## Notes

- Early version retains the 0.5-1 setting on RF RANGE, along with the accompanying L & C, from the RA-17. Later version replaces this with the WIDEBAND 75Ω setting.
- Early version takes the RF socket (SK11) off SK300 with a T connector. Later version adds SK300B to feed SK11.
- Some units remove AVC action from the RF Amp through the following alterations:
  - V3 (6ES8) is replaced with a 6DJ8 (sharp cutoff)
  - V24 is shorted
- Also in the AVC, R119 may be shorted.
- Some units have V5 replaced with a 6AU6.
- C41 is mislabeled as C44 on VFO1 chassis.
- Labeling of SK302 and 305 is mixed up between chassis and schematic.
- Capacitance in microfarads unless otherwise indicated.
- This is a re-drawing of a scanned version of the manufacturer schematic EC17700, obtained from:
  `http://koti.mbnet.fi/ijl/ra117sch.gif`
  Some part numbers and values were blurred in the scan, for surety they should be checked against the parts list in the manual, if in question.
- Drawn 2008 Jun 14 by bhilpert.

## Tube Functions & Types

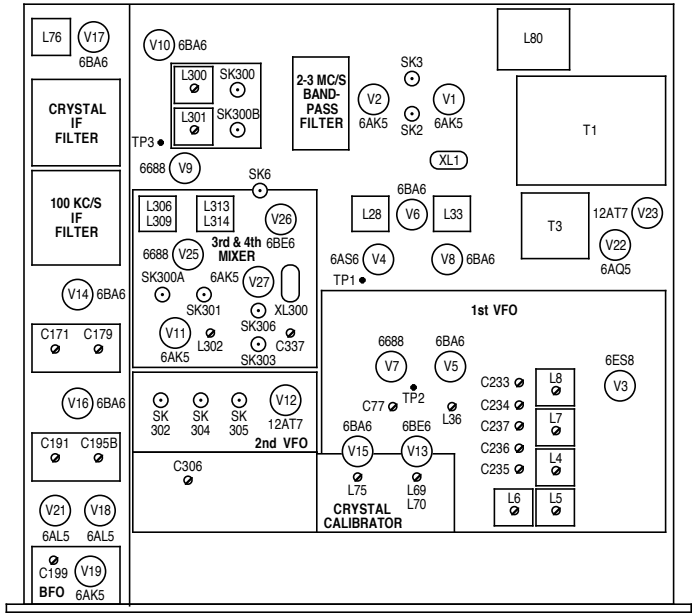
| Tube | Function | Type | V(P) | V(S) | V(K) |
|---|---|---|---|---|---|
| V1 | 1 MC/S Crystal Osc. | 6AK5 | 140 | 75 | 1.16 |
| V2 | Harmonic Generator | 6AK5 | 165 | 120 | 3 |
| V3 | RF Amp | 6ES8 | 172 | - | 90 |
| V3b | RF Amp | " | 90 | - | 1.1 |
| V4 | Harmonic Mixer | 6AS6 | 175 | 120 | 2 |
| V5 | 1st VFO | 6BA6 | 175 | 95 | - |
| V6 | 37.5 MC/S Amp | 6BA6 | 196 | 85 | 0.95 |
| V7 | 1st Mixer | 6688 | 173 | 120 | 0.85 |
| V8 | 37.5 MC/S Amp | 6BA6 | 195 | 85 | 0.95 |
| V9 | 2nd Mixer | 6688 | 168 | 135 | 0.86 |
| V10 | 37.5 MC/S Amp | 6BA6 | 205 | 108 | 2.06 |
| V11 | 2nd VFO Buffer | 6AK5 | 155 | 110 | 1.95 |
| V12 | 2nd VFO Osc. | 12AT7 | 100 | - | |
| V12b | 2nd VFO Amp | " | 195 | - | 44 |
| V13 | Calibrator (A) | 6BE6 | 225 | 90 | 2 |
| V14 | 1st IF Amp | 6BA6 | 175 | 70 | 0.92 |
| V15 | Calibrator (B) | 6BA6 | 220 | 110 | 6.5 |
| V16 | 2nd IF Amp | 6BA6 | 180 | 88 | 1.46 |
| V17 | IF Output | 6BA6 | 150 | 92 | 1.36 |
| V18 | AVC & TC | 6AL5 | - | - | 27 |
| V19 | BFO | 6AK5 | 155 | 110 | - |
| V20 | - | - | - | - | - |
| V21 | Detector & Noise Lim. | 6AL5 | - | - | - |
| V22 | Audio Output | 6AQ5 | 200 | 198 | 8.5 |
| V23 | Audio Line Output | 12AT7 | 205 | - | 2.2 |
| V23b | Audio Preamp | " | 104 | - | 1.5 |
| V24 | AVC Clamp | 5704 | - | - | - |
| V25 | 3rd Mixer | 6688 | 165 | 135 | 0.72 |
| V26 | 4th Mixer | 6BE6 | 185 | 135 | 0.72 |
| V27 | 1.7 MC/S Crystal Osc. | 6AK5 | 140 | 80 | 1.45 |

