

Magic Eye CW Centre Tune indicator

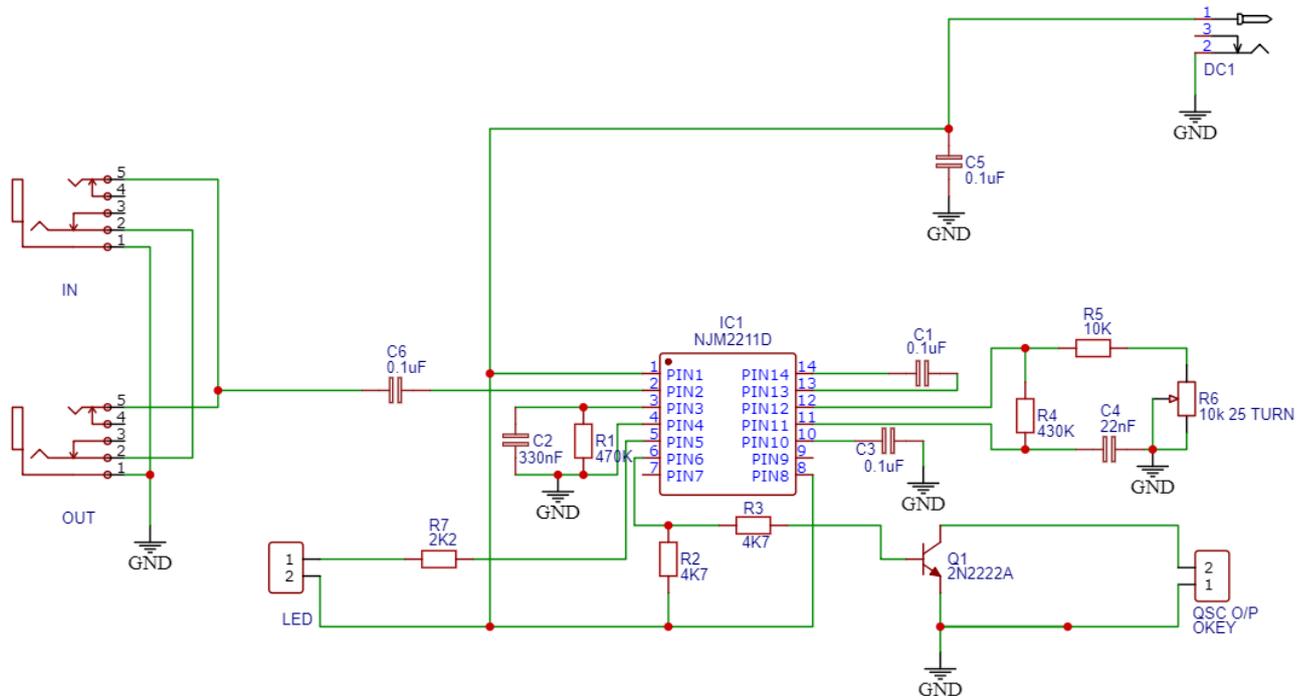
Old radios often had a 'Magic Eye' tuning indicator, normally green, that responded to the tuning.

It was a nice visual way to tune in a signal, many modern radios are fitted with a CW centre tune indicator, often like on my FTDX-1200 its very small and hard to see. This unit circuit can be connected into the audio out circuit, (just connect to the Data out of the radio or plug into the external speaker circuit). The module will accept a wide range of input voltages from just a few mV up to several volts of audio.



The user can set the frequency that the Magic Eye will respond to from around 450Hz to 1Khz so just about all sidetone frequencies can be selected.

Let me show you the circuit for the Eye.



Parts List

Magic Eye PCB

2211D Tone Decoder IC

IC Socket for above

2 x 3.5mm audio Jack sockets

1 x DC Power Socket

R1 470K Resistor

R2 4K7 Resistor

R3 4K7 Resistor (NOT SUPPLIED, Read Instructions)

R4 430K Resistor

R5 10K Resistor

R6 10K Trimmer

R7 4K7 Resistor (Was 2k2 but with current LED's that's to bright)

C1, C3, C5, C6 0.1uF (100nf) Marked 104

C2 330nF (Marked 334)

C4 22nF (Marked 223)

T1 2N2222 (or any Gen Purpose NPN) (NOT SUPPLIED, Read Instructions)

Green 5mm LED

Magic Eye Case

PCB Mounting screws

Magic Eye Front Panel

Magic Eye Back Panel

Case Fixing screws

Case top Magic Eye Sticker (Options fit)

Mounting Feet

If you are new to kit building tick each part off in these instructions when you have it fitted.

If you are an experienced builder please feel free to ignore these instructions and fit the parts in any order you wish. This is an easy to build project.

First fit the larger parts,

There are two PCB mounting jack sockets, one for the key input and one for the output to the speaker (if you use it this way), both sockets are the same and will only fit on the board one way, just make sure they are pushed fully down flush on the board while soldering them.

Jacks Fitted

Now fit the DC power connector, again this will only fit in one position so you should have no problems with this (Famous last words)

DC Socket Fitted

Now to fit the smaller parts.

