

Easy AM Transmitter!

by [rtty21](#) on January 7, 2011

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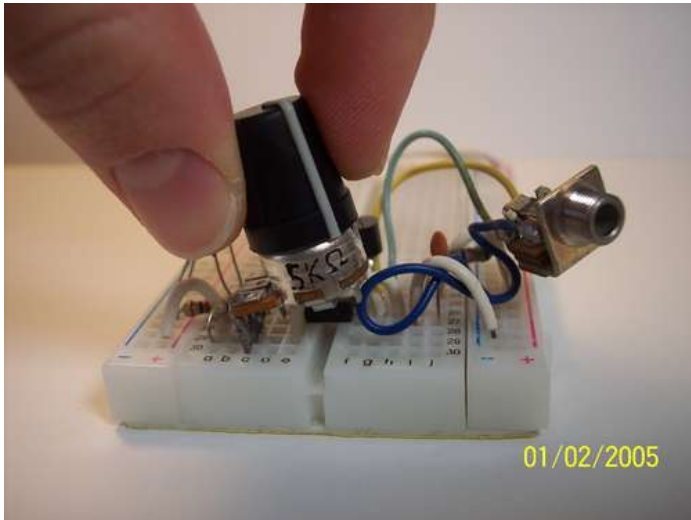
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Intro: Easy AM Transmitter!

You are going to build an AM radio transmitter AND you will be shown how it works. When you finish your radio, it will look something like mine in the picture below.

I have attached the PDF file in the last step to this Inst'able for those without a pro membership.



step 1: Parts and Prep (Small Stuff)

==These are the small components you will need==

--Small Stuff--

- 555 timer chip
- NPN transistor
- two #103 capacitors (0.01 microfarads or 10,000 picofarads)
- #102 capacitor (0.001 microfarads or 1,000 picofarads)
- some short wires
- two 1 Kilohm resistors
- 10 Kilohm resistor
- 1/8 inch (3.5 millimeter) female audio jack (yours may have more or less than three wires, but it must have at least two)
- 5 Kilohm potentiometer

==see next step for bigger components==

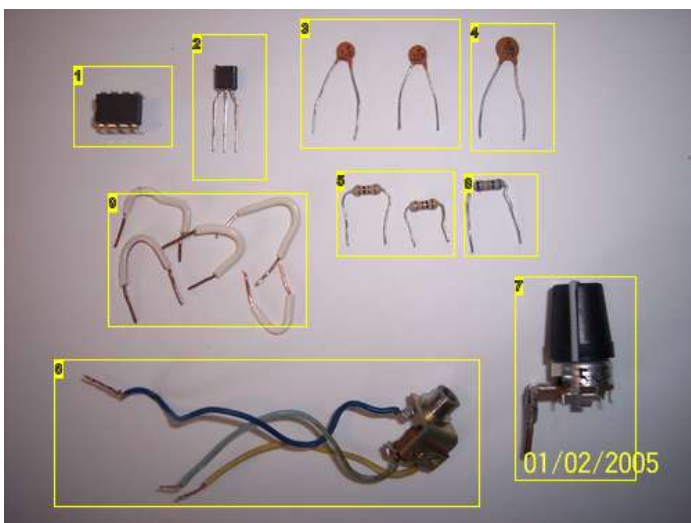


Image Notes

1. 555 timer chip
2. NPN transistor
3. two #103 capacitors
4. #102 capacitor
5. two 1 Kilohm resistors
6. 1/8 inch (3.5 millimeter) female audio jack
7. 5 kilohm potentiometer

- 8. 10 kilohm resistor
- 9. just wires.

step 2: Parts and Prep (Bigger Stuff)

==These are the bigger components you will need==

--Bigger Stuff--

- 1/8 inch (3.5 millimeter) male audio cable
- AM radio receiver
- Antenna. Yours doesn't have to be made out of a pop can, but the pop can works
- Breadboard

(see previous step for the small components)



Image Notes

1. 1/8 inch (3.5 millimeter) male audio cable
2. Breadboard
3. AM radio receiver
4. Antenna (mmm... Mist)
5. Small components (see previous step for details)

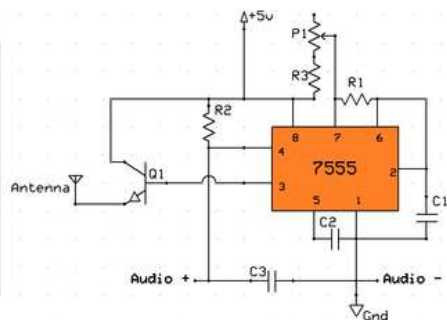
step 3: Schematic!!

