

Sequencer with computer interface

User manual

FW version 1.20.0521

Sequencer with computer interface (later in text sequencer) combines functionality of the 4 channel sequencer and simple computer interface for PTT switching and CW manipulation.

Table 1 Specifications

Parameter	Value
Sequencer channels number	4
Sequencer signal delays	0..500ms, programmable with 1ms step
Relay output (CH1)	2A 30VDC
Solid state switch (CH2..CH4 and CW keying)	50mA 50VDC
Timing precision	$\pm 3\%$ at 25C $\pm 4\%$ at -10..+60C
Power supply voltage	+8..15VDC
Power supply current	0.1A
Dimensions	50x40mm
Weight	50g

Sequencer features includes:

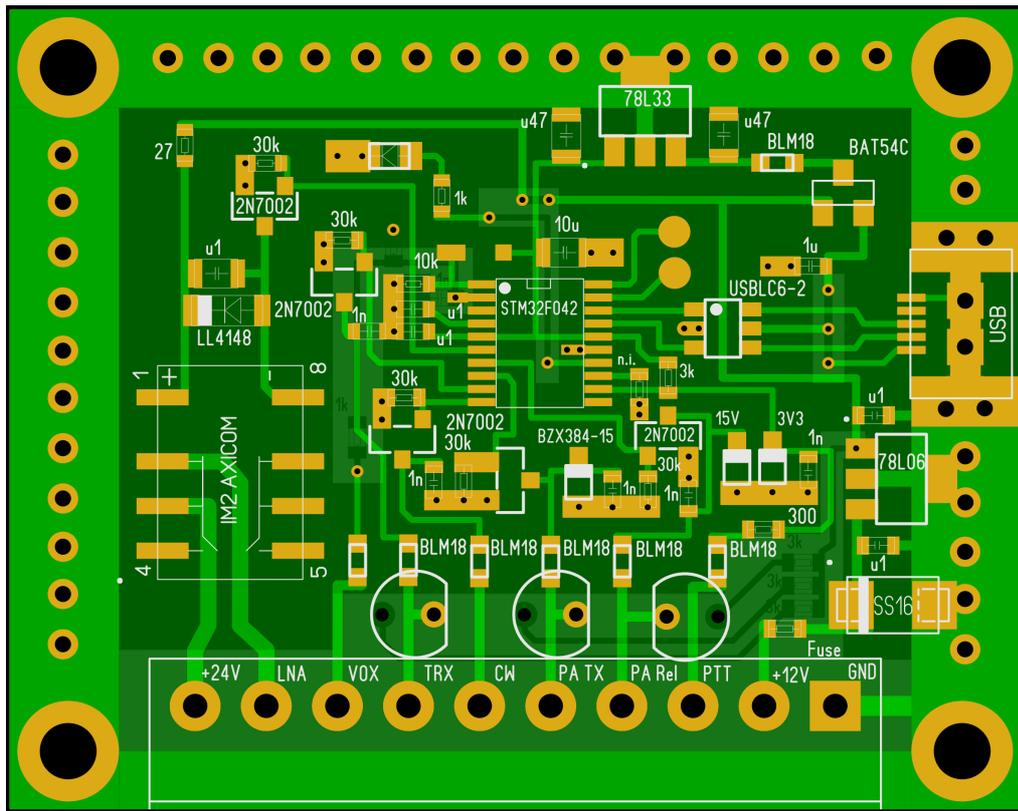
- 4 channels
- programmable delay (0..500ms) and polarity
- one channel (CH1) with relay output (SPST relay) and 2A/30VDC rating
- three channels (CH2..CH4) with 50mA/50VDC solid state switch
absolute timings precision is $\pm 3\%$ at 25C and $\pm 4\%$ at -10..+60C
- CW signal can be generated using the keyer, DTR or RTS line of the virtual COM port
- TX/RX switching can be initiated by external PTT signal, DTR or RTS line of the virtual COM port

Board connections

The sequencer is connected using one 10 contact connector, here is contacts description:

Contact	Board label	Description
1	Ground	Ground
2	+12V	Power supply
3	PTT	PTT input with pullup resistor, active low level
4	PA Rel	CH2 sequencer open drain output (use for PA bypass relay switching)
5	PA TX	CH3 sequencer open drain output (use for PA activation)
6	CW	Keying output from the internal computer interface, open drain output, active low
7	TRX	CH4 sequencer open drain output (use for TRX PTT signal)
8	VOX	Input for the external VOX signal, active high level
9	LNA	CH1 sequencer output, normally closed relay contact (use for LNA switching)
10	+24V	

There is also the microUSB connector that is used for the sequencer tuning, computer interface and firmware updates.



