E-rotor electronic siren

User and installation manual

Ver.1.0

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Contents:

1. Basic siren description

Electronic sirens are used to warning population in case of natural or industrial disasters. Siren can be controlled using different control methods like radio, local control or remote control. Electronic siren runs on batteries which are continuously charged which allows it to operate also in case of power supply failure.

Electronic siren E-rotor was designed as an economically acceptable replacement of old high power motor driven sirens. Siren control box is simple in its design, with control keypad and message LCD positioned directly on the Motherboard. It is a light version of an electronic siren, which intends to be controlled more from external source like binary input, RS232 or radio.

1.1. Individual modules

E-Rotor Motherboard

Module description
E-Rotor Motherboard is individual module designed to replay the audio files stored on the MMC memory card. The module has 2 controlled inputs and 2 controlled outputs separated

by optoelement. All inputs and outputs are grouped into one standard 19" euroconnector. Audio input and microphone input are installed into standard 3.5mm Jack connector. Module has LCD display, membrane keyboard and MMC card slot. Control of module is possible using CAN or RS232, whereby both protocoles are designed as open. E-Rotor Motherboard has also an integrated VHF FM radio receiver with RDS receive option. Output low frequency signal level can be adjusted using keypad with 1dB step up to +6dB level(1.55V). E-Rotor Motherboard is also measuring centre which measures batteries level, amplifiers, drivers and controls the charging. Module doesn't have the power supply due to audiosignal purity reason.

Module utilization

E-Rotor Motherboard is used with connection to E-Rotor Powersupply. Module is designed to use in electronic sirens but can be used also as an source of the audio signal with defined output level. Module can control up to 4 amplifiers PA08A which represents the overall output power of 1500W. In case more power is needed it is possible to use the expanding module, which allows to connect another 4 amplifiers to achieve the overall 3000W of power. This additional module communicates with motherboard using CAN bus.

Control elements of the module

Modul is controlled via

- keyboard - 6 keys and reset button, with LCD
- RS232 serial link, open protocol
- CAN bus, open protocol
- 2 binary buttons, fully programmable

Technical data of the module

- dimensions 120x120x50cm
- LCD display 2x 16 characters
- 2x serial link RS232
- CAN bus
- 2x binary input (programmable)
- 2x binary output (programmable)
- input for door sensor (switches LCD lummination)
- power supply – only using E-Rotor powersupply
- number of alarms 30 (possible to extend)
- data card type – MMC
- output level –18dB - +6dB programmable with 1dB steps
- inbuilt VHF radio 87,5-108MHz, input for aerial
- external audio input –6dB – 0dB
- audiosignal deformation up to 0,1%
- number of amplifiers connected max.4 (possible 8 with expanding module)

E-Rotor Power supply

Module description
E-Rotor Power supply is designed for connection of the E-Rotor Motherboard to external power. E-Rotor Power supply has 2 19" 64pin euro connectors, connectors for connection of 4

amplifiers, serial link connectors, binary inputs, connection to E-Rotor Charger and door contact input. E-Rotor Power supply has circuits which disconnects the load in case the batteries are low on voltage, changer 24/12V 6A for connection a GM type radio station.

Control elements of the module

- module is not controlled externally

Technical data of the module

- dimensions 120x120x30cm
- power input 21-28V DC from batteries
- power changer 24V/12V 6A, software controlled
- battery protection disconnecter in case of tension drop under 20,8V
- battery charging control

E-Rotor Charger

Module description

E-Rotor Charger is small module designed to disconnect batteries from power network, secures the passive control of charging and measuring of the batteries. Module is strongly recommended to use due to high current flowing from batteries to amplifiers during alarm.

Control elements of the module

- module is not controlled externally

Technical data of the module

- dimensions 30x80x80cm
- power input 21-28V DC from batteries
- tension measuring of batteries ahead and past of network

2. Installation

2.1.General notes

Number of amplifiers and horn modules depends on siren power according to:

- amplifier PA08 has 375W output power, standard siren has maximum 4 amplifiers, to one amplifier 2 or 3 drivers with horn can be connected, each with power 125W

For example:

Siren 750W has 2 amplifiers and 6 horn units

Siren 1000W has 4 amplifiers and 8 horn units

Siren 1500W has 4 amplifiers and 12 horn units

2.2. Assembly parts

Siren consists of following parts:

Siren box with electronics and package with siren horns with drivers and related accessories (package A and B). Every siren has only one package A and several packages B according to the siren power.

Package A has one extra part - covreing hat for top of the mast (pole) and its contents are:

- 2x aluminium alloy horns
- 2x horn hat to cover driver
- 1x mast covering hat
- 2x driver with connector
- 1x cable clamp
- 2x rubber ring to seal the driver th.3mm
- 2x rubber ring to seal the driver th.1,5mm
- 4x M10x55 bolt for horns connection
- 4x M10 nuts
- 4x washer 11mm
- 4x M6x35 bolt for fixing the driver covering hat