==Now that we have all of our components ready, lets put this together!==

I suggest constructing this on a breadboard first.
If you don't have a breadboard, you are defiantly missing out!
If you have any questions... ASK!

P.S. Don't forget to **SUBSCRIBE!** :)

Parts:	
P1...	5Kohm
R1...	1Kohm
R2...	10Kohm
R3...	1Kohm
C1...	1nf (#102)
C2...	10nf (#103)
C3...	10nf (#103)
Q1...	NPN transistor



step 4: Testing 1, 2, 3...

==Test your radio!==

To test the AM radio transmitter, simply set the antenna next to your AM radio receiver (Alarm clock) tuned to approximately 600 KHz. Then play with the potentiometer until you can hear your music on your radio.

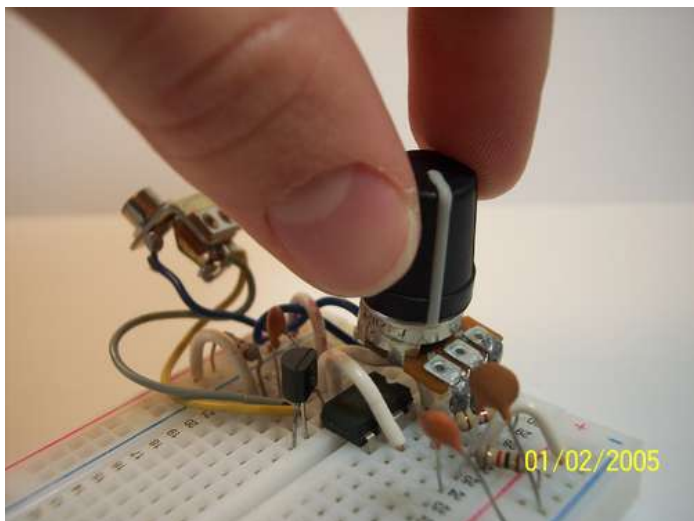
If you hear weird sounds when you turn the potentiometer (and do not hear the audio signal) That means that your audio signal is not on and your transmitter is working.

Not working? ASK ME!!! place a comment in the comment section below! :)

Otherwise try these for troubleshooting:

- ~Is there power applied to your transmitter?
- ~Is the audio signal on?
- ~try turning the potentiometer.

My antenna, power supply, and audio cable aren't connected to the circuit in this photo.



step 5: How... WHY?!?

==So how does this work??==

The audio signal is controlling when the radio signal is being transmitted. this is called amplitude modulation (See picture below). for more on the subject of amplitude modulation, go [HERE](#)

==Am I really transmitting AM radio?==

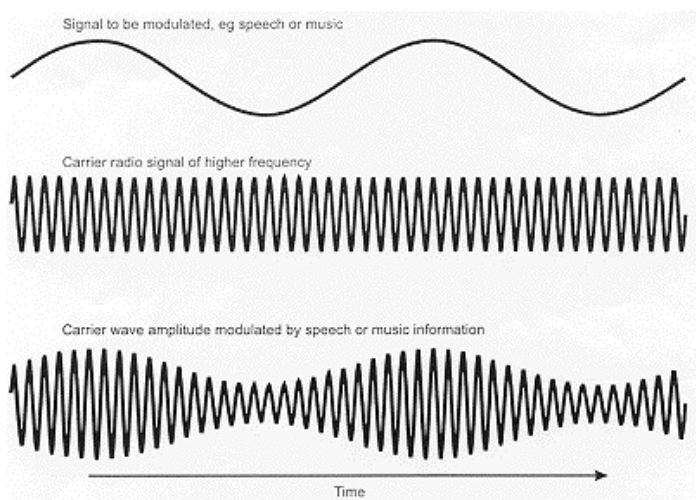
No you are not. You are transmitting at a low frequency that can be heard at higher AM frequencies. Lets say I transmit music at a base frequency of 300 Kilohertz (KHz) This music can be heard at the frequencies of 300KHz, 600KHz, 900KHz, 1200KHz. (etc...) This is called harmonics.

When the radio receiver's picks up a 300KHz signal on a 900KHz band, the signal is weaker than if you were to pick it up on the 600KHz band. This is why harmonics are only useful to a degree.

for more on the subject of harmonics, go [HERE](#)

==for some more radio information, see the next step!==

this picture shows amplitude modulation. image from <http://www.ofcom.org.uk>



step 6: Improving your radio!

