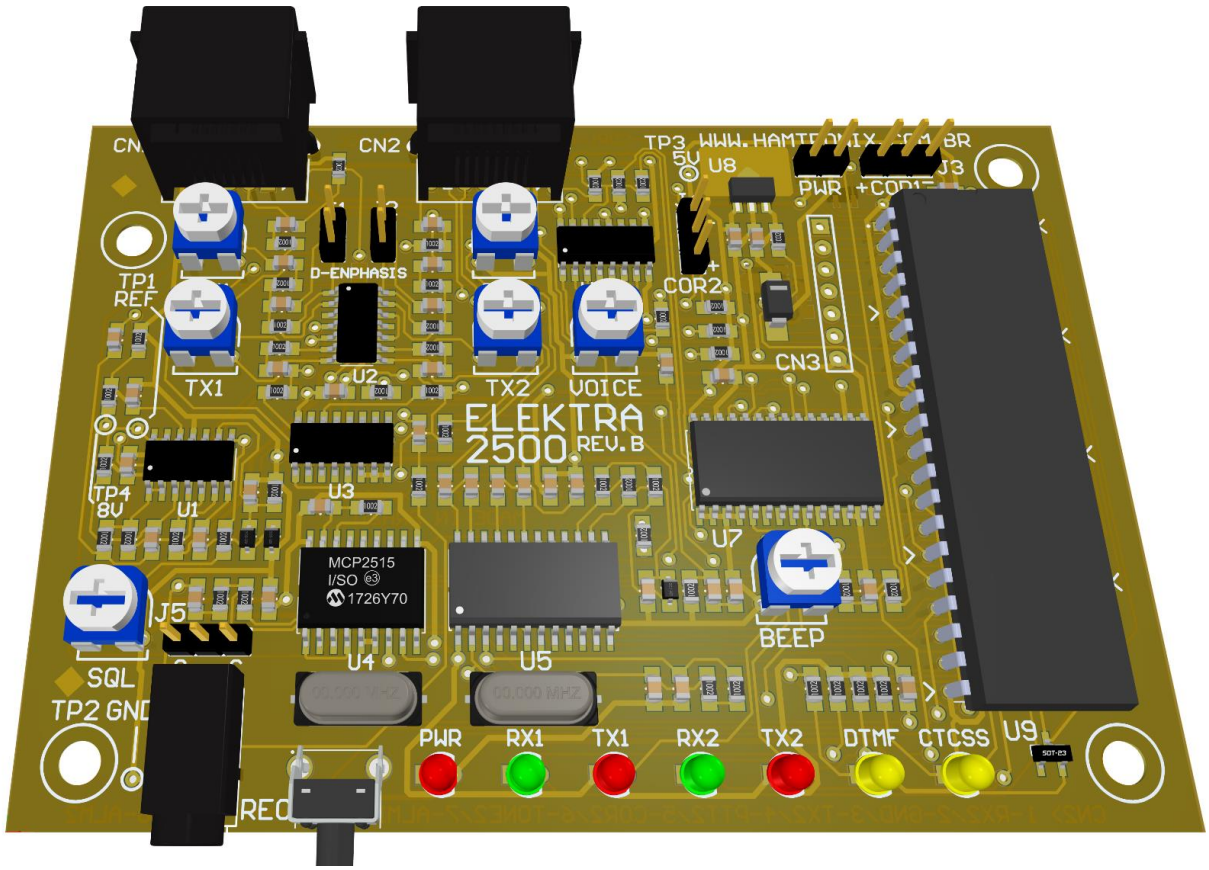
Hamtronix

VHF/UHF Repeater Controller Board

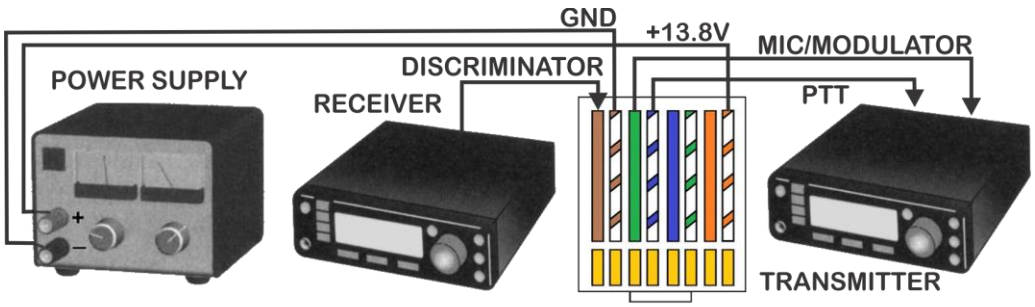
ELEKTRA 2500/CT



Instruction and Operation Manual

Firmware V2.52
Hardware Rev. C

QUICK GUIDE



The color sequence in the illustration is from network connector type T-568B (reversed pinout). If you are using a different sequence, check page 4 for pinout.

CN1	SIGNAL	COLOR	WHERE TO CONNECT
1	RX[1]	BROWN	RX AUDIO INPUT (COME FROM RECEIVER DISCRIMINATOR)
2	GND	BROWN/WHITE	COMMON GROUND (FROM POWER SUPPLY/RECEIVER/TRANSMITTER)
3	MIC	GREEN	TX AUDIO OUTPUT (GO TO THE TRANSMITTER MIC/MODULATOR)
4	PTT	BLUE/WHITE	PTT OUTPUT (GO TO THE TRANSMITTER PTT – ACTIVE IN LOW/OPEN COLECTOR)
5	COR1	BLUE	COR INPUT (FROM RECEIVER COR/COS) NOT USED IF USING BUILT IN SQUELCH
6	TONE[2]	GREEN/WHITE	PL/CTCSS LOGIC INPUT (ACTIVE IN LOW)
8	VCC	ORANGE/WHITE	+ 13.8V DC VCC/170mA max.

