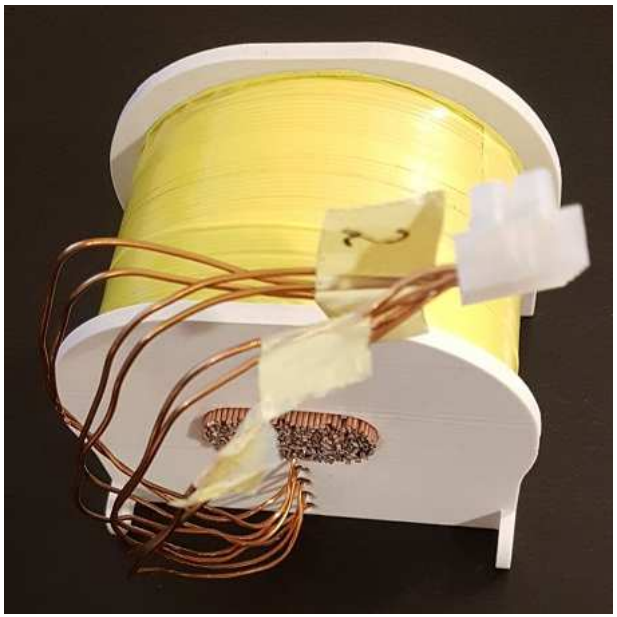
Generator coil Tests
Report 3

V1.0
2021-03-07

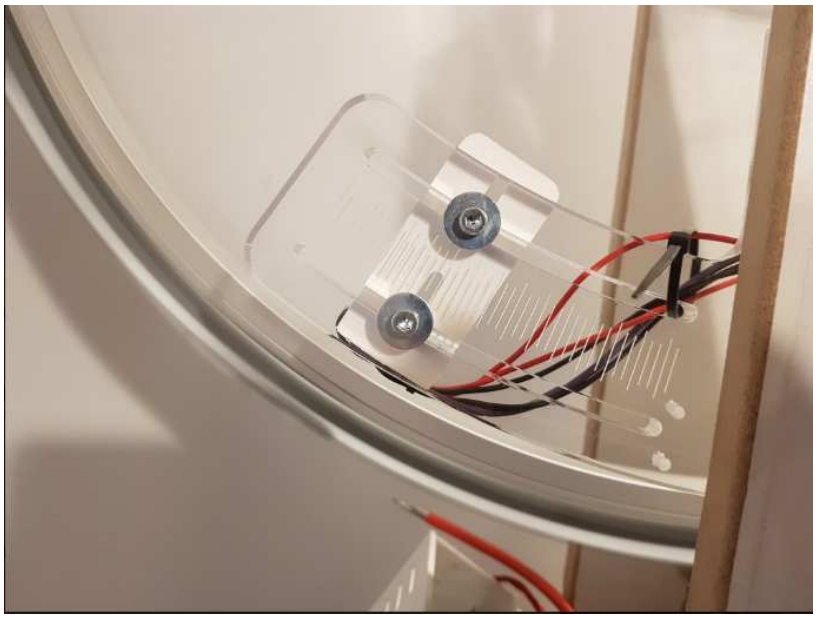
Content:

Generator coil specs

-Coil wire AWG 16
-4x Coil 291 windings, in series
-Total 1164 windings
-Total inductance +/-1.35H
-Core = welding rods, DIN 8554:G1 (=R45)

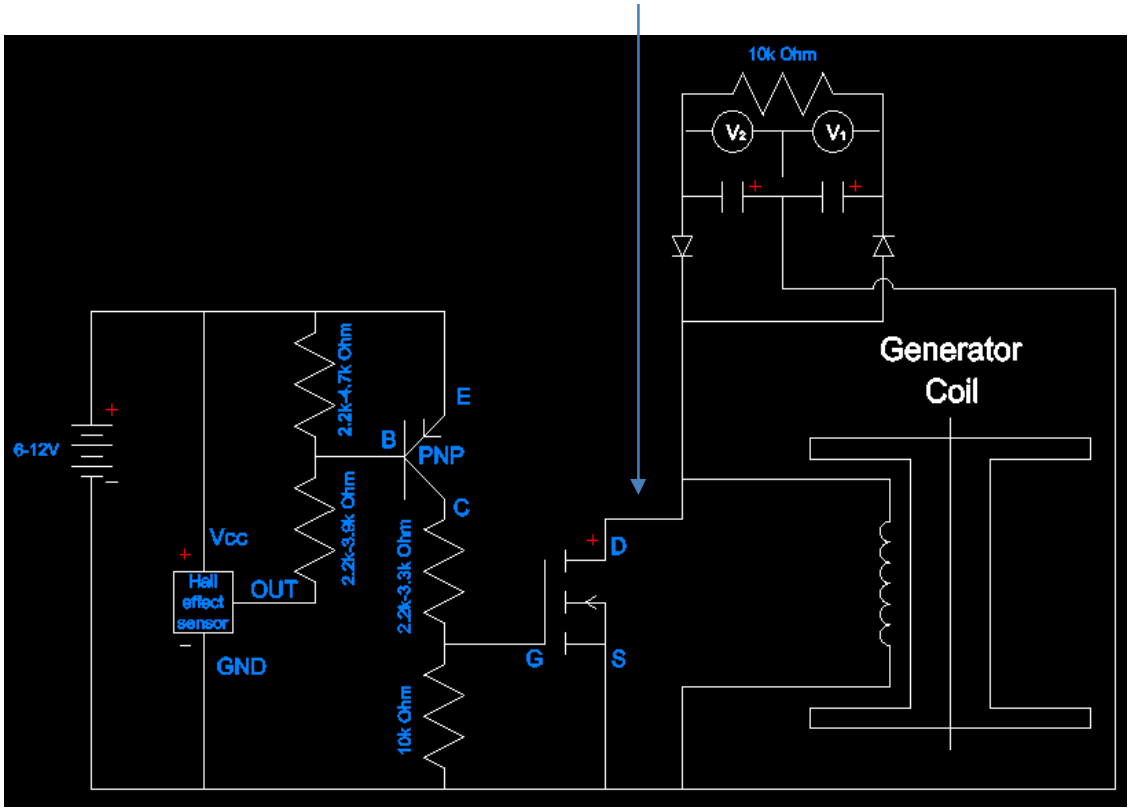


Adjustable Reed switch / Hall sensor brackets



2021-01-28 Test 1, Sheet 1 of 2
Hall sensor, with 10k Ohm load, 2mm coil gap, x10 probes
Test: *Re-evaluate how the voltage in the capacitors behaves with/without Hall/MOSFET circuit, without MOSFET diode.*

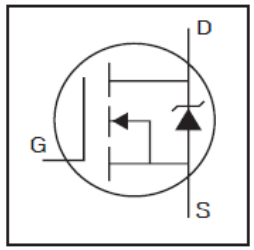
Location of MOSFET diode (1N4007)
left out for this test



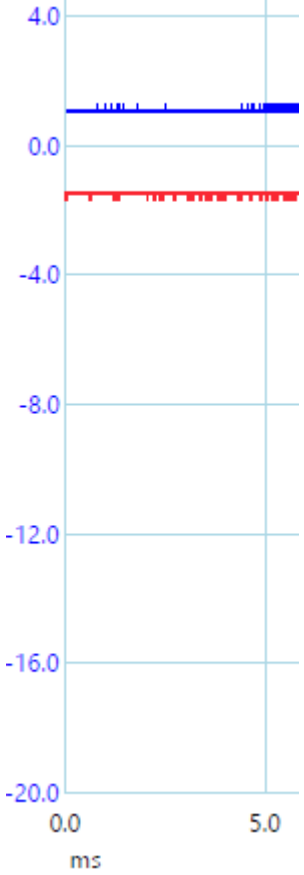
2021-01-28 Test 1, Sheet 2 of 2

Hall sensor, with 10k Ohm load, 2mm coil gap, x10 probes

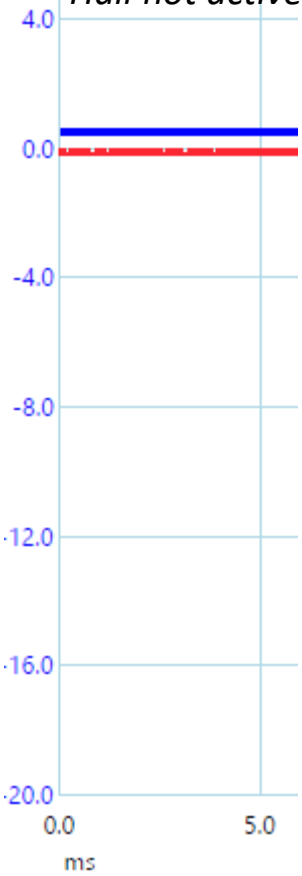
Test: *Re-evaluate how the voltage in the capacitors behaves with/without Hall/MOSFET circuit, without MOSFET diode.*



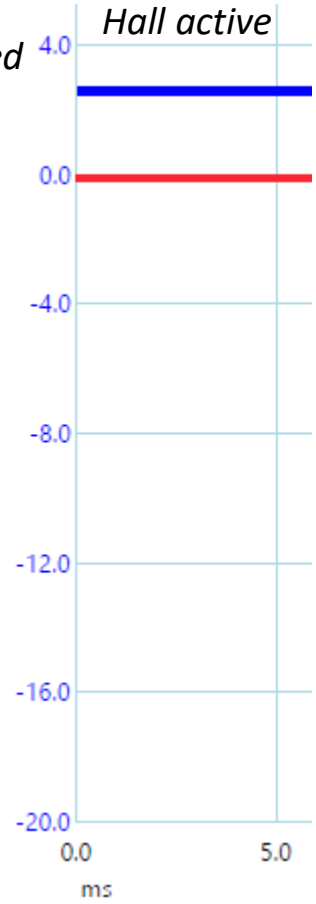
Voltage over 2 cap
Hall circuit not connected



Voltage over 2 cap
Hall circuit connected
Hall not active



Voltage over 2 cap
Hall circuit connected
Hall active



Conclusions:

When MOSFET diode is not installed:

-When Hall circuit is connected, but Hall not active, voltage in capacitors drop. I expected that the Mosfet would only conduct in 1 direction.

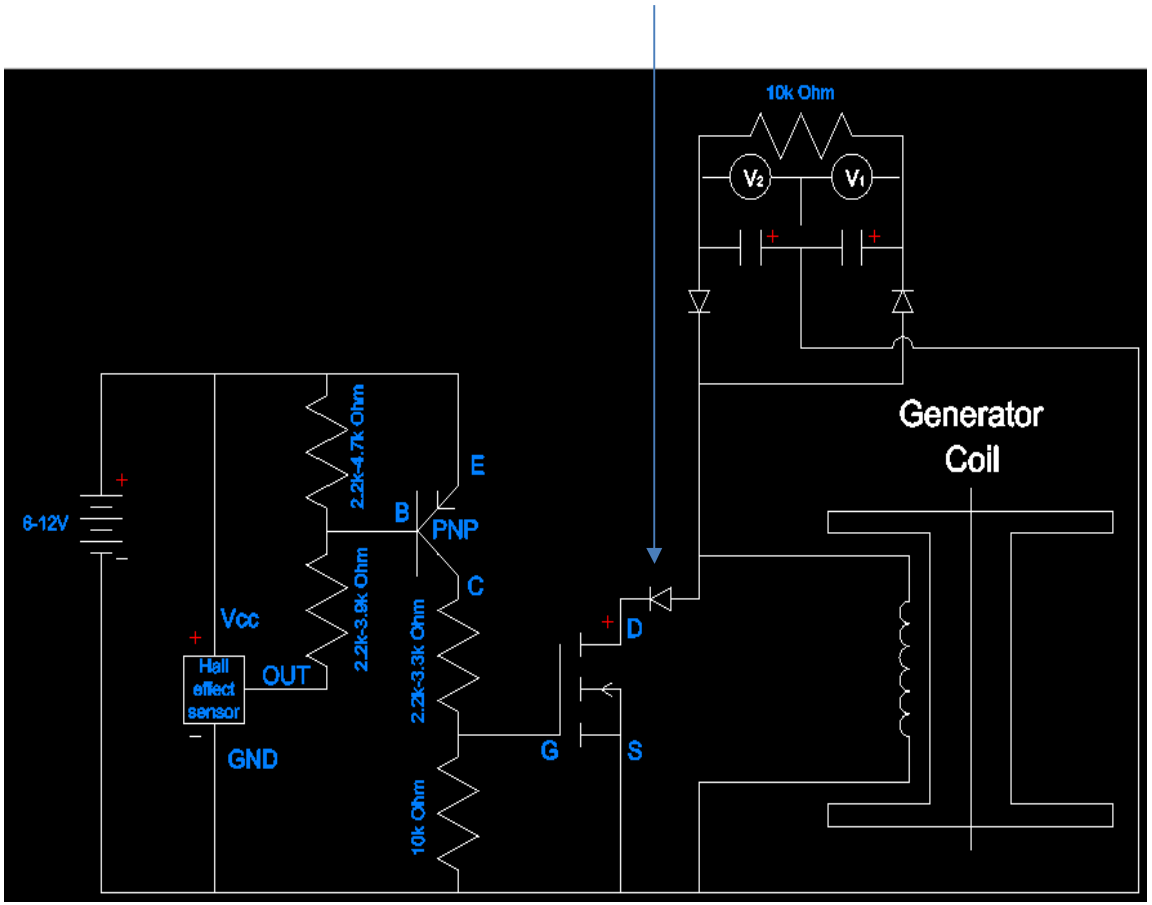
However, after looking in the spec sheet of the Mosfet it shows that due to its internal structure it does conducted in the opposite direction.

-With Hall circuit active, the total voltage in the capacitors is the same as with the Hall circuit not connected

-There no drag with the Hall sensor active

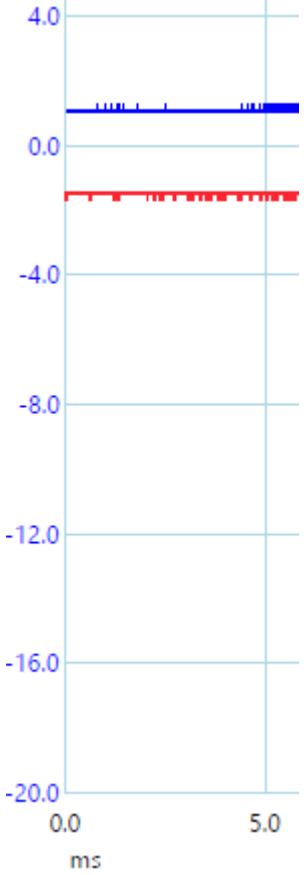
2021-01-28 Test 2, Sheet 1 of 2
Hall sensor, with 10k Ohm load, 2mm coil gap, x10 probes
Test: *Re-evaluate how the voltage in the capacitors behaves with/without Hall/MOSFET circuit, with MOSFET diode.*

Location of MOSFET diode (1N4007)

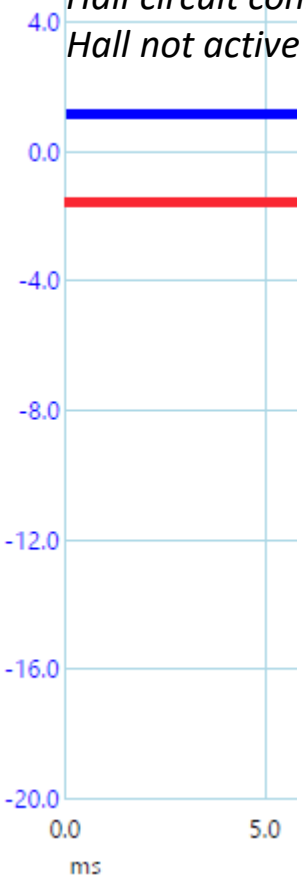


2021-01-28 Test 2, Sheet 1 of 2
Hall sensor, with 10k Ohm load, 2mm coil gap, x10 probes
Test: *Re-evaluate how the voltage in the capacitors behaves with/without Hall/MOSFET circuit, with MOSFET diode.*

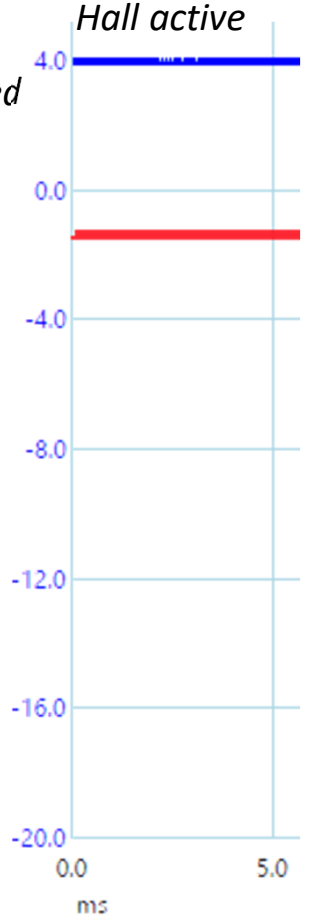
Voltage over 2 cap
Hall circuit not connected



Voltage over 2 cap
Hall circuit connected
Hall not active

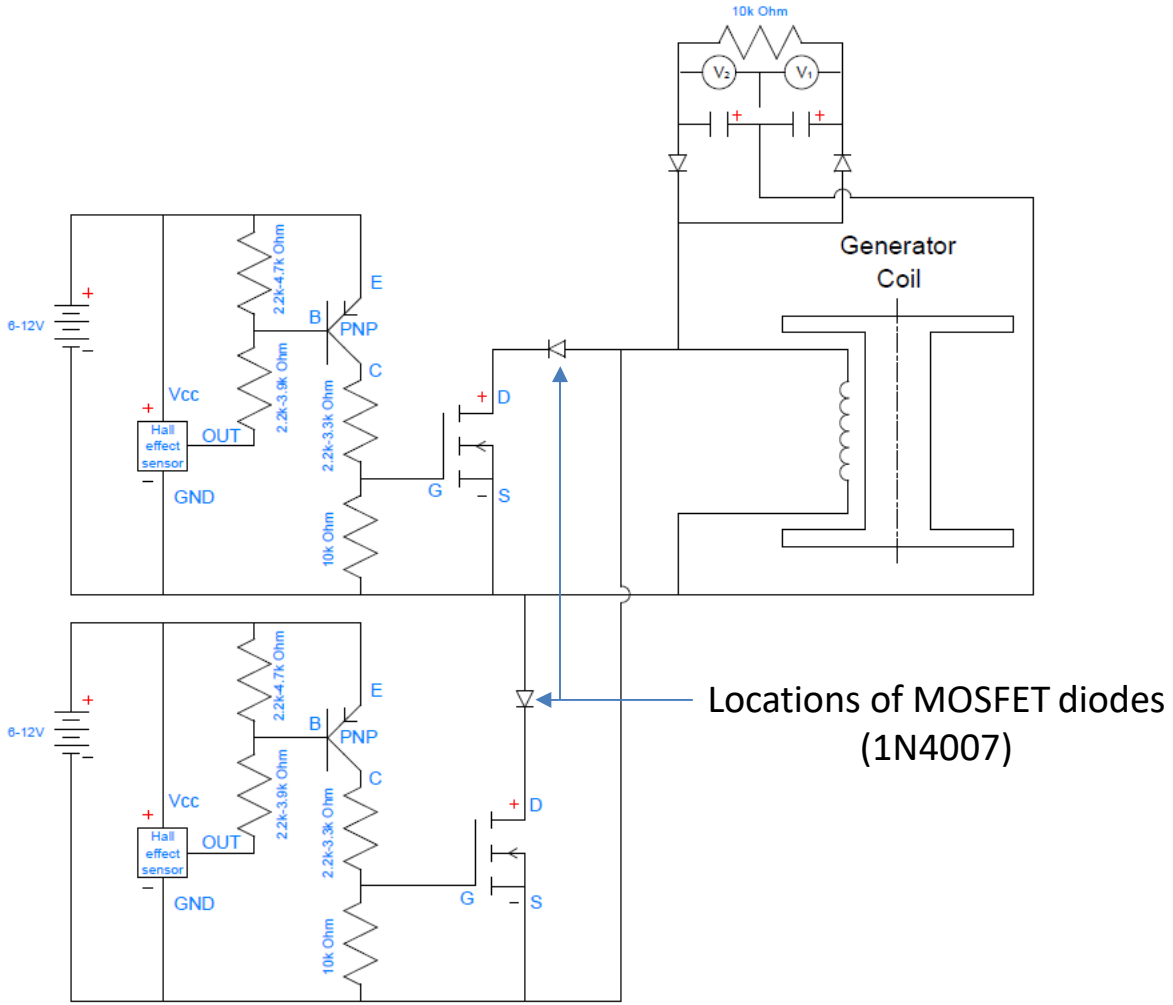


Voltage over 2 cap
Hall circuit connected
Hall active



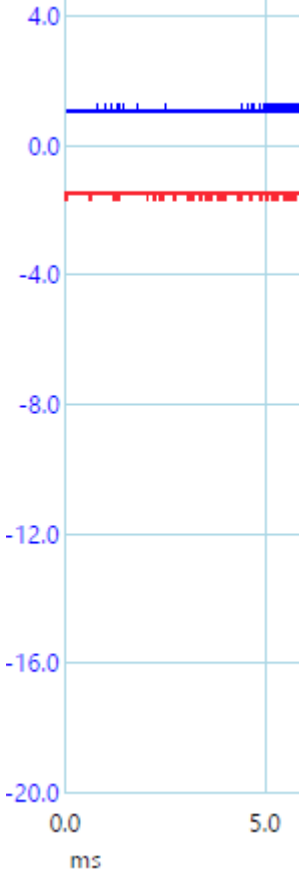
Conclusions:
When MOSFET diode is installed:
-When Hall circuit is connected, but Hall not active, voltage in capacitors do not drop
-With Hall circuit active, the total voltage in the capacitors can be higher as without the circuit, depending on the position of the Hall
-With Hall active, drag is present in more or less dominant for, depending on the position of the Hall. (Note that in this test the position the Hall sensor was NOT optimized again after inserting the diode otherwise the voltage would have bene higher, e.g. see test **2021-02-28 1.6**)

