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High Fidelity FM Transmitter

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FM broadcasting is radio broadcasting using frequency modulation technology. In order to attain high-fidelity broadcast of music and speech, all audio frequencies up to 15kHz must be transmitted. The high fidelity FM transmitter presented here achieves that using simple and readily available components. Its output frequency is locked to 96MHz using the phase-locked loop (PLL) approach.

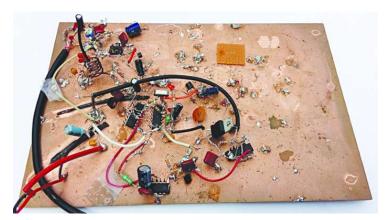


Fig. 1: Author's prototype wired on a copper clad sheet

Circuit and working

The author's prototype of the high fidelity FM transmitter circuit wired on a copper clad sheet is shown in Fig. 1. Block diagram and circuit are shown in Figs 2 and 3, respectively. The circuit is built around dual D-type positive-edge-triggered flip-flop 74AC74 (IC1), ripple-carry binary counter CD4060 (IC3 and IC5), low-power audio amplifier LM386 (IC6), phase-locked loop CD4046 (IC4), 5V voltage regulator 7805 (IC2) and a few other components.

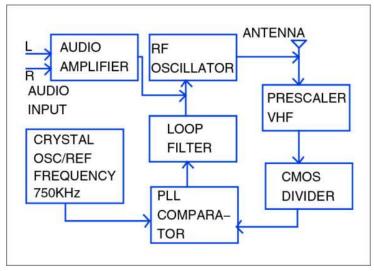


Fig. 2: Block diagram of the high fidelity FM transmitter

Transistor T1 along with resistors R1, R2 and R3, capacitors C2 and C5, coil L1, trimmer capacitor VC1, and varactor diode D1 forms a voltage-controlled oscillator (VCO) in Pierce configuration. IC1 acts as a VHF prescaler and divides the oscillator frequency by a factor of 4. Low-level RF output is taken via half-turn tap off L1 and fed to pin 3 of IC1 via C3 and to antenna via C4. The 24MHz (96MHz/4) output from the prescaler is further divided by 32 by binary counter IC3. This signal is available at its pin 5 (Q5).

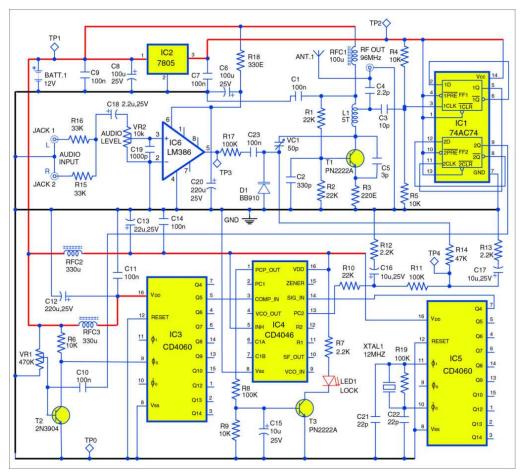


Fig. 3: Circuit of the high fidelity FM transmitter

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IC5 is used as a reference oscillator for the PLL, which generates a stable frequency of 750kHz at its pin 7. IC4 compares the two 750kHz signals presented to its pins 3 and 14, then decides the greatest frequency. The result is available at its pin 13, which switches between 12V and 0V.

Pin 13 of IC4 is coupled to a long time-constant filter formed by R10 and C16. C16 charges to the average DC voltage and so provides a control voltage to the transmitter's oscillator frequency control circuit, and varactor diode via R11 and R14. R13 and C17 form another filter.

Both filters have damping resistors, R12 and R13, to reduce the control loop's gain. Without these resistors the control circuit would over correct a frequency error, causing a larger and opposite frequency error.

Test Points		
Test point	Details	
TP0	OV (GND)	
TP1	12V	
TP2	5V	
TP3	Amplified audio signal	
TP4	3.6V-4.2V	
RF OUT	96MHz	
LED1	'On' when frequency is locked	

The error signal from pin 13 of IC4 is filtered and coupled back to the varactor diode to correct the frequency. In effect, the oscillator is stabilised and referenced to a 12MHz crystal, giving the crystal stability. The oscillator, however, can still be modulated to ± 75 kHz (wide-band frequency modulation) with an audio signal. This would have been impossible if a crystal directly controlled the oscillator.