Note 1: *The input audio should come from the receiver discriminator. The squelch circuit and PL decoder will not work correctly if the audio comes filtered from headphones or speaker. Cuts during receiving signals (RX1 LED goes off during modulations) is a symptom of filtered audio. If is the case, do not use the built-in squelch and use COR1 input. Change de J5 jumper to C and select the correct COR polarity in jumper J3.*

Note 2: *Not used in version 2500CT since there is a built in CTCSS/PL decoder.*

Function	Name	Option	Page
01	REPEATER TRANSMITTER ENABLE	[0] OFF, [1] ON	8
02	HANG TIME	[0]-[9] 300ms, 500ms, 1s, 2s, 3s, 5s and 10s	8
03	TIME TO THE COURTESY TONE (also called beep)	[0]-[9] X 50ms	8
04	DURATION OF THE COURTESY TONE	[0]-[9] X 50ms	8
05	TONE FREQUENCY	[0]-[D] X 100Hz starting at 300Hz	8
06	TYPE OF THE COURTESY TONE	[0]=single tone, [1]-[D] multi tone	8
07	ROLLER BEEP	[0]=OFF, [1]=1, [2]=10, [3]=20, [4]=40, [5]=60...	9
08	TYPE OF THE CONFIRMATION BEEP	[0]=no confirmation, [1]=2 tones, [2] melody	9
09	TIME OUT ACTION	[0]=no action, [1]=transmission drop	9
10	ID TEST	[1]=message 1, [2]=message 2, [3]=CW, [4]= FW version and serial number	9
11	REPEATER PORT PL (CTCSS) ENABLE	[0]=OFF, [1]=ON	9
12	AUXILIARY PORT PL (CTCSS) ENABLE	[0]=OFF, [1]=ON	9
13	REPEATER PL (CTCSS) FREQUENCY	[0]-[38]	9
14	ID TIMER	[0]-[7] X 5 min.	9
15	ID SELECTION	[0]=CW, [1]=message 1, [2]=Smart	10
16	CW ID FREQUENCY	[0]-[9] X 100Hz starting at 300Hz	10
17	CW ID SPEED	[1]-[5] (1 slow/5 fast)	10
18	CW ID MESSAGE	[0]-[55]	10
19	VOICE ID MESSAGES	[1]=message 1, [2]= message 2	11
20	ALARM	[0]=OFF, [1]=ON	11
21	MONITORING	[0]=OFF, [1]=ON	11
22	REPEATER PORT ENABLE	[0]=OFF, [1]=ON	11
23	AUXILIARY PORT ENABLE	[0]=OFF, [1]=auxiliary, [2]=ctrl, [3]=link, [4] cross	11
24	TRANSMISSION TEST	[0]=OFF, [1]=carrier, [2]=tone	11
25	SIMPLEX REPEATER ENABLE	[0]=OFF, [1]=ON, [2]=ON + Courtesy tone	12
26	REPEATER TIME OUT	[0]-[9] X 30s	12
27	REMOTE OUTPUT 1	[0]=OFF, [1]=ON, [2]=pulse	12
28	REMOTE OUTPUT 2	[0]=OFF, [1]=ON, [2]=pulse	12
29	REMOTE OUTPUT 3	[0]=OFF, [1]=ON, [2]=pulse	12
30	REMOTE OUTPUT 4	[0]=OFF, [1]=ON, [2]=pulse	12
31	REMOTE OUTPUT 5	[0]=OFF, [1]=ON, [2]=pulse	12
32	REMOTE OUTPUT 6	[0]=OFF, [1]=ON, [2]=pulse	12
33	REPEATER PORT DTMF ENABLE	[0]=OFF, [1]=ON	12
34	DTMF MUTE ENABLE	[0]=OFF, [1]=ON	12
35	PASSWORD SETUP	[#SSSS SSSS#]	12
36	RESET	Restart with the user configuration	13
37	FULL RESET	Restart with factory default configuration	13
38	VOICE RECORDER LOCK ENABLE	[0]=OFF, [1]=ON	13
39	MULTI FUNCTION BUTTON SETUP	[0]=PLAY, [1]=COR/REC, [2]=TX OFF	13
40	VOICE MESSAGE DURATION	[1]=1 message up to 20s, [2]=2 messages up to 10s	13
41	VOICE ID PRIORITY	[0]=low priority, [1] high priority	13
42	SUPER USER MODE ENABLE	[0]=OFF, [1]=ON	13
43	COURTESY TONE EDITOR	[Freq] [Dur] [Int] [Freq] [Dur] [Int] [Freq] [Dur]	13

TECHNICAL SUPPORT

If any doubt remains after a complete reading of this manual, please visit our web site. You will find last minute information and a FAQ section with answers to frequent questions.

You can get support by e-mail:

suporte@hamtronix.com.br

PRECAUTIONS

Please observe the following precaution to prevent radio equipment and controller damage:

- Do not modify controller circuits unless instructed by a Hamtronix documentation.
- Do not place the controller in excessively dusty areas, humid areas, wet areas, nor on unstable surfaces that may cause short-circuits.
- If abnormal odor or smoke is detected coming from the board, turn off the power immediately and contact support for help.
- The case is made of a biodegradable material and should not be exposed to high temperatures.

WARRANTY

This Warranty covers all defects in materials and workmanship of this product for the original purchaser. This Warranty will remain in effect for two (2) years from the date of purchase. This Warranty does not cover damage, deterioration or failure resulting from:

1) Accident, misuse, abuse, neglect, unauthorized product modification or failure to follow instruction contained in this manual.
2) Water or other elements.
3) Repair or attempted repair by anyone not authorized by Hamtronix.
4) Any unit which is not new when sold to the first end user or upon which the serial number has been defaced, modified or removed.

