Service Instruction FT790RII

Compiled and illustrated by DL1RQ

A. PLL Unit, Part I

1) Reference Oscillator

Connect the frequency counter to pin 16 of Q420 and adjust TC402 for 10,245 MHz ± 10Hz. Remove the counter.

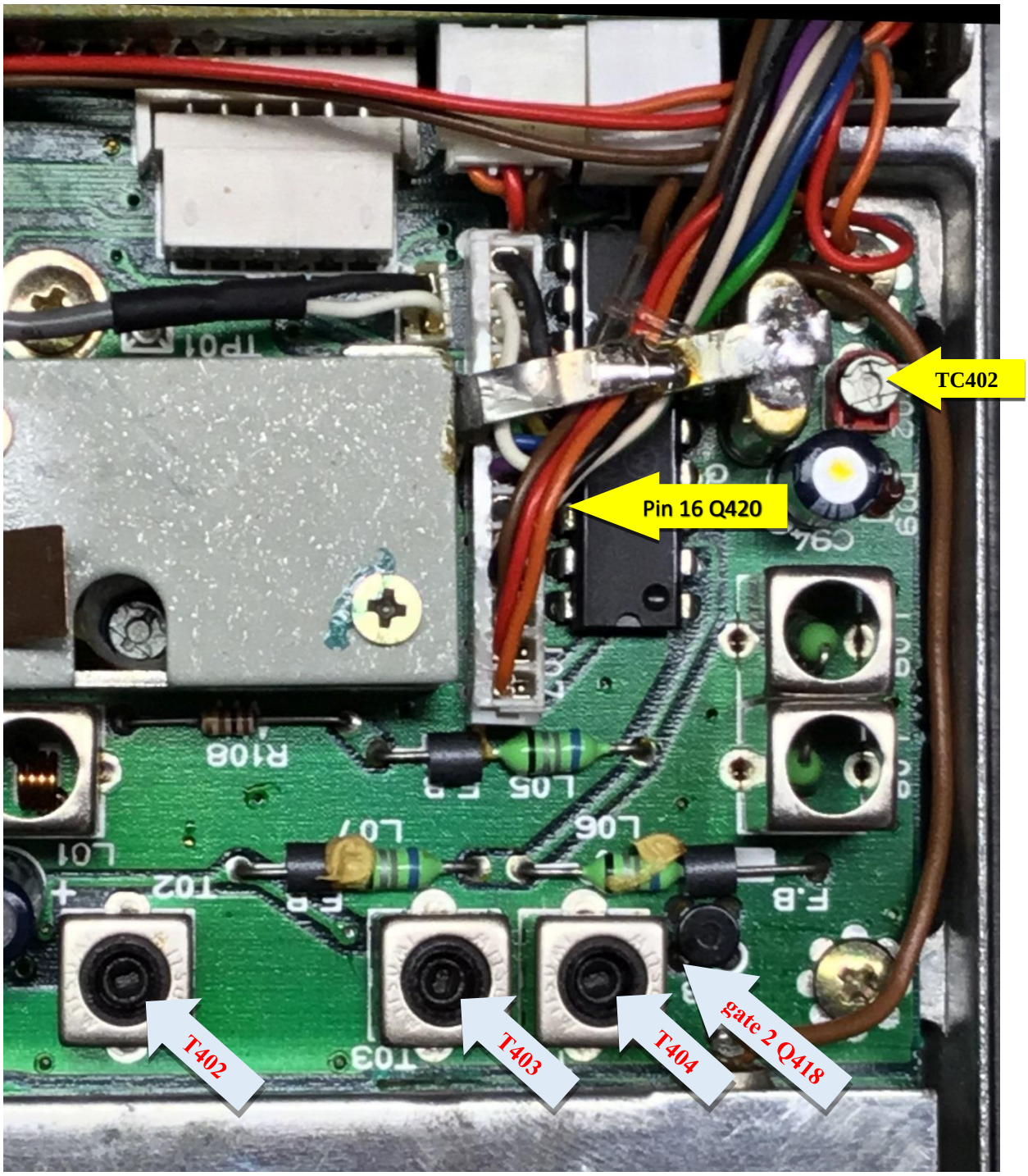

Fig. 1 (PLL/PA Board)

2) Loop Resonant Circuits

Connect the RF voltmeter (Oscilloscop, Spectrum-Analyzer) to the **gate 2 of Q418**. Adjust **T402**, **T403** and **T404** for maximum RF voltage. Remove the Voltmeter.