Package B contents are:
- 2x aluminium alloy horns
- 2x horn hat to cover driver
- 2x cable release ducts
- 2x driver with connector
- 1x cable clamp
- 2x rubber ring to seal the driver th.3mm
- 2x rubber ring to seal the driver th.1,5mm
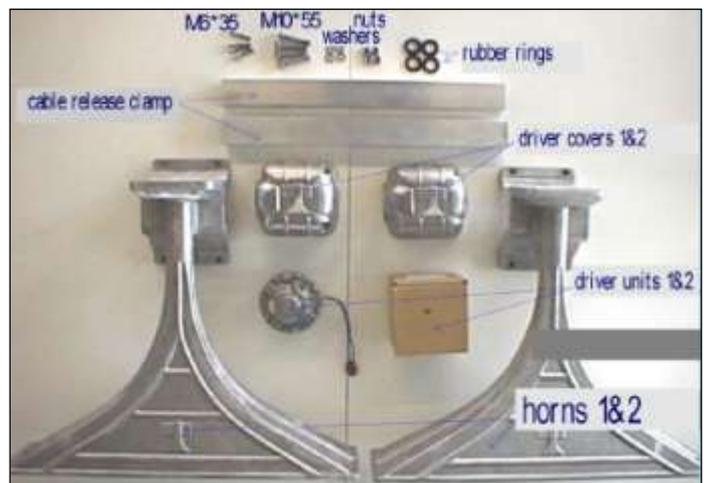
- 4x M10x55 bolt for horns connection

- 4x M10 nuts

- 4x washer 11mm

- 4x M6x35 bolt for fixing the driver covering hat

Siren box contents are:

- 1x siren box with electronics

- 2x 12V DC batteries

2.3. Horns installation

The mechanical fixation of the mast with the horns, or with an antenna, is based on project documentation designed by building engineer. The horns should be installed on the tube with diameter specified in project documentation. Standard mast consists of painted or zinc coated tube, material type 11353.0.

Siren horns can be installed according to the following figures, to a flat or skid roof:
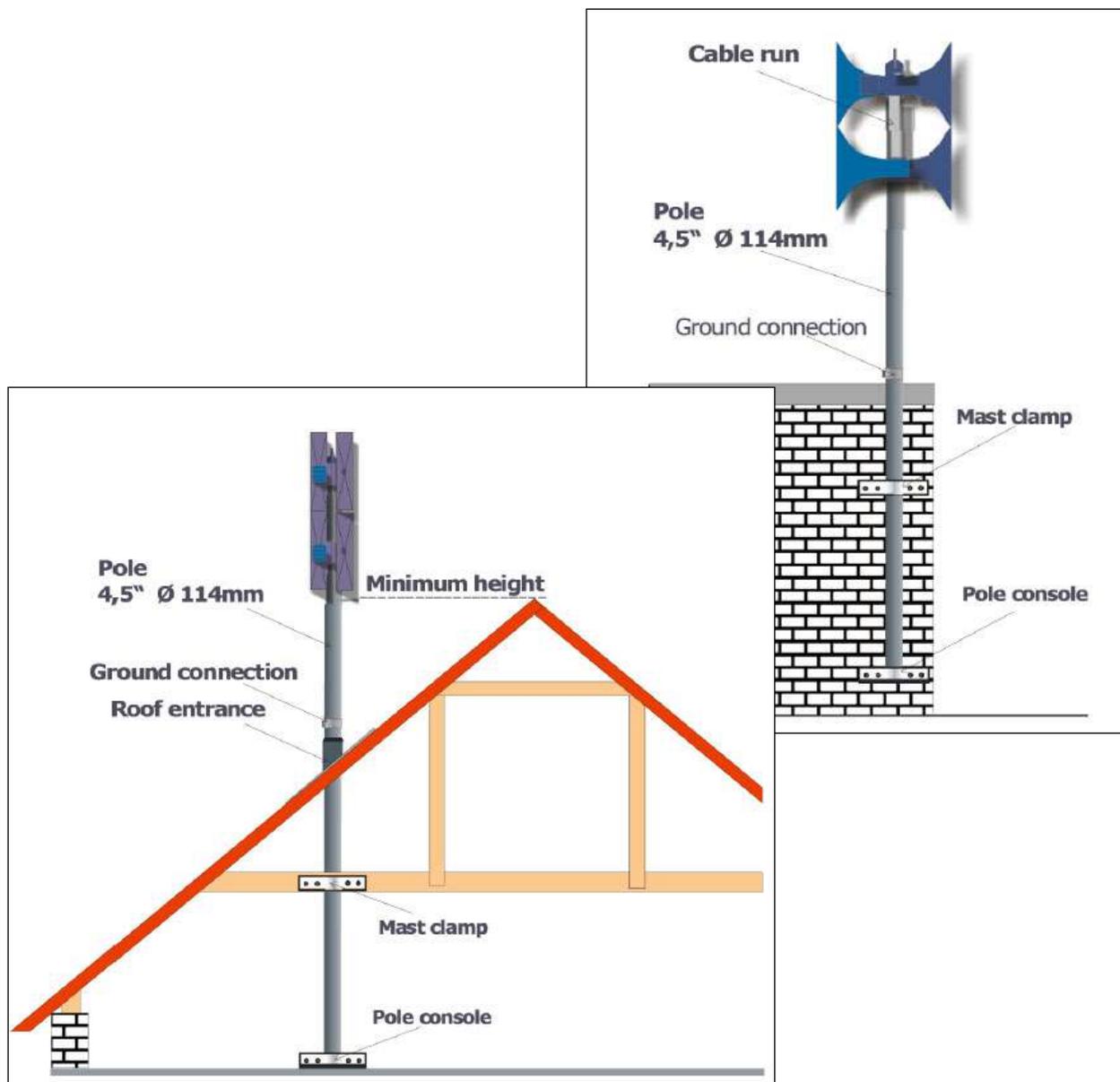
Minimum tube mast diameter is 114mm.