Resistors

R1 :- 470K Resistor

Resistors can be fitted either way around. Make sure you do not confuse this resistor with the two 4K7 ones used elsewhere in the circuit.

R1 fitted

Next Fit R2 (4K7)

Now you would expect to fit R3, R3 is not supplied with the Kit, it is only used for experimental purposes, more on that later

Now fit R4 (430K)

Next R5 (10K)

Now fit R6, R6 is a 10K trimmer that can be adjusted to set the decoders lock frequency when we test the unit later

Next the last resistor R7 (4K7)

Capacitors

There are 6 capacitor's and 3 different values used, make sure you fit the right one in the right place, like the resistors they can be fitted either way around.

C1 0.1uF (Marked 104)

C3 0.1uF (Marked 104)

C5 0.1uF (Marked 104)

C6 0.1uF (Marked 104)

Now two different value ones

C2 330nF (Marked 334)

C4 22nF (Marked 223)

Transistor T1 This like R3 does not need fitting and is not supplied, it is for special purposes only (more on this later)

Now fit the IC Socket onto the PCB, make sure that no pins are tucked in and all pins can be seen through the board.

The final part to solder to the board is the Green LED, this acts as the Magic Eye itself,

IT is very important to fit the LED the correct way round, this is the most common point of failure. The LED as one lead shorter than the other, if you look at the PCB you will see the position for the LED near the bottom of the PCB. One of the two holes as a square pad. This is the one the SHORT leg of the LED must be fitted to. The LED should be fitted so it stands about 10 - 12mm above the board (it will be bent forward when in the case so a longer lead length is needed.

That is the board built. Now fit the decoder chip into the socket. The Chip as a small dot near one of the pins, this dot tells us which pin is pin 1. This pin must be nearest the space for R3 on the PCB.

It may be a good time to test the magic eye now.

The easiest way is to use an external speaker with your radio. Plug the speaker into the rear of the Magic Eye, the lead will normally be connected to the output socket but to be honest both sockets are in parallel so it doesn't really mater which socket you use.

Plug a lead from the radios ext speaker socket to the other socket on the Magic eye. You should hear the audio in the speaker as normal. With 12 v applied to the Magic eye tune your radio to a steady CW signal. Take time and tune the signal to the pitch you want the decoder to respond to. Now adjust the blue trimmer to set the lock frequency, the Green LED will light in sympathy with the incoming CW signal once you get the right frequency. The bandwidth is tight so I have used a 25 turn trimmer. Tune through the signal and check the lock on the magic eye, you may have to adjust the trimmer to be sure you lock just where you want. Once this is done your finished and its time to box up the Magic Eye.

Put the rear panel in the grove on the bottom panel of the case and drop the pcb into its mounting position. Use the two screws provided to fix the board to the case.

Now put the front panel in place and carefully bend the led so it protrudes through the hole in the front panel.

Now fit the lid and the two case fixing screws.

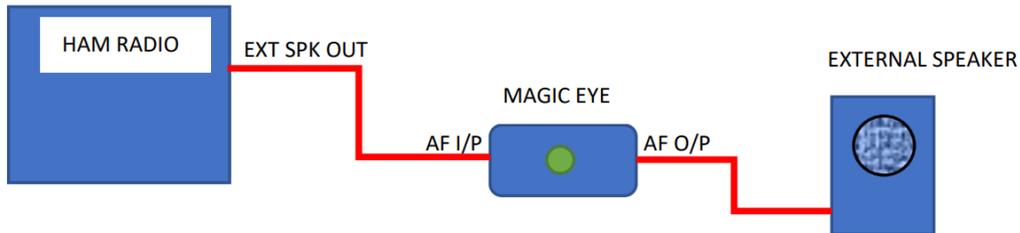
If you wish you can attach the top sticker to the case but that's up to you.

The mystery of R3 and T1....

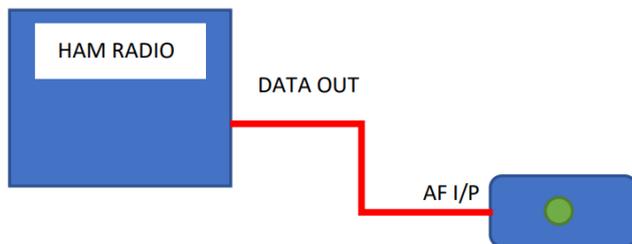
These parts will act as a simple switch that actives when the eye locks, on the PCB there are two solder points labelled OKEY , this is a output to switch a oscillator to reform the CW signal, if the eye is working but you have a lot of background noise then this can work an external oscillator to reform the CW signal without the noise. These feature is only experimental and not guaranteed

Using the Magic Eye

The magic eye only needs a very small amount of audio to lock and many people will use the data out port of the radio to feed the Magic eye, I use mine in line with an external loudspeaker and get excellent results that way. The sketch below shows typical connection setups (of course you will also need power to make the Magic eye work (9-15v))



Option 2: Low level AF source



Plug the Magic Eye into a Data out / Tape out, or any Low level audio out from the radio. No mods needed to the Magic Eye

If you have any questions or problems please feel free to contact me

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