Ritron Model(s):	RQX-111,117,411,417 Q-Series Callboxes
	RQX-127,427-XT XT-Series Callboxes
Current Firmware Revision:	9S1N3812.s19
Revision Update:	December 7, 2021

RQX firmware revision history:

1.   9S1N3801   released: 04/07/2015   ECN-4844, ECN-4858

Firmware revision 38.01 was installed on the initial prototype release of the RQX-111,-111M,-117,-117M,-411,-417.

3.   9S1N3803   released: 10/07/2015   ECN-4883, ECN-4884

a.   Provisions for voice record using the PCB programmer and .wav audio files.

b.   Save and record voice messages from .snd digital audio files.

c.   Changes to low battery detection (checks for low battery while transmitting).

4.   9S1N3804   released: 01/12/2016   ECN-4902

a.   Limits the maximum volume control setting to 75% when supply voltage is greater than 6VDC to protect the speaker when externally powered. This is accomplished automatically in firmware and does not affect or limit programmable setting.

5.   9S1N3805   released: 05/16/2016   ECN-4916

a.   DQC encode updated for squelch tail elimination by sending 134.4Hz turn-off code for 160mS before dropping the transmitter.

b.   DQC decode updated for squelch tail elimination using 134.4Hz turn-off code per EIA specifications.

c.   CTCSS QC encode updated to send 180° tone reversal for 150mS before dropping the transmitter.

d.   CTCSS QC decode updated for squelch tail elimination per EIA specifications.

e.   Noise squelch reference level is automatically decreased by a value 2 when programmed for QC and DQC decode. This will tighten squelch for reliable decode at low RF levels.

f.   Fix problem with Selcall where RX code was used for both RX and TX if an RX code was programmed.

g.   Fix problem with Power Save mode carrier detection by increasing on time from 100mS to 200mS.

h.   EE memory location can be used to adjust the RF output level from pin 18 of the RDA.

- This change is to address a problem of overdrive to the input of the TX final in VHF radios. With overdrive the TX power control could not be adjusted low enough to satisfy some TX low power test limits.

- EE memory location can be programmed with values 08-0F for 5-7 dBm.

- Any value in EE memory location that is outside the 08-0F range is ignored and a factory default value is used. Factory default values programmed into the 38.05 firmware are 08 (5dBm) for VHF and 0F (7dBm) for UHF. Previous firmware revisions used a default drive level of 0F (7dBm) for both UHF and VHF.

6.   9S1N3806   released: 07/20/2018   ECN-5082

a.   Ability to operate with MKL25Z128VFT4 (314C0018) or MKL27Z128VFT4 (314C0019).

b.   Correct Busy Channel Lockout problem where:

With Busy Channel Lockout enabled and Auto Turn-Off enabled:

- When PTT button is pressed to turn on radio and TX, you get Busy Channel indication for about 5 seconds (4 cycles of busy tone) before radio will TX. This occurs with no incoming RX signal present.

- If radio is awake the TX works as expected, immediate TX if no RX signal and Busy Channel Lockout operation if the RX signal is present.

c.   Correct problem where Q-series de-energizes the relay when PTT pressed even in GateGuard on/off, toggle, or momentary mode.

d.   Update programming of RDA register 5B for each CTCSS tone.

RDA register 5B sets the allowable frequency error for initial decoding, and the allowable frequency error once tone is decoded. DQC now uses value 0309 in RDA register 5B (previously DQC value was 0403).

e.   Add programming of RDA register 5C for each CTCSS tone (previously set to 051D on all tones).

RDA register 5C sets the CTCSS phase threshold, error in and out threshold. DQC uses value 051D in RDA register 5C (same as it was).

f.   Radio must successfully decode tone for 40mS before it is considered valid. This is to prevent false decode.

g.   For tone frequencies 110.0Hz and below: Once successful decode is detected the radio must see 40mS of continuous no-decode before it is considered invalid.

For tone frequencies 110.0Hz and above: Once successful decode is detected the radio must see 250mS of continuous no-decode before it is considered invalid.

This is to prevent erratic decode and talkoff. As a result of this change the radio will not respond to tone reversal squelch tail elimination when using tones 110.9Hz and above. The user will experience a brief squelch tail when using tones 110.9Hz and above.

h.   CTCSS tone 107.2Hz now uses the 110Hz LPF cutoff frequency instead of the 250Hz

7. 9S1N3807   released: 08/18/2018   ECN-5086

a. Firmware revision 38.06 provided ability to operate with MKL27Z128VFT4 (314C0019), which has a problem with 2-tone decode due to a +/-1.5% frequency tolerance on the internal 48MHz oscillator and a +/-1.3% allowable frequency error for 2-tone decode.

   To resolve the issue Firmware 38.07 allows 2-tone frequency error of +/-2.6%.

8. 9S1N3808   released: 01/16/2019   ECN-5127

a. UHF NB RX sensitivity is improved by changing RDA register 32 programming from 7396 to 7415. This increases RX AGC Target Power and decreases AGC Loop Gain for UHF NB. This addresses isolated instances where UHF NB receiver would be erratically de-sensed by >20dB at low RF levels.