Note: for lightning protection the siren has to be connected to ground system of building!

The horn mast is usually connected to the wall or to the column with clip anchors (see the example pictures):


The horn stanchion can be anchored with ropes or can be attached to an inner wall of the buiding through the roof (see the example pictures)

Horns assembly procedure

- first install the horns from package "A"

- fix both horns to a pole either facing to same or to opposite directions at position about 250mm from top of the mast

114mm tube/mast

4x Bolts M6.X30
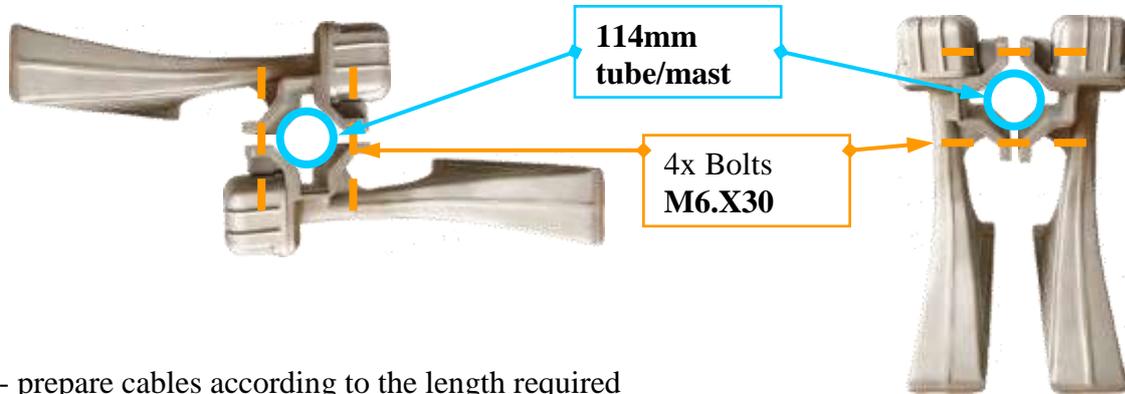
- prepare cables according to the length required

- put cables through the tube mast and connect the cables to a drivers of a first horn pair

- assembly the holding clamp according to the picture:

- install connectors to all cables, keeping the specified polarity according to the picture:
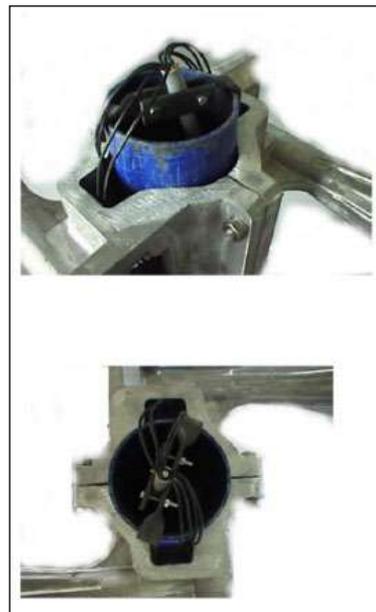
- put a rubber washer into a horn thread and the screw the driver gently into a horn

- keep the water drain hole of the driver facing down to a ground

- mount a hat cover to a top of the mast and fix it to a top horn pair

- for other horns installation use package "B"

- continue from the top to the bottom and install a covering cable U ducts

Driver should be connected properly, keeping + and − connectors according to the drawing:

+ → →

− ←

Water drain hole must be **pointed down!**
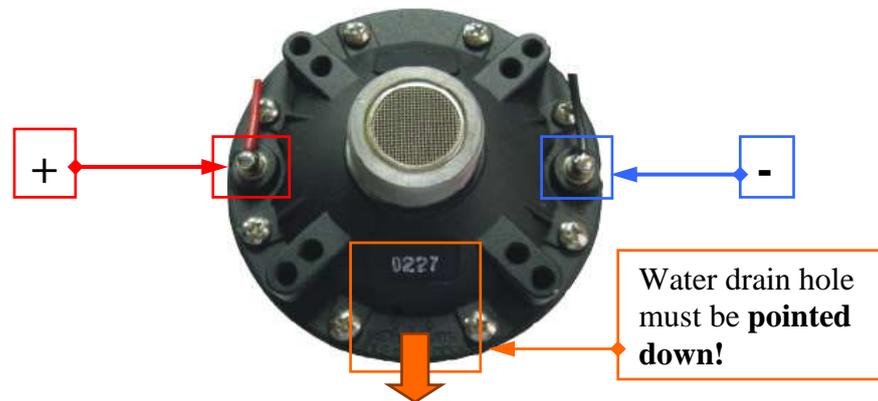
Driver specification: power **150 W**, impedance **8 Ω**
Recommended cable: LiYY/1 8×1.0 300 / 300 V (for connection of 4 drivers)
0-30m cable length – use **1.0mm^2** wire diameter
30-50m cable length – use **1.5mm^2** wire diameter
Attention!: It is not recommended to use driver cables longer than 50 meters because of significant signal power losses.

