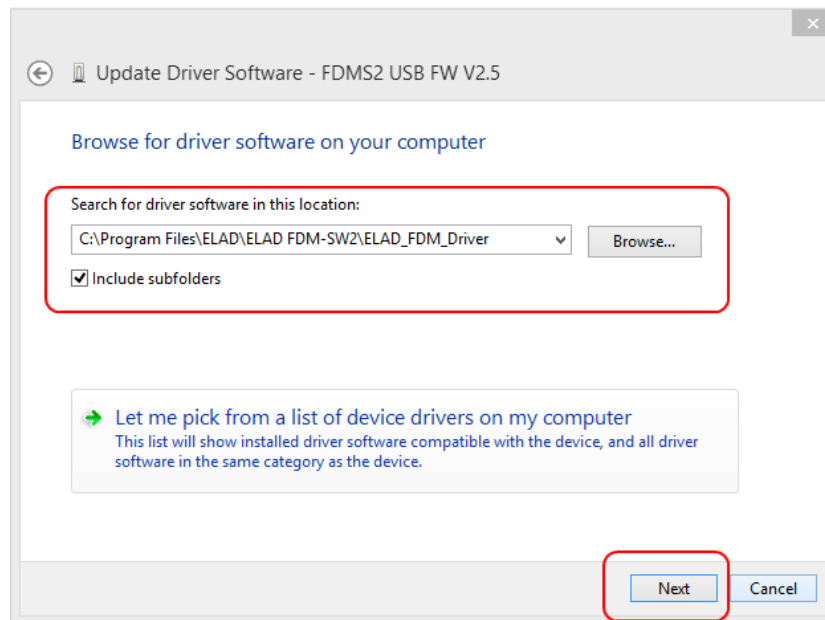
Open the **Device Manager**, expand **Other devices** and locate the FDM-S2 node. Select FDM-S2, right click on it and execute **Update Driver Software**.



When Windows starts the installation procedure, select the option **Browse my computer for driver software** (the second option).



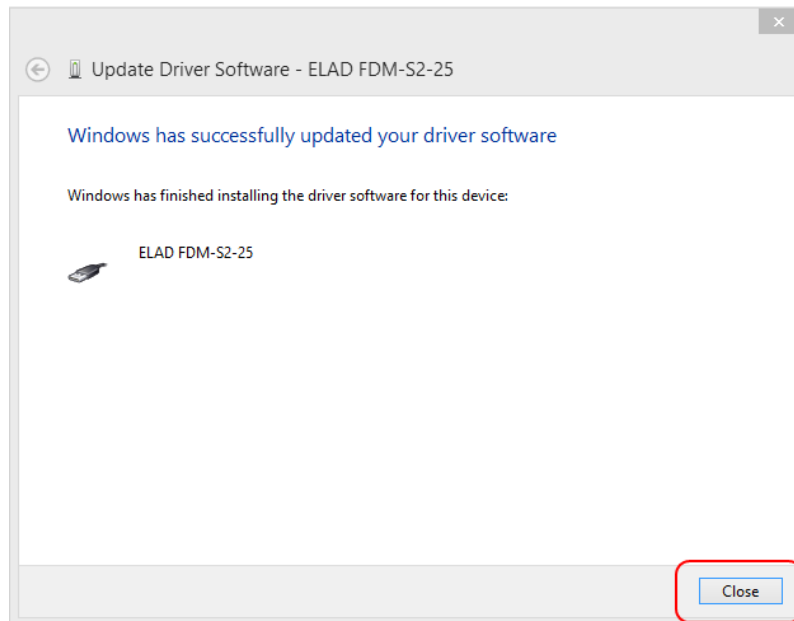
In the next window, insert the driver folder location using the **Browse** button and check the option **Include subfolders**, in this way the manual driver search is enabled. Select the folder: **C:\Program Files (x86)\ELAD\ELAD FDM-SW2\ELAD_FDM_Driver** then click **Next**.



Click **Install**.