When the transmitter is initially switched on, allow a couple of seconds for the frequency to settle. This is a little annoying, but it allows the transmitter modulating frequency to be as low as 10Hz.

The stereo audio input is taken from audio jacks JACK1 and JACK2 and combined in R15 and R16. VR2 is audio-level control. The amplified audio frequency (AF) from IC6 is fed to the varactor diode via R17 and C23 for frequency modulation of the RF signal.

Connect a piece of wire (78cm long) to the RF output as an antenna. You may use an external RF amplifier at RF output to amplify the signal to 1W level.

Semiconductors: IC1		PARTS LIST
IC1 - 74AC74 dual D-type flip-flop with preset and clear IC2 - 7805, 5V regulator IC3, IC5 - CD4060 ripple-carry binary counter IC4 - CD4046 phase-locked loop IC6 - LM386 low-power audio amplifier LED1 - 5mm LED D1 - BB910 varactor diode T1, T3 - PN2222A npn transistor T2 - 2N3904 npn transistor T2 - 2N3904 npn transistor Resistors (all 1/4-watt, ±5% carbon): R1, R2, R10 - 22-kilo-ohm R3 - 220-ohm R4, R5, R6, R9 - 10-kilo-ohm R7, R12, R13 - 22-kilo-ohm R8, R11, R17, R19 - 100-kilo-ohm R14 - 47-kilo-ohm R15, R16 - 33-kilo-ohm R18 - 330-ohm VR1 - 470-kilo-ohm potmeter VR2 - 10-kilo-ohm potmeter VR2 - 10-kilo-ohm potmeter Capacitors: C1, C7, C9-C11, C14, C23 - 100nF ceramic disk C2 - 330pF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 220μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C16 - 2.2μF, 25V electrolytic C17 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22pF ceramic disk C3 - 30μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - 12W battery or 12V DC power supply ANT.1 - 78cm single-strand wire as	- AND COMPANY OF THE REAL PROPERTY.	
With preset and clear 7805, 5V regulator CD4060 ripple-carry binary counter CD4046 phase-locked loop CD4046 phase-lock		- 74AC74 dual D-type flip-flop
IC2 - 7805, 5V regulator IC3, IC5 - CD4060 ripple-carry binary counter IC4 - CD4046 phase-locked loop IC6 - LM386 low-power audio amplifier LED1 - 5mm LED D1 - BB910 varactor diode T1, T3 - PN2222A npn transistor Resistors (all 1/4-watt, ±5% carbon): R. R		
IC3, IC5 - CD4060 ripple-carry binary counter IC4 - CD4046 phase-locked loop IC6 - LM386 low-power audio amplifier LED1 - 5mm LED D1 - BB910 varactor diode T1, T3 - PN2222A npn transistor T2 - 2N3904 npn transistor Resistors (all 1/4-watt, ±5% carbon): - 22-kilo-ohm R1, R2, R10 - 22-kilo-ohm R3 - 220-ohm R4, R5, R6, R9 - 10-kilo-ohm R7, R12, R13 - 22-kilo-ohm R8, R11, R17, - 100-kilo-ohm R14 - 47-kilo-ohm R15, R16 - 33-kilo-ohm R18 - 330-ohm VR1 - 470-kilo-ohm potmeter VR2 - 10-kilo-ohm potmeter Capacitors: C1, C7, C9-C11, C14, C23 - 100nF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100µF, 25V electrolytic C12, C20 - 22µF, 25V electrolytic C1	IC2	
COUNTER CD4046 phase-locked loop CC	IC3, IC5	
IC6 LM386 low-power audio amplifier LED1 - 5mm LED D1 - BB910 varactor diode T1, T3 - PN2222A npn transistor T2 - 2N3904 npn transistor Resistors (all 1/4-watt, ±5% carbon): R1, R2, R10 R3 - 22-kilo-ohm R4, R5, R6, R9 - 10-kilo-ohm R7, R12, R13 - 2.2-kilo-ohm R8, R11, R17, R19 - 100-kilo-ohm R14 - 47-kilo-ohm R15, R16 - 33-kilo-ohm R18 - 330-ohm VR1 - 470-kilo-ohm potmeter VR2 - 10-kilo-ohm potmeter Capacitors: C1, C7, C9-C11, C14, C23 - 100nF ceramic disk C3 - 30PF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 100μF, 25Ne electrolytic		
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D1		The state of the s
T1, T3		
T2 - 2N3904 npn transistor Resistors (all 1/4-watt, ±5% carbon): R1, R2, R10 - 22-kilo-ohm R3 - 220-ohm R4, R5, R6, R9 - 10-kilo-ohm R7, R12, R13 - 2.2-kilo-ohm R8, R11, R17, R19 - 100-kilo-ohm R14 - 47-kilo-ohm R15, R16 - 33-kilo-ohm R18 - 330-ohm VR1 - 470-kilo-ohm potmeter VR2 - 10-kilo-ohm potmeter Capacitors: C1, C7, C9-C11, C14, C23 - 100nF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 220μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C16 - 2.2μF, 25V electrolytic C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 22pF ceramic disk C3 - 10μF, 25V electrolytic C15 - C17 - 10μF, 25V electrolytic C15 - C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 22pF ceramic disk C3 - 100μH, 2-hole balun ferrite core C10 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as		