RDA Register 32 Programming

REG	BITS	Description	38.07 UHF NB	38.08 UHF NB	UHF WB	VHF NB	VHF WB
32		Radio programming	7396	7414	7564	73D6	7564
	15	rsvd	0	0	0	0	0
	14:12	AGC Enable Delay	320uS	320uS	320uS	320uS	320uS
	11:6	AGC Target Power	26dB	32dB	42dB	30dB	42dB
	5:3	AGC Update Step	320uS	320uS	1.28mS	320uS	1.28mS
	2:0	AGC Loop Gain	128	64	32	128	32

9. 9S1N3809   released: 06/19/2019   ECN-5171

a. TX power slope setting has to this point been set during high power alignment and applied at all operating conditions, high power/low power/external 12V in/6-cell battery/3-cell battery. This power slope is not appropriate for 4V (3-cell battery) operation.

   Firmware 38.09 will provide a separate slope setting for 4V (3-cell battery) operation.

10. 9S1N3810   released: 06/12/2020   ECN-5249_2

9S1N3810 firmware changes to RQX-111,117,127,411,417,427,-XT are to improve DTMF decode operation when used with Ritron products that have DTMF encode capability.

a. RDA register changes.

38.09	38.10		38.09 to 38.10 changes
31 0031	31 0131	b 8:6	ct_mode = dc_ct<8:6> from 000 (//0:fast->slow) to 100(//4:fast->slow)
58 840D	58 8405	b 3	disable "1: bypass sub-audio HPF"
70 004C	70 00B1	b 11:0	dtmf_coef_1_2nd_harm[11:0] (see Note)
74 090E	74 08DE	b 11:0	dtmf_coef_5_2nd_harm[11:0] (see Note)
75 0833	75 081F	b 11:0	dtmf_coef_6_2nd_harm[11:0] (see Note)
76 0806	76 0810	b 11:0	dtmf_coef_7_2nd_harm[11:0] (see Note)
77 2264	77 6264	b 15:12	dtmf_th_row_rel[3:0] from 0010 to 0110
78 D984	78 D8E4	b 9:5	dtmf_th_twi_rev[4:0] from 01100 to 00111

Note: Changes to recommended values per RDA1846S_programming_guide_1.3.pdf.

b. When decoding DTMF, must get two consecutive samples of tone to detect as first tone. DTMF sample rate is 10.42mS.

c. Add "DTMF decode without de-emphasis" flag at EE location 01D5 b3. When set:

   When "DTMF decode without de-emphasis" flag is set with DTMF Paging

   1. RDA register 58 = 8485 to disable de-emphasis when waiting to decode DTMF.
   2. As soon as DTMF is decoded RDA register 58 = 8405 to enable de-emphasis.
   3. Once Inband decode reset time (loc 0009) is satisfied RDA register 58 = 8485 and awaits DTMF string.

   When "DTMF decode without de-emphasis" flag is set with DTMF GateGuard or Listen-In operation

   1. De-emphasis is enabled (58 = 8405) until any DTMF digit is decoded, then de-emphasis is disabled (58 = 8485) until one of the following three conditions are met:
      - The programmed DTMF code is decoded.
      - 1 second elapses without receiving any digits.
      - More than 7 digits are received.
   2. The 1st character must be * for reliable operation. This is only necessary on radios where the "DTMF decode without de-emphasis" flag is set for GateGuard or Listen-In operation.

   Note: PC Programmer RQX-PCPS must be updated to implement this feature on firmware 38.10 or higher.

d. Decoded DTMF digits are returned in programmer terminal mode.

   Example: With DTMF string "22580" decoded the following is returned:

   222222222-------222222222--------555555555--------888888888--------000000000--

   - DTMF sample rate is 10.42mS. Each digit returned is a sample.
   - "-" signifies a Space Time sample.
   - Three consecutive Space Time samples must be decoded to be considered valid.
   - The example is from an input signal of 90mS Mark Time, 90mS Space Time, 100mS End Time.

e. Values programmed starting at EE location 0150 for RDA programming are loaded last. Previously the 0150 registers get programmed before the DTMF registers so therefore they get overwritten.

11. **9S1N3811**　　　**released: 12/16/2020**　　　**ECN-5274**

Auctus Technologies has changed their chip packaging and testing plant for the RDA1846S (Ritron 315C0013). For compatibility with chips produced by the new and old packaging facilities the following change is made:

During the initialization of the boot register, add register 0x0F configuration of 0x8A24 (previous default 0x8824). This changes the "PLL_regbit_DIV2" parameter to compensate the performance of the PLL in high temperature environment and keep the locked state.

---

12. **9S1N3812**　　　**released: 12/07/2021**　　　**ECN-5356**

RQX Q-Series firmware is updated to 9s1N3812 for issues with the Alert message when Busy Channel TX Inhibit is enabled. If a pre-existing received signal was present when the callbox turned on it was heard on the speaker and the Alert message was not sent. Changes are as follows:

a. With Busy Channel TX Inhibit enabled, if a pre-existing received signal is present when the callbox turns on it is not heard on the speaker.

b. With Busy Channel TX Inhibit enabled, if a pre-existing received signal is present when the callbox turns on the Alert message is sent after the received signal is removed.

c. Remove the 4 second Busy Channel TX Inhibit timer. Busy Channel TX Inhibit operation on previous revisions allowed the callbox to transmit with a received signal present if it was within 4 seconds of the previous transmission. This was to accommodate repeater hangtime, which is now a programmable attribute.