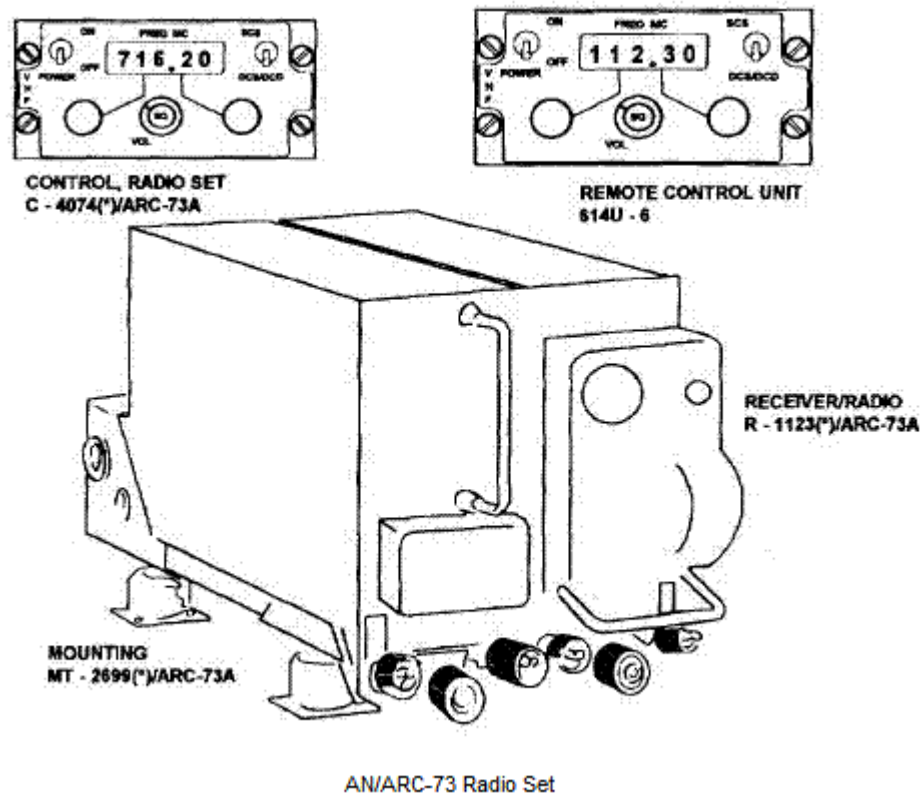


AN/ARC-73 or 51X-2B + 17L7



Air band transceiver, built by Collins Radio Co.

AN/ARC-73 Radio set, 116-151.95MHz, 720 chan, 50kHz step, 80 preset, AM, 20 W, 28 VDC at 8 Amps,

Major components: [T-879](#), [R-1123](#) and [C-4074](#).

AN/ARC-73A Radio set, 116-149.95MHz TX, 108-151.95MHz RX, 50kHz steps, AM, 20 W, 28 VDC at 8 Amps,

Major components: [T-879](#), [R-1123](#) and [C-4074](#).

The ARC73 radio set consists of:

- ARC-73 part COLLINS nr
- R-1123A (51X-2B) receiver,
- T-879 (17L-7) transmitter,
- C-4074 (614U-) control unit and
- MT-2699 (390E-2) dual shockmount

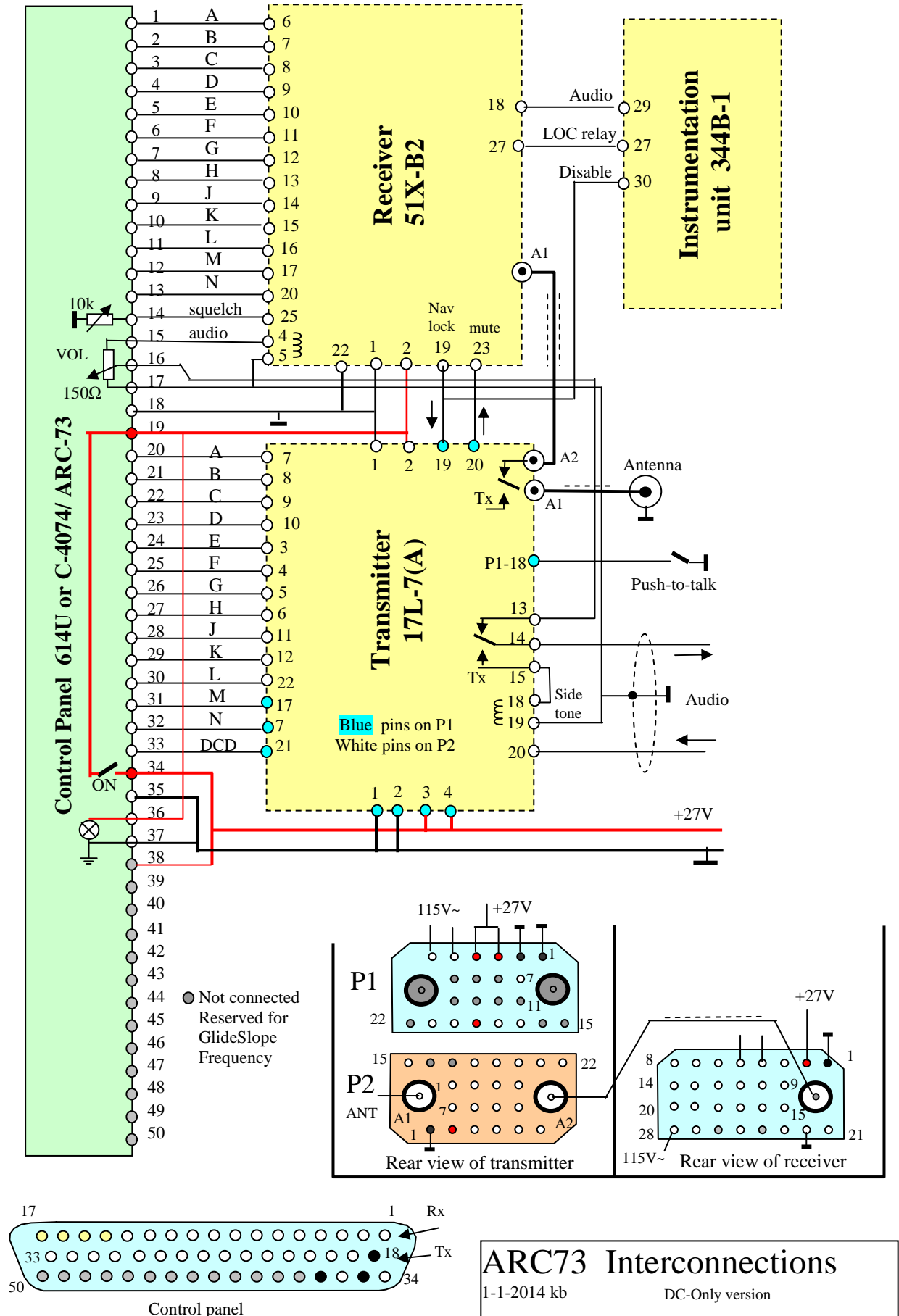
The ARC73 will transmit/receive at:

