

## 122G\_003 FM Modulation Modification Part A&B REV 002

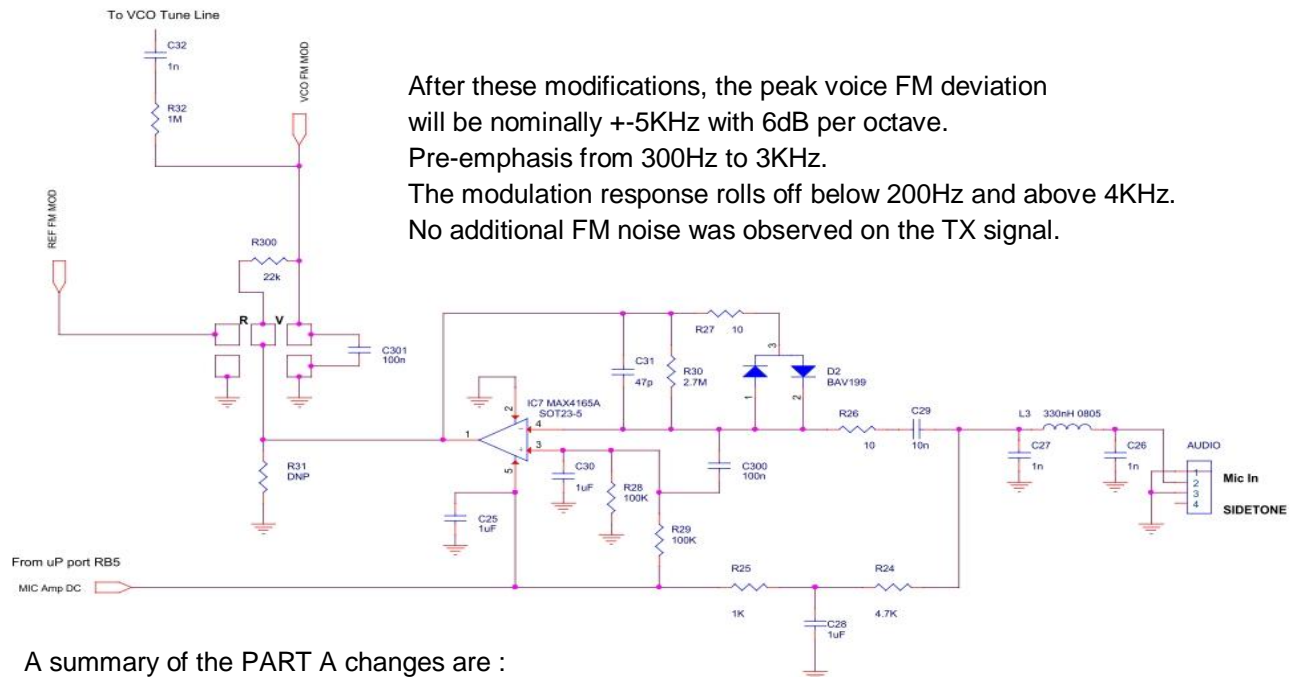
The original manufactured 122G\_003 PCB suffers from some issues with audio on FM.

There are two parts to this modification, Part A which deals with the microphone amplifier/ modulator and part B that restores FM tone modulation (if desired) when using an external reference.

The original microphone amplifier has poor deviation peak limiting, insufficient microphone gain and an incorrect overall frequency response resulting in the FM modulation pre-emphasis being incorrect.

The following PART A modification addresses all of these microphone audio issues and vastly improves the microphone gain, modulation limiting and frequency response resulting in far superior performance from the original. The FM voice modulation is applied directly to the PLL VCO to allow for either internal or external 10MHz references. No additional FM noise is apparent on the TX signal.

**PART A**, Several component values are changed and 3 components are added. The modified microphone amplifier schematic is shown below :



After these modifications, the peak voice FM deviation will be nominally  $\pm 5\text{KHz}$  with 6dB per octave.

