

KIT 16. PHONE FM TRANSMITTER

This kit attaches in series to one of your phone lines. When there is a signal on the line (that is, when you pick up the handset) the circuit will transmit the conversation a short distance. In particular it will radiate from the phone line itself. It is a passive device - there is no battery. It uses the signal on the phone line for power. No aerial is needed - it feeds back the RF signal into the phone line which radiates it in the FM band. The frequency of transmission may be adjusted by the trimcap.

Note that some countries may ban any electronic device which attaches to the telephone. It is the responsibility of the purchaser to check the legal requirements for the operation of this kit and to obey them.

The kit is constructed on a single-sided printed circuit board. Protel used to design the board and make the schematic.

ASSEMBLY INSTRUCTIONS

The ZTX320 has a **flat** and a **curved** side. Match these two sides with the **flat** and **curved** sides as shown on the overlay for T2. Also note these points when assembling this Kit:

- two of the three coils have enamel insulation lacquer on them. This must be physically removed from both ends of the coil before it can be soldered. Now during the manufacture of these coils they have been solder dipped to remove this lacquer. But check each leg to see that this is the case.
- spread out the turns in the L3 coil about 1 mm apart. The coils should not touch.
- a solder connection (or tap) is required from the top of the first turn in the L3 coil to the pad next to the coil. Solder a piece of wire to the top of the first turn as shown on the overlay. Then solder the other end to the pad immediately next to the L3 coil.
- the cathodes of all diodes point to the top of the PCB.
- attach 3" of wire with an alligator clip on the end to the pads between the diodes marked - 'TO LINE'

No aerial is needed. The phone line itself acts as a sufficient aerial. To make the Kit small, resistors & diodes stand on their ends.

The kit attaches to ONE of the two phone lines going to your phone. Either of the two lines will do. In most of the world this is the green or red wire. In the UK it is one of the wires attached to the terminals 2 or 5. Cut the phone line. Attach one alligator clip to one cut end and the other alligator clip to the other cut end. Take your phone off the hook and turn on an FM radio at about 93 MHz. It should be very easy to tune into the transmission. Take a portable FM receiver outside and follow the phone line.

CIRCUIT DESCRIPTION

The circuit is a radio frequency (RF) oscillator that operates around 93 MHz (93 million cycles per second). Power for the circuit is derived from the full wave diode

bridge. C1, C8, L3 & T1 forms the FM oscillator. Every Tx needs an oscillator to generate the Radio Frequency (RF) carrier waves.

L1, C6, T2 forms the power amplifier. Audio from the telephone lines is coupled through R3 & C2 into the base of T1 to modulate the oscillator. This is done by varying the junction capacitance of the transistor. Junction capacitance is a function of the potential difference applied to the base of the transistor.

R1 & C4 act as a low pass filter. C3 is a high frequency shunt. L2 is call a RFC (radio frequency shunt.) It decouples the power and audio from the transmitter amplifier circuit.

This type of circuit usually should be calibrated. The resonant frequency of the L1-C6 amplifier circuit should be adjusted to match the resonant oscillator frequency of C1, C9-L3. However, in practice, we think you will find that the unit operates perfectly OK as it is constructed without the need to calibrate anything.

If you want to try calibration you will need a frequency meter, a CRO or just trial and error. Calibrate by moving the coils of L1 further apart.

With C1 at 27p you will find that the kit tunes into the FM band in the 86 - 95 MHz area. With C1 at 22p the band is raised to about 90-95mhz (depending in the coil spacing.) If you want to move this tunable area still higher to over 100MHz range then replace C1 by a 15pF or 10pF capacitor. This assumes that the on-hook voltage is about the standard 48V. If the on-hook voltage of an extension phone network is lower, say about 39V, C1 will have to be lower in the 15p to 10p range to be in the commercial FM band in this case.

Note that you should not hold the kit physically in your hands if you try to do any calibration. Your own body capacitance when you touch it is more than enough to change the oscillation frequency of the whole unit.

You can experiment to get greater transmission range away from the phone line by adding an aerial (about 150 cm of 26 gauge wire) to the collector of T2.

