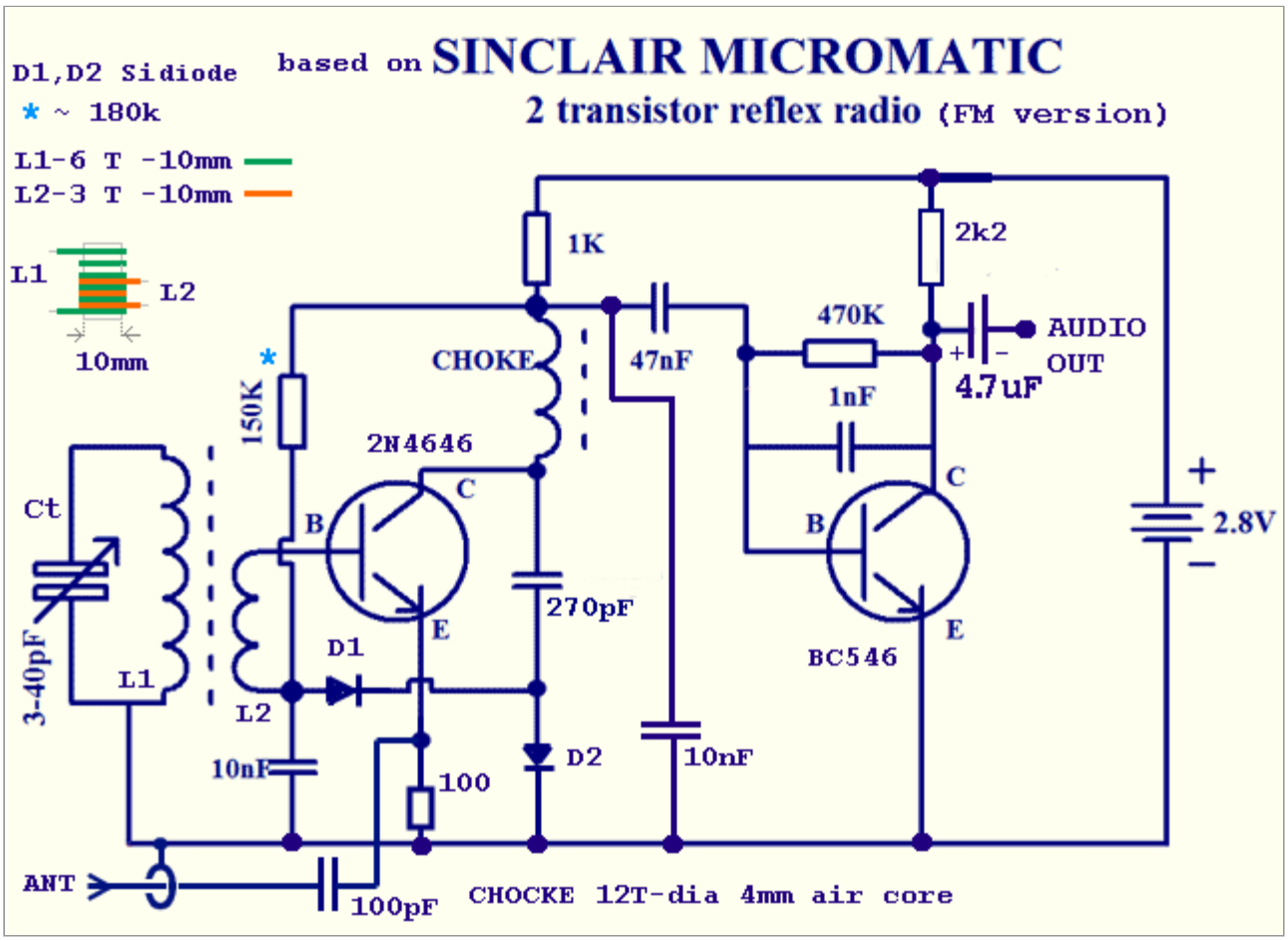
FM MICROMATIC

Fri Dec 04, 2015 9:10 pm

Hi
Because i cannot receive nothing on AM in my area i decide to try to build
similar circuit BUT for FM range.
Schematic is almost the same as original sinclar Micromatic .
Only difference is emitter resistor (100 ohm) and antenna capacitor (100pF).
I was very surprised when circuit start to work without a problem.

ATTACHMENTS



MicroFM.png (38.43 KiB) Viewed 2749 times

gzimmer

Re: FM MICROMATIC

Sat Dec 05, 2015 12:39 am

Aurel ,

Interesting! I don't think I have seen an FM Reflex before.

Presumably it is using slope detection (Aurel, can you confirm that it is actually receiving VHF FM stations?).

I would expect that a bit of Regeneration would help (just a gimmick cap between Base and Emitter),
unless by chance it is already close to oscillating.

Or perhaps it actually is oscillating, and working as a Homodyne (does it whistle a lot?)

P.S. The original Sinclair Micromatic was for AM, but there actually was a Sinclair FM set. It was called the "Micro FM" and was a superhet with a pulse counting detector. http://rk.nvg.ntnu.no/sinclair/audio/ga ... -fm_ad.jpg

Thanks ..... Zim

Selenium

Re: FM MICROMATIC

Sat Dec 05, 2015 4:52 am

I am having difficulty accepting the viability of this circuit as an FM receiver and have had no luck finding a datasheet for a 2N4646 transistor nor can I find any reference to it.

As a reflex receiver it seems unlikely to have the selectivity necessary for slope detection, although some of the later Sinclair AM receivers did add a small capacitor between the collector and inductor of the first transistor to induce regeneration.

Because it has only 2 sideband pairs, FM modulation with a low modulation index may be detected similarly to AM, but I'm not so sure about wideband FM used in the FM broadcast band.

I am curious where this schematic was first published. It seems unlikely that Clive Sinclair would use the word CHOCKE on his schematics.

gzimmer

Re: FM MICROMATIC

Sat Dec 05, 2015 5:31 am

> but I'm not so sure about wideband FM used in the FM broadcast band.

Wideband FM (eg broadcast FM) is about all you will pick up with this kind of slope detection as the selectivity is so broad.

Narrow band FM (eg two way radio) is far too narrow.

.....Zim

Last edited by gzimmer on Sat Dec 05, 2015 7:12 am, edited 1 time in total.

gzimmer

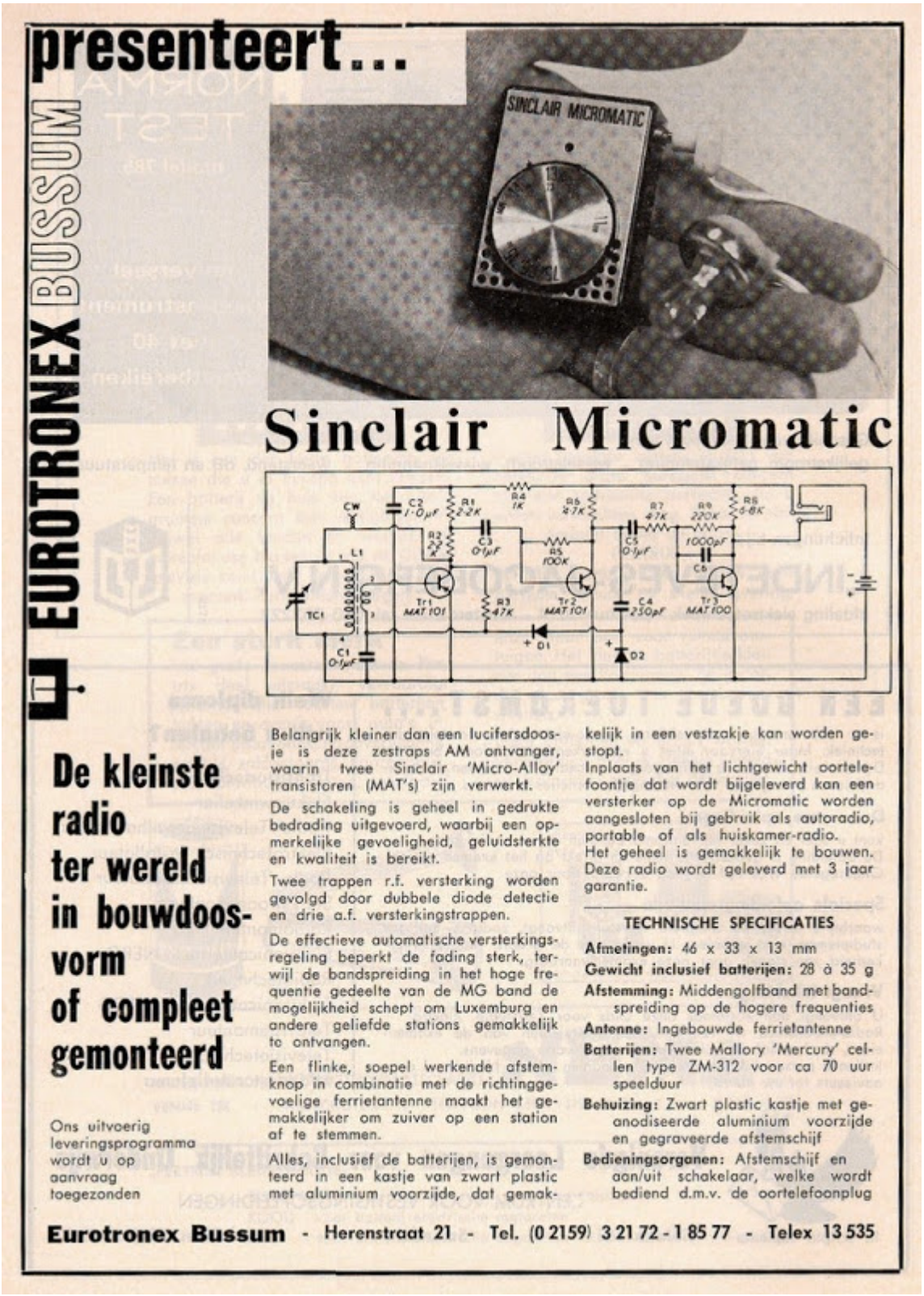
Re: FM MICROMATIC

Sat Dec 05, 2015 5:50 am

Apparently there were two versions of the Sinclair Micromatic:

A two transistor reflex called the "Micromatic",
(the manual is here http://www.petervis.com/Radios/sinclair ... anual.html)

which evolved from an earlier three transistor reflex called the "Micro-6".



presenteert...

EUROTRONEX BUSSUM

Sinclair Micromatic

De kleinste radio ter wereld in bouwdoos-vorm of compleet gemonteerd

Ons uitvoerig leveringsprogramma wordt u op aanvraag toegezonden

Belangrijk kleiner dan een lucifersdoosje is deze zestraps AM ontvanger, waarin twee Sinclair 'Micro-Alloy' transistoren (MAT's) zijn verwerkt.

De schakeling is geheel in gedrukte bedrading uitgevoerd, waarbij een opmerkelijke gevoeligheid, geluidsterkte en kwaliteit is bereikt.

Twee trappen r.f. versterking worden gevolgd door dubbele diode detectie en drie a.f. versterkingstrappen.

De effectieve automatische versterkingsregeling beperkt de fading sterk, terwijl de bandspreiding in het hoge frequentie gedeelte van de MG band de mogelijkheid schept om Luxemburg en andere geliefde stations gemakkelijk te ontvangen.

Een flinke, soepel werkende afstemknop in combinatie met de richtinggevoelige ferrietantenne maakt het gemakkelijker om zuiver op een station af te stemmen.

Alles, inclusief de batterijen, is gemonteerd in een kastje van zwart plastic met aluminium voorzijde, dat gemakkelijk in een vestzakje kan worden gestopt.

Inplaats van het lichtgewicht oortelefoontje dat wordt bijgeleverd kan een versterker op de Micromatic worden aangesloten bij gebruik als autoradio, portable of als huiskamer-radio.

Het geheel is gemakkelijk te bouwen. Deze radio wordt geleverd met 3 jaar garantie.

TECHNISCHE SPECIFICATIES

Afmetingen: 46 x 33 x 13 mm

Gewicht inclusief batterijen: 28 à 35 g

Afstemming: Middengolfband met bandspreiding op de hogere frequenties

Antenne: Ingebouwde ferrietantenne

Batterijen: Twee Mallory 'Mercury' cellen type ZM-312 voor ca 70 uur speelduur

Behuizing: Zwart plastic kastje met geanodiseerde aluminium voorzijde en gegraveerde afstemschijf

Bedieningsorganen: Afstemschijf en aan/uit schakelaar, welke wordt bediend d.m.v. de oortelefoonplug

Eurotronex Bussum - Herenstraat 21 - Tel. (0 2159) 3 21 72 - 1 85 77 - Telex 13 535

There was also a Canadian clone of the Micromatic

..... Zim

Last edited by gzimmer on Sat Dec 05, 2015 6:04 am, edited 2 times in total.

Selenium

Re: FM MICROMATIC

Sat Dec 05, 2015 5:56 am

> **gzimmer wrote:**
> Wideband FM (eg broadcast FM) is about all you will pick up with this king of slope detection as the selectivity is so broad.
>
> Narrow band FM (eg two way radio) is far too narrow

Many years ago I built a frequency converter to convert the narrowband VHF police transmissions down to the AM broadcast band so that they could be received on a normal AM car radio. The reason they could be received was because the selectivity of the AM receiver was narrow enough that slope detection was acceptable with narrowband FM transmissions.

The "Sinclair" schematic shown as a reflex receiver has very poor selectivity and I question its ability to be used as a slope detector.

gzimmer

Re: FM MICROMATIC

Sat Dec 05, 2015 6:11 am

> The "Sinclair" schematic shown as a reflex receiver has very poor selectivity and I question its ability to be used as a slope detector.

Which is why it can only detect Wide Band FM (eg Broadcast FM).

Any tuned circuit can be used to slope detect, as long as the signal is wide enough.

This is how all the Superregen receivers manage to receive Broadcast FM.
And a Superregen will be even wider.

.....Zim

Last edited by gzimmer on Sat Dec 05, 2015 7:13 am, edited 1 time in total.

Selenium

Re: FM MICROMATIC

Sat Dec 05, 2015 6:17 am

> **gzimmer wrote:**
> Which is why it can only detect Wide Band FM (eg Broadcast FM).

Wouldn't that also imply that a crystal set can receive wideband FM?

Come to think of it I seem to remember some articles on the subject.

http://solomonsmusic.net/FM_CrystalRadio.html

It looks like I'm going to have to build the FM version to try it out.

Selenium

Re: FM MICROMATIC

Sat Dec 05, 2015 6:28 am

> **gzimmer wrote:**
> This is how all the superregen receivers manage to receive Broadcast FM.

Although I have seen this information posted in many places, my experience leads me to believe that this is not the process that superregenerative receivers use to detect FM.

In a selective AM receiver, narrowband FM modulation may be detected by slope detection in two places on the dial when tuned to the upper and lower sidebands of the FM carrier.

In a superregeneration receiver, the amount of instantaneous received energy at the beginning of the regeneration cycle determines the oscillator start time and the amplitude of the demodulated signal. For an FM signal, this is simply the sum of many of the sidebands, particularly those close to the carrier that are present at

the beginning of the regeneration cycle.

Slope detection would require constant monitoring of the FM carrier and sidebands during the entire regeneration cycle and this is not how a superregenerative receiver works.

For this reason even though it has been stated many times that superregens detect by using slope detection, my belief is that this is not the case.

The link below is to a book on Google books discussing FM detection using a superregenerative receiver.

https://books.google.ca/books?id=6vo8AA ... FM&f=false
.

gzimmer

Re: FM MICROMATIC

Sat Dec 05, 2015 7:05 am

> Slope detection would require constant integration of the sidebands during the entire regeneration cycle

No, it doesn't.

When the Carrier shifts up and down the slope, the slope causes Amplitude Modulation of the FM carrier. This AM can then be detected by any simple envelope detector.

Even a crystal set can Slope Detect FM.

.....Zim

DrM

Re: FM MICROMATIC

Sat Dec 05, 2015 8:06 am

And a normal regenerative receiver can even detect FM by injection locking of the oscillator onto the swinging carrier of the FM RF signal.

Selenium

Re: FM MICROMATIC

Sat Dec 05, 2015 1:53 pm

> **gzimmer wrote:**
> > Slope detection would require constant integration of the sidebands during the entire regeneration cycle
>
> No, it doesn't.
>
> When the Carrier shifts up and down the slope, the slope causes Amplitude Modulation of the FM carrier.

If the Bessel chart for a wideband 75 KHz deviation, 15 KHz maximum modulation frequency is examined (Modulation Index = 75/15 = 5), it will be discovered that there are 8 useful sidebands on each side of the

carrier requiring a bandwidth of approximately 240 KHz. There is very little carrier amplitude and at some FM modulation indices the carrier can be zero.

A superregen receiver detects the instantaneous RF energy at the start of each regeneration cycle (quench period). It does not respond to the modulation information at all for the greatest portion of the quench frequency period. This instantaneous energy alters the startup time of the oscillator. This variation in startup time is then detected as modulation.

In an FM signal as in an AM signal, the carrier itself contains no information. An unmodulated FM carrier will only quiet a superregen receiver. All the information is contained in the sidebands. In order for a superregenerative receiver to detect this information, because it responds to the instantaneous received RF energy present only at the start, it must be affected by the instantaneous RF energy in the sum of most of the FM sidebands which is basically a very short sampling process.

> **DrM wrote:**
> And a normal regenerative receiver can even detect FM by injection locking of the oscillator onto the swinging carrier of the FM RF signal.

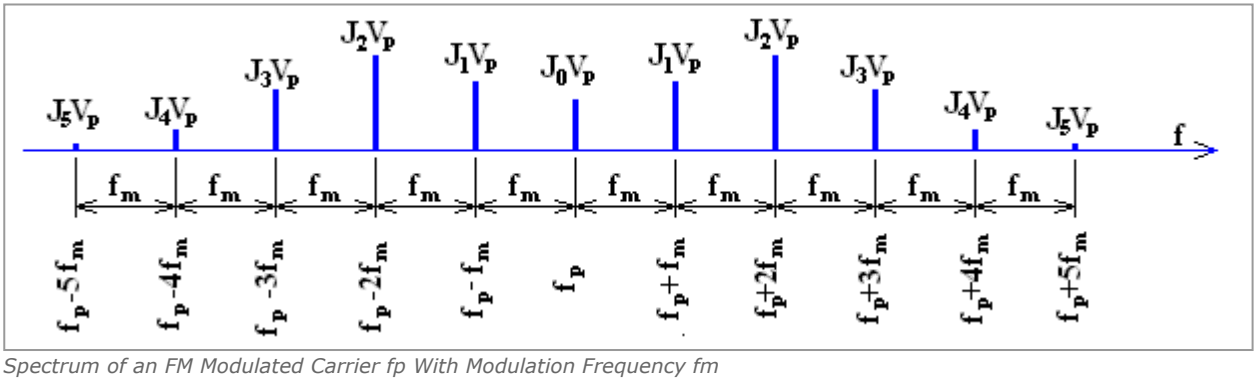
At some level this information supports that given above. When the carrier is locked, there is no sliding carrier and no slope detection and the modulation information contained in the energy of all the sidebands is detected as AM.