Horns are assembled according to the drawing below:

2x Bolts to fix the hat

Water drain hole must be **pointed down!**

Thread for driver 100W-150W

4x Bolts **M6.X30** to fix the horn to the 114mm mast
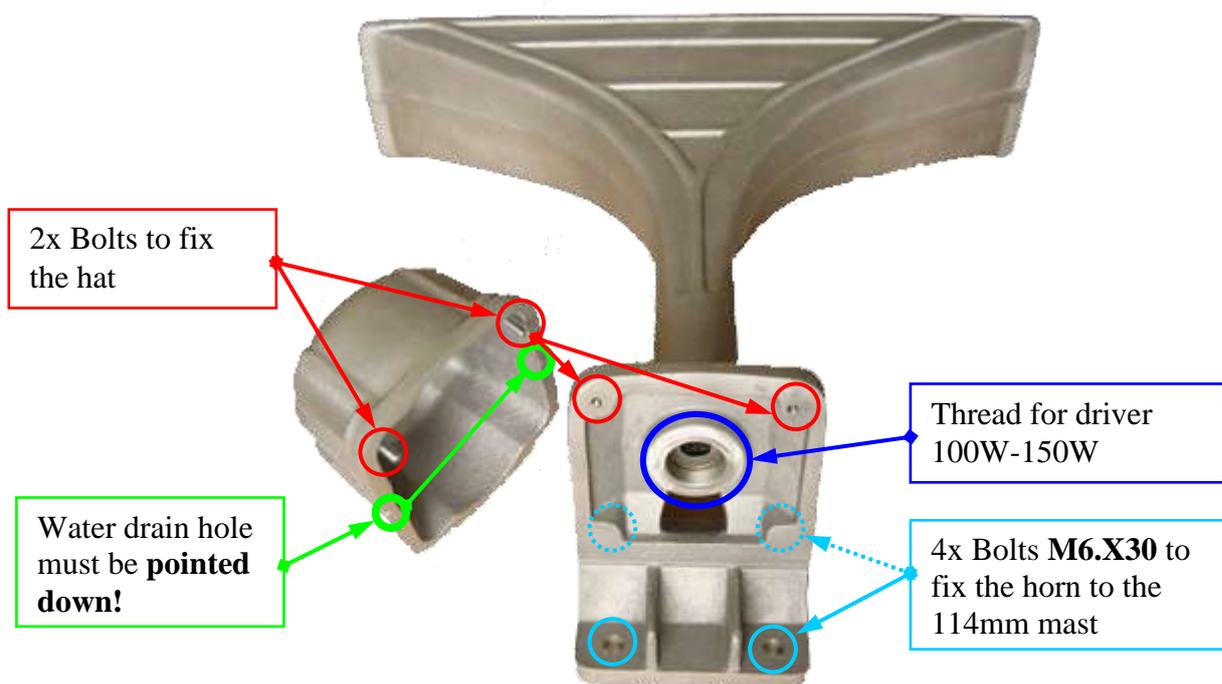
| Wire length from top of the pole to speaker driver connector in mm						
	E-rotor 750W			E-rotor 1500W		
Horn position	1st	2nd	3rd	4th	5th	6th
Channel A	350	980	1 610	2 240	2 870	3 500
Channel B	350	980	1 610	2 240	2 870	3 500
Length	700	1 960	3 220	4 480	5 740	7 000
2x wires	1 400	3 920	6 440	8 960	11 480	14 000
Overall cable length from top of the pole to drivers (mm)	11 760			34 440		
Distance from top of the pole to control box (mm) *(example value)	10 000			10 000		
Overall cable length needed (mm)	**131 760**			**274 440**		
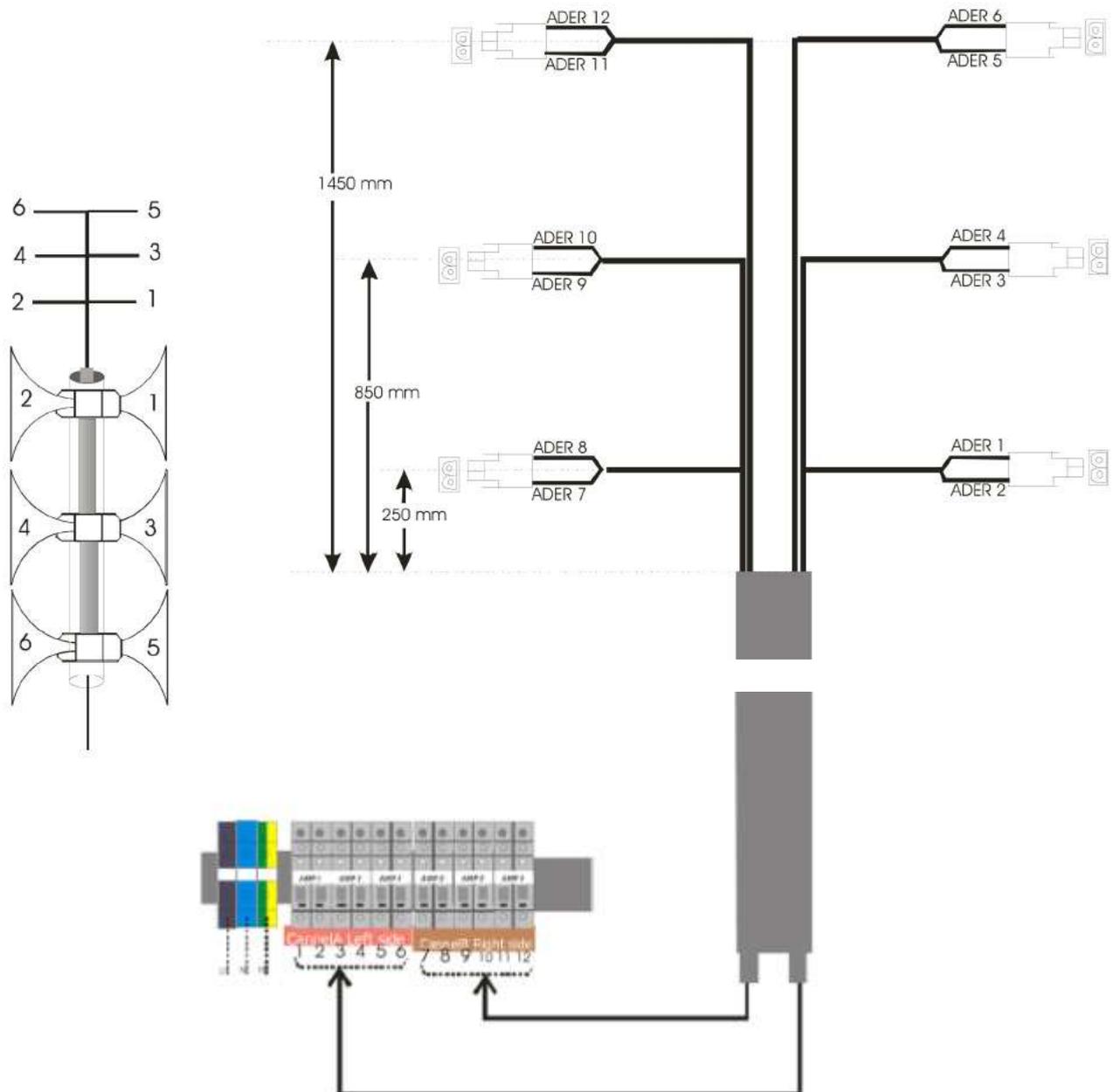
2.4. Siren box installation