Sequencer operation

Sequencer can be switched to transmit by the following signals:

- Footswitch (or other signal, active to ground, connected to PTT contact)
- External VOX signal (when the VOX function is active)
- USB computer interface (when this function is active)

All those signals are combined by the logical OR function. So, when any signal is active the sequencer will switch to transmit. All signals should become inactive to switch sequencer to receive.

When transmit event is detected sequencer will start timer and will generate signals at channel 1 ... channel 4 according to the programmed delays (the delays can be adjusted in the control program from 0 to 500ms of the total delay). The CW keying is blocked until switching cycle is over. Additional delay can be specified for the CW signal. The CW signal delay line delays CW keying, so the first CW characters will be transmitted after the RX to TX switching cycle is over.

When transmit signal is released sequencer will block CW keying immediately and initiate TX to RX switching cycle deactivating signals according to the programmed delays (the delays can be adjusted in the control program from 0 to 500ms of the total delay).

CW keying can be done by computer interface. Sequencer blocks CW keying until it is not fully switched to transmit.

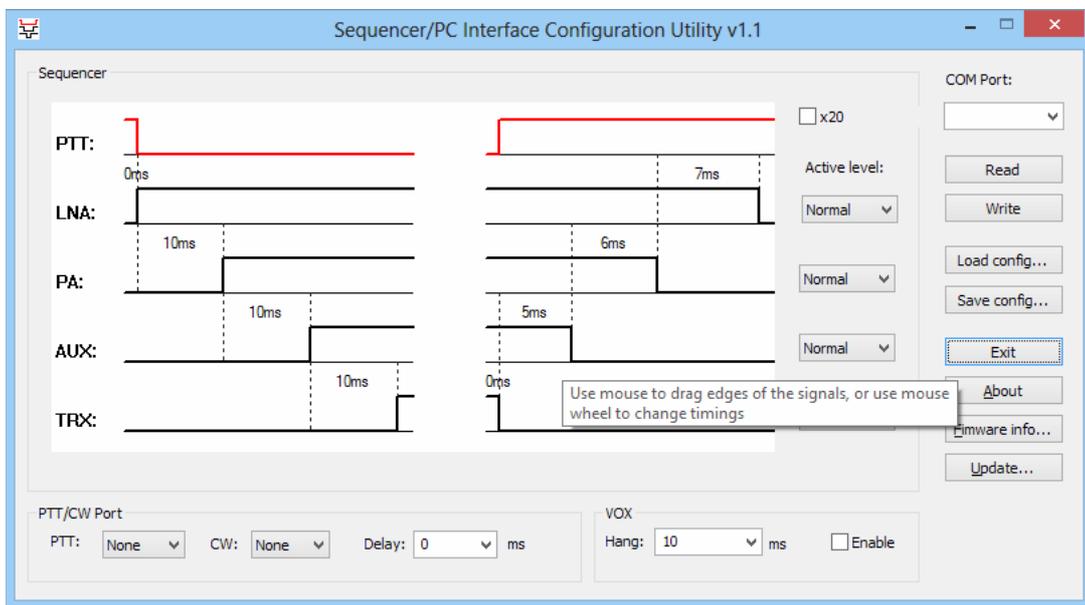
The VOX hang time can be tuned in the control program. The VOX activates from the computer interface keying signal or from the external VOX signal.

