# 3. Circuit Description.

## *1. Audio Stages.*

Audio circuitry is divided into three stages.

1). Input FET stage
2). Second stage
3). Final stage

The Input FET stage is on PCB 691. Junction FET TR1 provides an input impedance greater than 1GΩ. The DC conditions of TR1 are set by RP1.

The second stage is on PCB-698. TR6, TR7, TR8, TR9 and TR10 are CMOS switches used to control the gain of the operational amplifier IC1 by variation of the effective feed back resistor network. The light dependant resistor contained in the opto device OPTO shunts this network. The output from the IC1 is rectified and amplified in TR11 to control the LED current in device OPTO thus providing more than 20 dB of limited overload margin at full gain. The voltage at base of TR14 is increased via TR11 to switch off a 'normally on' LED 'LED1' which indicates the overload and the compression is taking place. Note that a wireless microphone is never used in this condition. The overload indication is to facilitate the setting of the gain to prevent such occurrence. The overload margin is thus primarily for type approval purposes and to prevent distortion in the event of unexpected high noises.
IC3 is both a high pass and low pass filter. Frequencies below 30Hz and above 20KHz are attenuated. The low pass filter is used to reduce the occupied bandwidth for type approval purposes. IC3 provides a low impedance source required by the next stage.

The final stage is on PCB 696. The main part of this stage is the frequency dependant square root companding system comprising IC7 and IC8. R87 and diode clippers D6 and D7 provide bandwidth limiting of overload transients which may be too short to be limited by second stage, thus ensuring the occupied bandwidth is limited even in the transient. Adjustment of deviation is provided by potentiometer RP3.

## *2. RF Stages.*

The RF Stages are on PCB 698. TR1 on this PCB is a low noise voltage controlled Colpitts oscillator tuned by varactors VC2 and VC3. VC3 provides the synthesiser locking to the required frequency at half the final output frequency and VC2 enables frequency modulation by audio frequencies from the 696 PCB via Connector 4.
The second harmonic of the oscillator is selected in the tuned circuit in the drain of FET. Third and higher harmonics are attenuated by CT2/L4/C10 PI network. The tuned collector TR2 circuit amplifies the required frequency and the fundamental and higher harmonics are attenuated. Some signal from this amplifier is taken to the synthesiser FIN via C87/L6/CT8/C88 filter network. The PI network before the final collector tuned stage TR3 provides further attenuation to higher harmonics. The T-network followed by PI network after the TR3 stage ensures harmonics are satisfactorily reduced.

Main tuning is accomplished by trimmer capacitors shown. Power adjustment requires adjustment of R12 and sometimes R15 to allow for variations in the gain of the RF devices.

IC4 and IC5 form the synthesiser. A full description of the working of IC5 is available in the technical literature. X1 is the reference crystal to which the synthesiser is locked.

The user via infrared interface provided selects one of the thirty-two frequencies on which the transmitter pre-programmed to operate. The unit is default to its last working frequency. During initial lock up conditions or after the frequency change has been requested, out of lock pulses from pin2 of IC5 is used to clamp the base of the output device TR3 via TR5 and TR4. Both DC bias and RF drive are removed thereby removing the output during the brief lock up phase. VCO is disabled in the event of wrong data being loaded.

VC1 modulates the Reference crystal slightly by 1Hz sine wave (supplied by PIC micro-controller circuitry on PCB 697) via R26. The amplitude of this 1Hz signal once the initial set up done in the factory depends upon the battery voltage thus enables transmitting the battery status to the receiver.

The tuned circuit L13 and C54 resonate to the crystal frequency. Its purpose is to step up RF voltage, which is then rectified in a voltage multiplying arrangement. This provides a zero current 50V supply for the condenser microphone capsule. A separate oscillator is not incorporated for this purpose in order to avoid additional unwanted spurious modulations of the RF carrier, thus ensuring the high quality of radiated signal. TR13 is used to eliminate the pulling of the reference frequency.

## *3. Power and Processor.*

PIC Micro controller and power supply circuits are on PCB 697.
IC4, IC5, IC6 and IC7 form a step up DC-DC regulated –3V, +3V, and 7V supplies from 1.5V AA battery.
IC1, IC2 and IC3 form the Micro controller circuitry with infrared interface. The table of thirty-two frequencies and other information such as Serial number are stored and accessed by IC1 in IC2.
IC1 controls the correct data loading into the synthesiser (when the user via infrared interface requests frequency changes) and controls CMOS switches for Audio Gain adjustment and LF Cut select. It also outputs information such as unit's battery voltage, serial number of the unit and notes which are pre-programmed in house to the remote infrared controller. In addition, it provides the facility of switching the IR communication off as a precaution against interference during the normal operation of the transmitter. HxiR is default to IR communication enabled.