Improvement R7-AGC „FAST"

Introduction

The AGC "FAST" in the R7 is nearly useless. The time constant "FAST" is ten(!) times shorter than AGC "MEDIUM" and sounds horrible; the signal pops up and down like being modulated by a fast sawtooth generator; this is caused by the relation C1114 to C1119 (5nF to 50nF). Therefore i never used AGC in "FAST" up to now but triggered by a discussion in the drakelist i decided to examine this topic (a typical "weekender").

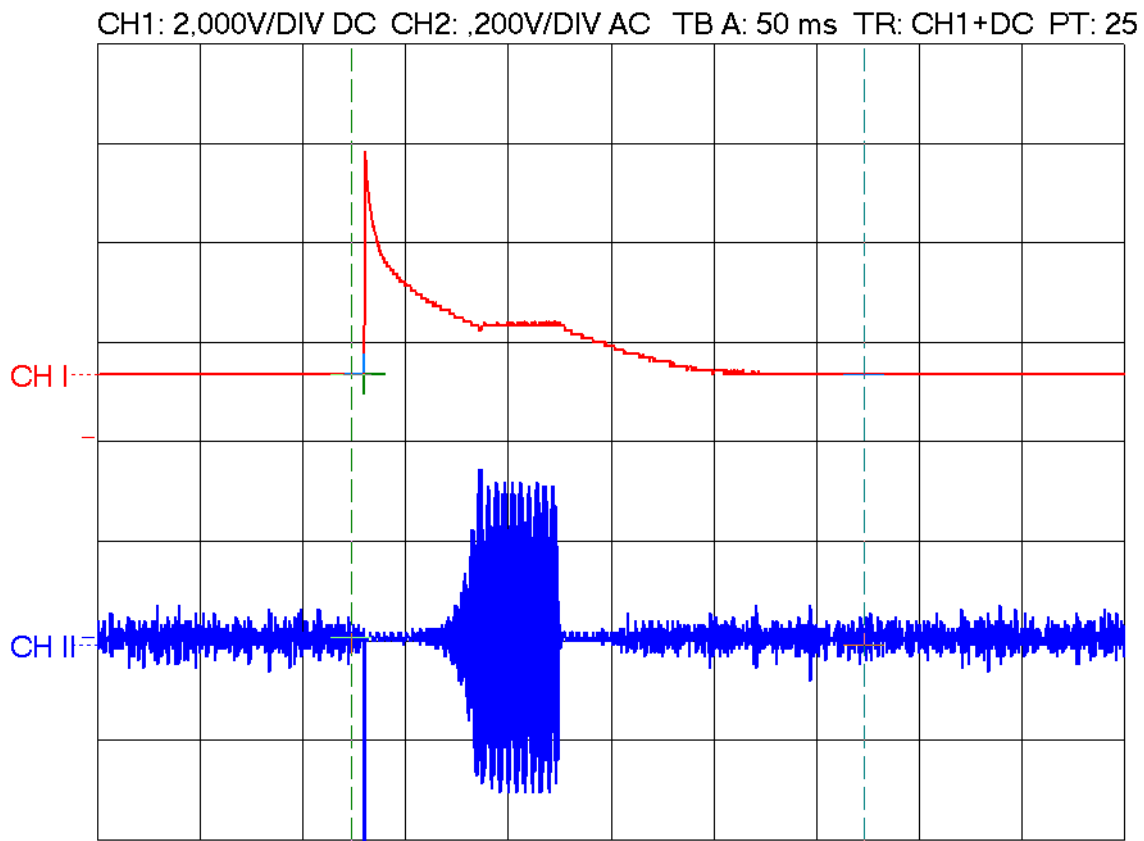## Analysis on 2nd / 3rd IF, AGC-board