Sequencer setup

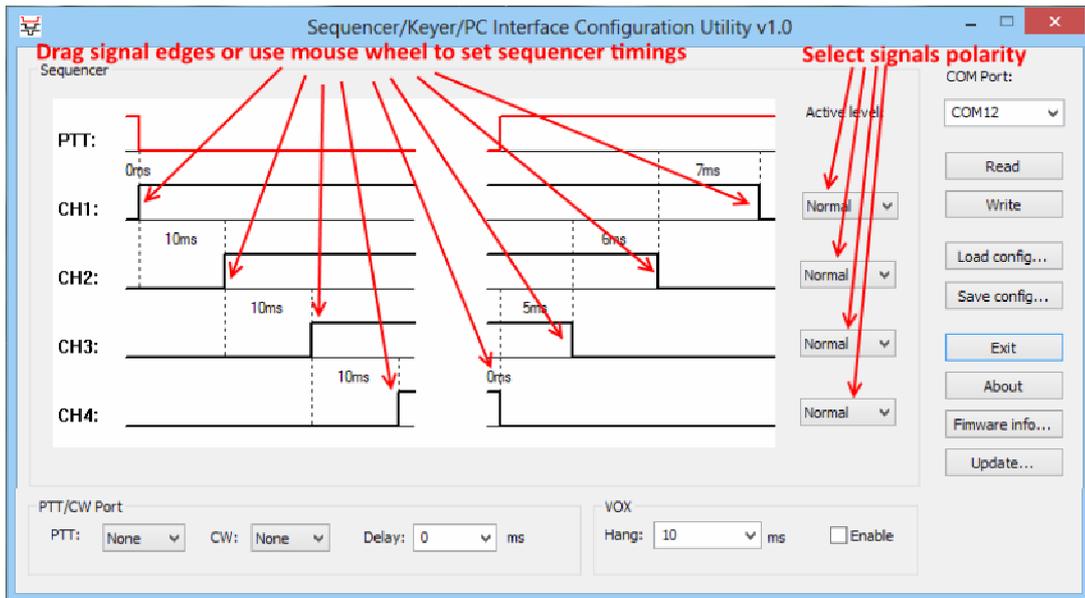
You should program the necessary delays/polarity and other parameters to the sequencer before using it.

Attach the USB cable to the module and plug the USB cable to the USB port of the PC. The PC should find the STMicroelectronics Virtual COM Port and install drivers for it automatically. You can also download and install driver manually from here <https://vhfdesign.com/data/zip/en.stsw-stm32102.zip> or here <http://www.st.com/en/development-tools/stsw-stm32102.html> in case of any difficulties.

When the drivers are installed and sequencer is attached to the PC USB port run sequencer configuration PC software Sequencer.exe (the program can be downloaded from this page <https://vhfdesign.com/other/cw-key-sequencer.html>). You should see the following main program dialog on start up:



The necessary timing can be set by dragging the signal edges on the diagram or by using the mouse wheel (hover the mouse cursor over the signal you want to change and use mouse wheel to adjust it). The signal active level can be set to Normal or Inverted using the **Active level** dropdown lists. The high level on the diagram corresponds to closed relay contacts or solid state switch:

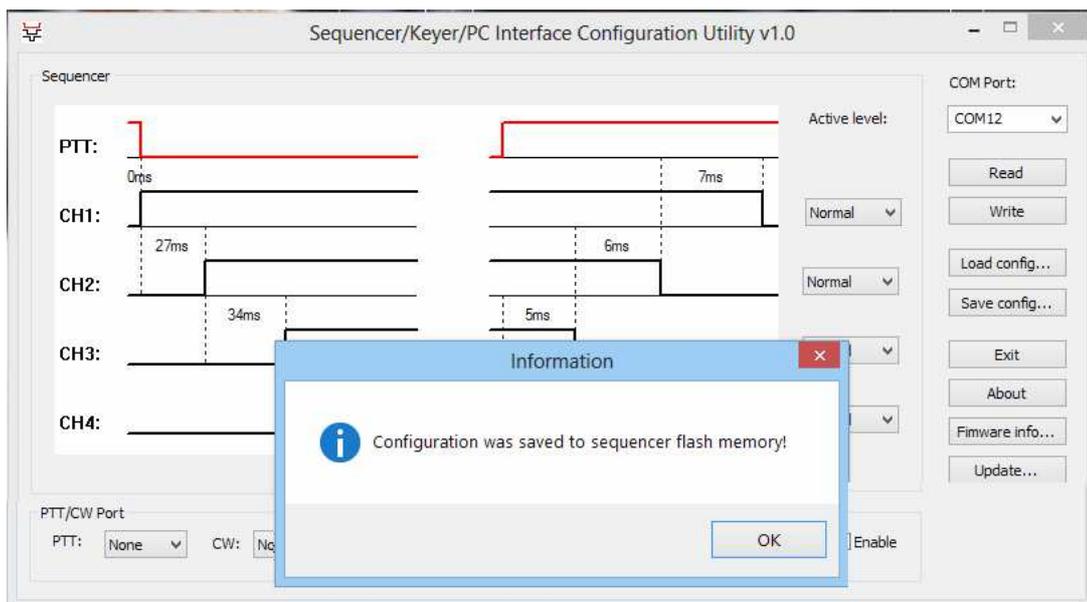


The PTT/CW computer interface can be configured by the **PTT/CW Port** control group. Select the desired virtual COM port line to control the PTT and CW signals respectively. Use the same settings in you logger software (or other program that you use to control your radio).

