

ELAD FDM-DUOr Dual Mode SDR Receiver



USER MANUAL

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Revision History

Revision	Date	Description	
Rev 1.1	04/2016	Added the OW cat command description.	
		• Updated the MA, MB and RF cat command descriptions with CWR	
		information.	
		Updated firmware versions table.	
Rev 1.2	06/2016	• Updated the picture in the section "5.1.2 - E1 Receiver Settings"	
		with the AGC Threshold parameter.	
		 Updated the section "8.4 - UI firmware update". 	
		Updated the firmware versions table.	
Rev 1.3	01/2017	Moved the preselectors description in section "3 - Preselectors	
		Description".	
		Updated the preselectors description.	
		Updated firmware versions table.	
Rev 1.4	11/2017	Added the TH cat command description.	
		Moved Firmware Update section in another document.	
		Added Product Warranty.	
		Updated firmware versions table.	
Rev 1.5	12/2017	• Added the FM MODE menu description, see "6.1.8 – Change	
		Operating Mode" and "6.5 – Settings Menu List".	
		Updated firmware versions table.	
Rev 1.6	05/2018	Added "FCC SDoC" section.	

1 Overview

1.1 Notice

Amateur radio regulations vary from country to country. Confirm your local amateur radio regulations and requirements before operating the ELAD FDM-DUOr.

1.2 Firmware versions

The features described in this manual refers the following firmware versions :

RX Demodulator	User Interface	USB Interface	FPGA
Ver. 1.49	Ver. 4.73	Ver. 4.09	Ver. 2.00
Date: 11/23/2017	Date: 12/21/2017	Date: 05/28/2015	Date: 07/30/2014

1.3 Introduction

Thank you for choosing the FDM-DUOr. It is an innovative dual mode SDR (Software Defined Radio) receiver covering the frequency range from 9kHz to 54MHz. The FDM-DUOr can be used like a standard receiver in stand-alone mode or in remote mode to exploit the full potential of the ELAD FDM-SW2 software. The FDM-DUOr can still be connected to the FDM-SW2 software when it works in "stand-alone" mode.

NOTE: For detailed information about ELAD FDM-SW2 software refer to user manual available at http://sdr.eladit.com/FDM-sw220Software/Doc/

1.3.1 Main Features

- Frequency range: 9kHz to 54MHz in direct sampling mode.
- Two antenna connectors (one with a 54MHz low-pass filter, the other one without).
- 10 slots for preselectors (filters). Settable by the user with the FDM-SW2 software.
- Operating modes: CW, CWR, LSB, USB, AM and FM.
- ADC Linear LTC2165,16bit @122.88MHz.
- FPGA Spartan 6 XC6SLX25 + Serial Flash for stand-alone mode.
- Stand-alone RX demodulator with STM32F4 ARM floating point μController.
- LPC1766 Cortex M3 for LCD & Keyboard control.
- Clocking source Si5338 driven by 10MHz TCXO or external reference input.
- CAT USB interface with FTDI controller.

1.3.2 Block Diagram



ELAD FDM-DUOr (Receiver ONLY) BLOCK DIAGRAM

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1.4 Precautions

- Connect the receiver only to a power source described in this manual.
- Take care when plugging-in cables, avoid applying sideways pressure that might damage the connectors.
- Avoid operating in wet conditions.
- For better performance and safety, connect the receiver to good earth ground using a short, heavy, braided cable.
- Ground all outdoor antennas for this receiver using approved methods. Grounding helps protect against voltage surges caused by lightning. It also reduces the chance of build-up of static charge.

2 Panels Description

2.1 Front Panel Description



1 - LCD Display

See <u>LCD Display</u>.

2 - E1 Knob

Available functions : settings of audio volume, squelch for FM, gain control (AGC), noise reduction (NR), noise blanker (NB) and auto notch (AN). See <u>Knobs functions</u> for more information about knobs use.

3 - Main Knob

Available functions : VFO tuning, memory selection in MEM mode, step selection in VFO mode. See <u>Knobs functions</u> for more information about knobs use.

4 - Main audio output for speakers and headphones (front panel)

5 - Auxiliary audio output

6 - E2 Knob

Available functions : settings of reception filters, CW pitch value, and RIT value. See <u>Knobs functions</u> for more information about knobs use.

7 - MODE and MENU buttons

Operating mode selection (AM, CW, ...). Tune mode activation. "QuickStep" function activation. Access to the setup menu. See <u>Keys functions</u> for more information about keys use.

8 - VFO and MEM buttons

Basic VFO and memory operations. See <u>Keys functions</u> for more information about keys use.

2.2 Rear Panel Description



1 - USB Receiver Data Connector

USB 2.0 port. Connect it to computer to use the SW2 software. Please use the supplied cable.

2 - Frequency Reference Input

SMA 50 Ohm connector. Apply an 10MHz 0dBm signal.

3 - Input Antenna 1 Connector

M-type 50 Ohm connector. Connected to the integrated low pass filter.

4 - Input Antenna 2 Connector

M-type 50 Ohm connector. Not connected to the integrated low pass filter.

5 - Mute Input Connector

3.5mm stereo jack connector.



RING: do not connect (reserved for future use). TIP : mute input, connect to GROUND to activate the mute functionality.

6 - CAT USB Serial Port

USB 2.0 port. Connect it to the computer to manage the FDM-DUOr through the CAT (Computer Aided Transceiver) protocol.

7 - Power Switch

Turns on or off the FDM-DUOr.

8 - Power Connector

Voltage to apply : 13.8V. Maximum current consumption : 0.6A DC.

9 - Expansion Port

DB9 connector for external hardware. THIS IS NOT A STANDARD SERIAL PORT.



- Pin 1: SPI Latch
- Pin 2: I2C SCL
- Pin 3: SPI Clock
- Pin 4: I2C SDA
- Pin 5: Ground
- Pin 6: DUOr TX
- Pin 7: DUOr RX
- Pin 8: SPI Data
- Pin 9: +5V

10 – Main audio output for speakers and headphones (rear panel)

11 – Ground Connector

For better performance and safety, connect it to an earth ground using a short and wide cable.

3 Preselectors Description

3.1 Preselectors Slots

The FDM-DUOr has ten slots for preselector filters, also simply called preselectors or filters. To change the preselectors configuration remove the top cover, identify the appropriate slot and insert or remove the preselector board. The picture below shows their position and numbering. Use the FDM-DUOr manager in the FDM-SW2 software (as described in **3.3** - **Modify the preselectors configuration**) to send the preselectors configuration to the FDM-DUOr.



As shown in the FDM-DUOr front end block diagram below, use slots 4 to 10 for HF (under Antenna 1) and slots 1 to 3 if using Antenna 2 (no low pass filter).



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3.2 Preselectors List

Actual available preselectors (*)						
Code Description		Code	Description			
FHP05M-1	High Pass 500 kHz	FBP17-1	Band Pass 17 m			
FHP1M7-1	High Pass 1700 kHz	FBP15-1	Band Pass 15 m			
FBP160-1	Band Pass 160 m	FBP12-1	Band Pass 12 m			
FBP80-1	Band Pass 80 m	FBPY	Bypass module (**)			
FBP40-1	Band Pass 40 m	FPCB-B3	Empty module for self-made filters			
FBP30-1	Band Pass 30 m	FPCB-H5	Empty module for self-made filters			
FBP20-1	Band Pass 20 m					

^(*) Please refer to ELAD website for updated list of preselector modules.

FPCB-B3 Preselector Schematic





FPCB-H5 Preselector Schematic





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3.3 Modify the preselectors configuration

The filters configuration is stored in the FDM-DUOr internal memory. To modify and save this configuration use the "FDM-DUO Manager" feature in the ELAD FDM-SW2 SDR Software.

1	FDM-DUO S-Meter	FDM-SW2 😵 🚍 🗖 🔀
FDM-DUO Stand Alone Control Mode RX1 = Stand Alone (CF) RX = TX Artenna Automation Use only RTX/TX Artenna Use both RTX/TX and RX Artenna		Attenuator LP54MHz Note Blanker Note BW Frequency OFF 100 0 0 0 FRV RV2 RV3 RV4 Mode LSB V Fitter BW 2.500 0
Volume 0 Volume AUX 50 TX Power 1.0W 50 AGC AGC Gain FAST 1 MACRO 1 MACRO HE	TX FFDM-DUO Manager X CAT Pot COM13 V AV5 = 2	Alde MELULUM Thr Thr Auto Notch 100% Auto Notch 67% Sql
MEM 3 MEM 4 MEM 5 7070	20kHz 14040xHz 2,5MHz 13,0MHz 5 60m 49m 40m 0 Start 14100kHz 14120kHz 14140kHz 1,0MHz 15,5MHz 16,0MHz 16,5M 15m 12m 10	Sql -140dBm RX4 Vol 1 ● 100% 1 Vol 2 ● 67% 1 1 Sql ● -140dBm 1 1
LSB USB	FILE FDM-Duo LSB BW 2,5kHz LO 14.070.000Hz No file select 0.00.00/00.00:00 0.00.00/00.00:00 0.00.00/00.00:00 0.00.00/00.00:00 0.00.00/00.00:00 0.00.00/00.00:00 0.00.00/00.00:00 0.00.00/00 0.00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00 0.00/00:00 0.00/00:00 0.00/00:00 0.00/00:00 0.00/00:00 0.00/00:00:00 0.00/00:00:00 0.00/00:00:00 0.00/00	UTC Time 11/04/2016 14:24:23 Local time 11/04/2016 16:24:23 FDM-SW2 CPU Usage 4,5% Total CPU Usage 25,4%
TUNE FDM-DUO 2 C		

- 1. Click on the "FDM-DUO" button.
- 2. In the "FDM-DUO control panel", click on the "FDM-DUO MANAGER" button.
- Choose the right COM port, the right baud rate (menu 70 of the FDM-DUOr) and click on "Start". You need to connect the CAT USB port of the FDM-DUOr to the computer to perform this operation.

The loading process may take some time, depending on the baud rate selected.

FDM-DUO Manager							
Memories Backlight Preselectors 1							
Internal Preselectors				Load	2		
	Filter ID	Enabled		High Pass Freq	Low Pass Freq		2
	1	NO	•	0	1		3
	2	NO	•	0	0		
	3	NO	•	0	0		
	4	YES	•	13.600.000	21.500.000		
	5	YES	•	21.500.000	35.000.000		
	6	YES	•	1.700.000	54.000.000		
	7	YES	•	0	1.700.000		
	8	NO	•	0	0		
	9	NO	•	0	0		
	10	NO	•	0	0	Message	5
				Save	4	Ĵ	Configuration Saved

Then.

- 1. Select the "Preselectors" tab.
- 2. The "Load" button allows you to retrieve from the FDM-DUOr the current configuration.
- 3. Set a filter. The settings table is formed by 10 rows, one for each filter slot of the FDM-DUOr. Each row contains 4 fields :
 - the filter ID / slot number : from 1 to 10,
 - the state of the filter/slot : enabled or not,
 - the beginning frequency of the filter use, otherwise called "high pass frequency",
 - the end frequency of the filter use, otherwise called "low pass frequency".
 - For each row choose the "Enabled" state and if enabled, enter the desired High Pass and Low Pass frequencies which specify the activation band of the filter.
- 4. Press the "Save" button to store the configuration in the FDM-DUOr internal memory.
- 5. A message box appears to confirm the operation or indicate a negative outcome.