| Type | Count | Alternate | Shield |
|---|---|---|---|
| 6AK5 | 5 | 5654 | 7S |
| 6AL5 | 2 | 5726 | 7S |
| 6AQ5 | 1 | 6005 | 7T |
| 6AS6 | 1 | 5725 | 7S |
| 6BA6 | 8 | 5749 | 7M |
| 6BE6 | 2 | 5750 | 7M |
| 6ES8 | 1 | ECC189 | 9M |
| 6DJ8 | | ECC88/E88CC | 9M |
| ECC88 | | 6DJ8 | 9M |
| E88CC/6922 | | 6DJ8 | 9M |
| E188CC/7308 | | 6DJ8 | 9M |
| 12AT7 | 2 | 6201 | 9M |
| 5704 | 1 | - | - |
| 6688 | 3 | E180F | 9S |
| | 26 | | |

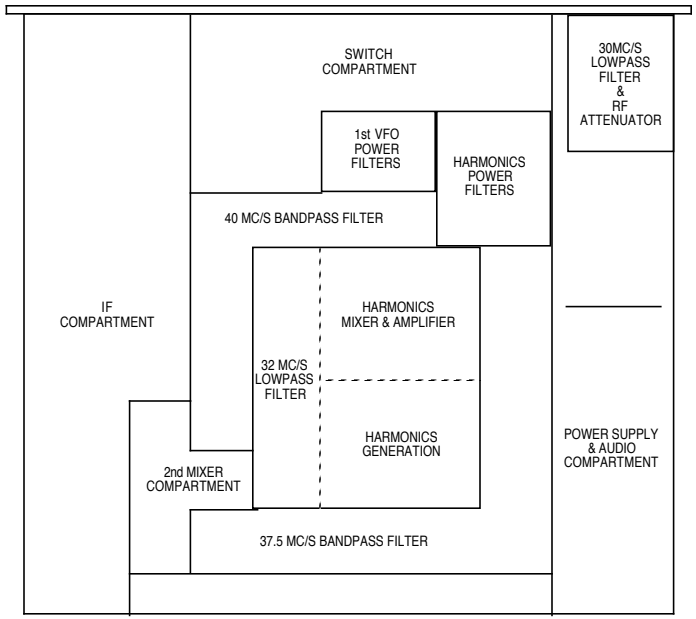
| Shield Count | |
|---|---|
| 7 Short | 8 |
| 7 Med | 10 |
| 7 Tall | 1 |
| 9 Short | 3 |
| 9 Med | 3 |
| | 25 |