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R1, R2, R10 R3 - 220-ohm R4, R5, R6, R9 R7, R12, R13 R8, R11, R17, R19 - 100-kilo-ohm R14 - 47-kilo-ohm R15, R16 - 33-kilo-ohm R18 - 330-ohm VR1 - 470-kilo-ohm potmeter VR2 - 10-kilo-ohm potmeter Capacitors: C1, C7, C9-C11, C14, C23 - 100nF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 220μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22μF, 25V electrolytic C19 - 100μP, 25V electrolytic C19 - 100μP, 25V electrolytic C19 - 100μP, 25V electrolytic C19 - 10μH, 2-hole balun ferrite core RFC2, RFC3 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 XTAL1 - Audio input jacks XTAL1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as		
R3 - 220-ohm R4, R5, R6, R9 R7, R12, R13 - 2.2-kilo-ohm R8, R11, R17, R19 - 100-kilo-ohm R14 - 47-kilo-ohm R15, R16 - 33-kilo-ohm R18 - 330-ohm VR1 - 470-kilo-ohm potmeter VR2 - 10-kilo-ohm potmeter Capacitors: C1, C7, C9-C11, C14, C23 - 100nF ceramic disk C2 - 330pF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 22μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C16 - 2.2μF, 25V electrolytic C17 - 10μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22μF, 25V electrolytic C19 - 100μF, 25V electrolytic C19 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - Audio input jacks XTAL1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as		
R4, R5, R6, R9 R7, R12, R13 R8, R11, R17, R19 - 100-kilo-ohm R14 - 47-kilo-ohm R15, R16 - 33-kilo-ohm R18 - 330-ohm VR1 - 470-kilo-ohm potmeter VR2 - 10-kilo-ohm potmeter Capacitors: C1, C7, C9-C11, C14, C23 - 100nF ceramic disk C2 - 330pF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 22μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22μF ceramic disk C3 - 300μF reamic disk C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22μF ceramic disk C21, C22 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as		
R7, R12, R13 R8, R11, R17, R19 - 100-kilo-ohm R14 - 47-kilo-ohm R15, R16 - 33-kilo-ohm R18 - 330-ohm VR1 - 470-kilo-ohm potmeter VR2 - 10-kilo-ohm potmeter Capacitors: C1, C7, C9-C11, C14, C23 - 100nF ceramic disk C2 - 330pF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 22μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22μF, 25V electrolytic C19 - 100μF, 25V electrolytic C19 - 10μF, 25V electr		
R8, R11, R17, R19 - 100-kilo-ohm R14 - 47-kilo-ohm R15, R16 - 33-kilo-ohm R18 - 330-ohm VR1 - 470-kilo-ohm potmeter VR2 - 10-kilo-ohm potmeter Capacitors: C1, C7, C9-C11, C14, C23 - 100nF ceramic disk C2 - 330pF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 220μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C16 - 2.2μF, 25V electrolytic C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22μF ceramic disk C21, C22 - 22μF ceramic disk C3 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as		
R19 - 100-kilo-ohm R14 - 47-kilo-ohm R15, R16 - 33-kilo-ohm R18 - 330-ohm VR1 - 470-kilo-ohm potmeter VR2 - 10-kilo-ohm potmeter Capacitors: C1, C7, C9-C11, C14, C23 - 100nF ceramic disk C2 - 330pF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 22μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 100pF ceramic disk C21, C22 - 22μF, 25V electrolytic C19 - 100pF ceramic disk C21, C22 - 22μF, 25V electrolytic C19 - 100pF ceramic disk C21, C22 - 22μF, 25V electrolytic C1 - 50pF trimmer Miscellaneous: RFC1 RFC2, RFC3 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air		- Z.Z-KHO-ONIII
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R15, R16 - 33-kilo-ohm R18 - 330-ohm VR1 - 470-kilo-ohm potmeter VR2 - 10-kilo-ohm potmeter Capacitors: C1, C7, C9-C11, C14, C23 C14, C23 - 100nF ceramic disk C2 - 330pF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 22μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 100μF, 25V electrolytic C19 - 100μH, 2-hole balun ferrite core RFC2, RFC3 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1		
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VR1		
VR2 - 10-kilo-ohm potmeter Capacitors: C1, C7, C9-C11, C14, C23 - 100nF ceramic disk C2 - 330pF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 220μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 330μH readymade axial inductor KFC1 - 100μH, 2-hole balun ferrite core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - Audio input jacks XTAL1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as		TO THE PARTY OF TH