The siren box is mounted on the wall with 4 screws and fasteners. The min. length of the screws in the fasteners is 100mm and they should be 10mm thick. The fasteners have to correspond to the wall material (concrete, brick, perforated brick etc.). Non regular fixations are described in the individual project documentation.

Batteries

Batteries are positioned at the bottom of the siren box, connected together with interconnection cable.
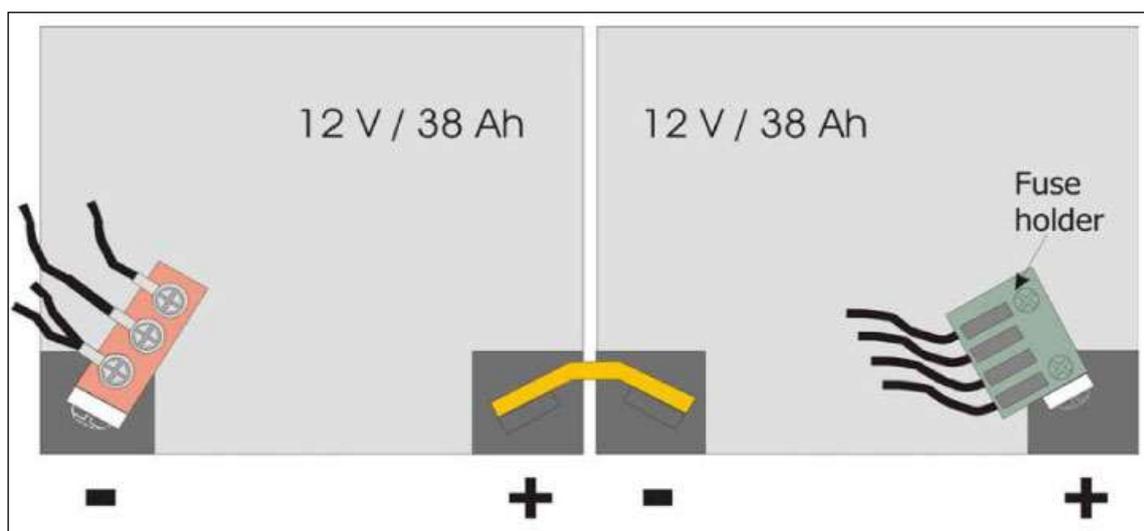
Power supply 230V AC is connected to a switch board according to the picture and according to valid norms and regulations:
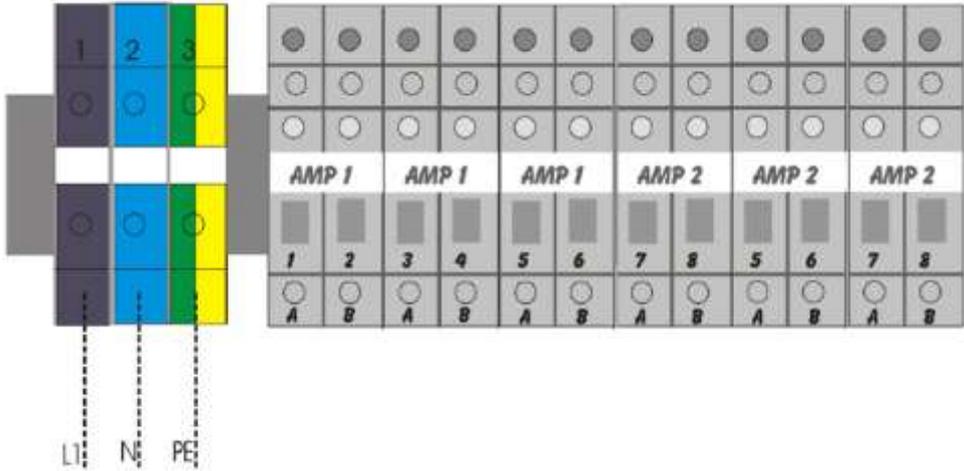

