

11. Noise and Sensitivity Investigation in FSK 23 kHz range

Draft V1.0

UFO Doctor, Dec.11th, 2011, rev. Dec 17th, 2011

1. Introduction

The PLL needs an undisturbed input signal at a level > 5mV

The following photos taken from the storage scope at 1msec/Div show:

Top: Synch (2V/Div) ("Aile" from ORANGERX)

Middle: PLL-Inp. (200, 50 and 20 mV/div, see legends)

Bottom: PLL Filter Pin 8 (2V/Div), perfect for signal quality investigation

Supply: 7.2V (and later 15V for increased audio power, see chapter 4)

2. Experiment with Circuit V4, R6 = 2.2k (HP Gain 22 at fo), Vcc 7.2V

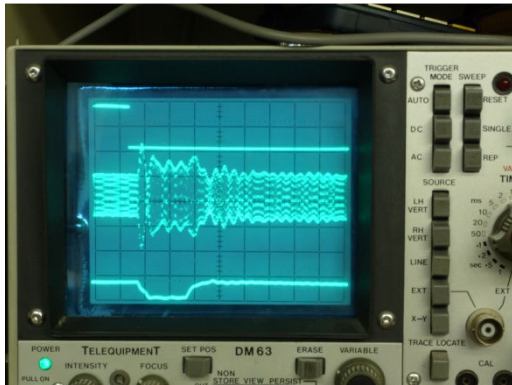


Fig. 1. Dist. ca. 1m, Inp. 200mV/Div

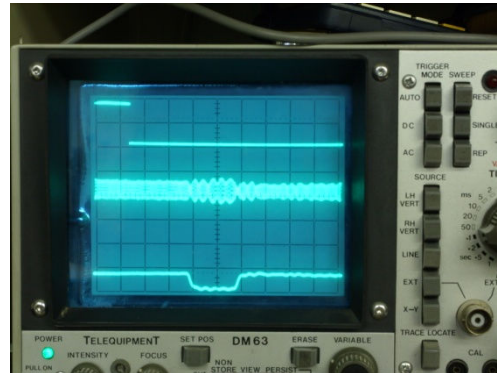


Fig. 2. Dist. ca. 1.5m, Inp. 200mV/Div

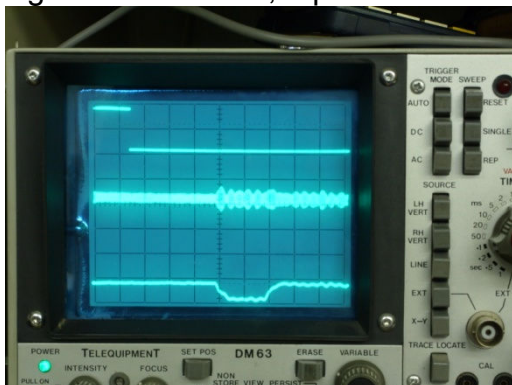


Fig. 3. Dist ca. 1.8m, Inp. 200mV/Div

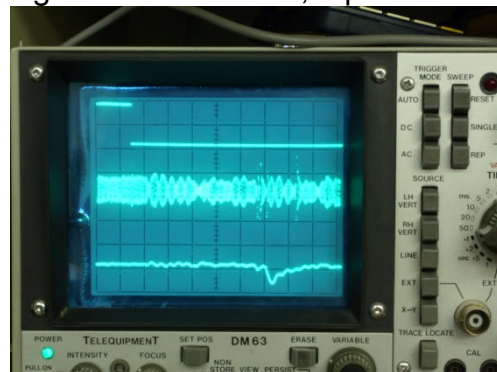


Fig. 4. Speaker turned 90 Degree
Inp. 50mV/Div

Comment:

The BP shows noise, the amplification should get reduced

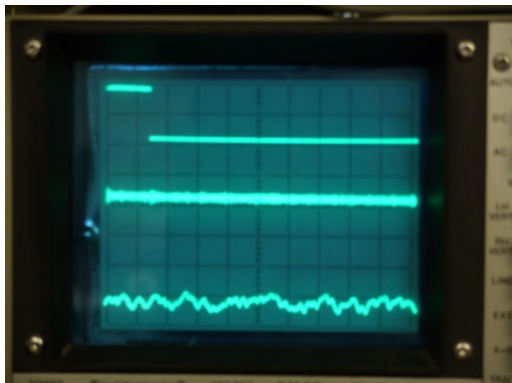


Fig. 5. Mic off
(only capacity 33 pF at BP Input),
Inp. 50mV/Div

3. Experiment with Circuit V4, R6 = 100k (HP Gain 1 at fo), Vcc 7.2V

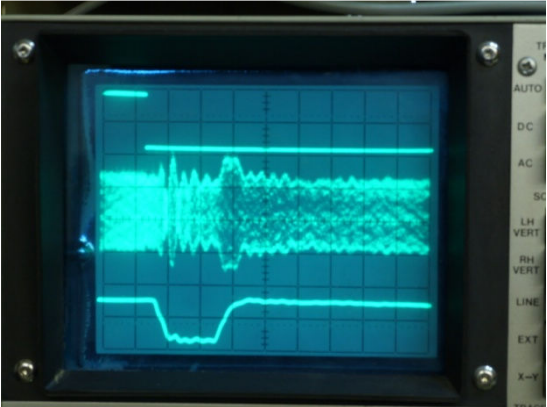


Fig. 1. Dist. ca. 0.8m, Inp. 20mV/Div

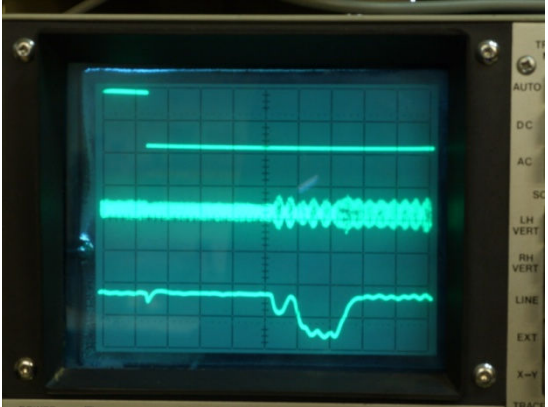


Fig. 2. Dist. ca. 1.5m, Inp. 20mV/Div (not perfect line of sight)

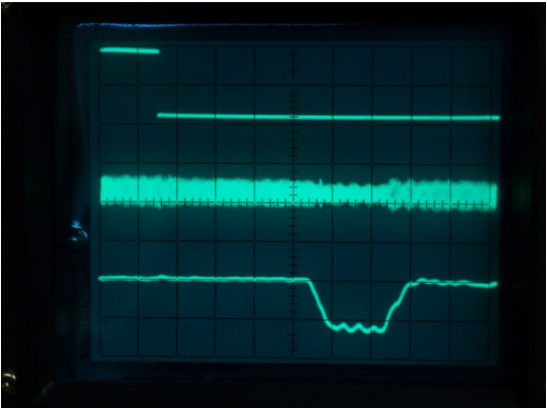


Fig. 3. Dist. ca. 1.8m, Inp. 20mV/Div

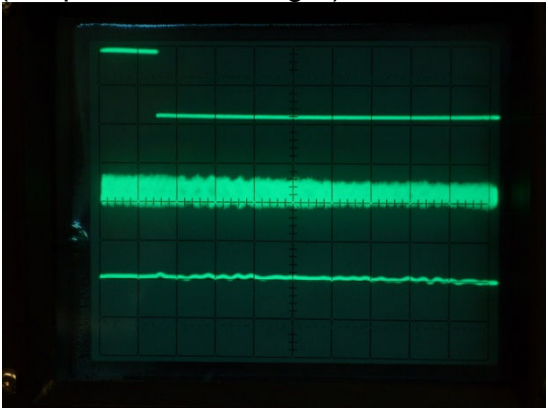


Fig. 4. Speaker turned 90 Degree Inp. 20mV/Div

Comment:
The BP shows a noise, but acceptable.

The main noise comes from the Electret Mic.