First some measurements were made with a HF signal generator, a manually triggered single pulse generator for burst modulating the HF signal generator and a digital scope.
The HF signal generator was set to 7.1MHZ and a S9 signal, the burst duration was set to 100ms. The scope was connected to checkpoints CP1 (CH1) and CP2 (CH2) to measure the AGC-voltage (CP1) and the regulated IF (CP2); see picture 1.
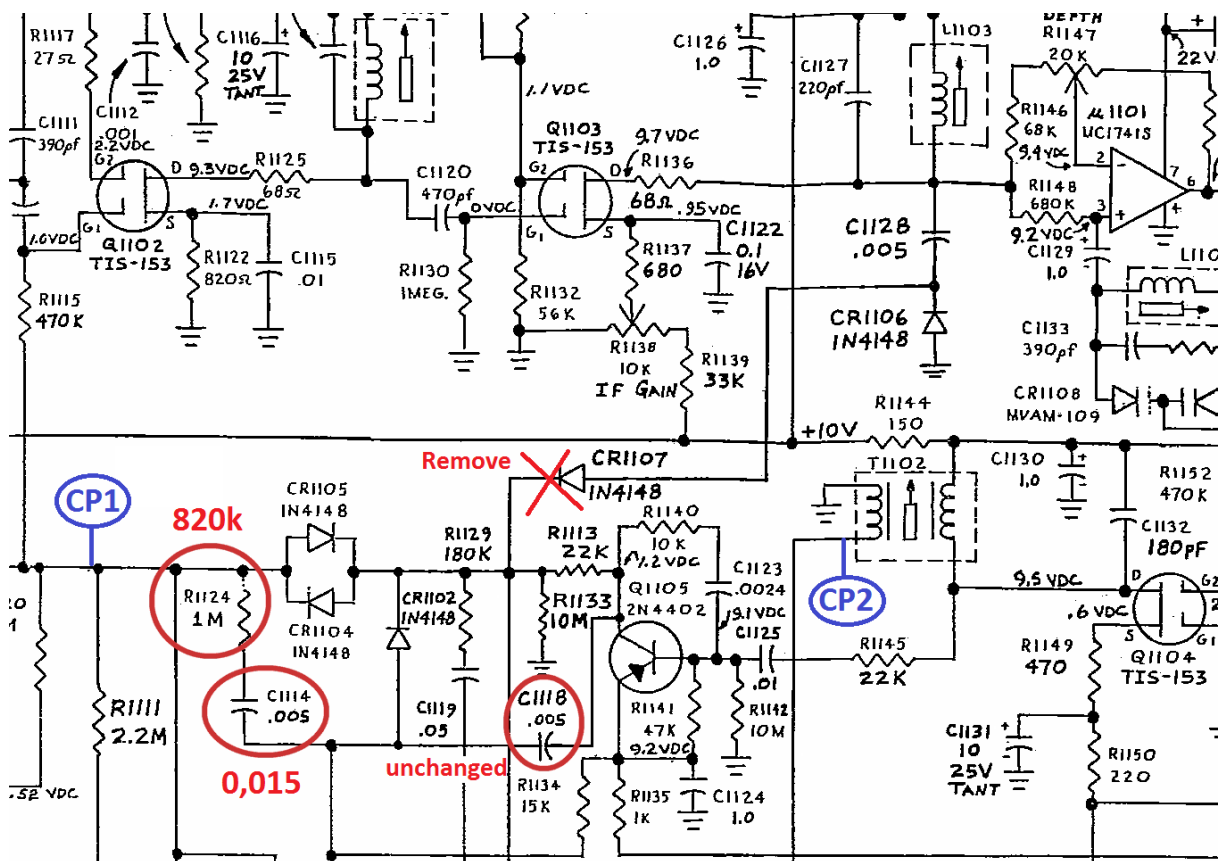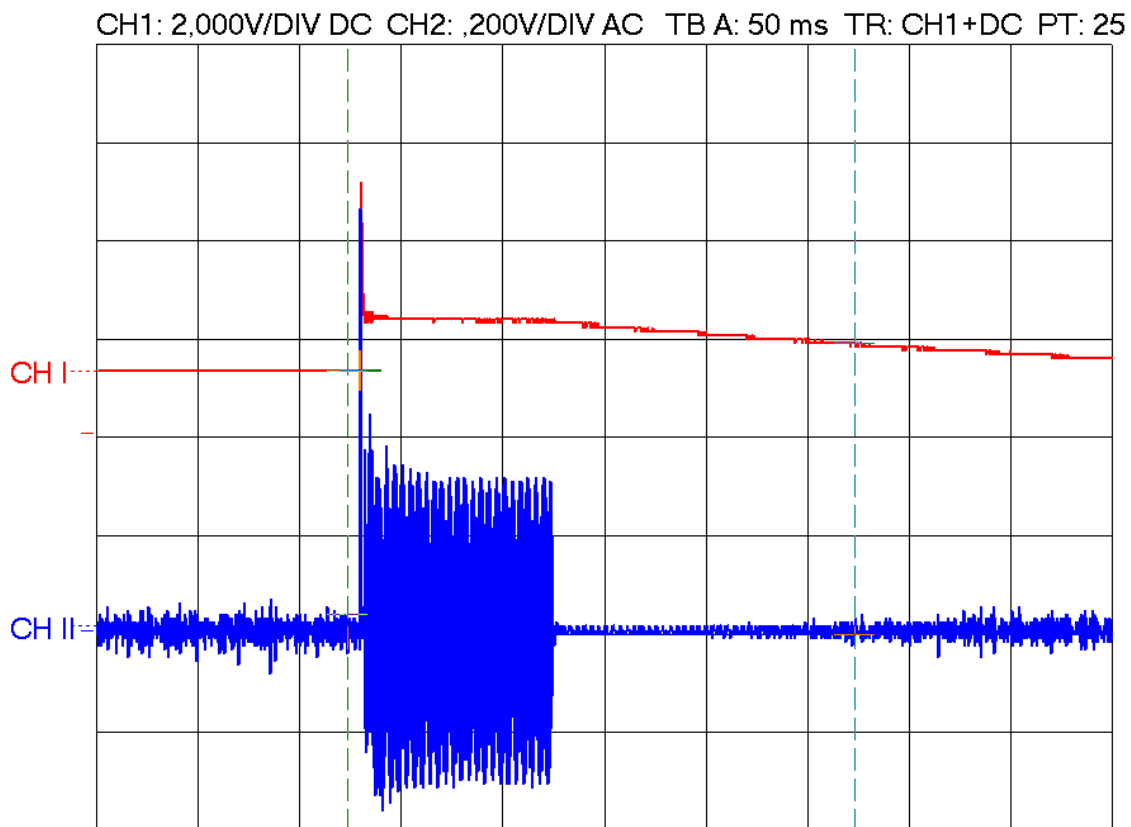

