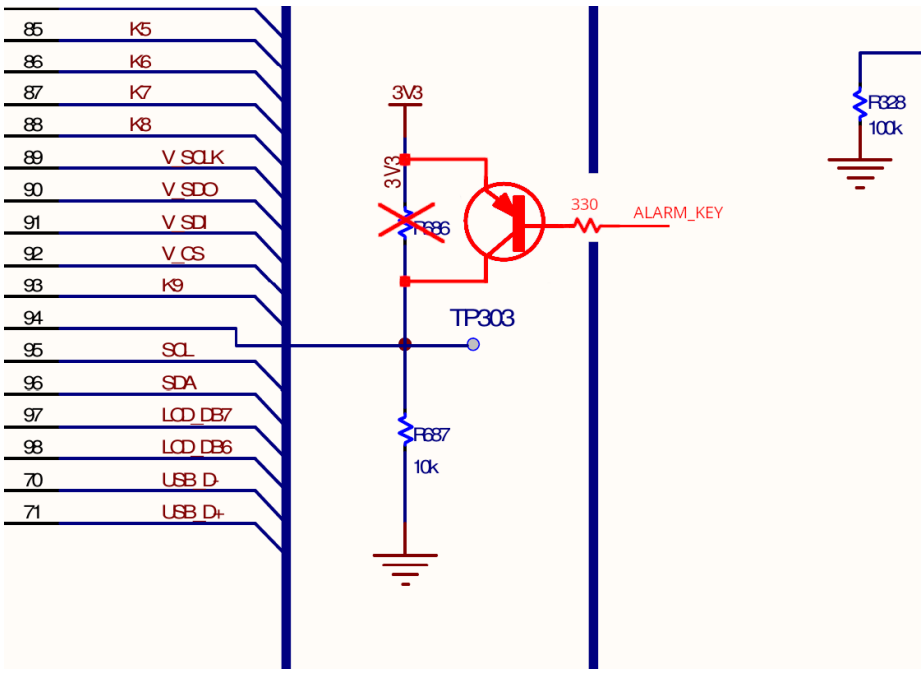
LIST OF CHANGES TO CS760 HARDWARE

May 8, 2024

Revision history

- **08/05/2024**: updated mic audio path section.
- **07/05/2024**: first issue.

User-controlled BOOT0



Aim

This modification is needed to allow the end user to put the microcontroller in bootloader mode by pressing the orange "alarm" button while powering on the radio. With this design, the operation of the button after the radio is powered on remains unchanged.

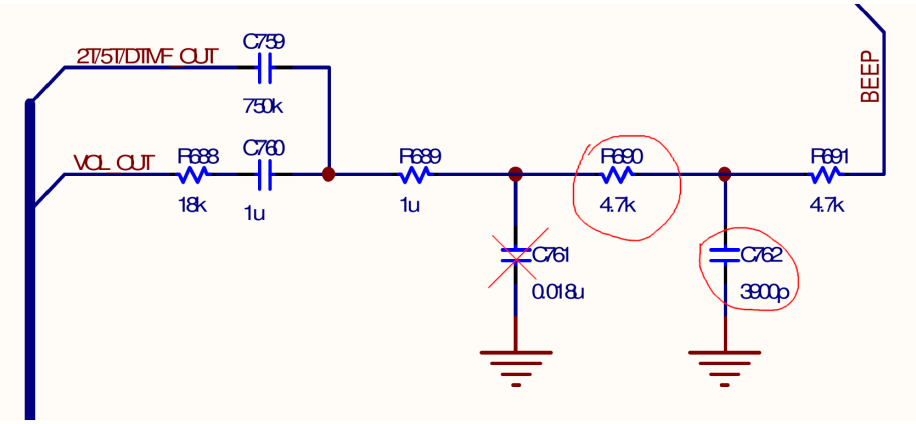
List of changes

Place a PNP transistor in parallel to R686 - already not fitted - connecting the base to the ALARM_KEY net (on MCU pin PE10) through a 330Ω resistor. The transistor used in the prototype is an MMBT2907, but any general purpose PNP transistor (e.g. 2N3906) should be good.

Possible issues

There is the possibility that the radio always goes into bootloader mode at power on, even if the alarm button is not pressed. In this case change R698 to 20kΩ to increase the time after which the nRESET line of the MCU is deasserted to 2ms.

Baseband TX path



Aim

This modification moves the cut-off frequency of the lowpass filter used to smooth the DAC signal to 22.5kHz. This is required in order to have a cleaner M17 4FSK baseband signal: the original RC filter had a significant phase lag at 2.4kHz, causing an unrecoverable distortion of the baseband signal.