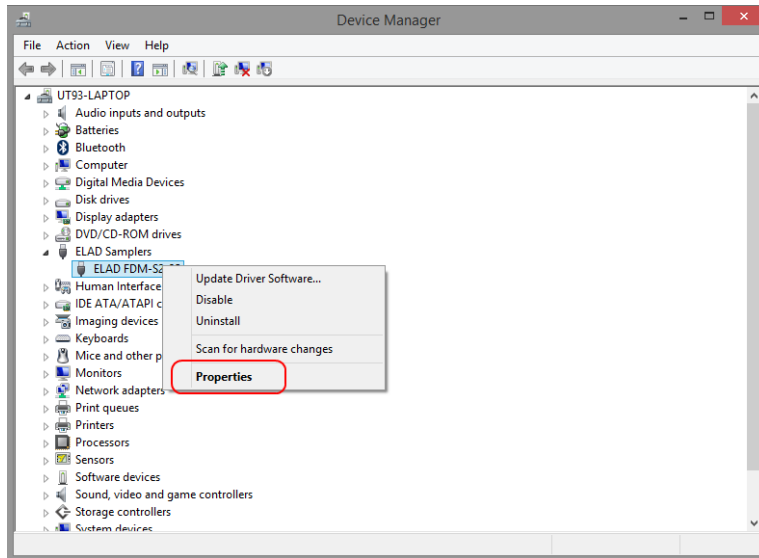
Let the hardware installation complete automatically.



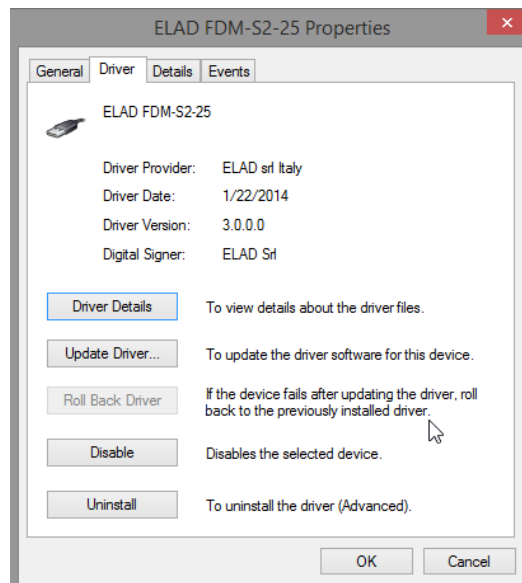
At the procedure ending, click on **Close**, then disconnect and reconnect the FDM-S2 on the same USB port. Now the USB driver of the FDM-S2 is installed on your computer.

3.2 Driver installation check

To check the driver current version, connect the FDM-S2 to the computer USB port where the driver is already installed and power on the FDM-S2. Open the **Device Manager**, expand the **ELAD Samplers** node, right click on **ELAD FDM-S2** and select **Properties**.

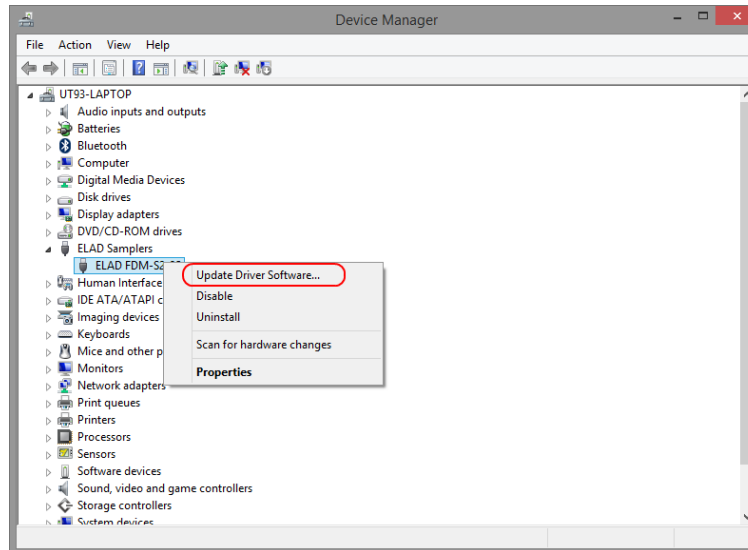


When the window opens, select the **Driver** tab. You can read provider name, current driver release date and current driver version. The picture below gives an example.

