Refer to Schematic Diagrams and Block Diagram.

1. Means for Determining Frequency

This equipment is employing a Phase Locked Loop (PLL) circuit (IC102, TB31202) along with the direct oscillation type VCO (D108 & Q112). TX operation frequency (Ftx) and RX 1st Local frequency (Frvco) are determined by the PLL circuit and are respectively generated by the VCO circuit.

The operation frequencies of this equipment is specified from 462.5625 to 462.7125 MHz and 467.5625 to 467.7125MHz (14 Channels).

The VCO directly oscillates frequency range of 462.5625 to 167.7125 MHz at transmitting, and 21.7 MHz below the operation frequency range is also oscillated at receiving because of setting the first intermediate frequency at 21.7 MHz.

Either Ftx or Frvco and the reference oscillation frequency 21.25 MHz (X101) are applied to the PLL IC (IC102).   Ftx (or Frvco) is divided by N (Divide Ratio) and the divided frequency F1 is obtained as below;

$$F1 = Ft \ (or \ FRVCO) \ / \ N$$

The reference oscillation signal (21.25 MHz) is also divided by 3400 at IC102, and the resultant F2 is calculated as below;

$$F2 = 21.25 \ (MHz) \ / \ 3400 = 6.25 \ (kHz)$$

F1 is compared with F2 at IC102, and if they are equal in frequencies, the phase locked loop will be under the locked condition.

Therefore, Ft (or Frvco) is determined as below;

$$Ft \ (or \ Frvco) = N \times F2 = N \times 6.25 \ (kHz)$$

Ft is changeable at the increment of 6.25 kHz by varying the programmed divide ratio N.   For example, when the divide ration is programmed to 74010 at the channel number 1, Ft can be calculated as follows;

$$Ft = 74010 \times 6.25 \ (kHz) = 462.5625 \ (MHz)$$

In the same manner, VCO frequencies for channel number 1 to14 are determined as shown in the Table 1.

2. Channel Selection Program

The divide ratio of the Programmable Divider in the CPU (IC303) is determined through the Channel ROM and the Channel Up/Down Counter by controlling the channel DATA input terminals (Pin 75 & Pin 76) of IC303.

The serial data is then fed into PLL IC(Pin 6, Pin 7 and P8) of IC102. TX/RX mode switch also changes the divide ratio of the Programmable Divider by changing the applied channel DATA at Pin 45(PTT) of IC303.

3. Means for Frequency Stabilization

Overall frequency stability of the unit is determined depending on crystal oscillator X101.   Stability rank of X101 is used +/- 1.5 ppm in the temperature range from -10 deg.C   to +55 deg.C. The temperature compensation circuits(D106, D107and th101) are assisting the frequency stability of X101 within +/-2.5ppm in the temperature range from -30deg C to -10deg C.

4. Means for Attenuation of Spurious Emission

The Low Pass Filter circuit which consists of the capacitors (C172, C137, C175, C140, C177) and the inductors (L108 & L111) is installed between the TX Final Amplifier (Q106) and the RF output terminal to reduce the spurious harmonic emissions.

5. Means for Limiting Modulation

IC308 and Q311 are amplifier for frequency modulator which provides 6dB/oct of pre-emphasis, limiting circuit. Also this IC108 has a function of a low pass filter circuit to avoid the harmful interference in adjacent channels. (Limiter input : pin 3 of IC108, Low pass filter output : pin 6 of IC108)

6. Means for Limiting Power

The RF Output stage (Q106, Q107, Q108) of this transmitter is designed to generate the maximum transmitter power within 0.5 Watts.   Tx power level is controlled by adjusting gate voltage of final device Q106.

7. Means for Prevention of unauthorized Frequency Emissions

This equipment has the TX Inhibit circuit which keeps off a transmitting of unauthorized frequency.

When the PLL circuit is not locked, a state of pin 5 of the PLL (IC102) is "L" (Low Level) so that the TX power supply Q115 and Q118 do not operates absolutely.

Table 1: Frequency Chart of VCO Frequency (FVCO) and Divide Ratio (N)

Channel Number	Operation Freq. (MHz)	TX Divide Ratio (N)	TX VCO Freq.(MHz)	RX Divide Ratio (N)	RX VCO Freq.(MHz)
1	462.5625	74010	462.5625	70538	440.8625
2	462.5875	74014	462.5875	70542	440.8875
3	462.6125	74018	462.6125	70546	440.9125
4	462.6375	74022	462.6375	70550	440.9375
5	462.6625	74026	462.6625	70554	440.9625
6	462.6875	74030	462.6875	70558	440.9875
7	462.7125	74034	462.7125	70562	441.0125
8	467.5625	74810	467.5625	71338	445.8625
9	467.5875	74814	467.5875	71342	445.8875
10	467.6125	74818	467.6125	71346	445.9125
11	467.6375	74822	467.6375	71350	445.9375
12	467.6625	74826	467.6625	71354	445.9625
13	467.6875	74830	467.6875	71358	445.9875
14	467.7125	74834	467.7125	71362	446.0125