CIRCUIT DESCRIPTION(FRS-0168)

TRANSMITTER SECTION

RF Frequency Oscillator(VCO)

Q9 functions as a voltage control clap oscillator (VCO).The frequency is determining by the Q9,C45,C46,C53,C54,C23,D7,DV1 and L1.The RF output of VCO is fed to both of the PLL U2 prescaler input and RF driver of transmitting by the buffer Q10.

PLL CIRCUIT

U2 on main PCB is a phase lock loop (PLL)IC. The output of the oscillator(crystal 20.95MHz)is input to the programmable reference divider .This 20.95MHz frequency is divided to 12.5KHz as the reference frequency built in the PLL IC.RF frequency from VCO is still divided to about 12.5KHz by the prescaler built in the PLL IC. The phase difference between the reference frequency and the divided frequency by the prescaler will output to the tracking filter(C52.R37.C49.R38.C59.) for locking the frequency .The DC voltage by filtering from the tracking filter is fed the varactor diode to control the VCO oscillator frequency until the VCO frequency is locked. For the transmitter ,the frequency is from 462.5625 to 467.7125MHz through CH1 TO CH14.For the receiver ,the frequency is from 441.1625 to 446.3125 MHz .VC1 is used to adjust RF frequency .The choice of crystal and components is such that the required frequency tolerance is maintained over the required range of temperature and voltage.

RF Amplifier and Power Amplifier

In the transmitter mode, the switch diode D13 and D12 are ON.RF signal from the buffer Q14(on main PCB) is fed to the base of T1 through the RF drive Q15 by the coupled capacitor.T1(on main PCB) is RF power amplifier.

Circuits for Suppression of Spurious Radiation

In addition to inter-stage filtering the out of final T1 is coupled to the antenna through one 'LC' and double 'PI' network (L7,C94,C91,L4,L10, L11,C75,C90 and C88)
Which serves both to match and reduce harmonic to adequate level .The RF maximum power is 0.5Watt.

Circuits for Limiting Power

During alignment, R89 is selected to provide about 0.5-watt output power.

Modulation and Response

Q2 and Q3(on main PCB) is MIC amplifier. The amplified audio signal is fed to DV2 for making F3E type modulation.VR2 is used to adjust the modulation deviation to ensure the deviation is not larger than 2.5KHz.Q4(on main PCB)is the switch which is OFF at transmitter mode and ON in the receiver mode. C6,C9,R11,C10 are used to determine the transmit response which is 3.125KHz.

Circuit for Limiting Modulation

D1,D2,Q1 give the auto MIC control circuit. When the modulating voltage is excessive. R7 will obtain DC voltage which turns on Q1,This feedback system keeps the maximum modulation deviation is not exceed 2.5KHz.

MPU Controller

U3 on LCD PCB is a MCU controller. It is used to control the unit in the transmitter (Q24)/receiver mode(Q5) ,LCD display ,back ground led of LCD ON/OFF(Q8 D6.D8) TOP LED ON/OFF(Q26 D9) battery checking(U5A),and functional control(S1 to S5,PTT).By the time, MCU may create both of the beep sound when the control button is pressed . X1,C13, C28 function as oscillator(4MHz) for MCU logic control.

Power Supply

U1(on main PCB) is a regulator that the out DC voltage is 3.3V. This stable output is used to feed to VCO circuit, MCU, receiver part. SW3 is used to control the power supply ON/OFF.

RECEIVER SECTION

The receiver is a conventional double conversion with the first local oscillator controlled by VCO operating at frequency 21.4MHz below the received frequency to produce the first IF 21.4MHz and the second local oscillator 20.950MHz to produce the second IF 450KHz.

Local Oscillator

When the unit is in the receiver mode, MCU control PLL circuit to make the VCO frequency is locked in the range of 441.1625 to 446.3125MHz. This VCO output is used as the first local oscillator that feed the first mixer(base of Q6 on main PCB). X3(on the MAIN PCB),C16,C15 and the circuit built in U2 is given the seconds local oscillator.

RF amplifier

RF signal from antenna is fed to the base of Q7 is one stage RF amplifier .The output from the collector of Q7 is giver to the base of Q6 for the first mixing.

Mixer CIRCUIT

Q6 functions as the first mixer. The second mixer is built in the U4 MC3361.

IF Amplifier

Q13 functions as the first IF amplifier, which the first IF signal is fed from the first mixer Q6 through IF filter F2. The second IF amplifier is built in U4 MC3361 through the second IF filter F3.

Demodulation

L17 and the built circuit of U4 (on IF PCB) function as the demodulation circuit.

Audio Power Amplifier

U6 on the main PCB is an audio power amplifier. The gain of amplifier determines by R52 and R51.

Auto Squelch

When there is (or not)RF signal, Pin 9 of U4(on IF PCB)output the small(larger) noise. This noise is fed to pin 10 of U4. After the noise is amplified by the built amplifier of U4, the noise the voltage on Pin 12 of U4 will down(or rise) below(or over)0.7V and pin 13 goes to low(or high) level, which is fed to MCU. MCU output the high(or low) level that making pin 7 of U6 on the main PCB is goes low(or high level). The audio is into the un-muting (or muting)status.
VR3 on the IF PCB is used to adjust the starting mute point.