- 17L7 Transmits on 118 ... 151.95 MHz in 50kHz steps (680 channels)
- 17L7A Transmits on 116 ... 149.95 MHz in 50kHz steps (680 channels) = MIL version ARC-73A
- 51X-B(2) Receives 108 ... 151.95 MHz in 50kHz steps (880 channels)

The control panel has internal moveable end-stops for both minimum and maximum frequency :

MIN stop at 108 or 118 MHz, and **MAX.** stop at 135.95 or 151.95 MHz.

The receiver has two outputs. One for audio with a speech filter of 300Hz ... 3900Hz, the second output is for NAV signals like VOR or LOC with full bandwidth of 20Hz to 11 kHz. The transmitter has a carbon microphone input for 1Vrms with a bandwidth of 300 - 3500Hz.



VHF Control Panels 614U -1, 2, 3, 5, 6, 7 or C4074/ARC-73

The 614U panel has two independent 13-wire frequency control switches, one for 51X-2 receiver and one for the 17L-7 transmitter.

Switch pos.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
			----- NAV -----					----- COMM -----							----- EXTENDED -----							Skip				
Even	MHz	M	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154
Odd	MHz	J	109	111	113	115	117	119	121	123	125	127	129	131	133	135	137	139	141	143	145	147	149	151	153	155
TRANSMIT	P2-7	A			X	X?		X				X	X		X		X				X	X		X		
17L-7 pin	P2-8	B				X			X				X	X		X		X					X	X	X	
	P2-9	C					X			X				X	X				X				X	X		X
	P2-10	D	X					X			X				X	X	X			X			X	X	X	X
	P1-7	N															X	X	X	X	X	X	X	X	X	X
RECEIVE	6	A	X	X	X			X				X	X		X		X	X			X	X	X		X	
51X-2 pin	7	B		X	X	X			X				X	X		X		X	X			X	X	X		X
	8	C	X		X	X	X			X				X	X		X		X	X			X	X	X	X
	9	D		X		X	X	X			X				X	X		X		X	X			X	X	X
	20	N	X	X	X	X	X	X	X	X	X	X	X	X	X	X										

Pin nr on 614U control panel			
		Rx	Tx
MHz select	A	1	20
	B	2	21
	C	3	22
	D	4	23
Fract. MHz select	E	5	24
	F	6	25
	G	7	26
	H	8	27
Odd MHz	J	9	28
50 kHz	K	10	29
00 kHz	L	11	30
Even MHz	M	12	31
Extended	N	13	32
10kΩ Squelch pot		14	33 DCD
150 Ω Vol.pot top		15	34 power switch to 19
Vol.pot wiper		16	35 gnd
Vol pot cold		17	36 Dial lamps
gnd		18	37 Dial lamps gnd

Pink area not accessible
 Green area 108-117.95 Rx only accessible in 614U-3 or 3A

Fractional MHz control lines E,F,G,H (same code for Rx and Tx) :

Line	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Rx pin 51X-2B	Tx pin 17L-7
E	X		X	X		X	X				10	P2-3
F		X	X	X			X				11	P2-4
G			X	X	X			X	X		12	P2-5
H				X		X		X	X	X	13	P2-6