==Modify your radio==

I want you to modify your radio and post a comment below that tells us what you did and how it worked! it's that simple!

Although, I do have some suggestions:

- Try changing R2 to a 3.3Kohm resistor.
- Try cutting C3 out of your circuit.
- try connecting the radio antenna to ground through a 1Kohm resistor

So now it is your turn to teach me! what have you done to improve your radio??



step 7: Extra Info.

The radio transmitter we made can only transmit at frequencies from 110KHz to 480KHz. The AM radio band is from 520KHz to 1610KHz. Harmonics are essential to be able to hear audio signals transmitted from our radio transmitter.

==I buy almost all of my electronic components at MOUSER.com==

==If you liked this, SUBSCRIBE!==

==I'm making more instructables just like this one!==


I sincerely hope you don't hurt yourself while making this project! That being said, you are solely responsible for everything that happens while constructing this project. If you believe that you are not responsible for your own actions, then god help you. :)



Comments


50 comments [Add Comment](#)


[view all 102 comments](#)

 **pyrohaz** says: Feb 21, 2011. 5:24 AM [REPLY](#)
Brill instructable dude :) Only problem, with it being built on a breadboard, I think you would reach a maximum frequency at one point, where you would no longer be able to get any faster due to breadboard capacitance etc.

At low frequencies, its pretty much unnoticable but once you start getting faster and faster, reactance is decreased etc.


Nice job though :)

 **clone4crw** says: Feb 20, 2011. 3:16 PM [REPLY](#)
is there a connection between C1, C2, and pin 1? It's kinda hard to tell in the schematic.


 **rtty21** says: Feb 20, 2011. 4:32 PM [REPLY](#)
Yes. C1, C2, C3, 555 pin 1, Audio-, and GND are all connected. The schematic program I used (ExpressPCB) is a mediocre Schematic program. If you are looking for a free Schematic with much to offer, try out CadSoft!!
<http://www.cadsoft.de/download.htm>


 **Gedo479** says: Feb 19, 2011. 10:16 AM [REPLY](#)
how did you connect the potentiometer???


 **rtty21** says: Feb 19, 2011. 8:36 PM [REPLY](#)
I connected it between pin 6 and R3


 **Gedo479** says: Feb 19, 2011. 11:45 AM [REPLY](#)
i am going to make it on a pcb what changes should i make to achieve same results??


 **rtty21** says: Feb 19, 2011. 8:35 PM [REPLY](#)
If you want the same results, go for no changes!


 **shmelfhelp** says: Feb 6, 2011. 6:52 AM [REPLY](#)
Is there anything particular to do for the antenna. What type of wire did you use?

 **rtty21** says: Feb 8, 2011. 9:27 AM [REPLY](#)
I used a pop can, others use coils [BE CAREFUL WITH COILS!!!] Me and my friend found that we were the human body is in fact best antenna. lol. I'm sounding like an after school special on drug awareness or something along those lines... Ha!
good luck with the antenna!

 **Electrified Geek** says: Jan 14, 2011. 12:14 AM [REPLY](#)
If you say, "The radio transmitter we made can only transmit at frequencies from 110KHz to 480KHz. The AM radio band is from 520KHz to 1610KHz. Harmonics are essential to be able to hear audio signals transmitted from our radio transmitter." how then would i hear it on my car radio

 **rtty21** says: Jan 14, 2011. 7:55 AM [REPLY](#)
First off, your car radio must be tuned to the AM band. Secondly, Signals transmitted at a given frequency will be heard at multiples of that frequency. so... "Lets say I transmit music at a base frequency of 300 KiloHertz (KHz) This music can be heard at the frequencies of 300KHz, 600KHz, 900KHz, 1200KHz. (etc...) This is called harmonics."

 **Electrified Geek** says: Jan 14, 2011. 5:46 PM [REPLY](#)
if fact, all of the sudden, i got confused. that knob your turning in the picture (i forget what its called), is that used for tuning what station you want to broadcast or is it the volume?

 **rtty21** says: Jan 15, 2011. 11:06 AM [REPLY](#)
it is called a potentiometer and yes it is used for varying the frequency generated.



Electrified Geek says:
how do i make it broadcast at a fixed frequency such as 950 khz?