Pre-emphasis from 300Hz to 3KHz.

The modulation response rolls off below 200Hz and above 4KHz.

No additional FM noise was observed on the TX signal.

A summary of the PART A changes are :

C29 changed from 100nF to 10nF

R26 changed from 1k to 10 ohm

D2 changed from BAT54S to BAV199LT1G

R27 changed from 100 ohm to 10 ohm

R30 changed from 1M to 2.7M

C31 changed from 1nF to 47pF

R32 changed from 470k to 1M

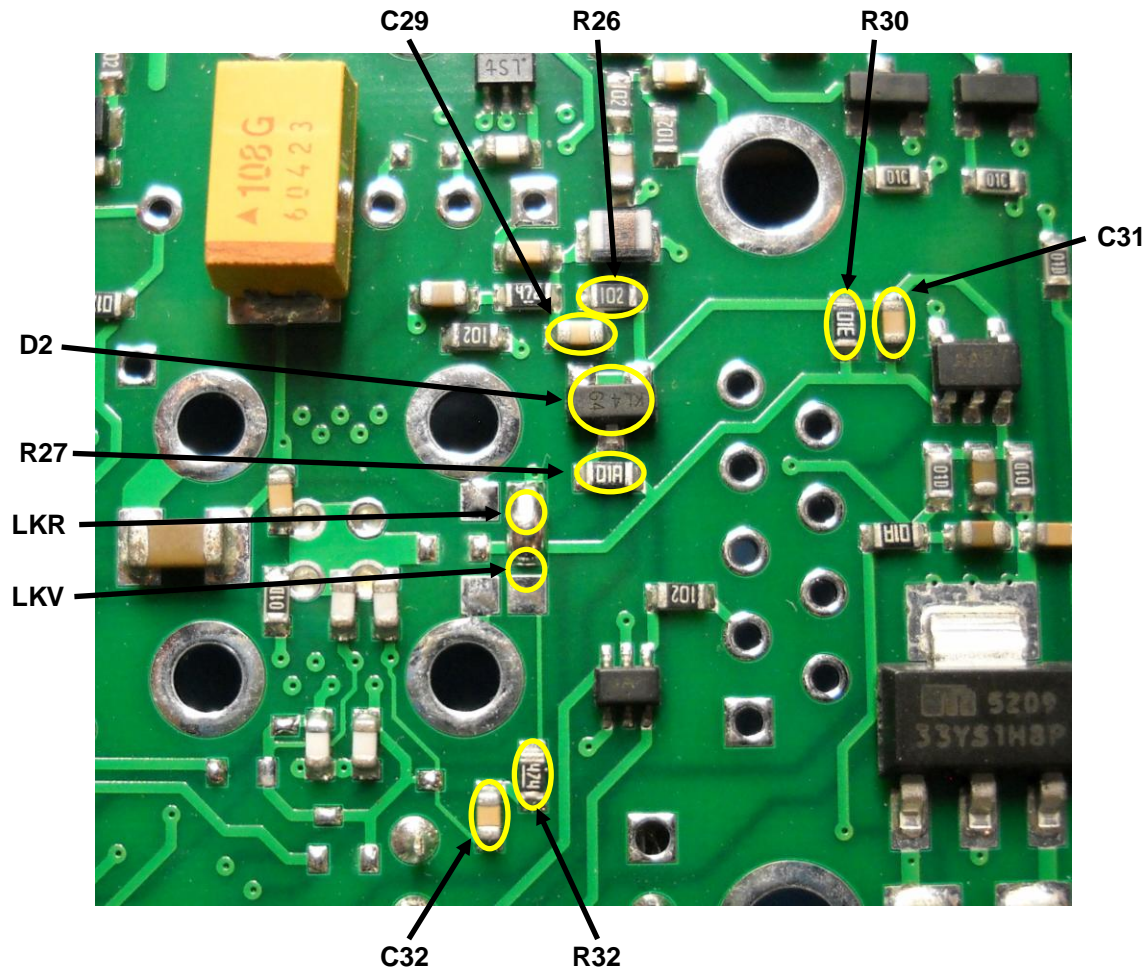
C32 changed from 10nF to 1nF

Link LKR left open , Link LKV left open

Added parts C300 = 100nF , C301 = 100nF (1206) , R300 = 22k

Refer to the image below to allow easy identification of the parts which are to be changed. The image shows the original PCB as supplied before modification.