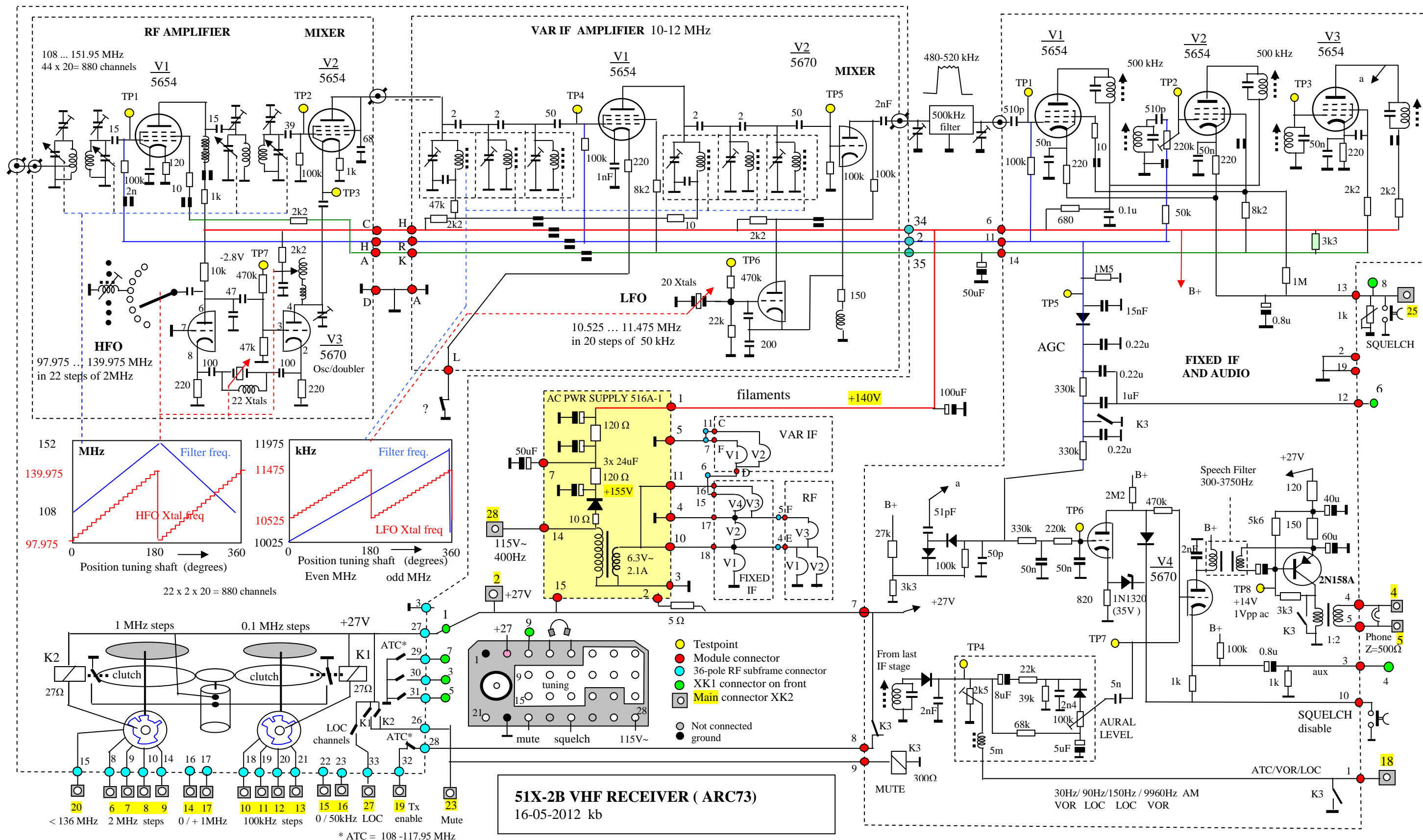
J-line to Rx Pin 14 resp. Tx pin P1-17 connected to ground for odd MHz
 K-line to Rx Pin 15 resp. Tx pin P2-12 connected to ground for .x0 MHz
 L-line to Rx Pin 16 resp. Tx pin P2-22 connected to ground for .x5 MHz
 M line to Rx Pin 17 resp. Tx pin P2-11 connected to ground for even MHz
 N-line to Rx Pin 20 resp. Tx pin P1-7 X connected to ground for extended MHz

pin 33 connects to ground when DCD selected and freq= 118,119,120,127,128 or 129 MHz
 pin 34 connects to pin 19 when powerswitch is "ON"

Positions marked "X" above are connected to ground in the control panel
 Postions **not** marked "X" are interconnected in the control panel and not to ground.

614U-6 has extra outputs for Glideslope receiver channel selection when freq=108 or 109.xx mc
 614U-7 has extra outputs for DME transceiver channel selection when freq= 110 ... 117.xx mc





51X-2B VHF RECEIVER

MIL name R-1123A / ARC-73

The receiver covers 108-151.95 MHz in 50 kHz steps, 880 channels

Input Sensitivity 3uV Antenna impedance 52 Ω.

Output 100mW into 500 Ω (7Vrms)

The receiver is a double superhet, with one RF stage.

The RF stage is tuned with a four-fold variable capacitor

1st LO 97.975 - 139.975 MHz in 2 MHz steps (22 Xtals),

first IF 10-12 MHz, variable, permeability tuned

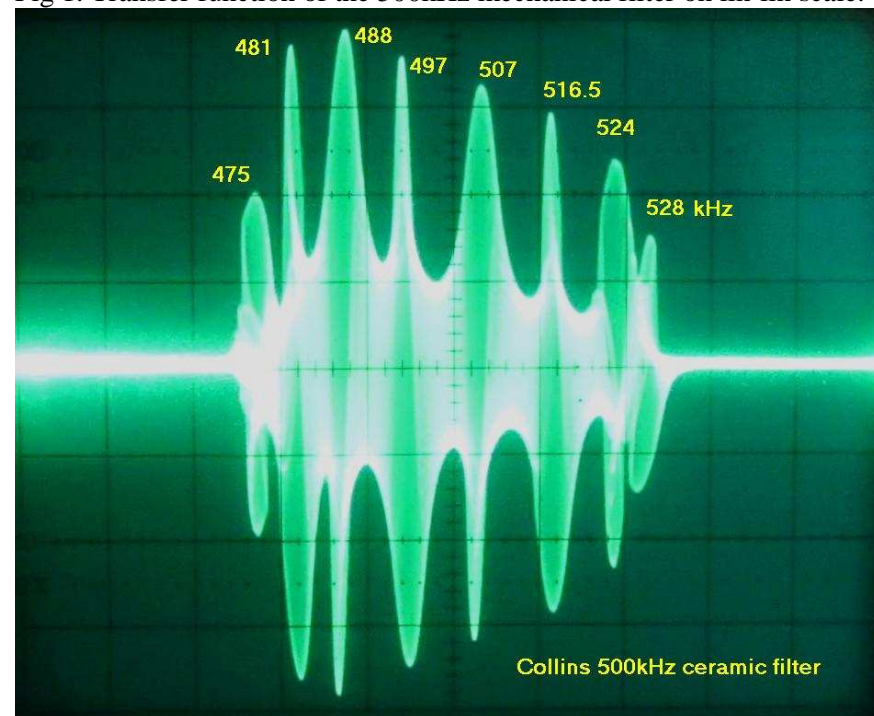
2nd LO 10.525 - 11.475 MHz in 50kHz steps (20 Xtals)

In total $22 \times 20 \times 2 = 880$ channels

second IF 500kHz fixed

The Xtals of the second LO are used twice: once 500kHz below the first IF signal, and in a second turn of the selector at 500kHz above the first IF signal. The result is a 500kHz signal that is filtered in a **Collins mechanical filter**. The transfer function on a linear scale is shown below. On a log scale, the passband ripple is 6dB, the signal is 60dB down outside 460 ... 540 kHz.