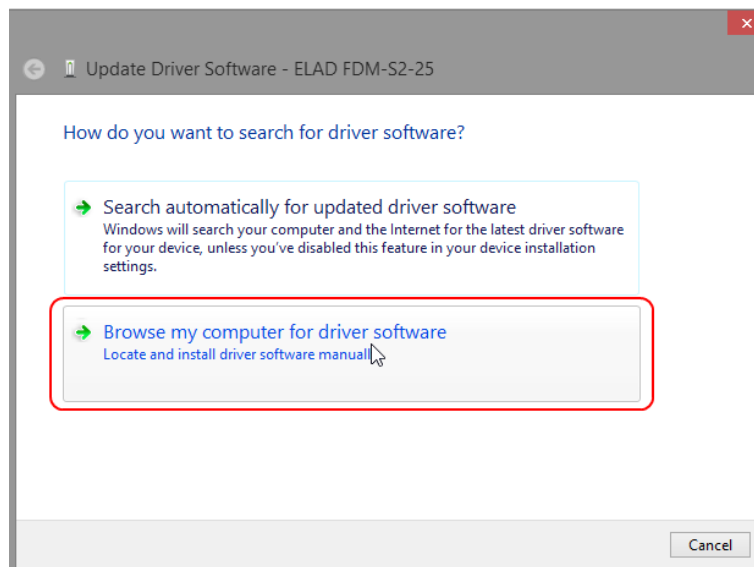


3.3 Manual driver update

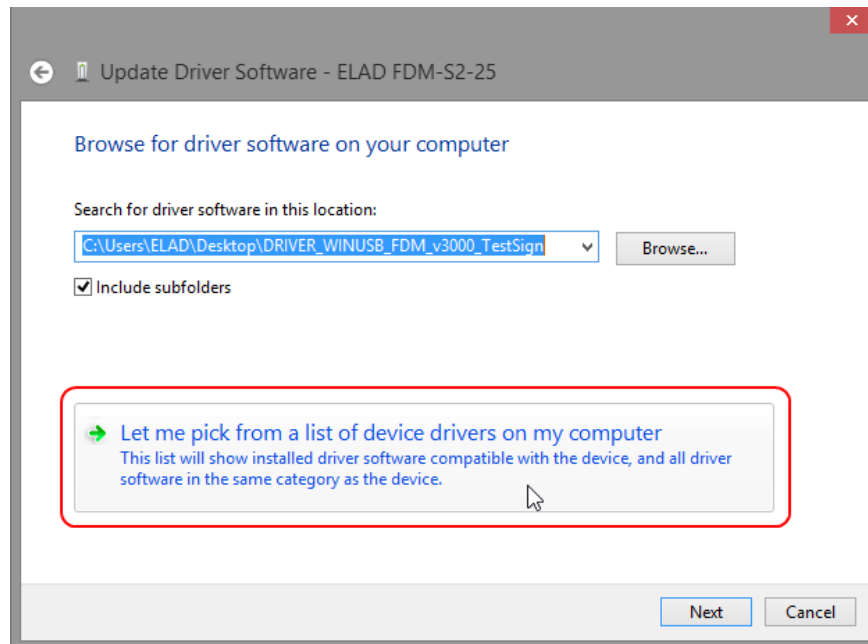
To update the driver, connect the FDM-S2 to the computer USB port where the driver is already installed and power on the FDM-S2. Open the **Device Manager**, expand the **ELAD Samplers** node, right click on **ELAD FDM-S2** and execute **Update Driver Software**.