Cables from horns are connected to a switch board according to the picture:
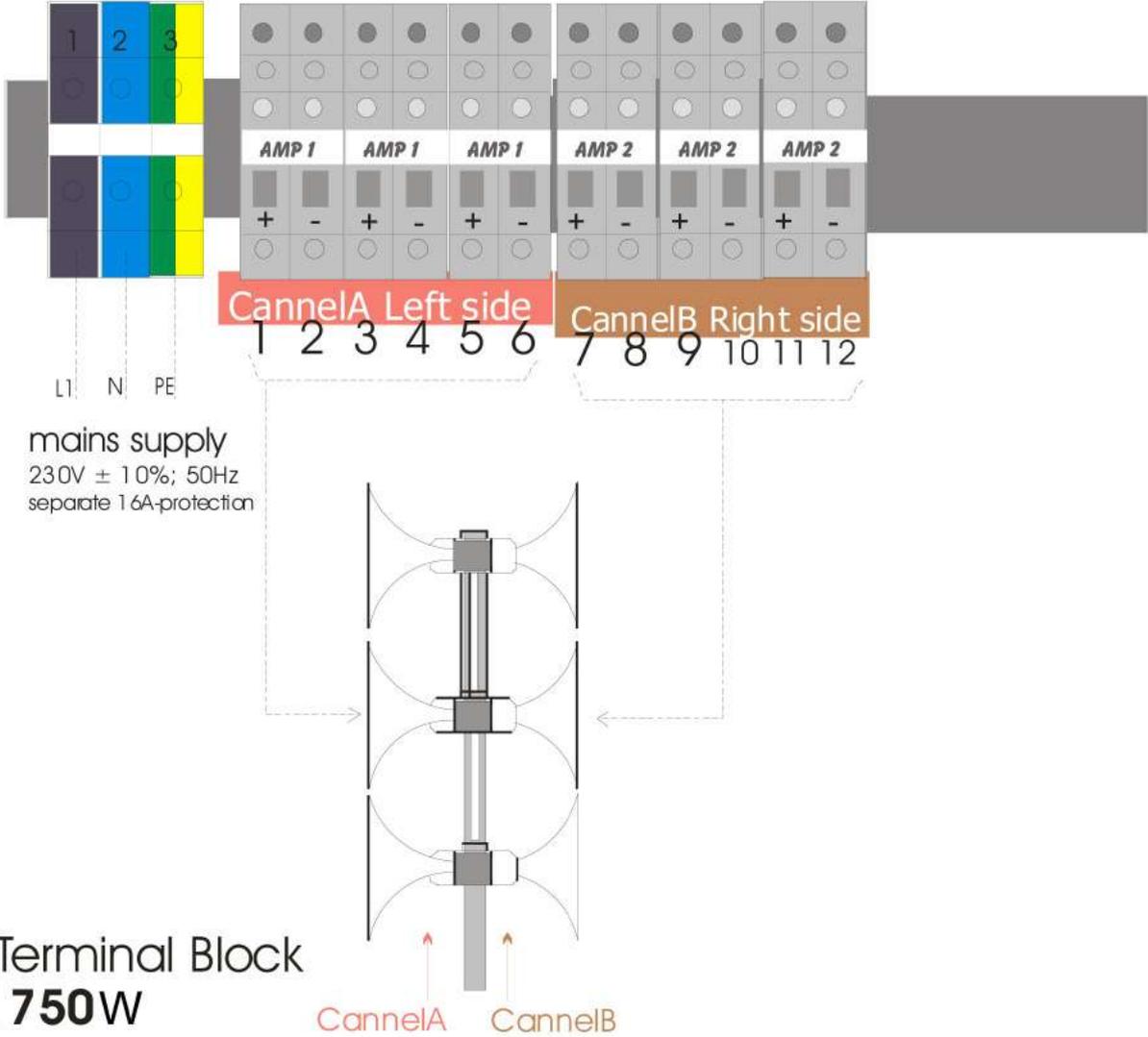
3. Siren control