### Bottom side of PCB prior to PART A modification



### PART A Modification Procedure

1 – Carefully remove all of the components as shown above and remove excess solder remaining on the pads with solder wick.

2 – Remove the solder from link LKR

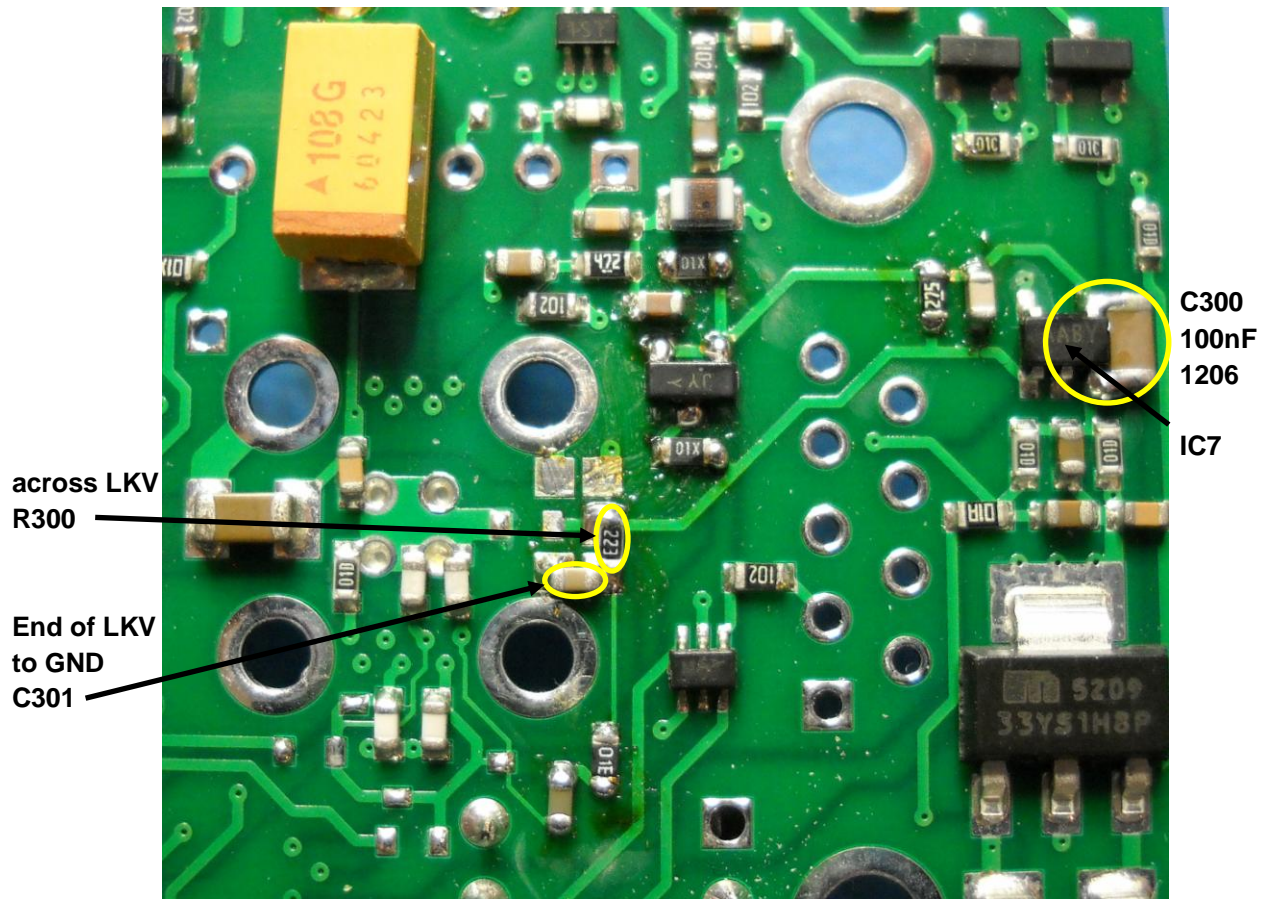
3 – Solder in the new component values for C29 = 10nF, R26 = 10ohm, D2 = BAV199LT1G, R27 = 10ohm, R30 = 2.7M, C31 = 47pF, R32 = 1M, C32 = 1nF