I should also point out that for narrowband FM, the modulation index is very small and as can be seen by the Bessel chart there are much fewer sidebands. In the case of a modulation index in the vicinity of 0.5 there are basically only 2 useful sidebands, the same as AM. This reinforces the suggestion that because a superregen receiver detects only the instantaneous RF energy at the start of each quench cycle, that in a superregen receiver the modulation information is sampled and recovered from the sum of the energies contained in the instantaneous amplitudes of most of the FM sidebands at the start of each quench period.

In the end I might be disagreeing about semantics here. In narrowband FM slope detection, only a limited number of sidebands are needed to be selected to achieve modulation recovery with acceptable distortion using an AM envelope detector. In wideband FM many sidebands must be selected to get acceptable distortion and a superregen receiver does not detect the modulation the same as an envelope detector.

It seems to me that a system that requires the majority of the sidebands to be recovered and doesn't use envelope detection should not necessarily be called slope detection.

ATTACHMENTS



Spectrum of an FM Modulated Carrier fp With Modulation Frequency fm
clip_image023.gif (4.91 KiB) Viewed 2548 times

Modulation index	Sideband															
	Carrier	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0.00	1.00																
0.25	0.98	0.12															
0.5	0.94	0.24	0.03														
1.0	0.77	0.44	0.11	0.02													
1.5	0.51	0.56	0.23	0.06	0.01												
2.0	0.22	0.58	0.35	0.13	0.03												
2.41	0	0.52	0.43	0.20	0.06	0.02											
2.5	−0.05	0.50	0.45	0.22	0.07	0.02	0.01										
3.0	−0.26	0.34	0.49	0.31	0.13	0.04	0.01										
4.0	−0.40	−0.07	0.36	0.43	0.28	0.13	0.05	0.02									
5.0	−0.18	−0.33	0.05	0.36	0.39	0.26	0.13	0.05	0.02								
5.53	0	−0.34	−0.13	0.25	0.40	0.32	0.19	0.09	0.03	0.01							
6.0	0.15	−0.28	−0.24	0.11	0.36	0.36	0.25	0.13	0.06	0.02							
7.0	0.30	0.00	−0.30	−0.17	0.16	0.35	0.34	0.23	0.13	0.06	0.02						
8.0	0.17	0.23	−0.11	−0.29	−0.10	0.19	0.34	0.32	0.22	0.13	0.06	0.03					
8.65	0	0.27	0.06	−0.24	−0.23	0.03	0.26	0.34	0.28	0.18	0.10	0.05	0.02				
9.0	−0.09	0.25	0.14	−0.18	−0.27	−0.06	0.20	0.33	0.31	0.21	0.12	0.06	0.03	0.01			
10.0	−0.25	0.04	0.25	0.06	−0.22	−0.23	−0.01	0.22	0.32	0.29	0.21	0.12	0.06	0.03	0.01		
12.0	0.05	−0.22	−0.08	0.20	0.18	−0.07	−0.24	−0.17	0.05	0.23	0.30	0.27	0.20	0.12	0.07	0.03	0.01

Bessel Chart Demonstrating Up To 8 Useful Sidebands on Each Side of the Carrier in Commercial Wideband FM Broadcasting
bessel.jpeg (88.46 KiB) Viewed 2546 times

Last edited by Selenium on Sat Dec 05, 2015 7:02 pm, edited 3 times in total.

aurel

Re: FM MICROMATIC

Sat Dec 05, 2015 5:48 pm

Hi gzimmer

> Aurel, can you confirm that it is actually receiving VHF FM stations?)

Yes of course-standard FM (88-108MHz)
as i say i use same topology of sinclair circuit and use VHF/UHF transitor from old
VHF/UHF TV antenna amplifier.
This transistor is very similar to BFR91A or BFR 93..
also i try 2SC3355 and 2N9018 and work to with little bit different base bias
resistor must be from 120k to 180k-
base voltage in my case is 0.74V
I use small variable cap from old portable radio to tune stations.
For chocke i have one small coil of 11 turns (dia) 4mm.
All 4 strongest FM stations i received very clear (without hiss) and really very strong

even i don't use next transistor as AF preamplifier ???
normal open dipol antenna with coax cable i then connact on emitter of transistor
and that is .
It is really easy to build this circuit...

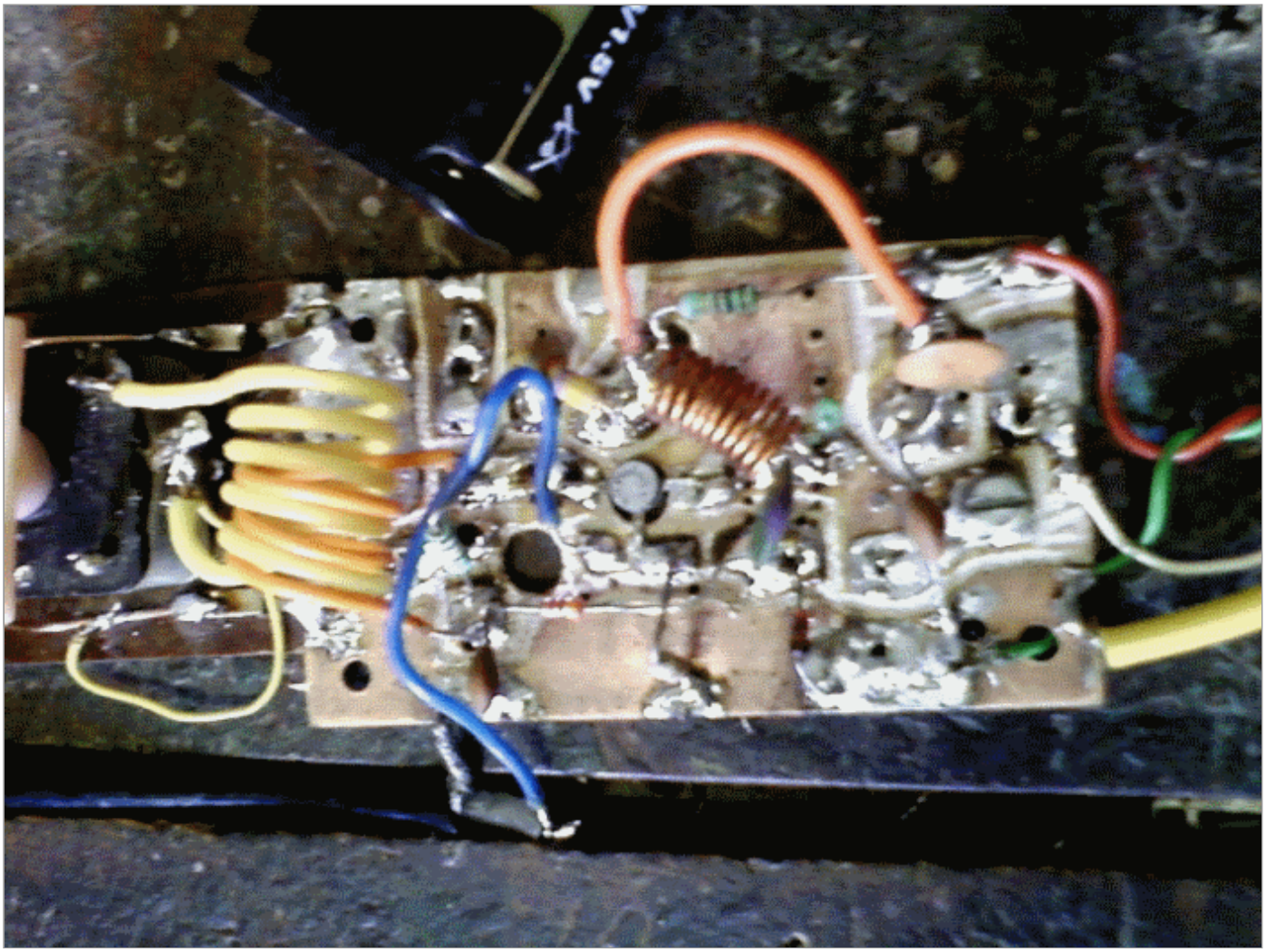
aurel

Re: FM MICROMATIC

Sat Dec 05, 2015 6:39 pm

here is a image of circuit when blue wire is anttena ..yes work directly
without cap 100pF but in this case effect on recived range.
better is to use 100pF and then connect to antenna.
yellow wire is L1 tuning coil and orange wire is L2 secondary coil (3 T) inside
or between L1 turns starting from lower side of coil.
In circuit you see transistor 2N4646(pH ON4646).

ATTACHMENTS



AurelMicromatic.gif (178.85 KiB) Viewed 2506 times

gzimmer

Re: FM MICROMATIC

Sun Dec 06, 2015 3:24 am

> There is very little carrier amplitude and at some FM modulation indices the carrier can be zero.

When I referred to the carrier sliding up and down the slope, I was referring to the total energy in the signal (carrier plus sidebands).
Certainly there may be other detection modes present (especially if the stage is oscillating), however there's no need to invoke them to explain what's going on.

However, if you want to argue that a Superregen is injection locking, then I could argue that it is locking to a different (instantaneous) frequency at the beginning of each cycle, which then results in the tuning slope recovering the modulation.

Whatever, it's simple slope detection.

.....Zim

Last edited by gzimmer on Sun Dec 06, 2015 3:45 am, edited 1 time in total.

第 2 页 [实际：第 15 - 30 项] 去到顶部 上滚一页 下滚一页 去到底部

qrp-gaijin

Re: FM MICROMATIC

Sun Dec 06, 2015 3:33 am

Good job aurel on making the working FM receiver! Any chance we can see a YouTube video of it in action?

blog: http://qrp-gaijin.blogspot.com

transistor495

Re: FM MICROMATIC

Sun Dec 06, 2015 4:12 am

I don't see this circuit to work on medium to distant FM signals, because there is no regeneration, it may slope detect only heavily strong local signals like how some crystal receivers are done. Selectivity will be worst, but it has acceptable selectivity if used on AM mode. AM version has a potential to add a tickler winding effectively boosting the performance.

seanvn

Re: FM MICROMATIC

Sun Dec 06, 2015 4:12 am

Actually FM modulation is an analog error correction code. There has been very little research in that area, though of course digital error correction codes are everywhere.

aurel

Re: FM MICROMATIC

Tue Dec 08, 2015 2:31 pm

> I don't see this circuit to work on medium to distant FM signals

don't be so sure...
of course you must have good outdoor VHF antenna and there is no problem to
pick up distant FM stations...like in most receivers
without good and high-enough mounted antenna...right?

transistor495

Re: FM MICROMATIC

Wed Dec 09, 2015 2:16 pm

Your FM micromatic does not make any sense. The detector is still on the AM BCB region. There is no regeneration. Totally unworkable circuit.

aurel

Re: FM MICROMATIC

Wed Dec 09, 2015 3:28 pm

> There is no regeneration. Totally unworkable circuit.

really ..how you know that?
do you see that i have emitter resistor?
and yes i don't know is there regeneration or not
maybe oscillate....maybe work as synchro-detector
IF work as original circuit then is ordinary TRF
and with good antenna i can pick up whole FM range without problem
if you don't believe that is your problem...
all in all is easy to build and try then you tell me ...is work
or not work for you..OK?

Pat Pending

Re: FM MICROMATIC

Wed Dec 09, 2015 10:56 pm

> **transistor495 wrote:**
> Your FM micromatic does not make any sense. The detector is still on the AM BCB region. There is no regeneration. Totally unworkable circuit.

The detector is almost identical to a charge/pump detector that has been used in simple, low I.F, pulse counting F.M. receivers including Sinclair's own. Conceivably the choke is coupling signal back to the tank circuit and causing the stage to oscillate. When I have time I will try this circuit to see what happens! Don't think I've ever seen a single active device, re-gen, superhet, reflex, vhf FM receiver before, but that doesn't mean they can't be made

seanvn

Re: FM MICROMATIC

Wed Dec 09, 2015 11:43 pm

It probably did work because there was an LC circuit, some non-linearity for RF (slope) detection and some audio amplification. In those times there were no circuit simulators to help the design effort. People came up with whatever kind of heuristics to explain to themselves what worked and what didn't work. Often radio circuits designed that way worked more by happenstance than for any other reason.

gzimmer

Re: FM MICROMATIC

Wed Dec 09, 2015 11:50 pm

transistor495 said,

> The detector is still on the AM BCB region.

This is nonsense. Clearly the coils are tuned to the FM BC band (the circuit shows a 6 turn Inductor and a 40pF trimmer Cap).

Pat Pending said,

> The detector is almost identical to a charge/pump detector that has been used in simple, low I.F, pulse counting F.M. receivers including Sinclair's own.

Again this is nonsense. The Sinclair Micro FM was a Superhet which used a 100KHz IF and six transistors.

Aurel posted a neat design in good faith, and he doesn't deserve this kind of rubbish.

I feel that the Mod needs to step in and stamp out some of this idiocy.
If people are going to make wild claims, they need to put up some justification.
Certainly controversy helps build readership, but it also drives away the more valuable contributors.

.....Zim

Last edited by gzimmer on Wed Dec 09, 2015 11:56 pm, edited 1 time in total.

KR1S
Site Admin

Re: FM MICROMATIC

Wed Dec 09, 2015 11:55 pm

> **gzimmer wrote:**
> I feel that the Mod needs to step in and stamp out some of this idiocy.

The Mod hates to step into technical discussions that are over his head! That said, civility is expected, though I've seen worse than this. Thanks to Aurel for generously sharing many circuits with us, and I hope he continues to do so.

Jim (AKA *The Mod*)

Jim Kearman, KR1S

Southeast Arizona

Ham-er

Re: FM MICROMATIC

Thu Dec 10, 2015 12:57 am

> **KR1S wrote:**
> *The Mod* hates to step into technical discussions that are over his head! That said, civility is expected, though I've seen worse than this. Thanks to Aurel for generously sharing many circuits with us, and I hope he continues to do so.
>
> Jim (AKA *The Mod*)

Yep, if there is disagreement it should be backed up with some reason or theory.
We don't just jump on someone like that.

I have disagreed with Aurel a few times but I DO hope that he keeps experimenting and sharing.

73
kb0lxy

Pat Pending

Re: FM MICROMATIC

Thu Dec 10, 2015 1:20 am

Please note Zim, I was defending Aurel and his "outside the box" ingenuity, and offering a possible explanation of how this circuit may be working. And I can see that it could easily be a novel way to economically resolve a vhf FM signal, however it is doing it. I also agree with you and Aurel that members should not criticize the work and thoughts of others until they have tried for themselves. My comments about the charge pump discriminator is not rubbish as you state, the voltage doubling am detector is an almost identical circuit only possibly the time constants being different, it was reference to a small part of the circuit, in an attempt to lead others to realize this was originally designed as a radio and is in essence little changed barring it's reception band. I was not referring to how many transistors the circuits may or may not have,(the Sinclair micro FM actually has seven not six) my own pulse counting receiver that I designed and built myself a few years ago has only one tuned circuit, but contains no less than 17 transistors, making Aurel's design eight times more economical than mine! If you don't understand my English idiom, I can only apologize, but I chimed in on this post because I thought the contribution that was being made was worthy of further discussion and encouragement. I do intend to built this little circuit to see if my assumptions are correct, or otherwise, instead of just reading the posts and making glib comments. Edit I also enjoy Aurel's style in his posts as he doesn't resort to unnecessary technobabble that should be reserved for doctoral dissertation instead of trying to showboat to other members. Keep up the good work Aurel!

Last edited by Pat Pending on Thu Dec 10, 2015 10:55 pm, edited 2 times in total.

Pat Pending

Re: FM MICROMATIC

Thu Dec 10, 2015 2:18 am

Now for my theory of how this design works! Stray inductive coupling from the choke feed back to the tank circuit may be inducing oscillation (1) at signal frequency being mixed with the aerial signal and being synchronously detected. or (2) working regeneratively, or, (3) my favourite, if only because it's the one I suggested in the previous post! The incoming signal being amplified in common base mode, and mixed with the "local oscillation" (generated as above) giving an I.F. that is coupled to the diodes via the 270pf cap, that charge pump the 0.01uf cap to give demodulation of the incoming program. To be finally amplified at A.F. How cool would that be? After all if reflexing is possible on M.W. it is at least in theory possible at V.H.F? Gonna build it any way to find out for sure, and after all the fuss, I think I owe it to you all to poke scope and spectrum probes at every node. (Have to borrow use of spectrum analyzer. not that rich!)

aurel

Re: FM MICROMATIC

Thu Dec 10, 2015 12:38 pm

Hi guys...
there is no need for panic or flames
t495 is little bit fast in conclusion

> Aurel posted a neat design in good faith

thanks Zim..yes as always
In my first post i was say that because AM not exists in my area
i try to tune FM with same circuit.
of course i have change tuning coil that i can pick up FM(88-108).
I am not sure how this circuit work ..but work!

Slam

Re: FM MICROMATIC

Thu Dec 10, 2015 2:50 pm

Hi Fellas
When these first came out I was besotted with the whole concept of a 2 transistor radio in a box the size of a match box , bugged the hell out of my old man till he weakened and got one for a birthday pressie for me - so disappointed with performance and button cell wastage soldered wires to battery lugs for external power and had to sit the thing inside my x- tal set coil to get good reception but still loved it ! Still have it and that first tank coil I ever made
Cheers Gents

第 3 页 [实际：第 30 - 45 项] 去到顶部 上滚一页 下滚一页 去到底部

transistor495

Re: FM MICROMATIC

Thu Dec 10, 2015 3:26 pm

If you think it works, then it should be reproduceable on another pcboard or anyone else(to make sure that the reception is not caused by spurious oscillations caused by parasitic capacitances and related slope detection.

Also is it works only with one type of device(2N4646) that is nobody been even heard of?

How long are those FM transmitters from your area?

A video presentation will answer many questions.

KR1S
Site Admin

Re: FM MICROMATIC

Thu Dec 10, 2015 3:46 pm

In an **earlier post**, Aurel says

> This transistor is very similar to BFR91A or BFR 93..
> also i try 2SC3355 and 2N9018 and work to with little bit different base bias

You can see the device near the center of the board, in the photo in this post:
viewtopic.php?f=4&t=6689#p63545

Jim

Jim Kearman, KR1S

Southeast Arizona

Pat Pending

Re: FM MICROMATIC

Thu Dec 10, 2015 5:42 pm

> **transistor495 wrote:**
> If you think it works, then it should be reproduceable on another pcboard or anyone else

I am making one and will let you know.