Local control of the siren is possible using membrane buttons on the control unit keypad. Actual status of the siren is displayed on the LCD. Keypad has 6 function buttons and reset button.
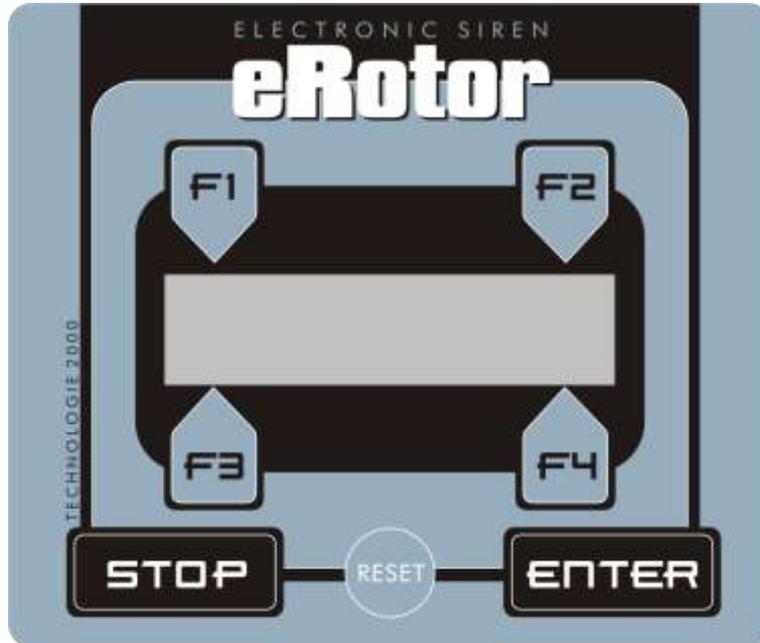
Button **"RESET"** will always perform a restart of the siren CPU, same as when the siren is switched on. When pressed this button siren will stop all current activity and initialize itself. The Reset button should be used only marginal, for most cases all functions of the siren can be triggered with other buttons.

Button **"STOP"** is used to stop the siren current activity. It can stop the alarm in progress. When browsing through the menu the Stop button serves also as return or previous button.

Button **"ENTER"** will confirm and execute selected function.

Buttons **"F1,F2,F3,F4"** had various meaning, which is shown on the LCD always close to individual button (where arrow of the button points).

3.1. Main menu

When idle, the siren is in main menu. On the LCD there is name of the siren with its power in first line and menu items "START" and "MENU" in second line.

```
       eRotor:500
START             MENU
```
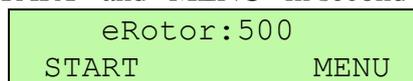
Menu item **"START"** (button F3 or F1) will open a new menu from which the siren can be activated:

- start of the alarms
- start of the verbal messages
- start of the integrated FM radio receiver

- start of the external audio source input

Item **"MENU"** (buttons F4 or F2) will open other selection menu, used for test of the siren and other maintenance functions. These functions are intended for trained technical staff and requires basic knowledge of the siren. Common user will not use it except test purpose.

3.2.Start of the audio file stored on MMC memory card

Warning alarm signals and verbal messages are stored on the MMC memory card. This allows the user to put custom alarm sounds and other audio files which are required. Following manual describes the use of the standard default file configuration on the MMC card.

Start of the alarm procedure:

I. press **"F3"** in Main menu (START) and following menu will display:

```
TONE/MESSAGE
EXT.INPUT     RADIO
```

II. press **"F1"** (TONE/MESSAGE) and following menu will display:

```
Varying tone
<--      01       -->
```

III. using the buttons **"F3"** (previous) and **"F4"** (next) browse the list to find required alarm sound. The list of default sound is described in chart on the following page. Then press **"ENTER"** and following menu will display:

```
         Start?
[NO]            [YES]
```

IV. activation is confirmed with **"F4"** button. **"F3"** button will return to previous menu. Button **"STOP"** will cancel the selection and return to Main menu.

If the selection was confirmed the siren will activate the amplifiers and start reproducing the selected audio file. When playing the alarm, siren will display the playing time in the second line of the LCD.

Button "STOP" can interrupt the alarm at any time and siren will return to Main menu or will proceed to next command in the command queue.

No.	Text on LCD	File name	Description
01	Varying tone	1vary.wav	Standard siren wailing tone
02	Stable tone	2stable.wav	Standard siren steady tone
03	Message no.3	3msg.wav	Verbal message
04	Message no.4	4msg.wav	Verbal message
05	Message no.5	5msg.wav	Verbal message
06	Message no.6	6msg.wav	Verbal message
07	Message no.7	7msg.wav	Verbal message
08	Gong 1	8gong1.wav	Gong tone
09	Gong 2	9gong2.wav	Gong tone
10	Warning test (F)	amsgtst.wav	Verbal warning message, woman voice
11	Warning test (M)	bmsgtst.wav	Verbal warning message, man voice
12	–	-	
13	–	-	
14	–	-	
15	–	-	
16	–	-	
17	–	-	
18	–	-	
19	–	-	
20	–	-	
21	–	-	
22	–	-	
23	–	-	
24	–	-	
25	–	-	
26	–	-	
27	–	-	
28	–	-	
29	TEST: 15kHz 5sec	tst_15k.wav	
30	TEST: 1kHz 30sec	tst1k0db.wav	Sinus signals used for testing and measurements
31	TEST: 10kHz /16b	tst_10k.wav	
32	TEST: 440Hz /16b	tst_440.wav	

Chart: List of audio files stored on the default MMC card .

3.3.Activation of the FM radio receiver

Siren has as default in-built FM radio receiver, which is tuned on required radio station. Signal from this radio station can be transmitted using siren.

Start of the FM radio procedure:

I. press **"F3"** (START) in main menu and following menu will display:

```
TONE/MESSAGE
EXT.INPUT     RADIO
```

II. press **"F4"** (RADIO) and following menu will display:

```
RADIO start  MHz

```

Siren will activate the amplifiers and initialize the FM radio receiver. During the initialization the display shows "start" text. After successful tuning the radio frequency is displayed in first line and time of playing is displayed in second line.

```
RADIO 103.9  MHz
00:01
```

Button "STOP" can interrupt the transmission and siren will return to Main menu or will proceed to next command in the command queue.