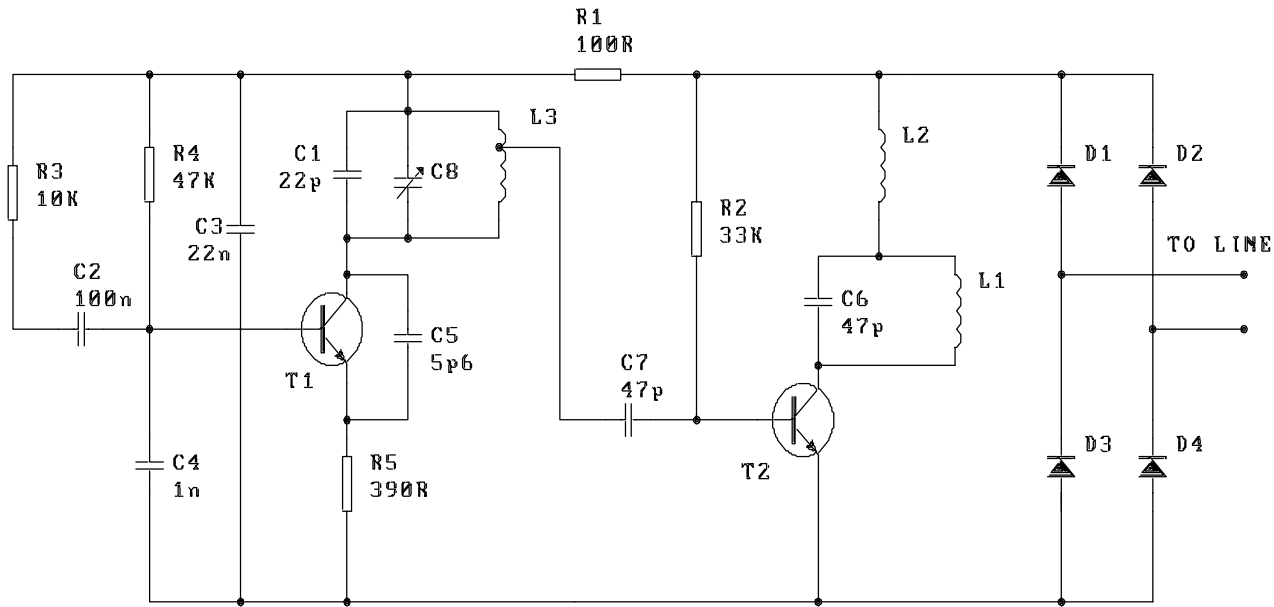
WHAT TO DO IF IT DOES NOT WORK

Poor soldering is the most likely reason that the circuit does not work. Check all solder joints carefully under a good light. Next check that all components are in their correct position on the PCB. Did you check that all the enamel is all removed from the ends of the twocoils L1 & 2 before soldering?

For more information about DIY kits visit our website at

<http://kitsrus.com>

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T1 BC547 BC548
 C8 5 - 20pF

D1..D4 1N4148
 T2 ZTX320

| | |
|-----------------------------|---|
| Resistors 1/4W, 5%: | |
| R1 100R | 1 |
| R2 33K | 1 |
| R3 10K | 1 |
| R4 47K | 1 |
| R5 390R | 1 |
| Capacitors ceramic: | |
| C1 27p or 22p | 1 |
| C2 100n 104 | 1 |
| C3 22n (223) | 1 |
| C4 1n (102) | 1 |
| C5 5p6 | 1 |
| C6,7 47p | 2 |
| C8 Red trimcap 5-20pF | 1 |
| Transistors: | |
| T1 BC547 or BC548 | 1 |
| T2 ZTX320 | 1 |
| L1 6 turn enamelled Cu wire | 1 |
| L2 8 turn enamelled Cu wire | 1 |
| L3 6 turn tinned Cu wire | 1 |
| Diodes D1,2,3,4 1N4148 | 4 |
| Alligator clip cable | 1 |
| K16 PCB | 1 |