Circuit Description of the AR16

1. The incoming signal is fed to the antenna BPF (Band Pass Filter) according to the frequency. The BPF is consisted from F1~ F6. The output signal coming from the BPF is led to the RF pre amplifier and then goes to the Mixer Circuit #1. In the Mixer Circuit #1, the input signal is mixed with the local oscillator signal generated by the VCO (Voltage Controlled Oscillator) with 429.9 ~ 859.9MHz frequencies to obtain the 440.1 MHz and 45 MHz of the 1st IF (Intermediate Frequency) signals.

F1 Circuit: The incoming signal between 0.5 ~ 5 MHz will be led to the F1 LPF (Low Pass Filter) consisted of the L102, L103, etc. and is amplified by the Q109 transistor. Then the signal is fed to the MIX 1 circuit (IC102). In the MIX 1 circuit, the local oscillator signal (440.1 MHz higher than the input signal) will be mixed to convert the 440.1 MHz of the 1st IF frequency.

F2 Circuit: The incoming signal between 50 ~ 108 MHz will be led to the F2 filter circuit, D103, D101. After being amplified by the Q109, a RF amplifier transistor, the incoming signal will be led to the MIX 1 circuit (IC102). In the MIX 1 circuit, the local oscillator signal (440.1 MHz higher than the input signal) will be mixed to convert the 440.1 MHz of the 1st IF frequency.

F3 Circuit: The incoming signal between 108 ~ 280MHz will be led to the F3 BPF circuit, consisted from the L107, L106, etc. After being amplified by the Q109, a RF amplifier transistor, the incoming signal will be led to the MIX 1 circuit (IC102). In the MIX 1 circuit, the local oscillator signal (440.1 MHz higher than the input signal) will be mixed to convert the 440.1 MHz of the 1st IF frequency.

F4 Circuit: The incoming signal between 280 ~ 400 MHz will be led to the F4 BPF circuit, consisted from the L112, L113, etc. After being amplified by the Q109, a RF amplifier transistor, the incoming signal will be led to the MIX 1 circuit (IC102). In the MIX 1 circuit, the local oscillator signal (440.1 MHz higher than the input signal) will be mixed to convert the 440.1 MHz of the 1st IF frequency.

F5 Circuit: The incoming signal between 400 ~ 700 MHz will be led to the F5 BPF circuit, consisted from the L116, L117, etc. After being amplified by the Q114, a RF amplifier transistor, the incoming signal will be led to the MIX 1 circuit (IC102). In the MIX 1 circuit, the local oscillator signal (45 MHz higher than the input signal) will be mixed to convert the 45 MHz of the 1st IF frequency.

F6 Circuit: The incoming signal between 700 ~ 1300 MHz will be led to the F6 HPF (High Pass Filter) circuit, consisted from the L121, L122, etc. After being amplified by the Q116, a RF amplifier transistor, the incoming signal will be led to the MIX 1 circuit (IC102). In the MIX 1 circuit, when the receive frequency is between 700 ~ 870 MHz, the local oscillator signal (45 MHz higher than the input signal) will be mixed to convert the 45 MHz of the 1st IF frequency.

When the receve frequency is between 870 ~ 1300MHz, the local oscillator signal (440.1 MHz lower than the input isgnal) will be mixed with the input signal in the MIX 1 circuit to convet the 440.1 MHz of the 1st IF frequency.

2. The 1st IF frequency of 440.1MHz will be led to the SAW filter (BPF) and will be fed to the MIX 2 circuit (Q104). Then the input signal will be mixed with the local oscillator signal to get 45 MHz of the IF frequency. The 395.1 MHz of the local oscillator signal is obtained from the crystal oscillator (formed by the X101(43.9MHz) and Q101) by a series of a frequency tripler (Q103, and Q102). When the 1st IF frequency is 45 MHz, the signal is amplified by the IF AMP (Q105).

3. WFM (Wide FM) signals
When the unit is in the WFM mode, the 45MHz of the IF signal is amplified by the IF AMP (Q107) and will be led to the MIX 3 circuit (Q113). In the MIX 3 circuit, the input signal is mixed with the 34.3 MHz of the local oscillator signal generated by the X102 and Q110 to convert to the 10.7 MHz of the 2nd IF frequency. It will be be led to the BPF (CF102), the 2nd IF amplifier (Q111), and WFM/AM IC chip (IC101) to be amplified and be detected to an audio signal.

4. FM (Narrow FM), AM signals
When the unit is in the FM or AM mode, the 45MHz of the IF signal is led to the IF AMP (Q100) through the IF filter (XF100) to be amplified, and will be led to the FM IC (IC100). In the FMIC, the input signal is mixed with the 44.545MHz of the local oscillator signal to convert to the 455KHz of the IF frequency. After passing through the IF filter (CF100), and when the unit is in the FM mode, the IF signal will be led to the FM IC (IC100) to be amplified and be detected to an audio signal. When the unit is in the AM mode, the IF signal will be led to the WFM IC (IC101) to be amplified and be detected to an audio signal.

5. Audio Circuit
The detected audio signal will go through the MUTE/SW circuit to be led to the AF PA (IC7) to drive a speaker.

6. Squelch Circuit

When the unit is in the FM or AM mode, the noise signal output from the FM IC (IC100) is adjusted the Squelch adjustment pot (VR101) , and will be amplified by the IC100. The noise signal is converted to a DC voltage, and will be led to the CPU (IC6) through the D116.

When the unit is in the WFM mode, the noise signal output from the FM/AM IC (IC101) is led to the Q106 and the VR102. The noise signal is now converted to a DC voltage. The signal will be led to the CPU (IC6) through the D113.

The CPU (IC6) will detect the squelch status and controls the audio amplifier.

7 Signal Strength Meter

When the unit is in the FM or AM mode, the IC100 will generate a DC signal according to the input signal level. The signal will be led to the CPU (IC6) through the D114.

When the unit is in the WFM mode, the IC101 will generate a DC signal according to the input signal level. The signal will be led to the CPU (IC6) through the Q115.

The A/D convertor in the PU will drive the Signal meter segments on the LCD unit.

8 PLL (Phase Locked Loop) Circuit

The PLL circuit is consisted of the PLL IC (IC103), LPF (Low Pass Filter, Q119, Q122), VCO (Voltage Controlled Oscillator, Q300, Q301), Amplifier (Q117). Oscillation Frequency has been controlled by the serial data sent from the CPU. In meanwhile, the reference frequency has been obtained by the X103 (14.4MHz) by dividing the signal output controlled by the CPU.

9. One (1) KHz frequency step

When the channel steps are selected less than 5KHz, the output data from the CPU will be converted by the IC251 to control the crystal oscillator (X100) so that 1 KHz of reference frequency is obtained.

10. Control Circuit

The CPU (IC6) will control all necessary controls for the AR16. The CPU is operating with 4 V DC which is generated by the DC-DC converter (IC1). The voltage detector (IC2) is checking the line voltage and will shut of the power circuit when the line voltage is dropped lower than 2.2 V DC.

The CPU (IC6) will also control the EEPROM (IC9) to read or write memory channel data.

The CPU has a built-in LCD driver and drives the LCD.

11. Power Circuit

The power ON/OFF setting is controlled by the CPU through the Q1.

The power ON/OFF for the Audio Amplifier (IC7) is controlled by the Q3.

The Power ON/OFF for the VCO circuit of the PLL circuit is controlled by the Q2.

The IC5 (DC-DC converter) generates a 20V DC voltage to supply to the VCO unit.