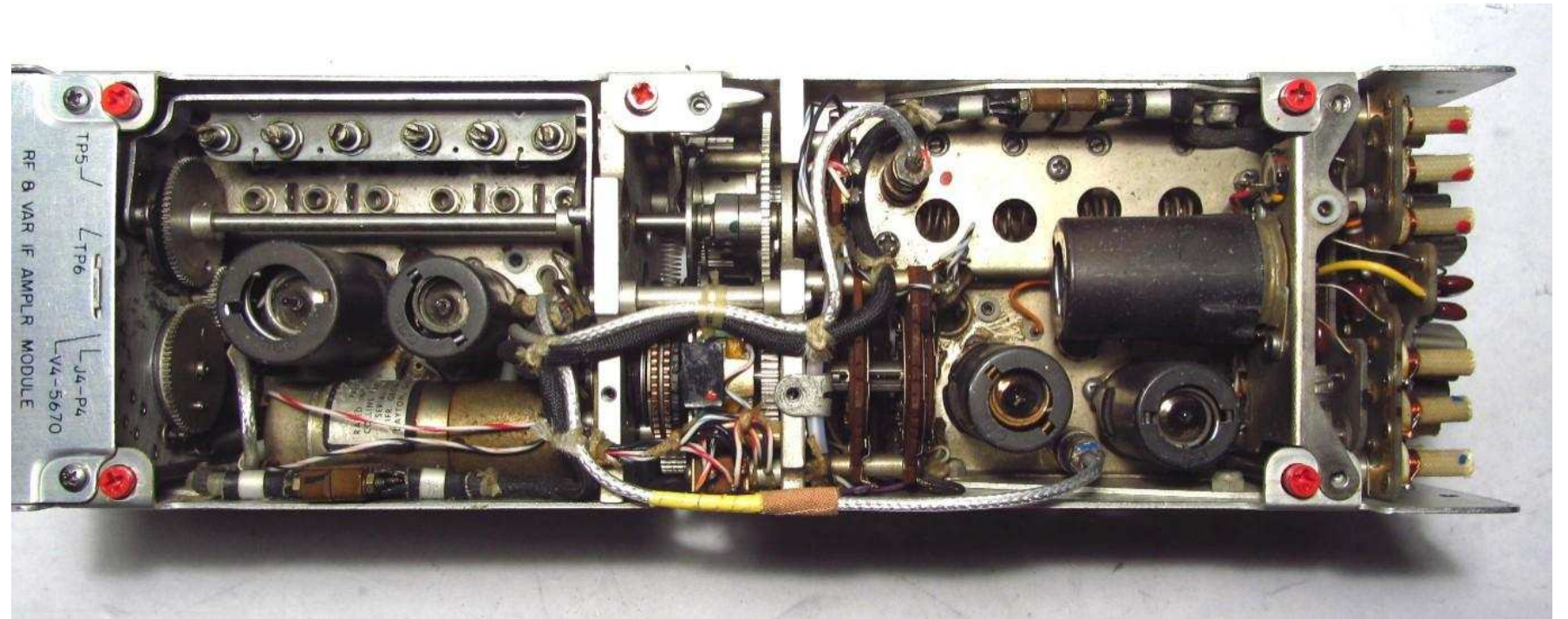
Fig 1. Transfer function of the 500kHz mechanical filter on lin-lin scale.



The ripple in the passband is possibly too high due to the 50 ohm generator impedance, instead of 5k as specified by Collins. Load was 100k as specified.

AGC

Automatic gain control is fast for the communication signals, but must be slow for navigation as the modulation frequency is low, 30Hz for the VOR, 90Hz or 150Hz for LOC. This is done automatically when pins 6 and 7 on the noval socket XK1 on the front are interconnected.



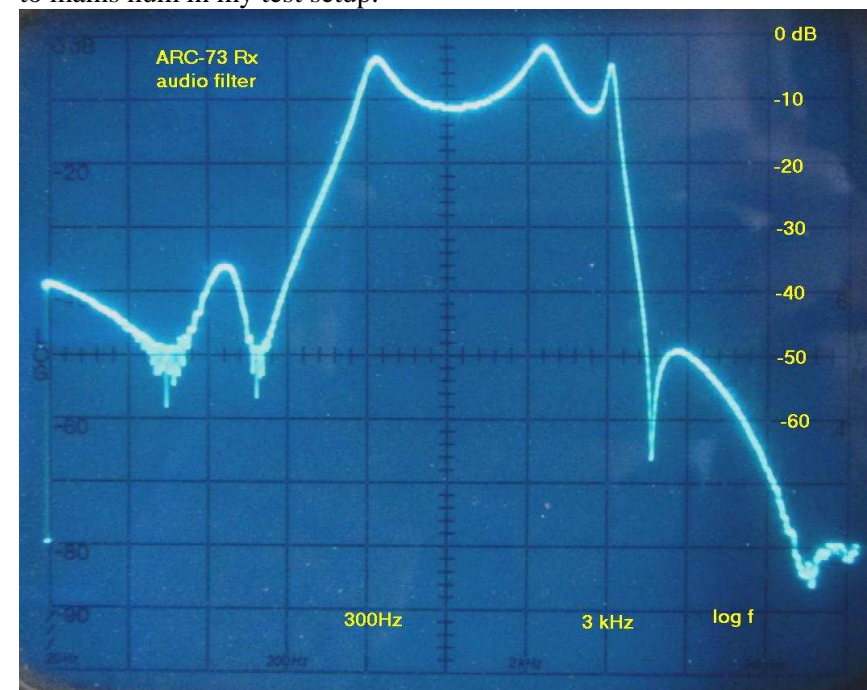
The AGC voltage on TP5 with squelch adjusted at 5uV is ..V at -80dBm input and ...V at -20dBm input.

ATC output.

The receiver has a wide-band output for the VOR signals (30Hz and 11kHz) or LOC signals (90 and 150Hz). This output is not squelched nor clipped. Three contacts are available that close to ground on the ATC channels (108-117.95 MHz), one can be used to slow down the AGC response, another to select horizontal (VOR/LOC) or vertical (comm.) antenna

Squelch and audio

The squelch tube is controlled by the AGC voltage. The audio stage has a sharp speech filter with 300 – 3700 Hz passband (see below). The filter peaks are at 320, 1400 and 3000 Hz. The peak at 50Hz was due to mains hum in my test setup.