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C1, C7, C9-C11, C14, C23	Control of the Contro	To the offin pointer.
C14, C23 - 100nF ceramic disk C2 - 330pF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 220μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 30pF trimmer Miscellaneous: RFC1 - 100μH, 2-hole balun ferrite core RFC2, RFC3 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - Audio input jacks XTAL1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as	THE STATE OF THE PROPERTY OF THE PARTY OF TH	
C2 - 330pF ceramic disk C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 220μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 30pF trimmer Miscellaneous: RFC1 - 100μH, 2-hole balun ferrite core RFC2, RFC3 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - Audio input jacks XTAL1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as		
C3 - 10pF ceramic disk C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 220μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 30pF trimmer Miscellaneous: RFC1 - 100μH, 2-hole balun ferrite core RFC2, RFC3 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - Audio input jacks XTAL1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as		
C4 - 2.2pF ceramic disk C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 220μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 30pF trimmer Miscellaneous: RFC1 - 100μH, 2-hole balun ferrite core RFC2, RFC3 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - Audio input jacks XTAL1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as		
C5 - 3pF ceramic disk C6, C8 - 100μF, 25V electrolytic C12, C20 - 220μF, 25V electrolytic C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 30pF trimmer Miscellaneous: RFC1 - 100μH, 2-hole balun ferrite core RFC2, RFC3 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - Audio input jacks XTAL1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as		
C6, C8 C12, C20 C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 VC1 - 50pF trimmer Miscellaneous: RFC1 - 100μH, 2-hole balun ferrite core RFC2, RFC3 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 XTAL1 JACK1, JACK2 XTAL1 BATT.1 - 12V battery or 12V DC power supply ANT.1 - 22μF, 25V electrolytic - 2.2μF, 25V electrolytic - 100μH, 2-hole balun ferrite core - 330μH readymade axial inductor - 12V SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ - Audio input jacks - 12MHz crystal oscillator - 12V battery or 12V DC power supply - 78cm single-strand wire as		
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C13 - 22μF, 25V electrolytic C15-C17 - 10μF, 25V electrolytic C18 - 2.2μF, 25V electrolytic C19 - 1000pF ceramic disk C21, C22 - 22pF ceramic disk C21, C22 - 50pF trimmer Miscellaneous: RFC1 - 100μH, 2-hole balun ferrite core RFC2, RFC3 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - Audio input jacks XTAL1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as	C12, C20	
C18 C19 C19 C100pF ceramic disk C21, C22 VC1 Discellaneous: RFC1 RFC2, RFC3 C100μH, 2-hole balun ferrite core C10μH C		
C18 C19 C19 C100pF ceramic disk C21, C22 VC1 Discellaneous: RFC1 RFC2, RFC3 C100μH, 2-hole balun ferrite core C10μH C	C15-C17	
C21, C22 - 22pF ceramic disk VC1 - 50pF trimmer Miscellaneous: RFC1 - 100µH, 2-hole balun ferrite core RFC2, RFC3 - 330µH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - 12WHz crystal oscillator BATT.1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as	C18	
VC1 - 50pF trimmer Miscellaneous: RFC1 - 100µH, 2-hole balun ferrite core RFC2, RFC3 - 330µH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - Audio input jacks XTAL1 - 12WHz crystal oscillator BATT.1 - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as	C19	
Miscellaneous: RFC1 - 100μH, 2-hole balun ferrite core RFC2, RFC3 - 330μH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - Audio input jacks - 12MHz crystal oscillator - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as	C21, C22	
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RFC2, RFC3 - 330µH readymade axial inductor L1 - 5T 20 SWG 8mm dia. air core spread over 1.2 or 1.5cm. Tap at 1/2T from V+ JACK1, JACK2 - Audio input jacks XTAL1 - 12MHz crystal oscillator - 12V battery or 12V DC power supply ANT.1 - 78cm single-strand wire as	Miscellaneous:	
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Construction and testing