> **transistor495 wrote:**
> To make sure that the reception is not caused by spurious oscillations caused by parasitic capacitances and related slope detection

I get where you are coming from but does it matter? Penicillin was discovered by accident. Somone had to be observant to discover it.

gzimmer

Re: FM MICROMATIC

Fri Dec 11, 2015 10:45 am

transistor495 said

> If you think it works, then it should be reproduceable on another pcboard or anyone else
> (to make sure that the reception is not caused by spurious oscillations

> caused by parasitic capacitances and related slope detection.

This post really has me puzzled.

It is well documented that a simple Crystal Set can receive FM BC stations by means of Slope Detection.
As this circuit is simply an amplified Crystal Set, why would it not work?
Having useful RF and Audio gain, it should work even better than a FM Crystal Set.

And what on earth is wrong with Slope Detection?

Admittedly it is a Reflex circuit, but that has no bearing on the above.
A reflex simply saves one transistor by using it twice. There is no magic.

> Also is it works only with one type of device(2N4646) that is nobody been even heard of?

And what possible relevance is this? It's clearly an ex Phillips VHF transistor, and if it works, it works. What's the big deal?

????????????

.....Zim

transistor495

Re: FM MICROMATIC

Fri Dec 11, 2015 4:11 pm

Don't get puzzled much, stay balanced =)

I only mean if it is a phenomena by means of unwanted oscillation behaviour then it won't be replicable and the output will be non-predictable. Then it won't qualify as a workable receiver.

I'm just adding my observations only. And there is no point in debating if nobody able to explain how the circuit actually works, if it ever works. Before buildig up theories, let us see if it is a reproduceable circuit or not.

> **gzimmer wrote:**
> And what on earth is wrong with Slope Detection?
> .....Zim

And nobody told here slope detectoion is too bad, although you can search online to understand the disadvantages.

aurel

Re: FM MICROMATIC

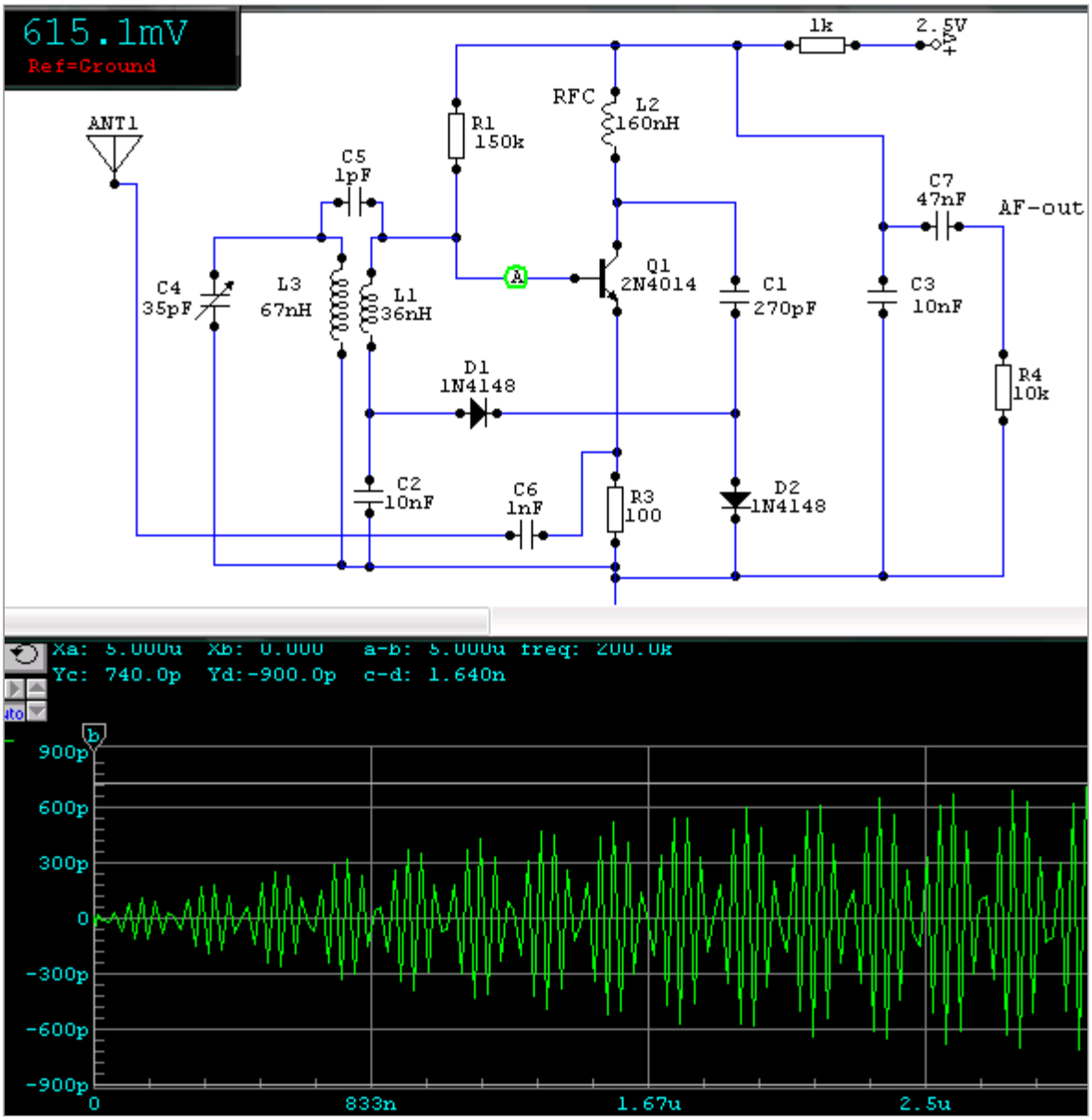
Fri Dec 11, 2015 10:08 pm

> if nobody able to explain how the circuit actually works, if it ever works.

well if original sinclair circuit work ,even if work not very well ...it work.
Next simulation (used different transistor from -Circuit maker List)

show that my circuit oscillate only if **C3 – 10nF** is connected
which means that is created some sort of relaxation oscillator
or if you wish colpits-type.
Because when i connect 56pF cap between colector and ground
frequency is changed and i tune different FM station.
Also i add in serie with tuning cap ,capacitor 27pF to better cover
whole fm range ,of course circuit don't have any AGC so weak stations
are with lower audio but i still can tune them.
And as i say before i use open dipole antenna (with baloon transformer) which is
connected trough 1nF cap to transistor emitter.
So it is easy to build and anyone can try .

ATTACHMENTS



FM_SIM3.png (11.96 KiB) Viewed 1019 times

qrp-gaijin

Re: FM MICROMATIC

Sat Dec 12, 2015 12:21 am

> **aurel wrote:**
> Next simulation (used different transistor from –Circuit maker List)
> show that my circuit oscillate only if **C3 – 10nF** is connected

What Q values are you using for the coils in your simulation?

---

blog: http://qrp-gaijin.blogspot.com

Pat Pending

Re: FM MICROMATIC

Sat Dec 12, 2015 1:39 am

Hi all. I've hooked the circuit up and.....it works. Sort of. Well not bad for first fire up. Not difficult to tune but distorted. And I had to alter some component values, eg. 270pf now 18pf, 1k collector resistance now 3k9, base bias 220k, transistor type that I use is S9018, I've also tried BF194 (lower Ft). The layout is critical, coil winding sense also critical including collector choke (I think some feed back from here). The circuit seems to work as a re-gen, if the diodes are not fed from the collector the circuit oscillates. Will look at it more over the weekend. To tired now its late. Bye!

transistor495

Re: FM MICROMATIC

Sat Dec 12, 2015 2:08 pm

> **aurel wrote:**
> show that my circuit oscillate only if **C3 – 10nF** is connected
> which means that is created some sort of relaxation oscillator
> or if you wish colpits-type.

Right, could be a sort relaxation oscillation[quench] along with original VHF oscillations, -that looks like what you have made is a variation of super-regenerative receiver. Or the circuit may be in between regen to superregen state, if you add a regen control, then the things would be more easy -audio may get improved but the characteristic distortion of around 30% will be there anyway -inherent problem with slope detection

I quit slope detector receivers long back and moved more into HiFi side

Here in the below video, someone neatly presents an ultra simple fm receiver, that you may get tempted to try. How it works?

qrp-gaijin

Re: FM MICROMATIC

Sat Dec 12, 2015 2:24 pm

Not sure if this is already covered by the existing discussion, but here's one theory how an AM-only detector can detect FM (thanks to multipath reception): http://techlib.com/electronics/allband.htm#Karen

I think I saw an article by Polyakov also that mentioned something similar, though I can't find it now. (EDIT: here it is -- http://zpostbox.ru/fm_crystal_radios.html)
.

---

blog: http://qrp-gaijin.blogspot.com

aurel

Re: FM MICROMATIC

Sat Dec 12, 2015 10:55 pm

some info here:
http://www.petervis.com/Radios/sinclair ... radio.html
.

transistor495

Re: FM MICROMATIC

Sun Dec 13, 2015 2:55 pm

> Here in the below video, someone neatly presents an ultra simple fm receiver, that you may get tempted to try. How it works?

The interesting circuit in the previously posted video not only so simple, but I observed many other things as well. It oscillates, covers a good frequency range and sensitive also. I tried to monitor closely into the audio quality of the receiver and surprised that it appears far better than a regen/super-regen fm radio output. I couldn't detect any major distortion, so it suggests like a colpittz based regen-synchronous mode FM detector. I really don't know till what extent they can perform in reality. HIgh frequencies looks particularly good, but the lower frequency quality cannot be observed from that cheap speaker to the audio recorder. The audio section used a 100uF cap for speaker coupling should be particularly noted -need to be improved. The guy did a good job on execution..

> **qrp-gaijin wrote:**
> Not sure if this is already covered by the existing discussion, but here's one theory how an AM-only detector can detect FM (thanks to multipath reception): http://techlib.com/electronics/allband.htm#Karen

Few times back I did try this allband receiver but unfortunately in a no AM/FM signal area  , I ended up catching some mobile phone signals buzzing and some random electrical noises. IIRC, the diode I used was BAT85.

Pat Pending

Re: FM MICROMATIC

Sun Dec 13, 2015 4:15 pm

Hi everyone! I've now done a bit more tinkering with Aurels circuit, the following may be of interest as non of it was as I expected. Using Aurels circuit as a guide, I have now replaced the one hundred ohm emitter resistor with a peaking circuit (for more efficient coupling from a small antenna), tuning now sharper (very wide range too, @65-100mhz). I removed the 270pf capacitor and biased the transistor base from a pot to see what happens with different bias levels, it stopped working (Diodes important!?) Reconnect cap but to top end of collector coil by mistake. It started working again, however now with clearer sound but less volume. Get out trusty oscilloscope, the trace of the signal at the transistor collector can only be described as an amplitude modulation on a approx 30mhz (ish) FM carrier, (its this frequency whatever station it tunes to), looks like classic slope detection to me(?) putting the end of a small screwdriver into the center of the collector coil decreases this carrier frequency. Inserting a rfc in series with the collector resistor improved the volume on the piezoelectric speaker I was using. I removed this speaker from the circuit to replace it with an amp, it stopped working, (The speaker has a capacitance of around 5nf), add 4n7 cap to ground, and its working again, with not to bad quality, but not HiFi, also a steady whistle is present (SCA beat?). I think the original heavy distortion was due to audio modulation causing big variation in transistor bias? Now the diodes are acting as an AGC maybe? (Definitely the bias goes down as you tune a strong signal), a strong local station has an "echoey" quality to the sound, that improves if the antenna signal is lowered. Simulations haven't helped, I think what's going on is to

complex, and there are to many variables, for instance, if the collector coil is wound in the opposite direction, or moved closer or further from the signal tuning tank, the reception stops. To summarise then:
1. It CAN work. Point to Aurel.
2. I believe stray coupling IS involved in its operation. Point to transistor 495
3. The charge pump diode circuit is NOT doing the demodulation. Point to Zim (Rats! I was wrong, demodulation seems to be being done solely by the current drawn by the circuit being sensed by the collector resistor, a perfectly legitimate method).
4. I'm not sure what to call it? fremodyne maybe? Thoughts?

I will leave it for others to speculate. Interesting maybe, but I think we're trying to reinvent the wheel here. I will post sketch of circuit and photo when I've a chance to "resize" for the board, (and my data allowance) Good luck everyone.

aurel

Re: FM MICROMATIC

Sun Dec 13, 2015 4:38 pm

thanks Pat....
main problem whic i have is with choke or RFC because nowhere is
defined what kind of choke is used in original circuit.
I use one with 20 turns / 3 mm dia (air core) from small chip radio
and it looks that work ok.
also i have in plan to build really small version of this receiver as proof that
can be made .

Pat Pending

Re: FM MICROMATIC

Sun Dec 13, 2015 4:53 pm

If what I think is correct, and your circuit works similarly to mine, then your choke and how it's made and mounted is quite important to the circuit's operation. I had quite a hard time getting it to work with different components. Will try to get my circuit posted soon, as its got several differences you may be interested in. Although I have described them, you may like and understand a diagram better.

第 4 页 [实际：第 45 - 60 项] 去到顶部 上滚一页 下滚一页 去到底部

aurel

Re: FM MICROMATIC

Sun Dec 13, 2015 5:55 pm

thanks Andy ...
i must found (or build) small tuning cap like is used in original circuit.
Ahh yes RFC(choke) is important part of circuit because enable feedback
to regenerative (and reflex)amplifier.
In my case i place choke verticaly like in original circuit.
From my version of russian ZeroIF receiver i add emitter resistor
but collector resistor is 2.2 .-> 2.7k.

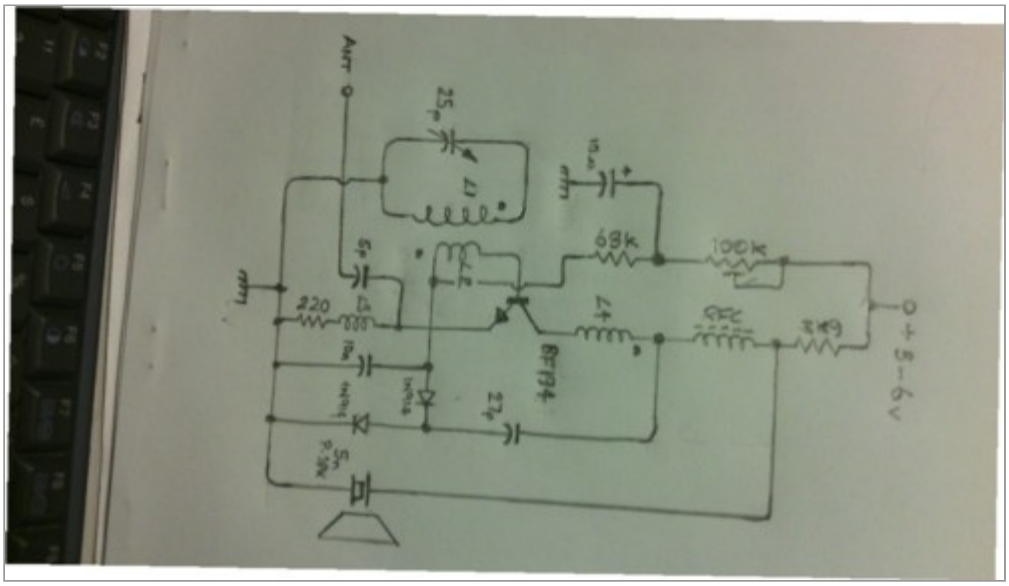
Pat Pending

Re: FM MICROMATIC

Mon Dec 14, 2015 1:30 am

Back to the smart phone again. My computer PSU has just blown up 😳. Going to try to see if I can photo a sketch of the diagram then post that. I know it's a waste of data, but I hate being messed about by digital electronics, damn thing is only 11 years old(!). I've got a radio from the thirties that still works, and it has still got most of it's original parts. Now where are my pills! The receiver diagram is only for illustration of my previous posts, and I wouldn't try to claim that any one should build it expecting great things, I managed to get it to work to prove to myself that a reflex vhf FM set would work. I kind of failed, although it did receive some FM stations. the coils are as follows:-
L1=6turns 18swg (1.2mm) spaced 1 turn 8mm dia.
L2=3turns 18swg (1.2mm) bi fillar with earthy end of L1
L3=L4=14turn 25swg (0.5mm) close wound 3mm dia.
Choke=300uH pile wound type,(second hand part that seems to be wound on a 1w carbon compo resistor, high resistance I assume)

ATTACHMENTS



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Pat Pending

Re: FM MICROMATIC

Mon Dec 14, 2015 7:20 am

Aurel. Sinclair used to use a compression "compensator" trimmer with a modification to fit a control knob.It was possible to buy the conversion kit to fit a long 1/4" standard control shaft to screwdriver adjusted types. But I've not seen any of the mica trimmers or conversion kits for sale in years. I have seen modern small screwdriver adjusted Vc's adapted for a control knob on someone's radio blog, I will try to find it again and send you the link.

aurel

Re: FM MICROMATIC

Mon Dec 14, 2015 12:08 pm

Hi Andy and thanks for schematic.
i see that you use BF194 and yes this type of planar require higher voltage.

Instead of your collector coil you can use 100-220 ohm resistor
this maybe can get better results.

> compression "compensator" trimmer

yes i know i have somewhere those things from old car radios.

transistor495

Re: FM MICROMATIC

Mon Dec 14, 2015 3:49 pm

> **aurel wrote:**
> some info here:
> http://www.petervis.com/Radios/sinclair ... radio.html

The RFC(radio frequency choke) in the AM reflex radio should be a inductance value close to 2mH, or I would try experimentally for the best value in between 1mH to 2mH, the value should be chosen so that it effectively choke out the full AM BCB bandwidth without supressing the radio performance, however this value should mean different in your FM circuit.

I observe that both of your implementation variations use different value of RFCs(30uH in aurel case, and 300uH in pat's case), the difference is noticeable, so does that mean that each of you trying to supress entirely different frequencies?