Speechfilter response on log-log scale

Front connector XK1

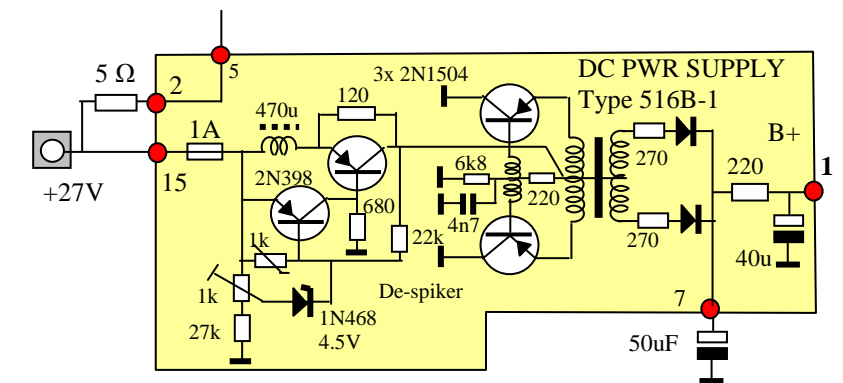
A 9-pin noval connector is used in conjunction with an external VOR/LOC decoder like the Collins 344B-1 Instrumentation Unit.

Rear connector XK2

28 pin DPA connector with one coax input for the antenna signal. Connects to the remote control panel and power source.

Power supplies, filaments

The 51X-2 was available with either AC input (115V/400Hz) or DC-only input. The only difference is the power supply module. All filaments are in parallel in the AC version, but in the DC version they are connected series/parallel. A 5 ohm dropper resistor is mounted in the main chassis to reduce the 27.5V to $4 \times 6.3 = 25.2V$. The DC supply has a de-spiker to block spikes up to 70V on the DC input, and a 5W inverter to provide 150V/45mA.



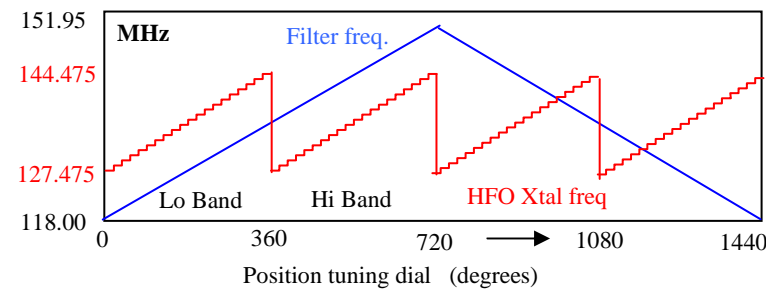
You can mail me at a.k.bouwknegt -at- home.nl

ARC-73 (Collins 17L-7) Transmitter tuning Mechanical Tuning Unit

The mechanical tuning system is the backbone of the RF module of the 17L-7. It consists of a 27Vdc motor, two electromechanical clutches K2 and K3 to transfer motion to the crystal selector shafts of the high frequency oscillator (HFO) and the low Frequency oscillator (LFO).

The 18 HFO crystals are in 1 MHz steps, the 20 LFO crystals have 50 kHz steps.

The LFO and HFO signals are mixed, and a multistage tuned filter selects the carrier signal from the result. The variable capacitor (varco) shaft of this filter is driven from a mix of the HFO and LFO shafts.



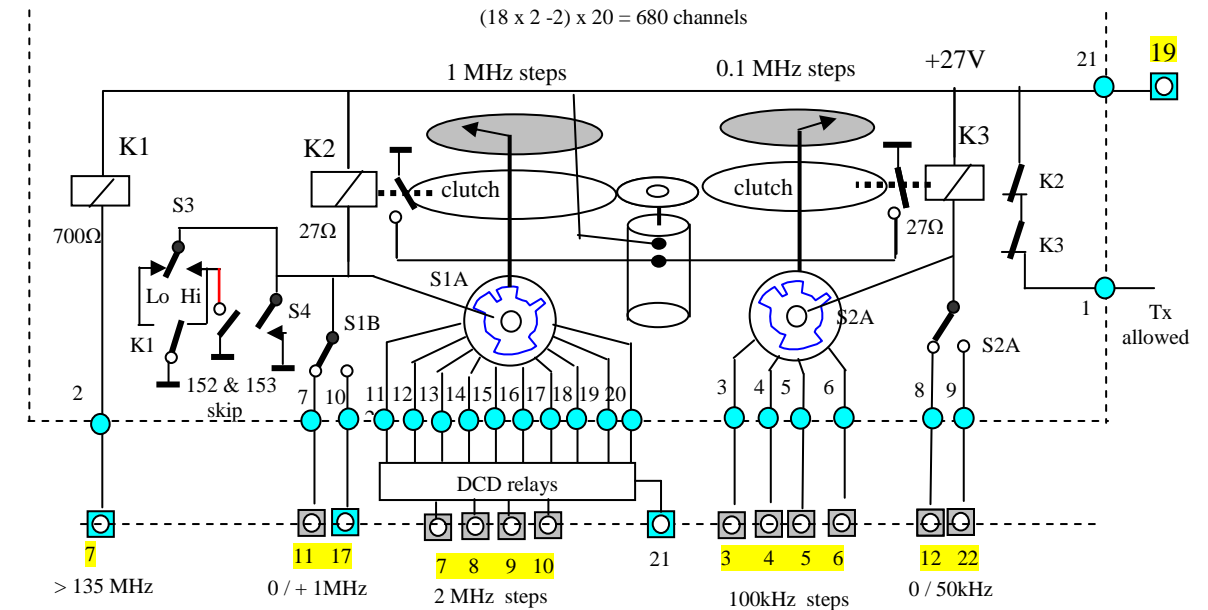
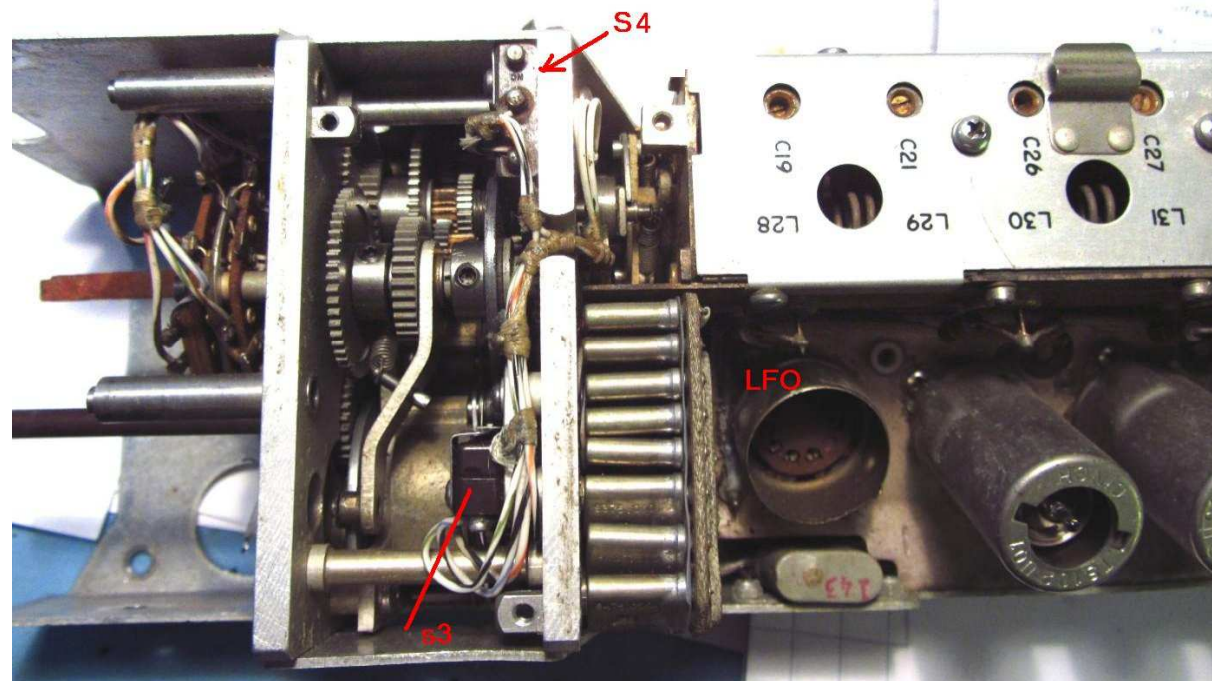
The 18 crystals of the HFO are used twice: once above the Tx frequency (Lo band), and once below the Tx frequency (Hi Band).