Some rules to keep in mind :

- the frequency to enter is in Hertz,
- the High Pass frequency must be strictly slower than the Low Pass frequency,
- in the same way the Low Pass frequency must be strictly higher than the High Pass frequency,
- in case of use of the FBPY bypass module, insert it to the last used slot.

Slot number	Antenna	Preselector code	Frequency range
1	ANT 2	-	-
2	ANT 2	-	-
3	ANT 2	-	-
4	ANT 1	FBP-13/21	13.6MHz – 21.5MHz
5	ANT 1	FBP2135	21.5MHz – 35.0MHz
6	ANT 1	FHP1M7-1	1.7MHz – 54MHz
7	ANT 1	FBPY	0Hz – 1.7MHz
8	ANT 1	-	-
9	ANT 1	-	-
10	ANT 1	-	-

For example, considering the default configuration of the FDM-DUOr which is :

To select the right filter the FDM-DUOr analyses the configuration following the ascending order of the slots. If the current tuning frequency is inside the frequency range the filter is selected, if not it passes to the next slot. This mean that filters that have more bandwidth should be left last. It is recommended to place the bypass module in the last used slot and to enable it in the frequency range which is not covered by the others filter modules.

Some cases with the above configuration :

- tuning frequency set to 14MHz : the filter on the fourth slot is selected,
- tuning frequency set to 28MHz : the filter on the fifth slot is selected,
- tuning frequency set to 52MHz : the filter on the sixth slot is selected,
- tuning frequency set to 1MHz : the filter on the seventh slot is selected.

If you want to mount a new filter, for example FBP-40-1 with the frequency range 7MHz – 7.45MHz, it is better to insert it in slot 4 and move all the other filters by one slot.

Slot number	Antenna	Preselector code	Frequency range
1	ANT 2	-	-
2	ANT 2	-	-
3	ANT 2	-	-
4	ANT 1	FBP-40-1	7MHz – 7.45MHz
5	ANT 1	FBP-13/21	13.6MHz – 21.5MHz
6	ANT 1	FBP2135	21.5MHz – 35.0MHz
7	ANT 1	FHP1M7-1	1.7MHz – 54MHz
8	ANT 1	FBPY	0Hz – 1.7MHz
9	ANT 1	-	-
10	ANT 1	-	-

So the configuration should become :

4 LCD Display



- 1. LP: turns on when the low pass filter is active. ATT: turns on when attenuation is active.
- 2. METER: displays the signal strength in S-units.
- 3. Units of measurements of the values displayed. The "S" letter of SWR is also used to indicate that the "QuickStep" function is active.
- 4. PK: blinks if the ADC of reception is "overloaded".
- 5. Secondary indication: displays the signal strength in dBm.
- 6. Measurement unit for the secondary indication.
- LOC: turns on when the Main Knob is locked.
 REM: turns on when the remote mode is active, turns off when the stand-alone mode is active.
- 8. CAT: turns on when a CAT command is received. SERV: turns on when the service mode is enabled.
- 9. Displays the selected operating mode.
- 10. Turns on when the external frequency reference is present.
- 11. E2 selected function :
 III: filter bandwidth setting,
 PITCH : CW pitch frequency setting,
 RIT : Receiver Incremental Tuning setting.
- 12. Alphanumeric characters to displaying messages and numeric values.

13. E1 selected function :

VOL: main volume setting, SQL : squelch setting (for FM mode), AGC: automatic gain control settings, NR: noise reduction setting, NB: noise blanker setting, AN : auto notch setting.

- 14. Displays the selected VFO, A or B.
- 15. MEM: turns on in memory mode.
 VFO: turns on in VFO mode.
 SET: turns on when the setting menu is shown.
 SET: turns on jointly to MEM when the VFO→MEM menu is active.
- 16. In memory mode, displays the selected memory index. When in the setting menu, displays the menu number.
- 17. RX: reception state indication.

5 Quick Start

These instructions are intended only for a quick guide, detailed instructions are given later in this manual.

5.1 First of all

To avoid having a forest of buttons and knobs as front panel, each control has different operating modes.

The buttons can be "short pressed" or "long pressed" to activate different functions. The different functions associated to each pressure are written in different colors just above the corresponding button. Each top white label is associated to the "short pressure" on the button, while the lower blue label is associated to the "long pressure".

	Example	
A/B M swaps A and B VEOs if "short prossed" and swaps VEO and Momony mo	do if "long proceed"	
swaps A and B VFOS IT Short pressed, and swaps VFO and Memory mo	de li long pressed .	
The A/B label refers to the A/B VFO swap obtained with a "short pressure".		
The M label refers to the VFO/Memory mode swap obtained with a "long pres	sure".	

A button is "long pressed" when it is kept pressed for more than 1 sec. This value can be changed using menu 71 (Hold Time) as explained in section 6.5 - Settings Menu List.

Valid values can vary from 500 ms to 2500 ms.

The knobs can be pressed as well to control a different parameter.

The E1 knob usually controls the audio volume, but if pressed once it controls the squelch value.

Tuning

Example

Long Pressure

The tuning knob can be pressed to change the tuning step or to enter the "Digit by digit tuning mode".

The tuning knob operations are detailed in section 6.1.1 - Tuning.

Reset

5.2 Reset

When first approaching a largely programmable device like FDM-DUOr it is nearly unavoidable to mess some parameters with useless values. This is not a problem and should not prevent users from trying the different settings, since a "reset" command is available to bring back the device to the factory settings.

The reset procedure is quite simple:

- short press the MENU button
- turn the F2 knob until reading 81 DEFAULT on the display
- short press the E2 knob to show "N" on the right of DEFAULT
- turn the E2 knob to change "N" to "Y"
- short press the E2 knob
- wait for the radio reset and restart

5.3 A first trip

A radio like FDM-DUOr has many possible application scenarios, both used as a stand-alone device, and paired with its mate software.

In this section the simplest and most common uses will be shown, to allow a first familiarization with FDM-DUOr.

The first use for FDM-DUOr is, clearly, reception. To do that, just connect the device to a 12V power supply (or to a battery) and turn it on by using the back switch.



After some seconds the device is in reception mode with VFO A enabled.

The main controls are as follows:



The tuning is done using the main tuning knob.

It is possible to change the tuning step to an alternate value with a short pressure on the button.

Another short pressure on the $\sum_{i=1}^{N}$ button resets the usual tuning step.

It is possible to change the tuning step to various values with a short pressure on the tuning knob. This leads the tuning knob to select different tuning steps.

Once the desired step has been selected, another short pressure on the tuning knob will bring it back to control the tuning, using the new selected step.

Volume and bandwidth

The volume is set by the E1 knob.

The E2 knob controls the bandwidth.

Enhancing Reception

By clicking on the E1 knob, it is possible to activate some useful options:

- 1. Audio Volume: this, as seen previously, is the default behavior;
- 2. Squelch Value: if activated, the related icon on the display blinks;
- 3. Automatic Gain Control On/Off: if activated, the AGC icon on the display blinks;
- 4. Automatic Gain Control Speed: it is possible to select Slow, Medium, or Fast;
- 5. Noise Reduction: it is possible to activate and set the level, if activated the NR icon on the display blinks;
- 6. Noise Blanker: it is possible to activate and set the level, if activated the NB icon on the display blinks;
- 7. Auto Notch: it is possible to activate and select two different levels of intervention; when activated, Auto Notch detects and kills an audio persistent tone.

By clicking on the E2 knob, it is possible to activate some useful options:

- 1. Filter Bandwidth: this, as seen previously, is the default behavior;
- 2. CW Pitch: this allows to choose the preferred CW reception tone;
- 3. Receive Incremental Tuning On/Off;
- 4. Receive Incremental Tuning Value: this allows to move the reception frequency away from the transmission frequency; this function appears only if the previous Receive Incremental Tuning is set to On.

6 User Interface

6.1 VFO Mode

The VFO mode is the default mode of FDM-DUOr. Each VFO memorize the tuning frequency, mode and tuning step

LP ATT PRE ANT 12 IN MICUSB	
S 1 3 5 7 9+10 +20	
MEM I D D HK HK HK HK HK	KI HANKIKIKI KHZ FMW IO
	REFIN PAD KEY
E1 VOL SOL MIC AGC NR NB	AN E2 III PWR PITCH RITXIT

6.1.1 Tuning

In this mode, use the Main Knob to tune a frequency. A short pressure on the main knob enter the frequency step menu



Use the main knob to modify the tuning step, then with a short pressure return in the VFO menu.

With a long pressure over the main knob, the Digit by Digit Frequency tuning mode is activated



SELECTED DIGIT

In this mode use the main knob to modify the selected digit and E1 or E2 to change witch digit you want to modify. Apply a short pressure on main knob to return in the standard tuning mode.

6.1.2 E1 Receiver Settings

Apply a short pressure on the E1 knob to change the E1 selected parameter, the selected parameter icon is turned on in the LCD. Turn until one click the E1 knob to display the parameter value, then turn again E1 to modify the parameter value.



SQL: if the Squelch is turned on the relative SQL icon blinks.

AGC: if the AGC is turned OFF (manual gain mode), the AGC icon blinks.

NR and NB: if the Noise Reducer or the Noise Blanker is turned on the relative NR or NB icon blinks.

6.1.3 E2 Receiver Settings

Apply a short pressure on the E2 knob to change the E2 selected parameter, turn until one click the E1 knob to display the parameter value, then turn again E1 to modify the parameter value.



RIT: if the RIT is turned on the relative RIT icon blinks, note that if the RIT is turned off the "Rit Value" menu is not displayed. To modify the RIT value you have to use the E2 knob to change the selected digit key to change the digit selection. Keep press the key to reset the RIT value. and press the

6.1.4 Switch VFO

Use the A/B button to switch VFO-A/B.

6.1.5 Store VFO to memory

Use the Ver key to store the current VFO settings into a memory

	PKH CAT SERV
\$ 1 3 5 7 9+10 +20 +40	+60 SWR LSB USB
	KHZ FMW IQ
E1 VOL SQL MIC AGC NR NB AN E2	ITT PWR PITCH RIT XIT

Use E2 knob or main knob to select the destination memory and confirm with a short pressure on E2.

6.1.6 "QuickMem" Mode

Keep pressed the $\bigvee_{i=1}^{V-M}$ key to enter the "QuickMem" mode.

The memory channels 180 to 199 are reserved for the "QuickMem" selection. Keep pressed the \underbrace{V}_{F1}^{F1} key until the desired frequency appears on the LCD display, then release the key and the current VFO is set to the frequency and mode saved in the memory channel.

You can use the "FDM-DUOr Manager" feature in the ELAD FDM-SW2 software to customize the memory channels.

6.1.7 VFO-A = VFO-B

With long pressure on $\frac{M-V}{F2}$ key you get VFO-A = VFO-B

RX]-{ 8 8, pk h	Wout LOC JBm REM CAT SERV
S 1 3 5 7 9+10 +20 SET I B B M M M M	+40 +6	SWR MSW MSW	LSB USB SAMCW±
VFO A B W W W W	AN E2	PWR PI	PAD KEY CH RIT XIT

6.1.8 Change Operating Mode

With a short pressure on the $\frac{MODE}{F3}$ button, you can change the receiver mode between the available modes:



When you do not use the FM mode, you can disable it with the setting menu 14 "FM MODE". The main purpose of this functionality is to not hear the FM exasperating noise when changing between modes and you are not using the FM mode.