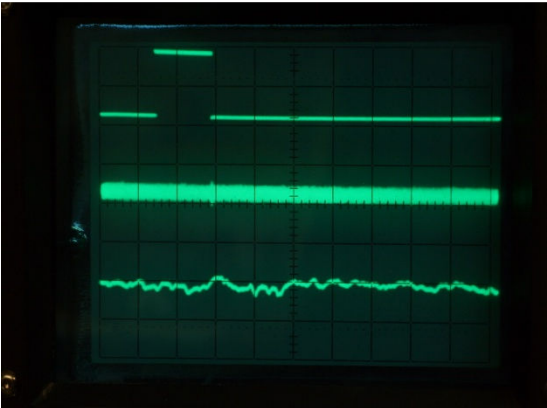


Fig. 5. Mic off (only capacity 33 pF at BP Input), Inp. 20mV/Div

**4. Experiment with Circuit V4, R6 = 100k (HP Gain 1 at fo)
Increased power of the Speaker, Vcc 15V for High Woofer Speaker**

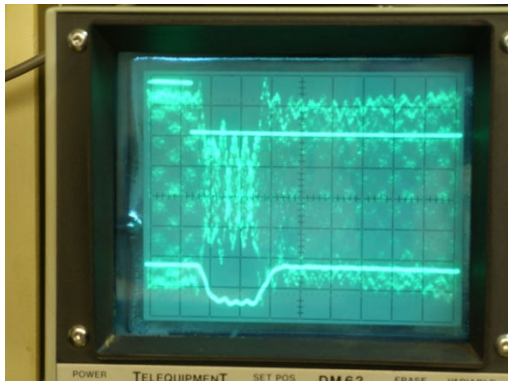


Fig. 1. Dist. ca. 0.8m, Inp. 20mV/Div

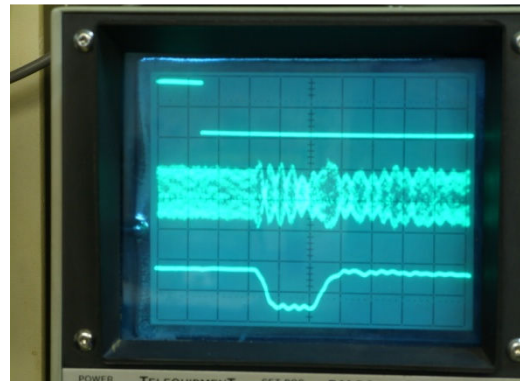


Fig. 2. Dist. ca. 1.5m, Inp. 20mV/Div

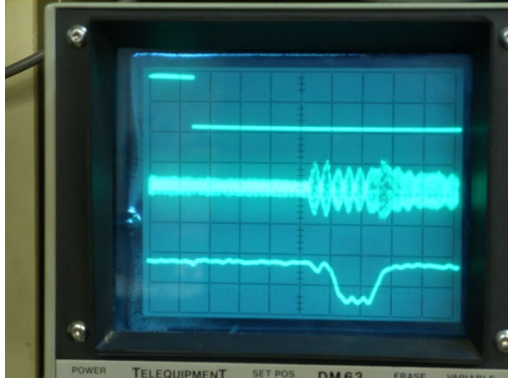


Fig. 3. Dist. ca. 1.8m, Inp. 20mV/Div

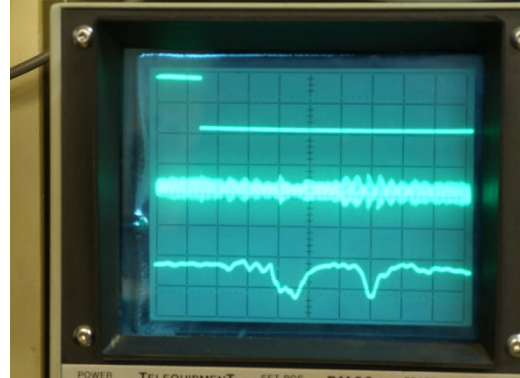


Fig. 4. Speaker turned 90 Degree
Inp. 20mV/Div (its better now!)