NOTE: **All of the remaining steps in this section (A) require that plug P3001 be removed from PJ401 (1st Local Out) and a 50 Ohm resistor (dummy load) be connected across PJ401. P3001 will be replaced in step A. 4) d).**

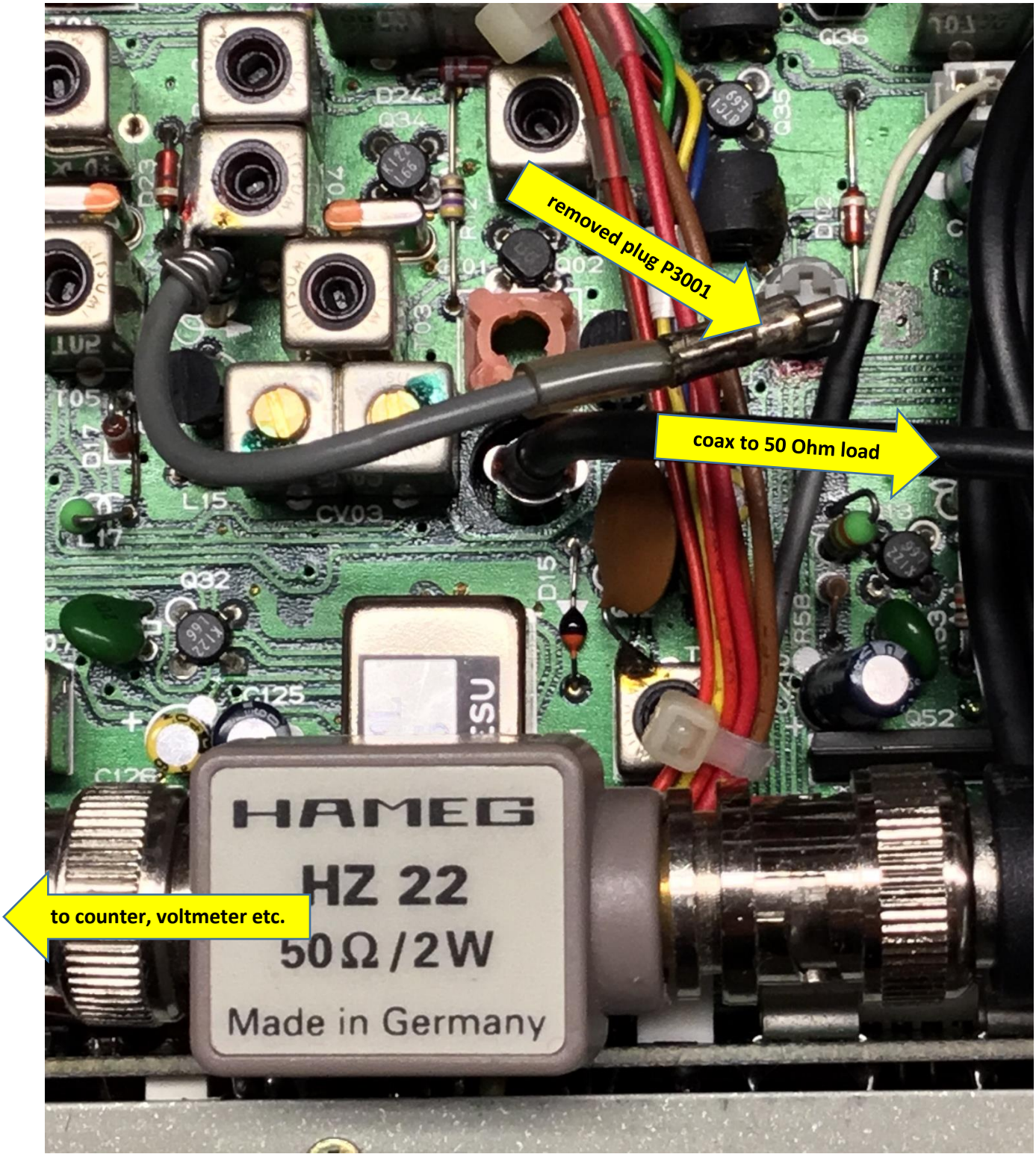

Fig. 2 (Main Board)