2021-01-28 Test 3, Sheet 1 of 2
Hall sensor, with 10k Ohm load, 2mm coil gap, x10 probes
Test: *Test function of double Hall/MOSFET circuit, with MOSFET diodes.*

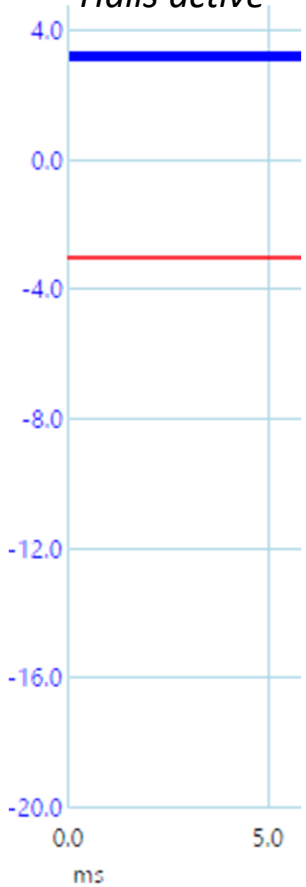


2021-01-28 Test 3, Sheet 2 of 2
Hall sensor, with 10k Ohm load, 2mm coil gap, x10 probes
Test: *Test function of double Hall/MOSFET circuit, with MOSFET diodes.*

Voltage over 2 cap
Hall circuit not connected



Voltage over 2 cap
Hall circuits connected
Halls active



Conclusions:
When MOSFET diodes are installed:
-With Hall circuits active, the total voltage in the capacitors can be higher as without the circuit, depending on the position of the Halls
-With Halls active, drag is present in more or less dominant for, depending on the position of the Hall. When optimizing Hall position, voltage per capacitor could go over 80V, with increased drag, see test **2021-02-28 1.6.**

2021-02-28 Test 1, Sheet 1 of 13
Hall sensor, with 10k Ohm load, 2mm coil gap, x10 probes
Test: *How does the Hall signal vs Coil signal look, in relation to:*

1.1 Hall circuit not connected and not active, no diode, Hall sensor pos. optimized for max voltage 2 cap connected. Sheet 2 & 3 of 13

1.2 Hall circuit connected but not active, no diode, Hall sensor pos. optimized for max voltage 2 cap connected. Sheet 4 & 5 of 13

1.3 Hall circuit connected and active, no diode, Hall sensor pos. optimized for max voltage (in 1 cap), 2 cap connected. Sheet 6 & 7 of 13

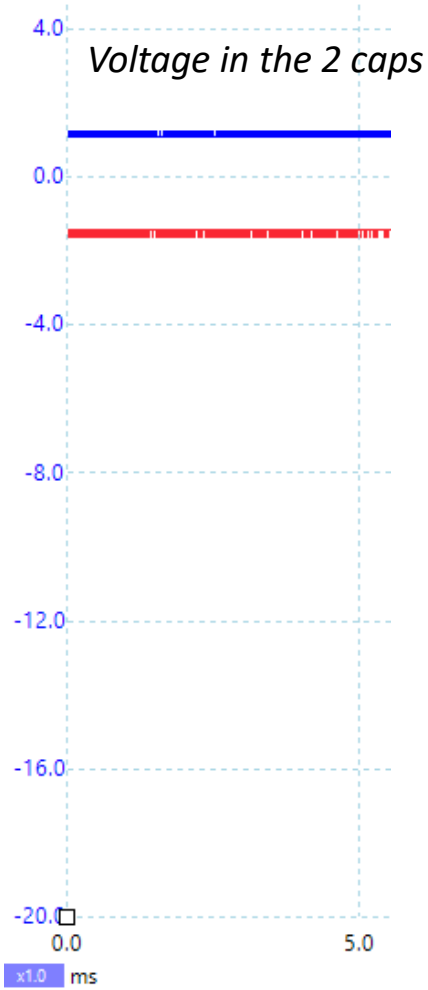
1.4 Hall circuit connected but not active, diode, Hall sensor pos. left in same as previous, 2 cap connected. Sheet 8 & 9 of 13

1.5 Hall circuit connected and active, diode Hall sensor pos. left in same as previous, 2 cap connected. Sheet 10 & 11 of 13

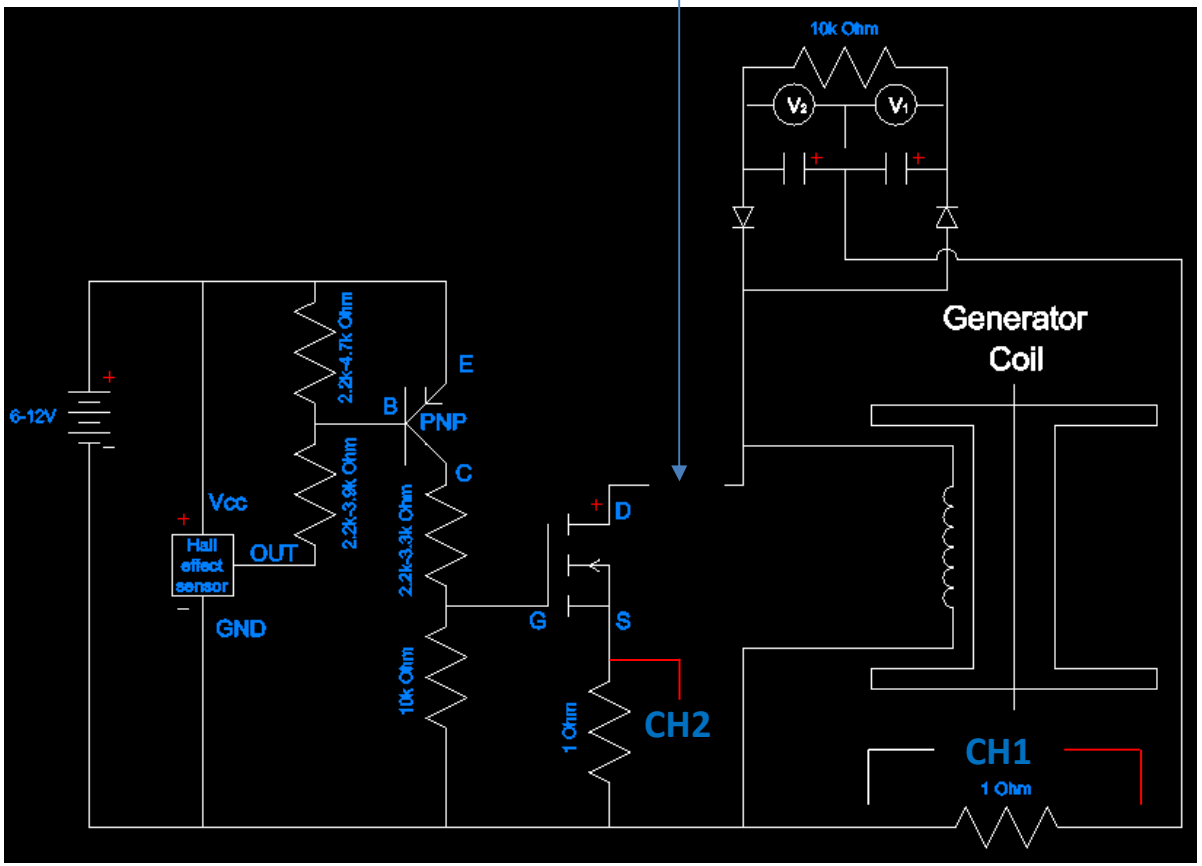
1.6 Hall circuit connected and active, diode Hall sensor pos. optimized for max voltage (in 1 cap), 2 cap connected. Sheet 12 & 13 of 13

Test: *How does the Hall signal vs Coil signal look, in relation to: 2021-02-28 1.1 Hall circuit not connected and not active, no diode, Hall sensor pos. optimized for max voltage 2 cap connected*

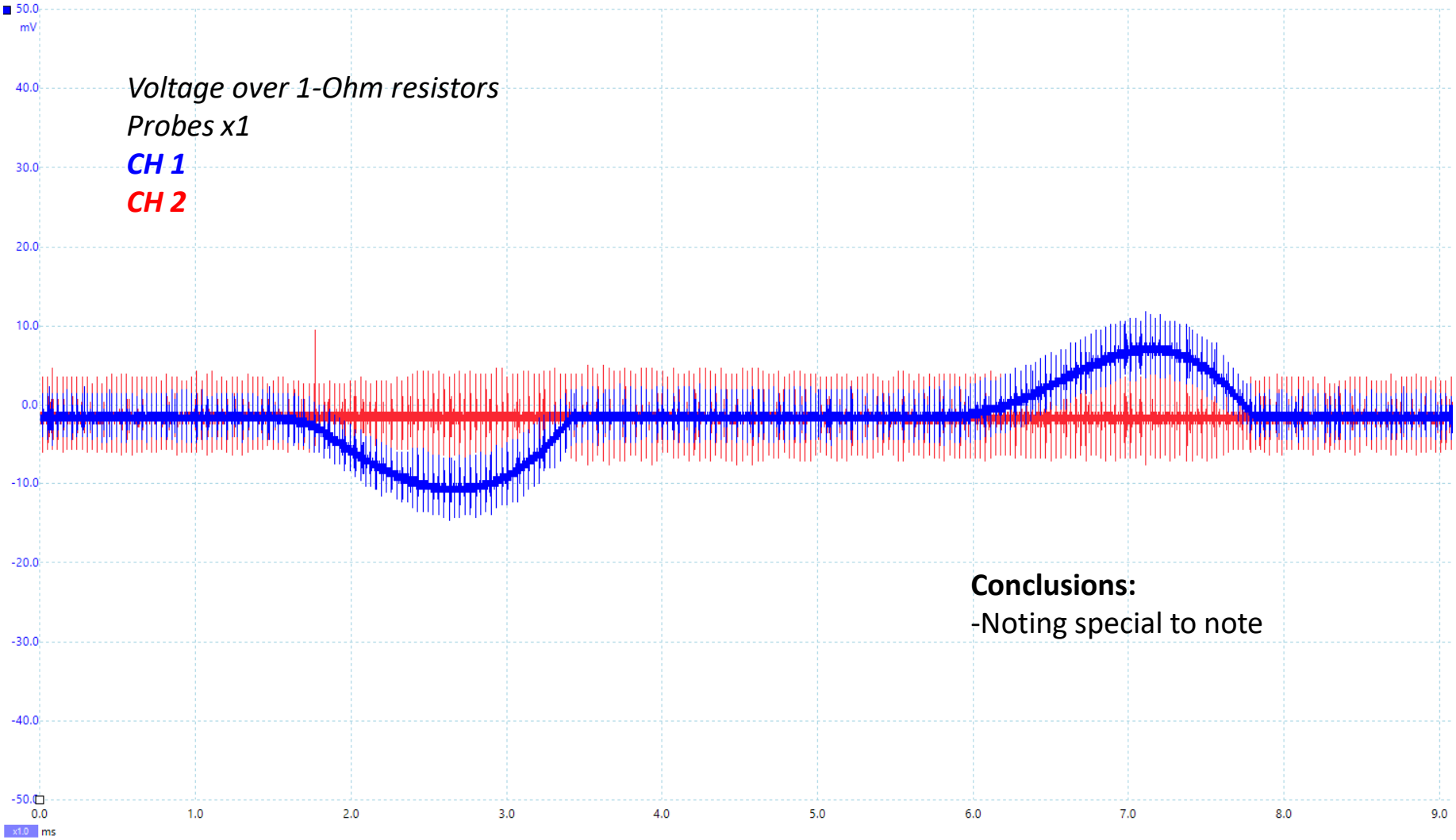
Caps: 400V, 100uF
Diodes: 1N4007
Hall Effect sensor:
Honeywell – SS443A
Mosfet: IRFP260NPBF



Hall circuit not connected

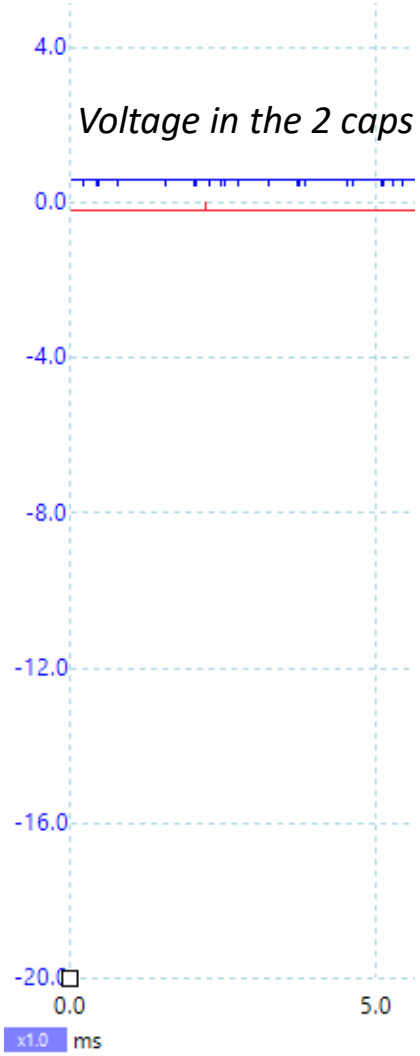


Test: *How does the Hall signal vs Coil signal look, in relation to: 2021-02-28 1.1 Hall circuit not connected and not active, no diode, Hall sensor pos. optimized for max voltage 2 cap connected*

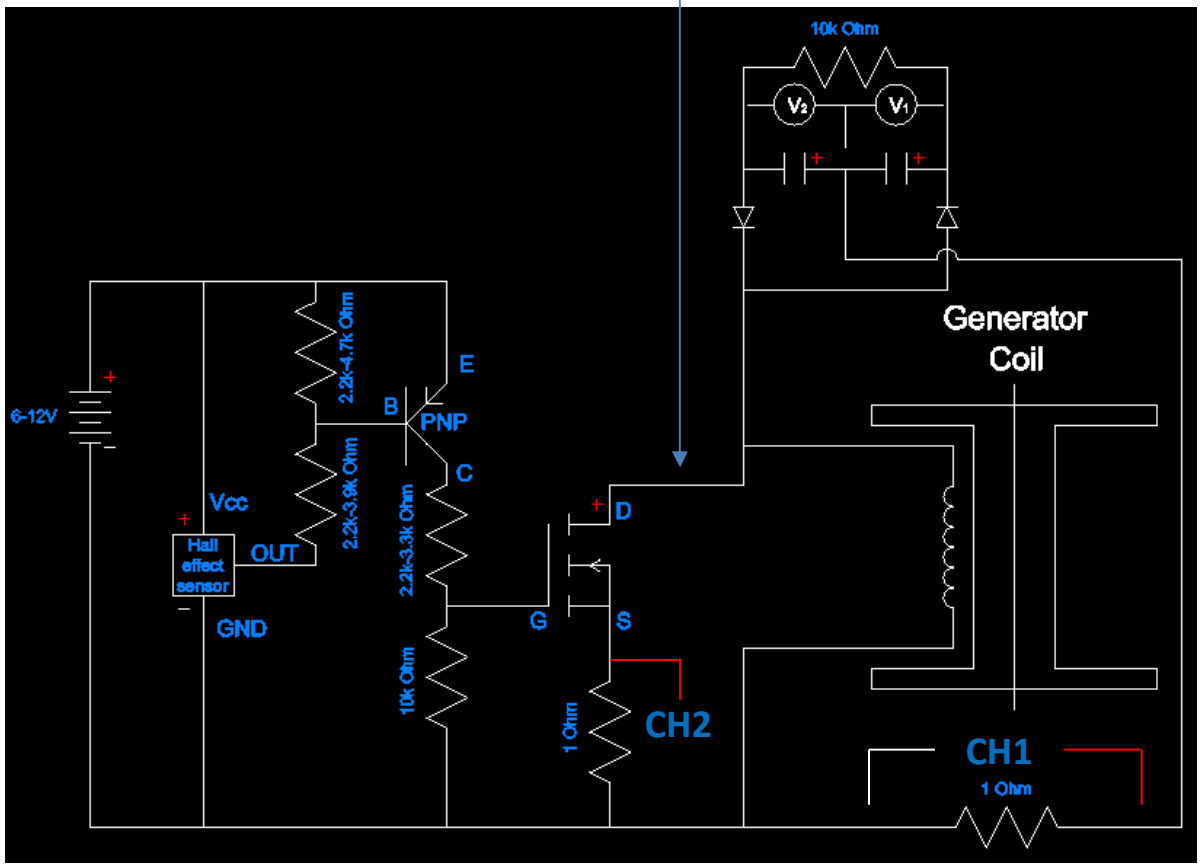


Test: *How does the Hall signal vs Coil signal look, in relation to: 2021-02-28 1.2 Hall circuit connected but not active, no diode, Hall sensor pos. optimized for max voltage 2 cap connected*

Caps: 400V, 100uF
Diodes: 1N4007
Hall Effect sensor:
Honeywell – SS443A
Mosfet: IRFP260NPBF



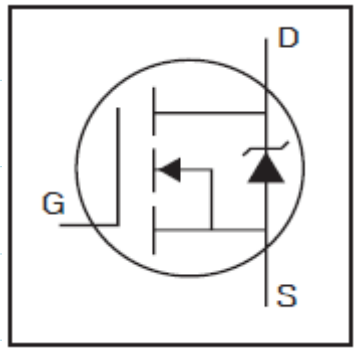
Hall circuit connected



Test: *How does the Hall signal vs Coil signal look, in relation to: 2021-02-28 1.2 Hall circuit connected but not active, no diode, Hall sensor pos. optimized for max voltage 2 cap connected*

Conclusions:

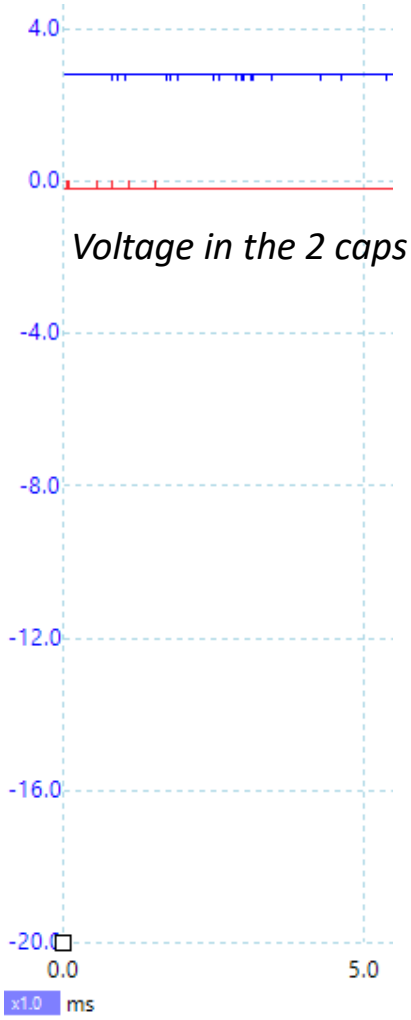
-With the hall circuit connected, but not activated, I assumed the Mosfet would not conduct and thus expected to see the same voltages in the caps and the same voltages over the resistors as per 2021-02-28 1.1. However after looking in the spec sheet of the Mosfet it shows that due to its internal structure it does conducted in the opposite direction.



