



# Crystal-Controlled AM Transmitter

JOY MUKHERJI

This is a very simple and easy-to-make AM transmitter for the shortwave band. It can be used as a simple cordless microphone as well.

## Circuit and working

Fig. 1 shows circuit diagram of the crystal-controlled AM transmitter. It is built using an electret microphone (MIC1), low-power audio amplifier

LM386 (IC1), 2-way DIP switch (DIP1), transistors PN2222A (T1) and 2N3866A (T2) with a heat-sink and a few other components.

The circuit transmits on 6.4MHz and 7.2MHz. The output is selected by a single crystal frequency with the help of DIP switch DIP1. Operation of the circuit is simple.

Transistor T1 and its associated components make up a Colpitts oscillator with resistors R1, R2, R3 and R4 providing biasing and capacitors C2

and C3 the feedback. Transistor T1 amplifies tiny oscillations present in the crystals at the fundamental frequencies of  $X_{TAL1}$  or  $X_{TAL2}$ . IC1 is used as series modulator.

Amplified audio from electret microphone MIC1 is directly coupled to the collector of transistor T1. The audio signal is superimposed on the carrier frequency by varying the DC input to the oscillator. Due to careful design, 100% modulation is obtained by speaking into the microphone. Transistor T2 is a simple emitter-follower that is used as a buffer between the oscillator and the outside world. The crystal-controlled AM transmitter is only 40mW amplitude modulated, but modulation peaks can rise to 160mW with full modulation.

## Construction and testing

An actual-size, single-side PCB for the crystal-controlled AM transmitter is shown in Fig. 2 and its component layout

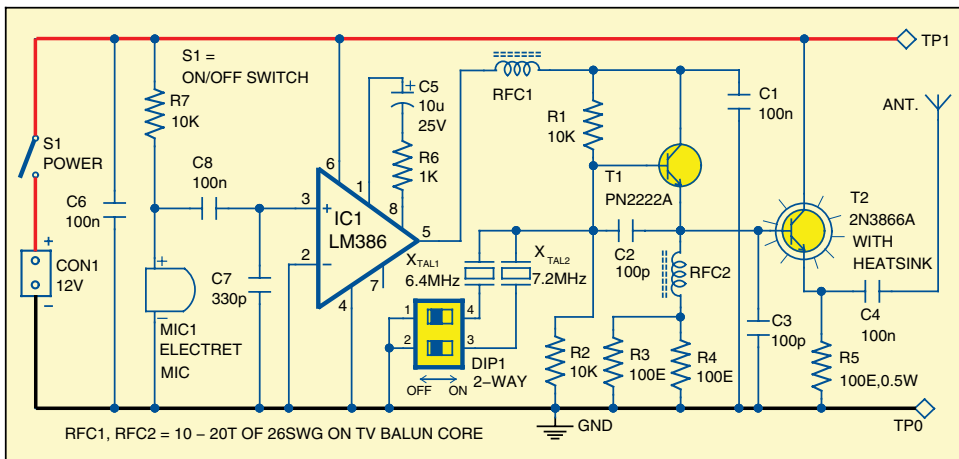


Fig. 1: Circuit diagram of the crystal controlled AM transmitter

## PARTS LIST

### Semiconductors:

IC1	- LM386 low-power audio amplifier
T1	- PN2222A npn transistor
T2	- 2N3866A npn transistor with heat-sink

### Resistors (all 1/4-watt, $\pm 5\%$ carbon, unless stated otherwise):

R1, R2, R7	- 10-kilo-ohm
R3, R4	- 100-ohm
R5	- 100-ohm, 0.5W
R6	- 1-kilo-ohm

### Capacitors:

C1, C4, C6, C8	- 100nF ceramic disk
C2, C3	- 100pF ceramic disk
C5	- 10 $\mu$ F, 25V electrolytic
C7	- 330pF ceramic disk

### Miscellaneous:

S1	- On/off switch
DIP1	- 2-way DIP switch
MIC1	- Electret microphone
$X_{TAL1}$	- 6.4MHz crystal
$X_{TAL2}$	- 7.2MHz crystal
CON1	- 2-pin terminal connector
RFC1, RFC2	- RF choke (10 turns of 26SWG wire on TV balun)

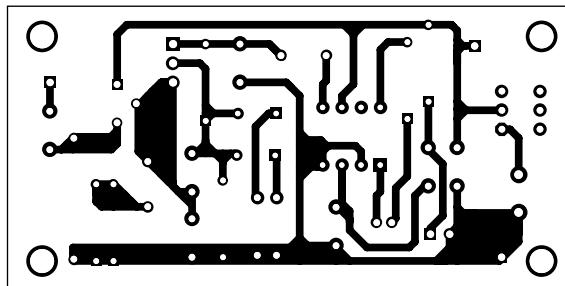


Fig. 2: An actual-size PCB layout for the transmitter

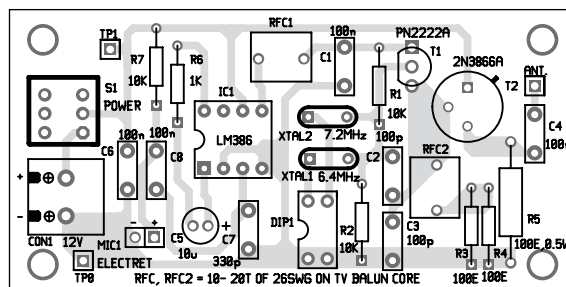


Fig. 3: Component layout for the PCB

## Test Points

Test point	Details
TP0	0V
TP1	12V

in Fig. 3. Use a 7.5-metre long wire for the antenna. A regulated 12V hum-free power supply or a 12V battery should be used. Enclose the circuit in a small plastic box.

Before using the circuit, verify test point voltages are as given in the table. ●

The author is an electronics hobbyist and a small-business owner in Albany, New York, USA. His interests include designing radio-frequency circuits