Over the whole Lo + Hi band, the varco of the tuned filters makes only a half turn.

So, the HFO crystal selector makes 4 turns for

one full turn of the varco.

Microswitch S4 is on the varco shaft and forces the motor to skip the unused half turn. Microswitch S3 is on a shaft with twice the speed, and used to select LoBand or HiBand. In HiBand, the last two positions (152 and 153 MHz) are skipped. In Lo Band, the LFO frequency is *decreasing* with increasing transmit frequency, while in Hi Band, the LFO frequency is *increasing* with increasing transmit frequency. Relay K1 near the LFO crystals reverses the sequence in the Loband case.



The DCD relay connects MTU pins via the rear plug to the control panel, depending on the SCS / DCS mode. When P1-21 is left open, normal mode is selected (same frequency for receive and transmit). When P1-21 is connected to ground (Dual channel mode) then the transmit frequency is 6 MHz above the receive frequency for the first 6 columns in the table below, or 12 MHz lower in case of the last 3 columns. The control panel allows 118-119-120-127-128-129 MC (Rx) only for DCD, so all transmit 6MHz above the receive frequency. The coding of the MHz switch S1A is as follows. "X" means no connection (that output is open).

dial	S1A input:	11	12	13	14	15	16	17	18	19	20
118/119/136/137		X	X	X	X	X	X	X	X	X	X
120/121/138/139			X	X	X	X	X	X	X	X	X
122/123/140/141				X	X	X	X	X	X	X	X
124/125/142/143				X	X	X	X	X	X	X	X
126/127/144/145		X	X	X	X	X	X	X	X	X	X
128/129/146/147		X	X	X	X	X	X	X	X	X	X
130/131/148/149		X	X	X	X	X	X	X	X	X	X
132/133/150/151		X	X	X	X	X	X	X	X	X	X
134/135/-----/----		X	X	X	X	X	X	X	X	X	X

Rear connector Pin of P2	Normal	Dual Chann
7	11 & 12	14 & 17
8	18	19
9	20	12 & 13
10	14 & 16	15