This board must be interconnected with radio equipment or accessories using connectors. Any sign of direct soldering to the board will void the Warranty.

Hamtronix's liability is limited to repairing or replacing its own products. Hamtronix shall not be liable for any damages, whether incidental, consequential or otherwise, because of any defective Hamtronix product.

If it is necessary to send the product for servicing, shipping charges are the responsibility of the applicant.

FIRMWARE UPDATES

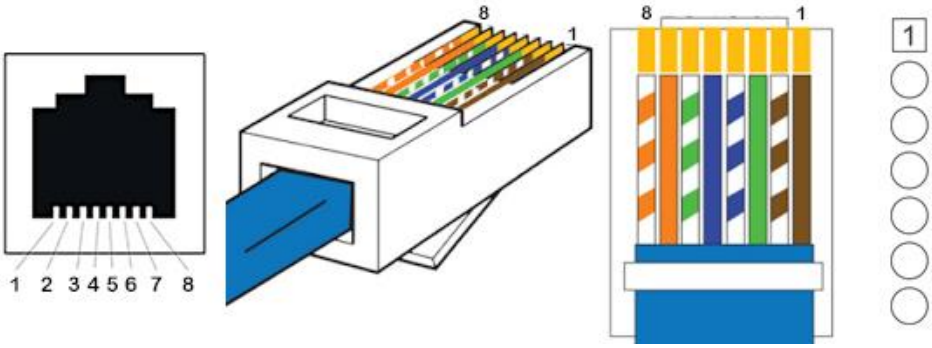
Firmware updates, when available, will be published at our web site. Update requests, if compatible with your hardware, can be requested and will be free of charge during the Warranty period. The controller must be shipped to Hamtronix for firmware updates. All shipment charges will be paid by customer. Also, an updated microcontroller will be available for sale in our online web store under parts/service menu.

SUPPLIED ACCESSORIES

- 1 ELEKTRA 2500/CT controller board
- 1 biodegradable case
- 2 cables with one installed RJ45 connector each
- 1 bracket
- This printed Instruction Manual

CONNECTORS

PINOUT



Female CN1/CN2 Male CN1/CN2 Male CN3

CN1 – Repeater (RPT)

Pin	Signal	Color	Description
1	RX1	Brown	RX audio input (come from receiver discriminator)
2	GND	Brown/White	Common ground (from power supply/receiver/transmitter)
3	MIC/MOD	Green	TX audio output (go to the transmitter mic/modulator)
4	PTT1[1]	Blue/White	PTT output (go to the transmitter PTT)
5	COR1[2]	Blue	COR/COS input (from receiver COR/COS) (Max. 15V)
6	TONE1[2]	Green/White	PL/CTCSS logic input
7	FAN[3]	Orange	Fan output
8	VCC	Orange/White	+ 13.8V DC VCC/170mA max.

Nota [1]: *Open collector type – active in low - max. 300mA.*
Nota [2]: *COR1: J5 in C position and select the correct COR polarity in J3. Squelch: J5 in S position and J3 in (-).*
Nota [3]: *Active in low (low: < 0.6V/high: > 2.4V and < 5.1V). Not used in model 2500CT.*
Nota [4]: *Open collector type – active in low - max. 300mA. To avoid noises in transmission use AC powered fan.*

CN2 – Auxiliary (AUX)

Pin	Signal	Color	Description
1	RX2	Brown	RX audio input (come from receiver discriminator or speaker)
2	GND	Brown/White	Common ground (from power supply/receiver/transmitter)
3	MIC/MOD	Green	TX audio output (go to the transmitter mic/modulator)
4	PTT2[1]	Blue/White	PTT output (go to the transmitter PTT)
5	COR2	Blue	COR/COS input (come from receiver logic)
6	TONE2[2]	Green/White	PL/CTCSS logic input
7	ALM IN	Orange	Alarm input (active when higher than 2V DC (max. 15V)
8	MON IN	Orange/White	Monitoring input (active when higher than 2V DC (max. 15V)

Nota [1]: *Open collector type – active in low - max. 300mA.*
Nota [2]: *Active in low (low: < 0.6V/high: > 2.4V and < 5.1V).*

CN3 – Remote

Pin	Signal	Description
1	OUTPUT 1	Remote Logic Output 1 (OV=OFF/5V=ON)
2	OUTPUT 2	Remote Logic Output 2 (OV=OFF/5V=ON)
3	OUTPUT 3	Remote Logic Output 3 (OV=OFF/5V=ON)
4	OUTPUT 4	Remote Logic Output 4 (OV=OFF/5V=ON)
5	OUTPUT 5	Remote Logic Output 5 (OV=OFF/5V=ON)
6	OUTPUT 6	Remote Logic Output 6 (OV=OFF/5V=ON)
7	GND	Common Ground

Note 1: *10mA per port maximum. Exceeding this limit can damage the microcontroller.*
Note 2: *These digital output ports are also available in 2500CT model but cannot be used at the same time with the built in CTCSS decoder. If the decoder is being used and you change a remote output, the frequency of the decoder will change randomly.*

INSTALLATION AND TESTS

TURNING ON THE CONTROLLER FOR THE FIRST TIME

Be sure the jumper J5 is in S (Squelch) position and J3 in negative position (-). Close SW1 terminal. If you hear the transmission of a melody, the connections between controller and transmitter are correct. Turn the squelch (SQL) trimpot fully counterclockwise. Now adjust slowly clockwise until the green LED RX1 goes out. It is recommended to always close the squelch a little more, as the noise at the reception can vary throughout the day. Transmit to the repeater input frequency. It should retransmit the signal ending with a courtesy tone, which will indicate that the connections between receiver and controller are also correct. If the melody is not transmitted or there is not retransmission, open the SW1 contact and review your CN1 connections. If you prefer to use COR1 instead the build-in squelch, chance J5 to C (COR) position and select the correct COR1 polarity at J3.

