ARC 51 BX

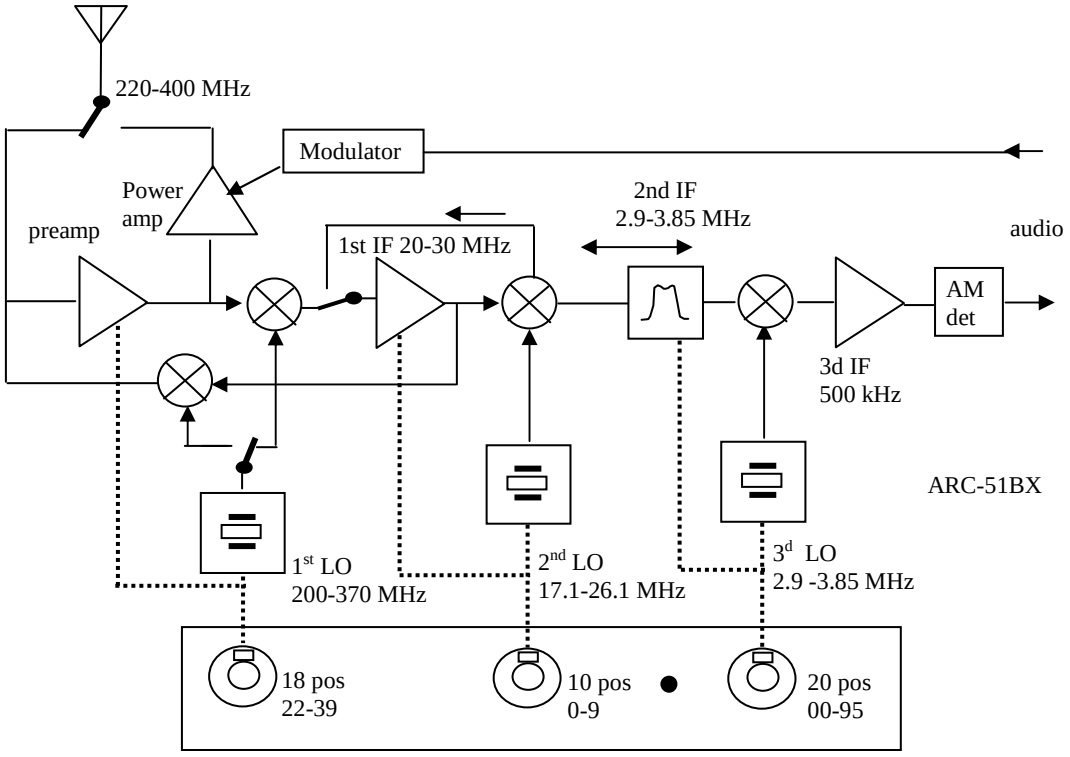
The ARC-51BX is a compact UHF military aircraft transceiver, made by Rockwell-Collins around 1969. The transceiver has 3500 Xtal controlled channels between 225MHz and 400MHz. Channel distance is 50kHz, audio bandwidth is 6kHz, and the modulation is AM.

Frequency control
Three rotary knobs on the remote control panel select the tens of MHz (18 positions), units MHz (10 positions) and kHz (20 positions, in 50kHz steps)
Each rotary switch position is transferred by 5 contacts to the ARC51-BX.

The receiver is a triple superhet, the first knob controls the first local oscillator (LO) , etc.
There are 18 + 10 + 20 = 48 Xtals, selecting 18 x 10 x 20 = 3600 channels.

The dials can be set anywhere from 220.00 ..399.95, so 3600 channels, however the first 100 channels (up to 225 MHz) are not used in the official spec. MIL-R-22659D.

During transmit (key down), the oscillator frequencies are added backward from third to first LO using the same IF filters as in the receive mode. This requires a lot of relays.



The RF preamp is mechanically tuned from 225 - 400 MHz BW 3 MHz
The 1e IF is mechanically tuned from 20 – 30 MHz BW 300 kHz
The 2e IF is mechanically tuned from 2.9 - 3.9 MHz BW 50 kHz
The 3e IF is fixed, centered around 500 kHz. BW 15 kHz (490-505 kHz)

With all dials at minimum, the receive frequency is 200 + 17.1+ 3.40 – 0.5 = 220.00 MHz
and the transmit frequency is 200 + 17.1+ 2.90 = 220.00 MHz
With all dials at maximum, the receive frequency is 370 + 26.1+ 3.35 + 0.5 = 399.95 MHz
and the transmit frequency is 370 + 26.1+ 3.85 = 399.95 MHz

Xtal frequency of the local oscillators

Pos		1st LO	2nd LO	3d LO
	Xtal	tank	Xtal	Xtal
1	66.66 MHz	200 MHz	17.1 MHz	3.40 MHz
2	70	210	18.1	3.45
3	73.33	220	19.1	3.5
4	76.66	230	20.1	3.55
5	80	240	21.1	3.6
6	83.33	250	22.1	3.65
7	86.66	260	23.1	3.7
8	90	270	24.1	3.75
9	70 *	280	25.1	3.8
10	72.5	290	26.1	3.85
11	75	300	-	2.9 **
12	77.5	310	-	2.95
13	80	320	-	3.0
14	82.5	330	-	3.05
15	85	340	-	3.1
16	87.5	350	-	3.15
17	90	360	-	3.2
18	92.5	370	-	3.25
19	-	-	-	3.3
20	-	-	-	3.35

*) Up to pos 8, the second stage of the spectrum generator (1st LO) is a tripler, from position 9 onwards, it is a quadrupler according to the anode circuit tuning.

**) The first 10 positions have the third LO *above* the signal frequency, the last 10 channels have the 3^{e} LO *below* the signal frequency. During transmit, upper and lower half of these Xtals are swapped, so the 3d LO frequency is exactly in the pass band of the second IF for all 20 positions of the third dial. The 3d LO signal is passed back to the 3d mixer, and added to the second LO frequency. This signal is filtered and amplified in the first IF amplifier.

The resulting frequency is added to the first LO, and filtered and amplified in the RF preamp.

The first LO shall have a very stable frequency, just 7kHz variation is allowed on 350MHz (20ppm) over an ambient temperature variation from -15° to + 45°C. Therefore, the 18 Xtals are placed in an oven with a thermostat-switched, 25W heating element.