Table 2 DCD relay

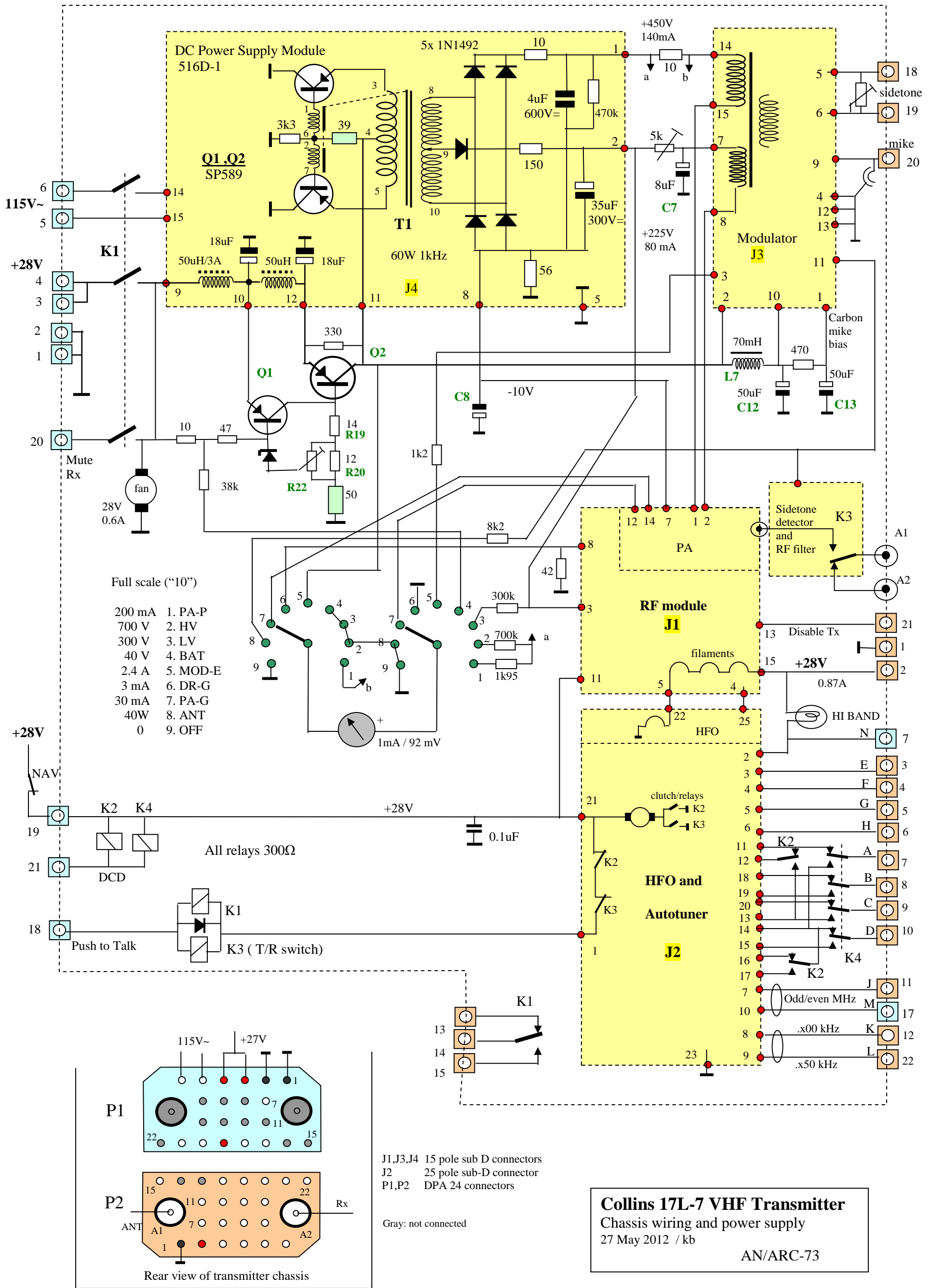
Example: in normal mode, with line A connected to ground in the control panel, the motor stops when both MTU pins 11 and 12 are open, i.e. at 118, 126, 128 and 132 etc MHz.

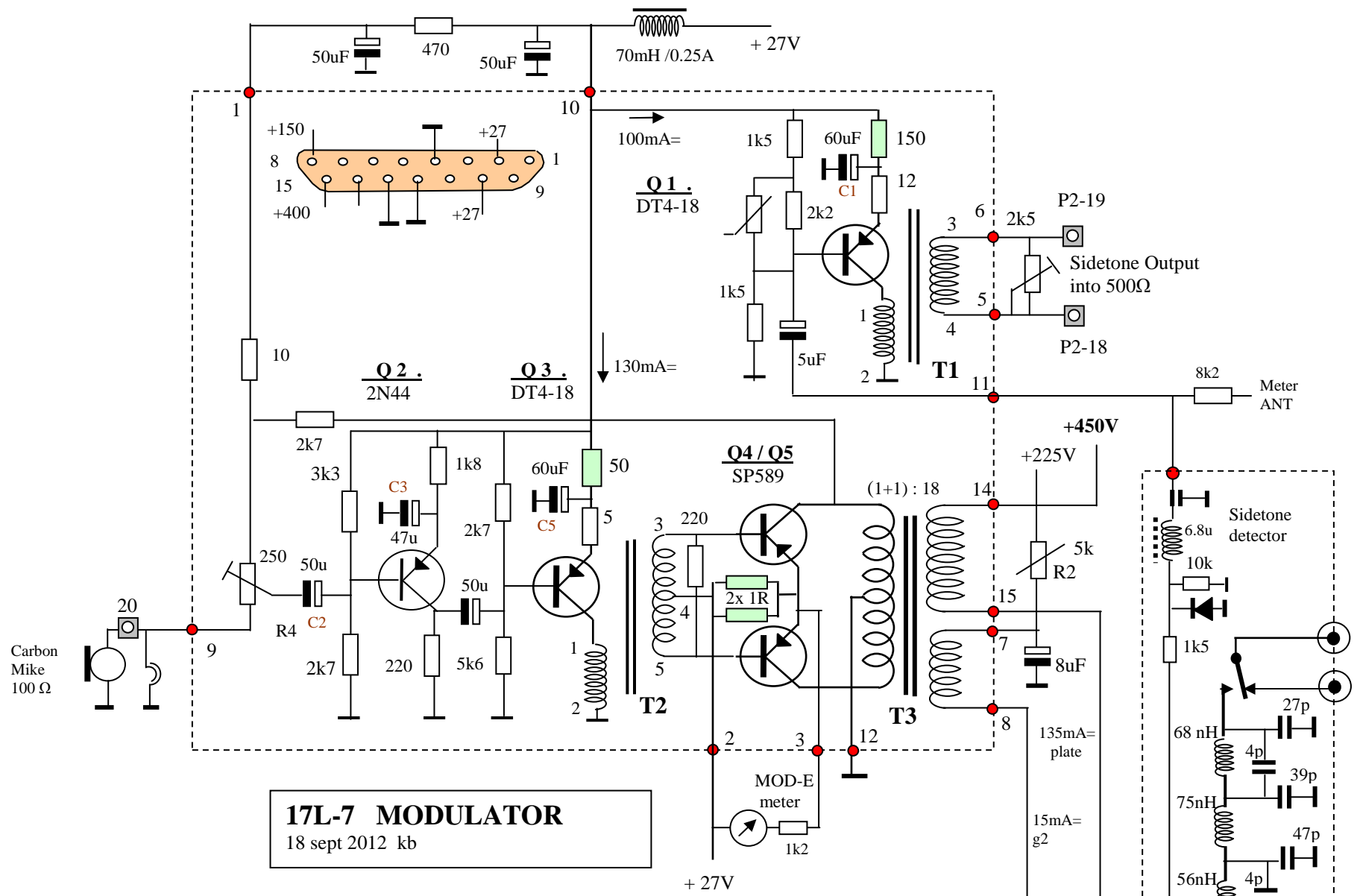
m	118	120	122	124	126	128	130	132	134	MTU Pins used in	Pin on P2
c	119	121	123	125	127	129	131	133	135	normal mode	Rear side connector
A	X				X	X	X	X		11 & 12	7
B		X				X	X		X	18	8
C			X				X	X		20	9
D	X			X				X	X	14 & 16	10