PCB layout of the high fidelity FM transmitter is shown in Fig. 4 and its components layout in Fig. 5. House the transmitter in a small plastic box. Keep all leads as short as possible. Use good-quality

shielded cable for input audio connections. 12V DC regulated hum-free power supply is recommended.

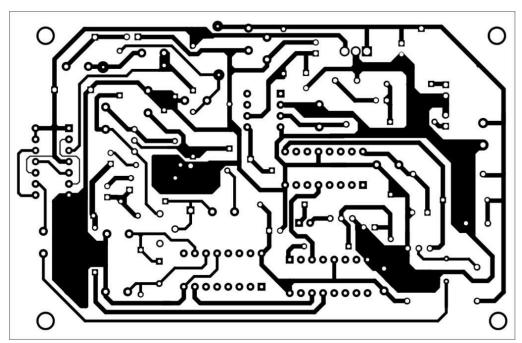


Fig. 4: PCB layout of the high fidelity FM transmitter

The operating frequency of the transmitter is 96MHz. Set VR2 to minimum and adjust VC1 for a reading of 3.6V to 4.2V at test point TP4. VR1 is biasing control for transistor T2 and should be set in the middle position. LED1 should light up to indicate a frequency lock at 96MHz. Feed audio signal at JACK1 or JACK2. This signal will be transmitted at 96MHz via antenna ANT.1. Tune the FM receiver to 96MHz. You should be able to hear the transmitted signal in your FM receiver. You can also use your mobile phone if it has inbuilt FM receiver.

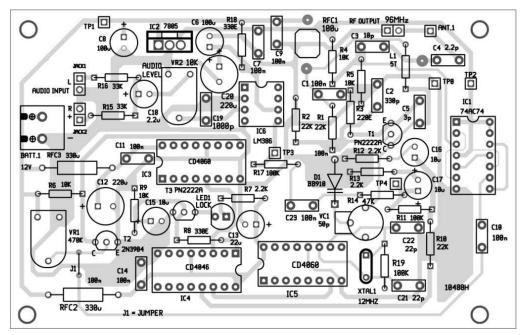


Fig 5. Component layout of the PCB given above

Vary VR1, VR2 and VC1 for adjustment. For test points and troubleshooting, refer to test points table.

Download PCB and component layout PDFs: click here