4 – Add C300 (100nF 1206) directly across pins 3 & 4 on IC7 (refer to the next image)

5 – Add R300 across the old link location LKV (refer to the next image)

6 – Add C301 between the end of LKV and the adjacent unused ground pad. (refer to the next image)

### Bottom side of PCB after PART A modification



R300 is placed on the old link location LKV, C301 is placed from the end of LKV to ground. C300 is placed directly across pins 3 & 4 on IC7, directly beside the package of IC7.

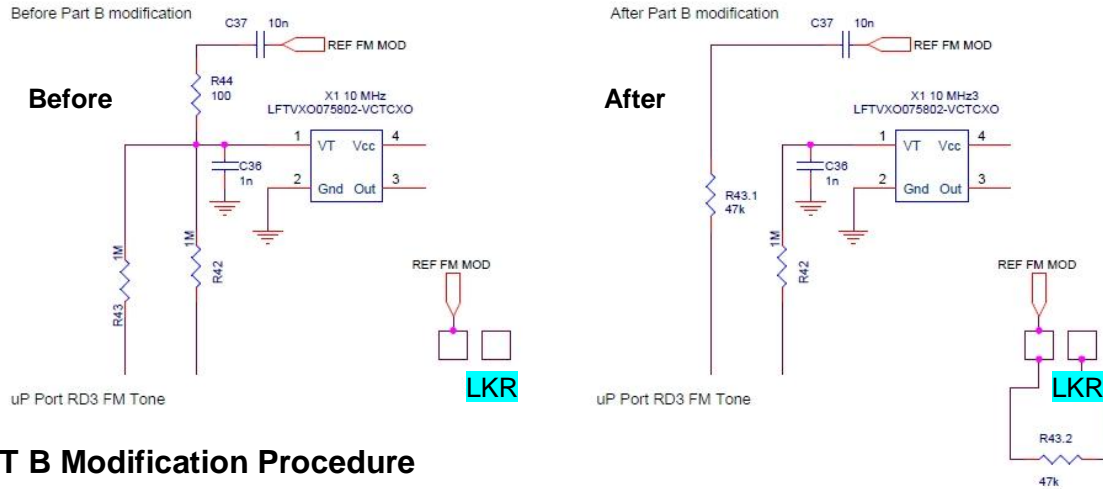
**Note**, All capacitors and resistors are 0603 size except for C300 which is a 1206 size 100nF capacitor.

#### Modification Part A parts list :

C29	10nF, 0603, >=25V, X7R
R26, R27	10 ohm, 0603
D2	BAV199LT1G
R30	2.7M, 0603
C31	47pF, 0603 >=25V, COG
R32	1M, 0603
C32	1nF, 0603, >=25V, X7R
C300	100nF, 1206, >=25V, X7R
C301	100nF, 0603, >=25V, X7R
R300	22k, 0603

