Purpose:

BlackJack is a miniature hands-free device that plugs into the 2.5 mm output jack of a mobile phone. Working in conjunction with a FM radio, Blackjack provides hands-free speakerphone feature to any mobile phone. BlackJack has a built-in microphone that picks up the user's voice for outgoing transmission. It outputs the incoming audio or voice (via radio frequency) to a FM station on a car radio for listening.

Theory of Operation:

Normal connection of BlackJack to a mobile phone is via a 2.5 mm plug. The incoming voice is detected via Pins J1-1 and J1-2 (common). The user's voice is detected by an electret microphone (MC1) and sends to the mobile phone via Pins J1-3 and J1-2. C11 and L3 filter out any RF interference. R13 and Z1 serve as a microphone protection circuit against static electricity discharge.

BlackJack uses a 3-volt coin battery for operation. S1 is the on / off switch and LED 1 provides visual indication that the unit is on. Transistor Q1 is biased very lightly (6-10 uA) by R3 and R4 and it behaves as a voltage controlled capacitor. Its control voltage is the incoming audio or voice from the mobile phone. The signal level is properly matched to Q1 with the help of voltage attenuator R1 and R2. C2, C3 and C15 are for filtering and signal coupling purposes.

Transistor Q2, crystal X1, voltage controlled capacitor Q1, capacitors C3 and C4 collectively form a classic oscillator running at 17.734475Mhz. R6 and R11 are bias resistors. R7 and C7 isolate the oscillator from the supply bus. Since voltage controlled capacitor Q1 is controlled by the mobile phone audio or voice, the oscillator frequency will be pulled slightly from its nominal frequency of 17.734475MHz according to the input audio level. The result is a frequency modulated (FM) signal. The output signal is developed across L1 for coupling to output amplifier Q3 via C6.

Output amplifier Q3 is a tuned staged. R8 and R12 are bias resistors. R9 and C5 are filters to isolate Q3 from the supply bus. Capacitors C9 and C14 are RF filters. The collector load is a tank circuit (antenna coil and C8) tuned to the 5^{th} harmonics of Q2 output. The tuned frequency corresponds to 88.7 MHz on a FM radio band. This tuned frequency output is outputted or radiated into free space by the tank circuit.