Receiver System

■1-1 VHF Front End

The received signal from the antenna passes through a lowpass filter and then through a transmission/reception switching circuit (antenna switch) and enters the band-pass filter (L22,L23).
The signal passing through the band-pass filter (L22, L23) is amplified by with an RF amplifier (Q22), passes through a band-pass filter (L19, L21) and enters the first mixer (Q21).
These band-pass filters are tuned to a desired frequency by varicaps (D36, D39, D40, D41).

■1-2 UHF Front End

The received signal from the antenna passes through a lowpass filter and then through a transmission/reception switching circuit (antenna switch) and enters the band-pass filter (L10,L20,L27).
The signal passing through the band-pass filter (L10,L20,L27) is amplified by with an RF amplifier (Q9), passes through a band-pass filter (L7,L8,L9) and enters the first mixer (Q8).
These band-pass filters are tuned to a desired frequency by varicaps (D10,D16,D34,D35,D3,D6,D28,D38).

A tuning voltage corresponding to the desired signal is applied to each varicap through the DA terminal (pin 23) of the MPU (IC1) to tune to the receive frequency.
Double super heterodyne
Reception method 1st IF Frequency 38.85MHz (Lower)
2nd IF Frequency 450kHz (Lower)

■ IF Circuit

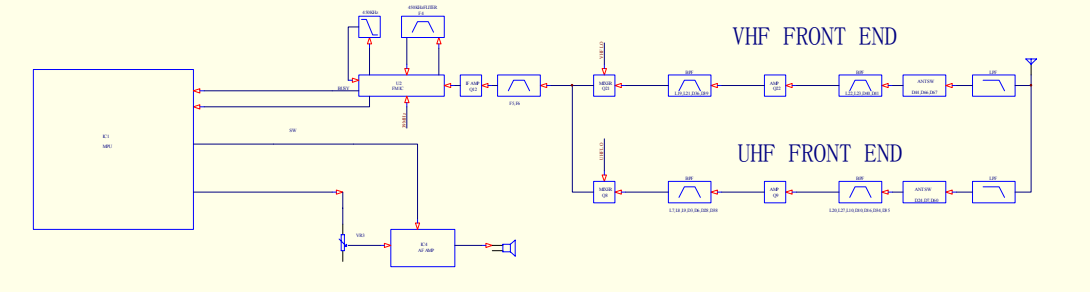
The first IF signal passes through crystal filter: F5,F6 to remove unwanted components.
The first IF signal passing through the F5,F6 is amplified by an IF amplifier (Q12) and the resulting signal enters the FM IC (U2).
The first IF signal (38.85 MHz) amplified by the IF amplifier (Q12) and the second IF signal (39 MHz) generated by tripling the 13MHz reference oscillator frequency of the TCXO (X1) by Q19, are mixed in the FM IC to produce a second IF signal (450 kHz) (Lower heterodyne).
The second IF signal passes through a ceramic filter (F4) to remove unwanted components and passes through the IF amplifier in the FM IC again and is detected to produced an audio signal.

■ Squelch

A noise component is obtained by passing FM detection output (FM IC pin 14) .

■ AF Amplifier

The detected audio signal is amplified by IC1(pin 16,17), the signal output of IC1 pin 25 passes through an AF volume (VR3) and is amplified to a specified output level with an AF amplifier (IC4).
The audio signal amplified with the AF amplifier (IC4) is output through an internal speaker or an external speaker jack (J4).
The beep tone are output from the (pin 20) of the MPU (IC1), enters the AF amplifier (IC4) and is output as a monitor tone.



Transmitter System

■ Microphone Amplifier Circuit

The audio signal from the microphone enters a microphone amplifier (IC6).
The signal passes through a pre-emphasis circuit, limiter amplifier and splatter filter inside the microphone amplifier.
The splatter filter will remove distortion outside the audio band.

■ Modulation Circuit

The audio signal amplified by the microphone amplifier (IC6) passes through a semi-fixed volume (VR4) for

modulation adjustment, and goes to the VCO modulation varicap (D46) for variable reactance phase modulation.