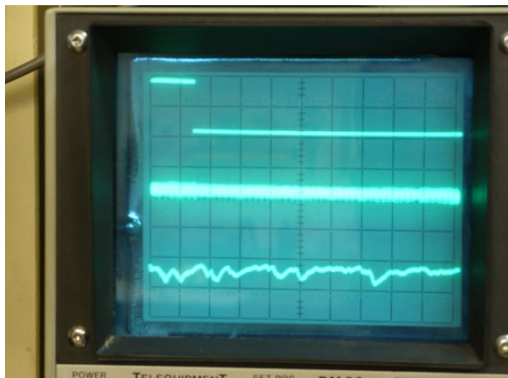


Fig. 5. Speaker off
Inp. 20mV/Div
PLL shows "Locked in"

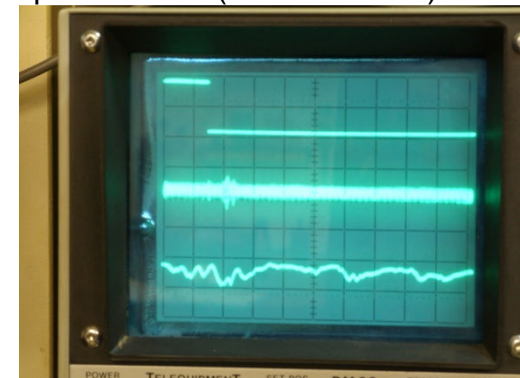


Fig. 6. Mic off
(only capacity 33 pF at BP Input)
Inp. 20mV/Div

5. Discussion 1

The dual HP and the BP give a noisy output signal, this is well known.

The noise of the Mic is acceptable

The sensitivity of the Mic at 20 to 30 kHz is poor

An increase of the speaker power (190mA @15V supply) is helpful, but not the solution.

Further investigations at FSK frequencies in the 17 to 19 kHz range with only +/- 2% frequency variation are needed.

6. Mic Test JLI A1 to A4 at short distance face to face

- Mic: Courtesy by JLI Electronics Inc., Harleysville, PA, USA, four types:
(See data sheet on internet: specified for 1 to 20 kHz only)

A1/B1: JLI-60AY107

A2/B2: B6022AP-C

A3/B3: JLI-64PNT

A4/B4: F6027AP423-31

Distance: 0.5 m

Signal: Sinus at High woofer Speaker

Inp Amp. Vpp: 2

Mic Amp. mVpp:

Freq kHz	A1	A2	A3	A4
10	20	22	12	15
11	35	30	20	60
12	35	38	20	70
13	15	22	18	42
14	18	15	12	20
15	8	8	8	20
16	8	7	4	10
17	6	4	3	8
18	4	5	2	5
19	5	5	4	8
20	5	4	3	10