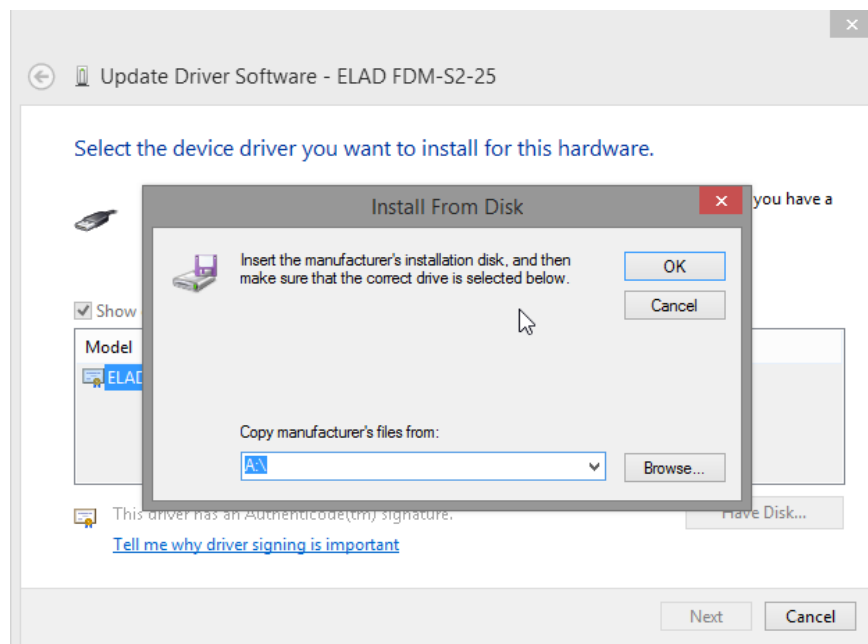
When Windows starts the installation procedure, select the option **Browse my computer for driver software**.



In the next window, disable the option **Include subfolders** and choose **Let me pick from a list of device drivers on my computer**. Don't click Next.

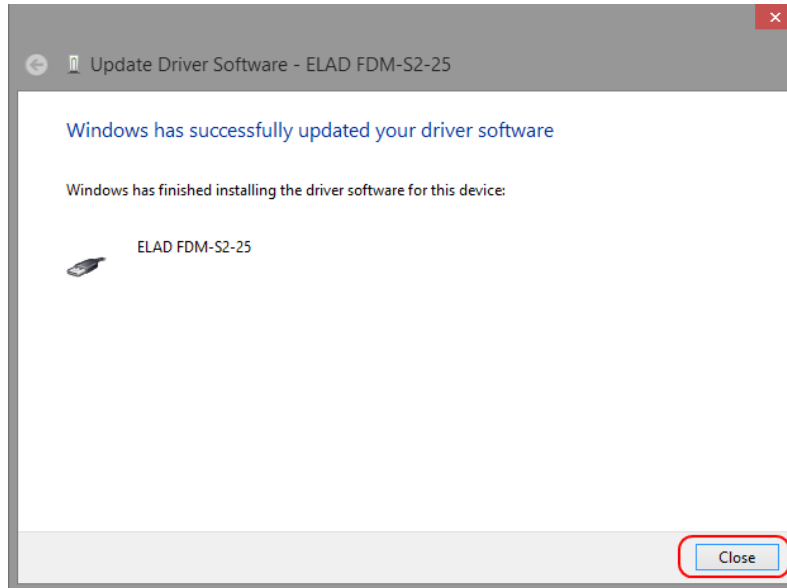


Verify that **Show compatible hardware** option is checked and ELAD FDM-S2 is selected, then click on **Have a Disk**. In this way the manual driver update is enabled. Don't click Next.

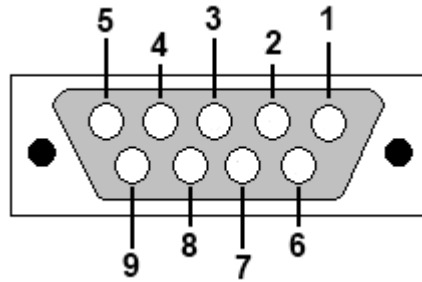


Click on **Browse** and search for the FDM-S2 driver update folder location, then open `winusb_fdmsampler.inf` file. Click **OK** and then **Next**.

Let the hardware installation complete automatically, at the procedure ending click on **Close**, then disconnect and reconnect the FDM-S2 device on the same USB port.



Annex - External Hardware Connector



- Pin 1: SFE Latch 595
- Pin 2: I2C SCL
- Pin 3: SFE CLOCK 595
- Pin 4: I2C SDA
- Pin 5: Ground
- Pin 6: Mute
- Pin 7: Reserved
- Pin 8: SFE Data 595
- Pin 9: Vcc (4.5V)

To mute the FDM-S2, connect the Pin 6 to ground.