6.1.9 "QuickStep"

With a short pressure on the $\begin{bmatrix} S \\ F4 \end{bmatrix}$ key, the "QuickStep" function is activated. This function quickly sets the frequency step preset selected in the "QuickStep" setting menu, press again the $\begin{bmatrix} S \\ F4 \end{bmatrix}$ key to set the previous frequency step.

6.2 MEM Mode

To activate the memory mode, apply a long pressure on $\frac{A/B}{M}$. In MEM mode it is possible to receive, transmit and change the E1/E2 settings in the same way of the VFO mode.

LP ATT PRE ANT 12 INMICUSB	- 8 1,	Wour LOC
	PK H	CAT SERV
S 1 3 5 7 9+10 +20 +40 +60		LSB USB
	mSW	SAM CW ±
	KHz	FAW IQ
E1 VOL SQL MIC AGC NR NB AN E2		CH RIT XIT

6.2.1 Select and edit a memory

Use the main knob to select a memory. Apply a long pressure on the main encoder to enter the edit memory menu. In this menu it is possible to modify the selected memory frequency in digit by digit mode.

	81.	Nout LOC Bm REM CAT SERV
S 1 3 5 7 9+10 +20 +40 +60 MEM A	swr sw KHz	LSB USB SAM CW± FMW IQ
E1 VOL SQL MIC AGC NR NB AN E2		CH RT XI

6.2.2 Delete a memory



	-I B B WOUT LOC B B B B M REM PK H CAT SERV
\$ <u>1</u> 3579+10+20+40+60	SWR LSB USB
MEM 20 0 0 1 EE 0 YES	msw samcw± KHz fmw iq refin Pad key
E1 VOL SQL MIC AGC NR NB AN E2	WR PITCH RIT XIT

Use the E2 knob to set yes or no and make a short pressure on E2 to confirm.

6.2.3 Set memory to VFO

Use the $\frac{A/B}{M}$ button to select the VFO-A/B. Use the $\frac{M+V}{F2}$ key to set in the selected VFO the selected memory frequency and mode. When this function is used, the FDM-DUOr automatically switches to the VFO mode.

6.2.4 Change the memory display mode

Apply a short pressure on the $\begin{bmatrix} S \\ F4 \end{bmatrix}$ key to show the memory label in the LCD main display. Press shortly again $\begin{bmatrix} S \\ F4 \end{bmatrix}$ to return to display the memory frequency.



You can use the "FDM-DUOr Manager" feature in the ELAD FDM-SW2 software to customize the memory channels.

6.3 Knobs functions

Menu	Action	Main Knob	E1 Knob	E2 Knob
	Value modified	Change selected VFO frequency	Enter E1 selection parameter	Enter E2 selection parameter
VFO	Short Pressure	Enter STEP menu	Change E1 selected parameter	Change E2 selected parameter
	Long Pressure	Switch to DIGIT by DIGIT tuning mode	(2)	(2)
	Value modified	Change tuning step value		
STEP	Short Pressure	Exit from STEP Menu		
	Long Pressure	Switch to DIGIT by DIGIT tuning mode	(2)	(2)
	Value modified	Select next/previous memory	Enter E1 selection parameter	Enter E2 selection parameter
MEM	Short Pressure		Change E1 selected parameter	Change E2 selected parameter
	Long Pressure	Switch to DIGIT by DIGIT tuning mode	(2)	(2)
E1 Selection: VOL - SQL - AGC - NR - NB	Value modified	Back to VFO or MEM menu	Modify E1 selected parameter value	Modify E2 selected parameter value
	Short Pressure	Back to VFO or MEM menu	Change E1 selected parameter	Change E2 selected parameter
	Long Press	Switch to DIGIT by DIGIT tuning mode	(2)	(2)
E2 Selection: FILTER - PITCH	Value modified	Back to VFO or MEM menu	Modify E1 selected parameter value	Modify E2 selected parameter value
	Short Pressure	Back to VFO or MEM menu	Change E1 selected parameter	Change E2 selected parameter
- KI I	Long Pressure	Switch to DIGIT by DIGIT tuning mode	(2)	(2)
	Value modified	Change the destination memory		Change the destination memory
VFO > MEM	Short Press			Save VFO in the selected memory
	Long Pressure		(2)	(2)
	Value modified			Change Yes/No
Delete MEM	Short Pressure			Confirm Yes/No
	Long Pressure			
	Value modified			Change parameter selection
SETUP -	Short Press			Enter parameter setup menu
CHOICE (MENU button)	Long Pressure			

The following table describes the knob functions for some user interface menu :

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Menu	Action	Main Knob	E1 Knob	E2 Knob
	Value modified	Parameter coarse variation (1)	Parameter coarse variation (1)	Parameter fine variation
PARAMETER	Short Press			Save and exit
MODIFICATION	Long Pressure			
	Value modified	Modify the current digit value	Change digit selection	Change digit selection
DIGIT by DIGIT Tuning	Short Pressure	Switch to standard tuning mode	Switch to standard tuning mode	Switch to standard tuning mode
	Long Pressure		(2)	(2)

(1) Available only for certain menu.

(2) Press simultaneously E1 and E2 to lock/unlock all the keys and knobs. When the keys/knobs lock function is activated the E1/E2 icons blink.

6.4 Keys functions

The following table describes the keys functions :

Mode	Pressure	A/B M	V►M F1	M►V F2	MODE F3	S F4	MENU F5
VEO	Short Switch VFO VFO to MEM - menu		-	Change selected VFO operating mode Enable/disable Quickstep function		Enter settings menu	
VIO	Long	Switch to MEM mode	Enter "QuickMem" menu	VFO A = B	-	-	Lock/Unlock Main Knob
NAENA	Short	Switch VFO	-	Selected memory to VFO	Change selected memory operating mode	Change memory display frequency/label	Enter settings menu
	Long	Switch to VFO mode	Enter delete memory menu	-	-	-	Lock/Unlock Main Knob

6.5 Settings Menu List

The following table describes the FDM-DUOr settings menu list. To enter the settings menu mode, press the $\frac{MENU}{F5}$ key. Use E2 to select the menu, then apply a short pressure on E2 to display the current menu setting, if you want to change the setting use the E2 knob and confirm the setting with a short pressure on E2. In some menu you can also use the main knob to change the setting more quickly. To turn back or exit the menu just press $\frac{MENU}{F5}$.

Menu	Title	Description	Available Settings	Default
		RECEPTION MENU		
1	RX ATT	Receiver input attenuation	0dB, 10dB, 20dB and 30dB	OdB
3	SNAP	Round to step	OFF or ON	ON
4	AGC TH	AGC Threshold	From 0 to 10	4
6	AUX VOL	Auxiliary output volume	From 0 to 100	50
7	QUICKSTEP	Step selected for the "QuickStep" mode	1Hz, 5Hz, 10Hz, 25Hz, 50Hz, 100Hz, 250Hz, 500Hz, 1kHz, 2kHz, 3kHz, 4.5kHz, 5kHz, 7.5kHz, 9kHz, 10kHz, 12.5kHz, 25kHz, 50kHz, 100kHz, 125kHz, 250kHz, 500kHz, 1MHz	1kHz
12	SET CW MODE	Enable / disable CW reverse mode	YES or NO	NO
14	FM MODE	Enable / disable FM mode	OFF or ON	ON
		GENERAL SETTINGS MENU	J	1
60	FR OFFSET	Enable / Disable the frequency offset for the visualization	OFF or ON	OFF
61	OFS VALUE	Frequency offset value for the	+/- 99.999999999 GHz.	OHz
		visualization	See <u>Frequency</u>	
			visualization offset menu	
70	CAT BAUD	CAT serial port baud rate	9600, 38400, 57600, 115200	38400
71	HOLD TIME	Hold time to detect a long pressure	From 500 to 2500ms	1000ms
72	REPT TIME	Repetition time when a key is pressed	From 100 to 1500ms	600ms
73	BACKLIGHT	Enables the backlight to change when the DUO changes modality between Stand-Alone and Remote	YES or NO	YES
		SERVICE MENU		
80	SERVICE	Enable Service mode	ON or OFF	OFF
81	DEFAULT	Restore default parameters	YES or NO	NO
82	UI UPDATE	If Service mode is active, enable the firmware update mode	YES or NO	NO
83	VIEW SN	Display the FDM-DUOr serial number		
84	VIEW FW	Display the FDM-DUOr firmware versions	Firmware	UI
85	CLK ADJ	Sets the internal clock correction value. It is used to have a fine frequency setting. In case of "Ref In" utilization, this parameter is not relevant.	±50000 dots (not Hz)	-

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6.5.1 Frequency visualization offset menu

The frequency visualization offset is helpful when using a transverter. The Frequency offset set in digit by digit mode with some improvements to set a signed 10 digit offset in a 9 digit display.

- E2: Select the digit to modify
- Main encoder: modify the selected digit value
- E1: change the visualization
 - o kHz: the 8 most significant digit of the frequency offset are displayed
 - \circ $\;$ Hz: the 9 least significant digit of the frequency offset are displayed
- E1 or Main encoder short pressure: change the sign of the offset (+/-)
- E2 short pressure: save the setting

EXAMPLES:

Frequency offset value: +10,000,034,120 Hz

o kHz Display mode

LP ATT PRE ANT 12 IN MICUSB		-/882	Volt LOC Bm REM CAT SERV
\$ 1 3 5 7 9+10 +20			
	$\Box \supset \Box$	mSW	SAMCW±
	<u></u>	KHz	
E1 VOL SQL MIC AGC NR NB AN			CH RIT XIT

• Hz Display mode

LP ATT PRE ANT 12 IN A RX 000000000000000000000000000000000000	AICUSB			Wour LOC dBm REM CAT SERV
	+10 +20 	*40 	+60 SWR	LSB USB SAMCW± FMW IQ
	NR NB AN	E2 _/		FAD REY TCH RIT XIT

7 CAT Remote Control

7.1 General Specifications

The FDM-DUOr receiver uses a full-duplex, asynchronous, USB serial interface for communicating through the USB CAT port. Each data is constructed with 1 start bit, 8 data bits, 1 stop bit, no parity is used (8N1). The baud rate is selectable in the [70] CAT BAUD menu. Available values are 9600, 38400, 57600, 115200 bps.

The FDM-DUOr implements proprietary commands and also a subset of the Kenwood TS-480 command set. Some of those TS-480 commands have no effect on the receiver, they only ensure the compatibility of the FDM-DUOr with Ham Radio Deluxe.

7.2 Commands Types

A CAT command is composed of an alphabetical part, various parameters and a terminator that signals the end of the command. For example to set the VFO-A to 14MHz the command is: "FA00014000000;" with :

- "FA": alphabetical command,
- "00014000000": parameter,
- ";": terminator.

CAT commands can be classified as shown below:



EXAMPLE

- To set the VFO-A to 14MHz the PC sends the SET command type "FA00014000000;"
- To read the VFO-A frequency the PC sends the **READ command type** "FA;", the **ANSWER** response type is returned to the PC: "FA00014000000;".

NOTE

Some particular rules about the CAT commands on the FDM-DUOr :

- not all the commands have the three types of command/response (SET, READ and ANSWER),
- normally, send the SET command type will not cause the FDM-DUOr to send the ANSWER response type but if a command does not have a READ command type and has the SET and ANSWER type, then send the SET command will cause the FDM-DUOr to send the ANSWER response type.