Here is my theory:

Both of you have different stare oscillations developed in your circuit, in pat's case it is somewhere at 30MHz(prominent, there could be a mix of oscillations happening, lower and higher levels including harmonics), but at the same time the BJT amplifier is configured as a minimal regen for LC resonant VHF FM signals applied. The simple phenomena I can see here is that resonant VHF signal variations can amplitude modulate the stray oscillations(which is happening in the same stage) resulting in a vague slope detection of VHF signals. I don't see anything other than an alternate and inferior form of super-regenerative detector here. Here the self quench is altered by stray oscillations. To prove this phenomena or to make it with a defined operation, you could wire a BJT colpittz oscillator running at a low level frequency, same time wire it as a tuned LC resonant VHF amplifier. Nothing unusual. Now your theories are always welcome.

My another thought is that if this simple modification can make Sinclair AM reflex into FM reflex, then the clever engineers might have came up with that already, making a cheap AM/FM receiver by simply switching the LC circuit. No right? Instead they came up with a cheap alternate -the micro FM charge pump circuit -which has the potential to output good performance including the audio.

aurel

Re: FM MICROMATIC

Mon Dec 14, 2015 4:33 pm

> No right?

NO ...they don't have transistor what i have or better to say
i doubt that at those times exists such a HF transistors like we have

today...
never the less...
your explanation may have some good points.
Andy ..in his expariment build some sort of hybrid between russian
ZeroIF receiver and sinclar Reflex AM receiver ...
heh we can call it ZeroReflex ...what might be interesting option
Well about AM re-modulation ...i am not so sure about that.
IF incoming FM signal modulate oscillator frequency
then oscillation level must be really very low like in super or regen
then producuct is AM modulation of oscillator signal is recovered as audio
signal with evenlope detector.

Choke for FM can be 75cm of tiny wire wound over 6mm plastic body to
create endless impedance for FM signal .
In my case i first use 11 turns .dia 4mm 0.5 wire
but then i replace this coil with 20 turns -dia 3mm 0.1wire
which is cca 350nH
also work with
coil :
25 turns dia 4mm 0.2 wire len- 8mm which is cca 1 microH.

Pat Pending

Re: FM MICROMATIC

Mon Dec 14, 2015 8:40 pm

Transistor 495. I have looked further into how my circuit is working. I think the circuit when it is working, is oscillating at low level, at between say, 95 to 130MHz controlled by the vc, the level set by 100k pot and the level kept constant by the diodes. This is mixed with the wideband input signals, and when a signal from a transmitter mixes down to 30MHz it is slope detected by the inductor L4, (I've stopped the oscillation and tested this in circuit with a signal generator injecting into the emitter, it's got a big resonance at around 30MHz). The circuit in operation is a little starved of supply current, so basically when it is in resonance more current flows in the 3k9 resistor and audio can be extracted from here. The rfc was one I had (it has a ferrite body not a resistor by the way)its value is not critical it just has to stop the top of L4 being loaded down at RF, it seems it's series tuned mostly by the 27pf cap. The transistor type that I've used was about in the 1960s but was probably still better than Sinclair's ones as they were renowned for using manufacturing rejects, I have one of the early micromatic and the micro FM as well, and they are both interesting little sets but their performance is not great! But maybe still better than mine! If the clever engineers had come up with my version including the antenna for wearing on the customers head, (like me its a bit deaf), I think they would soon have no job . I may try later to make a more clinical design, instead of one relying on stray coupling and luck!
Aurel. Have already tried resistor instead of L4, wont work, I think although similar our circuits work in different modes maybe, It seems your results are better? I cannot for instance get mine to tune top of FM band (transistor ft?) where my favourite stations are! And I have to adjust bias for different signal levels, like a re-gen. Good luck to all.

Last edited by Pat Pending on Mon Dec 14, 2015 10:22 pm, edited 1 time in total.

aurel

Re: FM MICROMATIC

Mon Dec 14, 2015 10:16 pm

> I cannot for instance get mine to tune top of FM band (transistor ft?) where my favourite stations are! And I have to adjust bias for different signal levels, like a re-gen.

hi Andy
yeah my transistor is for VHF/UHF (from TV antenna amplifier) as i say very simlar to BFR91A
this transistors are better for high freqs.
But i think that problem might be in chocke ,my is air core coil 20 turns dia 3mm.
Also i have one 120k fixed resistor and one 50k trimer to set base current.
when i set it once the work for whole range
and whole range i covered without problem.

Pat Pending

Re: FM MICROMATIC

Mon Dec 14, 2015 11:11 pm

I can change L4 a little by squeezing and opening the turns a bit but all this does is alter the 30MHz I mentioned, and you have to re- tune the station. I have had L4 set at one point where I only get a very faint shortwave station wherever the tuning is set, like IF breakthrough maybe? The choke (RFC) makes no difference, I've even put a 1.8 mH coil with a pot core here that worked, (with muffled sound). I have been reading up about fremodyne receivers, and this "fits the bill" how it operates, if a bit crudely. Thinking about the transistor, I've tried using a 9018, and it behaves the same (700MHz typ. Ft.), so the problem is elsewhere. I am always tempted to cut and try on simple circuits like this, but if they work you wonder why, if they don't, you have more work to make them! I have a little superregen that I listen to aircraft traffic on, that also does quite well on FM. I'll try to find the schematic for that to compare, that tunes to @180MHz Ok. (I designed that one properly, when I had more time). Worry not I will share any improvements, prepare to be underwhelmed. 😀

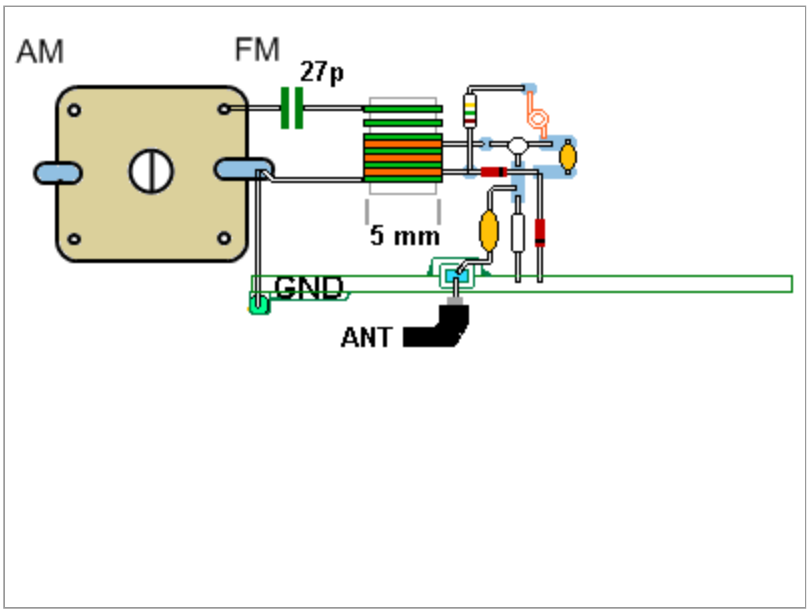
aurel

Re: FM MICROMATIC

Tue Dec 15, 2015 6:27 am

hi Andy
my layout looks like this :

ATTACHMENTS



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transistor495

Re: FM MICROMATIC

Tue Dec 15, 2015 6:15 pm

Pat, nice theory.

in most superhet receivers I seen LO signal is prominent, not IF.Here this is a single BJT circuit.

At any low level, the LO signal(which creates a heavy ~30MHz IF) as per your theory should be traceable on a nearby placed VHF radio. All super-regens or fremodynes emits heavy VHF LO signal to surrounding air. In your case a long antenna also connected. So LO signal should be traceable -from which frequency till what frequency.

> No defined VHF LO
> No defined IF trap/filter
> Very low level and untraceable VHF LO signal produces a heavy ~30MHz IF
> No heavy IF amplification but still ~30MHz IF is detectable on CRO/ still LO is not detectable
> IF breakthrough?

All these things are not matching to the 'superhet' theory. Higly unlikely.

Have you got to listen to the micro fm receiver when it was originally made or any time near to that? It can surely go deaf due to
aging..

aurel

Re: FM MICROMATIC

Tue Dec 15, 2015 9:57 pm

well
i am not sure what you talking about
sinclair MICRO FM is so called 'pulse counting receiver'
and what is this is that carier swing cca +-75kHz -> 150kHz
there is stated 120kHz ..oK this swing is represented as new carrier and then is amplifyed 3 times with filtering then is used frequency to voltage converter to

transform signal into audio signal and that it is all about.

yes in micromatic case looks that there is no oscillator
but are you sure HF signal is returned trough 270pF cap to
base of transitor creating positive feedback ...?
is that not oscillator loop?
yes base is grounded by 10nF cap but i think that some small part of
signal get base of transistor .

Pat Pending

Re: FM MICROMATIC

Tue Dec 15, 2015 10:56 pm

Aurel. Thanks for your clear layout diagram. I will assemble one to see if I can receive any stations here, (we have mostly poor signals, commercial radios are marginal here without good, outside antenna). Are you in a good signal area at your location for FM? My layout is done on a groundplain with small pieces of copper clad board stuck on for connection. I have lifted the pad for the collector off the board and it stops working! So I think the answer is with this new thin PCB laminate making good capacitors on the groundplain! This Manhattan style construction has caused no problems for me before with VHF circuits using thicker laminate.

Transistor 495. L.M.A.O. where to start. Hum. Sinclair micro FM that I have, I built in 1974, they were only available as kits. My Dad bought it for me for my birthday and we built it together, he got it from a work mate who had bought it five years before, and had not assembled it. I did not say in my post that it was deaf, I said its performance wasn't great, I said the circuit that I have built was a bit deaf.

I did not say that the 30MHz signal was prominant. It was very low level. The circuit does produce a local oscillation, I have detected it on a normal FM set, and commercial aircraft band receiver. I cannot resolve it on my oscilloscope because the one I have at home is only 40MHz capable. I said quite clearly approximately 95 to 130 MHz

I am sorry but the other points can be gathered from my posts if you read carefully you will understand, even if you do not agree. With your knowledge and experience you would maybe share your own designs for simple, low component count FM radios.

Have a nice day everyone!

transistor495

Re: FM MICROMATIC

Wed Dec 16, 2015 6:52 am

> **Pat Pending wrote:**
>
> Transistor 495. L.M.A.O. where to start. Hum. Sinclair micro FM that I have, I built in 1974, they were only available as kits. My Dad bought it for me for my birthday and we built it together, he got it from a work mate who had bought it five years before, and had not assembled it. I did not say in my post that it was deaf, I said its performance wasn't great, I said the circuit that I have built was a bit deaf.

Great to hear that you bought and built the micro fm receiver. Are you remembering the part nos of all the 7 transistors used in this circuit. It has not been clearly mentioned anywhere. I have been looking towards a modern realization of sinclair micro fm for a fun . You guys can also join if you wish.

Any assembly instructions, photos or whatever any materials you have regarding this radio?

aurel

Re: FM MICROMATIC

Wed Dec 16, 2015 2:25 pm

I have already build this radio with npn transistors (posted somewhere here on forum)
but i am not impressed with results.
Maybe i use wrong transistors

第 5 页 [实际：第 60 - 75 项] 去到顶部 上滚一页 下滚一页 去到底部

transistor495

Re: FM MICROMATIC

Wed Dec 16, 2015 4:56 pm

> **aurel wrote:**
> I have already build this radio with npn transistors (posted somewhere here on forum)
> but i am not impressed with results.
> Maybe i use wrong transistors

Sinclair might have used earlier Germanium VHF transistors for RF/osc(you can try AF139/AF239 PNP here) and any HF RF transistors for 3 stage IF and detector(you might try AF200/AF125/AF126 PNP types) and a audio driver(AC125/AC126 types for common eg). These are PNPs for exact replica of the circuit, but I don't have any idea about the original types and gain they used in these stages. Also what types of diodes they used in detector stage is another question..

From picture what I understand it tank coil L3 is slug tuned type, L1 and L2 not clear -again that should not make a challenge because that is broadlband amplifier. AFC looks particularly interesting..

Pat Pending

Re: FM MICROMATIC

Wed Dec 16, 2015 7:59 pm

Sinclair micro FM. Info.
Transistors were rebranded reject microalloy germanium. only the first two need to be rf types as the if goes no higher at fundamental than @200KHz.
Link to excellent Australian site with this, and other pulse counting receivers.
http://members.iinet.net.au/~cool386/

aurel

Re: FM MICROMATIC

Wed Dec 16, 2015 10:13 pm

Yes fm micro is funny thing but is very unstable.
When i build i probably made few mistakes(as usual)

last two transistors (F/V converter is not problematic)
so called IF stage require 2 transistors (biasing is problematic)
and most problematic part is oscillator(in this case syncro..YES iT is!)
heh maybe i cantry to build 3V version ..again

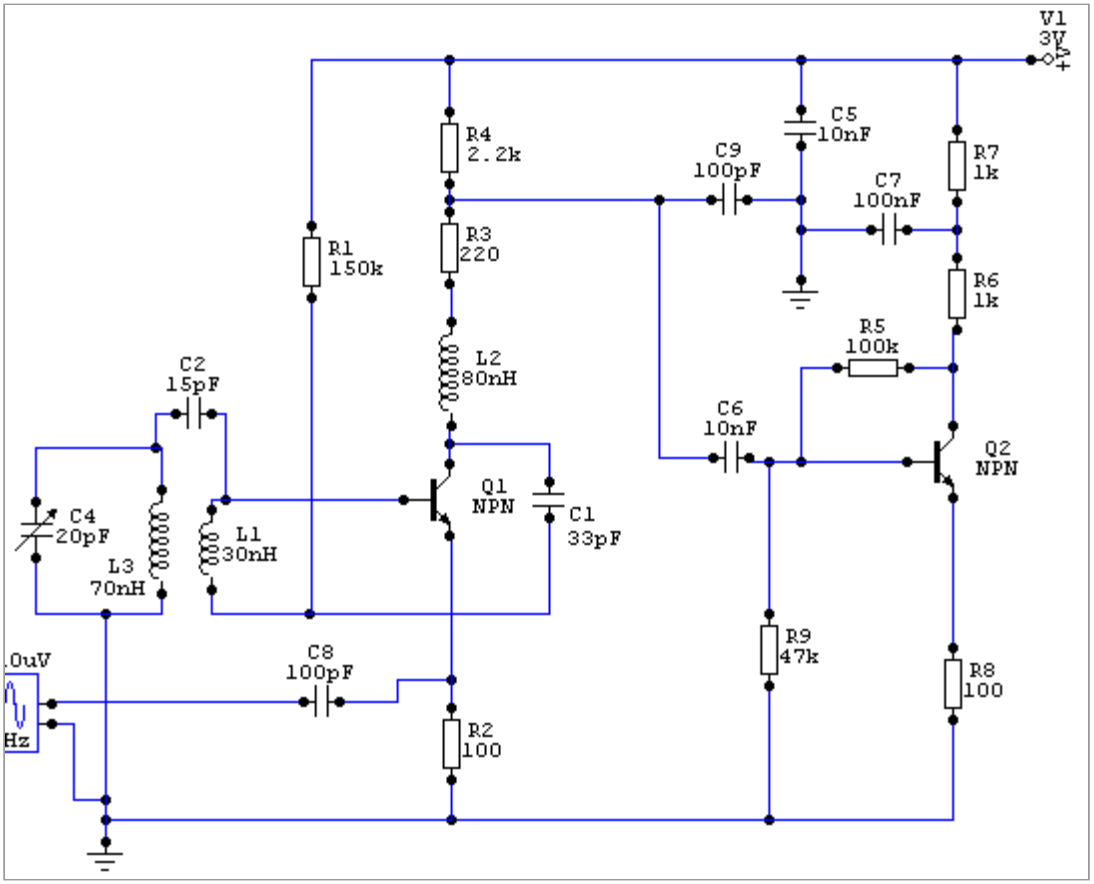
aurel

Re: FM MICROMATIC

Wed Dec 16, 2015 11:23 pm

..maybe something like this...

ATTACHMENTS



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aurel

Re: FM MICROMATIC

Wed Dec 16, 2015 11:48 pm

..or maybe this guy from Russia have a solution..

http://radiokot.ru/konkursCatDay2014/55/

.

qrp-gaijin

Re: FM MICROMATIC

Thu Dec 17, 2015 1:01 am

> **aurel wrote:**
> ..or maybe this guy from Russia have a solution..
>
> http://radiokot.ru/konkursCatDay2014/55/

I see from that schematic that the Sinclair Micro FM uses, for part of its AF amplifier chain, a simple AC-coupled cascade of 3 common-emitter stages (Tr3, Tr4, Tr5), each with identical collector-feedback biasing. This is similar to my 1.2v 90 dB AF amp here: http://theradioboard.com/rb/viewtopic.php?f=8&t=5853

If it's good enough for Sinclair, it's good enough for me!

I do notice Sinclair has a different method for decoupling the Vcc line (R14, R15, R17, C12, C14, C16) than my method (http://theradioboard.com/rb/viewtopic.p ... 134#p54134)

Probably Sinclair's method is more reliable, but mine uses fewer components.

---

blog: http://qrp-gaijin.blogspot.com

Pat Pending

Re: FM MICROMATIC

Thu Dec 17, 2015 5:22 am

> **qrp-gaijin wrote:**
> I see from that schematic that the Sinclair Micro FM uses, for part of its AF amplifier chain, a simple AC coupled cascade of 3 common-emitttical collector-feedback biasing. This is similar to my 1.2v 90 dB AF amp here: http://theradioboard.com/rb/viewtopic.php?f8&t=5853

The Sinclair micro FM uses the resistance coupled stages tr3-tr5 as an IF.Amp. it works only because the intermediate frequency is so low, the price you pay for that is double tuning.

I doubt that anything that Sinclair produced at that time could be described as reliable. They used inferior semiconductors/components, and with the high price, and the avaiability of cheaper ready made minature radios with better perfomance from Japan and Hong Kong, made the kits for the micro FM very unpopular.

It may just be an unkind story, but the micro alloy transistors used by Sinclair were claimed to be batch failed production runs that were rescued from being dumped and the ones that tested as working, were marked and were claimed to be Sinclair's own unique product! He was nothing if not a truly outstanding salesman!

DrM

Re: FM MICROMATIC

Thu Dec 17, 2015 7:17 am

Due to the very low IF output of the MicroMatic's autodyne converter stage, the Local Oscillator can easily get synchronised onto a strong FM-broadcast signal. In this case the IF will be zero, or the baseband AF.

aurel

Re: FM MICROMATIC

Thu Dec 17, 2015 7:39 am

yeah problem with double tuning is very big ,but same is with poor superhet too.
as far as is found only Fisher electronic build such a tuner (pulse counting)
but more complex than sinclair and that perform far better.
There is also design with tunel diode

DrM

Re: FM MICROMATIC

Thu Dec 17, 2015 8:28 am

> **aurel wrote:**
> yeah problem with double tuning is very big ,but same is with poor superhet too.
> as far as is found only Fisher electronic build such a tuner (pulse counting)
> but more complex than sinclair and that perform far better.
> There is also design with tunel diode

Would you like to post a schematic of the pulse counting tuner by Fisher Electronic?

transistor495

Re: FM MICROMATIC

Thu Dec 17, 2015 2:09 pm

> **DrM wrote:**
> Due to the very low IF output of the MicroMatic's autodyne converter stage, the Local Oscillator can easily get synchronised onto a strong FM-broadcast signal. In this case the IF will be zero, or the baseband AF.