You can specify an additional delay that will be applied to the CW keying after the RX to TX switching cycle is over (CH4 line activated) using the **Delay** field.

The VOX function can be activated by the **Enable** checkbox in the **VOX** control group. The VOX hang time can be selected in the **Hang** dropdown list or entered in the same field.

After you have tuned the configuration of the sequencer you have to write it to the sequencer flash memory. Select the sequencer virtual COM port in the **COM Port** list and press **Write** button. The program will report if the configuration was written successfully:



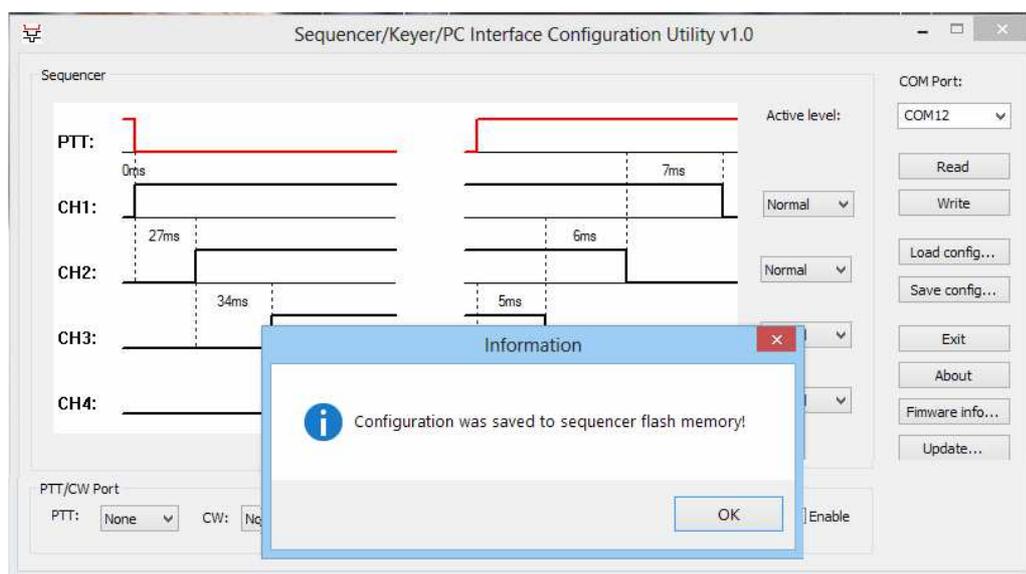
If you need to correct the configuration of the sequencer you can read its current configuration. Select sequencer virtual COM port in the **COM Port** list and press **Read** button.

You can also save configuration for the further use to the file using the **Save config** button and load it later using **Load config** button if needed.

Firmware update

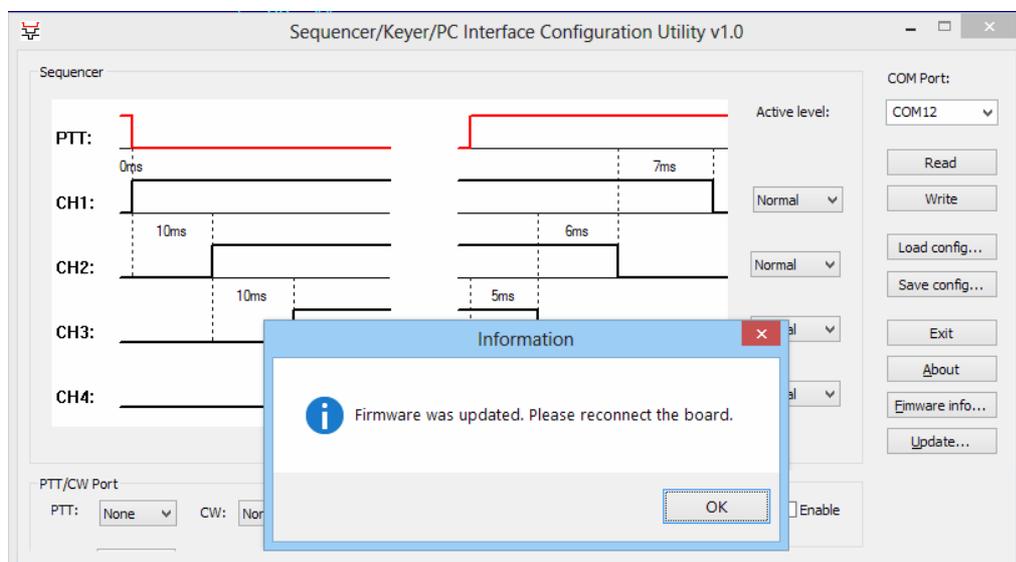
Sequencer firmware is user upgradeable and can be updated if needed. You have to download firmware image file (you can download firmware images from this page <https://vhfdesign.com/other/cw-key-sequencer.html>). Connect sequencer to the computer, run Sequencer.exe utility, select correct COM port and read sequencer configuration. Now save your sequencer configuration to the file using the **Save config** button (sequencer configuration will be overwritten during firmware update). Then press **Update** button.