m	118	120	122	124	126	128	130	132	134	MTU Pins used in	Pin on P2
c	119	121	123	125	127	129	131	133	135	Dual chann mode	Rear side connector
A		X		X				X	X	14 & 17	7
B	X		X		X				X	19	8
C	X	X				X				12 & 13	9
D		X	X	X			X			15	10

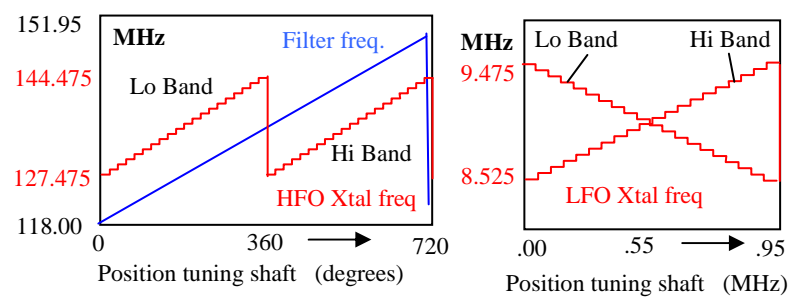
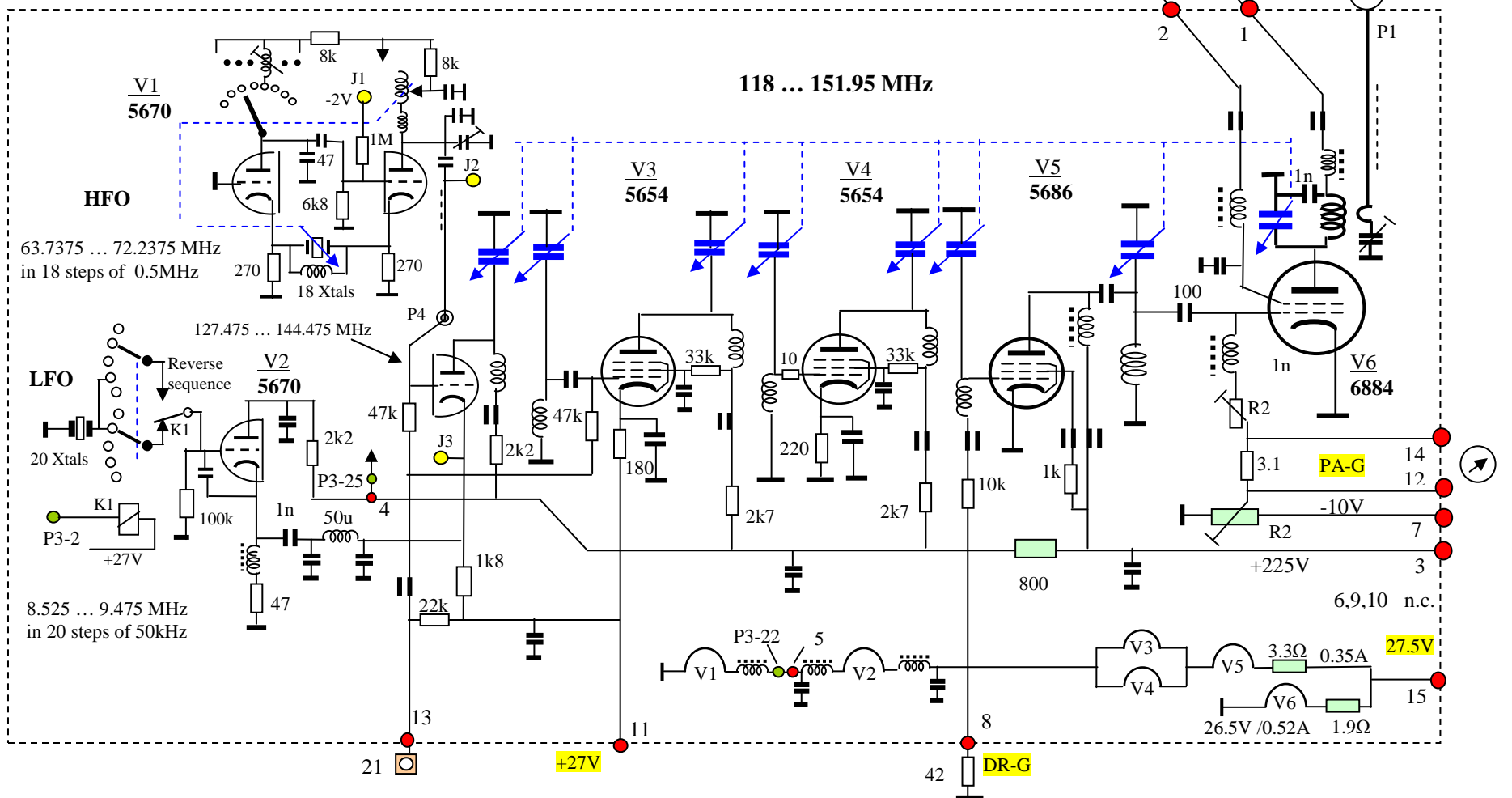
Example: Control set at 124MHz dual channel -> receive 124, Transmit at 130 MHz

AN /ARC-73 Transmitter (Collins 17L-7) Power supply and chassis wiring





17L-7 MODULATOR
18 sept 2012 kb



- Testpoint
- Pin on 15-pin connector P2 (LFO and amplifier)
- Pin on 25-pin connector P3 (HFO and tuning)

Collins 17L-7 RF Module
ARC-73
18/9/2012 kb