AUDIO SETTINGS

Trimpot	Description	Where acts
RX-1	Repeater input audio level	Input audio coming from the receiver on the repeater port
TX-1	Repeater output audio level	Output audio to the repeater transmitter
RX-2	Auxiliary input audio level	Input audio coming from the receiver on the auxiliary port
TX-2	Auxiliary output audio level	Output audio to the auxiliary transmitter
BEEP	Courtesy Tone and CW level	Audio of courtesy tones, melodies and CW identifier
VOICE	Voice reproduction audio level	Audio of the recorded messages

RETRANSMISSION AUDIO ADJUSTMENT

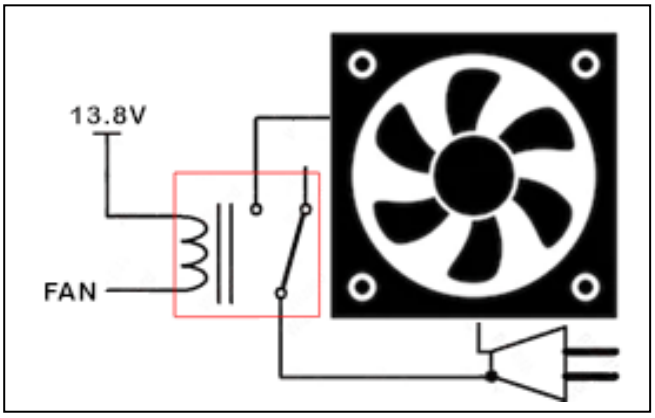
The amplitude of the retransmitted audio depends on the input (RX-1) and output (TX-1) settings. To keep the repeater audio amplitude the same as a simplex operation, proceed as follows:

1) Disable the DTMF mute (function 34-0).
2) Connect a multimeter to the headphone output of a transceiver tuned to the repeater frequency output.
3) Ask someone to transmit a DTMF tone for, let´s say, 30s.
4) At the repeater frequency input (press MON / REV in your transceiver) check the mV AC reading.
5) At the repeater frequency output (release the MON / VER) check the mV AC reading.
6) Adjust RX1 and TX1 to obtain the same voltage as in the input frequency.
7) Test with and without de-emphasis jumper J1. Leave it in the position where the audio is best.

LEDs

Label	Color	What it indicates
PWR	Red	Power is on
RX-1	Green	Repeater receiver receiving a signal
TX-1	Red	Repeater transmitting
RX-2	Green	Auxiliary receiver receiving a signal
TX-2	Red	Auxiliary transmitting
DTMF	Yellow	DTMF decoding
CTCSS	Yellow	PL/CTCSS decoding

TIMED FAN OUTPUT



The Elektra 2500 can control fans to cool the repeater/auxiliary transmitter. When the repeater is in use, the fan is activated and remains on for 2 minutes after the transmission ends. The fan is not activated during CW or voice identifications.

The fan drive output (CN1-7) is an open collector type active in low. Max. 300mA. See the connection diagram on the left.

Note: *DC fans are noisy. Prefer AC fans.*

DETERMINING COR LOGIC

Locate the COS/COR signal on your receiver. This line has a DC voltage that changes when a signal is being received. If the COR line is 0 volts and goes to a positive voltage when a signal is received it is said to be (positive logic) or active HIGH. If the COR line is a positive voltage and goes to 0 volts when a signal is received it is said to be (negative logic) or active LOW. Any voltage under 0.8V is considered low state and greater than 2V high state. If you receiver has positive COR, jumper J3 (or J4 in case auxiliary port) should be at center and + position. If you receiver has negative COR, jumper J3 (or J4 in case auxiliary port) should be at center and - position. It is not necessary to use the input COR1 if using the controller 's internal squelch.

Note: Finding the COR signal on a receiver, according to some customers, is the biggest obstacle to installation. To meet this demand, we added a squelch circuit that generates its own COR signal, eliminating the need for a COR connection from the receiver. But keep in mind that using the receiver's own squelch circuit is the most recommended, since this circuit has been optimized for the specific characteristics of that product. The controller squelch needs the discriminator signal to work, but the amplitude and frequency response varies depending on the brand and model, not allowing it to be as efficient as that of the receiver itself. So, if you can choose which one to use, always prefer the receiver's COR signal.

VIRTUAL ASSITANT

Elektra 2500 is compatible with Virtual Assistants for Artificial Intelligence (Google Home, Amazon Eco etc.). This allows you to ask questions through the repeater and get answers on a multitude of subjects. You can ask for the weather forecast, ask for general information and even schedule ads for specific times. The prerequisites for installing this functionality are:

- One virtual assistant device
- Availability of Wi-Fi with Internet at the repeater's operating site
- Internal modifications to the assistant device
- Interfacing circuit

Interfacing Google-Elektra

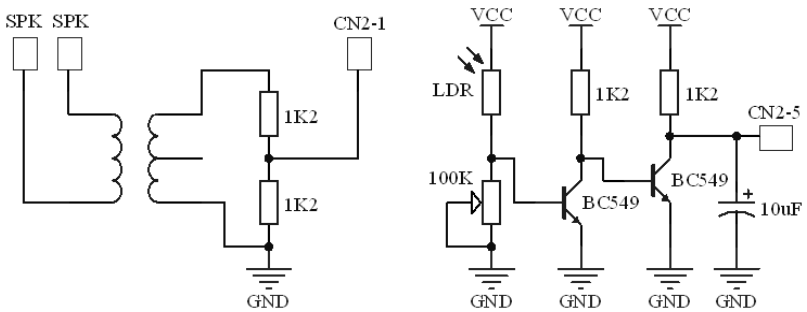
Audio is obtained through the device's internal speaker. In that case, you will need to open it to access the terminals. Search YouTube for instructions on how to open your virtual assistant.