7.3 Cat Commands

7.3.1 Active commands list

COMMAND	FUNCTION	SET	READ	ANS.
AT/RA	RF ATTENUATOR	YES	YES	YES
DT	DUO TYPE	-	YES	YES
FA	VFO-A FREQUENCY	YES	YES	YES
FB	VFO-B FREQUENCY	YES	YES	YES
FI	INTERNAL FILTER MODULES	YES	YES	YES
FR/FT	VFO/MEM MODE	YES	YES	YES
GC	GAIN CONTROL	YES	YES	YES
GI	GENERAL INFORMATION	-	YES	YES
GS	GAIN SETTINGS	YES	YES	YES
IF	INFORMATION	-	YES	YES
LB	LCD BACKLIGHT	YES	YES	YES
LP	LOW PASS	YES	YES	YES
MA	VFO-A MODE	-	YES	YES
MB	VFO-B MODE	-	YES	YES
MC	MEMORY CHANNEL	YES	YES	YES
MD	MODE	YES	YES	YES
MR	MEMORY READ	-	YES	YES
MU	MUTE RX	YES	YES	YES
MW	MEMORY WRITE	YES	-	-
NB	NOISE BLANKER STATUS	-	YES	YES
NC	NOISE REDUCTION	YES	YES	YES
NK	NOISE BLANKER	YES	YES	YES
NO	AUTO NOTCH	YES	YES	YES
NR	NOISE REDUCTION STATUS	-	YES	YES
OS	FVO STATE	YES	YES	YES
OV	FVO VALUE	YES	YES	YES
OW	FVO VALUE	YES	YES	YES
PI	PITCH	YES	YES	YES
RC	RIT CLEAR	YES	-	-
RD	RIT DOWN	YES	YES	YES
RF	RECEPTION FILTERS	YES	YES	YES
RI	READS RSSI	-	YES	YES
RT	RIT STATUS	YES	YES	YES
RU	RIT UP	YES	YES	YES
RV	RIT VALUE	YES	YES	YES
SE	SERVICE	YES	YES	YES
SM	S METER	-	YES	YES
SN	SERIAL NUMBER	-	YES	YES
SQ	SQUELCH	YES	YES	YES
TH	AGC THRESHOLD	YES	YES	YES
VA	AUX VOLUME	YES	YES	YES
VM	MAIN VOLUME	YES	YES	YES
VS	FIRMWARE VERSION	-	YES	YES

FVO : Frequency Visualization Offset (for transverter use)

RIT : Receiver Incremental Tuning

RSSI : Received Signal Strength Indicator

7.3.2 Active commands tables

AT	Rea	Reads or sets the input attenuator status									Parameters: P1 '0': 0dB
Set	1	2	3	4	5	6	7	8	9	10	(1': 10dB
	A	т	P1	;							'2': 20dB
Read	1	2	3	4	5	6	7	8	9	10	(3': 30dB
	A	т	;								5.300B
Answer	1	2	3	4	5	6	7	8	9	10	
	A	Т	P1	;							

DT	Rea	ds th	e FDM	-DUO) type	2					Parameters: P1 Always 002
Set											
Read	1	2	3	4	5	6	7	8	9	10	
	D	т	;								
Answer	1	2	3	4	5	10					
	D	Т	P1	P1	P1	;					

FA	Rea	ds or	sets tl	ne VF	O A f	requ	ency				Parameters: P1
Set	1	2	3	4	Frequency in Hz (11 digit)						
	F	A	P1	P1	P1	P1	P1	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	P1	P1	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	F	A	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	F	A	P1	P1	P1	P1	P1	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	P1	P1	P1	;							

FB	Rea	ds or	sets tl	he VF	O B fi	reque	ency				Parameters: P1
Set	1	2	3	4	Frequency in H2 (11 digit)						
	F	в	P1	P1							
	11	12	13	14	15	16	17	18	19	20	
	P1	P1	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	F	в	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	F	В	P1	P1	P1	P1	P1	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	P1	P1	P1	;							

FI	Rea	ds or	sets th	ne int	ernal	ngs	Parameters: P1 module index, from '0' to '9'						
Set	1	2	3	4	5	6	7	8	9	10	P2 module state:		
	F	I	P1	P1	P2	Р3	P3	Р3	Р3	P3	'0' not used		
	11	12	13	14	15	16	17	18	19	20	'1' used		
	Р3	Р3	P3	Р3	Р3	Р3	P4	P4	P4	P4	1 useu		
	21	22	23	24	25	26	27	28			D2 modulo low froquency		
	P4	P4	P4	P4	P4	P4	P4	;			P3 module low frequency		
Read	1	2	3	4	5	6	7	8	9	10			
	F	I	P1	P1	;						P4 module high frequency		
Answer	1	2	3	4	5	6	7	8	9	10			
	F	I	P1	P1	P2	Р3	P3	P3	P3	P3]		
	11	12	13	14	15	16	17	18	19	20]		
	Р3	Р3	P3	P3	P3	Р3	P4	P4	P4	P4]		
	21	22	23	24	25	26	27	28					
	P4	P4	P4	P4	P4	P4	P4	;			1		

FR	Rea	ds or	sets tl	ne VF	O or I	M.CH	l mod	е			Parameters: P1 0: VEO-A
Set	1	2	3	4							
	F	R	P1	- 7	2: M CH						
Read	1	2	3	4	2. W.CH						
	F	R	;								
Answer	1	2	3	4	5	9 10					
	F	R	P1	7							

FT	Rea	ds or	sets tl	ne VF	O or I		Parameters: P1 0: VEO-A	
Set	1	2	3	4	1: VEO-B			
	F	R	P1	;	2: M CH			
Read	1	2	3	4	2. W.CH			
	F	R	;					
Answer	1	2	3	4	5	5 7 8 9	10]
	F	R	P1	;				

GC	Rea	ds or	sets th	ne act	ive g	ain co	ontro	l			Parameters: P1
Set	1	2	3	4	0: auto (AGC)						
	G	С	P1	;			1: manual				
Read	1	2	3	4							
	G	С	;								
Answer	1	2	3	4	5	10					
	G	С	P1	;							

GI	Rea	ds th	e recei	ver st	tate						Parameters: P1 : RIT state			
Set					0:0π 1:on									
											P2 : always 0			
Read	1 2 3 4 5 6 7 8 9 1								10	P3 : selected memory index (000-				
	G I ;										199)			
Answer	1	2	3	4	5	6	7	8	9	10	$\mathbf{R}\mathbf{A}$: always 0			
	G	I	P1	P2	P3	P3	P3	P4	P5	P6	F4. always 0			
	11	12	13	14	15	16	17	18	19	20	 P5 : operating mode (see MD) PC : receiver mode (see FD (FT)) 			
	P7	P8	P8	P8	P8	;					P6: receiver mode (see FR/FT)			
											P7 : always 0			
											P8 : always 0000			

GS	Rea	ds or	sets th	ne co	ntrol	gain	settir	ngs			Parameters: P1
Set	1	2	3	4	0: auto (AGC)						
	G	S	P1	P2	P2	P2	;				1: manual
Read	1	2	3	4	5	6	7	8	9	10	
	G	S	P1	;							P2 for P1='0'
Answer	1	2	3	4	5	6	7	8	9	10	0 : slow
	G	S	P1	P2	P2	P2	;				1 : medium 2 : fast
											P2 for P1='1' 0 : OFF 1 a 10 : active

IF	Retr	ieves	the r	Parameters: P1: Frequency 11 digit							
Set											P2: 5 spaces P3: RIT value in tens of hertz
Read	1 T	2 F	3	4	5	6	7	8	9	10	0: OFF
Answer	1	2	3	4	5	6	7	8	9	10	1: ON P5: Always 0
	I	F	P1	P1	P1	P1	P1	P1	P1	P1	P6/P7: Memory ch. Number 0-199
	11	12	13	14	15	16	17	18	19	20	P8: Always 0
	P1 21	P1 22	P1 23	P2 24	P2 25	P2 26	P2 27	P2 28	P3 29	P3 30	P9: Operating Mode (See MD)
	P3	P3	P3	P4	P5	P6	P7	P7	P8	Р9	P10: See FR/FI
	31	32	33	34	35	36	37	38	39	40	P11: Always U
	P10	P11	P12	P13	P14	P14	P15	;			P12: Always 0 P13: Always 0 P14: Always 0 P15: Space

LB	Sets	s/Rea	ds the	LCD	backl	ight p	baran	neter	5		Parameters: P1 mode
Set	1	2	3	4	5	6	7	8	9	10	0 : temporary set
	L	В	P1	P3	P3	Р3	P4	P4	P4	P5	1 : Rx Stand Alone
	11	12	13	14	15	16	17	18	19	20	2 : Rx Remote (PC Controlled)
	P5	P5	;								
Read	1	2	3	4	5	6	7	8	9	10	P2 mode selection
	L	В	P2	;							1 : Rx Stand Alone
Answer	1	2	3	4	5	6	7	8	9	10	2 : Rx Remote (PC Controlled)
	L	В	P2	P3	P3	Р3	P4	P4	P4	P5	
	11	12	13	14	15	16	17	18	19	20	P3 : RED component (0 to 100)
	P5	P5	;								P4 : GREEN component (0 to 100)
											P5 : BLUE component (0 to 100)

LP	Rea	ds th	e Low-	Pass	Filter	-	Parameters: P1 0: not active	
					1: active			
Pood	1	2	3	4				
Reau	L	P	;	_				
Answer	1	2	3	4	5	10		
	L	Р	P1	;				

MA	Rea	ds the	e VFO	A ope	Parameters: P1:						
Set					1: LSB						
											2: USB
Read	1	2	3	4	5	6	7	8	9	10	Δ: EM
	М	D	;								5. 0.0
Answer	1	2	3	4	5	6	7	8	9	10	7. CM/D
	М	D	P1	;							7. CWR

MB	Rea	ds the	e VFO	В оре	Parameters: P1: 1: LSB						
Set					2: USB						
											3. CM
Read	1	2	3	4	5	6	7	8	9	10	J: EM
	М	D	;								5: ANA
Answer	1	2	3	4	5	6	7	8	9	10	
	М	D	P1	;							7. CWR

МС	Reca	alls or	reads	s the I	Parameters: P1: 0 or 1 P2: 00 to 99						
Set	1 2 3 4 5 6 7 8 9 10										12.00.035
	М	С	P1	P2	P2	;					
Read	1	2	3	4	5	6	7	8	9	10	
	М	С	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	М	С	P1	P2	P2	;					

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MD	Reca	alls or	reads	s the o	opera	ting	mode	9			Parameters: P1:			
Set	1	2	3	4	5	10	2. LISB							
	М	D	P1	;			3: CW							
Read	1	2	3	4	5	6	7	8	9	10	4: FM			
	М	D	;								5. 414			
Answer	1	2	3	4	5	6	9	10						
	М	D	P1	;							7. CWR			