Note: the maximum cable length should not exceed 100 mm.

Technical Specifications

ELAD FDM-S2		Rev. 1 02/2014	
TECHNICAL SPECIFICATIONS			
GENERAL	Frequency Coverage	HF+50MHz Band (10 kHz ÷ 54 MHz): Direct Sampling Mode VHF1 Band (74-108MHz): Undersampling Mode VHF2 Band (135-148MHz): Undersampling Mode Bypass for experimenting use	
	Antenna Connectors	HF+50MHz Band input: SMA (50 Ω) SMA/BNC adapter included VHF1 & VHF2 Bands input: SMA (50 Ω) SMA/BNC adapter included	
	Temperature Range	0 ÷ 40 °C	
	PC Interface	High-Speed USB 2.0 (480 Mbit/s)	
	Power Supply	USB powered with double USB cable (included)	
	Power Consumption	Less than 4 W (5 V-750 mA) from USB (double USB cable required) With slow Sample Rate DLLs (for example 192kSamp/sec) typical 2.6 W	
	External I/O Connector	Female DB9 (mute control, I ² C and SPI interface)	
	Absolute Maximum RF Input Level	+20 dBm	
	Dimensions	110 (W) x 40 (H) x 90 (D) mm	
	Weight	360 g	
HF+50MHz Band RECEIVER	Configuration	Direct sampling – ADC DDC with FPGA Xilinx Spartan6 XC6LXC25	
	A/D Conversion	122.88 MSPS @ 16 bit/sample	
	Sensitivity	HS ⁽¹⁾ Typical: -122 dBm (CW, BW 500 Hz, 10 dB (S+N)/N)	LS ⁽²⁾ Typical: -110 dBm (CW, BW 500 Hz, 10 dB (S+N)/N)
	3rd Order Intercept Point	HS ⁽¹⁾ Typical: +23 dBm @ 14 MHz, Spacing 2 kHz +16 dBm @ 50 MHz, Spacing 2 kHz	LS ⁽²⁾ Typical: +31 dBm @ 14 MHz, Spacing 2 kHz +25 dBm @ 50 MHz, Spacing 2 kHz
	Blocking Gain Compression	Typical: > 115 dB @ 10 MHz, Spacing 2 kHz, CW, BW 500 Hz	
	Noise Floor (MDS)	HS ⁽¹⁾ Typical: -132 dBm @ 14 MHz, CW, BW 500 Hz, NR ⁽³⁾ Off -138 dBm @ 14 MHz, CW, BW 500 Hz, NR ⁽³⁾ On -130 dBm @ 50 MHz, CW, BW 500 Hz, NR ⁽³⁾ Off -136 dBm @ 50 MHz, CW, BW 500 Hz, NR ⁽³⁾ On	LS ⁽²⁾ Typical: -120 dBm @ 14 MHz, CW, BW 500 Hz, NR ⁽³⁾ Off -126 dBm @ 14 MHz, CW, BW 500 Hz, NR ⁽³⁾ On -118 dBm @ 50 MHz, CW, BW 500 Hz, NR ⁽³⁾ Off -124 dBm @ 50 MHz, CW, BW 500 Hz, NR ⁽³⁾ On
	Clipping Level	HS ⁽¹⁾ : -8 dBm @ 14 MHz, -12 dBm @ 50 MHz	LS ⁽²⁾ : +4 dBm @ 14 MHz, 0 dBm @ 50 MHz
	Internal Spurious Carriers	Typical: < -115 dBm @ 384 kSamp/sec, HS ⁽¹⁾	
VHF1 Band RECEIVER	Configuration	Undersampling – ADC DDC with FPGA Xilinx Spartan6 XC6LXC25	
	A/D Conversion	122.88 MSPS @ 16 bit/sample	
	Sensitivity (WBFM @ 12 dB SINAD)	HS ⁽¹⁾ Typical: 2.5 μV @ 98 MHz	LS ⁽²⁾ Typical: 10 μV @ 98 MHz
	3rd Order Intercept Point	HS ⁽¹⁾ Typical: +21 dBm @ 98 MHz, Spacing 2 kHz	LS ⁽²⁾ Typical: +29 dBm @ 98 MHz, Spacing 2 kHz
	Noise Floor (MDS)	HS ⁽¹⁾ Typical: -126 dBm @ 98 MHz, CW, BW 500 Hz, NR ⁽³⁾ Off -132 dBm @ 98 MHz, CW, BW 500 Hz, NR ⁽³⁾ On	LS ⁽²⁾ Typical: -114 dBm @ 98 MHz, CW, BW 500 Hz, NR ⁽³⁾ Off -120 dBm @ 98 MHz, CW, BW 500 Hz, NR ⁽³⁾ On
	Clipping Level	HS ⁽¹⁾ : -3 dBm @ 98 MHz	LS ⁽²⁾ : +9 dBm @ 98 MHz
	Internal Spurious Carriers	Typical: < -110 dBm @ 384 kSamp/sec, HS ⁽¹⁾	
VHF2 Band RECEIVER	Configuration	Undersampling – ADC DDC with FPGA Xilinx Spartan6 XC6LXC25	
	A/D Conversion	122.88 MSPS @ 16 bit/sample	
	Sensitivity (FM @ 12 dB SINAD)	Typical: 0.4 μV @ 145 MHz, NR ⁽³⁾ Off 0.2 μV @ 145 MHz, NR ⁽³⁾ On	
	3rd Order Intercept Point	Typical: +5 dBm @ 145 MHz, Spacing 2 kHz	
	Noise Floor (MDS)	Typical: -137 dBm @ 145 MHz, CW, BW 500 Hz, NR ⁽³⁾ Off -143 dBm @ 145 MHz, CW, BW 500 Hz, NR ⁽³⁾ On	
	Clipping Level	Typical: -19 dBm @ 145 MHz	
	Internal Spurious Carriers	Typical: < -100 dBm @ 384 kSamp/sec	
FM Band Rejection	> 60 dB Typical: 75 dB Measured: 80dB @ 145 MHz, Interferer @ 100.76 MHz		
⁽¹⁾ High Sensitivity Mode, ⁽²⁾ Low Sensitivity Mode, ⁽³⁾ Noise Reduction			
All stated specifications and other product information provided in this document are subject to change without notice or obligation.			