No, AFC will come into play.

Use double conversion to eliminate double-tuning. 10.7 first then to a low IF. If you look on Fisher pulse counter, you're likely going to see this approach only(I think..)

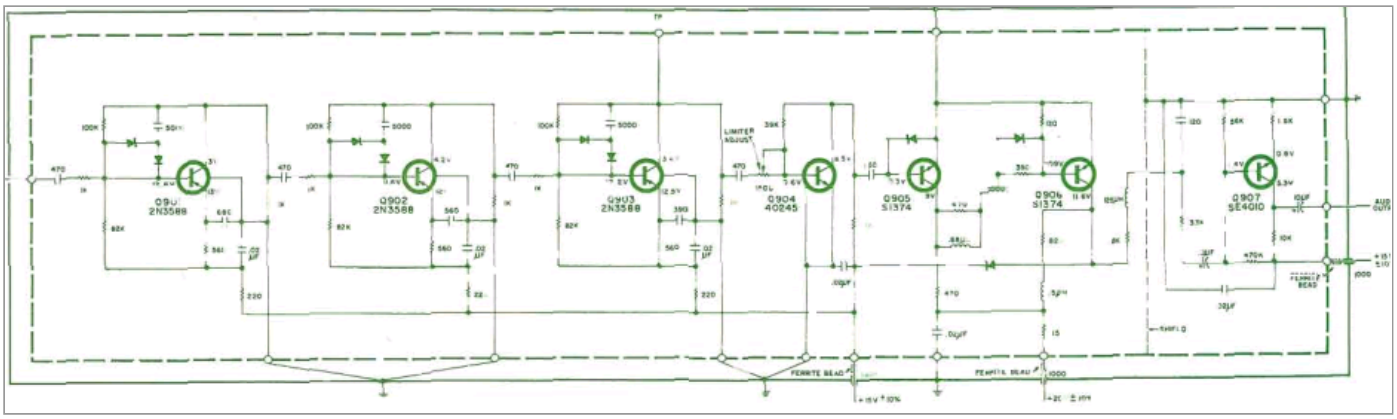
aurel

Re: FM MICROMATIC

Thu Dec 17, 2015 2:48 pm

yeah...yeah..yeah
this double conversion use to much transistors and then is almost easier
to build standard IF stage with IF transformers than build all this cramps.
however Fischer use alo complex thing...

ATTACHMENTS



Fisher.png (90.58 KiB) Viewed 885 times

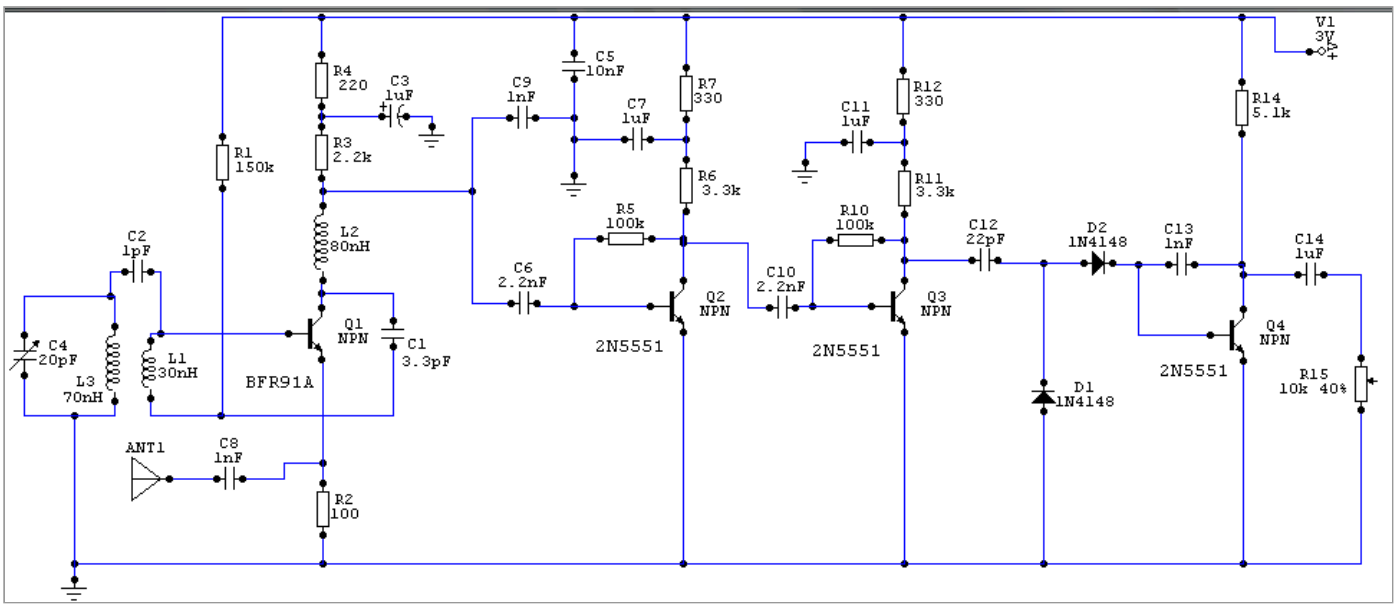
aurel

Re: FM MICROMATIC

Thu Dec 17, 2015 9:30 pm

well...looking into that russian version and because i already have layout with few transistors on pcb i will try rebuild this receiver exactly like this:

ATTACHMENTS



FMmicro2.png (10.92 KiB) Viewed 870 times

aurel

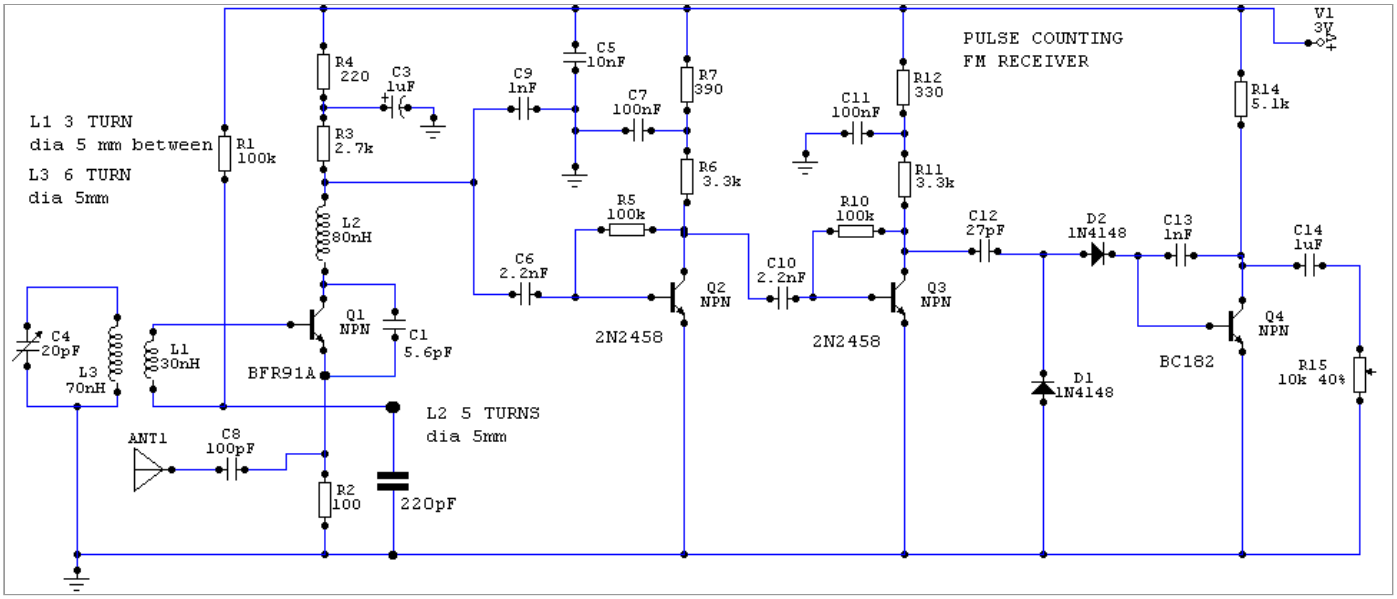
Re: FM MICROMATIC

Fri Dec 18, 2015 10:44 pm

hi
i made some changes and build this circuit
and IT WORK with just 4 transistors i connect circuit to
my amplifier and first nothing without any noise
but when i turn variable cap little bit left from center i get first station

very strong with little strange deep sound
then i set with plastic stick ferite coil in collector then sound become
clear like hifi...yes .
Circuit is very sensitive but i think that preamplifier should improve sensitivity alot.
all in all guys if you have time and interest try to build...

ATTACHMENTS



FMPULSE.png (28.46 KiB) Viewed 838 times

aurel

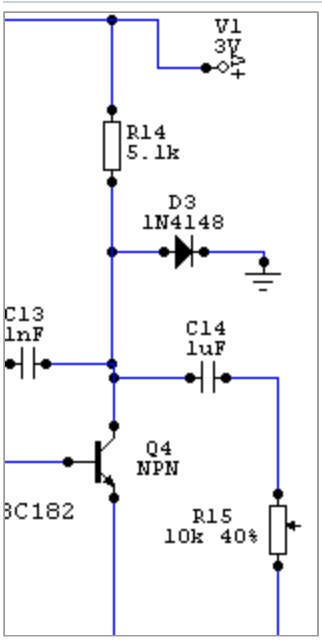
Re: FM MICROMATIC

Sun Dec 20, 2015 2:48 pm

Hi
Here is small video aboutt circuit ..i apologize video is not very good
because i use old cell phone .
http://basicprograming.free-forum.net/d ... php?id=132

another thing
with addition of small diode in colector of converter transistor you can
remove overloading of amplifier.

ATTACHMENTS



Diode.png (1.8 KiB) Viewed 777 times

第 6 页 [实际：第 75 - 90 项] 去到顶部 上滚一页 下滚一页 去到底部

qrp-gaijin

Re: FM MICROMATIC

Mon Dec 21, 2015 3:41 am

> **aurel wrote:**
> Hi
> Here is small video aboutt circuit ..i apologize video is not very good
> because i use old cell phone .
> http://basicprograming.free-forum.net/d ... php?id=132.

Unfortunately I can't seem to download the file (the error says "You are not authorised to download this attachment.").

Can you upload it to YouTube?

Thanks by the way for taking the time to document your receiver with a video. I think this important (and I try to do it myself for my own projects) because I view this kind of audio-visual documentation as our generation's unique contribution to the dying art of radio homebrewing.

---

blog: http://qrp-gaijin.blogspot.com

aurel

Re: FM MICROMATIC

Mon Dec 21, 2015 7:04 am

ah yes...i forget this is on my forum
i will try upload to another place

Anyway....is anyone try to build?
Instead of BFR91 you can use C3355,N9018 etc...

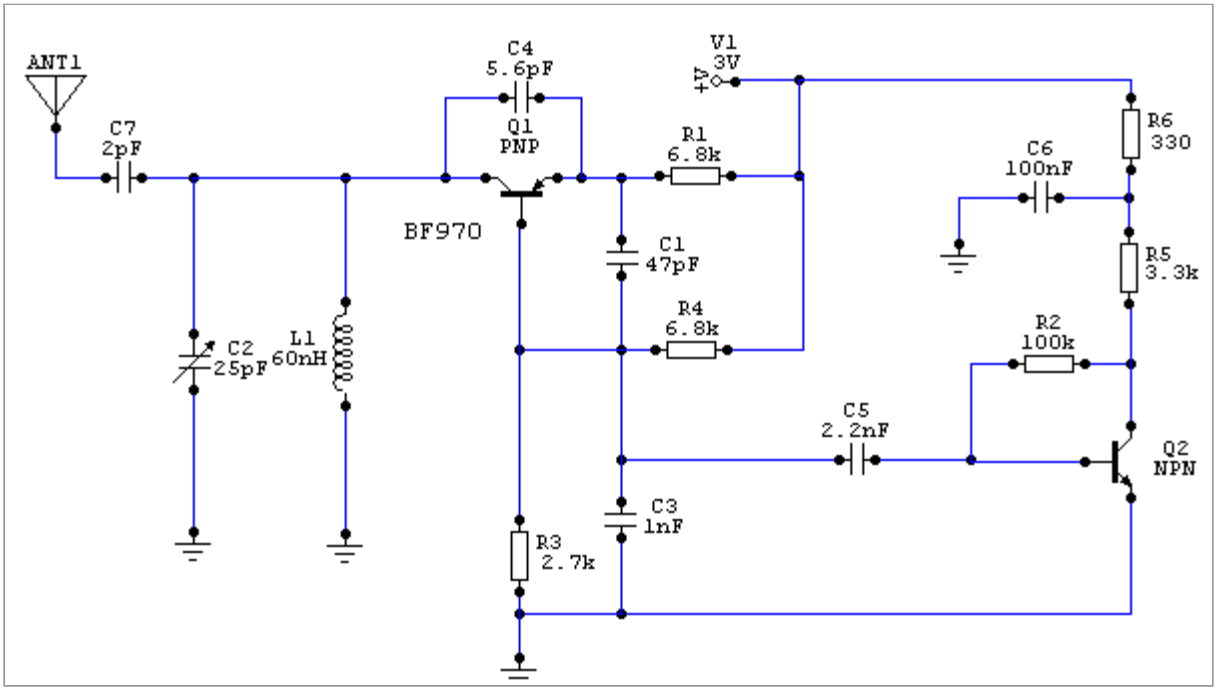
aurel

Re: FM MICROMATIC

Mon Dec 21, 2015 7:54 pm

This can be another option for frontend for pulse counting reciver.
Oscillator circuit is from old exYu magazine and i already test and work fine as local oscillator in FM range.

ATTACHMENTS



FMPULSE2.png (5.36 KiB) Viewed 522 times

achu

Re: FM MICROMATIC

Wed May 09, 2018 4:29 pm

Hi Aurel,
Which simulation software are you using?I m tempted to ask.

Post Reply Return to "Solid State Radios" 79 posts 1 2 3 4 5 6
Jump to
next page

qrp-gaijin

Re: FM MICROMATIC

Sun Dec 06, 2015 3:33 am

Good job aurel on making the working FM receiver! Any chance we can see a YouTube video of it in action?

---

blog: http://qrp-gaijin.blogspot.com

transistor495

Re: FM MICROMATIC

Sun Dec 06, 2015 4:12 am

I don't see this circuit to work on medium to distant FM signals, because there is no regeneration, it may slope detect only heavily strong local signals like how some crystal receivers are done. Selectivity will be worst, but it has acceptable selectivity if used on AM mode. AM version has a potential to add a tickler winding effectively boosting the performance.

seanvn

Re: FM MICROMATIC

Sun Dec 06, 2015 4:12 am

Actually FM modulation is an analog error correction code. There has been very little research in that area, though of course digital error correction codes are everywhere.

aurel

Re: FM MICROMATIC

Tue Dec 08, 2015 2:31 pm

> I don't see this circuit to work on medium to distant FM signals

don't be so sure...
of course you must have good outdoor VHF antenna and there is no problem to
pick up distant FM stations...like in most receivers
without good and high-enough mounted antenna...right?

transistor495

Re: FM MICROMATIC

Wed Dec 09, 2015 2:16 pm

Your FM micromatic does not make any sense. The detector is still on the AM BCB region. There is no regeneration. Totally unworkable circuit.

aurel

Re: FM MICROMATIC

Wed Dec 09, 2015 3:28 pm

> There is no regeneration. Totally unworkable circuit.

really ..how you know that?
do you see that i have emitter resistor?
and yes i don't know is there regeneration or not
maybe oscillate....maybe work as synchro-detector
IF work as original circuit then is ordinary TRF
and with good antenna i can pick up whole FM range without problem
if you don't believe that is your problem...
all in all is easy to build and try then you tell me ...is work
or not work for you..OK?

Pat Pending

Re: FM MICROMATIC

Wed Dec 09, 2015 10:56 pm

> **transistor495 wrote:**
> Your FM micromatic does not make any sense. The detector is still on the AM BCB region. There is no regeneration. Totally unworkable circuit.

The detector is almost identical to a charge/pump detector that has been used in simple, low I.F, pulse counting F.M. receivers including Sinclair's own. Conceivably the choke is coupling signal back to the tank circuit and causing the stage to oscillate. When I have time I will try this circuit to see what happens! Don't think I've ever seen a single active device, re-gen, superhet, reflex, vhf FM receiver before, but that doesn't mean they can't be made

seanvn

Re: FM MICROMATIC

Wed Dec 09, 2015 11:43 pm

It probably did work because there was an LC circuit, some non-linearity for RF (slope) detection and some audio amplification. In those times there were no circuit simulators to help the design effort. People came up with whatever kind of heuristics to explain to themselves what worked and what didn't work. Often radio circuits designed that way worked more by happenstance than for any other reason.

gzimmer

Re: FM MICROMATIC

Wed Dec 09, 2015 11:50 pm

transistor495 said,

> The detector is still on the AM BCB region.

This is nonsense. Clearly the coils are tuned to the FM BC band (the circuit shows a 6 turn Inductor and a 40pF trimmer Cap).

Pat Pending said,

> The detector is almost identical to a charge/pump detector that has been used in simple, low I.F, pulse counting F.M. receivers including Sinclair's own.

Again this is nonsense. The Sinclair Micro FM was a Superhet which used a 100KHz IF and six transistors.

Aurel posted a neat design in good faith, and he doesn't deserve this kind of rubbish.

I feel that the Mod needs to step in and stamp out some of this idiocy.
If people are going to make wild claims, they need to put up some justification.
Certainly controversy helps build readership, but it also drives away the more valuable contributors.

.....Zim

Last edited by gzimmer on Wed Dec 09, 2015 11:56 pm, edited 1 time in total.

KR1S
Site Admin

Re: FM MICROMATIC

Wed Dec 09, 2015 11:55 pm

> **gzimmer wrote:**
> I feel that the Mod needs to step in and stamp out some of this idiocy.

The Mod hates to step into technical discussions that are over his head! That said, civility is expected, though I've seen worse than this. Thanks to Aurel for generously sharing many circuits with us, and I hope he continues to do so.