Voltage over 1-Ohm resistors
Probes x1
CH 1
CH 2

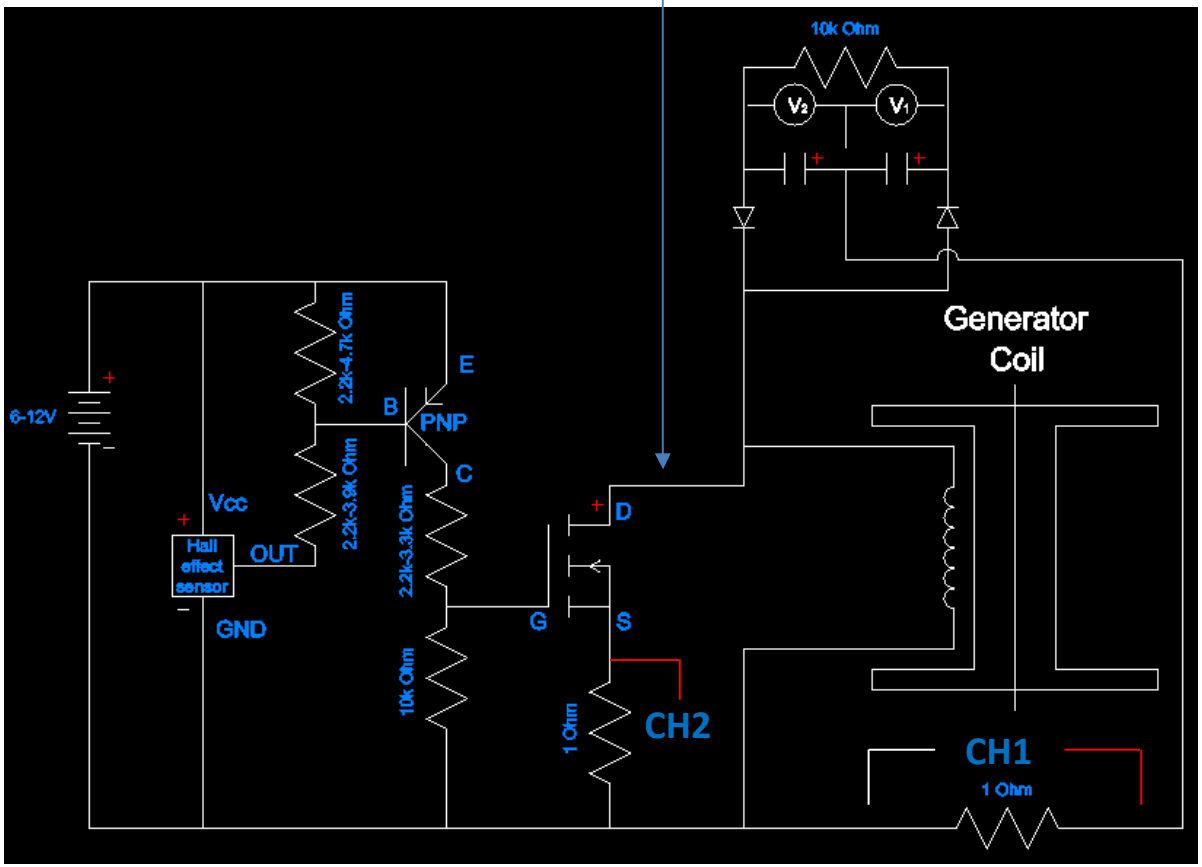
Test: *How does the Hall signal vs Coil signal look, in relation to:*
2021-02-28 1.3 Hall circuit connected and active, no diode, Hall sensor pos. optimized for max voltage (in 1 cap), 2 cap connected

Caps: 400V, 100uF
Diodes: 1N4007
Hall Effect sensor:
Honeywell – SS443A
Mosfet: IRFP260NPBF

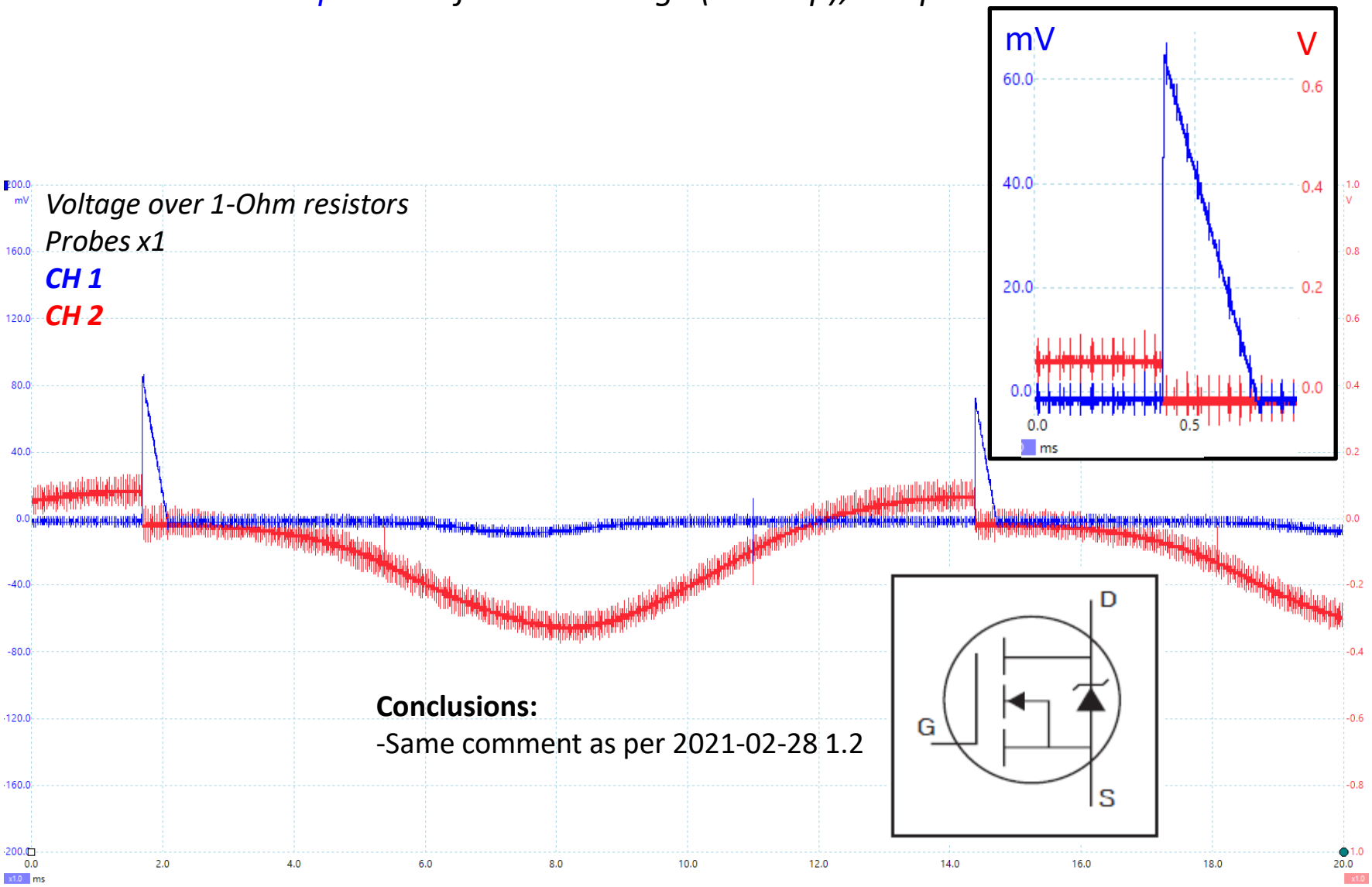


Voltage in the 2 caps

Hall circuit connected



Test: *How does the Hall signal vs Coil signal look, in relation to:*
2021-02-28 1.3 Hall circuit connected and active, no diode, Hall sensor pos. optimized for max voltage (in 1 cap), 2 cap connected

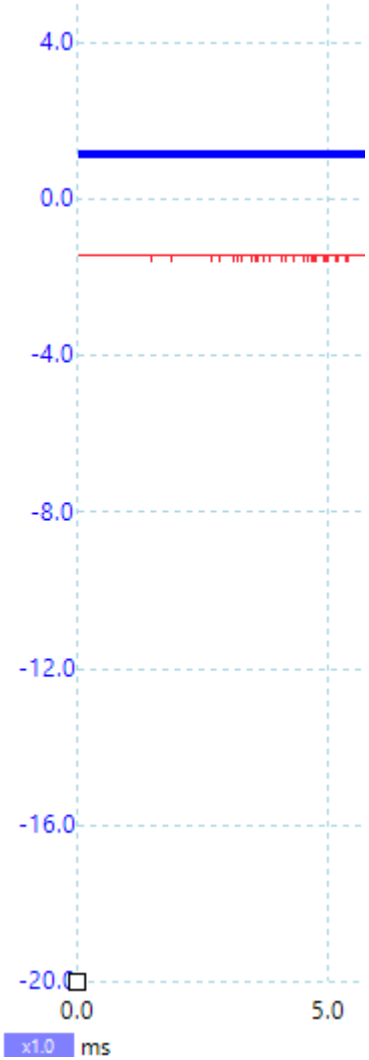


Conclusions:

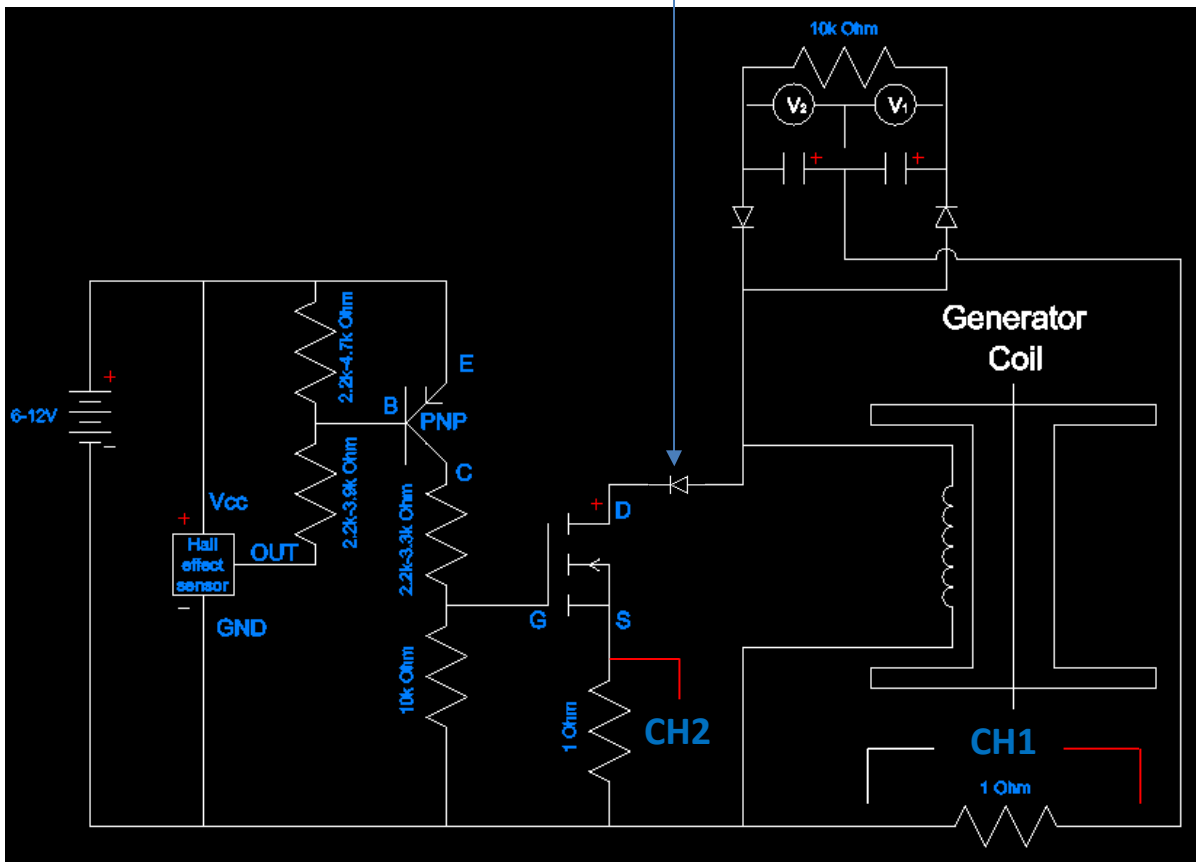
-Same comment as per 2021-02-28 1.2

Test: *How does the Hall signal vs Coil signal look, in relation to: 2021-02-28 1.4 Hall circuit connected but not active, diode, Hall sensor pos. left in same as previous, 2 cap connected*

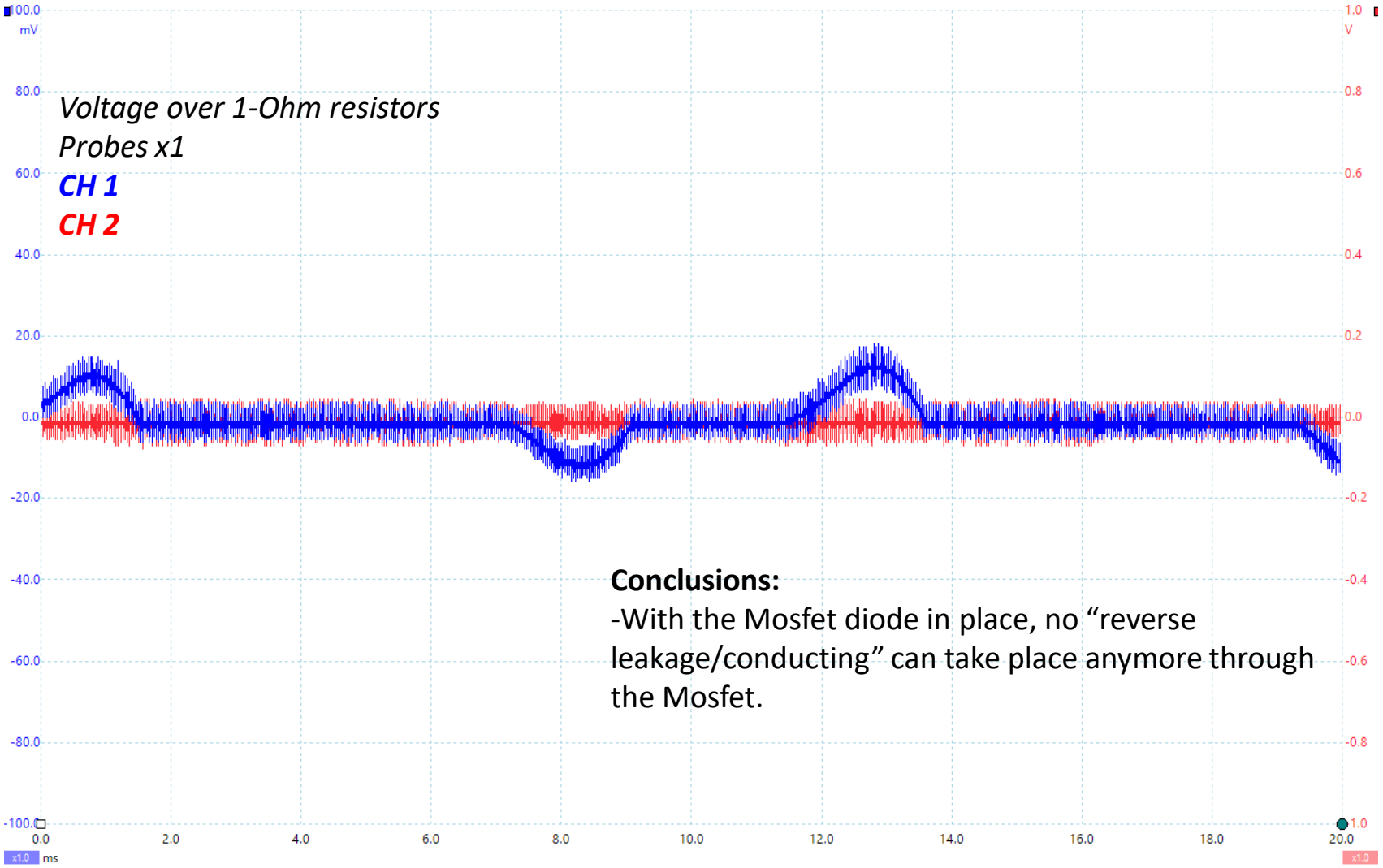
Caps: 400V, 100uF
Diodes: 1N4007
Hall Effect sensor:
Honeywell – SS443A
Mosfet: IRFP260NPBF



Hall circuit connected, with diode



Test: *How does the Hall signal vs Coil signal look, in relation to: 2021-02-28 1.4 Hall circuit connected but not active, diode, Hall sensor pos. left in same as previous, 2 cap connected*

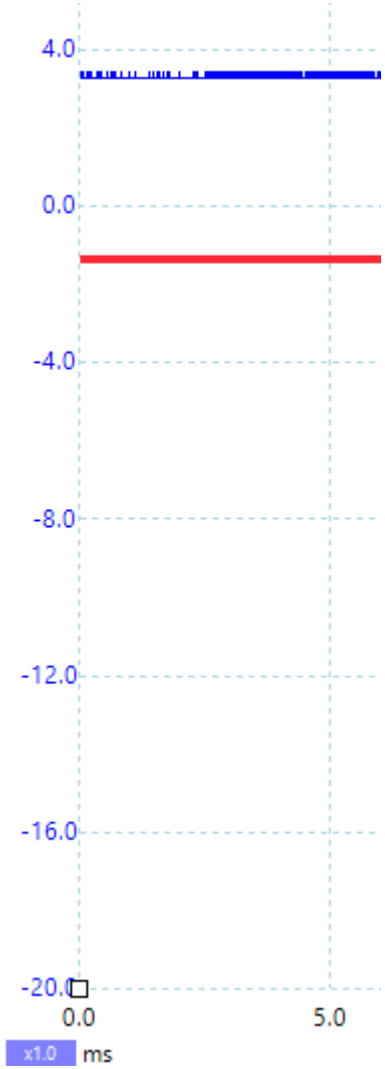


Conclusions:

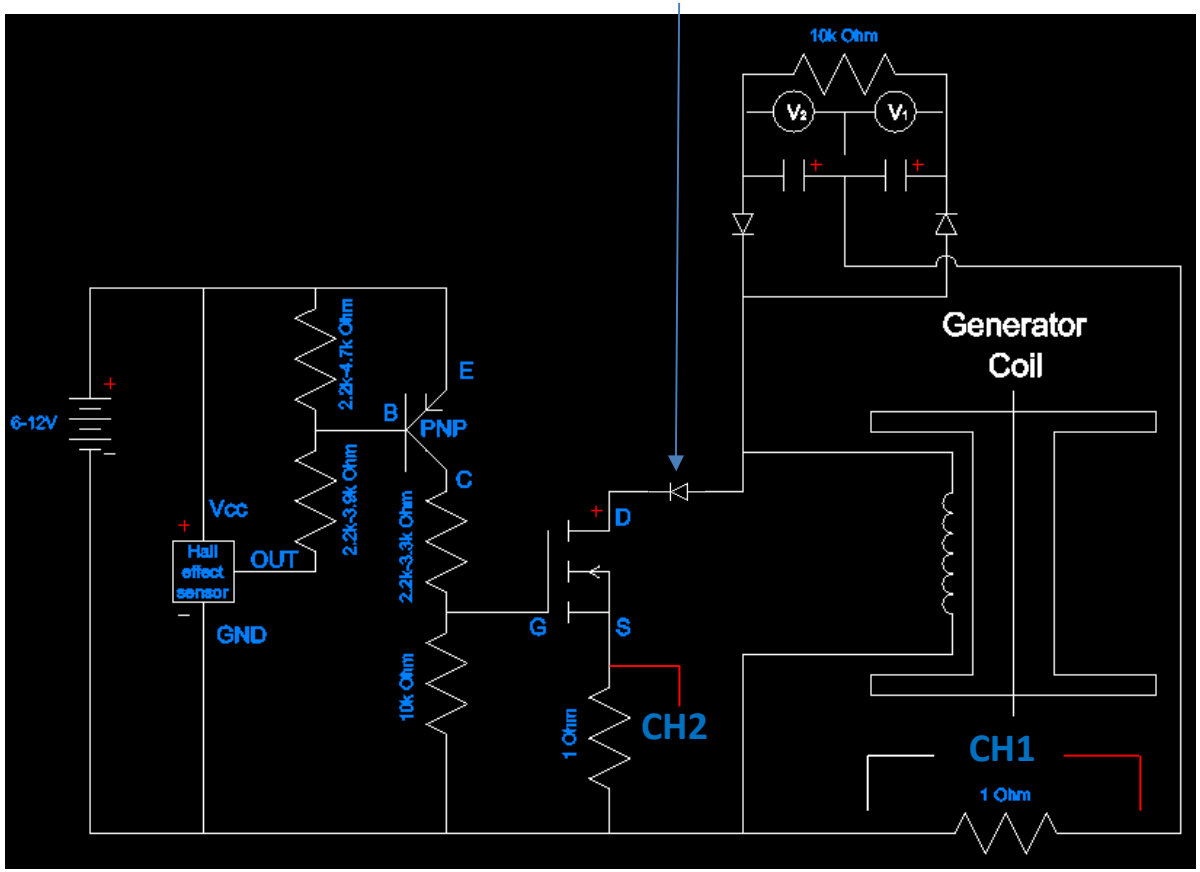
-With the Mosfet diode in place, no “reverse leakage/conducting” can take place anymore through the Mosfet.