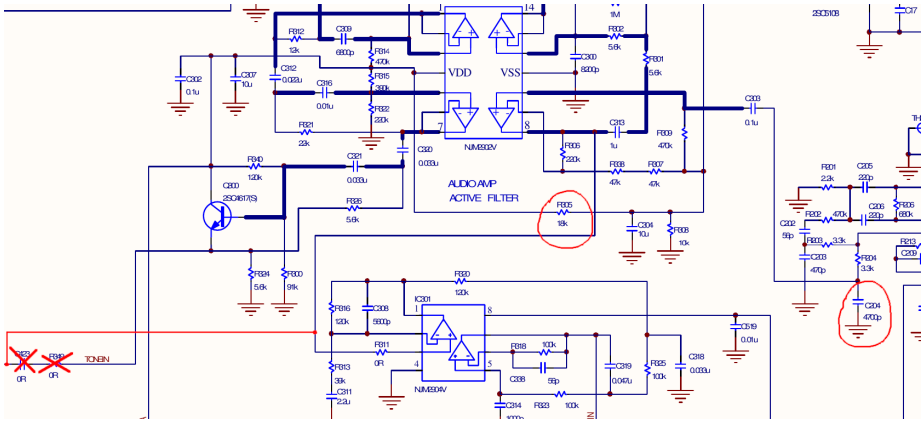
List of changes

- Remove C761.
- Change value of R690 to 0Ω.
- Change value of C762 to 1.5nF.

Possible issues

This modification should not have any impact on FM and DMR voice transmission. There is the possibility of a small impact on DTMF tones and speaker "beeps" in terms of an increased amplitude of the components with frequencies above 1kHz.

Baseband RX path



Aim

This modification is required to allow the MCU to sample the demodulated baseband signal output by the FM demodulation stage. The changes are required in order to widen the bandiwdth of the lowpass filter on IC200 output to 20kHz and to bias the signal going to the ADC input to 1.65V.

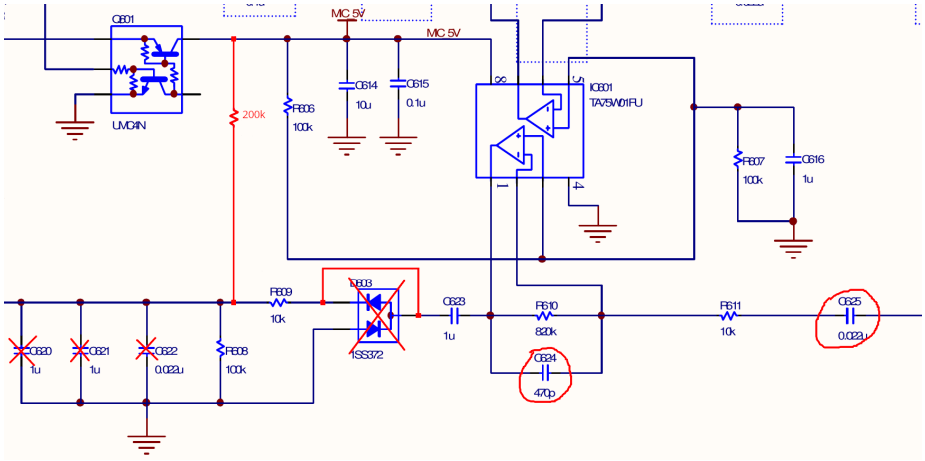
List of changes

- Remove C423.
- Remove R349.
- Change value of R305 to 20kΩ.
- Change value of C204 to 2.2nF.
- Connect pin 1 of IC300 (output of the first Op-Amp) **after** C423.

Possible issues

This modification should not have any impact on FM and DMR voice reception. It has an impact on the decoding of DTMF and 2T/5T signalling tones (ZVEI).

Mic audio path



Aim

This modification is required to allow the MCU to sample the microphone sample continously, since this cannot be done exploiting the HR_C6000 capabilities. The changes are needed to remove the peak-detector used for VOX, change the bandiwdth of the low-pass filter embedded in the inverting amplifier to ∼4kHz and to add a bias of 1.65V to the amplified signal. Additionally, changing C625 with a 0Ω resistor is required in order to allow Codec2 to better detect the voice pitch.

List of changes

- Remove C620.
- Remove C621.
- Remove C622.
- Remove D603.
- Bypass D603 connecting C623 and R609.
- Add a 200kΩ resistor between the MIC_5V power rail and the net for VOX audio, connecting it **after** R609.
- Change value of C624 to 47pF.
- Change C625 with a 0Ω resistor.

Possible issues

This modification disrupts the original circuitry of VOX, requiring an update of the firmware in order to restore the original functionality. No impacts are expected on FM and DMR transmission.