Jim (AKA *The Mod*)

Jim Kearman, KR1S

Southeast Arizona

Ham-er

Re: FM MICROMATIC

Thu Dec 10, 2015 12:57 am

> **KR1S wrote:**
> *The Mod* hates to step into technical discussions that are over his head! That said, civility is expected, though I've seen worse than this. Thanks to Aurel for generously sharing many circuits with us, and I hope he continues to do so.
>
> Jim (AKA *The Mod*)

Yep, if there is disagreement it should be backed up with some reason or theory.
We don't just jump on someone like that.

I have disagreed with Aurel a few times but I DO hope that he keeps experimenting and sharing.

73
kb0lxy

Pat Pending

Re: FM MICROMATIC

Thu Dec 10, 2015 1:20 am

Please note Zim, I was defending Aurel and his "outside the box" ingenuity, and offering a possible explanation of how this circuit may be working. And I can see that it could easily be a novel way to economically resolve a vhf FM signal, however it is doing it. I also agree with you and Aurel that members should not criticize the work and thoughts of others until they have tried for themselves. My comments about the charge pump discriminator is not rubbish as you state, the voltage doubling am detector is an almost identical circuit only possibly the time constants being different, it was reference to a small part of the circuit, in an attempt to lead others to realize this was originally designed as a radio and is in essence little changed barring it's reception band. I was not referring to how many transistors the circuits may or may not have,(the Sinclair micro FM actually has seven not six) my own pulse counting receiver that I designed and built myself a few years ago has only one tuned circuit, but contains no less than 17 transistors, making Aurel's design eight times more economical than mine! If you don't understand my English idiom, I can only apologize, but I chimed in on this post because I thought the contribution that was being made was worthy of further discussion and encouragement. I do intend to built this little circuit to see if my assumptions are correct, or otherwise, instead of just reading the posts and making glib comments. Edit I also enjoy Aurel's style in his posts as he doesn't resort to unnecessary technobabble that should be reserved for doctoral dissertation instead of trying to showboat to other members. Keep up the good work Aurel!

Last edited by Pat Pending on Thu Dec 10, 2015 10:55 pm, edited 2 times in total.

Pat Pending

Re: FM MICROMATIC

Thu Dec 10, 2015 2:18 am

Now for my theory of how this design works! Stray inductive coupling from the choke feed back to the tank circuit may be inducing oscillation (1) at signal frequency being mixed with the aerial signal and being synchronously detected. or (2) working regeneratively, or, (3) my favourite, if only because it's the one I suggested in the previous post! The incoming signal being amplified in common base mode, and mixed with the "local oscillation" (generated as above) giving an I.F. that is coupled to the diodes via the 270pf cap, that charge pump the 0.01uf cap to give demodulation of the incoming program. To be finally amplified at A.F. How cool would that be? After all if reflexing is possible on M.W. it is at least in theory possible at V.H.F? Gonna build it any way to find out for sure, and after all the fuss, I think I owe it to you all to poke scope and spectrum probes at every node. (Have to borrow use of spectrum analyzer. not that rich!)

aurel

Re: FM MICROMATIC

Thu Dec 10, 2015 12:38 pm

Hi guys...
there is no need for panic or flames
t495 is little bit fast in conclusion 

> Aurel posted a neat design in good faith

thanks Zim..yes as always
In my first post i was say that because AM not exists in my area
i try to tune FM with same circuit.

of course i have change tuning coil that i can pick up FM(88-108).
I am not sure how this circuit work ..but work!

Slam

Re: FM MICROMATIC

Thu Dec 10, 2015 2:50 pm

Hi Fellas
When these first came out I was besotted with the whole concept of a 2 transistor radio in a box the size of a match box , bugged the hell out of my old man till he weakened and got one for a birthday pressie for me - so disappointed with performance and button cell wastage soldered wires to battery lugs for external power and had to sit the thing inside my x- tal set coil to get good reception but still loved it ! Still have it and that first tank coil I ever made
Cheers Gents

next page

transistor495

Re: FM MICROMATIC

Thu Dec 10, 2015 3:26 pm

If you think it works, then it should be reproduceable on another pcboard or anyone else(to make sure that the reception is not caused by spurious oscillations caused by parasitic capacitances and related slope detection.

Also is it works only with one type of device(2N4646) that is nobody been even heard of?

How long are those FM transmitters from your area?

A video presentation will answer many questions.

KR1S
Site Admin

Re: FM MICROMATIC

Thu Dec 10, 2015 3:46 pm

In an **earlier post**, Aurel says

> This transistor is very similar to BFR91A or BFR 93..
> also i try 2SC3355 and 2N9018 and work to with little bit different base bias

You can see the device near the center of the board, in the photo in this post:
viewtopic.php?f=4&t=6689#p63545

Jim

Jim Kearman, KR1S

Southeast Arizona

Pat Pending

Re: FM MICROMATIC

Thu Dec 10, 2015 5:42 pm

> **transistor495 wrote:**
> If you think it works, then it should be reproduceable on another pcboard or anyone else

I am making one and will let you know.

> **transistor495 wrote:**
> To make sure that the reception is not caused by spurious oscillations caused by parasitic capacitances and related slope detection

I get where you are coming from but does it matter? Penicillin was discovered by accident. Somone had to be observant to discover it.

gzimmer

Re: FM MICROMATIC

Fri Dec 11, 2015 10:45 am

transistor495 said

> If you think it works, then it should be reproduceable on another pcboard or anyone else
> (to make sure that the reception is not caused by spurious oscillations
> caused by parasitic capacitances and related slope detection.

This post really has me puzzled.

It is well documented that a simple Crystal Set can receive FM BC stations by means of Slope Detection.
As this circuit is simply an amplified Crystal Set, why would it not work?
Having useful RF and Audio gain, it should work even better than a FM Crystal Set.

And what on earth is wrong with Slope Detection?

Admittedly it is a Reflex circuit, but that has no bearing on the above.
A reflex simply saves one transistor by using it twice. There is no magic.

> Also is it works only with one type of device(2N4646) that is nobody been even heard of?

And what possible relevance is this? It's clearly an ex Phillips VHF transistor, and if it works, it works. What's the big deal?

???????????

.....Zim

transistor495

Re: FM MICROMATIC

Fri Dec 11, 2015 4:11 pm

Don't get puzzled much, stay balanced =)

I only mean if it is a phenomena by means of unwanted oscillation behaviour then it won't be replicable and the output will be non-predictable. Then it won't qualify as a workable receiver.

I'm just adding my observations only. And there is no point in debating if nobody able to explain how the circuit actually works, if it ever works. Before buildig up theories, let us see if it is a reproduceable circuit or not.

> **gzimmer wrote:**
> And what on earth is wrong with Slope Detection?
> .....Zim

And nobody told here slope detectoion is too bad, although you can search online to understand the disadvantages.

aurel

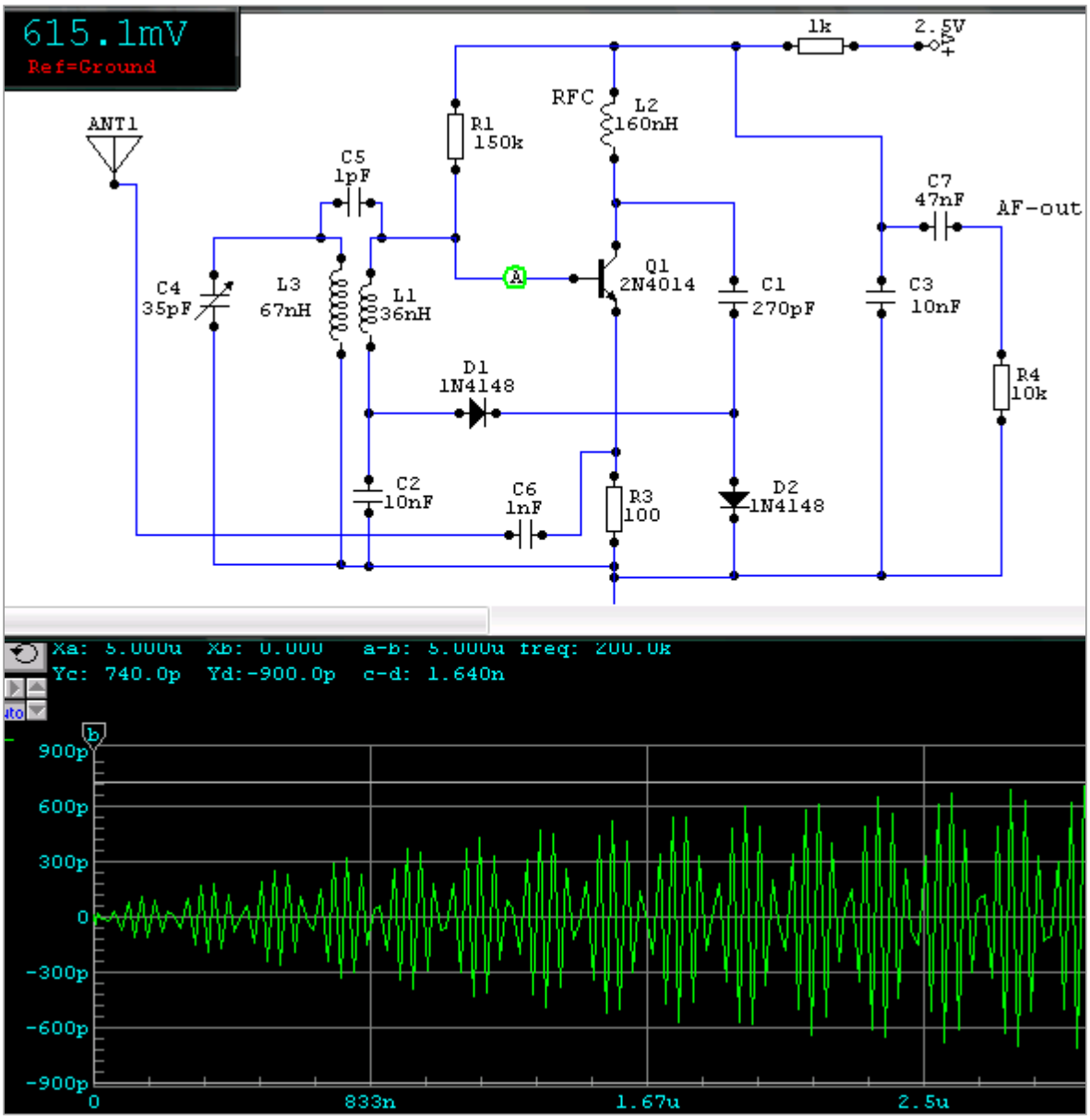
Re: FM MICROMATIC

Fri Dec 11, 2015 10:08 pm

> if nobody able to explain how the circuit actually works, if it ever works.

well if original sinclair circuit work ,even if work not very well ...it work.
Next simulation (used different transistor from -Circuit maker List)
show that my circuit oscillate only if **C3 - 10nF** is connected
which means that is created some sort of relaxation oscillator
or if you wish colpits-type.
Because when i connect 56pF cap between colector and ground
frequency is changed and i tune different FM station.
Also i add in serie with tuning cap ,capacitor 27pF to better cover
whole fm range ,of course circuit don't have any AGC so weak stations
are with lower audio but i still can tune them.
And as i say before i use open dipole antenna (with baloon transformer) which is
connected trough 1nF cap to transistor emitter.
So it is easy to build and anyone can try .

ATTACHMENTS



FM_SIM3.png (11.96 KiB) Viewed 1019 times

qrp-gaijin

Re: FM MICROMATIC

Sat Dec 12, 2015 12:21 am

> **aurel wrote:**
> Next simulation (used different transistor from –Circuit maker List)
> show that my circuit oscillate only if **C3 – 10nF** is connected

What Q values are you using for the coils in your simulation?

---

blog: http://qrp-gaijin.blogspot.com

Pat Pending

Re: FM MICROMATIC

Sat Dec 12, 2015 1:39 am

Hi all. I've hooked the circuit up and.....it works. Sort of. Well not bad for first fire up. Not difficult to tune but distorted. And I had to alter some component values, eg. 270pf now 18pf, 1k collector resistance now 3k9, base bias 220k, transistor type that I use is S9018, I've also tried BF194 (lower Ft). The layout is critical, coil winding sense also critical including collector choke (I think some feed back from here). The circuit seems to work as a re-gen, if the diodes are not fed from the collector the circuit oscillates. Will look at it more over the weekend. To tired now its late. Bye!

transistor495

Re: FM MICROMATIC

Sat Dec 12, 2015 2:08 pm

> **aurel wrote:**
> show that my circuit oscillate only if **C3 - 10nF** is connected
> which means that is created some sort of relaxation oscillator
> or if you wish colpits-type.

Right, could be a sort relaxation oscillation[quench] along with original VHF oscillations, -that looks like what you have made is a variation of super-regenerative receiver. Or the circuit may be in between regen to superregen state, if you add a regen control, then the things would be more easy -audio may get improved but the characteristic distortion of around 30% will be there anyway -inherent problem with slope detection

I quit slope detector receivers long back and moved more into HiFi side

Here in the below video, someone neatly presents an ultra simple fm receiver, that you may get tempted to try. How it works?

qrp-gaijin

Re: FM MICROMATIC

Sat Dec 12, 2015 2:24 pm

Not sure if this is already covered by the existing discussion, but here's one theory how an AM-only detector can detect FM (thanks to multipath reception): http://techlib.com/electronics/allband.htm#Karen

I think I saw an article by Polyakov also that mentioned something similar, though I can't find it now. (EDIT: here it is -- http://zpostbox.ru/fm_crystal_radios.html)
.

---

blog: http://qrp-gaijin.blogspot.com

aurel

Re: FM MICROMATIC

Sat Dec 12, 2015 10:55 pm

some info here:
http://www.petervis.com/Radios/sinclair ... radio.html
.

transistor495

Re: FM MICROMATIC

Sun Dec 13, 2015 2:55 pm

> Here in the below video, someone neatly presents an ultra simple fm receiver, that you may get tempted to try. How it works?

The interesting circuit in the previously posted video not only so simple, but I observed many other things as well. It oscillates, covers a good frequency range and sensitive also. I tried to monitor closely into the audio quality of the receiver and surprised that it appears far better than a regen/super-regen fm radio output. I couldn't detect any major distortion, so it suggests like a colpittz based regen-synchronous mode FM detector. I really don't know till what extent they can perform in reality. HIgh frequencies looks particularly good, but the lower frequency quality cannot be observed from that cheap speaker to the audio recorder. The audio section used a 100uF cap for speaker coupling should be particularly noted -need to be improved. The guy did a good job on execution..

> **qrp-gaijin wrote:**
> Not sure if this is already covered by the existing discussion, but here's one theory how an AM-only detector can detect FM (thanks to multipath reception): http://techlib.com/electronics/allband.htm#Karen

Few times back I did try this allband receiver but unfortunately in a no AM/FM signal area  , I ended up catching some mobile phone signals buzzing and some random electrical noises. IIRC, the diode I used was BAT85.

Pat Pending

Re: FM MICROMATIC

Sun Dec 13, 2015 4:15 pm

Hi everyone! I've now done a bit more tinkering with Aurels circuit, the following may be of interest as non of it was as I expected. Using Aurels circuit as a guide, I have now replaced the one hundred ohm emitter resistor with a peaking circuit (for more efficient coupling from a small antenna), tuning now sharper (very wide range too, @65-100mhz). I removed the 270pf capacitor and biased the transistor base from a pot to see what happens with different bias levels, it stopped working (Diodes important!?) Reconnect cap but to top end of collector coil by mistake. It started working again, however now with clearer sound but less volume. Get out trusty oscilloscope, the trace of the signal at the transistor collector can only be described as an amplitude modulation on a approx 30mhz (ish) FM carrier, (its this frequency whatever station it tunes to), looks like classic slope detection to me(?) putting the end of a small screwdriver into the center of the collector coil decreases this carrier frequency. Inserting a rfc in series with the collector resistor improved the volume on the piezoelectric speaker I was using. I removed this speaker from the circuit to replace it with an amp, it stopped working, (The speaker has a capacitance of around 5nf), add 4n7 cap to ground, and its working again, with not to bad quality, but not HiFi, also a steady whistle is present (SCA beat?). I think the original heavy distortion was due to audio modulation causing big variation in transistor bias? Now the diodes are acting as an AGC maybe? (Definitely the bias goes down as you tune a strong signal), a strong local station has an "echoey" quality to the sound, that improves if the antenna signal is lowered. Simulations haven't helped, I think what's going on is to

complex, and there are to many variables, for instance, if the collector coil is wound in the opposite direction, or moved closer or further from the signal tuning tank, the reception stops. To summarise then:
1. It CAN work. Point to Aurel.
2. I believe stray coupling IS involved in its operation. Point to transistor 495
3. The charge pump diode circuit is NOT doing the demodulation. Point to Zim (Rats! I was wrong, demodulation seems to be being done solely by the current drawn by the circuit being sensed by the collector resistor, a perfectly legitimate method).
4. I'm not sure what to call it? fremodyne maybe? Thoughts?

I will leave it for others to speculate. Interesting maybe, but I think we're trying to reinvent the wheel here. I will post sketch of circuit and photo when I've a chance to "resize" for the board, (and my data allowance) Good luck everyone.

aurel

Re: FM MICROMATIC

Sun Dec 13, 2015 4:38 pm

thanks Pat....
main problem whic i have is with choke or RFC because nowhere is
defined what kind of choke is used in original circuit.
I use one with 20 turns / 3 mm dia (air core) from small chip radio
and it looks that work ok.
also i have in plan to build really small version of this receiver as proof that
can be made .

Pat Pending

Re: FM MICROMATIC

Sun Dec 13, 2015 4:53 pm

If what I think is correct, and your circuit works similarly to mine, then your choke and how it's made and mounted is quite important to the circuit's operation. I had quite a hard time getting it to work with different components. Will try to get my circuit posted soon, as its got several differences you may be interested in. Although I have described them, you may like and understand a diagram better.

next page

aurel

Re: FM MICROMATIC

Sun Dec 13, 2015 5:55 pm

thanks Andy ...
i must found (or build) small tuning cap like is used in original circuit.
Ahh yes RFC(choke) is important part of circuit because enable feedback
to regenerative (and reflex)amplifier.
In my case i place choke verticaly like in original circuit.
From my version of russian ZeroIF receiver i add emitter resistor
but collector resistor is 2.2 .-> 2.7k.