Jan 23, 2011. 4:59 PM [REPLY](#)



rtty21 says:
1. you will need a good quality 555 such as this one that can reach those operating frequencies:

<http://www.mouser.com/Search/ProductDetail.aspx?R=TS555INvirtualkey51120000virtualkey511-TS555IN>

Jan 24, 2011. 6:05 AM [REPLY](#)

you can easily see (from the manufacturer's Data Sheet) that the maximum operating frequency of this 555 is 2MHz. this is well over double your desired frequency, which gives you alot more options in the future.

2. go to this web page for a great tool! its a 555 timer calculator!

<http://www.csgnetwork.com/ne555timer2calc.html>

when using this calculator, remember that the capacitance is measured in Farads! that means that if you wanted a value of 1uf, you would enter "0.000001" and if you wanted a value of 100pf (picofarads) you would enter "0.000000001"

my results when using this have been very accurate.
Here is what I believe you should use:

(When I say R1, I am talking about the "R1" on the 555 timer calculator webpage's R1. Likewise, when I say "R2" I am also talking about the 555 timer calculator webpage's R2.)

R1=4.7Kohm (4700 Ohms)

R2= one 4.7Kohm (4700 Ohms) wired in series with a 5Kohm Potentiometer (5000 Ohms)

Capacitor (C)= 100 picofarads (0.000000001 farads)

That should be enough to keep you working on it for a while! tell me how it goes, ask me more questions if you have any, and subscribe for more Instructables!



Electrified Geek says:

hey i'm sorry for making you research all this for me i just gave the 950 khz as a example but what would i have to do to transmit at any fixed frequency such as the 600? could i use something of this kind

Jan 25, 2011. 7:53 PM [REPLY](#)

<http://www.rr-circuits.com/parts/P-10k.jpg>

and then set the frequency as wanted and superglue or hotglue-it? would the glue short circuit or mess it up though?



Electrified Geek says:

check out this link

Jan 23, 2011. 10:56 PM [REPLY](#)

<http://www.radioshack.com/product/index.jsp?productId=2062356>

what do you think? where do i attache the wires?
thats the kind of potentiometer i have. will this work?



rtty21 says:

the radio shack potentiometer has an Audio taper and that is undesirable in this situation. try this one:

Jan 24, 2011. 6:17 AM [REPLY](#)

<http://www.mouser.com/ProductDetail/CTS-Electronic-Components/296UD502B1N/?qs=sGAEpiMZZMsEGgLEzQVydIwn2Dx6VYFWp9iFVdtsjv0%3d>



Electrified Geek says:

i think i saw a non audio-taper pot in radio shack -5k also you think that will work?

Jan 25, 2011. 7:34 PM [REPLY](#)



rtty21 says:

yep

Jan 26, 2011. 11:21 AM [REPLY](#)



Electrified Geek says:

Thanks for the prompt reply every time

Jan 27, 2011. 5:37 PM [REPLY](#)



Electrified Geek says:

hey thanx!

Jan 14, 2011. 5:37 PM [REPLY](#)



stevemartin says:

Window AC the most efficient way of air condationing.

Jan 20, 2011. 1:25 AM [REPLY](#)



rtty21 says:
I prefer liquid nitrogen. ;)

Jan 25, 2011. 2:39 PM [REPLY](#)



dungeon runner says:

If I were to build another circuit designed to recognize this audio signal, could I, say, light an LED via a push button spread over a small distance? If I could, what would this circuit entail?

Jan 25, 2011. 7:51 AM [REPLY](#)



rtty21 says:

You can easily make a radio receiver to pick up radio signals. The difficulty is not putting it together, but knowing how to! I have minimal knowledge of anything pertaining to receivers, so I am not the best person to ask about this. I am sure there are many websites that can help you out if you search on Google.com

Jan 25, 2011. 2:37 PM [REPLY](#)



harshesh says:

I perfectly understand how the 555 timer works for led lights.

but in case of audio as in this case, i dont understabd how is the audio wave carried through the circuit and then to the base of the transistor for it to be left out in the air by the antenna.

Jan 23, 2011. 8:38 PM [REPLY](#)



rtty21 says:

lets say your antenna is a foot or so wire. the wire has a little bit of "bounce" in it that allows it to create an electrostatic field in the surrounding space.

Jan 24, 2011. 6:22 AM [REPLY](#)



ehalahmi says:

Hi,

I need to transmit 77.5 Khz AM (for recreation of the DCF77 signal).

If I'll change R1/R3 will I be able to transmit 77.5 Khz ?

Can I connect a two levels (digital) output of "NPN open collector output" signal instead of Audio+ ?