Test: *How does the Hall signal vs Coil signal look, in relation to: 2021-02-28 1.5 Hall circuit connected and active, diode Hall sensor pos. left in same as previous, 2 cap connected*

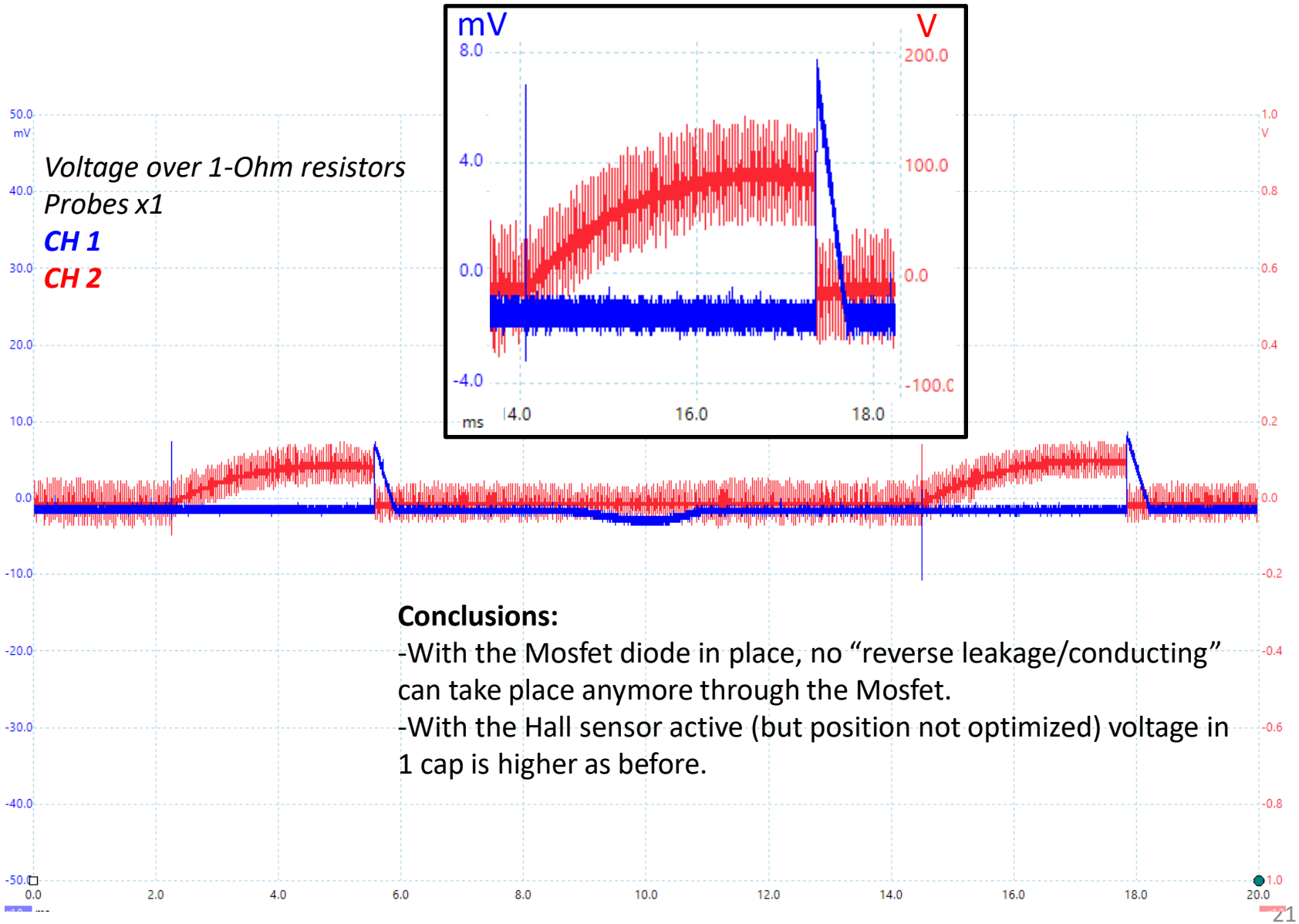
Caps: 400V, 100uF
Diodes: 1N4007
Hall Effect sensor:
Honeywell – SS443A
Mosfet: IRFP260NPBF



Hall circuit connected, with diode



Test: *How does the Hall signal vs Coil signal look, in relation to: 2021-02-28 1.5 Hall circuit connected and active, diode Hall sensor pos. left in same as previous, 2 cap connected*



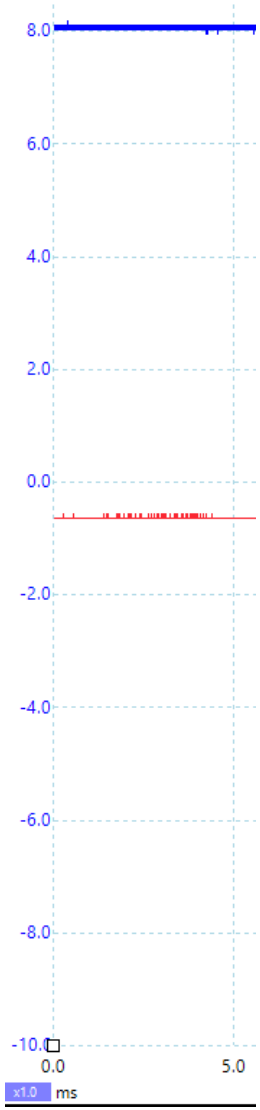
Voltage over 1-Ohm resistors
Probes x1
CH 1
CH 2

Conclusions:

-With the Mosfet diode in place, no “reverse leakage/conducting” can take place anymore through the Mosfet.

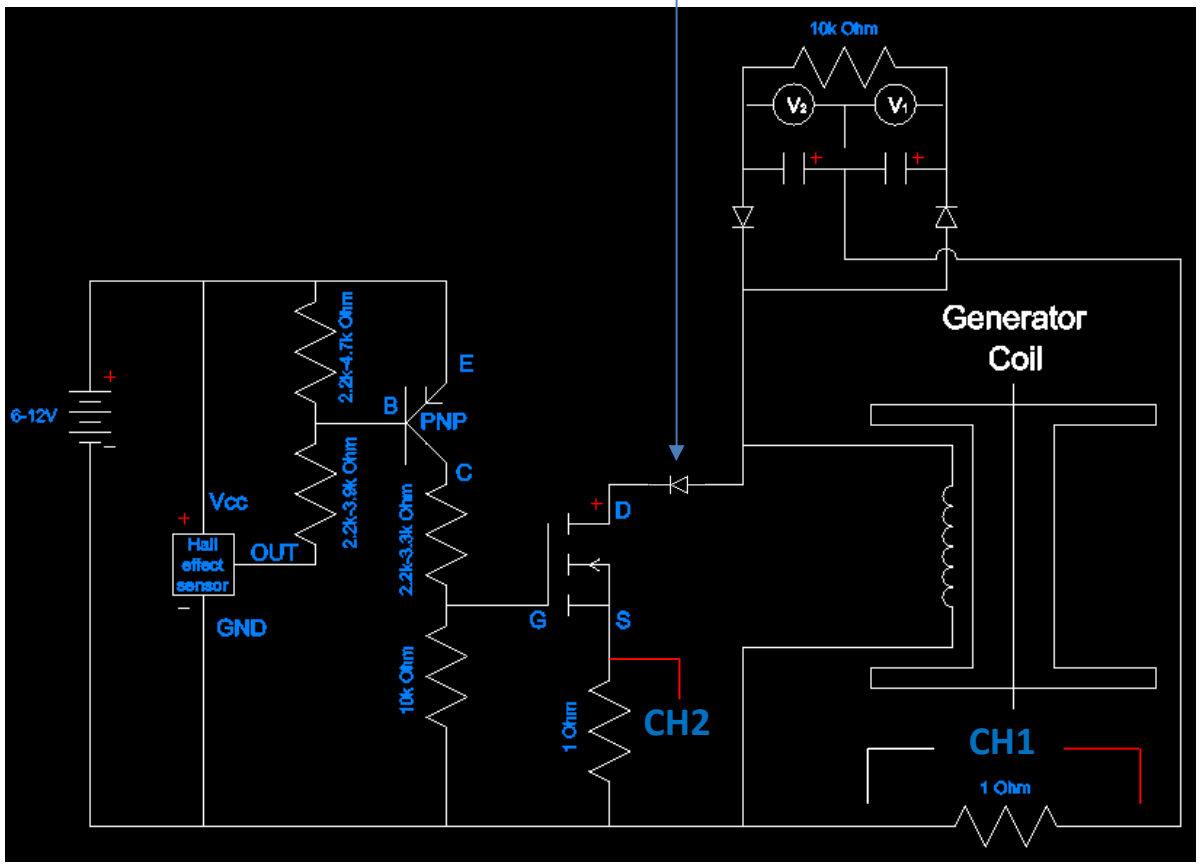
-With the Hall sensor active (but position not optimized) voltage in 1 cap is higher as before.

Test: *How does the Hall signal vs Coil signal look, in relation to: 2021-02-28 1.6 Hall circuit connected and active, diode Hall sensor pos. optimized for max voltage (in 1 cap), 2 cap connected*

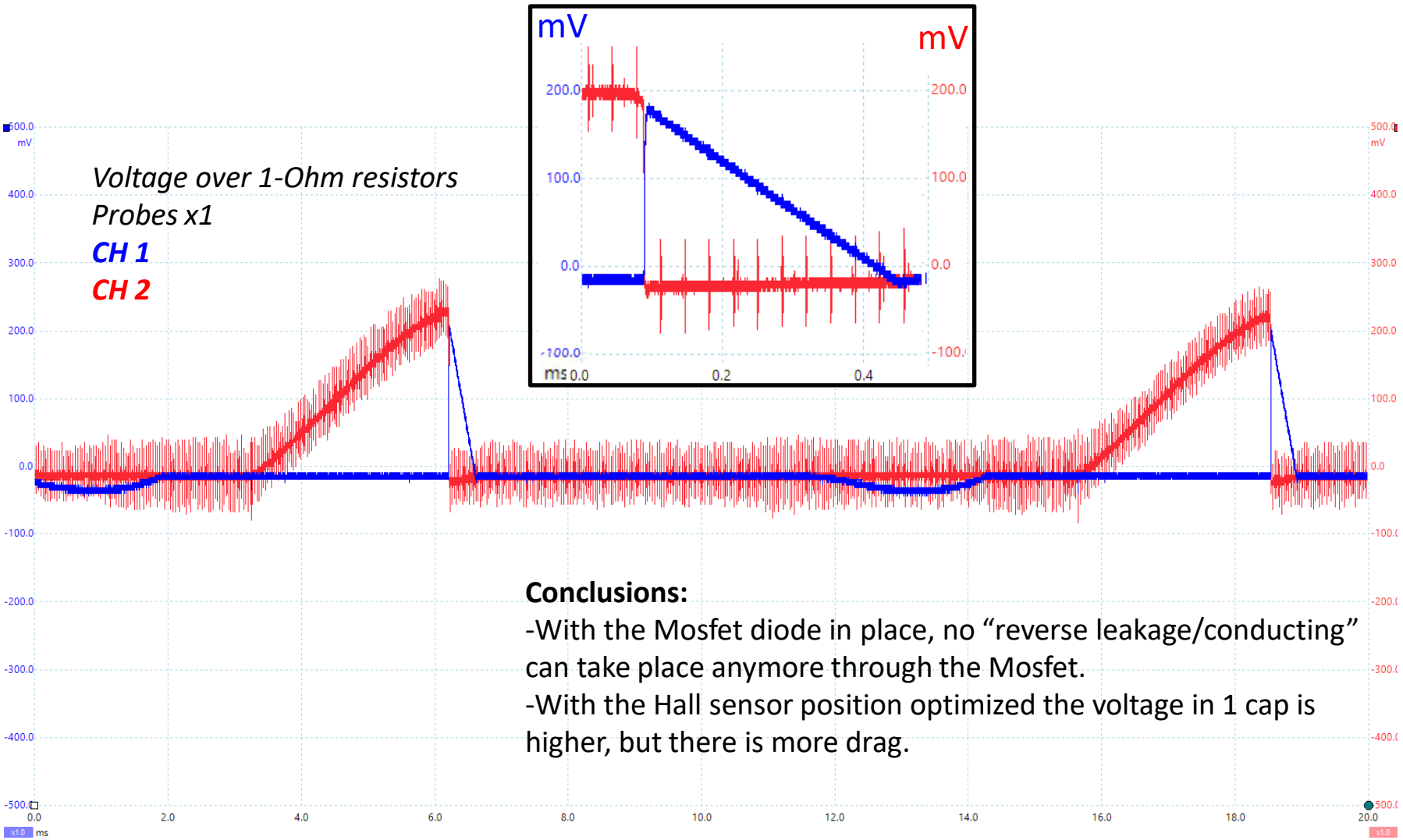


Caps: 400V, 100uF
Diodes: 1N4007
Hall Effect sensor:
Honeywell – SS443A
Mosfet: IRFP260NPBF

Hall circuit connected, with diode



Test: *How does the Hall signal vs Coil signal look, in relation to: 2021-02-28 1.6 Hall circuit connected and active, diode Hall sensor pos. optimized for max voltage (in 1 cap), 2 cap connected*



Conclusions:

-With the Mosfet diode in place, no “reverse leakage/conducting” can take place anymore through the Mosfet.

-With the Hall sensor position optimized the voltage in 1 cap is higher, but there is more drag.

2021-03-07 Test 1, Sheet 1 of 5
Hall sensor, with 10k Ohm load, 2mm coil gap, x10 probes
Test: *How does the Hall signal vs Coil signal look, in relation to (withUF4007 diodes instead of 1N4007 diodes):*

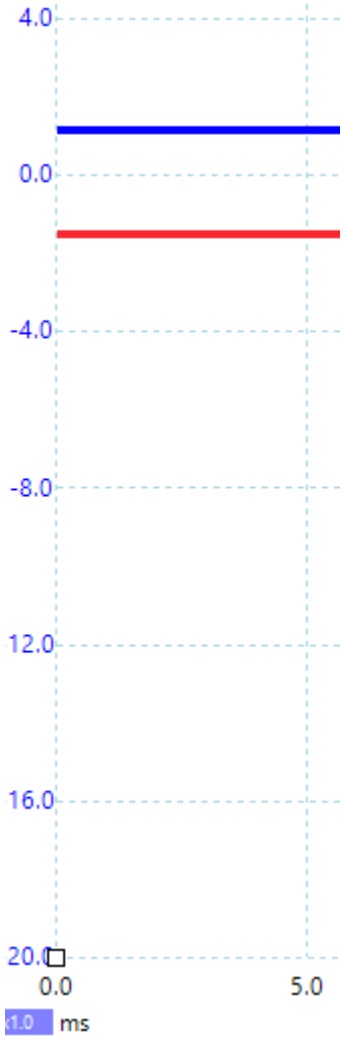
1.1 Hall circuit connected but not active, UF4007 diodes, Hall sensor pos. left as per 2021-02-28 test 1.5, 2 cap connected.* Sheet 2 & 3 of 5

1.2 Hall circuit connected and active, UF4007 diodes Hall sensor pos. left as per 2021-02-28 test 1.5, 2 cap connected.* Sheet 4 & 5 of 5

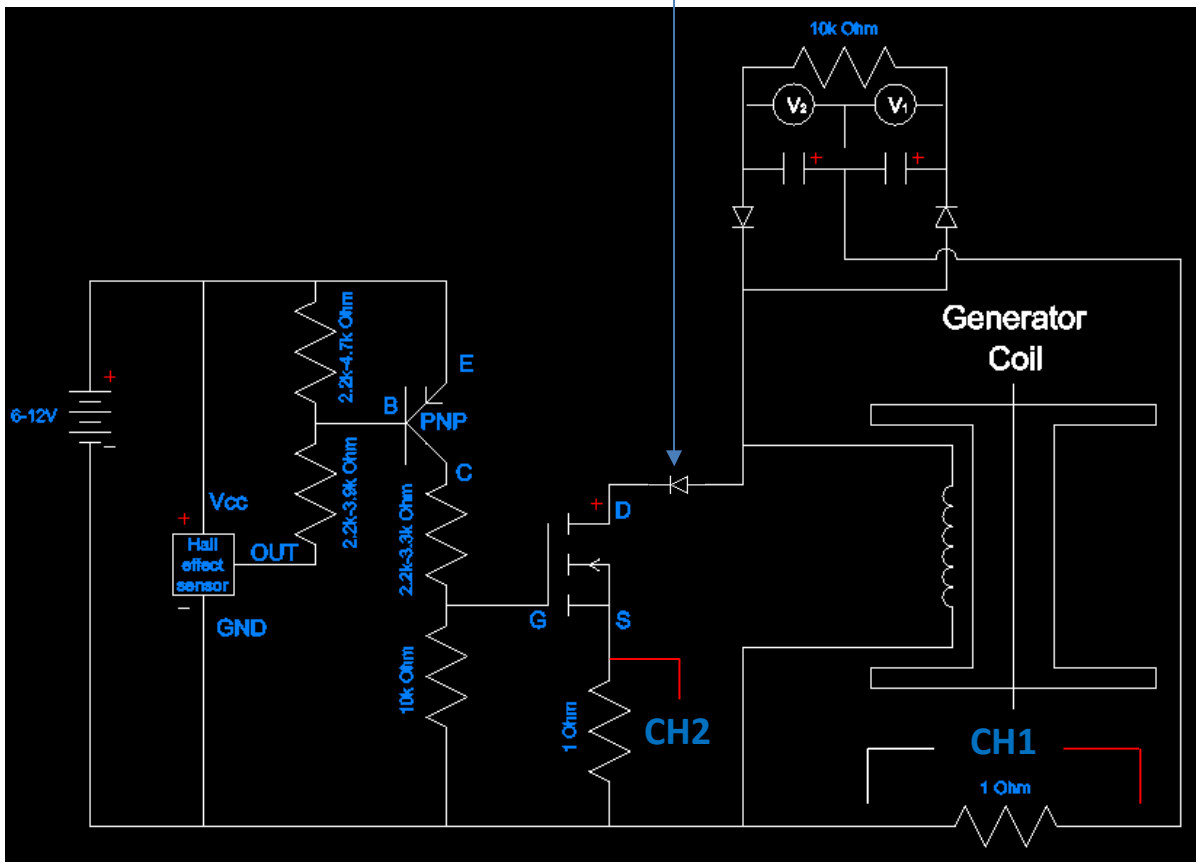
**This is pos. optimized for max voltage (in 1 cap), as per 2021-02-28 test 1.5.*