MR	Rea	ds the	Mem	nory c	hann	el dat	а				Parameters: P1: 0 P2/3: 000 to 199 Memory No.
Set											P4: Frequency (11 digit)
Read	1	2	3	4	5	6	7	8	9	10	P5: Mode (see MD command) P6: Always 0
	M	R	P1	P2	P3	P3					P7: Always 0
Answer	1	2	3	4	5	6	7	8	9	10	P7. Always 0
7 115 11 11	М	R	P1	P2	P3	P3	P4	P4	P4	P4	P9: Always 0 P9: Always 0 P10 to P13: Memory label, last 14 chars
	11	12	13	14	15	16	17	18	19	20	
	P4	P4	P4	P4	P4	P4	P4	P5	P6	P7	
	21	22	23	24	25	26	27	28	29	30	
	P8	P8	Р9	Р9	P10	P10	P10	P10	P10	P10	P14: 00
	31	32	33	34	35	36	37	38	39	40	P15: Memory status B: used F: free
	P10	P10	P10	P10	P10	P10	P10	P10	P11	P12	
	41	42	43	44	45	46	47	48	49	50	
	P15	P16	P16	P16	P16	P16	P16	P16	P16	;	P16: Memory label, first 8 chars

MU	Sets	s or re	ads th	ne mu	te fu	nctio	n stat	tus			Parameters: P1:
Set	1	2	3	4	001 : 0N						
	М	U	P1	P1		001.00					
Read	1	2	3	4	5	6	7	8	9	10	ן בס.
	М	U	;								FZ. 000 · OEE
Answer	1	2	3	4	5	6	7	8	9	10	000 . OFF
	M	υ	P2	P2	P2		002 : ON (turned on from jack)				

MW	Stor	e the	data	to the	Mem	ory c	hanne	el			Parameters: P1·0
	1			4	E		7			10	P2/3: 000 to 199 Memory No.
Set	1	2	3	4	5	6	/	8	9	10	P4: Frequency (11 digit)
	M	W	P1	P2	P3	P3	P4	P4	P4	P4	P5: Mode (see MD command)
	11	12	13	14	15	16	17	18	19	20	
	P4	P4	P4	P4	P4	P4	P4	Р5	P6	P7	P7: Always 0
	21	22	23	24	25	26	27	28	29	30	P7: Always 0
	P8	P8	P9	P6	P10	P10	P10	P10	P10	P10	P8: Always 0
	31	32	33	34	35	36	37	38	39	40	P9: Always U
	P10	P10	P10	P10	P10	P10	P10	P10	P11	P12	A share
	41	42	43	44	45	46	47	48	49	50	14 chars
	P15	P16	P16	P16	P16	P16	P16	P16	P16	;	
Read											P15: Memory status
											B: used
Answer											F: free
7 11500 CT	-										P16: Memory label, first 8 chars

NB	Read	ds the	noise	e blan	ker fu	inctio	n stat	us			Parameters: P1 0: Noise Blanker OFF
Set					1: Noise Blanker ON						
Read	1	2	3	4	5	6	7	8	9	10	
	N	В	;								
Answer	1	2	3	4	10						
	N	В	P1	;							

NC	Rea	ds or	sets th	ne no	ise re	ducti	on va	alue			Parameters: P1 always 0
Set	1	2	3	4	5						
	N	С	P1	P2	P2		P2 noise reduction value				
Read	1	2	3	4	10	0: OFF					
	N	С	P1	;		01 ~ 10 (active)					
Answer	1	2	3	4	5	10					
	N	С	P1	P2	P2	P2	;				

NK	Rea	ds or	sets th	ne no	ise bl	anke	r valu	ie			Parameters: P1 always 0
Set	1	2	3	4							
	N	K	P1	P2	P2		P2 noise blanker value				
Read	1	2	3	4	5	6	7	8	9	10	0: OFF
	N	K	P1	;		01 ~ 10 (active)					
Answer	1	2	3	4	5	10					
	N	K	P1	P2	P2	P2	;				

NO	Rea	ds or	sets th	ne au	to no	tch v	alue				Parameters:
Set	1	2	3	4	5	P1 always 0					
	N	0	P1	P2	P2	P2	7				
Read	1	2	3	4	10	P2 auto notch value					
	N	0	P1	;							0: OFF
Answer	1	2	3	4	5	6	7	8	9	10	01 ~ 02 (active)
	N	0	P1	P2	P2						

NR	Read	ds the	noise	e redu	iction	funct	ion st	atus			Parameters: P1 0: Noise Reduction OFF
Set						1: Noise Reduction ON					
Read	1	2	3	4	10						
	N	R	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	N	R	P1	;							

OS	Sets	/Rea	ds the	Frequ	iency	view	offset	t statı	IS		Parameters: P1
Set	1	2	3	4	0: not active						
	0	S	P1	;		1: active					
Read	1	2	3	4	10						
	0	S	;								
Answer	1	2	3	4	5	10					
	0	S	P1	;							

OV	Sets	:/Rea	ds the	Frequ	iencv	view	offset	t valu	е		Parameters:
•••		,			·····,				-		P1
Set	1	2	3	4	Always 'O'						
	0	v	P1	P2	P2						
	11	12	13	14	15	16	17	18	19	20	Offset sign'+' /'-'
	Р3	Р3	P3	P3	;	P3					
Read	1	2	3	4	5	6	7	8	9	10	Absolute value in Hz
	0	v	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	0	v	P1	P2	P3	Р3	P3	P3	Р3	Р3	
	11	12	13	14	15	16	17	18	19	20	
	P3	P3	P3	P3	P3	P3	P3	P3	P3	;	

ow	Sets	s/Rea	ds the	Frequ	iency	view	offset	t valu	e		Parameters: P1
Set	1	2	3	4	Offset sign'+' /'-'						
	0	W	P1	P2	P2						
	11	12	13	14	15	16	17	18	19	20	Absolute value in Hz
	P2	P2	P2	P2	P2	;					
Read	1	2	3	4	5	6	7	8	9	10	
	0	W	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	0	W	P1	P2	P2	P2	P2	P2	P2	P2	
	11	12	13	14	15	16	17	18	19	20	
	P2	P2	P2	P2	P2	;					

PI	Rea	ds or	sets th	ne pit	ch va	lue					Parameters: P1 pitch value in Hz
Set	1	2	3	4	5	6	7	8	9	10	0000 ~ 1000 in 10Hz step
	Р	I	P1	P1	P1	P1	;				
Read	1	2	3	4	5	6	7	8	9	10	
	P	I	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	P	I	P1	P1	P1	P1	;				

RA	Rea	ds or	sets th	ne att	enua	tor fı	unctio	on sta	atus		Parameters: P1 00: ATT OFF
Set	1	2	3	4	5	6	7	8	9	10	01: ATT ON (20dB)
	R	A	P1	P1	;						P2: always 00
Read	1	2	3	4	5	6	7	8	9	10	r 2. aiways 00
	R	A	;								
Answer	1	2	3	4	5	10					
	R	A	P1	P1	P2						

RC	Clea	rs th	e RIT v	alue							Parameters: None
Set	1	2	3	4	5	6	7	8	9	10	
	R	С	;								
Read											
Answer											

RD	Sets	RIT 1	to a ne	gativ	e valı	Je					Parameters: P1 pegative value of RIT to set (from 0
Set	1	2	3	4	5	6	7	8	9	10	to 50000Hz max value subject to
	R	D	P1	P1	P1	P1	P1	;			change)
Read	1	2	3	4	5	6	7	8	9	10	chunge)
	R	D	;								P2: always 1
Answer	1	2	3	4	5	6	7	8	9	10	
	R	D	P2	;							

RF	Rea	ds oi	r sets t	he re	cepti	on fil	ters v	values	5		Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1 (like MD command)
	R	F	P1	P2	P2	;					1: LSB
Read	1	2	3	4	5	6	7	8	9	10	2: USB
	R	F	P1	;							3/7: CW/CWR
Answer	1	2	3	4	5	6	7	8	9	10	4: FM
	R	F	P1	P2	P2	;					5: AM
							P2: see parameter details below				

P2		MO	DE	
	LSB/USB	CW/CWR	AM	FM
00	1600Hz	-	2500Hz	Voice Narrow
01	1700Hz	-	3000Hz	Voice Wide
02	1800Hz	-	3500Hz	Data
03	1900Hz	-	4000Hz	-
04	2000Hz	-	4500Hz	-
05	2100Hz	-	5000Hz	-
06	2200Hz	-	5500Hz	-
07	2300Hz	100Hz & 4	6000Hz	-
08	2400Hz	100Hz & 3	-	-
09	2500Hz	100Hz & 2	-	-
10	2600Hz	100Hz & 1	-	-
11	2700Hz	100Hz	-	-
12	2800Hz	300Hz	-	-
13	2900Hz	500Hz	-	-
14	3000Hz	1000Hz	-	-
15	3100Hz	1500Hz	-	-
16	4000Hz	2600Hz	-	-
17	5000Hz	-	-	-
18	6000Hz	-	-	-
19	DATA 300Hz	-	-	-
20	DATA 600Hz	-	-	-
21	DATA 1000Hz	-	-	-

RI	Rea	ds RS	SI								Parameters: P1 :
Set											'+' : positive value
Read	1	2	3	4	5	6	7	8	9	10	'!' : unreliable value
neuu	R	-	;		5	0		0	5		P2 :RSSI absolute value
Answer	1	2	3	4	5	6	7	8	9	10	
	R		P1	P2	P2	P2	P2	;			

RT	Rea	ds or	sets th	ne RIT	์ func	tion	statu	s			Parameters: P1 O: RIT function OFF
Set	1	2	3	4	5	6	7	8	9	10	1: BIT function ON
	R	т	P1	;							1. KIT function of
Read	1	2	3	4	5	6	7	8	9	10	
	R	т	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	R	Т	P1	;							

RU	Sets	RIT 1	to a po	sitive	e valu	е					Parameters: P1 positive value of BIT to set (from 0
Set	1	2	3	4	5	6	7	8	9	10	to 50000Hz max value subject to
	R	U	P1	P1	P1	P1	P1	;			change)
Read	1	2	3	4	5	6	7	8	9	10	change)
	R	U	;								P2: always 1
Answer	1	2	3	4	5	6	7	8	9	10	rz. diways I
	R	U	P2	;							

RV	Rea	ds or	sets tł	ne RIT	r valu	е					Parameters: P1 (+': positive o pull value
Set	1	2	3	4	5	6	7	8	9	10	'-': negative value
	R	v	P1	P2	P2	P2	P2	P2	P2	;	
Read	1	2	3	4	5	6	7	8	9	10	DJ.
	R	v	;								should a value of PIT to set (from 0
Answer	1	2	3	4	5	6	7	8	9	10	to 50000Hz max value subject to
	R	v	P1	P2	P2	P2	P2	P2	P2	;	change)

SE	Rea	ds or	sets tł	ne ser	vice n	nodes	status				Parameters: P1 always 1. Force the service
Set	1	2	3	4	5	6	7	8	9	10	mode
	S	E	P1	7							
Read	1	2	3	4	5	6	7	8	9	10	P2 always 0. If in service mode
	S	E	;								this CAT protocol is not available
Answer	1	2	3	4	5	6	7	8	9	10	
	S	E	P2	;							

SM	Read	ds the	e S-me	eter st	atus						Parameters: P1: Always 0 P2: Mater Read
Set	1	2	3	4	5	6	7	8	9	10	0000: S0
											0002: \$1
Read	1	2	3	4	5	6	7	8	9	10	0003.52
	S	М	P1	;							0004:53
Answer	1	2	3	4	5	6	7	8	9	10	0005.54
	S	м	P1	₽2	₽2	₽2	₽2	;			0006: S5 0008: S6 0009: S7 0010: S8 0011: S9 0012: S9+10 0014: S9+20 0016: S9+30 0018: S9+40 0020: S9+50 0022: S9+60