Declaration of Conformity (EC)

The product marked as

FDM-S2

manufactured by

Manufacturer: ELAD S.r.l.

Address: Via Col De Rust, 11 - Sarone
33070 CANEVA (PN)

is produced in conformity to the requirements contained in the following EC directives:

- R&TTE Directive 1999/5/CE
- EMC Directive 2004/108/CE
- Low Voltage Directive 2006/95/CE
- RoHS Directive 2011/65/CE

The product conforms to the following Product Specifications:

Emissions & Immunity:

ETSI EN 300 330-1
ETSI EN 301 489-1
ETSI EN 301 489-15
ETSI EN 301 783-2
EN 55022: 2006 + A1: 2007
EN 55024: 1998 + A1: 2001 + A2: 2003

Safety:

EN 60950-1: 2006 + A11: 2009

And further amendments.

This declaration is under responsibility of the manufacturer:

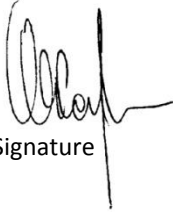
ELAD S.r.l.
Via Col De Rust, 11 - Sarone
33070 CANEVA (PN)

Issued by:

Name: Franco Milan
Function: President of ELAD

Caneva
Place

January, 29th 2014
Date


Signature

Declaration of Conformity (FCC)

The product marked as

FDM-S2

manufactured by

Manufacturer: ELAD S.r.l.

Address: Via Col De Rust, 11 - Sarone
33070 CANEVA (PN)

complies with the following requirements:

- FCC (Federal Communications Commission) Part 15

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC ID: 2AAE5FDM-S2

This product is distributed in USA by:

ELAD USA Inc.
7074 N RIDGE BLVD APT 3E
CHICAGO , IL 606453586
USA

Pho: 312-320-8160