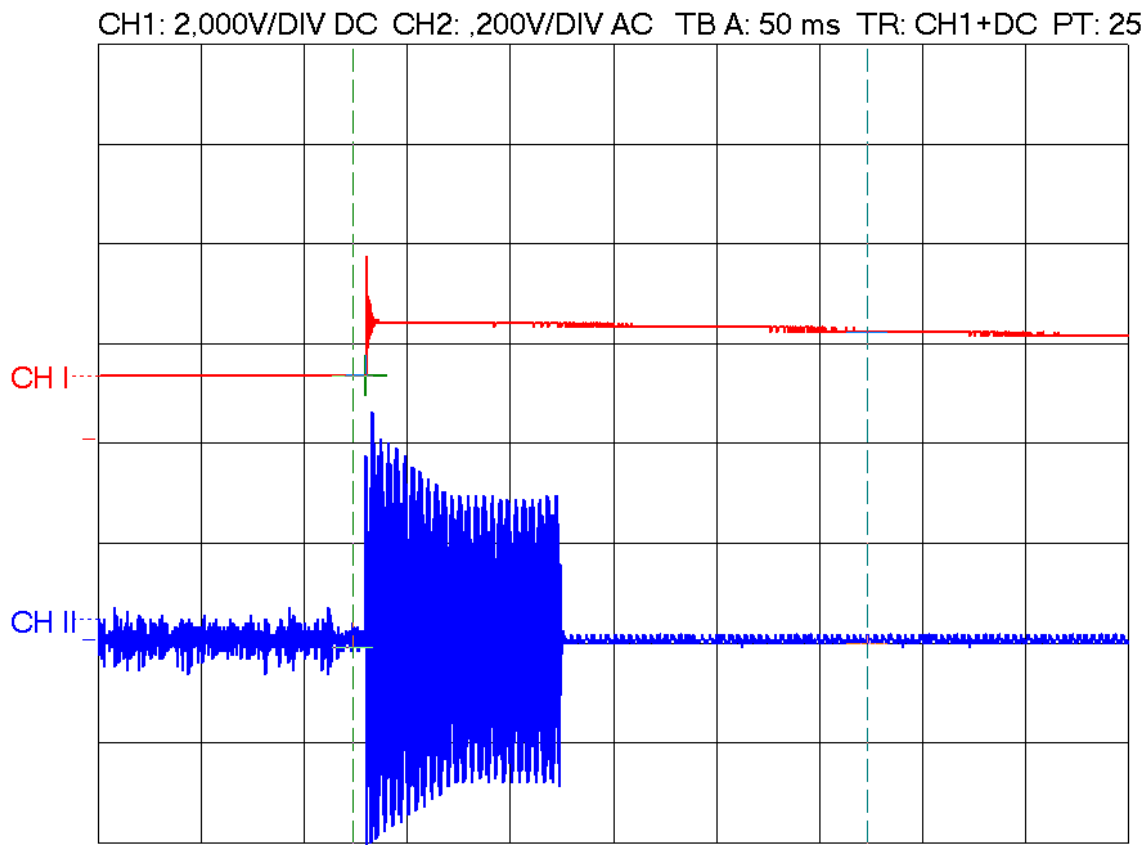Picture 1 Points of interest on 2nd / 3rd IF, AGC