Test: *How does the Hall signal vs Coil signal look, in relation to (withUF4007 diodes instead of 1N4007 diodes):*
2021-03-07 1.1 Hall circuit connected but not active, diode, Hall sensor pos. left in same as previous, 2 cap connected

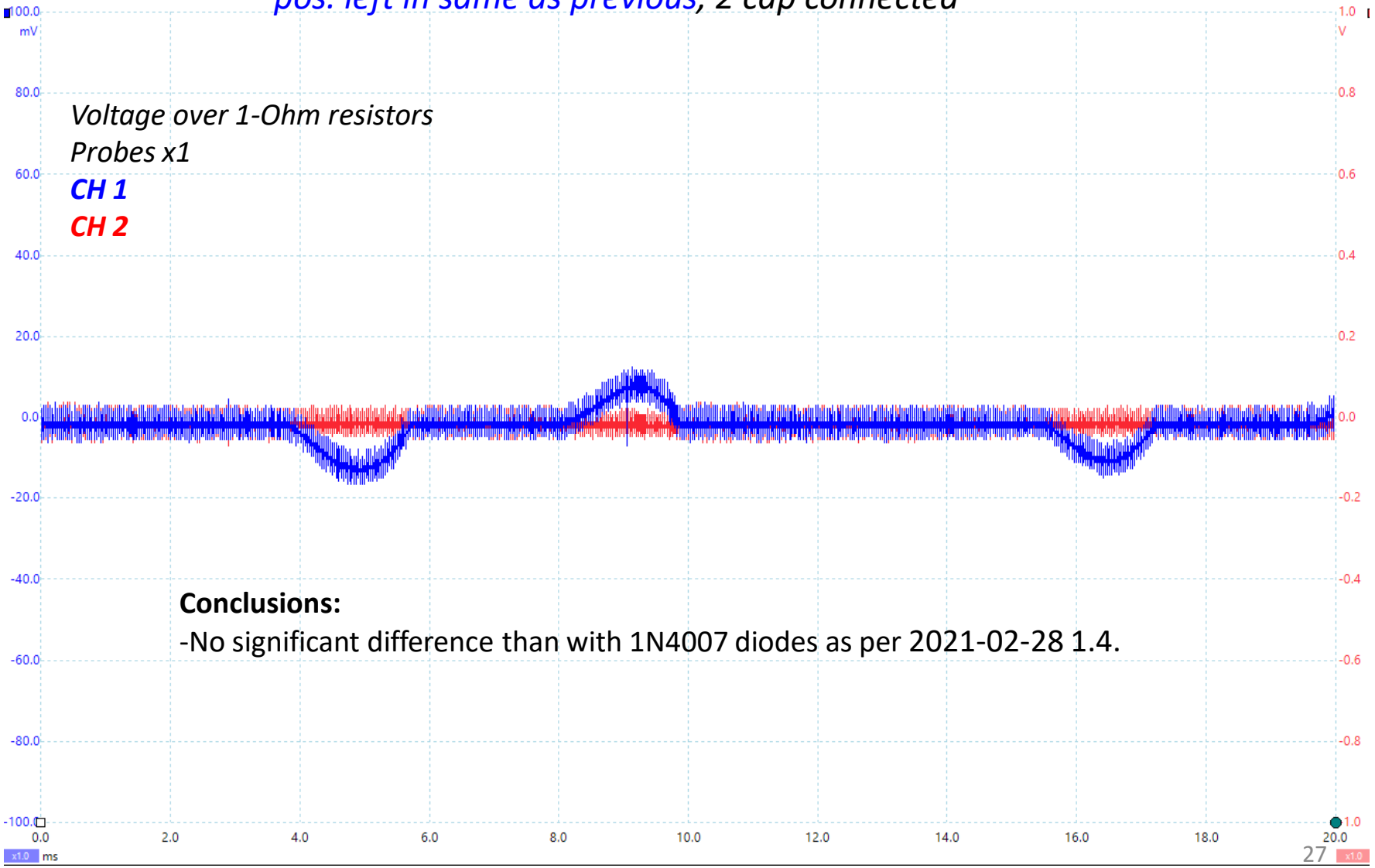
Caps: 400V, 100uF
Diodes: **UF4007**
Hall Effect sensor:
Honeywell – SS443A
Mosfet: IRFP260NPBF



Hall circuit connected, with diode



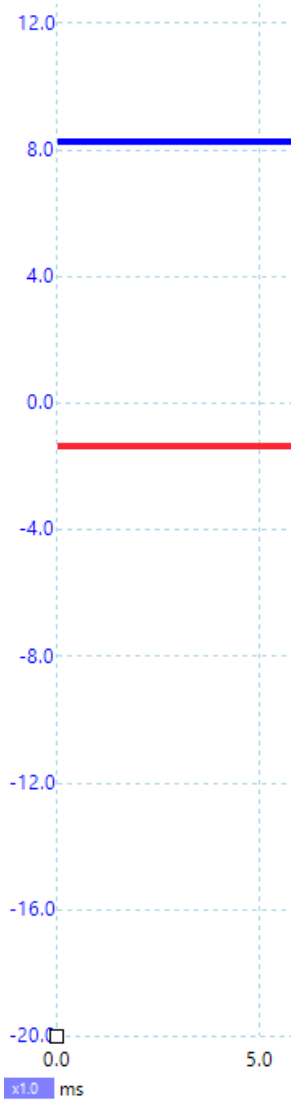
Test: *How does the Hall signal vs Coil signal look, in relation to (withUF4007 diodes instead of 1N4007 diodes):*
2021-03-07 1.1 Hall circuit connected but not active, diode, Hall sensor pos. left in same as previous, 2 cap connected



Conclusions:

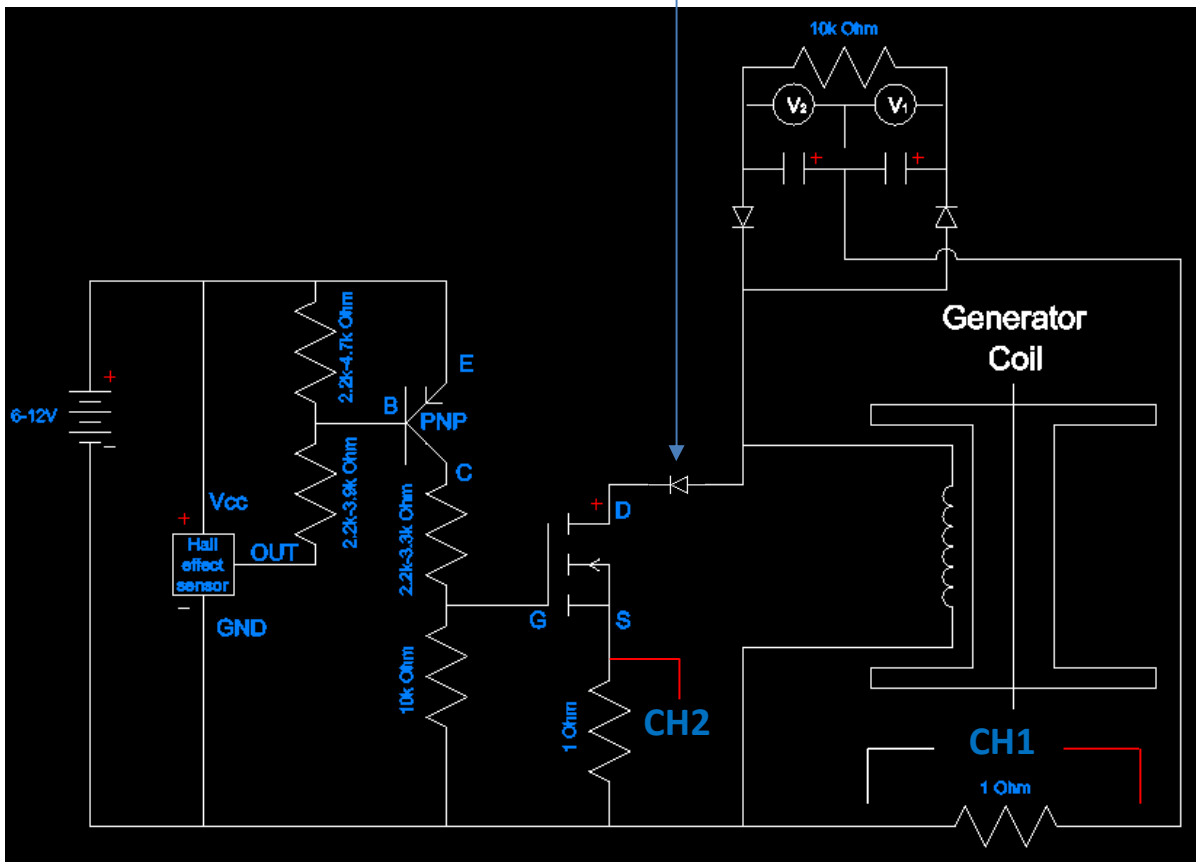
-No significant difference than with 1N4007 diodes as per 2021-02-28 1.4.

Test: *How does the Hall signal vs Coil signal look, in relation to (withUF4007 diodes instead of 1N4007 diodes):*
2021-03-07 1.2 Hall circuit connected and active, UF4007 diodes Hall sensor pos. left as per 2021-02-28 test 1.5, 2 cap connected.

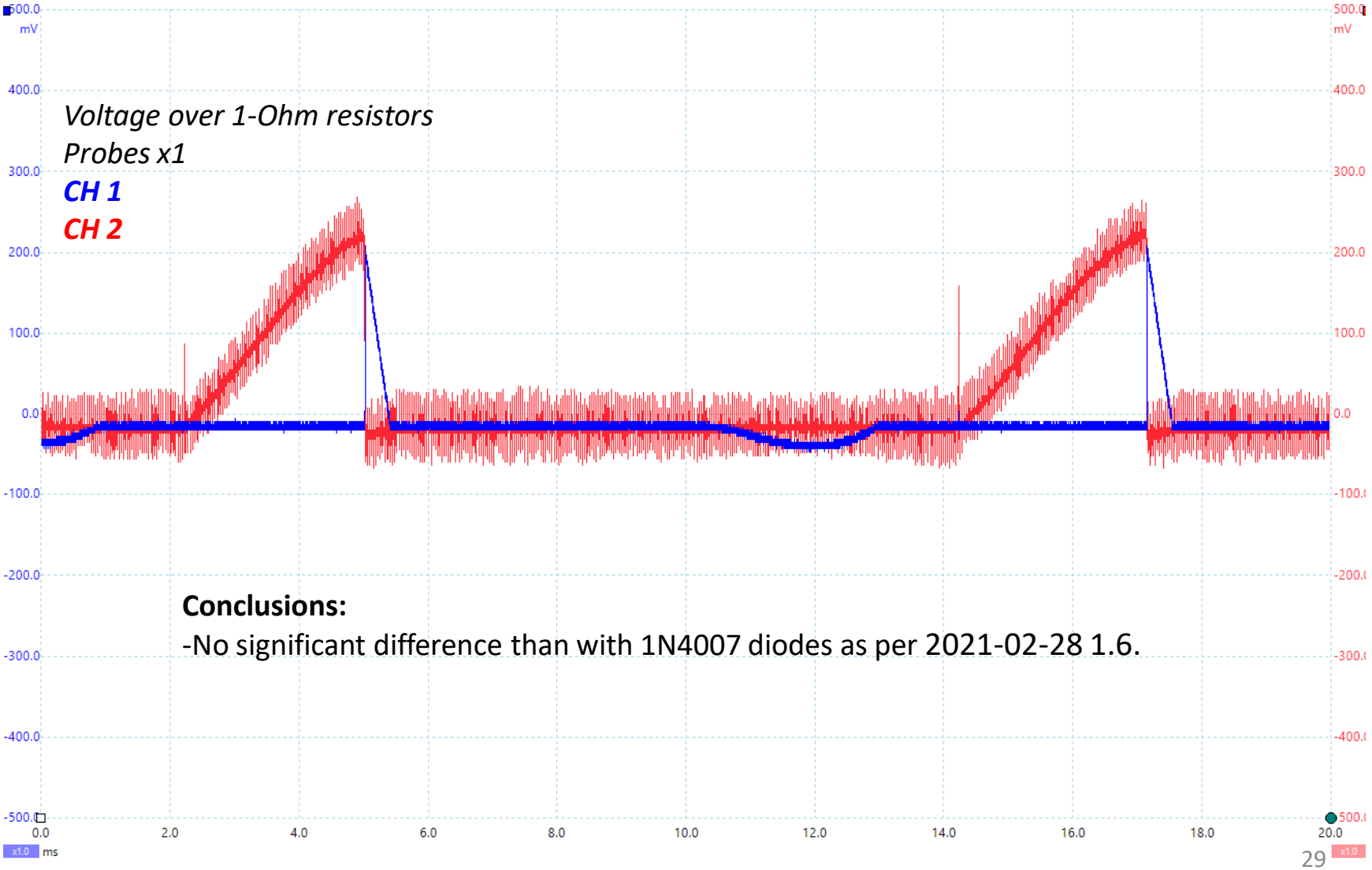


Caps: 400V, 100uF
Diodes: **UF4007**
Hall Effect sensor:
Honeywell – SS443A
Mosfet: IRFP260NPBF

Hall circuit connected, with diode



Test: *How does the Hall signal vs Coil signal look, in relation to (withUF4007 diodes instead of 1N4007 diodes):*
2021-03-07 1.2 Hall circuit connected and active, UF4007 diodes Hall sensor pos. left as per 2021-02-28 test 1.5, 2 cap connected.



Conclusions:

-No significant difference than with 1N4007 diodes as per 2021-02-28 1.6.

2021-01-25 Test 1, Sheet 1 of 3

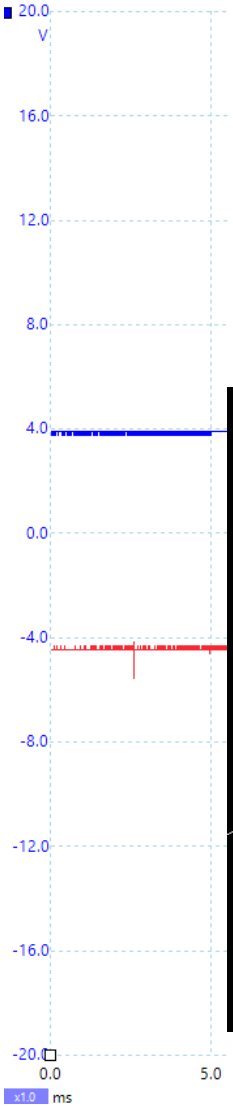
Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes

Test: *How does the Reed signal looks, in relation to:*

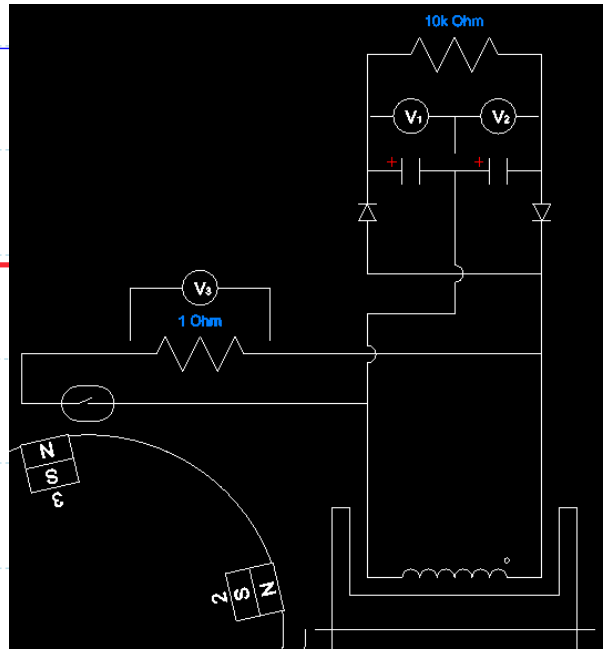
1.1 reed position optimized for max voltage in 2 cap

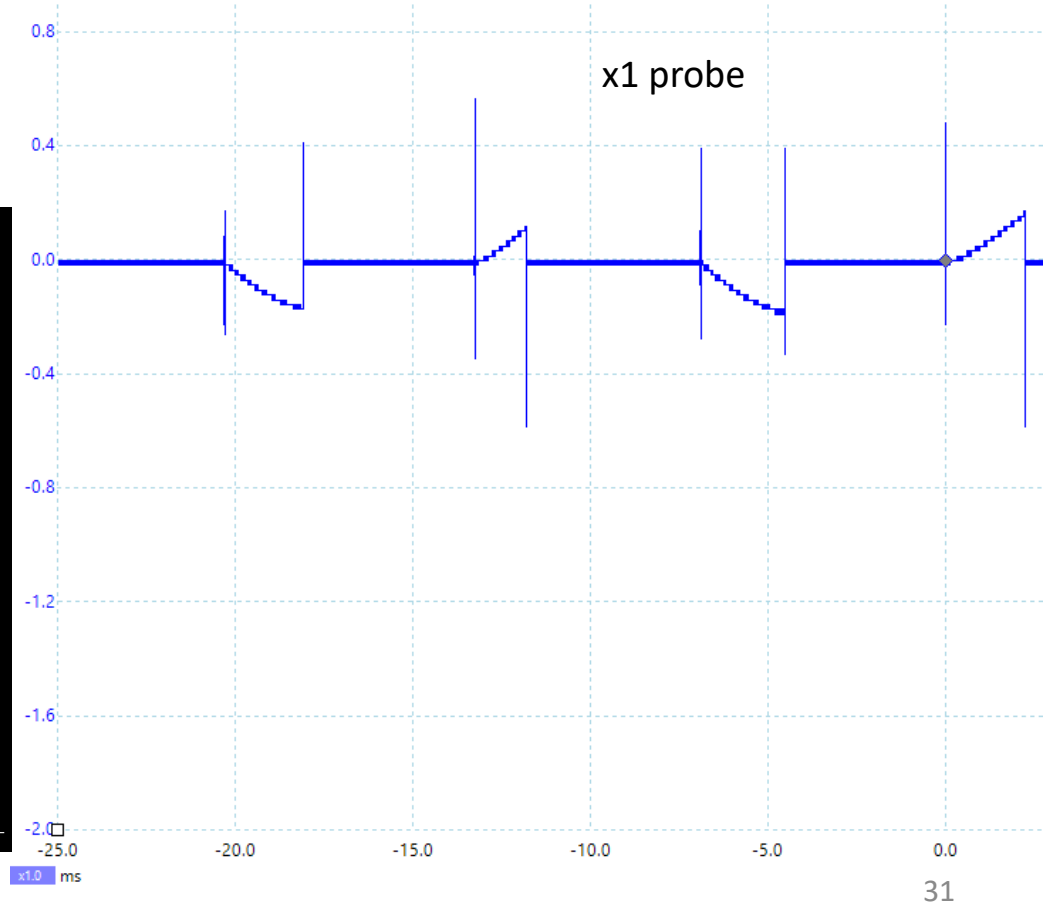
1.2 reed position optimized for max voltage in 1 cap (2 caps connected)