## PART B (FM Tone Modulation)

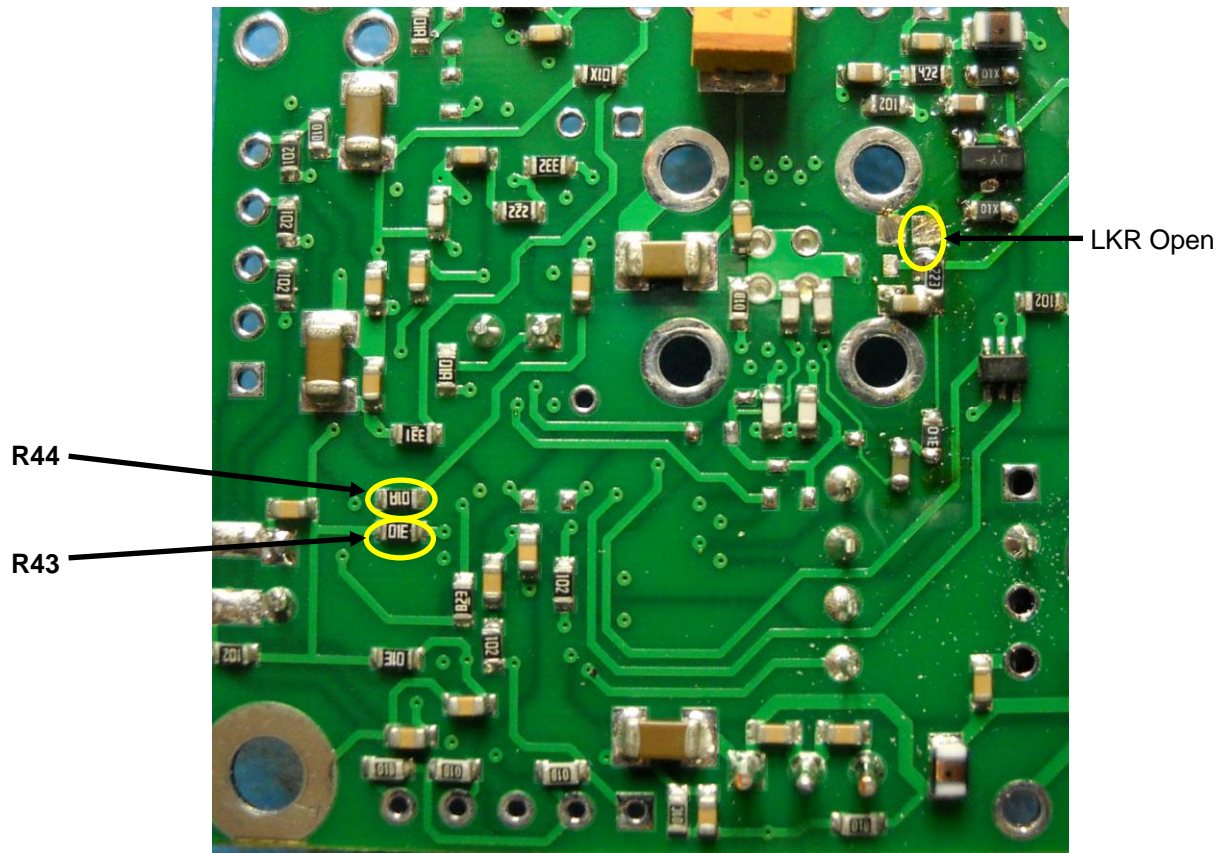
This part of the modification deals with restoring the loss of FM tone modulation which occurs if an external reference is used. FM tone deviation is around  $\pm 2\text{KHz}$ . This PART B modification is not necessary if FM tone modulation is not required or if an external 10MHz reference is not being used.



## PART B Modification Procedure

1 - Refer to the image below and locate R43 & R44 on the bottom side of the PCB which both need to be removed.