Select firmware image file. Sequencer will enter bootloader mode (the LED on the sequencer board will start heartbeat flashing) and the update process will be started:



Do not disconnect module, power off the computer or terminate Sequencer utility during firmware update!

The program will show a message after the firmware updating is finished:



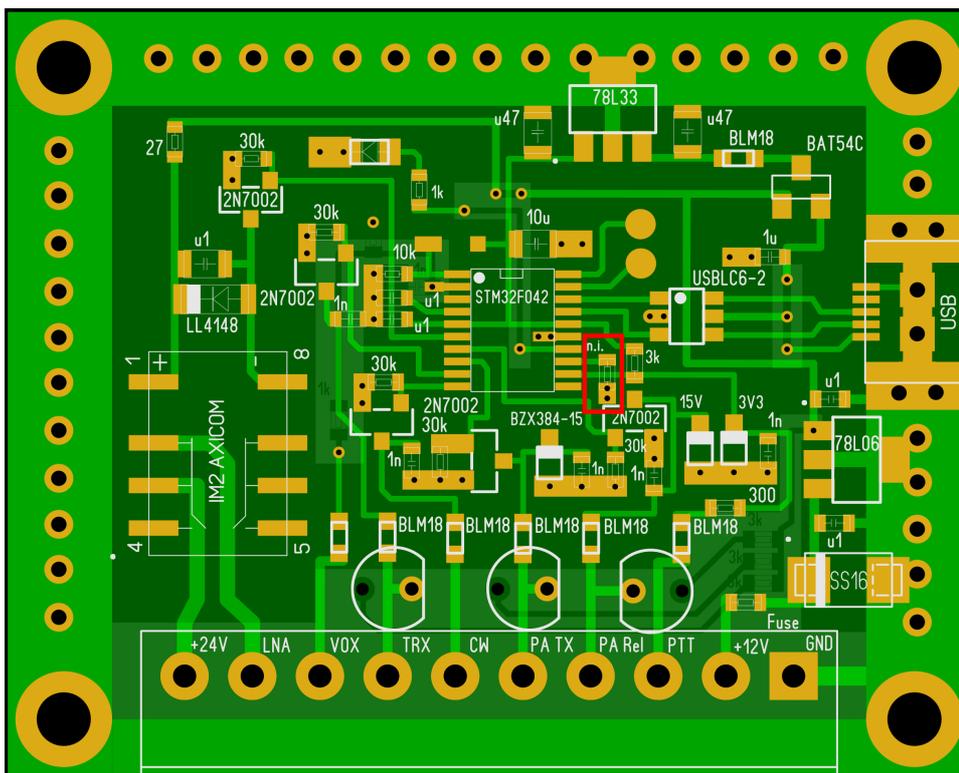
Now you should disconnect the sequencer from the computer USB port. Reconnect sequencer to the computer, restore saved configuration (using the **Load config** button) and save it to the module flash memory (using the **Save** button). Now sequencer is ready to use updated firmware.

"Debricking" the sequencer

When you power up sequencer it will check the firmware integrity and will stay in the bootloader mode if the firmware does not pass integrity test (the bootloader mode is indicated by heartbeat yellow LED flashing). If it happened (probably as a result of the unsuccessful firmware update) the sequencer firmware can be repaired. You should follow the instructions in the ***Firmware update*** section, but do not save sequencer configuration cause it will not be possible because of the damaged sequencer firmware.