The R7 was set to LSB and 2.3kHz selectivity and tuned for app. 800Hz audio with the burst signal. Pictures 2, 3 and 4 show the results for the unmodified circuit.

CH1: 2,000V/DIV DC CH2: ,200V/DIV AC   TB A: 50 ms TR: CH1+DC PT: 25

CH I

CH II

Picture 2 Original AGC "FAST" (That's sh...)

CH1: 2,000V/DIV DC CH2: ,200V/DIV AC   TB A: 50 ms TR: CH1+DC PT: 25

CH I

CH II

Picture 3 Original AGC "MEDIUM"

CH1: 2,000V/DIV DC CH2: ,200V/DIV AC   TB A: 50 ms TR: CH1+DC PT: 25

Picture 4 Original AGC "SLOW"

Whereas the AGC modes "M" and "S" are acceptable the mode "F" shows an inacceptable behavior (picture 2): The first part of the signal is suppressed for app. 50ms (50%) by a heavy overshoot in the AGC-voltage.

Examining the circuit, the reason was quickly found:
The diodes CR1106 and CR1107 are adding directly a DC-component to the AGC voltage derived from the IF. Interrupting this circuit improved the answer of the AGC considerably!

Picture 5 is the response of the AGC circuit ("FAST") with CR1107 in place (original).
Picture 6 is the same response with removed connection to CR1107.
Please note the better timebase resolution compared to pictures before….

I have no idea what the purpose of CR1106, CR1107 and C1128 is.
An acceleration of the AGC is not necessary and in all AGC modes and with various input levels from S1 to S9++ I couldn´t find any advantage; so the removal of this circuit is highly recommended (picture 7).
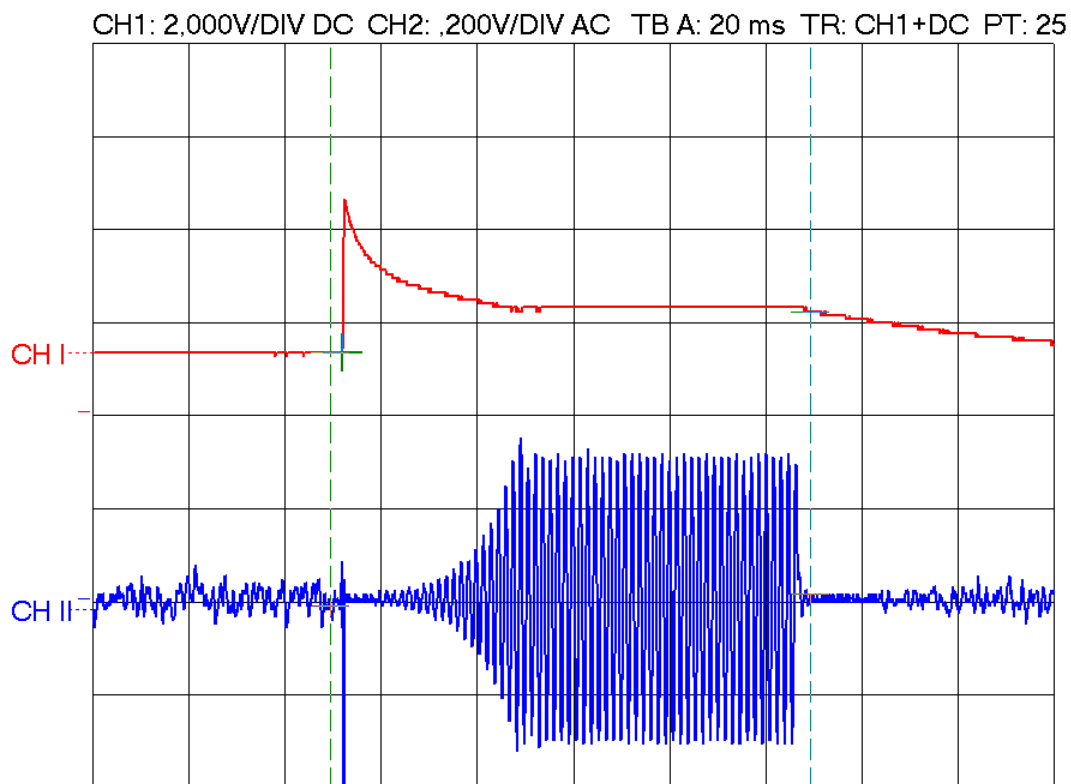The white-violet wire on bottom of the PCB should be removed (picture 7)!