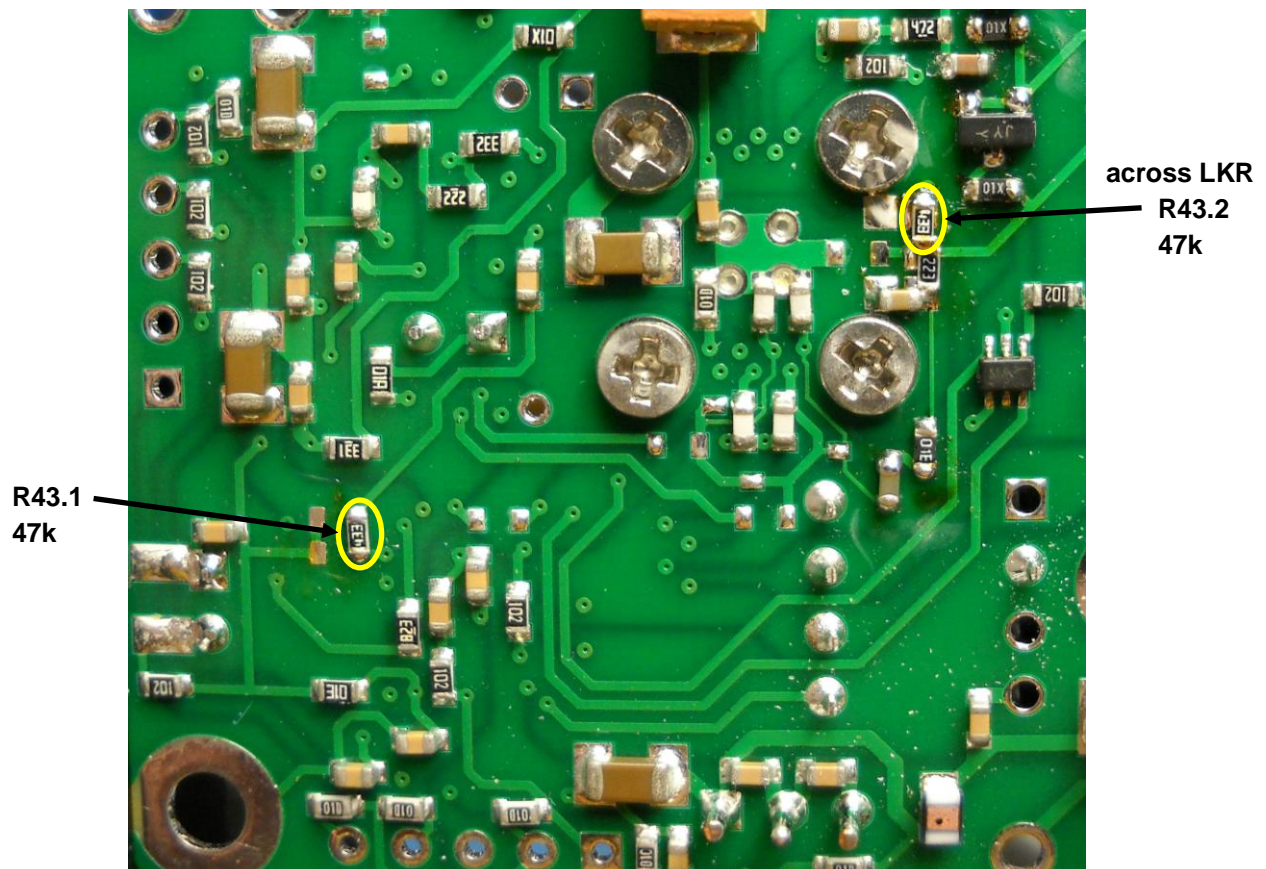
Bottom side of PCB prior to PART B modification (PART A already done)



2 – Referring to the image below, place a 47K 0603 (R43.1) resistor on the two pads at the right hand ends of the old locations for R43 & R44.

3 – Referring to the image below, place a 47K 0603 (R43.2) resistor across the open link LKR

### Bottom side of PCB after PART B modification



### Modification Part B parts list :

R43.1	47k, 0603
R43.2	47k, 0603

Note also that the PART B modification does not add any observed FM noise to the TX.