SN	Read	ds the	recei	iver se	erial n	umbe	er				Parameters: P1 Serial number
Set	1	2	3	4	5	6	7	8	9	10	Senarhumber
Read	1	2	3	4	5	6	7	8	9	10	
	S	N	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	S	N	P1	P1	P1	P1	P1	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	P1	P1	P1	P2	P2	P2	;				

SQ	Rea	ds or	sets th	ne squ	lelch	value	5				Parameters: P1 always 0
Set	1	2	3	4	5	6	7	8	9	10	P2 squelch value
	S	Q	P1	P2	P2	P2	;				0: OFF
Read	1	2	3	4	5	6	7	8	9	10	1-10: ON
	S	Q	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	S	Q	P1	P2	P2	P2	7				

TH	Rea	ds or :	sets the	e AGC	thres	shold	value	•			Parameters: P1 AGC threshold, 0 (OFF) ~ 10
Set	1	2	3	4	5	6	7	8	9	10	0(011) 10
	т	Н	P1	P1	;						
Read	1	2	3	4	5	6	7	8	9	10	
	т	н	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	т	н	P1	P1	7						

VA	Rea	ds or	sets tl	he au	xiliar	y volu	ume				Parameters: P1
Set	1	2	3	4	5	6	7	8	9	10	000 ~ 100
	V	A	P1	P1	P1	;					
Read	1	2	3	4	5	6	7	8	9	10	
	v	A	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	V	A	P1	P1	P1	;					

VM	Rea	ds or	sets th	ne ma	in vo	lume	2				Parameters: P1
Set	1	2	3	4	5	6	7	8	9	10	000 ~ 005
	v	М	P1	P1	P1	;					010 ~ 100 in 5 dots step
Read	1	2	3	4	5	6	7	8	9	10	
	v	М	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	v	Μ	P1	P1	P1	7					

VS	Rea	ds tl	he FD	M-DU	Or fir	mwa	are v	ersio	ns		Parameters: P1 firmware version to read
Set											F: FPGA
Read	1	2	3	4	5	6	7	8	9	10	U: USB audio
	v	S	P1	;							R. R. Demodulator
Answer	1	2	3	4	5	6	7	8	9	10	B2: firmware version in the format
	v	S	P1	P2	P2	P2	P2	P2	;		"xx.yy" with : - "xx" major number - "yy" minor number

7.3.3 Compatibility commands

The following commands have no effect on the receiver, they only ensure the compatibility of the FDM-DUOr with Ham Radio Deluxe.

AC											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 00
											P2: Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	A	С	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	A	С	P1	P1	P2	;					

AG											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
											P2: Always 000
Read	1	2	3	4	5	6	7	8	9	10	
	A	G	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	Α	G	P1	P2	P2	P2;					

AI											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	A	I	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	A	I	P1	;							

AN											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 1
Read	1	2	3	4	5	6	7	8	9	10	
	A	N	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	A	N	P1	;							

BC											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	В	С	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	В	С	P1	;							

ВҮ										
Set	1	2	3	4	5	6	7	8	9	10
Read	1	2	3	4	5	6	7	8	9	10
	в	Y	;							
Answer	1	2	3	4	5	6	7	8	9	10
	В	Y	P1	P2	;					

CA											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	С	A	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	С	A	P1	;							

CN											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 00
Read	1	2	3	4	5	6	7	8	9	10	
	С	N	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	С	A	P1	P1	;						

СТ											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	С	т	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	С	т	P1	;							

DL											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
											P2: Always 00
Read	1	2	3	4	5	6	7	8	9	10	
	D	L	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	D	L	P1	P2	P2	;					

EX											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: 000 - 060: Menu No.
											P2: Always 00
Read	1	2	3	4	5	6	7	8	9	10	P3: Always 0
	E	Х	P1	P1	P1	P2	P2	Р3	P4	;	P4: Always 0
Answer	1	2	3	4	5	6	7	8	9	10	P5: Always 0
	E	X	P1	P1	P1	P2	P2	Р3	P4	P5	
	11	12	13	14	15	16	17	18	19	20	
	P5	;]

FS											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1 Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	F	S	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	F	S	P1	;							

FW											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1 Always 0000
Read	1	2	3	4	5	6	7	8	9	10	
	F	W	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	F	W	P1	P1	P1	P1	;				

GT											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1 Always 000
Read	1	2	3	4	5	6	7	8	9	10	
	G	т	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	G	Т	P1	P1	P1	;					

ID											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: 020
Read	1	2	3	4	5	6	7	8	9	10	
	I	D	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	I	D	P1	P1	P1	;					

IS											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: "+"
											P2: Always 0000
Read	1	2	3	4	5	6	7	8	9	10	
	I	S	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	I	S	P1	P2	P2	P2	P2	;]

KS											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: 010
Read	1	2	3	4	5	6	7	8	9	10	
	K	S	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	K	S	P1	P1	P1	;					

MF											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	М	F	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	M	F	P1	;							

MG											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 000
Read	1	2	3	4	5	6	7	8	9	10	
	М	G	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	М	G	P1	P1	P1	;					

NL											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 000
Read	1	2	3	4	5	6	7	8	9	10	
	N	L	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	N	L	P1	P1	P1	;					

PA											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
											P2: Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	P	A	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	Р	A	P1	P2	;						

РС											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 005
Read	1	2	3	4	5	6	7	8	9	10	
	Р	С	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	P	С	P1	P1	P1	;					

PR											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	Р	R	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	P	R	P1	;							

PS											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 1
Read	1	2	3	4	5	6	7	8	9	10	
	Р	S	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	P	S	P1	;							

QR											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
											P2: Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	Q	R	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	Q	R	P1	P2	;						

RA											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 00
											P2: Always 00
Read	1	2	3	4	5	6	7	8	9	10	
	R	A	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	R	A	P1	P1	P2	P2	;				

RG											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 000
Read	1	2	3	4	5	6	7	8	9	10	
	R	G	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	R	G	P1	P1	P1	;					

RL											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 00
Read	1	2	3	4	5	6	7	8	9	10	
	R	L	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	R	L	P1	P1	;						

RM											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 1
											P2: Always 0001
Read	1	2	3	4	5	6	7	8	9	10	
	R	М	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	R	М	P1	P2	P2	P2	P2	;			

SD											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0000
Read	1	2	3	4	5	6	7	8	9	10	
	S	D	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	S	D	P1	P1	P1	P1	;				

SH											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 00
Read	1	2	3	4	5	6	7	8	9	10	
	S	Н	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	S	H	P1	P1	;						

SL											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 00
Read	1	2	3	4	5	6	7	8	9	10	
	S	Н	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	S	H	P1	P1	;						

SQ											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
											P2: Always 000
Read	1	2	3	4	5	6	7	8	9	10	
	S	Q	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	S	Q	P1	P2	P2	P2	;				

TN											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 00
Read	1	2	3	4	5	6	7	8	9	10	
	т	N	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	т	N	P1	P1	;						

то											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	т	0	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	т	0	P1	;							

TS											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	т	S	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	т	S	P1	;							

VD											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0000
Read	1	2	3	4	5	6	7	8	9	10	
	v	D	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	v	D	P1	P1	P1	P1	;				

VG											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 000
Read	1	2	3	4	5	6	7	8	9	10	
	v	G	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	v	G	P1	P1	P1	;					

VX											Parameters:
Set	1	2	3	4	5	6	7	8	9	10	P1: Always 0
Read	1	2	3	4	5	6	7	8	9	10	
	v	х	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	v	Х	P1	;							

49

8 Software & Driver Installation

8.1 Software installation

8.1.1 First-time install in Windows 8 and Windows 7

Double-click the file "setup.exe" in the provided USB stick.

	Application Tools	E	DAD_FDIM_SVV2_V1	_ooberaso			
File Home Shar	e View Manage						
9 😌 * T 🍺 « .	PR0_0 F ELAD_PR11-0009_FDW_51 F SW	PC + Betallest + ELAD_PDI	vi_Svv2_v1_006eta30		V 0	SEARCH ELAD_PDM_SW2_V1_0	- /
🔆 Favorites	Name	Date modified	Type	Size			
E Desktop	DotNetFX40	1/23/2014 5:46 PM	File folder				
🐌 Downloads	vcredist_x86	1/23/2014 5:46 PM	File folder				
💔 Dropbox	WindowsInstaller3_1	1/23/2014 5:46 PM	File folder				
Recent places	BLAD_FDMSW2Setup	1/23/2014 5:44 PM	Windows Installer	30,902 KB			
	🔂 setup	1/23/2014 5:44 PM	Application	424 KB			
libraries							
Documents							
Music							
E Pictures							
Videos							
🗞 Homegroup							
Computer							
Local Disk (C:)							
🖵 progetti (\\192.168.	2						
🗣 Network							

The windows installer first installs the prerequisites:

- Microsoft VC++ 2010 Runtime libraries
- Microsoft .NET Framework 4.0 (Only for Windows 7) and then the FDM-SW2 software.
- Click on "Accept" (Only for Windows 7)

5 ELAD FDM-SW1 Setup	×
For the following components:	
Microsoft .NET Framework 4 (x86 and x64)	
Please read the following license agreement. Press the page down key to see of the agreement.	e the rest
-	
	Â
MICROSOFT SOFTWARE	
MICROSOFT SOFTWARE SUPPLEMENTAL LICENSE TERMS	
MICROSOFT SOFTWARE SUPPLEMENTAL LICENSE TERMS MICROSOFT NET FRAMEWORK 4 FOR MICROSOF)FT
MICROSOFT SOFTWARE SUPPLEMENTAL LICENSE TERMS MICROSOFT .NET FRAMEWORK 4 FOR MICROSO WINDOWS OPERATING SYSTEM	DFT Ţ
MICROSOFT SOFTWARE SUPPLEMENTAL LICENSE TERMS MICROSOFT .NET FRAMEWORK 4 FOR MICROSO WINDOWS OPERATING SYSTEM)FT
MICROSOFT SOFTWARE SUPPLEMENTAL LICENSE TERMS MICROSOFT .NET FRAMEWORK 4 FOR MICROSO WINDOWS OPERATING SYSTEM	DFT 🗸
MICROSOFT SOFTWARE SUPPLEMENTAL LICENSE TERMS MICROSOFT .NET FRAMEWORK 4 FOR MICROSO WINDOWS OPERATING SYSTEM Wew EULA for printing Do you accept the terms of the pending License Agreement? If you choose Dont Accept, install will close. To install you must accept this agreement.	DFT .