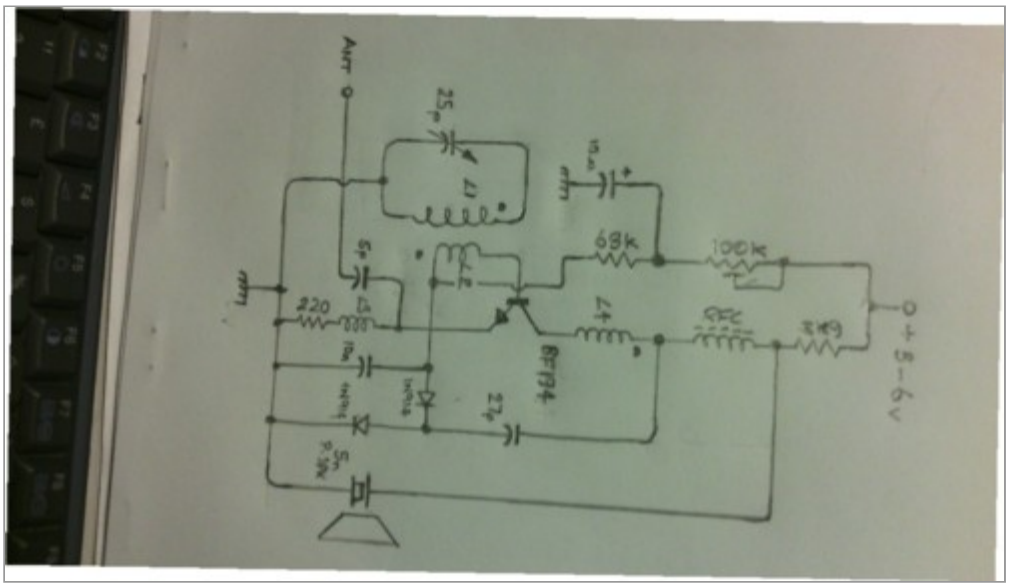
Pat Pending

Re: FM MICROMATIC

Mon Dec 14, 2015 1:30 am

Back to the smart phone again. My computer PSU has just blown up 😳. Going to try to see if I can photo a sketch of the diagram then post that. I know it's a waste of data, but I hate being messed about by digital electronics, damn thing is only 11 years old(!). I've got a radio from the thirties that still works, and it has still got most of it's original parts. Now where are my pills! The receiver diagram is only for illustration of my previous posts, and I wouldn't try to claim that any one should build it expecting great things, I managed to get it to work to prove to myself that a reflex vhf FM set would work. I kind of failed, although it did receive some FM stations. the coils are as follows:-
L1=6turns 18swg (1.2mm) spaced 1 turn 8mm dia.
L2=3turns 18swg (1.2mm) bi fillar with earthy end of L1
L3=L4=14turn 25swg (0.5mm) close wound 3mm dia.
Choke=300uH pile wound type,(second hand part that seems to be wound on a 1w carbon compo resistor, high resistance I assume)

ATTACHMENTS



IMG_20151213_215355.jpg (24.56 KiB) Viewed 1177 times

Pat Pending

Re: FM MICROMATIC

Mon Dec 14, 2015 7:20 am

Aurel. Sinclair used to use a compression "compensator" trimmer with a modification to fit a control knob.It was possible to buy the conversion kit to fit a long 1/4" standard control shaft to screwdriver adjusted types. But I've not seen any of the mica trimmers or conversion kits for sale in years. I have seen modern small screwdriver adjusted Vc's adapted for a control knob on someone's radio blog, I will try to find it again and send you the link.

aurel

Re: FM MICROMATIC

Mon Dec 14, 2015 12:08 pm

Hi Andy and thanks for schematic.
i see that you use BF194 and yes this type of planar require higher voltage.

Instead of your collector coil you can use 100-220 ohm resistor
this maybe can get better results.

> compression "compensator" trimmer

yes i know i have somewhere those things from old car radios.

transistor495

Re: FM MICROMATIC

Mon Dec 14, 2015 3:49 pm

> **aurel wrote:**
> some info here:
> http://www.petervis.com/Radios/sinclair ... radio.html

The RFC(radio frequency choke) in the AM reflex radio should be a inductance value close to 2mH, or I would try experimentally for the best value in between 1mH to 2mH, the value should be chosen so that it effectively choke out the full AM BCB bandwidth without supressing the radio performance, however this value should mean different in your FM circuit.

I observe that both of your implementation variations use different value of RFCs(30uH in aurel case, and 300uH in pat's case), the difference is noticeable, so does that mean that each of you trying to supress entirely different frequencies?

Here is my theory:

Both of you have different stare oscillations developed in your circuit, in pat's case it is somewhere at 30MHz(prominent, there could be a mix of oscillations happening, lower and higher levels including harmonics), but at the same time the BJT amplifier is configured as a minimal regen for LC resonant VHF FM signals applied. The simple phenomena I can see here is that resonant VHF signal variations can amplitude modulate the stray oscillations(which is happening in the same stage) resulting in a vague slope detection of VHF signals. I don't see anything other than an alternate and inferior form of super-regenerative detector here. Here the self quench is altered by stray oscillations. To prove this phenomena or to make it with a defined operation, you could wire a BJT colpittz oscillator running at a low level frequency, same time wire it as a tuned LC resonant VHF amplifier. Nothing unusual. Now your theories are always welcome.

My another thought is that if this simple modification can make Sinclair AM reflex into FM reflex, then the clever engineers might have came up with that already, making a cheap AM/FM receiver by simply switching the LC circuit. No right? Instead they came up with a cheap alternate -the micro FM charge pump circuit -which has the potential to output good performance including the audio.

aurel

Re: FM MICROMATIC

Mon Dec 14, 2015 4:33 pm

> No right?

NO ...they don't have transistor what i have or better to say
i doubt that at those times exists such a HF transistors like we have

today...
never the less...
your explanation may have some good points.
Andy ..in his expariment build some sort of hybrid between russian
ZeroIF receiver and sinclar Reflex AM receiver ...
heh we can call it ZeroReflex ...what might be interesting option
Well about AM re-modulation ...i am not so sure about that.
IF incoming FM signal modulate oscillator frequency
then oscillation level must be really very low like in super or regen
then producuct is AM modulation of oscillator signal is recovered as audio
signal with evenlope detector.

Choke for FM can be 75cm of tiny wire wound over 6mm plastic body to
create endless impedance for FM signal .
In my case i first use 11 turns .dia 4mm 0.5 wire
but then i replace this coil with 20 turns -dia 3mm 0.1wire
which is cca 350nH
also work with
coil :
25 turns dia 4mm 0.2 wire len- 8mm which is cca 1 microH.

Pat Pending

Re: FM MICROMATIC

Mon Dec 14, 2015 8:40 pm

Transistor 495. I have looked further into how my circuit is working. I think the circuit when it is working, is oscillating at low level, at between say, 95 to 130MHz controlled by the vc, the level set by 100k pot and the level kept constant by the diodes. This is mixed with the wideband input signals, and when a signal from a transmitter mixes down to 30MHz it is slope detected by the inductor L4, (I've stopped the oscillation and tested this in circuit with a signal generator injecting into the emitter, it's got a big resonance at around 30MHz). The circuit in operation is a little starved of supply current, so basically when it is in resonance more current flows in the 3k9 resistor and audio can be extracted from here. The rfc was one I had (it has a ferrite body not a resistor by the way)its value is not critical it just has to stop the top of L4 being loaded down at RF, it seems it's series tuned mostly by the 27pf cap. The transistor type that I've used was about in the 1960s but was probably still better than Sinclair's ones as they were renowned for using manufacturing rejects, I have one of the early micromatic and the micro FM as well, and they are both interesting little sets but their performance is not great! But maybe still better than mine! If the clever engineers had come up with my version including the antenna for wearing on the customers head, (like me its a bit deaf), I think they would soon have no job . I may try later to make a more clinical design, instead of one relying on stray coupling and luck!
Aurel. Have already tried resistor instead of L4, wont work, I think although similar our circuits work in different modes maybe, It seems your results are better? I cannot for instance get mine to tune top of FM band (transistor ft?) where my favourite stations are! And I have to adjust bias for different signal levels, like a re-gen. Good luck to all.

Last edited by Pat Pending on Mon Dec 14, 2015 10:22 pm, edited 1 time in total.

aurel

Re: FM MICROMATIC

Mon Dec 14, 2015 10:16 pm

> I cannot for instance get mine to tune top of FM band (transistor ft?) where my favourite stations are! And I have to adjust bias for different signal levels, like a re-gen.

hi Andy
yeah my transistor is for VHF/UHF (from TV antenna amplifier) as i say very simlar to BFR91A
this transistors are better for high freqs.
But i think that problem might be in chocke ,my is air core coil 20 turns dia 3mm.
Also i have one 120k fixed resistor and one 50k trimer to set base current.
when i set it once the work for whole range
and whole range i covered without problem.

Pat Pending

Re: FM MICROMATIC

Mon Dec 14, 2015 11:11 pm

I can change L4 a little by squeezing and opening the turns a bit but all this does is alter the 30MHz I mentioned, and you have to re- tune the station. I have had L4 set at one point where I only get a very faint shortwave station wherever the tuning is set, like IF breakthrough maybe? The choke (RFC) makes no difference, I've even put a 1.8 mH coil with a pot core here that worked, (with muffled sound). I have been reading up about fremodyne receivers, and this "fits the bill" how it operates, if a bit crudely. Thinking about the transistor, I've tried using a 9018, and it behaves the same (700MHz typ. Ft.), so the problem is elsewhere. I am always tempted to cut and try on simple circuits like this, but if they work you wonder why, if they don't, you have more work to make them! I have a little superregen that I listen to aircraft traffic on, that also does quite well on FM. I'll try to find the schematic for that to compare, that tunes to @180MHz Ok. (I designed that one properly, when I had more time). Worry not I will share any improvements, prepare to be underwhelmed. 😀

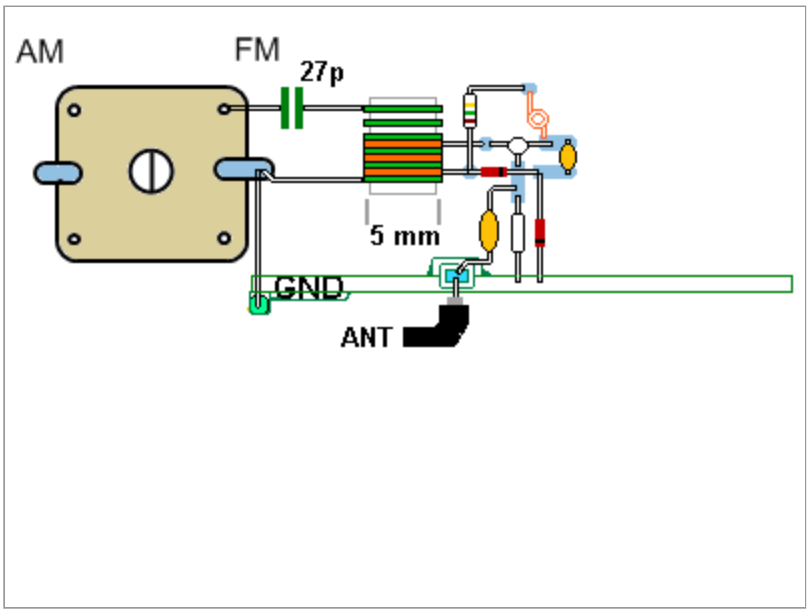
aurel

Re: FM MICROMATIC

Tue Dec 15, 2015 6:27 am

hi Andy
my layout looks like this :

ATTACHMENTS



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transistor495

Re: FM MICROMATIC

Tue Dec 15, 2015 6:15 pm

Pat, nice theory.

in most superhet receivers I seen LO signal is prominent, not IF.Here this is a single BJT circuit.

At any low level, the LO signal(which creates a heavy ~30MHz IF) as per your theory should be traceable on a nearby placed VHF radio. All super-regens or fremodynes emits heavy VHF LO signal to surrounding air. In your case a long antenna also connected. So LO signal should be traceable -from which frequency till what frequency.

> No defined VHF LO
> No defined IF trap/filter
> Very low level and untraceable VHF LO signal produces a heavy ~30MHz IF
> No heavy IF amplification but still ~30MHz IF is detectable on CRO/ still LO is not detectable
> IF breakthrough?

All these things are not matching to the 'superhet' theory. Higly unlikely.

Have you got to listen to the micro fm receiver when it was originally made or any time near to that? It can surely go deaf due to
aging..

aurel

Re: FM MICROMATIC

Tue Dec 15, 2015 9:57 pm

well
i am not sure what you talking about
sinclair MICRO FM is so called 'pulse counting receiver'
and what is this is that carier swing cca +-75kHz -> 150kHz
there is stated 120kHz ..oK this swing is represented as new carrier and then is amplifyed 3 times with filtering then is used frequency to voltage converter to

transform signal into audio signal and that it is all about.

yes in micromatic case looks that there is no oscillator
but are you sure HF signal is returned trough 270pF cap to
base of transitor creating positive feedback ...?
is that not oscillator loop?
yes base is grounded by 10nF cap but i think that some small part of
signal get base of transistor .

Pat Pending

Re: FM MICROMATIC

Tue Dec 15, 2015 10:56 pm

Aurel. Thanks for your clear layout diagram. I will assemble one to see if I can receive any stations here, (we have mostly poor signals, commercial radios are marginal here without good, outside antenna). Are you in a good signal area at your location for FM? My layout is done on a groundplain with small pieces of copper clad board stuck on for connection. I have lifted the pad for the collector off the board and it stops working! So I think the answer is with this new thin PCB laminate making good capacitors on the groundplain! This Manhattan style construction has caused no problems for me before with VHF circuits using thicker laminate.

Transistor 495. L.M.A.O. where to start. Hum. Sinclair micro FM that I have, I built in 1974, they were only available as kits. My Dad bought it for me for my birthday and we built it together, he got it from a work mate who had bought it five years before, and had not assembled it. I did not say in my post that it was deaf, I said its performance wasn't great, I said the circuit that I have built was a bit deaf.

I did not say that the 30MHz signal was prominant. It was very low level. The circuit does produce a local oscillation, I have detected it on a normal FM set, and commercial aircraft band receiver. I cannot resolve it on my oscilloscope because the one I have at home is only 40MHz capable. I said quite clearly approximately 95 to 130 MHz

I am sorry but the other points can be gathered from my posts if you read carefully you will understand, even if you do not agree. With your knowledge and experience you would maybe share your own designs for simple, low component count FM radios.

Have a nice day everyone!

transistor495

Re: FM MICROMATIC

Wed Dec 16, 2015 6:52 am

> **Pat Pending wrote:**
>
> Transistor 495. L.M.A.O. where to start. Hum. Sinclair micro FM that I have, I built in 1974, they were only available as kits. My Dad bought it for me for my birthday and we built it together, he got it from a work mate who had bought it five years before, and had not assembled it. I did not say in my post that it was deaf, I said its performance wasn't great, I said the circuit that I have built was a bit deaf.

Great to hear that you bought and built the micro fm receiver. Are you remembering the part nos of all the 7 transistors used in this circuit. It has not been clearly mentioned anywhere. I have been looking towards a modern realization of sinclair micro fm for a fun . You guys can also join if you wish.

Any assembly instructions, photos or whatever any materials you have regarding this radio?

aurel

Re: FM MICROMATIC

Wed Dec 16, 2015 2:25 pm

I have already build this radio with npn transistors (posted somewhere here on forum)
but i am not impressed with results.
Maybe i use wrong transistors

next page

transistor495

Re: FM MICROMATIC

Wed Dec 16, 2015 4:56 pm

> **aurel wrote:**
> I have already build this radio with npn transistors (posted somewhere here on forum)
> but i am not impressed with results.
> Maybe i use wrong transistors

Sinclair might have used earlier Germanium VHF transistors for RF/osc(you can try AF139/AF239 PNP here) and any HF RF transistors for 3 stage IF and detector(you might try AF200/AF125/AF126 PNP types) and a audio driver(AC125/AC126 types for common eg). These are PNPs for exact replica of the circuit, but I don't have any idea about the original types and gain they used in these stages. Also what types of diodes they used in detector stage is another question..

From picture what I understand it tank coil L3 is slug tuned type, L1 and L2 not clear -again that should not make a challenge because that is broadlband amplifier. AFC looks particularly interesting..

Pat Pending

Re: FM MICROMATIC

Wed Dec 16, 2015 7:59 pm

Sinclair micro FM. Info.
Transistors were rebranded reject microalloy germanium. only the first two need to be rf types as the if goes no higher at fundamental than @200KHz.
Link to excellent Australian site with this, and other pulse counting receivers.
http://members.iinet.net.au/~cool386/

aurel

Re: FM MICROMATIC

Wed Dec 16, 2015 10:13 pm

Yes fm micro is funny thing but is very unstable.
When i build i probably made few mistakes(as usual)
last two transistors (F/V converter is not problematic)

so called IF stage require 2 transistors (biasing is problematic)
and most problematic part is oscillator(in this case syncro..YES iT is!)
heh maybe i cantry to build 3V version ..again

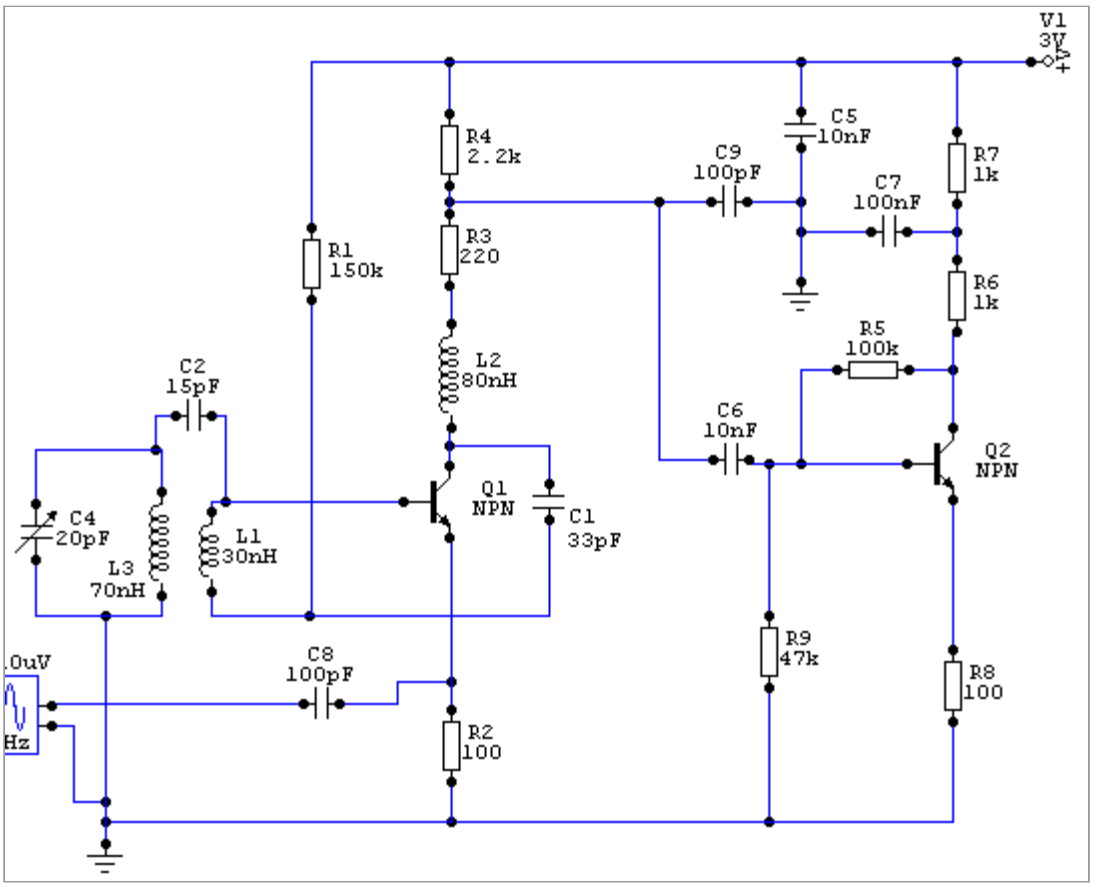
aurel

Re: FM MICROMATIC

Wed Dec 16, 2015 11:23 pm

..maybe something like this...