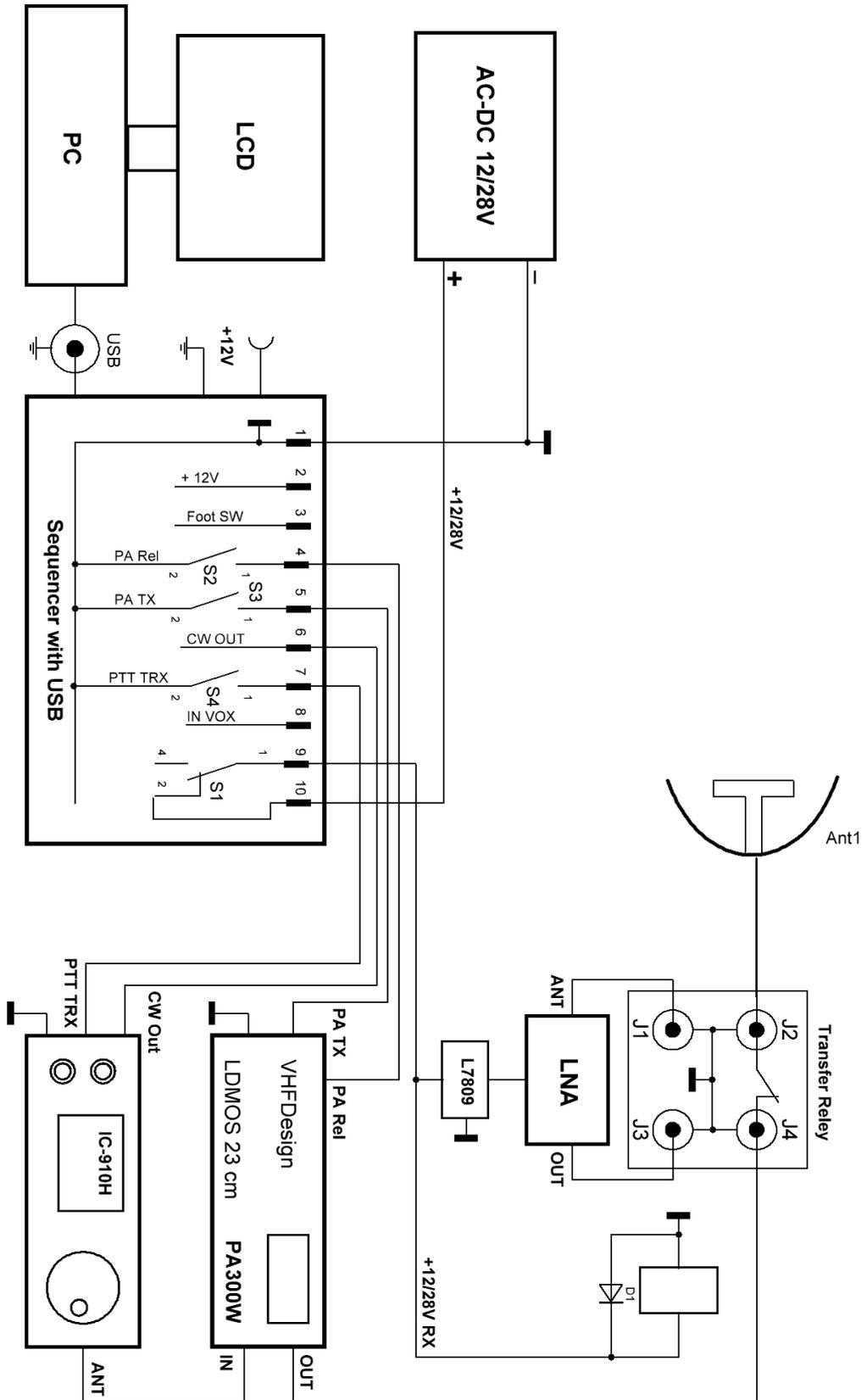
Forcing bootloader to activate

If the sequencer firmware does not work properly or you can not update firmware using standard method the bootloader mode can be activated manually. You have to disconnect sequencer and solder the jumper as indicated on the following drawing:



Now connect sequencer to the USB port. Sequencer should enter bootloader mode (the bootloader mode is indicated by heartbeat LED flashing). Now use the instructions for the "debricking". After flashing the firmware turn off the sequencer and remove the soldered jumper.

Appendix A Connection diagram



Appendix C Board layout