## Physical Layout

Top View




Bottom View




**Racal RA-117 Receiver**

Section: Notes, Layout, Tube List



Dwg. Rev.: 2013 Jan 17

### Frequency Mixing Equations

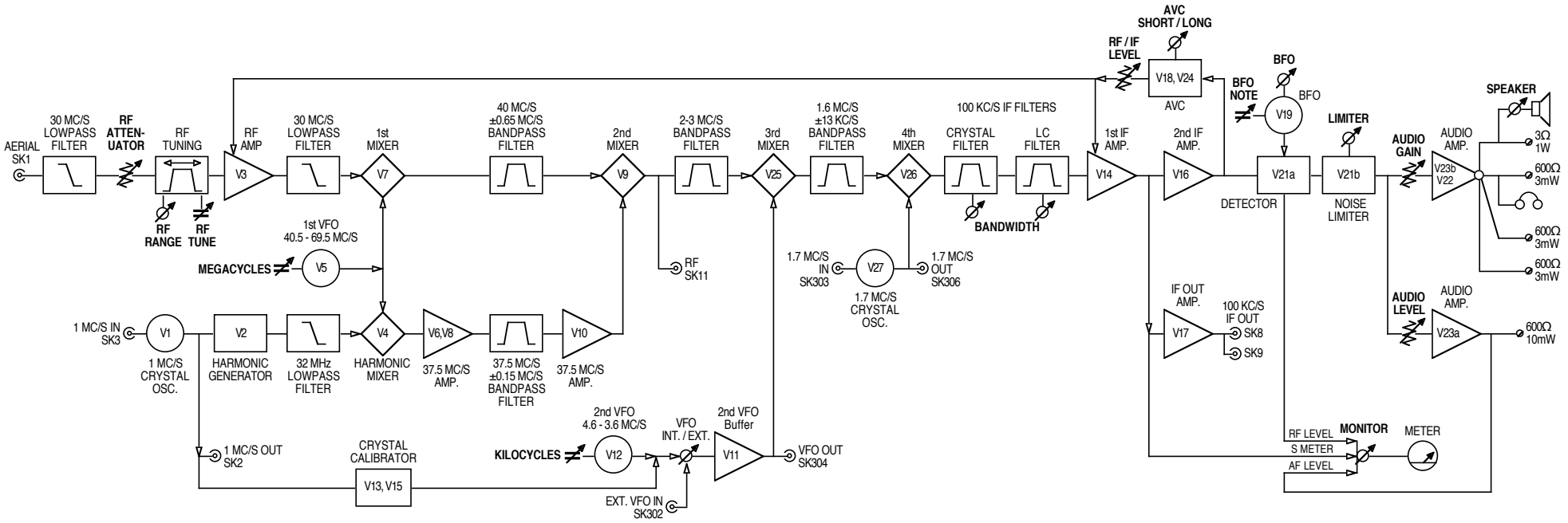
IF2 = (VFO1 – SIG) – (VFO1 – nX)
= nX – SIG
IF3 = VFO2 – IF2
IF4 = 1.7 – IF3