As the switching power supply of the assistant is noisy, we recommend the use of an audio isolation transformer, which feeds the signal to the auxiliary port input (CN2-1).

For voice commands, we use the auxiliary port output (CN2-3). As the assistant's microphones are shielded modules with digital outputs, we cannot interface analog audio directly. The solution was to use a headset speaker to play the audio close to one of the assistant's microphones. The microphones are located at the edges, aligned to the LEDs.

For the controller to know when to transmit, we use the circuit below to generate COR based on the lighting of the assistant's LEDs. Set jumper J3 to positive polarity. Set the auxiliary port to link mode (23-3). Adjust the circuit potentiometer so that the controller RX2 LED lights up according to the assistant's LEDs.

Initial audio adjustment: adjust the assistant's audio to 50% and set the audio trimpot of the RX2 auxiliary port in 12 o´clock. Ask the assistant any questions via repeater and check that the audio level for the assistant's microphone is enough for him to respond. If it is too low, increase TX2 or even RX1. The settings TX1, RX2 and the assistant volume itself influences the level of reproduction. Experiment with the two positions of the J2 de-emphasis jumper for better reproduction audio.



REPEATER AUDIO FIDELITY

The fidelity of the retransmission audio not only depends on the audio circuits of the controller, but where you get it from and where you send it to.

De-emphasis and Pre-emphasis

Before an FM transmitter transmits the audio on the air, the audio coming from the microphone must pass through a pre-emphasis circuit. This circuit boosts the audio at 6dB per octave. Pre-emphasis is needed in FM to maintain a good signal to noise ratio. At the receiver side, a de-emphasis circuit takes the unnatural sounding pre emphasized audio and turns it back into its original response. Pre emphasized audio is available directly from the audio demodulation (discriminator) circuitry.

How to get the best audio quality

As the input audio comes from the discriminator, it is the audio transmitted by the initial user with pre-emphasis. The controller adds courtesy beeps, identification and other signaling to this audio and directs it to its output. This output must be connected directly to the transmitter's modulator (after the pre-emphasis circuit), avoiding any additional treatment to the audio. When a user receives this audio at the destination, a de-emphasis circuit turns it back into its original audio.

How to get these signals on the transceivers

Many current radios now provide discriminator output (flat audio / disc / det) and modulator input (TX 1200/9600 / flat audio) on interface connectors for packet radio operation. Commercial radios also often have these signals on service / accessories connectors, such as Motorola and Vertex. Radios without these facilities have these signals internally. To obtain these internal signals, a certain technical knowledge is required. If you don't know how to do it, ask a technician for help.

Deemphasize selection on the controller

If your repeater transmitter does not have modulator input available in a packet radio or accessory connector and you don´t know the point internally, install the jumper J1 for deemphasize the incoming audio to use the MIC input of your transmitter.

There are other variables that can affect the audio. In practice, after making the connections, test the retransmission with and without the de-emphasis jumper and leave it in the position where the audio fidelity is best for your ears.

CONTROLL COMMANDS

CONTROLLING YOUR REPEATER OVER THE AIR

With exception of the squelch and audio levels, all functions are controlled over the air with your radio DTMF keypad.

COMMAND SINTAXES

Commands are as following: ***SSSSFF0#***

Where ***SSSS*** is a 4-digit password (default = 1234), ***FF*** is a 2-digit function, ***O*** is a 1-digit option and **#** a enter.

See the command to change the sound of courtesy tone:

1234066#

Your controller will answer valid commands with two high frequency confirmation beeps (function 08 must be enabled). If the entered command is invalid, a long, low frequency tone will be heard. The command must be entered completely in one transmission. If you release PTT switch before you complete a command, the entered numbers will be discarded.

You can enter more than one command without having to release PTT between them. # acts like a command separator. If entering a command and you made a mistake, just press * to clear the entered string and start over.

To get a correct decoding of DTMF tones, the signal must be free of noises or jamming. If the repeater is busy, wait until it becomes free prior to sending commands.

Note 1: *DTMF commands with incorrect password will not generate an error message. They will just be discarded.*
Note 2: *DTMF commands with intervals between digits exceeding 2s will be discarded.*
Note 3: *Some commands don't require an option or may require extra procedures. These exceptions will be explained in detail at function description next.*
Note 4: *Default password is 1234. After getting acquainted with the controller commands, change this password.*

FUNCTION DESCRIPTION

01 – REPEATER TRANSMITTER ENABLE (Default = 1)
This is the master repeater switch. This function must be enabled for normal repeater operation. The Elektra 2500 will continue to respond to DTMF commands and identify even when the repeater's transmitter is disabled. This function will automatically be enabled after a reset or power up.

0 Disable **1** Enable

02 – TRANSMITTER HANG TIME (TAIL) (Default = 4)
When not zero, the repeater's transmitter will remain on the air for a selected period before the it drops.

0 Drops Immediately	**3** Hang Time of 1s	**6** Hang Time of 3s	**9** Hang Time of 10s
1 Hang time of 300ms	**4** Hang Time of 1.5s	**7** Hang Time of 5s	
2 Hang Time of 500ms	**5** Hang Time of 2s	**8** Hang Time of 7.5s	

Note: *This time must be greater than the sum of the time for courtesy tone (function 03) and its duration (function 04) or the courtesy tone will not be heard.*

03 – TIMER TO COURTESY TONE (Default = 2)
This function determines the delay after a signal drop on the receiver and the courtesy tone occurs.

0 Immediately	**3** After 300ms	**6** After 600ms	**9** After 900ms
1 After 100ms	**4** After 400ms	**7** After 700ms	
2 After 200ms	**5** After 500ms	**8** After 800ms	

04 – DURATION OF COURTESY TONE (Default = 1)
Determine the duration of courtesy tone.