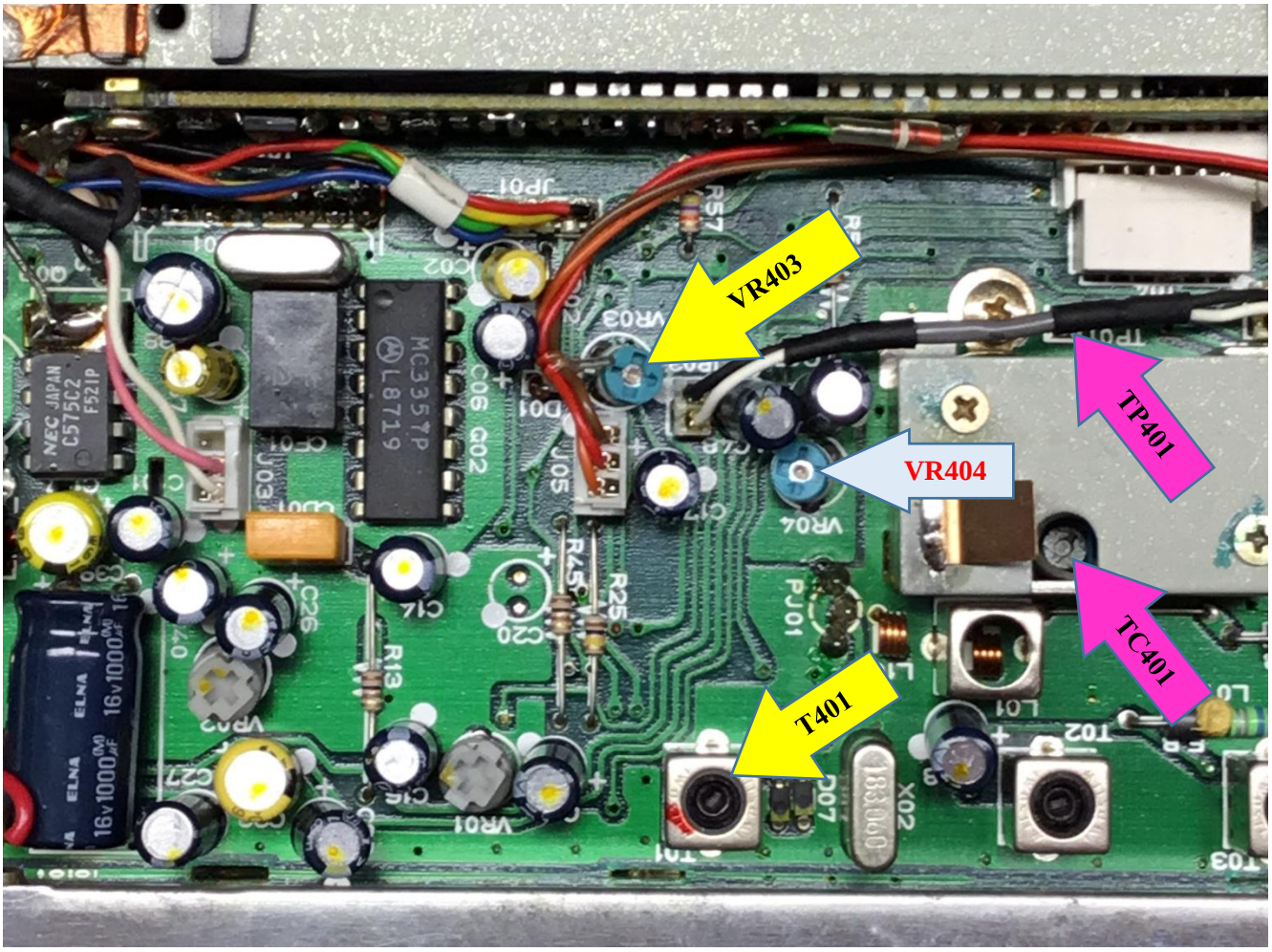

Fig. 3 (PLL/PA Board)

3) First Oscillator, D-to-A Converter

a) Connect the frequency counter across PJ401 with the 50 Ohm resistor and adjust VR403 for the same frequency in both transmit and receive (±25Hz).

b) Adjust T401 for counter indication 380,500 000 MHz within ±10Hz.

c) Set the front panel controls to USB, 434,998 500 MHz.

d) Slowly adjust the tuning knob until the display just steps down to 434,998 400 MHz.

e) Adjust **VR404** for the frequency 380,498 400 MHz ± 25Hz on the counter.

f) Remove the frequency counter.

4) PLL VCV (Varactor Control Voltage)

a) Select the FM mode and tune to the high band edge 440 MHz.

b) Connect the DC voltmeter to **TP401** and adjust **TC401** for 2,8V.