For comparison I checked the AGC-circuit in the TR7 and found no similarities regarding CR1106 and CR1107.

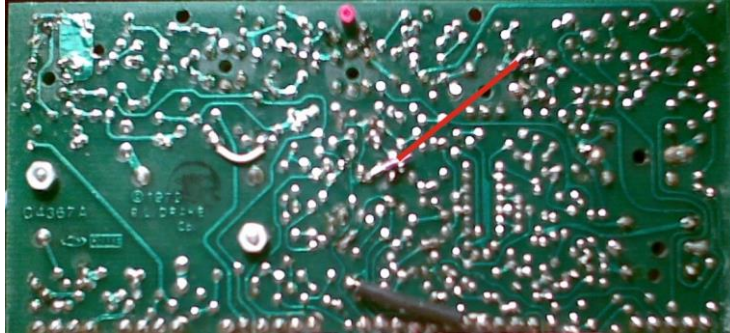This circuit was obviously an "idea" developed only for the R7.
Maybe the engineers wanted to optimize the AGC which is driven by 50kHz instead of 5645kHz in the TR7…..maybe…..

CH1: 2,000V/DIV DC CH2: ,200V/DIV AC   TB A: 20 ms TR: CH1+DC PT: 25

CH I

CH II
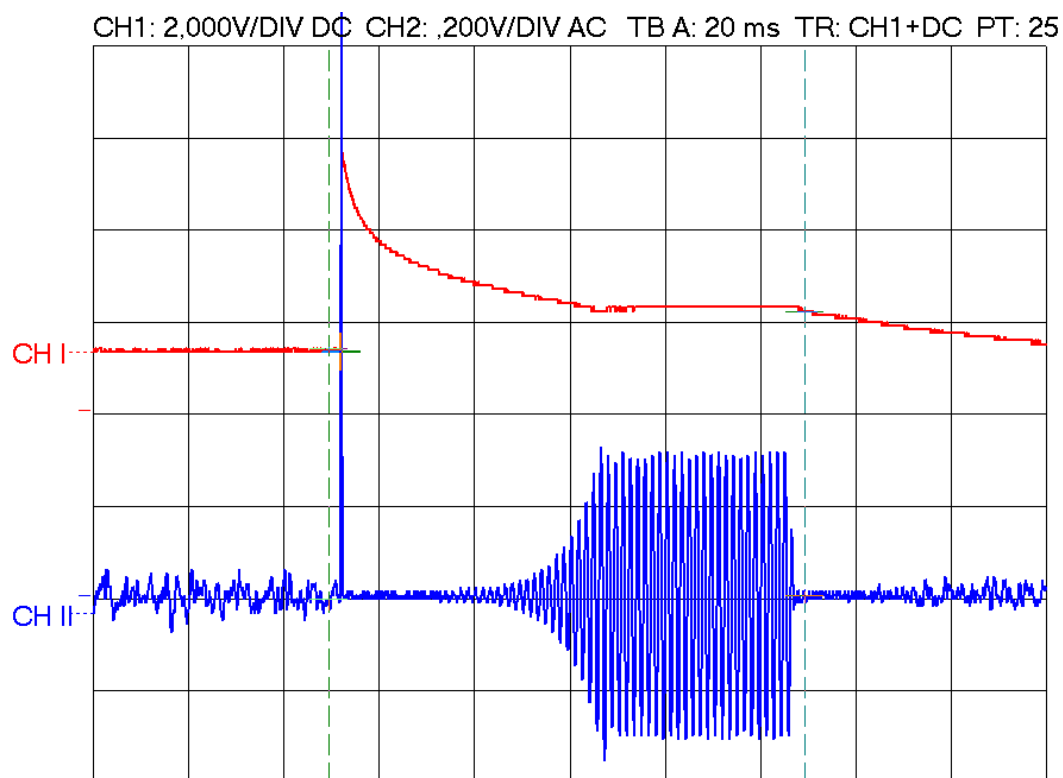
Picture 5 Original AGC "FAST" with CR1107

