

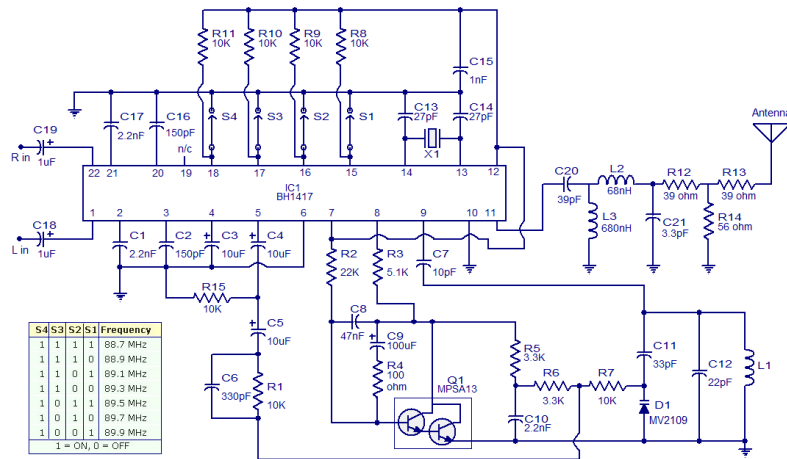
STEREO FM TRANSMITTER

PLL Stereo FM transmitter circuit.

BH1417 IC

The circuit shown here is of a good Stereo FM transmitter that can transmit high quality signals up to a range of 70 feet. The circuit is based on BH1417 PLL stereo transmitter IC from Rhom semiconductors. The IC has separate audio processing sections for the left and right channels, pre emphasis circuit for improving signal to noise ratio, crystal control circuitry for accurate frequency locking, multiplex circuit for making sum (left plus right) and difference (left minus right) {see this article for better understanding Stereo decoder circuit} etc. Another important feature of this IC is that the transmission frequency can be set using a 4 channel DIP switch. The IC can be powered from anything between 4 to 6V DC and has an output power around 20mW. At full output power the circuit consumes only 20mA and has a channel separation of 40dB. There are 14 possible preset transmission frequencies, starting from 88.7MHz and incrementing in steps of 0.2MHz that can be selected using the DIP switch. The PLL circuitry of the IC is so precise that there is practically no frequency drift.

Circuit diagram.



Stereo FM transmitter circuit using BH1417

Circuit description.

Capacitors C18 and C19 are DC decoupling capacitors for the left and right channel inputs. Capacitors C1 and C17 are used to set the amount of pre-emphasis required and here with the used values it is 50uS. Capacitors C2 and C16 sets the roll-off point of the low pass filter. The crystal X1 is a 7.6MHz crystal which sets the oscillator's frequency while capacitors C13 and C14 associated with are used for providing the appropriate loading. Resistors R8 to R11 are the pull-up resistors for the D0 to D3 (pins 15 to 18 of the IC) respectively. These pins can be held low by closing the corresponding switches. The RF oscillator of the IC is tuned using the components L1, C11, C12 and D1.

Capacitor C11 prevents and DC voltage being applied to the varicap diode D1 and thereby prevents current flow into the inductor L1. More over it reduces the effects of changes in the capacitance of D1 on the pin 9. Capacitor C7 prevents any DC current from flowing into the inductor L1 from pin 9 of the IC. The composite output signal at pin 5 is applied to the junction of R6 and R7 though a network comprising of components C4, C5, C6 and R1. In the circuit pin 19 of the circuit is left unconnected, but an optional capacitor at this pin can be used to set the pilot level and phase. Any way such a capacitor is not at all a necessity here and the circuit will work perfectly even if the capacitor at pin 9 is omitted.

The composite output signal undergoes some attenuation while passing through this network and finally reaches the varicap diode D1. The carrier frequency is controlled using the PLL (phase lock loop) phase detector output pin (pin 7) and the components connected around it. The darlington transistor Q1 is driven by the output of the pin7 and the transistor applies a control voltage on the varicap diode through resistor R5, R6 and R7. Capacitor C10 works as a high frequency filter while R7 is meant for isolation. Resistor R4 and capacitor C9 connected in series between the collector and base of Q1 provides further filtering. Resistor R4 improves the response of the transistor to transient changes while capacitor C9 improves low frequency filtering.

Capacitor C8 connected between collector and base of Q1 provides additional high frequency filtering. Resistor R3 serves as the collector load for the transistor Q1.

The modulated RF output is available at pin 11 and it is fed to the antenna through a filter network consisting of components L2, L3, C20, and C21. The job of this filter network is to remove harmonics. Resistors R12, R13 and R14 reduces the signal level to the antenna and as a result decreases the output power of the transmitter. Such a reduction is necessary to make the transmitter legal because in many countries transmitters that has an output power more than few milli watts (may change from nation to nation) are illegal. By omitting R12, R13, R14 and connecting the antenna directly to the junction of L2 and C21, the range can be increased, but do it at your own risk.

Setting up the transmitter.

Firstly set the frequency of transmission using the DIP switch. Then connect the circuit to the power supply and connect the positive lead of your multimeter to pin 8 of the IC and the negative lead to ground. The multimeter should show a reading equal to the supply voltage. Now move the positive lead of the multimeter to the junction of R5 and R6 and adjust the slug (ferrite core of L1) so that the multimeter reads 2V. The L1 has to be readjusted for getting 2V between junction of R5, R6 and Ground every time you change the transmission frequency.

Notes.

- Assemble the circuit on a good quality PCB.
- The circuit can be powered from anything between 4 to 6V DC. I recommend using a 6V battery pack.
- If you are using a battery eliminator for powering the circuit, it must be well regulated and free of any sort of noise.
- Antenna can be a 1 metre long insulated copper wire.
- Table for selecting the frequency is shown with the circuit diagram.
- Crystal X1 is 7.68MHz.
- For L1 make 2.5 turns of 1mm enamelled copper wire on a plastic former with an F29 ferrite slug inside it.
- Optional 10K POTs can be connected in series to the input pins (pins 22 and 1) of the IC for adjusting the channel balance.
- All electrolytic capacitors are rated at 10V DC.

Source: <http://todayscircuits.blogspot.com/2011/08/stereo-fm-transmitter.html#.VUCNZiGqqko>