Kind regard!

Jan 21, 2011. 2:04 PM [REPLY](#)



rtty21 says:

switch out R3 for a..... 10 Kohm resistor
and switch out R1 for a..... 2.2 Kohm resistor
now you may tune the radio for further adjustment. :)
Great Question!

--Rtty21

Jan 21, 2011. 11:08 PM [REPLY](#)



ehalahmi says:

Many thanks for the prompt reply.

Another question if I may. Can you please explain why changing the votlage on the RESET leg changes (lineraly) the amplitude of the output? Can you please explain how this part works?

Jan 22, 2011. 2:00 AM [REPLY](#)



rtty21 says:

pin four is RESET as you already know, so when it goes low, it shuts off the 555, and when it goes high, it turns on the 555. pin four in connected to +5V via 10Kohm resistor;that means that pin four's default state is on. when my audio signal drops below 0V, it stops the 555 from transmitting.

Everyone has been giving me really good questions and Ideas, and I think I'm going to make an "Easy AM Transmitter 2.0" in the near future.

Jan 22, 2011. 6:41 AM [REPLY](#)



ehalahmi says:

So if I understand correctly its has only 2 levels of amplituteds output. Either Vcc or 0. Like s binary AM?

Jan 22, 2011. 7:17 AM [REPLY](#)



ehalahmi says:

And a related quetions: If you couple the audio signal via a transformer to the 5V Vcc of the 555 wouldn't you get a better and smother output?

Jan 22, 2011. 7:39 AM [REPLY](#)



rtty21 says:

i have no idea

Jan 22, 2011. 12:56 PM [REPLY](#)



khas says:

Nice project man. Will this transmitter work with a 9v power supply?

Jan 19, 2011. 3:29 AM [REPLY](#)



rtty21 says:

The circuitry will definitely work with nine volts! The only thing that may not work with that voltage is the 555, but most all of them can handle up to 18V. I have never seen a 555 or a 556 (dual 555 timer in one IC) that cannot handle nine volts.

Jan 19, 2011. 5:34 AM [REPLY](#)

PLEASE NOTE! you may want to put a diode in series with the audio inputs to protect your audio supply (example: computer, ipod, clock radio, etc...)



Electrified Geek says:

hey, will any transistor work?

Jan 13, 2011. 7:25 PM [REPLY](#)



rtty21 says:

any npn transistor will work just fine

Jan 14, 2011. 7:51 AM [REPLY](#)



Electrified Geek says:

can you give me some numbers/codes other than 2n3904 because i have a few different kinds and i wanted to know if they would work

Jan 14, 2011. 5:39 PM [REPLY](#)



suicyd619 says:

did you think guys that this one r working???

pls help me to build this one ifor my project

those material on your post any materials did you add to make this one or nothing just all on your post???

to make this one? ty..

reply to me ASAP TY,,,,,

what is your current email so that i will contact you immediately for further question ,, i hope you will try to help me.,

Jan 14, 2011. 4:59 AM [REPLY](#)



rtty21 says:

Everything you need to know is written and explained in the instructable above, I'm sorry that I can't really respond to your question, it is hard to understand. If you have any problems, please send me a message and be very specific about what your problem is.

Jan 14, 2011. 7:57 AM [REPLY](#)



vysotsky1972 says:

What transistor is more preferable?

Jan 10, 2011. 4:18 AM [REPLY](#)



rtty21 says:

any NPN transistor will work just fine!

Jan 10, 2011. 1:48 PM [REPLY](#)



Electrified Geek says:

hey you think I can get all the parts at RadioShack?

Jan 13, 2011. 7:29 PM [REPLY](#)



rtty21 says:

Yes I believe you can

Jan 14, 2011. 7:52 AM [REPLY](#)



XDule 97 says:

could you name some popular NPN transistors because i cant go to my shop and just say "Give me an NPN transistor". He will ask me which one and i wouldn't know which one? Please i really want to build this project.

Jan 11, 2011. 3:06 AM [REPLY](#)



beehard44 says:

2n3904

Jan 11, 2011. 5:46 AM [REPLY](#)



suicyd619 says:

want can i use for the idon't get it?? Y? pop can?? how can i make antenna aside in pop can???

Jan 13, 2011. 5:39 PM [REPLY](#)



rtty21 says:

the pop can is the antenna. just attach the wire to the pop can and connect that wire to the emitter of the transistor

Jan 14, 2011. 7:51 AM [REPLY](#)

[view all 102 comments](#)