CH1: 2,000V/DIV DC CH2: ,200V/DIV AC   TB A: 20 ms TR: CH1+DC PT: 25

CH I

CH II

Picture 6 AGC "FAST" without(!) CR1107

Picture 7 Removal of connection to CR1107 on 2nd / 3rd IF, AGC-board

Solution on 2nd / 3rd IF, AGC-board

1. Remove wire to CR1107 as described above

Some proposals change R1124 to 470kOhm and C1114 and C1118 to 10nF (drakelist-forum). This helps but further investigations showed, that C1118 shouldn´t be increased - reason: C1118 stores without delay the very high first AGC-pulse due to the first burst and therefore blocks the RX for the time constant determined by this cap.
Increasing C1118 would prolong this blocking time and would chop the signal.

2. Change C1114 to 15nF and R1124 to 820kOhm
3. C1118 remains unchanged

If R1124 is selected smaller, e.g. 470kOhm, then the first burst also blocks the RX for a longer period because C1114 is charged too fast and too high.

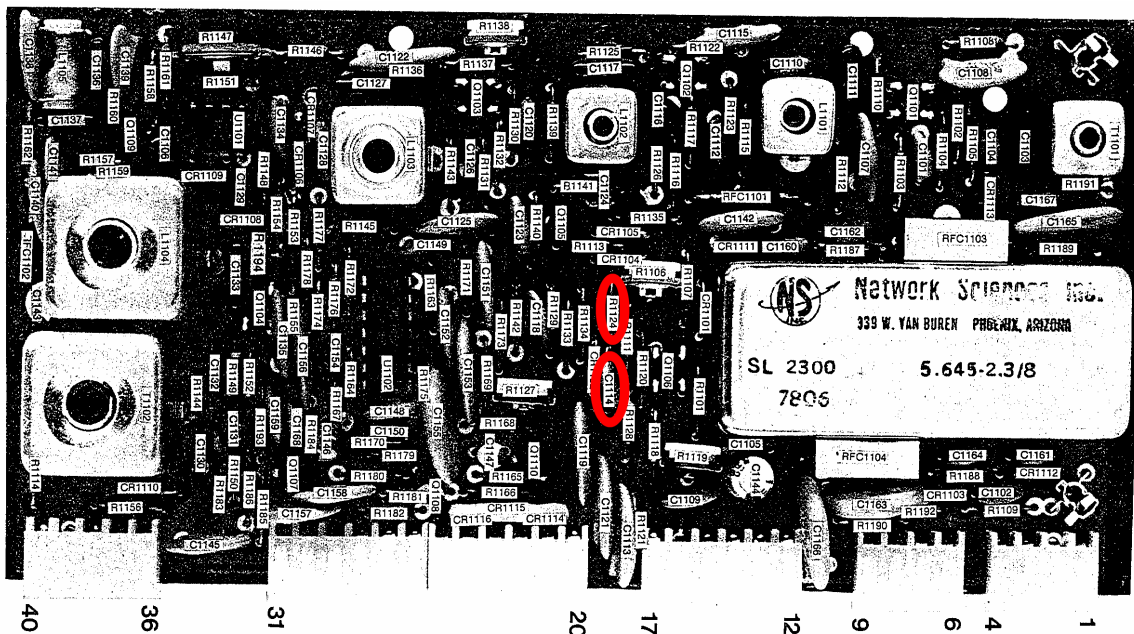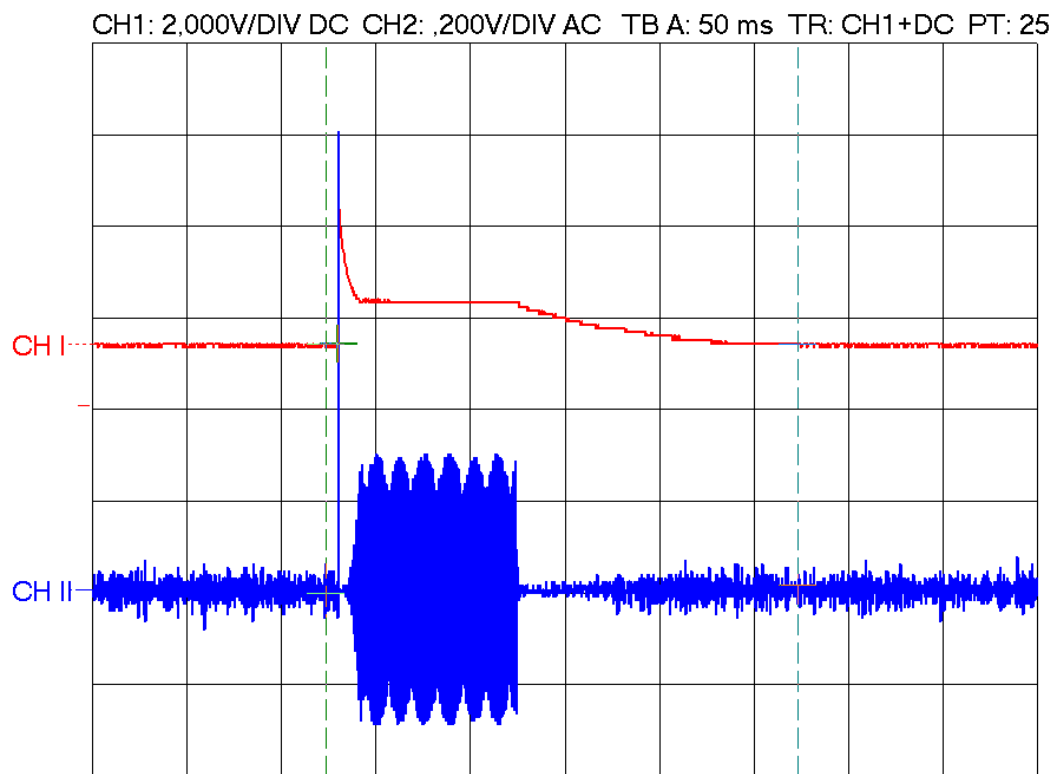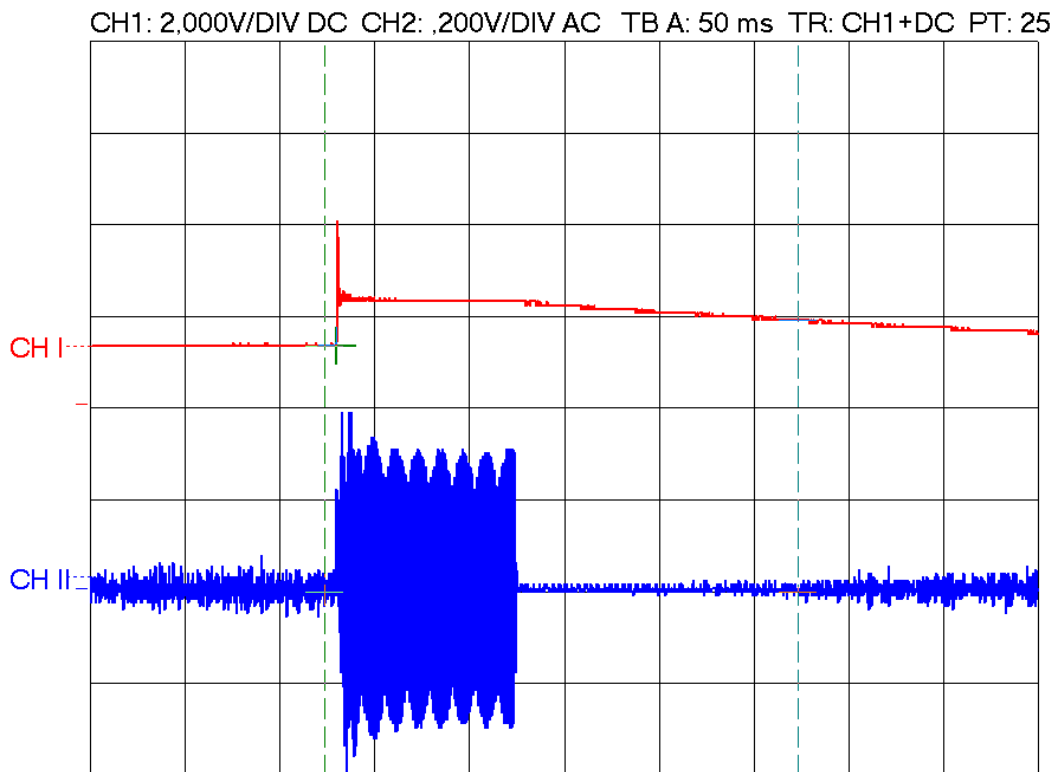AGC "FAST" is now only three times shorter than AGC "MEDIUM" (15nF to 50nF).