0 No Courtesy Tone	**3** 150ms long	**6** 300ms long	**9** 450ms long
1 50ms long	**4** 200ms long	**7** 350ms long	
2 100ms long	**5** 250ms long	**8** 400ms long	

Note: *This function only affects the single courtesy tone (see function 06). The duration of multi courtesy tones are not controlled by user, they are pre-determined by the firmware.*

05 – COURTESY TONE FREQUENCY (Default = 2)
Determine the frequency of courtesy tone.

0 300 Hz	**3** 600 Hz	**6** 900 Hz	**9** 1200 Hz	**C** 1500 Hz
1 400 Hz	**4** 700 Hz	**7** 1000 Hz	**A** 1300 Hz	**D** 1600 Hz
2 500 Hz	**5** 800 Hz	**8** 1100 Hz	**B** 1400 Hz	

Note: *This function only acts for single courtesy tone (see function 06). The frequency of multi courtesy tones are not controlled by user, they are pre-determined by the firmware.*

06 – COURTESY TONE SELECTION (Default = 0)
Determine the type of courtesy tone. Only the single tone may have its frequency and duration modified (See function 04 and 05 for details).

0 Single Tone	**5** Two apart	**A** Double Sweep Tone
1 Courtesy Tone Editor (See Function 43)	**6** Plim-Plim	**B** Four Fast Tones
2 Three Crescent Tones	**7** CW K letter	**C** Sweep Tone
3 Three Decreasing Tones	**8** NASA Quindar	**D** Droplet
4 Fast Tones	**9** Five Crescents Tones	

Note[1]: *Courtesy tone used in the communications of the NASA Apollo project when the Eagle lunar module landed in the moon. To learn more:*

https://www.youtube.com/watch?v=nrzeFNEv150 and https://www.youtube.com/watch?v=oQfMH-perhk

07 - ROLLER BEEP (Default = 0)
Determine after how many key ups the type of courtesy tone will automatically change.

0 Disable **2** every 10 **4** every 40 **6** every 80
1 Each transmission **3** every 20 **5** every 60 **7** every 100

Note: *Options 0 and 1 should only be used for demo purposes, since the constant change of courtesy tones can cause some users to key up all the time and bother other listeners. If function 06 is used, Roller Beep will be disabled.*

08 – CONFIRMATION TONE (Default = 1)
Determine the type of confirmation sound.

0 No confirmation sound **1** Two high frequency tones **2** Melody

09 – TIME-OUT ACTION (Default=1)
When time-out is exceeded, you can choose between transmitter drop until the signal that caused the drop disappears or just a funeral march sound of warning.

0 Timer-out warning sound **1** Transmitter drop

Note: *If the transmitter drops and the signal that caused the drop is still blocking the repeater, if you have a stronger signal you can press * to bring the transmitter back.*

10 – ID TEST
This function will allow you to test the IDs and check the controller's version and serial number.

1 Voice Message 1 playback **2** Voice Message 2 playback **3** CW ID **4** Software version

11 – REPEATER CTCSS ENABLE (Default = 0)
When enabled, will require a correct CTCSS to operate the repeater port.

0 Disable **1** Enable

Note: *This function should only be activated if there is a CTCSS decoder installed. It can be built-in, as in Elektra 2500CT model, external such as the Hamtronix TED300 module or from inside of the receiver. TONE1 input (CN1-6) is active with logic level 0 (voltage less than 0.6V) when the correct PL/CTCSS is present. Level 1 (greater than 3V and less than 5.5V) indicates absence of PL/CTCSS.*

12 – AUXILIARY CTCSS ENABLE (Default = 0)
When enabled, will require a correct CTCSS to operate the auxiliary port.

0 Disable **1** Enable

Note: *This function should only be activated if there is a CTCSS decoder installed. It can be external such as the Hamtronix TED300 module or from inside of the receiver. TONE1 input (CN2-6) is active with logic level 0 (voltage less than 0.6V) when the correct PL/CTCSS is present. Level 1 (greater than 3V and less than 5.5V) indicates absence of PL/CTCSS.*

13 – PL/CTCSS FREQUENCY SELECTION (Default=0)
Sets the frequency of the build in PL/CTCSS decoder of the Elektra 2500CT model.

CTCSS	Option	CTCSS	Option	CTCSS	Option	CTCSS	Option	CTCSS	Option	CTCSS	Option
-	00	85.4	08	110.9	16	146.2	24	183.5	32	210.7	40
67.0	01	88.5	09	114.8	17	151.4	25	186.2	33	218.1	41
69.3	02	91.5	10	118.8	18	156.7	26	189.9	34	225.7	42
71.9	03	94.8	11	123.0	19	159.8	27	192.8	35	229.1	43
74.4	04	97.4	12	127.3	20	162.2	28	196.6	36	233.6	44
77.0	05	100.0	13	131.8	21	167.9	29	199.5	37	241.8	45
79.7	06	103.5	14	136.5	22	173.8	30	203.5	38	250.3	46
82.5	07	107.2	15	141.3	23	179.9	31	206.5	39	254.1	47

Example: To select PL/CTCSS 74.4Hz enter: **123413#04#**

14 – ID TIMER (Default = 1)
Determine how often the ID (voice or CW) will be transmitted.

0 No ID **2** Every 10 min **4** Every 20 min **6** Every 30 min **8** every 3s
1 Every 5 min **3** Every 15 min **5** Every 25 min **7** Every 35 min

Note: *Option 08 is available for beacon or fox hunting applications in CW only. Prefer to use the 3s intervals for sending commands to controller.*

15 – ID SELECTION (Default = 0)
Determine which ID will be transmitted. Option 0 and 1 will be transmitted following the time programming on function 14. Option 2 will not play the ID after the time is exceeded until someone keys up the repeater, when the message 1 will be played. If the repeater is busy at the time of ID, message 2 will be played as soon as COR is lost.