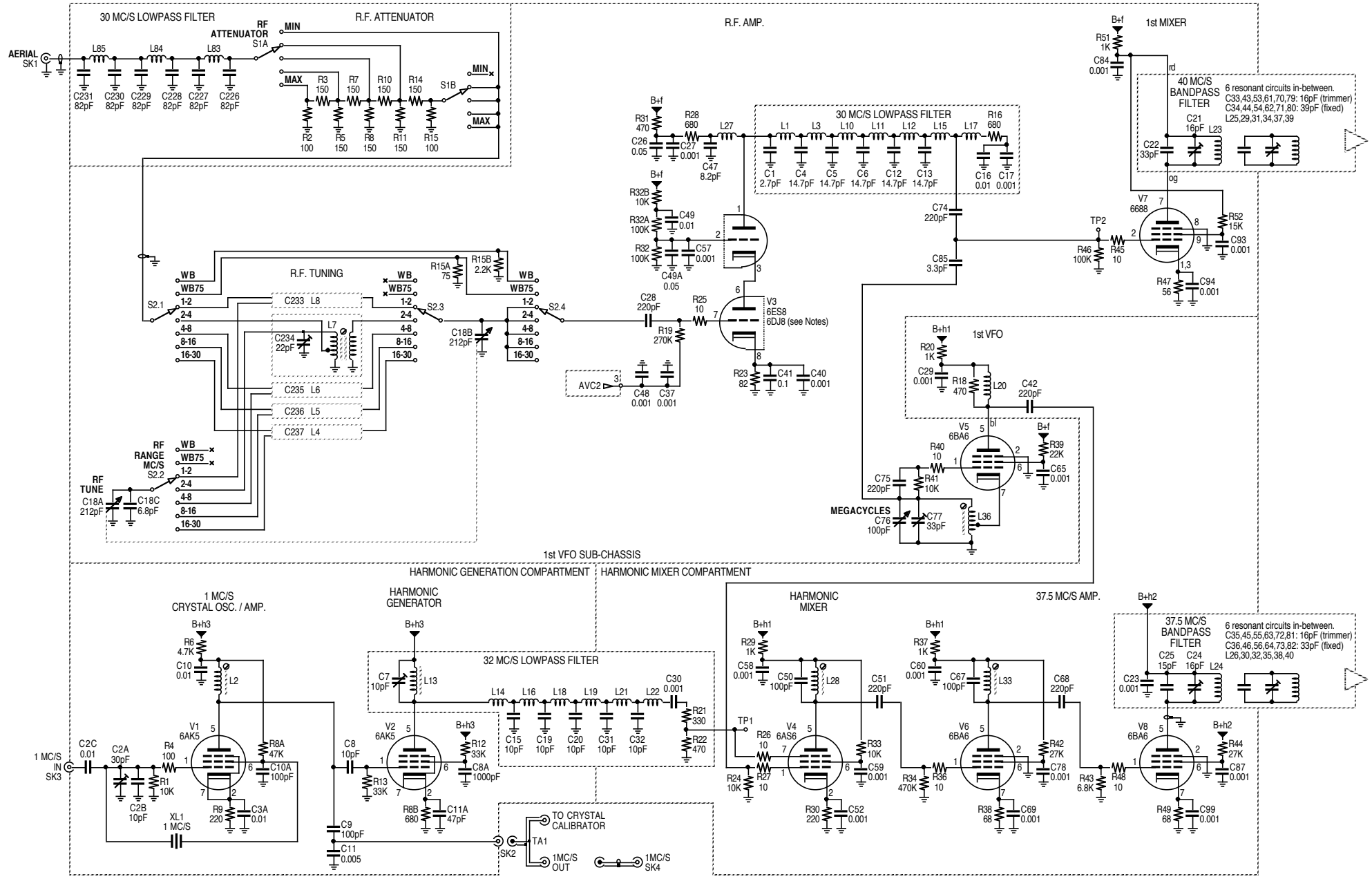
SIG = RF signal frequency
nX = an integral multiple of the 1MC/S Crystal Osc.
VFO1 = 1st VFO frequency
VFO2 = 2nd VFO frequency
IF2 = 2nd IF frequency (output of 2nd Mixer)
IF3 = 3rd IF frequency (output of 3rd Mixer)
IF4 = 4th IF frequency (output of 4th Mixer)

### Tuning Examples

All values in MHz except KHz Dial

| | Equation | 1a | 1b | 1c | 2a | 2b | 3 |
|---|---|---|---|---|---|---|---|
| **MHz Dial** | MD | 5 | 5 | 5 | 4.85 | 5.15 | 0 |
| **KHz Dial** | KD | 0 | 10 | 990 | 0 | 0 | 690 |
| **Signal Tuned** | SIG | 5 | 5.01 | 5.99 | 5 | 5 | 0.69 |
| **1st VFO** | VFO1 = 40.5 + MD | 45.5 | 45.5 | 45.5 | 45.35 | 45.65 | 40.5 |
| **1st IF** | IF1 = VFO1 - SIG | 40.5 | 40.49 | 39.51 | 41.35 | 40.65 | 39.81 |
| **Harmonic Amp** | HA = VFO1 - (INT(MD)+3) | 37.5 | 37.5 | 37.5 | 38.35 | 37.65 | 37.5 |
| **2nd IF** | IF2 = IF1 - HA | 3 | 2.99 | 2.01 | 3 | 3 | 2.31 |
| **2nd VFO** | VFO2 = 4.6 - KD | 4.6 | 4.59 | 3.61 | 4.6 | 4.6 | 3.91 |
| **3rd IF** | IF3 = VFO2 - IF2 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 |
| **4th IF** | IF4 = 1.7 - IF3 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