■ Drive and Final Circuit

For the VHF VCO(Q17) output signal passes through an RF amplifier (Q13, Q15) and drive amplifier (Q23, Q24,Q25), and is amplified by a power amplifier (Q26).
For the UHF VCO(Q31) output signal passes through an RF amplifier (Q14, Q16) and drive amplifier (Q23, Q24,Q25), and is amplified by a power amplifier (Q26).

■ APC Circuit

The APC (Automatic Power Control) circuit is used to obtain a stable transmission power and controls transmission output by detecting the drain current of Q25 and Q26.
The transmission output can be changed in three levels: High, Mid, and Low.
The reference voltage is output from the DA terminal (pin 23) of the MPU (IC1) and the detection voltage generated by R154, R155 and R156 are fed to the APC differential amplifier (U4).
The voltage in proportion to the difference between reference voltage and detection voltage is output from the BOUT terminal (pin 7) of U4 as an APC voltage.

The APC voltage controls the gate voltage of Q25 and Q26, and keeps transmission output stable.

PLL System

■ PLL Circuit

A reference frequency of 5 kHz or 6.25 kHz is produced by dividing the 13 MHz reference frequency of the TCXO (X1) with PLL IC (IC5). Comparison frequency is produced by amplifying VCO and dividing it with the PLL IC.
The PLL synthesizer with 5 kHz and 6.25 kHz step is configured by comparing phases of the reference frequency and comparison frequency.
The phase difference between reference frequency and comparison frequency passes through a charge pump in the PLL IC, then ripples are removed with a loop filter with lowrange passing characteristics to produce VCO control voltage (lock voltage).

■ VCO Circuit

The VHF VCO produces a desired frequency directly with a Colpits oscillation circuit containing an oscillation transistor (Q17) used for both transmission and reception. The VCO control voltage is applied to varicap (D48,50) to produce a desired frequency.
The UHF VCO produces a desired frequency directly with a Colpits oscillation circuit containing an oscillation transistor (Q17) used for both transmission and reception. The VCO control voltage is applied to varicap (D22,D33,D47,D54) to produce a desired frequency

■ Unlock Detection Circuit

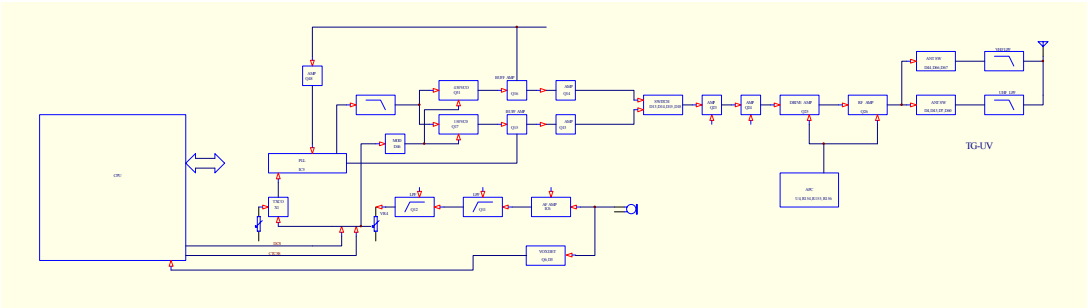
When the PLL is unlocked, the waveform of the pulse output from the Fo/LD terminal (pin 10) of the PLL IC (IC5), and the Fo/LD terminal is made "L" level. The voltage at the Fo/LD terminal is detected by the MPU to control transmission/reception switching timing.

■ CTCSS/DCS

The encode signal is generated by the MPU (IC1) and output from the TONE terminal (pin 20) of the MPU. The unwanted high-frequency components of the encode signal output from the MPU are removed with a low-pass filter, and applied to VCO modulation input (MOD) and TCXO VC terminal for modulation.
The decode signal is input to the SIGIN pin (pin 17) of the MPU after the waveform of the audio signal from the FM IC .Then the set CTCSS tone frequency and DCS code are detected by digital signal processing in the MPU to control muting.

■ VOX

The Q6 amplify the audio signal captured in the microphone, and then the signal is converted into the DC Voltage by D3. The DC voltage activates the MPU (IC1), and the VOX starts.


CPU
PLL
TCXO
TG-UV