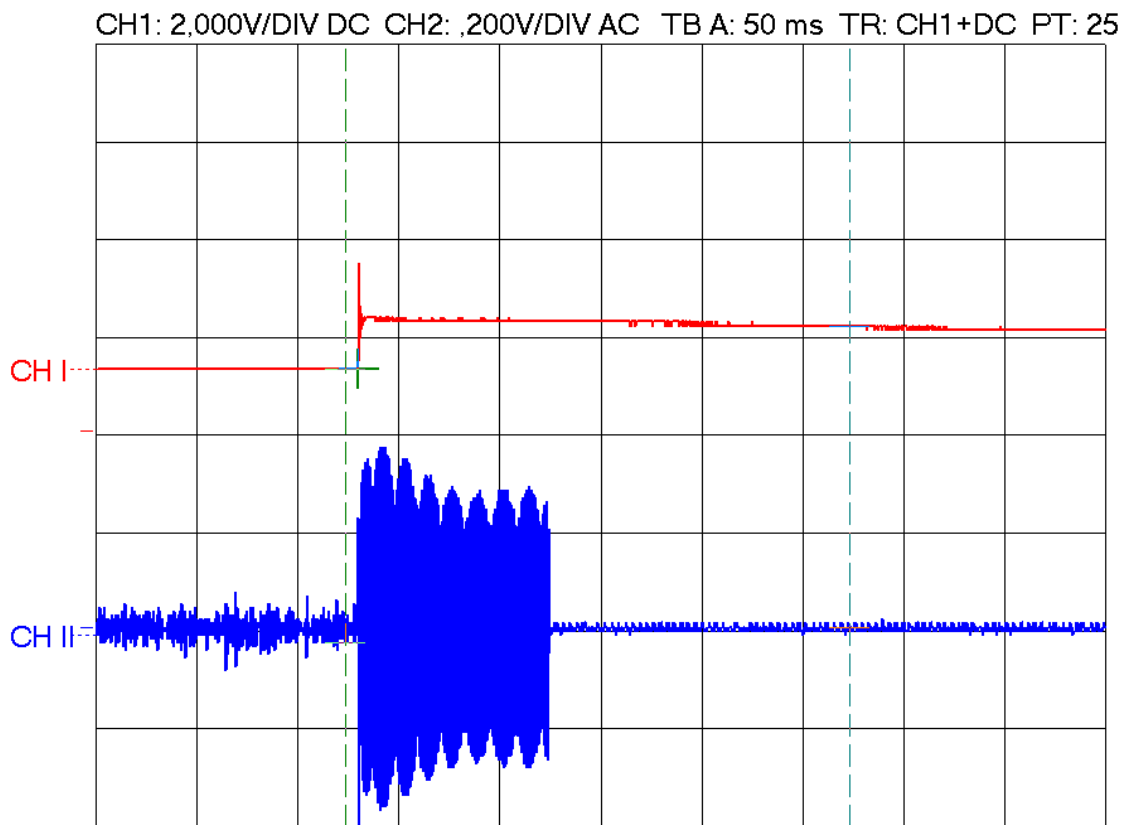Fig. 2-21 2nd/3rd IF/AGC Board Pictorial

Picture 8 Location of C114 and R1124

Following pictures 9, 10 and 11 (ignore "AM" due to aliasing effect) show the result and may be compared directly with pictures 2, 3 and 4.

CH1: 2,000V/DIV DC CH2: ,200V/DIV AC   TB A: 50 ms TR: CH1+DC PT: 25

Picture 9 Modified AGC "FAST"

CH1: 2,000V/DIV DC CH2: ,200V/DIV AC   TB A: 50 ms TR: CH1+DC PT: 25

Picture 10 Modified AGC "MEDIUM"

Picture 11 Modified AGC "SLOW"

In modes "M" and "S" no noticeable difference can be seen – and all is still OK.

The described modification is designed only for mode "F" - and for this mode the progress is great – compare pictures 2 and 9!

Experience

Now AGC "FAST" is also useable and sounds very similar to other good receivers.

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