Click on "Install"



Click on "Yes"



Click on Install



Microsoft Visual C++ 2010 x86 Redistributable installation is complete, click on "Finish"



Click on "Yes" to start the installation of the .Net Framework 4.0 (Only for Windows 7)



Click to "Next" to start the FDM-SW2 software installation



Chose the installation folder, then click on "Next"

₿	ELAD FDM-SW2	-		×
Select I	nstallation Folder		$\overline{(}$	
The installer	will install ELAD FDM-SW2 to the following folder.			
To install in t	his folder, click "Next". To install to a different folder, enter it below	w or click '	"Brow	se".
<u>F</u> older: C:\Progra	am Files\ELAD\ELAD FDM-SW2\	Brov	vse	
		Disk	Cost	
Install ELA	D FDM-SW2 for yourself, or for anyone who uses this computer: yone me			
	Cancel < Back		Next	<i>,</i>

Click on "Next"

1	ELAD FDM-SW2 - 🗆	×
Confirm In	Istallation	
The installer is re-	ady to install ELAD FDM-SW2 on your computer.	
Click "Next" to st	art the installation.	
	Cancel < Back Next >	

Click on "Yes"

۲		User Account Control	×
Do you want to unknown publis		to allow the following program from an plisher to make changes to this computer?	?
	Program name: Publisher:	P:_PRG_8\ELAD_PR11-00\ELAD_FDMSW2Setup.ms Unknown	i
ي ھ	how details	Yes No	
		Change when these notifications appe	<u>ear</u>

8.1.2 First-time install in Windows XP

Double-click the file "setup.exe" in the provided USB stick.

e Edit View Favorites	Tools	Help				
	PD 11 0000		CUID 111 000-1-	20		
PRG_OLLAD	PR11-0009	_FDM_SI(SW_PC(betalest(bLAD_FDP	1_3W2_V1_000eca	Turne	Data Madified	
File and Folder Tasks	(*)	DotNetEV40	5420	File Folder	1/23/2014 5:46 DM	
		Overedist x86		File Folder	1/23/2014 5:46 PM	
Rename this file		WindowsInstaller3 1		File Folder	1/23/2014 5:46 PM	
🙀 Move this file		RELAD FDMSW2Setup.msi	30.902 KB	Windows Installer P	1/23/2014 5:44 PM	
Copy this file	(🔂 setup.exe	424 KB	Application	1/23/2014 5:44 PM	
A Publish this file to the V	Veb					
E-mail this file						
Y Delete this file						
^						
Other Places	۲					
🗁 BetaTest						
A My Documents						
Shaved Deguments						
Division Documents						
My Computer						
S My Network Places						
Details	(*)					
	~					

Click on "Accept"

🐞 ELAD FDM-SW2 Setup	×
For the following components:	
Microsoft .NET Framework 4 (x86 and x64)	
Please read the following license agreement. Press the page down key see the rest of the agreement.	to
	^
MICROSOFT SOFTWARE SUPPLEMENTAL LICENSE TERMS	
MICROSOFT .NET FRAMEWORK 4 FOR MICROSOFT WINDOWS OPFRATING	~
View EULA for printing	
Do you accept the terms of the pending License Agreement	?
If you choose Don't Accept, install will close. To install you must accept this agreement. Accept Don't Accept	

Click on "Install"



Click on "Install"



Click on Next to install the FDM-SW2 software



Select the installation folder, then click on "Next"



Click on "Next"

🛃 ELAD FDM-SW2	
Confirm Installation	
The installer is ready to install ELAD FDM-SW2 on your computer.	
Click "Next" to start the installation.	
Cancel < Back	Next

The FDM-SW2 Software installation is completed



8.1.3 Update an existing software version

Double click on file ELAD_FDM_SW2_V_x.xx.msi included in the update and follow the instructions.

8.2 USB driver

8.2.1 USB driver installation in Windows 8 and Windows 7

8.2.1.1 First driver installation

To install ELAD FDM-DUOr driver, connect the FDM-DUOr USB RX port to a USB 2.0 socket on PC end power on the device. When Windows detects the new hardware, follow the steps listed below to install driver correctly:

Open **Control Panel** from **Start** menu, select "System" and "Device Manager". Expand "Other Devices" node: FDM-DUO.



Select FDM-DUO, right click on it and execute "Update driver software".

🚔 Device Manager – 🗖	×
File Action View Help	
a 🚔 UT93-LAPTOP	^
b 4 Audio inputs and outputs	
b Batteries	
Bluetooth	
b 1 Computer	
▷ 👳 Digital Media Devices	
▷ → Disk drives	
Display adapters	
≥ ≥ DV/CD-ROM drives	
Vigituman interface Devices	
E De ATA/ATAPI controllers	
b	
Mice and other pointing devices	
Nonitors	
Network adapters	
By Other devices	
DIA FDMDU0 USR FW v4 7	
▶ 🚔 Print queues Update Driver Software	
> 🖶 Printers Disable	
Processors Uninstall	
b The Sensors	
D Software device Scan for hardware changes	
Sound, video an	
N 📲 Sustem devices	Ť
Launches the Update Driver Software Wizard for the selected device.	

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

4		Device Manager	-	
File	Action Vie	w Help		
<hr/>	Image: A state of the state	🛛 📷 👰 😭 👧 🕫		
	UT93- II AL Ba Ba Ba BI	🖞 Update Driver Software - FDMDU0 USB FW v4.7	×	^
	Di Di Di Di	How do you want to search for driver software?		
	D	Search automatically for updated driver software Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.		
	M M M M M M	Browse my computer for driver software Locate and install driver software manually.		
	Pr Pr Pr Z Se Se Sc			
	C St		Cancel	~

In the next dialog-box, insert the driver folder location using "Browse" button and check the option "Include subfolders". In this way manual driver search is enabled

For 32 bit system select the folder: C:\Program Files\ELAD\ELAD FDM-SW2\ELAD_FDM_Driver For 64 bit system select the folder: C:\Program Files (x86)\ ELAD\ELAD FDM-SW2\ELAD_FDM_Driver Then click "Next".



Click Install.

Let the hardware installation automatically completes and, at the procedure ending, click on "Close"; then disconnect and connect FDM-DUOr device on the same USB socket.



Now ELAD FDM-DUOr USB driver is installed on your PC.

8.2.1.2 Driver installation verify

To verify FDM-DUO driver current version, connect the device to USB socket (where the device driver is already installed) and power on the device. Then open **Control Panel** from **Start** menu. Click on "System" and select "Device Manager".

Expanding "ELAD Samplers" node, right click on "ELAD FDM-DUO" and select "Properties".

🚔 Device Manager							
<u>File Action View H</u> elp							
Image: Second							

When dialog box opens, select "Driver" label: you must read provider name, current driver release date and current driver version. The figure shows an old FDM- DUO driver version.



8.2.1.3 Manual driver update

To update FDM-DUO driver, connect the device to USB RX socket (where the device driver is already installed) and power on the device. Then open **Control Panel** from **Start** menu. Click on "System" and select "Device Manager".

- 🗆 🗙 Device Manager 4 File Action View Help (= +) 📰 🔲 🛛 📰 💐 📴 😽 a 📇 UT93-LAPTOP Audio inputs and outputs Batteries Bluetooth 👰 Computer Digital Media Devices Disk drives
 Display adapters A DVD/CD-ROM drives A 📱 ELAD Samplers ELAD FDM-DL Update Driver Software.. IDE ATA/ATAP
 Imaging device Disabl Uninstall Keyboards Mice and other Scan for hardware changes Monitors Properties Network adapt Print queues Printers Processors Sensors Software devices 📢 Sound, video and game controllers Storage controllers System devices Launches the Update Driver Software Wizard for the selected device.

Under "ELAD samplers" list select "ELAD FDM-DUO", right click on it and execute "Update driver".

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



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

	×
€ 🛽 Update Driver Software - ELAD FDM-DUO	
Browse for driver software on your computer	
Search for driver software in this location:	
C:\Program Files (x86)\ELAD\ELAD FDM-SW2\ELAD_FDM_Driver V Browse	
✓ Include subfolders	
Let me pick from a list of device drivers on my computer	
This list will show installed driver software compatible with the device, and all driver software in the same category as the device.	
	_
Next Car	ncel

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

File Action	<	×
Image: Select the device devices used to install for this bandware Image: Select the device devices used to install from Disk Image: Select the mark Image: Select the mark		^
▷ ► Ke ▷ M ▷ M □ M □ M □ M □ M □ M □ M □ Itil me why driver signing is important □ Pr □ Pr □ Pr □ Pr		
▷ III Pr Pr ▷ III Set ▷ Software devices ▷ III Sound, video and game controllers ▷ III Sound, video and game controllers ▷ Storage controllers ▷ III Switzer devices		v

Click on "Browse" and search for FDM-DUOr driver update folder location; then open winusb fdmsampler.inf file. Click "OK" and then "Next".

Let the hardware installation automatically completes and, at the procedure ending, click on "Close"; then disconnect and connect FDM-DUOr device on the same USB socket.

4	Device Manager	• • ×
File Actio	n View Help	
	Update Driver Software - ELAD FDM-DUO	^
⊳ 🦃 B ⊳ 🕃 B ⊳ 📜 C ⊳ 💻 C	Windows has successfully updated your driver software	
	Windows has finished installing the driver software for this device:	
	ELAD FDM-DUO	
⊳ 🔮 N ⊳ 💮 P ⊳ 💮 P		
⊳		
⊳ <u>∎</u> s ⊳ ≼ s	Close	
	/stem devices	¥

To verify that a correct update is done, enter "Device Manager" in Control Panel; under "ELAD samplers" label select ELAD FDM-DUO driver (see sub-chapter <u>Driver installation verify in Windows 8 and Windows</u> <u>7</u>): right click on it and choose "Properties": select "Driver" label to visualize the last driver version (an example is depicted in figure below).

1	ELAD FDM-DUO Properties
	General Driver Details
	ELAD FDM-DUO
	Driver Provider: ELAD srl Italy
1	Driver Date: 1/22/2014
	Driver Version: 3.0.0.0
	Digital Signer: ELAD Srl
	Driver Details To view details about the driver files.
	Update Driver To update the driver software for this device.
	Roll Back Driver If the device fails after updating the driver, roll back to the previously installed driver.
	Disable Disables the selected device.
	Uninstall To uninstall the driver (Advanced).
	OK Cancel

8.2.2 USB driver installation in Windows XP

8.2.2.1 First driver installation

To install ELAD FDM-DUOr driver, connect the FDM-DUOr USB RX port to a USB 2.0 socket on PC and power on the device. Windows XP detects the new hardware and starts the hardware installation wizard. Then, next steps to install FDM-DUOr driver are listed below:

At the first dialog box, select the last option "No, not this time" and "Next".

Found New Hardware Wizard	
	Welcome to the Found New Hardware Wizard
	Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission). <u>Read our privacy policy</u>
	Can Windows connect to Windows Update to search for software?
	◯ Yes, this time only
	Ves, now and every time I connect a device
	Click Next to continue.
	< Back Next > Cancel

Select "Install from a list or specific location (Advanced)" and "Next".

In the next dialog-box, check the options "Search for the best driver in these location" and "Include this location in the search" to enable manual driver search. Clicking on "Browse", select the path where the driver folder is located: Local Drive (C:) \Programs\ELAD\ELAD FDM-SW2\ELAD_FDM_Driver. Then click "Next".

und New Hardware Wizard	
Please choose your search and installation options.	
 Search for the best driver in these locations. 	
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.	
Search removable media (floppy, CD-ROM)	
Include this location in the search: The search: The sear	
O Don't search. I will choose the driver to install.	
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.	
< Back Next > Cancel	

Let the hardware installation automatically completes and click on "Finish"; then disconnect and connect FDM- DUOr device on the same USB socket.

Found New Hardware Wizard	
	Completing the Found New Hardware Wizard The wizard has finished installing the software for: ELAD FDM-DUD
	Click Finish to close the wizard.
	< Back Finish Cancel

Now ELAD FDM- DUOr driver is installed on your PC.

8.2.2.2 Driver installation verify

To verify FDM-DUOr driver current version, connect the device to USB socket (where the device driver is already installed) and open **Control Panel** from **Start** menu. Click on "System" and select "Device Manager" under "Hardware" label.