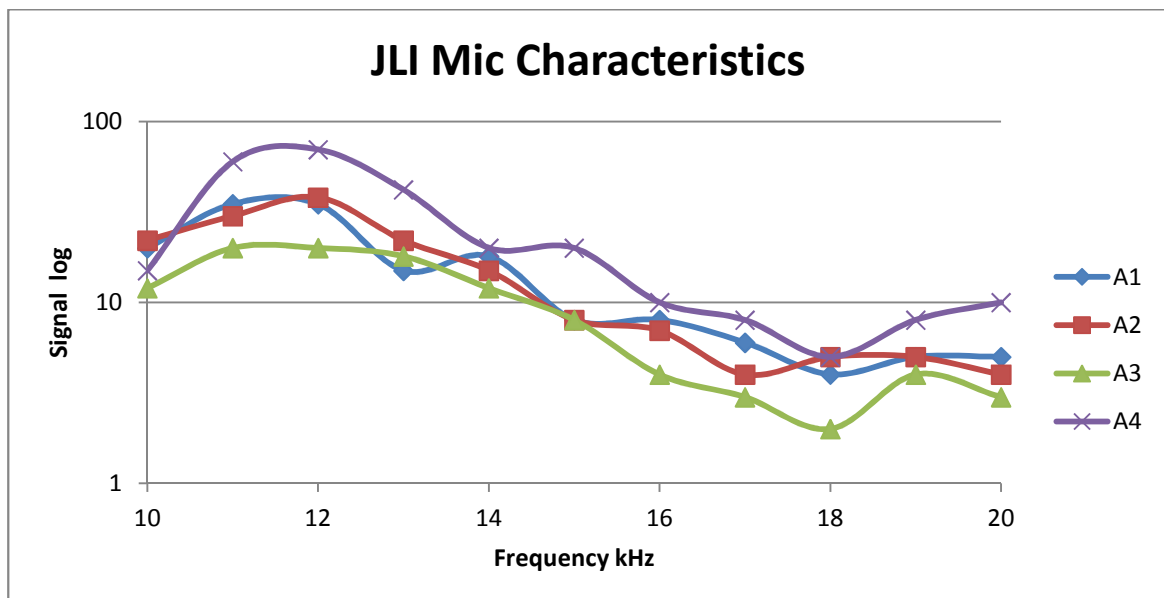


Fig. 7. Acoustic Transmission Characteristics Indoor in Laboratory

7. Discussion 2

All Mics from JLI are not perfect for frequencies above 15 kHz, but item 4 looks not so bad (F6027AP423-31)

8. Appendix Circuit V4

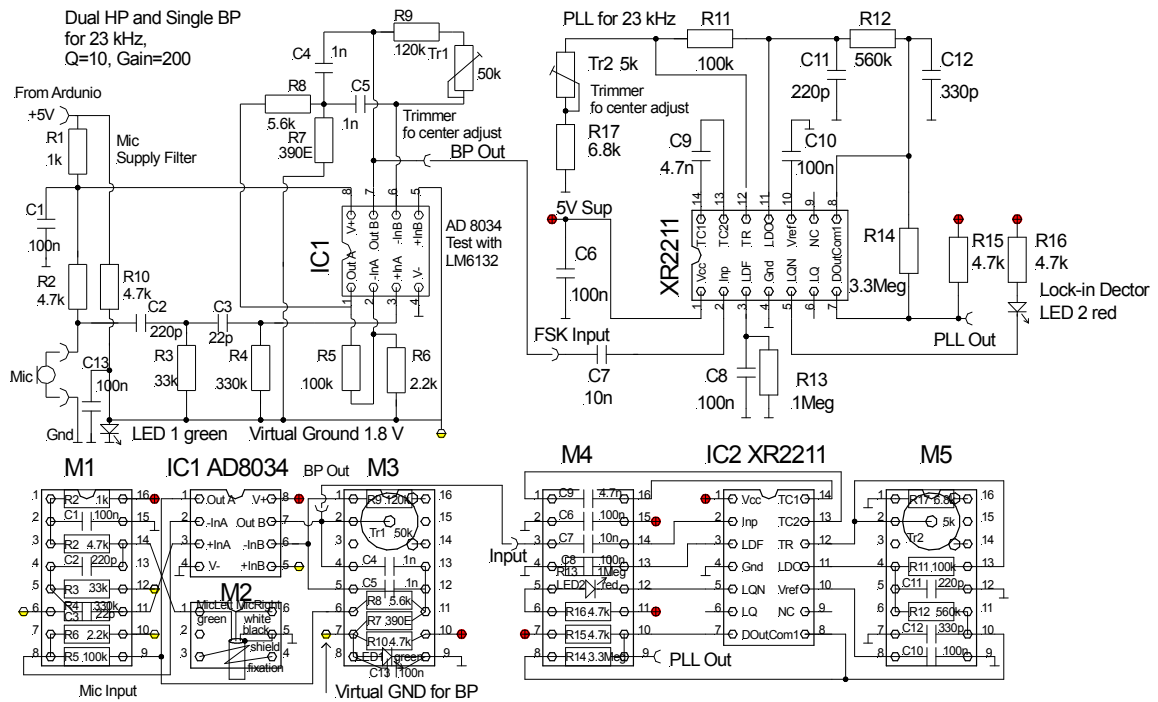


Fig. 8. BP and PLL Circuit for WireWapp Test Board