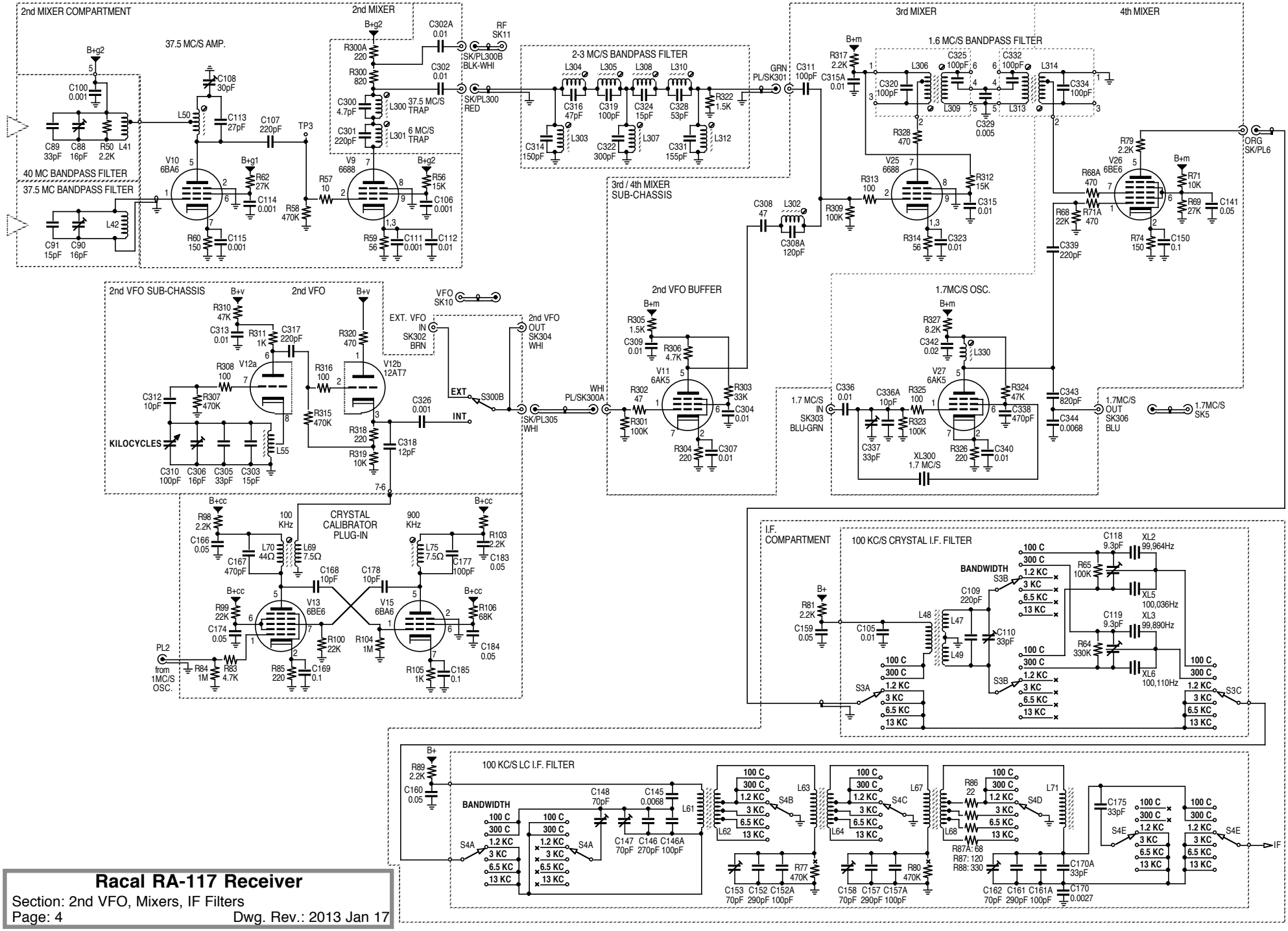





**Racal RA-117 Receiver**

Section: RF Input , 1st VFO, Harmonics Generation

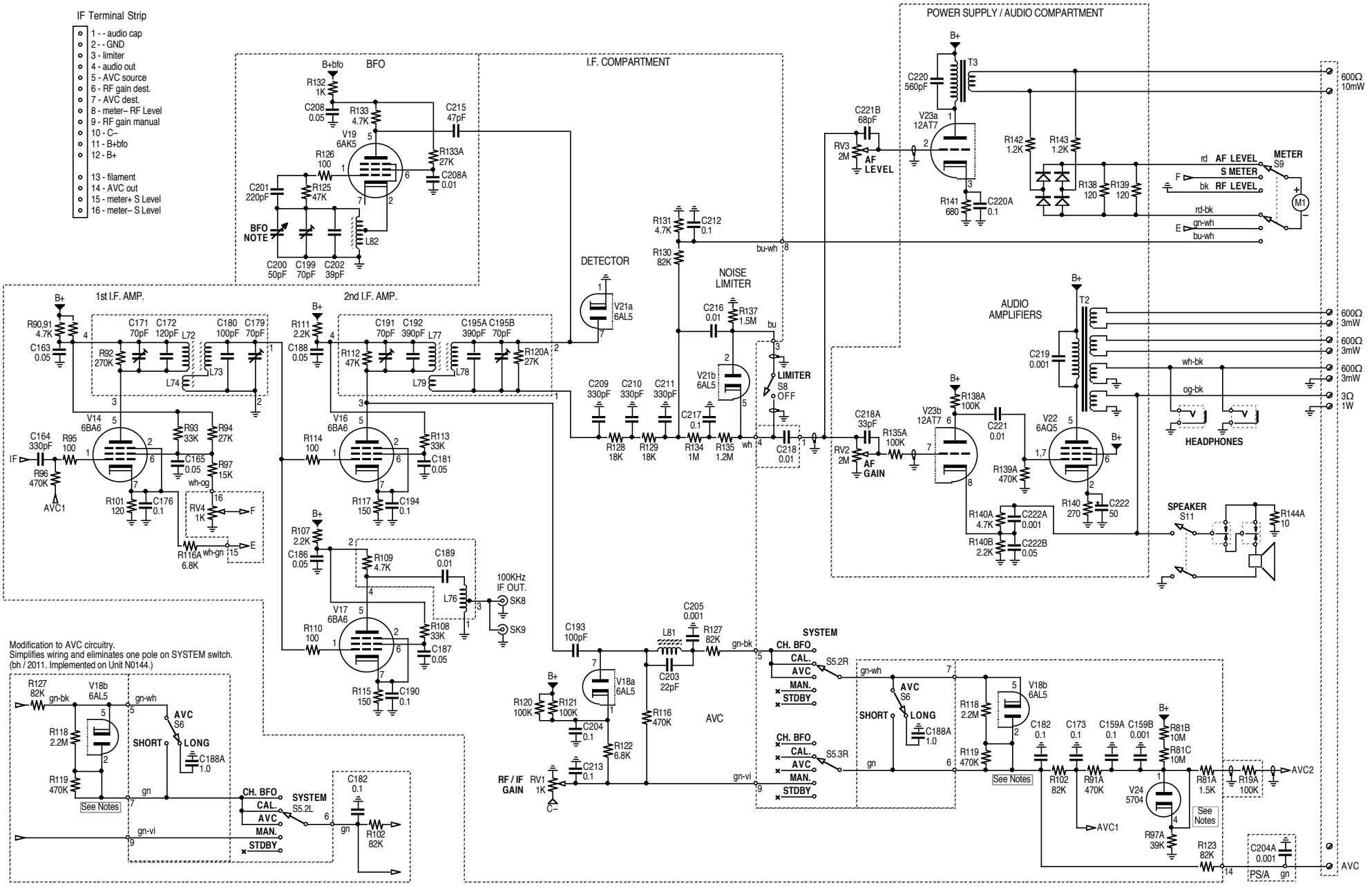
Page: 3 Dwg. Rev.: 2013 Jan 17




**Racal RA-117 Receiver**

Section: 2nd VFO, Mixers, IF Filters

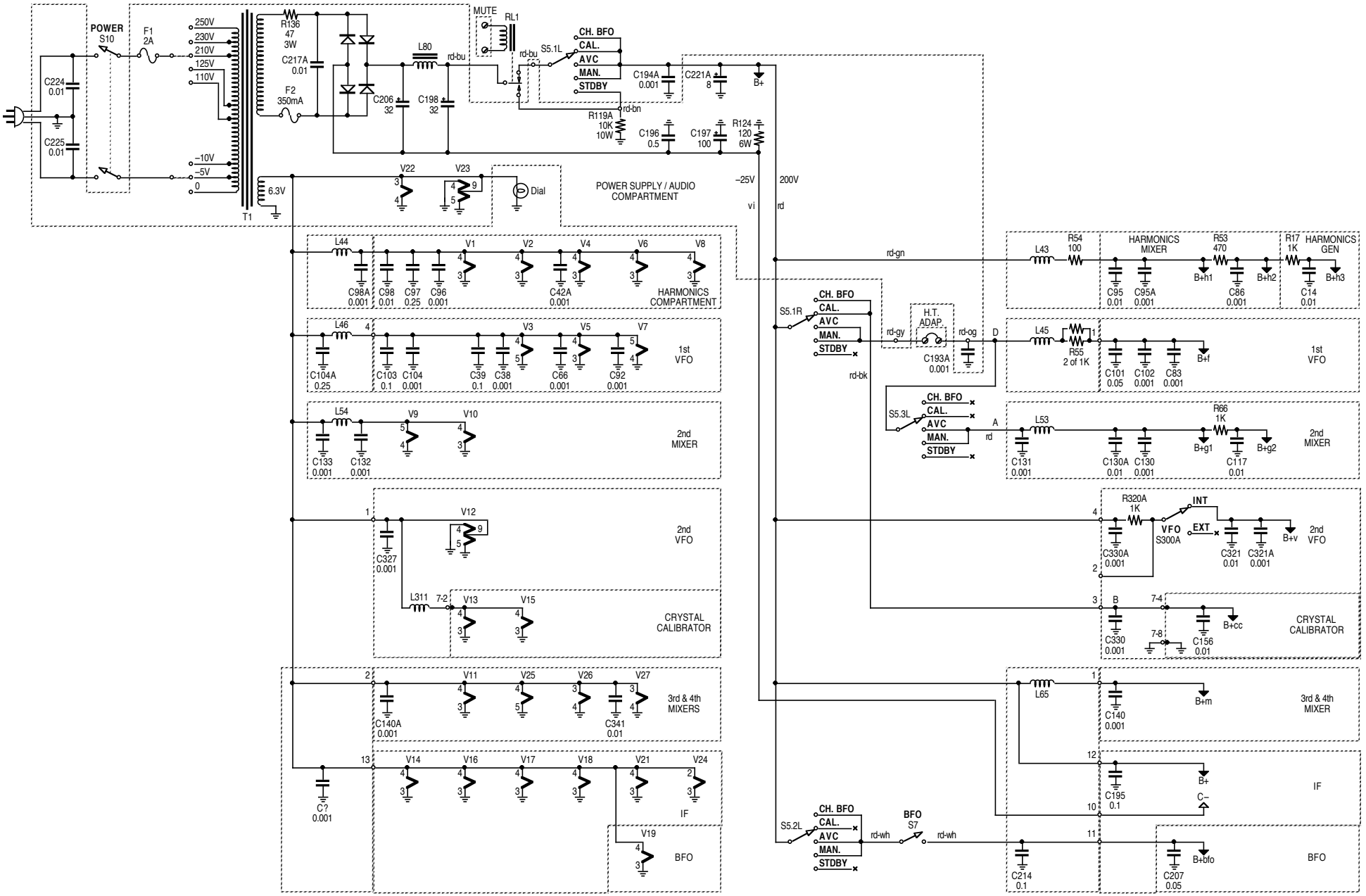
Page: 4 Dwg. Rev.: 2013 Jan 17




**Racal RA-117 Receiver**

Section: IF Amp, Detector, Audio, AVC

Page: 5 Dwg. Rev.: 2013 Jan 17




**Racal RA-117 Receiver**

Section: Power Supply

Page: 6 Dwg. Rev.: 2013 Jan 17

**Paper Capacitors**

| C | Voltage | Qty | >=350V |
|---|---|---|---|
| 0.005µF | 250V | 1 | |
| 0.005µF | 400V | 1 | 2 |
| 0.01µF | 250V | 3 | |
| 0.01µF | 400V | 1 | |
| 0.01µF | 500V | 27 | 31 |
| 0.02µF | 250V | 1 | 1 |
| 0.05µF | 350V | 19 | 19 |
| 0.1µF | 150V | 18 | |
| 0.1µF | 350V | 1 | 19 |
| 0.25µF | 150V | 2 | 2 |
| 0.5µF | 150V | 1 | 1 |
| 1µF | 150V | 1 | 1 |

**Electrolytic Capacitors**

| C | Voltage | Qty |
|---|---|---|
| 8µF | 350V | 1 |
| 32µF | 350V | 2 |
| 50µF | 12V | 1 |
| 100µF | 50V | 1 |