Important note: replay of the FM radio transmission is not time limited so **has to be stopped with "STOP" button!**

Replay can be stopped also remotely with STOP order.

3.4. FM radio receiver frequency tuning

It is possible to change the frequency during the FM radio transmission replay using **"F1"** and **"F2"** buttons. After pressing **"F1"** or **"F2"** following menu will display:

```
[-]   103.9  [+]
Write
```

In this mode buttons **"F1"** and **"F2"** change the frequency immediately and FM receiver is tuned immediately to this frequency. New set frequency is stored in the memory only after pressing the **"F3"** button (Write). If the frequency is not stored the FM receiver will be tuned to previous stored frequency.

3.5. External audio signal activation

Microphone, CD/MP3 player, radio voice input, local PA

Siren allows to amplify any low frequency signal (maximum -12dB level) which is connected to one of the external input connectors. Siren has 3 independent inputs:

Input 1:   **AUX/MIC** - is used for connection of microphone or standard source of audio signal like MP3/CD player, that is why there are 2 JACK 3.5" connectors, from which only one can be connected at a time. Microphone connector has also power output supply.

Input 2:   BMIS - is used for connection of local PA system

Input 3:   VOICE - is used to connect an radio station voice output

The labeling of the audio inputs is purely informational and can be configured.

Start of the FM radio procedure:

I. press **"F3"** (START) in main menu and following menu will display:

```
TONE/MESSAGE
EXT.INPUT   RADIO
```

II. press **"F3"** (EXT.INPUT) and following menu will display:

```
1:AUX/MIC 2:BMIS
3:VOICE
```

III. press **"F1"**, **"F2"** or **"F3"** according to the required input.

Siren will activate the amplifiers and will connect to external audio signal source. On the LCD there is displayed name of the started input in the first line and time of playing is displayed in second line.

For example when Input 1 is selected:

```
Audio Input: 1
00:01
```

Button "STOP" can interrupt the transmission and siren will return to Main menu or will proceed to next command in the command queue.

Important note: replay of the FM radio transmission is not time limited so **has to be stopped with "STOP" button!**

Replay can be stopped also remotely with STOP order.

3.6. Silent test of the siren

Siren allows to perform a complete self-test which tests function of the drivers using audio signal with high frequency (15kHz) and low intensity so nothing is heard from horns. Siren tests also

batteries and amplifiers. During the test siren can't perform other commands. Started test can't be interrupted.

I. press **"F4"** (MENU) in main menu and following menu will display:

```
TEST        SERVICE
INFO     CONFIGURE
```

II. pressing **"F1"** (TEST) will start test. The results will be displayed on the LCD continuously.

3.7. Service functions

These functions are intended for trained technical staff and requires basic knowledge of the siren. That is why common user should not start these functions.

Start of the service functions:

I. press **"F4"** (MENU) and following menu will display:

```
TEST        SERVICE
INFO     CONFIGURE
```

II. pressing **"F2"** (TEST) will display following menu"

```
CALIBRATE    1kHz
ANALYZER    15kHz
```

where menu items have following meaning:

"F1": CALIBRATE

Serves for accurate setup of border values of voltage and current for individual amplifiers and drivers. This settings requires sequential disconnection and reconnection of drivers and can be performed only with trained technician.

"F3": ANALYZER

Siren is equipped with POCSAG signal analyzer. Siren receiver sends the received tokens to Control unit using CAN bus and Control unit stores them in the Monitor. This function serves to evaluate the quality of radio signal coverage and for check of the radio receiver function.

"F2": 1kHz

Starts a replay of sinus 1kHz signal for 30 seconds. Serves for service measurements. Important note! This signal can be heard and is normally amplified with full power of the siren so it can be activated only with trained technician who will disconnect the amplifiers and drivers prior to starting.

"F4": 15kHz

Starts a amplifiers measurement function for 1 minute using sinus 15kHz signal. The results of measurements (voltage and current through amplifier) are displayed continuously on the LCD. Function buttons will change the tested amlifier number "F1"/"F2": AMP1 and AMP2, F3"/"F4": AMP3 and AMP4. Function can be activated only with trained technician.

### 3.8. Siren parameters setup

Setup of siren parameters will affect the siren behavior and requires the deeper knowledge of the siren so common user should not use it at any circumstances. This function can be activated only with trained technician.

Important note: improper setup can render the siren not functional!

Start procedure:

I. press the "F4" (MENU) button and then again "F4" (CONFIGURE)

Postup: V hlavní nabídce stiskněte „**F4**" (MENU) a potom „**F4**" (NASTAVENI) and following menu will display:
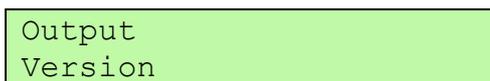
```
Output
Version
```

"F1": Output

It is possible to setup the output power of the motherboard in range of: +6dB to -7dB. This settings is used only when using a siren variant Erotor-AUDIO. In default settings with amplifiers the correct value is -6dB.

"F3": Version

Setup of siren type. It is possible to choose from following versions: 250, 500, 750, 1000, 1500, AUDIO. This setting will determine the number of amplifiers and drivers for one amplifier. Wrong settings will not affect the siren power, only self-tests will report errors.

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