0 CW ID **1** Voice Message ID **2** Smart Voice Message ID

Note: *If the repeater is busy at the time of ID for option 1, the voice will give a place for CW ID. This behavior can be changed with function 41. Option 2 will only be available if two messages are selected at function 40.*

16 - CW ID FREQUENCY (Default=7)
Determine the CW ID Tone Frequency.

0 300 Hz **3** 600 Hz **6** 900 Hz **9** 1200 Hz **C** 1500 Hz
1 400 Hz **4** 700 Hz **7** 1000 Hz **A** 1300 Hz **D** 1600 Hz
2 500 Hz **5** 800 Hz **8** 1100 Hz **B** 1400 Hz

17 –CW ID SPEED (Default = 4)
Determine the speed for CW ID.

1 Slowest **2** Slow **3** Medium **4** Fast **5** Faster

18 – CW ID SETUP
A maximum of 20 characters is available for CW ID message. See an example for programming the word "TEST" in CW:

Enter: **123418#2005192005#**

If the entered string is valid, you will hear the ok confirmation and the CW ID will play.

Note: *If you make a mistake when entering the string, just press * to clear the string and start over.*

CODES FOR CW PROGRAMMING

LETTER	CODE	CW	LETTER	CODE	CW	LETTER	CODE	CW
A	01	.-	T	20	-	. (AAA)	39	.-.-.-
B	02	-...	U	21	..-	Space	40	space
C	03	-.-.	V	22	...-	= (BT)	41	-...-
D	04	-..	X	23	-..-	: (OS)	42	---...
E	05	.	Y	24	-.--	; (KR)	43	-.-.-.
F	06	..-.	W	25	.--	((KN)	44	-.--.
G	07	--.	Z	26	--..	) (KK)	45	-.--.-
H	08	....	1	27	.----	# (HH)	46	.....
I	09	..	2	28	..---	/ (DN)	47	-..-.
J	10	.---	3	29	...--	" (AF)	48	.-..-.
K	11	-.-	4	30	....-	$ (SX)	49	...-..-
L	12	.-..	5	31	.....	` (WG)	50	.----.
M	13	--	6	32	-....	_ (IQ)	51	..--.-
N	14	-.	7	33	--...	+ (AR)	52	.-.-.
O	15	---	8	34	---..	* (SK)	53	...-.-
P	16	.--.	9	35	----.	? (IMI)	54	..--..
Q	17	--.-	0	36	-----	> (CT)	55	-.-.-
R	18	.-.	- (DU)	37	- ..-..-			
S	19	...	, (MIM)	38	--...--			

19 – VOICE ID MESSAGE RECORDING
The maximum recording time is 20s. If you choose Smart ID (function 15-2), this time will be split in two, resulting in two 10s messages each. After sending the command, release PTT switch and the next key up will be recorded and played back after recording. The voice ID time interval is the same as function 14.

1 – Message 1 record **2** – Message 2 record

Ex: To record a message press: **1234191**#

Note: *Don't exceed the maximum time selected or the messages may become overlapped. Function 38 (Voice Message Lock) must be disabled in order to record the voice message or you will get an error alert. Besides over the air recording, you can use an external source of audio by using the K1 audio jack. Use the same commands as you would by on the air recording, but when pressing the PTT, the external audio will be recorded instead.*

20 – ALARM INPUT (Default = 0)
This alarm input is available for violation detection for windows, doors or repeater cabinet. Using any kind of detector or sensor, a GND signal must be present all the time connected to alarm input (CN2-7) in order to not trigger the alarm. If this ground signal is missing, the alarm will be triggered and stay in alarm until a command is sent to turn it off. A siren sound will be transmitted over the air.

0 Disable **1** Enable

Note: *Even with alarm activated the repeater will still be available for communication, but the siren sound will return as soon as the communication ends.*

21 – MONITOR INPUT (Default = 0)
A monitor input is available for lost AC voltage or logic state monitoring. When this input (CN2-8) is open or high (5V), a short tone will precede the regular courtesy tone otherwise (low) nothing happens.

0 Disable **1** Enable

Note: *Due to a pull-up resistor this input will be considered high if not connected.*

22 – REPEATER PORT (Default = 1)
If disabled, the repeater will only accept signals coming from the link port.

0 Disable **1** Enable

Note: *This function only can be disabled if link port is enabled.*

23 - LINK PORT (Default = 0)

0 – Disable Signals from link port will be discarded
1 – Auxiliary Allow access to repeater coming from another frequency (high priority)
2 – Control Allow control access coming from another frequency (high priority)
3 – Link Link operation (no hang time for signals coming through this port)
4 – Cross Cross repeater operation

24 – TRANSMITTER TEST (Default = 0)

0 Disable **1** Carrier **2** Carrier with Tone

Note: *This option has no time-out. Make sure your transmitter can stay keyed up for extended periods without overheating. The tone frequency will be the same as simple courtesy tone (function 05)*

25 – SIMPLEX REPEATER (Default = 0)
Does not require separate receiver and transmitter. Even an HT can be used for this. When enabled, any incoming signal will be recorded and played back. The duration of each transmission should not exceed 20s or it will be cropped. Due to its low cost, simplex repeater mode can be invaluable for emergency and expedition purposes.

0 Disable **1** Enable **2** Enable with courtesy tone

Note: *As use the space for voice message ID, all prior contents will be lost. Function 38 must be disabled in order to use this function.*

26 – REPEATER TIME-OUT (Default = 6)
Determines the maximum allowed time for each transmission. 10 seconds before the time is up, a short beep will indicate that the time-out time has almost been reached. After time-out, a melody will be heard, and the transmitter may or may not drop depending on the setting of function 09. If dropped, will remain that way until the COR that caused the time-out is dropped.