**Mica Capacitors**

| C | Voltage | Qty |
|---|---|---|
| ? | | |
| ? | | |

**Ceramic Capacitors**

| C | Voltage | Qty |
|---|---|---|
| ? | | |
| ? | | |

**Resistors**

| R | P | Qty |
|---|---|---|
| 10 | 1/4 | 9 |
| 22 | 1/4 | 1 |
| 47 | 1/4 | 1 |
| 56 | 1/4 | 3 |
| 68 | 1/4 | 3 |
| 75 | 1/4 | 1 |
| 82 | 1/4 | 1 |
| | | |
| 100 | 1/4 | 11 |
| 100 | 1/2 | 1 |
| 120 | 1/4 | 4 |
| 150 | 1/4 | 11 |
| 220 | 1/4 | 6 |
| 220 | 1/2 | 1 |
| 270 | 1/2 | 1 |
| 330 | 1/4 | 2 |
| 470 | 1/4 | 7 |
| 470 | 1/2 | 1 |
| 680 | 1/4 | 4 |
| 820 | 1/2 | 1 |
| | | |
| 1K | 1/4 | 8 |
| 1K | 1/2 | 4 |
| 1.2K | 1/4 | 2 |
| 1.5K | 1/4 | 3 |
| 2.2K | 1/4 | 7 |
| 2.2K | 1/2 | 4 |
| 4.7K | 1/4 | 5 |
| 4.7K | 1/2 | 4 |
| 6.8K | 1/4 | 3 |
| 8.2K | 1/4 | 1 |
| | | 110 |

**Resistors**

| R | P | Qty |
|---|---|---|
| 10K | 1/4 | 6 |
| 15K | 1/4 | 3 |
| 15K | 1/2 | 1 |
| 18K | 1/4 | 2 |
| 22K | 1/4 | 4 |
| 27K | 1/4 | 3 |
| 27K | 1/2 | 4 |
| 33K | 1/4 | 2 |
| 33K | 1/2 | 4 |
| 39K | 1/4 | 1 |
| 47K | 1/4 | 5 |
| 68K | 1/2 | 1 |
| 82K | 1/4 | 3 |
| 82K | 1/2 | 1 |
| | | |
| 100K | 1/4 | 9 |
| 100K | 1/2 | 3 |
| 270K | 1/4 | 2 |
| 330K | 1/4 | 1 |
| 470K | 1/4 | 10 |
| | | |
| 1M | 1/4 | 3 |
| 1.2M | 1/4 | 1 |
| 1.5M | 1/4 | 1 |
| 2.2M | 1/4 | 1 |
| 10M | 1/4 | 2 |
| | | 73 |

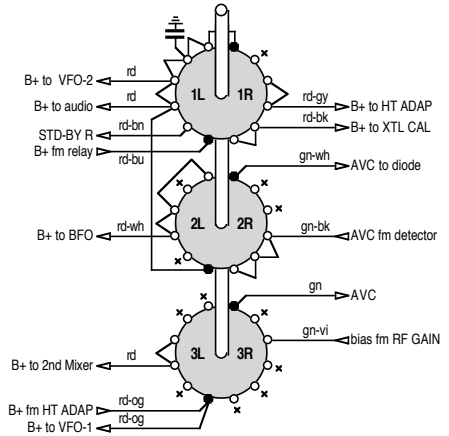
**Power Resistors**

| R | P | Qty |
|---|---|---|
| 47 | 3 WW | 1 |
| 120 | 6 WW | 1 |
| 10K | 3 WW | 1 |
| 10K | 10 WW | 1 |

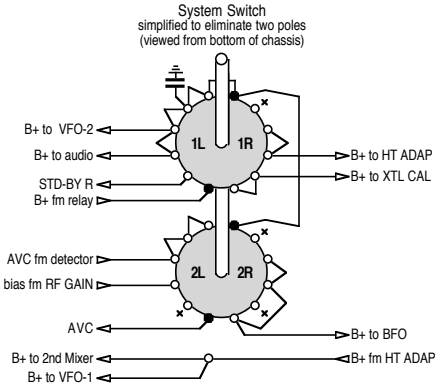
**Notes:**

10K@3W is in 3/4 mixer subchassis

System Switch
(viewed from bottom of chassis)




System Switch
simplified to eliminate two poles
(viewed from bottom of chassis)




System Switch
Unit N0714
(viewed from bottom of chassis)