1.3 reed position optimized for max voltage in 1 cap (1 cap connected)



Cap: 400V, 100uF
Diode: 1N4007
Reed Switch: Assemtech - GC2314 (15-25AT)





2021-01-25 Test 1, Sheet 2 of 3

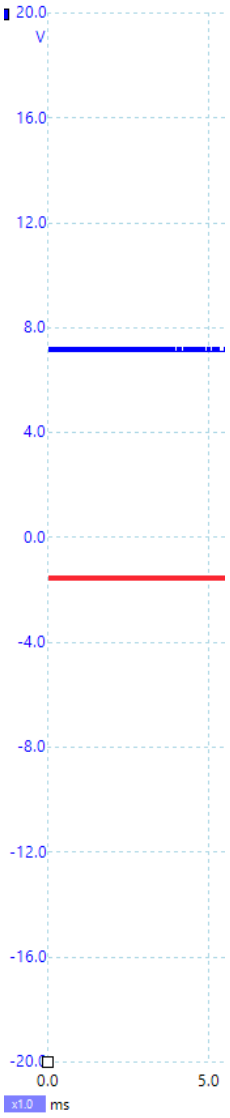
Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes

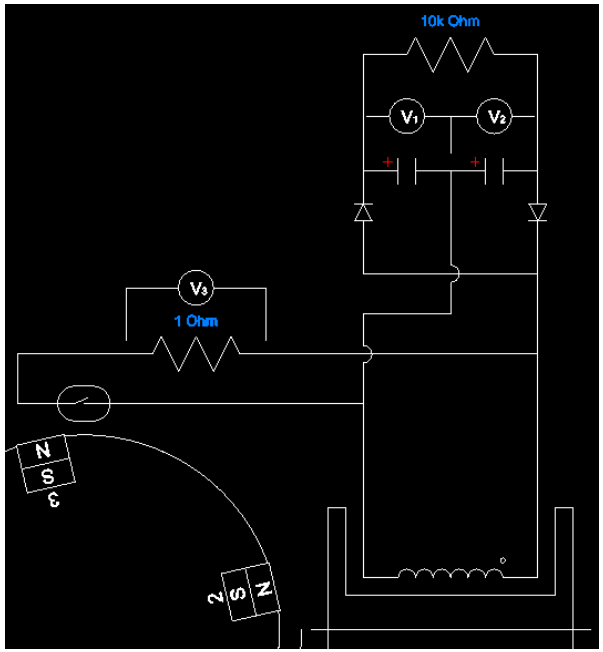
Test: *How does the Reed signal looks, in relation to:*

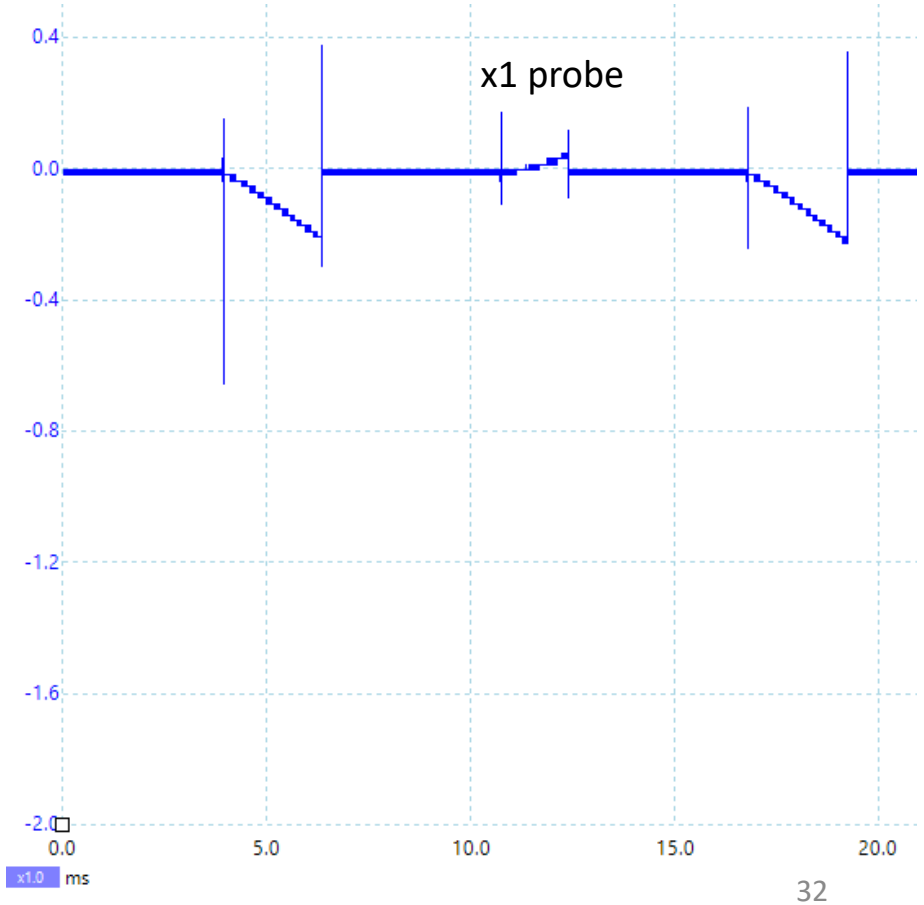
1.1 reed position optimized for max voltage in 2 cap

1.2 reed position optimized for max voltage in 1 cap (2 caps connected)

1.3 reed position optimized for max voltage in 1 cap (1 cap connected)







2021-01-25 Test 1, Sheet 3 of 3

Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes

Test: *How does the Reed signal looks, in relation to:*

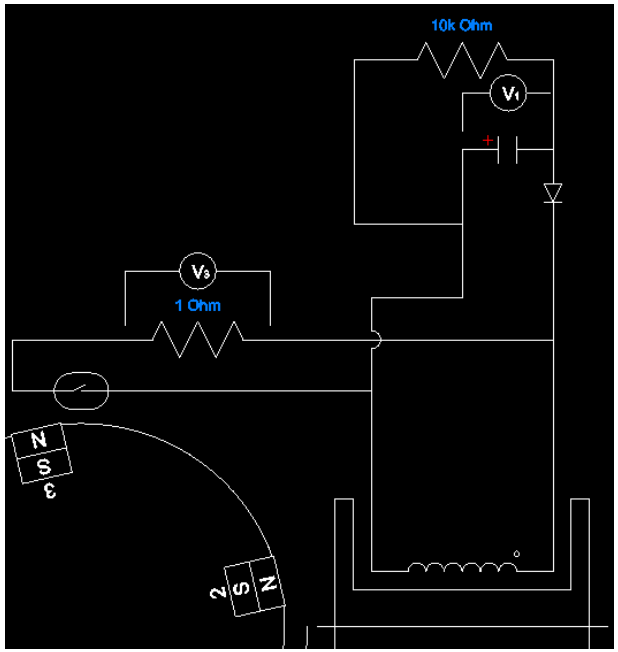
1.1 reed position optimized for max voltage in 2 cap

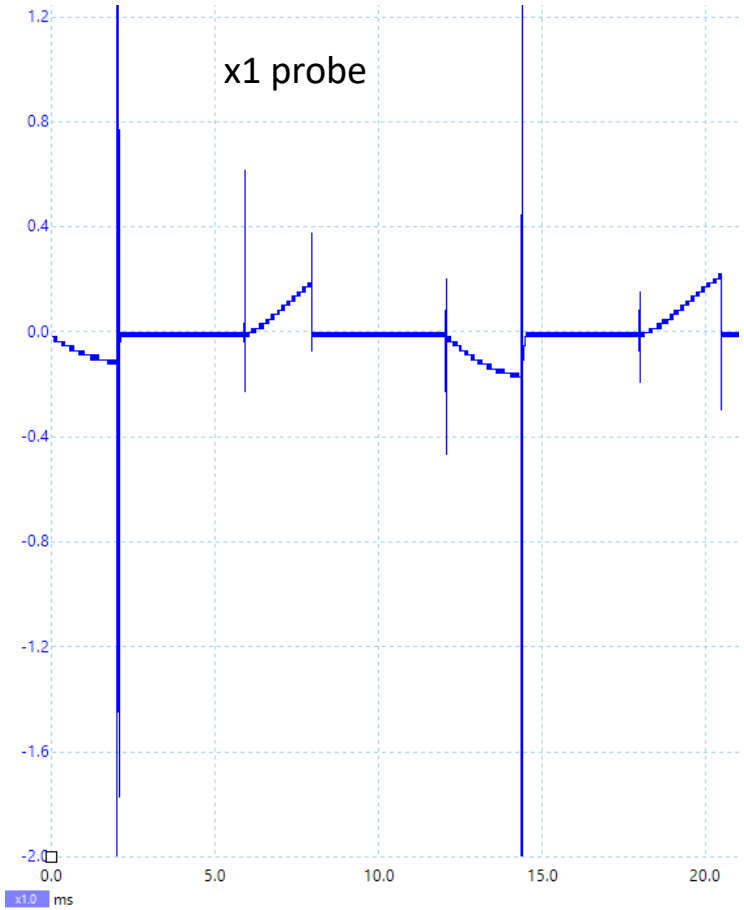
1.2 reed position optimized for max voltage in 1 cap (2 caps connected)

1.3 reed position optimized for max voltage in 1 cap (1 cap connected)

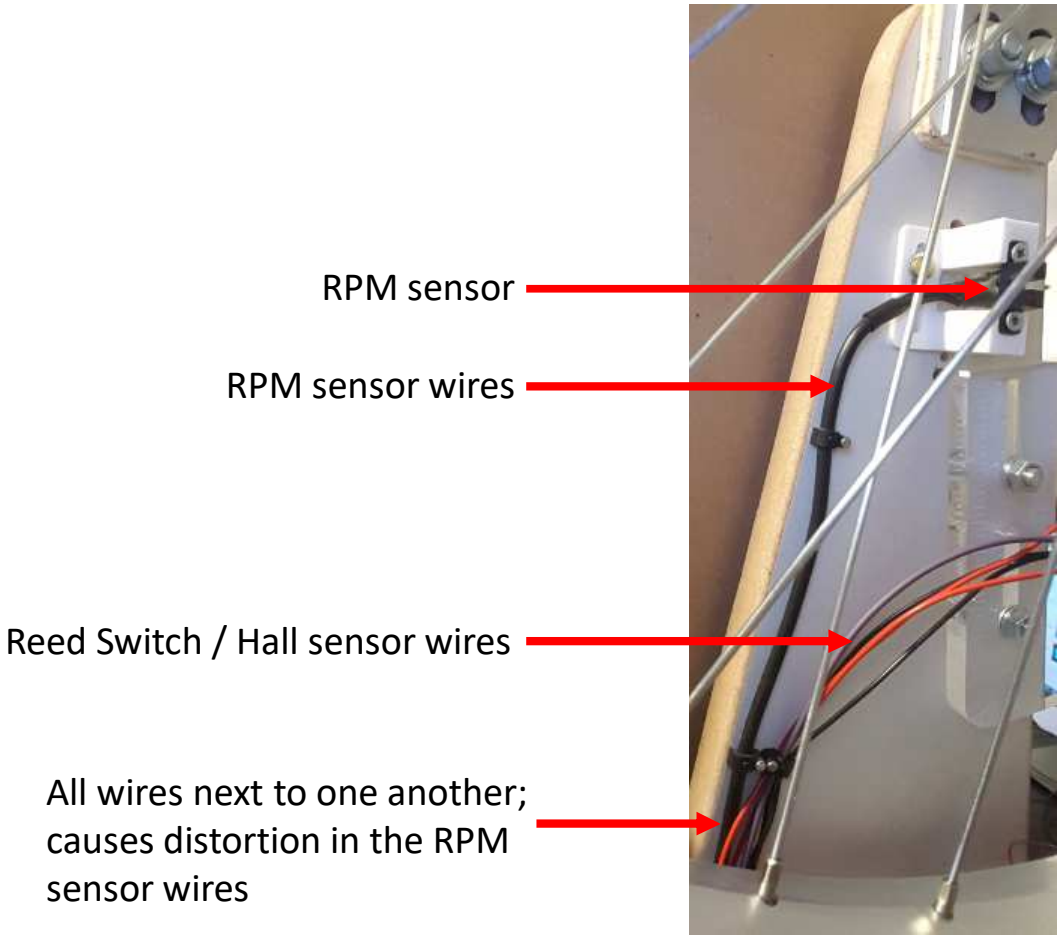
Conclusions:

-When only 1 capacitor is connected uncaptured spikes get very high and interfere with nearby wires of other devices





2021-01-26 Test 1**,** Sheet 1 of 3
Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes
Test: *Does distortion in RPM wires, caused by Reed switch coil shortening only take place if 1 capacitor is connected, or also if 2 coils are connected?*



2021-01-26 Test 1**,** Sheet 2 of 3

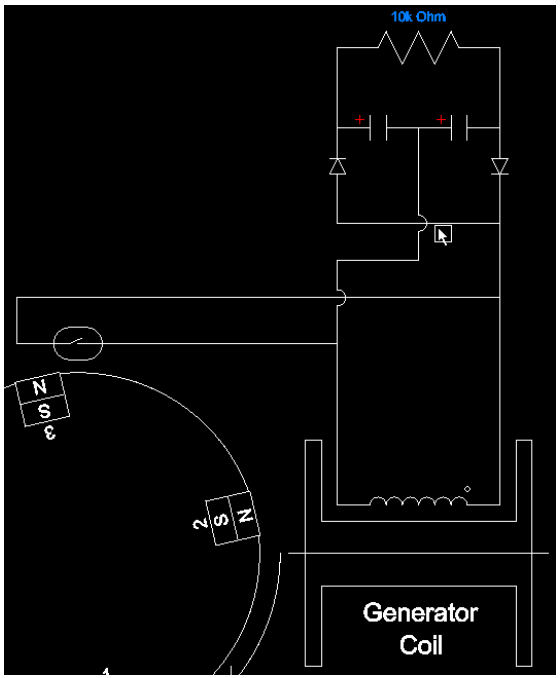
Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes

Test: *Does distortion in RPM wires, caused by Reed switch coil shortening only take place if 1 cap is connected, or also if 2 caps are connected?*

2 Capacitor circuit

Reed Switch OFF

Reed Switch ON



2021-01-26 Test 1**,** Sheet 3 of 3

Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes

Test: *Does distortion in RPM wires, caused by Reed switch coil shortening only take place if 1 capacitor is connected, or also if 2 coils are connected?*

Conclusions:

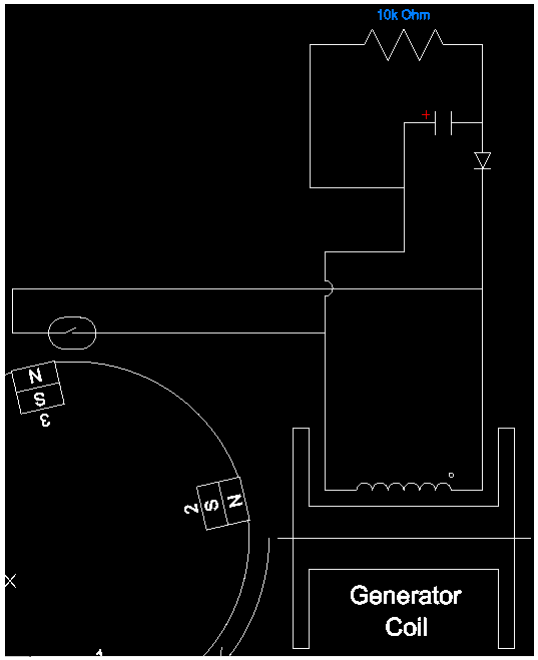
-When 2 capacitors are connected, no interference with RPM signals

-When only 1 capacitor is connected (uncaptured) spikes interfered with RPM signal

Reed Switch OFF

Reed Switch ON

1 Capacitor circuit



2021-01-26 Test 2, Sheet 1 of 6

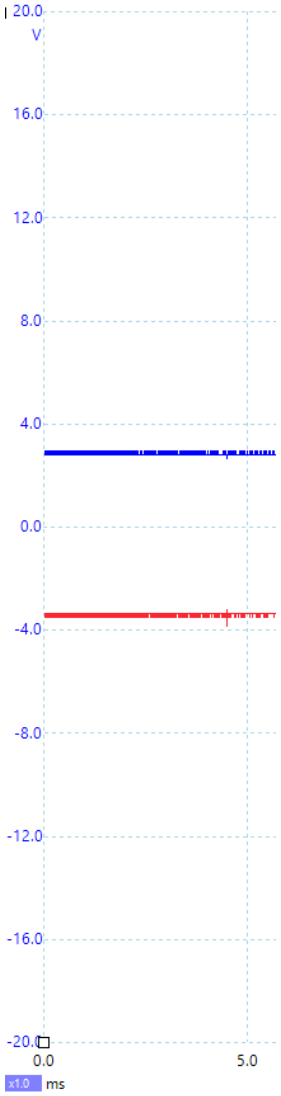
Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes

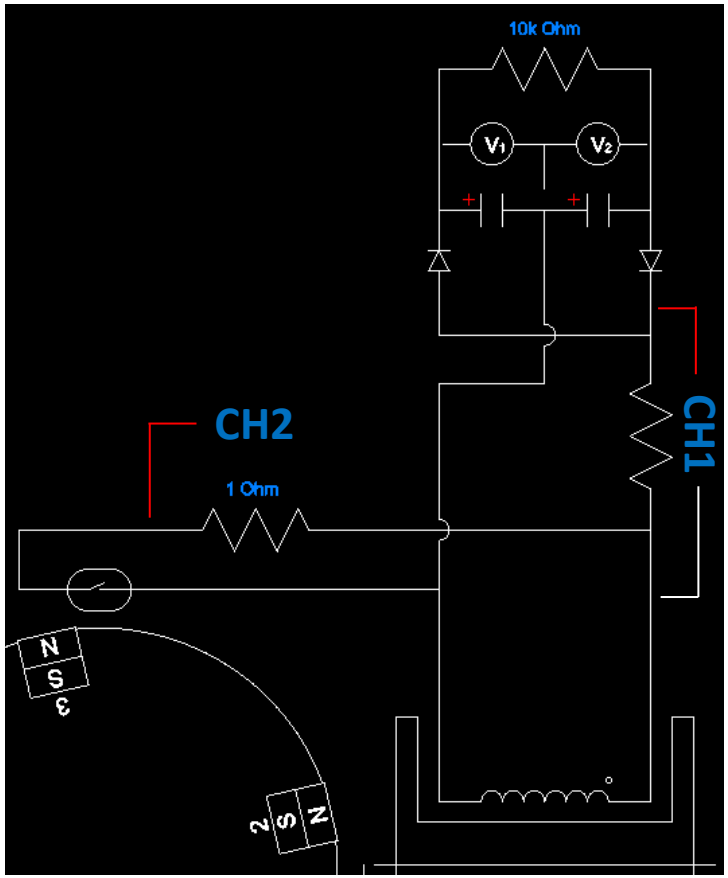
Test: *How does the Reed signal vs Coil signal look, in relation to:*

2.1 reed position optimized for max voltage in 2 cap

2.2 reed position optimized for max voltage in 1 cap (2 caps connected)

2.3 reed position optimized for max voltage in 1 cap (1 cap connected)