0 No time-out	**2** 60s (1min)	**4** 120s (2min)	**6** 180s (3min)	**8** 240s (4min)
1 30s	**3** 90s	**5** 150s	**7** 210s	**9** 270s

Note: *The timer counter is reset at courtesy tone. If the signal that caused the time-out drop is still on the receiver holding the transmitter keyed, you can send * to bring it back (your signal must be stronger in order to gain control).*

27 to 32 – REMOTE OUTPUTS 1 to 6 (Default = 0)
6 remote outputs are available for general purpose use.

0 Disable **1** Enable **2** Pulse (inverts state for 100ms)

Example: To enable output 5 press: **1234311#**

Note: *These outputs are CMOS logic and can drive a maximum of 10mA each. If you need to interface with a relay, use a transistor as a buffer. In model 2500CT, this output should not be used if build-in CTCSS decoder is being used. Changing remote outputs will cause CTCSS frequency to change randomly.*

33 – REPEATER DTMF CONTROL ENABLE (Default = 1)
You can disable the repeater port from accepting DTMF commands when the link port is up, and you can control it by another frequency on the link port.

0 Disable **1** Enable

Note: *You can't enable this function if the link port is down.*

34 - DTMF MUTE ENABLE (Default = 0)
When enabled, anytime a DTMF tone is received, the audio will be muted to the Repeater's transmitter. The transmit audio will remain muted for 2s after the last DTMF tone is received. This feature prevents control commands from being repeated. It provides an extra measure of security. There may be times when it is desirable to pass the DTMF tones through the repeater and you can disable this function.

0 Disable **1** Enable

Note: *Do not use excessive levels at RX-1 trim pot because saturated audio with high tone voices may fool the DTMF decoder and cause an undesirable mute over a voice communication.*

35 – PASSWORD SETUP (Default = 1234)
To change the password.

If the actual password is 1234 and you want 5678 press: **123435#56785678#**

Note: *The new password is entered twice for security purposes.*

36 - RESET
Restart the microcontroller with user programmed values. A melody is heard to indicate a successful reset. Have the same effect as power up.

Ex: 123436#

Note: *The voice message and CW programming are not affected.*

37 – REMOTE FULL RESET
Restart the microcontroller and all functions with default values.

Ex: 123437#

Note: *The voice message and CW programming are not affected.*

38 – VOICE MESSAGE LOCK (Default =1)
This is a security measure to protect the voice message from being erased by mistake. To be able to record a voice message or use the Simplex Repeater function, this function must be disabled.

0 Voice Lock Disable **1** Voice Lock Enable

39 – MULT-FUNCTION BUTTON (Default = 2)
Determine the action of button S1.

0 PLAY Starts message 1 playback
1 COR/REC COR simulation (acts like a REC button after function 19 to record a message)
2 TX OFF Drops transmitter (Useful when checking for duplexer desense)

40 – VOICE MESSAGE DURATION (Default = 1)

1 One 20s message **2** Two 10s messages

41 – VOICE ID PRIORITY (Default = 0)
When repeater is busy, and the ID time is up or the voice is playing back and a signal is received, the voice will be replaced by CW ID. If this option is enabled, the voice message will not be replaced.

0 Disable **1** Enable

42 – SUPER USER MODE (Default = 0)
If enabled, the password will not be required. Just enter the function and option.

0 Disable **1** Enable

Note: *The Master Reset is not available in this mode.*

43 – COURTESY TONE EDITOR (Default=611 611 61)
You can create your own exclusive courtesy tone. The courtesy tone can be composed by 3 tones and you can control the interval, duration and frequency of each one. This function acts on the simple tone (Function 06-1).

0	**300 Hz**	**3**	**600 Hz**	**6**	**900 Hz**	**9**	**1200 Hz**	**C**	**1500 Hz**
1	**400 Hz**	**4**	**700 Hz**	**7**	**1000 Hz**	**A**	**1300 Hz**	**D**	**1600 Hz**
2	**500 Hz**	**5**	**800 Hz**	**8**	**1100 Hz**	**B**	**1400 Hz**		

[F][D][I] [F][D][I] [F][D]#
F=Frequency, D=Duration e I=Interval

Try the following combinations: 830 330 62, 230 430 62 and 722 742 00 (CW letter A).
To enter the first example, press: 1234 43 # 830 330 62#

Note: *Zero duration tone will not be transmitted.*

TROUBLESHOOTING

In case of malfunction, perform a Full reset so that the values programmed by the manufacturer are reestablished. In this way all options of the functions return to the default values. It can be performed in three different ways:

1) Over the air, using a function 37: Enter: **123437#**

2) Over the air, using the master password. Enter: **NNNN123#**

Where **NNNN** is a 4-digit master password for full reset from the back cover If the master password is 6986, the command would be: 6986123#

Note: *The Master password cannot be changed by the user, so keep that password confidential. This command is not available if the controller is running in Super User mode (function 42).*

3) On the controller board, using the multifunction button: Switch off the controller by opening the SW1 switch; keep the multifunction button pressed; turn on the SW1 switch (the green RX1 LED will light); wait for it to flash (up to 20s) and then release the button. An open squelch noise followed by the startup melody will be transmitted and all functions will return to their default values.

Note: The recorded messages and CW programming are not affected by any of the reset methods.

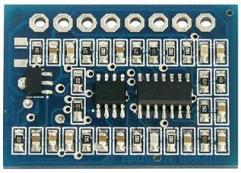
If the problem persists, contact technical support.

ACCESSORIES

- 7” Mini rack (Motorola) box

- TED300 Encoder / Decoder CTCSS module

- SSM350 Super Squelch Module



For more details on these accessories visit www.hamtronix.com

Serial Number	2962
Firmware Version	2.52
Master Password	8338

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