4. CIRCUIT DESCRIPTION

4.1 Frequency synthesizer

Frequency synthesizer consists of VCO, PLL IC (built in PRESCALER) and loop filter.

a) VCO

VCO is composed of ONE VCO. Oscillation circuit takes colpitts circuit using variable Diode. And VCO is composed of D1, Q8, Q9, C81, C75, VC1, L1, C74, C76, C69, C72.
VCO control voltage through loop filter adjusts frequency and Microphone signal through Modulation terminal makes modulation.

a) NOAA VCO

NOAA VCO is similer to ATT704 VCO. VCO is composed of ONE VCO.
Oscillation circuit takes colpitts circuit using variable Diode.
And VCO is composed of D201, L201, VC201, Q201, C204, C205, C206, C207.
VCO control voltage through loop filter adjusts frequency.

b) PLL IC (with NOAA)

PLL IC is adjustable IC to produce the wished frequency which VCO provides through loop filter.
It has internal counter using 21.25MHz reference frequency to make 6.25kHz as reference Signal.
VCO frequency from prescaled input is divided signal is compared with Reference signal phase in phase comparator.
Built-in charger pump changes voltage (until two signals are in phase) and charged voltage supplies VCO through loop filter to produce the desired frequency.
Frequency data associated with channel goes to PLL IC by CPU through CLOCK, DATA.
PLL IC enables by strobe line of CPU.

c) Loop Filter (with NOAA)

Loop filter is composed of R48,R49,C84,C85 (NOAA: R201,R202,C201,C202) and changes pulse from pin14(NOAA:pin3) to DC. and eliminates harmonic component in pulse.
It helps VCO and NOAA VCO oscillate clearly as DC voltage is supplied into Varicap.

4.2 RECEIVER

This is composed of Dual Conversion Super Heterodyne. First IF is 21.7MHz.
Local oscillator frequency is lower in 1'st IF than Rx frequency.
It is called low side injection. Second IF is 450kHz.
2nd local oscillator frequency comes to 21.25MHz.

a) Rx/Tx/NOAA Rx Conversion Circuit

Rx signal goes to Rx/Tx/NOAA Rx conversion circuit through FIXED Antenna connector, low pass filter(L5,L6,L7,C42,C43,C46,C47) And receiver resonance circuit composed of L8, C11. And NOAA receiver resonance circuit composed of L31, C301.

When transmitting, voltage through R25, L12, D5,6 supplies, D4,7 of receive input is short and Tx is on condition. When PIN diode is off in condition of Rx, L8 and C11 resonate serially and make impedance matching at Receiver. When TX PIN diode, RX receiver VCC is off in condition of NOAA Receiver, C301, L31, C302, L32, C303resonate serially and make NOAA impedance Matching at Receiver.

b) Front-End

Front-End has Q1 to provide a high sensitivity and low noise feature. It employs Saw filter as band pass filter to eliminate image frequency and to produce enough pass band by Q1 input and output.

NOAA Front-End is composed of C301, L31, C302, L32, C303.

c) Mixer (with NOAA Mixer)

Mixer has one base BFQ 67W(Q2)/NOAA Q32, to feature high low noise Feature high low noise quality.

It has RF signal through L7, L6, L5, C41, L8, C11, C12, SF1 and Q1 RF signal from Local oscillator mixed.

And NOAA RF signal through L7, L6, L5, C41, L8, C301, L31, L32, C303 and Q31 RF signal from Local oscillator mixed.

It develops 1'st IF 21.7MHz. 1'st IF goes to 1'st IF amplifier Q3(2SC4083) base through X-tal filter XF1.

IF of mixing signals is selected and taken into X-tal filter.

Output impedance of mixer is direct matched with input impedance of X-tal filter. Matching of filter satisfies pass bandwidth of filter, ripple elimination with in pass band, and attenuation characteristic of stop band.

X-tal filter is composed of two pole monolithic X-tal filter, 8kHz of IF bandwidth R11 is used as impedance matching with 1'st IF Amp Q3.

d) IF AMP and Detection

1'st IF AMP Q3 supplies IF (U12) mixer input pin16 through output resistor R13 and C21 to need gain in insertion loss of X-tal filter and last stage circuit. Multi-use IF IC makes up of mixer IF AMP.

pin1 2'nd local frequency enter to pin 1.

It supplies mixer of internal IC. Mixer output of IC through pin3 passes 450kHz ceramic filter, supplies 2'nd IF amplifier and limits.

After 2'nd IF AMP has a process of enough gain and AM rejection, it comes to quadrature detection. Demodulated audio signal by T1 (Quad Coil) is amplified and comes out to pin9. Detected audio signal through R22, C32 and input in audio amp. IC U4 through C124.

e) Squelch Circuit

Noise component of detected outputs has amplification Squelch threshold is controlled by Resistor R18,C31,R15,C24,R21.
Squelch is not operating NOAA mode.

f) Audio Amplifier

Demodulated audio signal enters to pin3 of U4.
After above signal amplies in U4 pin5 through C120.
It comes out to pin5 Then, It reaches at speaker.

4.3 Transmitter

When Tx develops with pressing PTT switch, VCO output amplifies through Q4, Q5 transmits by antenna through low pass filter.

Tx RF signal produced from Tx VCO is amplified by DRIVER Q6 through C5 and entered Q4 POWER TR input terminal with final amplification.

After this stage, the signal is emitted at antenna through 50 matching circuit to low pass filter(L7, L6, L5, C42, C43, C46, C47) to eliminate harmonic.

4.3-1 Audio Modulation and Audio Amplification

Audio signal produced by external or internal microphone, limits amplification by IC U7.. It enters to VCO through low pass filter and U2.
Max. Frequency modulation deviation is adjusted by VR1 keeps noise and audio from entering to VCO at time of Tx.
Audio modulation and Audio Amplification has characteristic of 6dB/OCT pre-emphasis by U7(NJM324V).