Expanding "ELAD Samplers" node, right click on "ELAD FDM-DUO" and select "Properties".

🚇 Device Manager	_ 🗆 🗙
File Action View Help	
□UT96-0FA846E120	^
🗈 🔩 Batteries	
E Computer	
E Sector Disk drives	
ELAD FOR Driver	
Elonpy disk drive Disable	
Human Interface Uninstall	
E Scan for hardware changes	
Mice and other p Properties	
🕀 🎟 Network adapters	
🖻 🥵 Other devices	
- 🖓 USB Device	
🔁 🍠 Ports (COM & LPT)	
🕀 🐲 Processors	_
E 😴 SCSI and RAID controllers	
🕀 🧐 Sound, video and game controllers	~
Opens property sheet for the current selection.	

When dialog box opens, select "Driver" label: you must read provider name, current driver release date and current driver version. The old ELAD FDM-DUOr driver version is shown in figure below as example.

ELAD FDM-DUO Propertie	es 🔹 🤶
General Driver Details	
ELAD FDM-DUO	
Driver Provider:	ELAD sri Italy
Driver Sate:	1/22/2014
Driver Version:	3.0.0.0
Digital Signer:	Not digitally signed
Driver Details T	o view details about the driver files.
Update Driver T	o update the driver for this device.
Roll Back Driver	i the device fails after updating the driver, roll ack to the previously installed driver.
Uninstall T	o uninstall the driver (Advanced).
	OK Cancel

8.2.2.3 Manual driver update

To update FDM-DUOr driver, connect the device to USB socket (where the device driver is already installed) and power on the device. Then open **Control Panel** from **Start** menu. Click on "System" and select "Device Manager" under "Hardware" label.

Select "ELAD FDM-DUO" from "ELAD Samplers" list, right click on it and execute "Update driver "



Now Windows XP launches the hardware update wizard: select the last option "No, not this time" and "Next".

Hardware Update Wizard	
	Welcome to the Handware Update Wizard
	Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission). <u>Read our privacy policy</u>
	Can Windows connect to Windows Update to search for software?
	🔘 Yes, this time only
	Yes, now and every time I connect a device
	💿 No, not this time
	Click Next to continue.
< Back Next > Cancel	

At next step select "Install from a list or specific location (Advanced)" and "Next".

Then, disable all check-boxes that the system automatically sets and choose the last option for manual driver update, as depicted in figure. Select "Next".

Hardware Update Wizard	
Please choose your search and installation options.	
Search for the best driver in these locations.	
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.	
Search removable media (floppy, CD-ROM)	
Include this location in the search:	
C:\Program Files\ELAD\ELAD FDM-SW2\ELAD_FD 🐱 Browse	
On't search. I will choose the driver to install. Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.	
< Back Next > Cancel	

Verify that "Show compatible hardware" option is checked and ELAD FDM-DUO is selected: then click on "Have a Disk". Don't click "Next".

Hardware Update Wizard	
Select the device driver you want to ins	stall for this hardware.
Select the manufacturer and model of you have a disk that contains the driver you	our hardware device and then click Next. If you want to install, click Have Disk.
ELAD FDM-DUO	k,
This driver is not digitally signed! Tell me why driver signing is important	Have Disk
	< Back Next > Cancel

Click on "Browse" and search for the FDM-DUOr driver update folder location; then open winusb fdmsampler.inf file, as depicted in figure. Click "OK" and then "Next".

Install F	rom Disk	X
-	Insert the manufacturer's installation disk, and then make sure that the correct drive is selected below.	OK Cancel
	Copy manufacturer's files from:	Browse

Now driver update starts: at next dialog box select "Continue Anyway" and ignore the warning.

Let the hardware update automatically completes and, at the procedure ending, click on "Finish"; then disconnect e connect FDM-DUOr device on the same USB socket.

Hardware Update Wizard	
	Completing the Hardware Update Wizard
	< <u>B</u> ack Finish Cancel
To verify that a correct update is done, enter "Device Manager" from **Control Panel**; under "ELAD Samplers" list, select ELAD FDM-DUO driver (see chapter <u>Driver installation verify in Windows Xp</u>) right click on it and choose "Properties". Select "Driver" label to visualize the last driver version (an example is depicted in figure below).

ELAD FDM-DUO Properties	X
General Driver Details	
ELAD FDM-DUO	
Driver Provider: ELAD srl Italy	
Driver Sate: 1/22/2014	
Driver Version: 3.0.0.0	
Digital Signer: Not digitally signed	
Driver Details To view details about the driver files.	
Update Driver To update the driver for this device.	
Roll Back Driver If the device fails after updating the driver, roll back to the previously installed driver.	
Uninstall To uninstall the driver (Advanced),	
OK Cance	

8.2.3 USB CAT Serial port

Connect the CAT USB port of FDM-DUOr to a USB 2.0 port of the PC . Windows download and install automatically the FTDI FT232R serial port driver.



When the installation process ends, open the windows device manager and check the FDM-DUOr USB serial port in the node Ports (COM & LPT).

A Device Manager	- 🗆 🗙
File Action View Help	
a 🚔 UT93-LAPTOP	^
Audio inputs and outputs	
> 🗃 Batteries	
> 🚯 Bluetooth	
Image: Computer	
> 👳 Digital Media Devices	
Disk drives	
b Set Display adapters	
DVD/CD-ROM drives	
⊳ 🕼 Human Interface Devices	
▷ cia IDE ATA/ATAPI controllers	
▷ Sa Imaging devices	
> — Keyboards	
Mice and other pointing devices	
Monitors	
⊳ 👰 Network adapters	
▲ " Ports (COM & LPT)	
USB Serial Port (COM5)	
V lass Print queues	
> 🖶 Printers	
Processors	
> 🚾 Sensors	
▷ ① Software devices	
Sound, video and game controllers	
⊳ 🔆 Storage controllers	
N 📲 Sustem devices	×

9 Firmware Update

This section was removed from this manual. Please download the specific documentation about firmware update here: <u>http://sdr.eladit.com/FDM-DUOr/</u>.

10 Technical Specifications

ELAD FDM-DUOr TECHNICAL SPECIFICATIONS		
GENERAL	USB 2.0 Ports (Peripheral Control)	2 (RX, CAT)
	Master Clock Frequency	122.88 MHz
	Master Clock Phase Noise	-136 dBc @ 100 kHz, -130 dBc @ 10 kHz
	10 MHz Reference Clock Stability	2.5 ppm TCXO within temperature range 0°C ÷ 40°C (32°F ÷ 104°F) Typical Stability within temperature range 15°C ÷ 35°C (59°F ÷ 95°F) 0.1 ppm i.e. 1Hz @ 10 MHz
	Frequency Resolution	1 Hz min.
	Antenna Connectors / Impedance	2x SO-239 / 50 Ohm
	Power Supply Requirements	13.8 Vdc ± 10%
	Current Drain	<500 mA @ 13.8 V
	Dimensions (W x D x H)	180 mm (7.00") x 155 mm (6.10") x 70 mm (2.75") including knob and connectors 180 mm (7.00") x 130 mm (5.10") x 70 mm (2.75") enclosure only
	Weight (approximate)	1.2 Kg (2.4 lb)
	Operating Temperature Range	0°C ÷ 40°C (32°F ÷ 104°F)
	Modes	CW, USB, LSB, AM, FM
	ADC Sampling Rate / Resolution	122.88 MHz @ 16 bits
	Wideband Frequency Coverage	10 kHz ÷ 54 MHz
	IQ Channel Bandwidth	192 kHz (24 bits)
	MDS @14.200MHz (BW 500Hz)	-132dBm
Stand Alone Mode	Typ. 3 rd order IMD DR (injection of a third signal strong and off frequency)	92dB
	Attenuator	10dB / 20dB / 30dB
	Spurious Response	>105 dBfs @ 0 dB attenuation
	DDC Image Rejection Ratio	>100 dB
	Receive Low Pass Filters Bandwidth	SSB: 300 Hz, 600 Hz, 1 kHz, 1.6 kHz ÷ 3.1 kHz (Step 100 Hz), 4 kHz, 5 kHz, 6 kHz AM: 2.5 kHz + 6 kHz (Step 500 Hz) CW: 100 Hz, 8 DR ⁽¹⁾ Level 1 ÷ 4, 100 Hz, 300 Hz, 500 Hz, 1kHz, 1.5 kHz, 2.6 kHz FM: Voice Narrow, Voice Wide, Data
	Headphones Connectors (front & rear) / Impedance	3.5 mm Stereo Jack / 8 Ohm
	AUX OUT Connector / Impedance	3.5 mm Stereo Jack / 8 Ohm
PC Based Mode (ELAD FDM-SW2 Software)	Modes	CW, CW SH+, CW SH-, CW Narrow Band, USB, LSB, AM, FM, WB FM (Stereo + RDS), SYNC AM, DSB, RTTY, ECSS, DRM
	IQ DDC Sampling Rate / Resolution	1 Channel (Slice) @ 32 bits: 192 kHz, 384 kHz, 768 kHz, 1536 kHz, 3072 kHz 1 Channel (Slice) @ 16 bits: 6144 kHz 2 Channels (Slices) @ 32 bits: 192 kHz, 384 kHz
	Simultaneous Receivers	4 with 1 Channel (Slice) DDC, 8 with 2 Channels (Slices) DDC
	Software Defined Filters	Double IF Notch Filters, Continuous Variable Band Filter
	Advanced DSP Features	Noise Blanker, Adaptive Noise Reducer, Adaptive Auto Notch, AGC
	Main Software Features	Recording and playback of IF and audio data stream, EIBI database support, Dx-Cluster spot visualization (Internet connection required), built in CAT protocol and Omni-Rig Server, double output channel (for VAC), support for external down-converter, WoodBox Tmate and Tmate2 compatibility
	Software Visualization	Input Data (Spectrum + Waterfall), IF Data (Spectrum + Waterfall), Audio Data (Spectrum + Waterfall)
(1) Digital Resona	tor	

All stated specifications and other product information provided in this document are subject to change without notice or obligation.

Product Warranty

ELAD S.r.l. warrants the FDM-DUOr for a period of 2 years inside Europe, and for a period of 1 year outside Europe unless otherwise specified. Warranty begins from the purchase date. All FDM-DUOr will be repaired or replaced due to malfunction resulting from no fault of the end user. This warranty covers normal intended usage of the product and does not cover misuse, abuse, accidents, viruses, unauthorized service parts or the combination of other unauthorized branded products used in conjunction with the FDM-DUOr.

Declaration of Conformity (EC)

The product marked as

FDM-DUOr

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 301 489-1 V1.9.2 ETSI EN 301 489-15 V1.2.1 ETSI EN 301 783-2 V1.2.1

Safety:

EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + A2:2013

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

July, 30th 2014 Date

Signature

Self Declaration of Conformity (FCC)

Supplier's Declaration of Conformity

Unique Identifier: ELAD FDM-DUOr

Party issuing Supplier's Declaration of Conformity

ELAD S.r.l. Via Col de Rust, 11 Sarone, PN 33070 Italy Ph: 0434 77248, fax: 0434 77231

Responsible Party – U.S. Contact Information

7074 N Ridge BLVD # 3E Chicago, IL 60645 USA 312-320-8160

FCC Compliance Statement

This device complies with Part 15 of the FCC Rules. 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.