2021-01-26 Test 2, Sheet 2 of 6

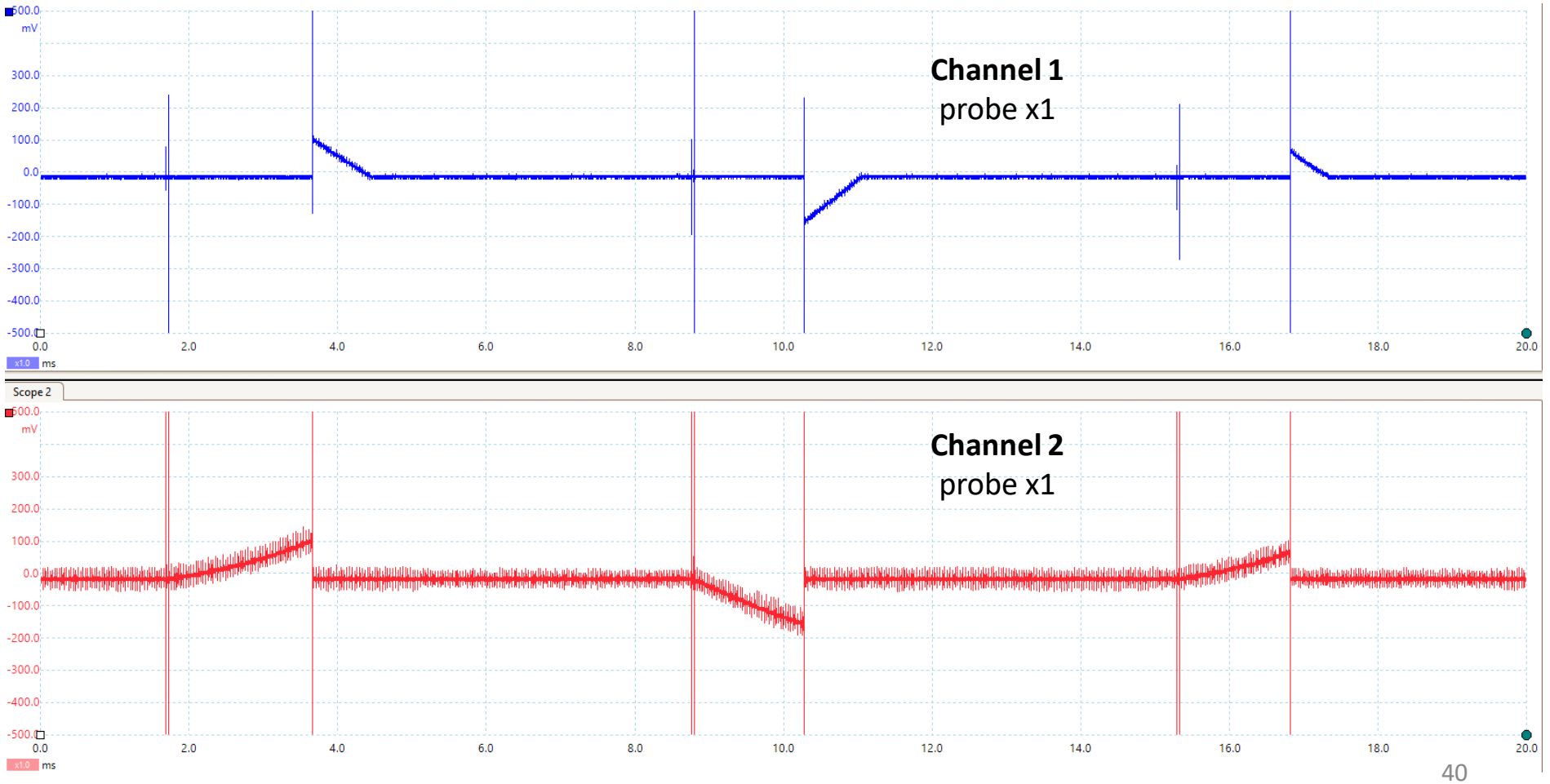
Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes

Test: *How does the Reed signal vs Coil signal look, in relation to:*

2.1 reed position optimized for max voltage in 2 cap

2.2 reed position optimized for max voltage in 1 cap (2 caps connected)

2.3 reed position optimized for max voltage in 1 cap (1 cap connected)



2021-01-26 Test 2, Sheet 3 of 6

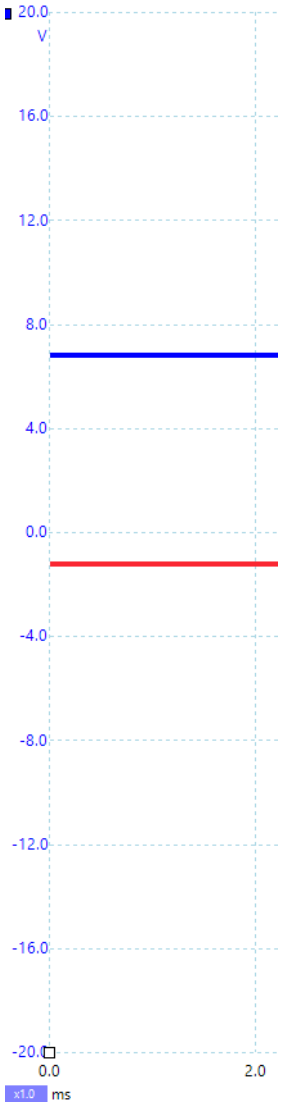
Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes

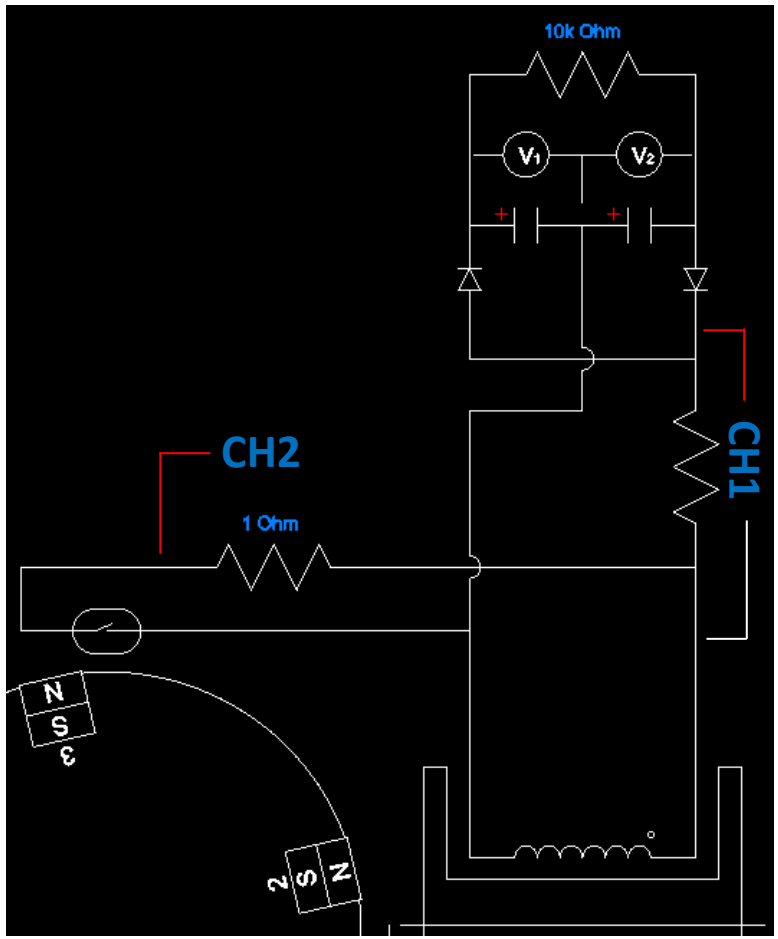
Test: *How does the Reed signal vs Coil signal look, in relation to:*

2.1 reed position optimized for max voltage in 2 cap

2.2 reed position optimized for max voltage in 1 cap (2 caps connected)

2.3 reed position optimized for max voltage in 1 cap (1 cap connected)





2021-01-26 Test 2, Sheet 4 of 6

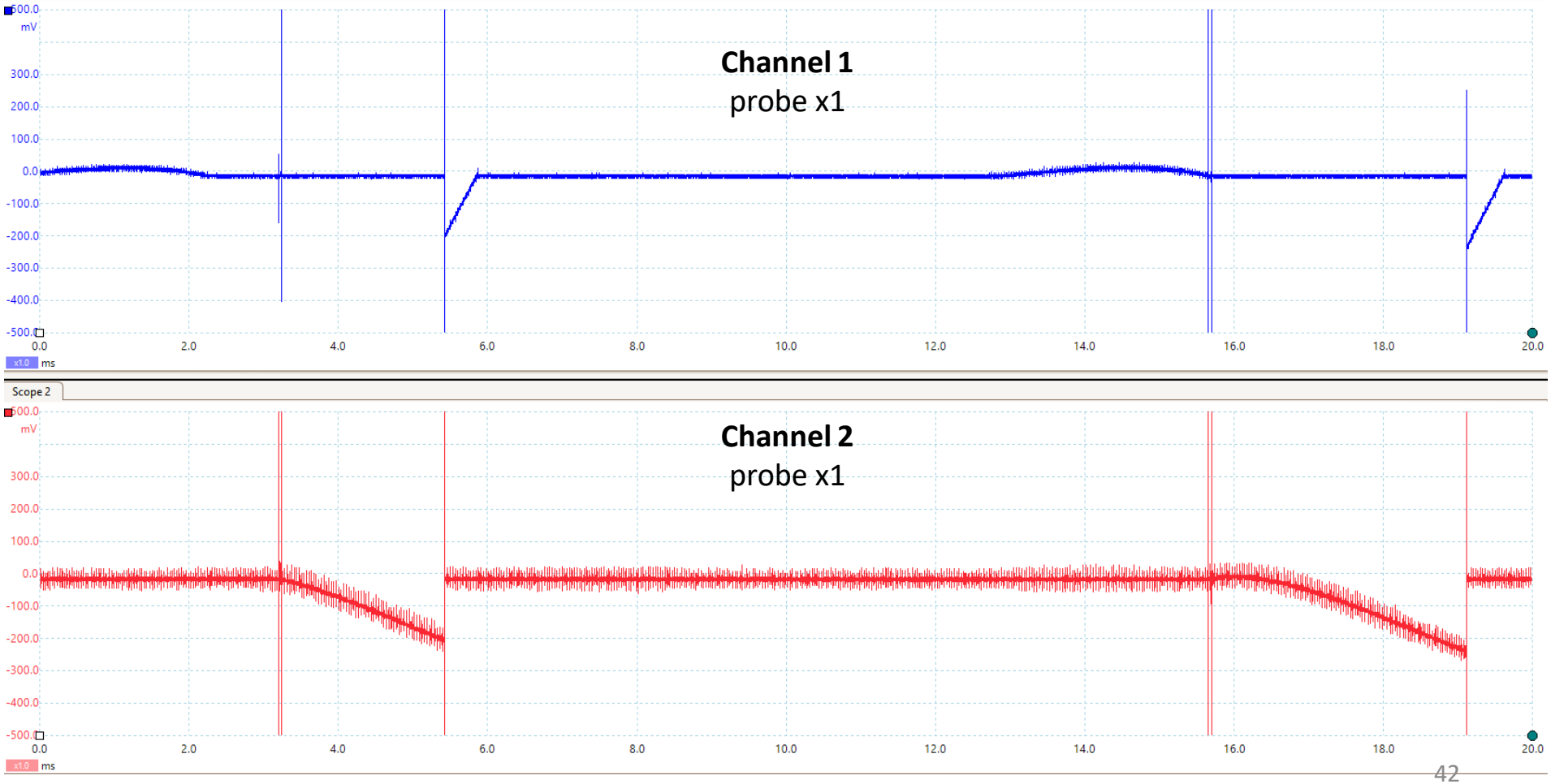
Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes

Test: *How does the Reed signal vs Coil signal look, in relation to:*

2.1 reed position optimized for max voltage in 2 cap

2.2 reed position optimized for max voltage in 1 cap (2 caps connected)

2.3 reed position optimized for max voltage in 1 cap (1 cap connected)



2021-01-26 Test 2, Sheet 5 of 6

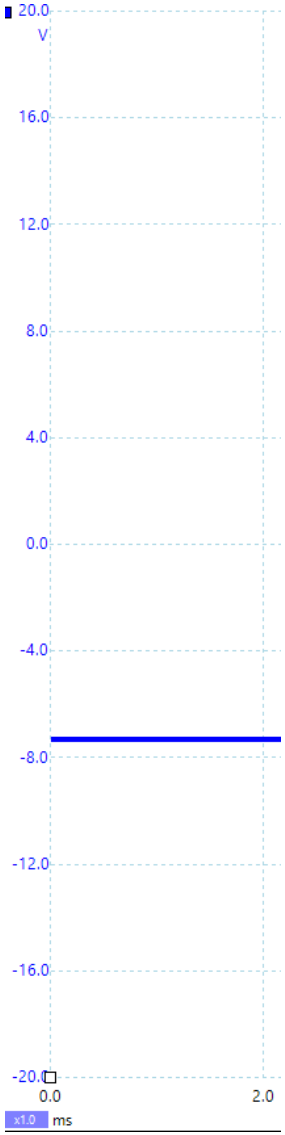
Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes

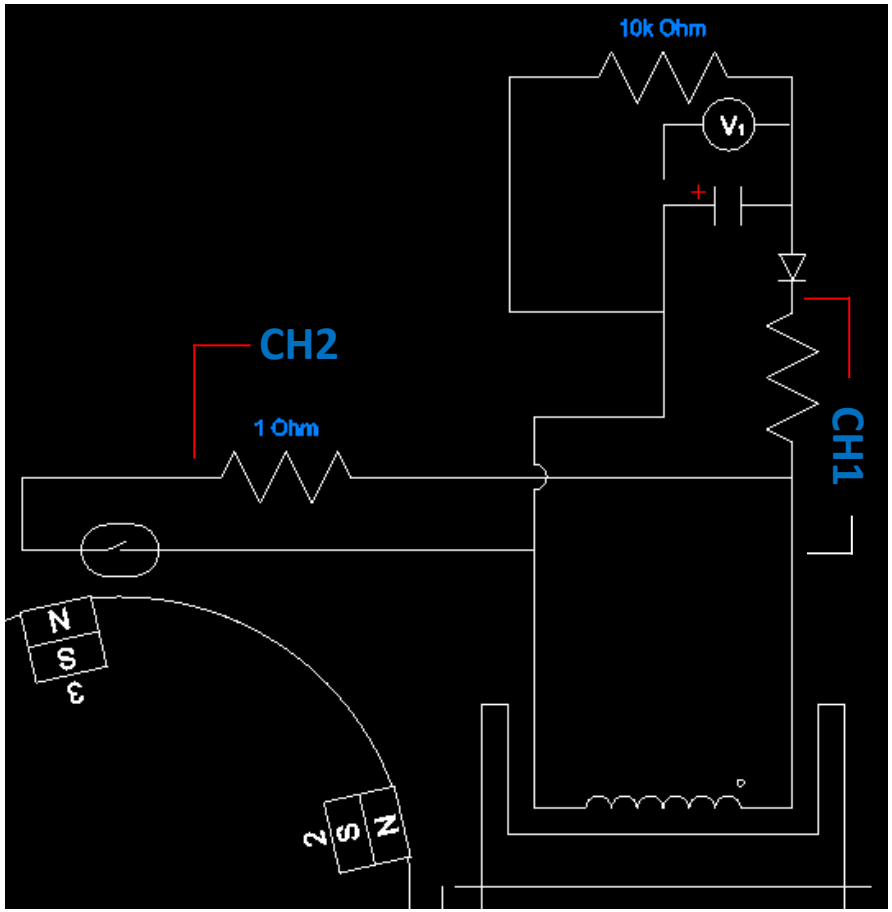
Test: *How does the Reed signal vs Coil signal look, in relation to:*

2.1 reed position optimized for max voltage in 2 cap

2.2 reed position optimized for max voltage in 1 cap (2 caps connected)

2.3 reed position optimized for max voltage in 1 cap (1 cap connected)





2021-01-26 Test 2, Sheet 6 of 6

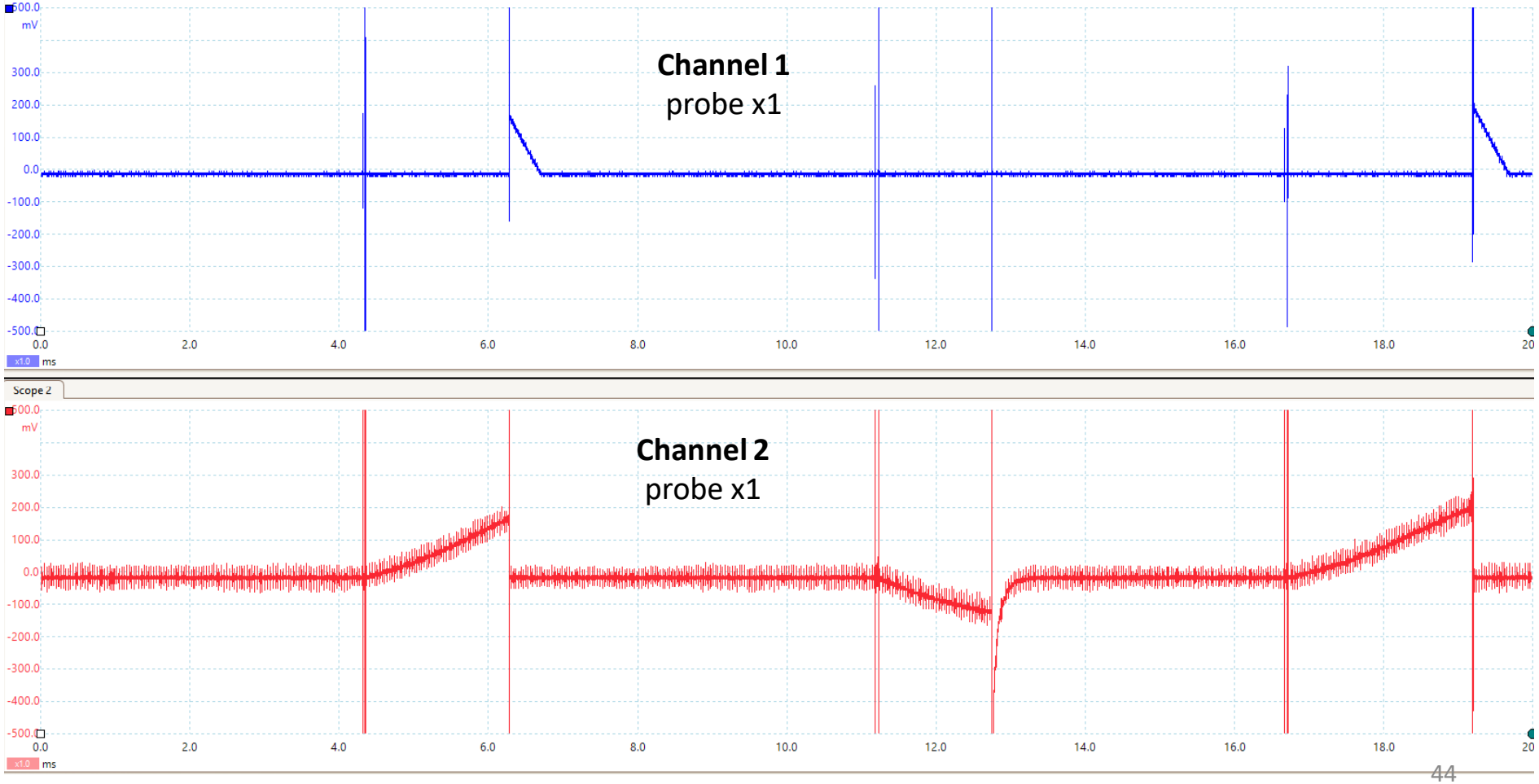
Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes

Test: *How does the Reed signal vs Coil signal look, in relation to:*

2.1 reed position optimized for max voltage in 2 cap

2.2 reed position optimized for max voltage in 1 cap (2 caps connected)

2.3 reed position optimized for max voltage in 1 cap (1 cap connected)