ATTACHMENTS



PULSE01.png (6.62 KiB) Viewed 962 times

aurel

Re: FM MICROMATIC

Wed Dec 16, 2015 11:48 pm

..or maybe this guy from Russia have a solution..

http://radiokot.ru/konkursCatDay2014/55/

.

qrp-gaijin

Re: FM MICROMATIC

Thu Dec 17, 2015 1:01 am

> **aurel wrote:**
> ..or maybe this guy from Russia have a solution..
>
> http://radiokot.ru/konkursCatDay2014/55/

I see from that schematic that the Sinclair Micro FM uses, for part of its AF amplifier chain, a simple AC-coupled cascade of 3 common-emitter stages (Tr3, Tr4, Tr5), each with identical collector-feedback biasing. This is similar to my 1.2v 90 dB AF amp here: http://theradioboard.com/rb/viewtopic.php?f=8&t=5853

If it's good enough for Sinclair, it's good enough for me!

I do notice Sinclair has a different method for decoupling the Vcc line (R14, R15, R17, C12, C14, C16) than my method (http://theradioboard.com/rb/viewtopic.p ... 134#p54134)

Probably Sinclair's method is more reliable, but mine uses fewer components.

---

blog: http://qrp-gaijin.blogspot.com

Pat Pending

Re: FM MICROMATIC

Thu Dec 17, 2015 5:22 am

> **qrp-gaijin wrote:**
> I see from that schematic that the Sinclair Micro FM uses, for part of its AF amplifier chain, a simple AC coupled cascade of 3 common-emitttical collector-feedback biasing. This is similar to my 1.2v 90 dB AF amp here: http://theradioboard.com/rb/viewtopic.php?f8&t=5853

The Sinclair micro FM uses the resistance coupled stages tr3-tr5 as an IF.Amp. it works only because the intermediate frequency is so low, the price you pay for that is double tuning.

I doubt that anything that Sinclair produced at that time could be described as reliable. They used inferior semiconductors/components, and with the high price, and the avaiability of cheaper ready made minature radios with better perfomance from Japan and Hong Kong, made the kits for the micro FM very unpopular.

It may just be an unkind story, but the micro alloy transistors used by Sinclair were claimed to be batch failed production runs that were rescued from being dumped and the ones that tested as working, were marked and were claimed to be Sinclair's own unique product! He was nothing if not a truly outstanding salesman!

DrM

Re: FM MICROMATIC

Thu Dec 17, 2015 7:17 am

Due to the very low IF output of the MicroMatic's autodyne converter stage, the Local Oscillator can easily get synchronised onto a strong FM-broadcast signal. In this case the IF will be zero, or the baseband AF.

aurel

Re: FM MICROMATIC

Thu Dec 17, 2015 7:39 am

yeah problem with double tuning is very big ,but same is with poor superhet too.
as far as is found only Fisher electronic build such a tuner (pulse counting)
but more complex than sinclair and that perform far better.
There is also design with tunel diode

DrM

Re: FM MICROMATIC

Thu Dec 17, 2015 8:28 am

> **aurel wrote:**
> yeah problem with double tuning is very big ,but same is with poor superhet too.
> as far as is found only Fisher electronic build such a tuner (pulse counting)
> but more complex than sinclair and that perform far better.
> There is also design with tunel diode

Would you like to post a schematic of the pulse counting tuner by Fisher Electronic?

transistor495

Re: FM MICROMATIC

Thu Dec 17, 2015 2:09 pm

> **DrM wrote:**
> Due to the very low IF output of the MicroMatic's autodyne converter stage, the Local Oscillator can easily get synchronised onto a strong FM-broadcast signal. In this case the IF will be zero, or the baseband AF.

No, AFC will come into play.

Use double conversion to eliminate double-tuning. 10.7 first then to a low IF. If you look on Fisher pulse counter, you're likely going to see this approach only(I think..)

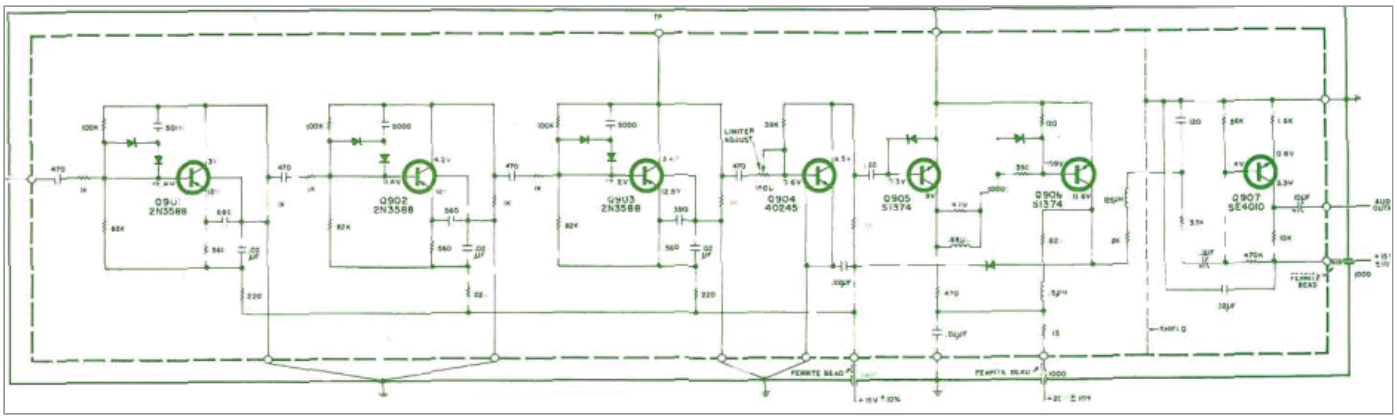
aurel

Re: FM MICROMATIC

Thu Dec 17, 2015 2:48 pm

yeah...yeah..yeah
this double conversion use to much transistors and then is almost easier
to build standard IF stage with IF transformers than build all this cramps.
however Fischer use alo complex thing...

ATTACHMENTS



Fisher.png (90.58 KiB) Viewed 885 times

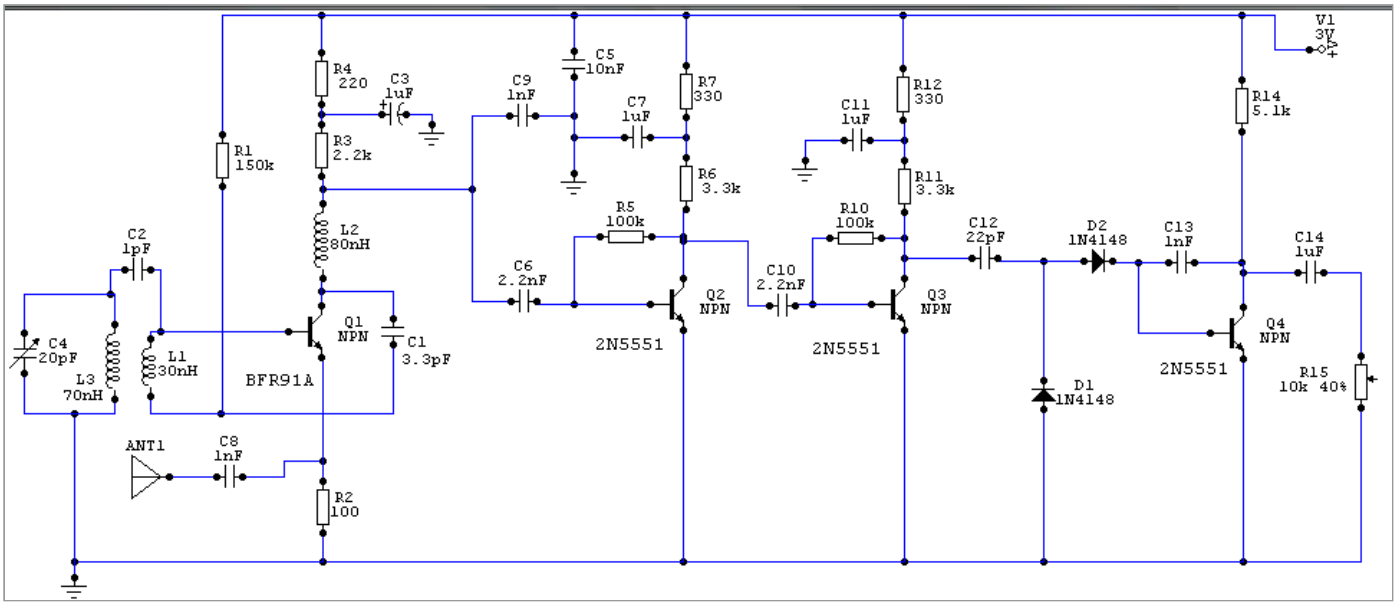
aurel

Re: FM MICROMATIC

Thu Dec 17, 2015 9:30 pm

well...looking into that russian version and because i already have layout with few transistors on pcb i will try rebuild this receiver exactly like this:

ATTACHMENTS



FMmicro2.png (10.92 KiB) Viewed 870 times

aurel

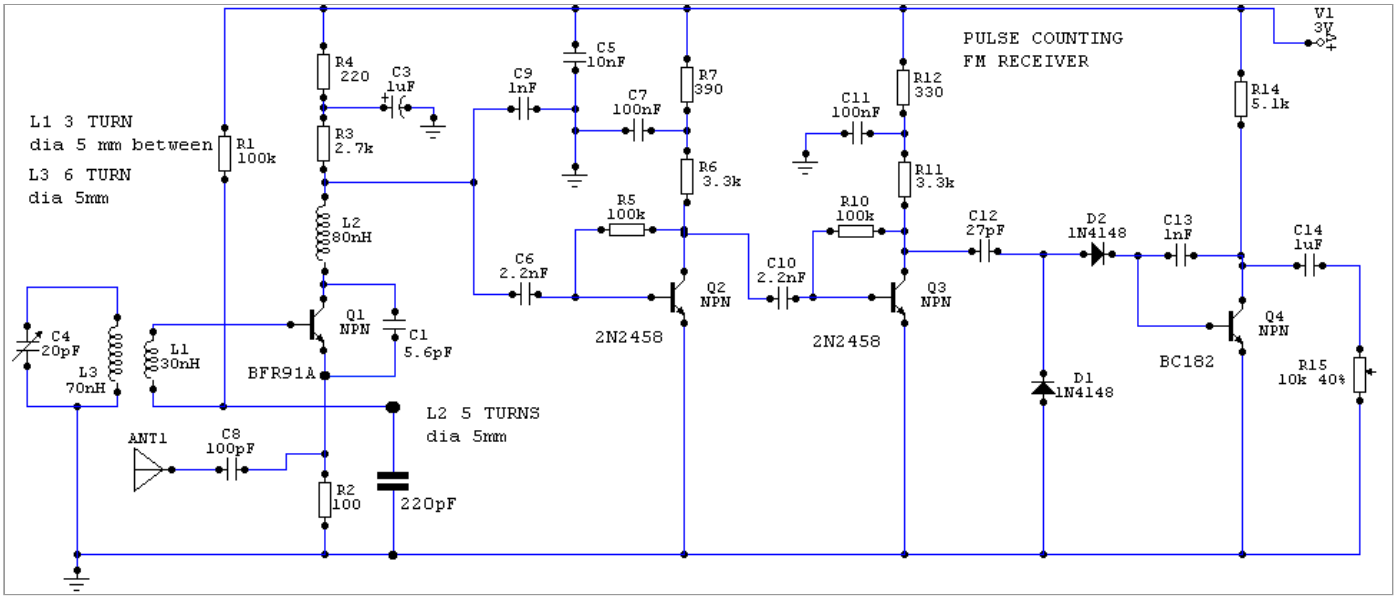
Re: FM MICROMATIC

Fri Dec 18, 2015 10:44 pm

hi
i made some changes and build this circuit
and IT WORK with just 4 transistors i connect circuit to
my amplifier and first nothing without any noise
but when i turn variable cap little bit left from center i get first station

very strong with little strange deep sound
then i set with plastic stick ferite coil in collector then sound become
clear like hifi...yes .
Circuit is very sensitive but i think that preamplifier should improve sensitivity alot.
all in all guys if you have time and interest try to build...

ATTACHMENTS



FMPULSE.png (28.46 KiB) Viewed 838 times

aurel

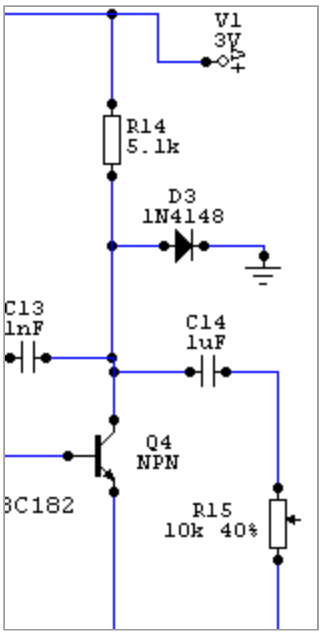
Re: FM MICROMATIC

Sun Dec 20, 2015 2:48 pm

Hi
Here is small video aboutt circuit ..i apologize video is not very good
because i use old cell phone .
http://basicprograming.free-forum.net/d ... php?id=132

another thing
with addition of small diode in colector of converter transistor you can
remove overloading of amplifier.

ATTACHMENTS



Diode.png (1.8 KiB) Viewed 777 times

next page

qrp-gaijin

Re: FM MICROMATIC

Mon Dec 21, 2015 3:41 am

> **aurel wrote:**
> Hi
> Here is small video aboutt circuit ..i apologize video is not very good
> because i use old cell phone .
> http://basicprograming.free-forum.net/d ... php?id=132.

Unfortunately I can't seem to download the file (the error says "You are not authorised to download this attachment.").

Can you upload it to YouTube?

Thanks by the way for taking the time to document your receiver with a video. I think this important (and I try to do it myself for my own projects) because I view this kind of audio-visual documentation as our generation's unique contribution to the dying art of radio homebrewing.

blog: http://qrp-gaijin.blogspot.com

aurel

Re: FM MICROMATIC

Mon Dec 21, 2015 7:04 am

ah yes...i forget this is on my forum
i will try upload to another place

Anyway....is anyone try to build?
Instead of BFR91 you can use C3355,N9018 etc...

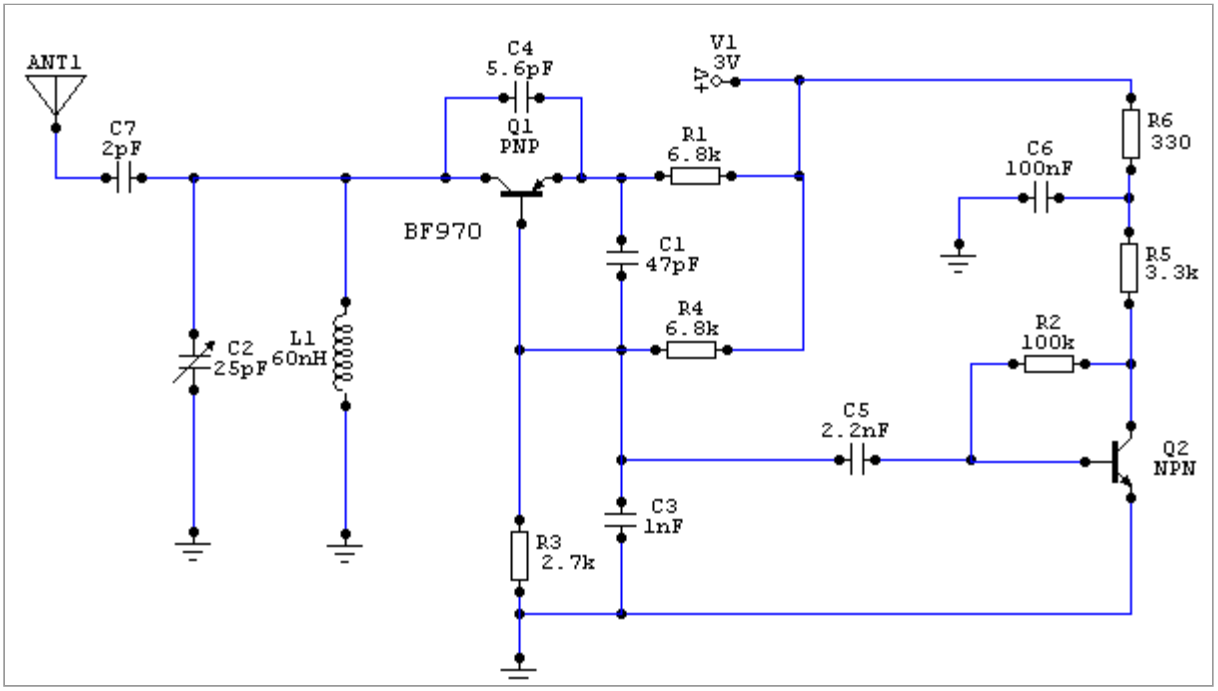
aurel

Re: FM MICROMATIC

Mon Dec 21, 2015 7:54 pm

This can be another option for frontend for pulse counting reciver.
Oscillator circuit is from old exYu magazine and i already test and work fine as local oscillator in FM range.

ATTACHMENTS



FMPULSE2.png (5.36 KiB) Viewed 522 times

achu

Re: FM MICROMATIC

Wed May 09, 2018 4:29 pm

Hi Aurel,
Which simulation software are you using?I m tempted to ask.