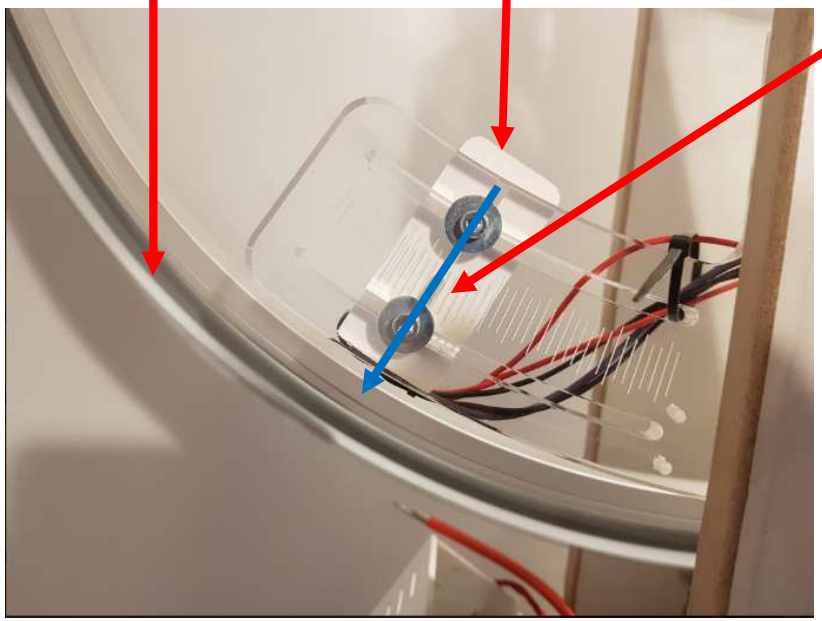


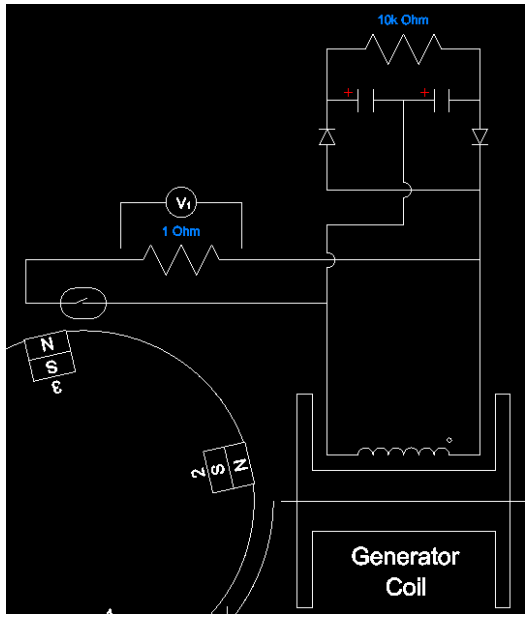
2021-01-26 Test 3, Sheet 1 of 2
Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes
Test: *How does the signal change if I bring the reed Switch closer to the magnets.*

Position of magnets on rotor

For this test I moved the bracket in this direction, closer to the magnets

Bracket with Reed switch /Hall sensor



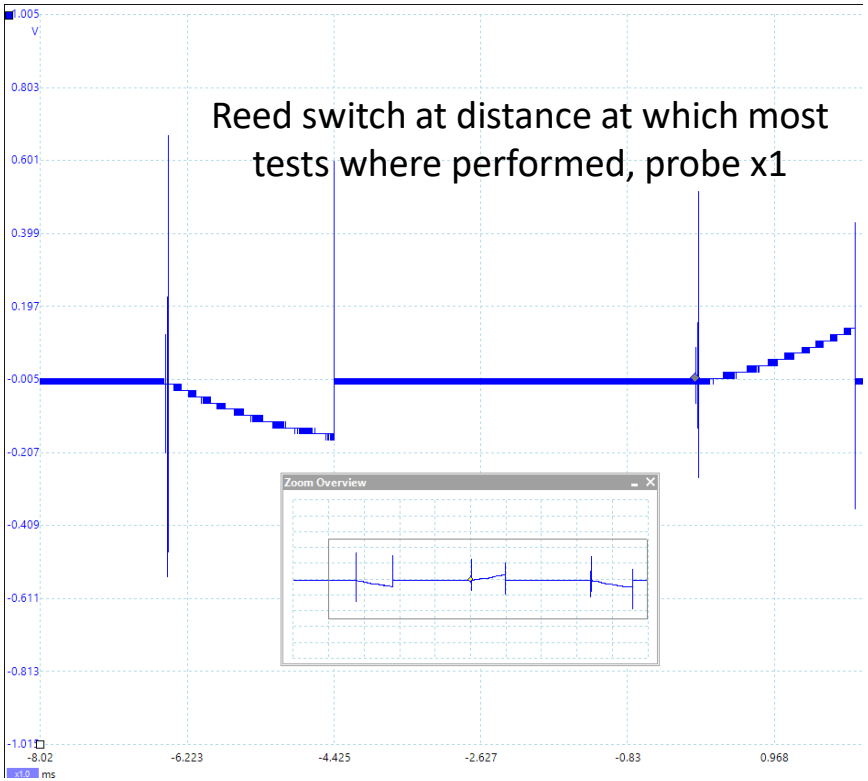


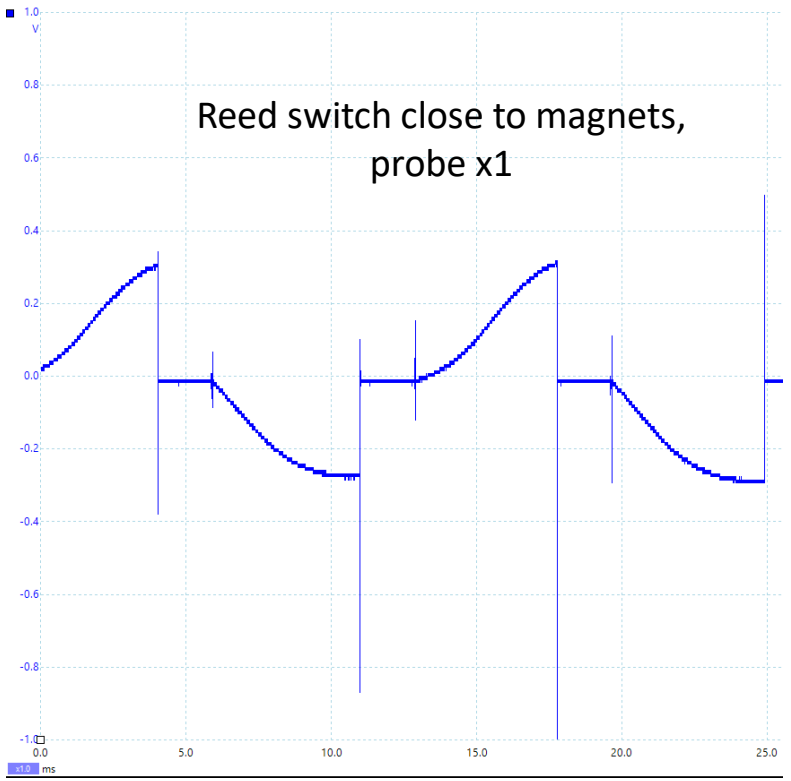
2021-01-26 Test 3, Sheet 2 of 2
Reed Switch, with 10k Ohm load, 2mm coil gap, x10 probes
Test: *How does the signal change if I bring the reed Switch closer to the magnets.*

Conclusions:

-When Reed is brought closer to magnets, amplitude of signal increases, RPMs drop, voltage in capacitors increases.

-If Reed is brought too close to the magnets for too long, it fails: it doesn't open anymore. So fix this the reed need to be moved away from the rotor and tapped lightly (e.g. with a screwdriver)



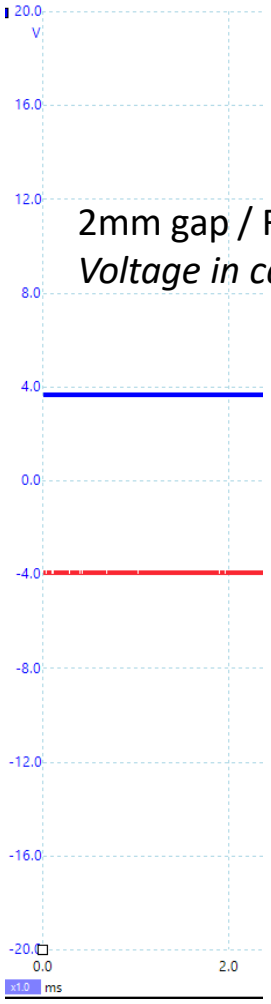


2021-01-26 Test 4, Sheet 1 of 3

Test: *How does the reed switch signal looks when zooming in on the spikes*

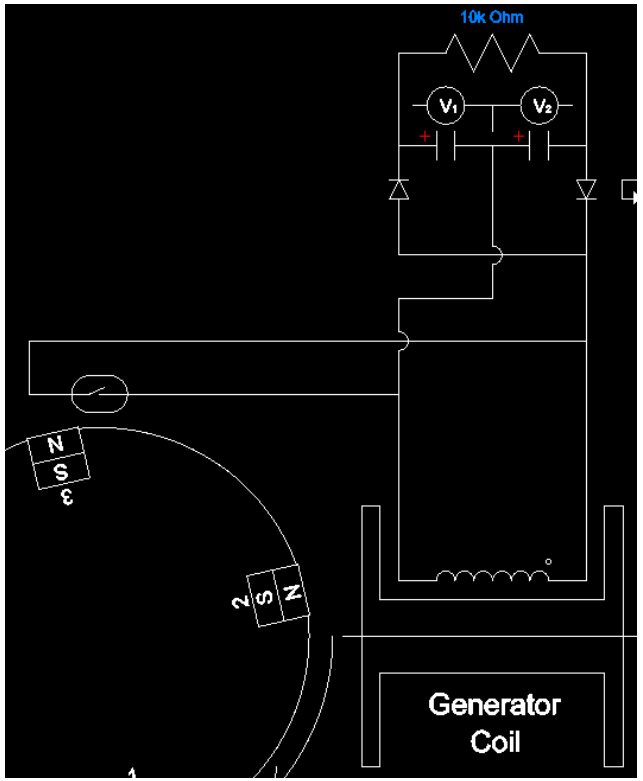
Setup

Before looking a the reed signal I first optimized the reed position for max voltage in 2 caps, without causing too much drag on the rotor.



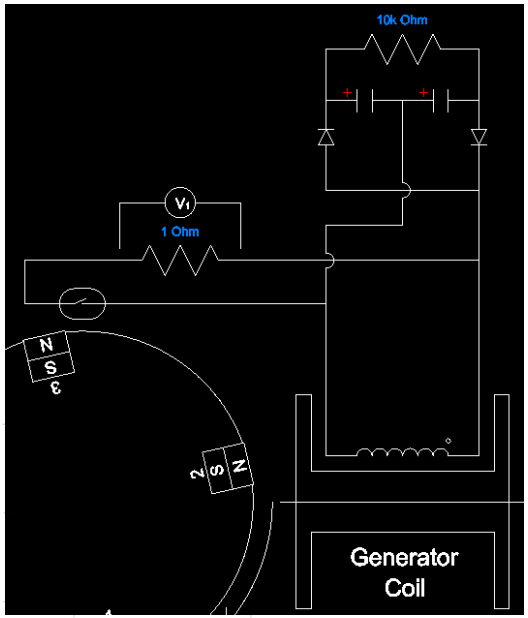
2mm gap / Reed Switch / x10 probes

Voltage in caps, Reed active



2021-01-26 Test 4, Sheet 2 of 3

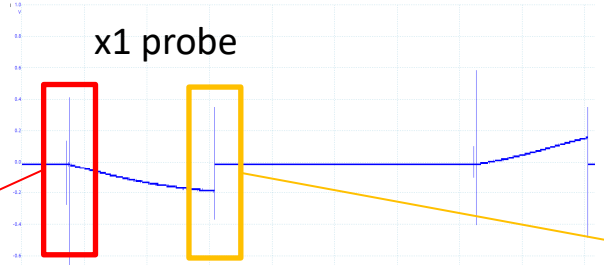
Test: *How does the reed switch signal looks when zooming in on the spikes*

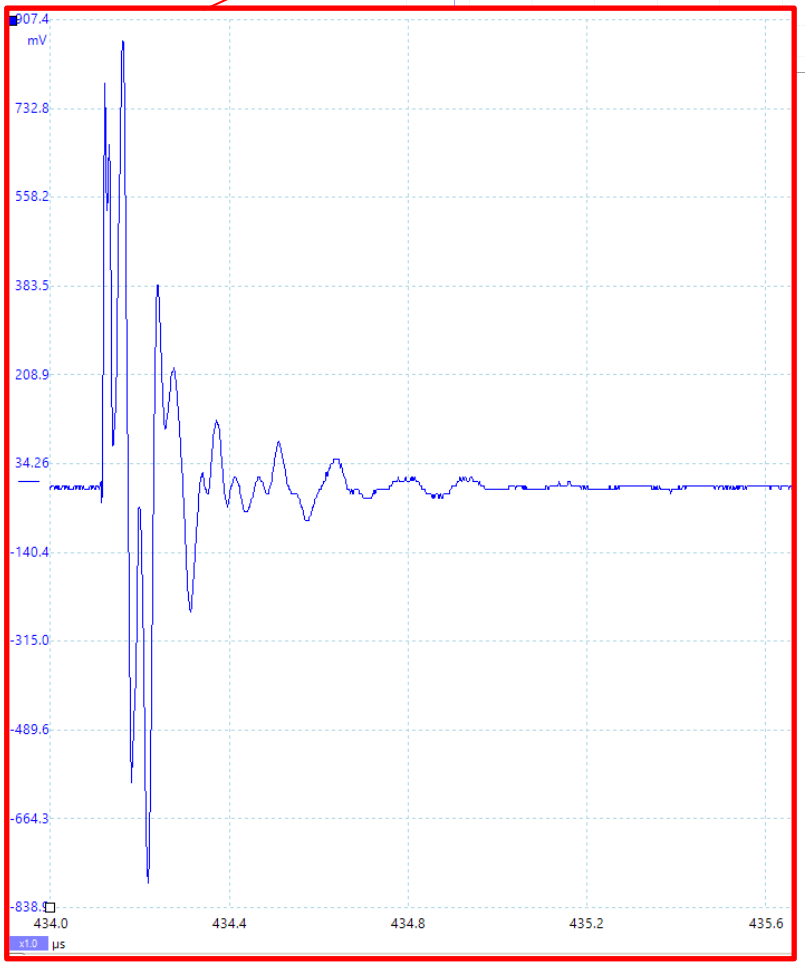


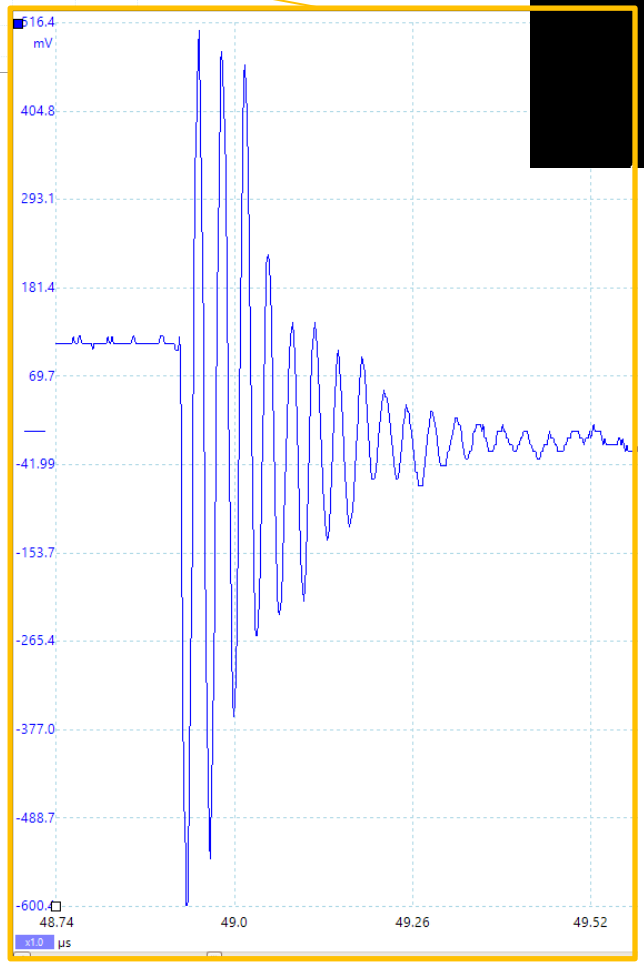
x1 probe

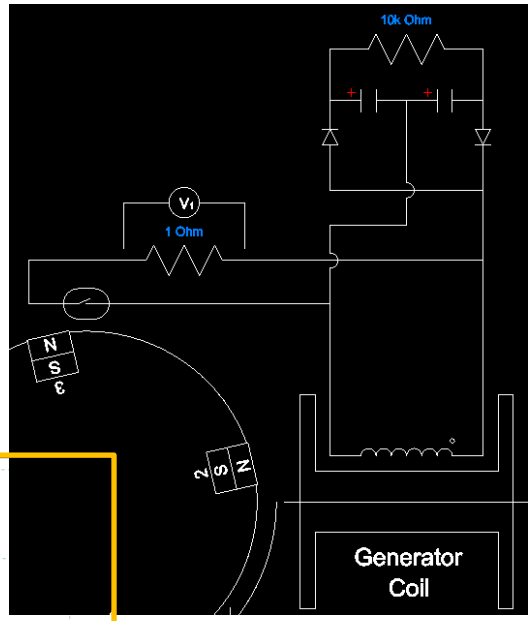
2021-01-26 Test 4, Sheet 3 of 3

Test: *How does the reed switch signal looks when zooming in on the spikes*









Overal Conclusions:

Traces of Reed v.s. Mosfet

When looking close up at the (spike) traces from the Reed switch (2021-01-26 Test 4) and the Mosfet (2021-02-28 Test 1.x), the Mosfet doesn't show anything out of the ordinary, while the Reed switch shows a trace which looks like "coil ringing". This "coils ringing" trace can also be observed while looking close up at the traces from the SG circuitry itself.

For a follow-up test it might be interesting to see how the capacitors charge and the drag on the rotor behaves, if during the part of the cycle where the coil is being charged/short circuited, a second discharge/break would take place.

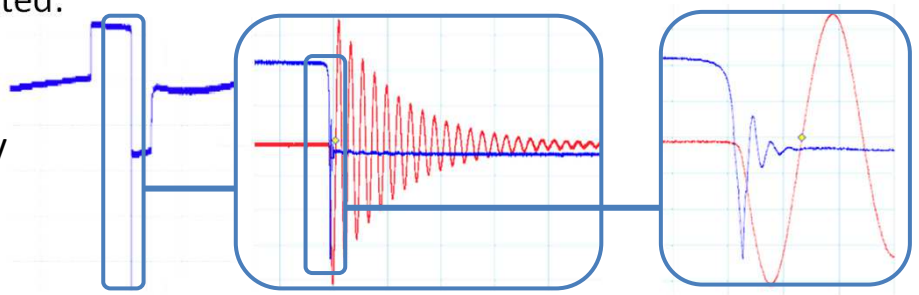
Further more, I'm curious to see how the close up trace would look like if instead of a Mosfet a Transistor is being used, like the ones in the circuitry of the SG.

Although the Reed switch seems to be able to yield better results, it is still a very fragile mechanical device, prone to breakage.

1N4007 vs UF4007 (in Mosfet circuit)

So far replacing the three 1N4007 diodes for UF4007 versions didn't seem to make a difference in the Mosfet circuit. For the Reed switch circuit this still has to be tested.

Traces of SG in Radiant mode in circuitry (blue) and around the circuitry (red)



Suggested future tests

MOSFET circuit
-Test with Transistor instead of a Mosfet and see what the trace looks like close up
-Test with different types of output diode for the MOSFET diode (now 1N4007), e.g. super fast/super slow diodes

Reed switch circuit
-Test with UF4007 diodes

-Include a timer circuit in the circuit, so the 'on-time' of the MOSFET/Reed can be adjusted (shortened), or even be changed to an intermitted signal

General
-Test with a different generator coil, e.g. more/less windings, thicker/thinner wire
-Test with thicker output wires
-Test with different capacitor diodes (now 1N4007/UF4007)
-Relative generator coil position to rotor magnets in relation to relative power coil position to rotor magnets, e.g. if in rest position a magnet is right above the power coil, make sure that generator coil positioned so that it sits in between two magnets (now both the generator coil and power coil have a magnet right above them in rest position)
-More accurate magnet placing on rotor (anticipation: will yield higher voltages in caps)