c) Tune the transceiver to the low band edge 430 MHz and confirm 1,25 ± 0,2 V.

d) Remove the voltmeter from TP401 and 50 Ohm dummy load from PJ401 and replace P3001 in PJ401.

B. Main Unit, Receiver

Note: **Remove plug P4701 in the PA unit from PJ3003 (RF Out) on the Main Unit for all of the steps in this section (B). (Ref. Fig. 4)**

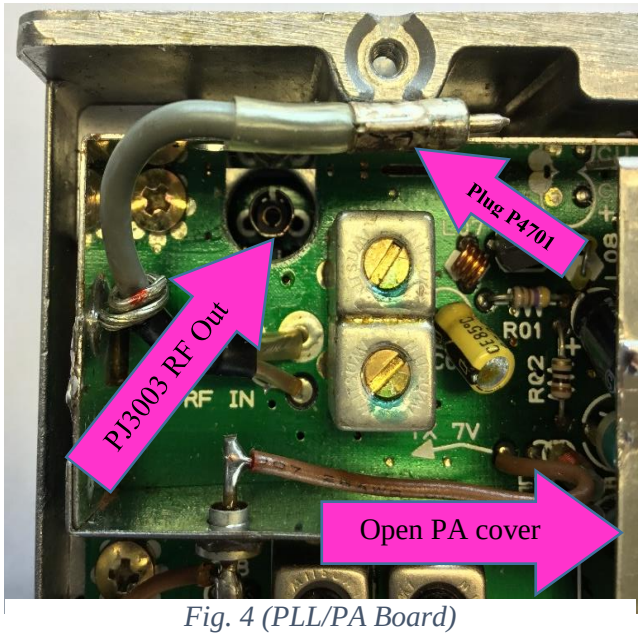

Fig. 4 (PLL/PA Board)

1) CW/FM Carrier Oscillator

a) Touch the frequency counter probe to gate 1 of Q3033 for the following adjustments.

b) Set the mode to CW, short the KEY jack to transmit, and adjust TC3004 for 13,988 500 MHz ± 10Hz.

c) Now select the FM mode, close the PTT line and adjust **T3013** for 13,988 380 MHz ± 10Hz.

d) Remove the counter.

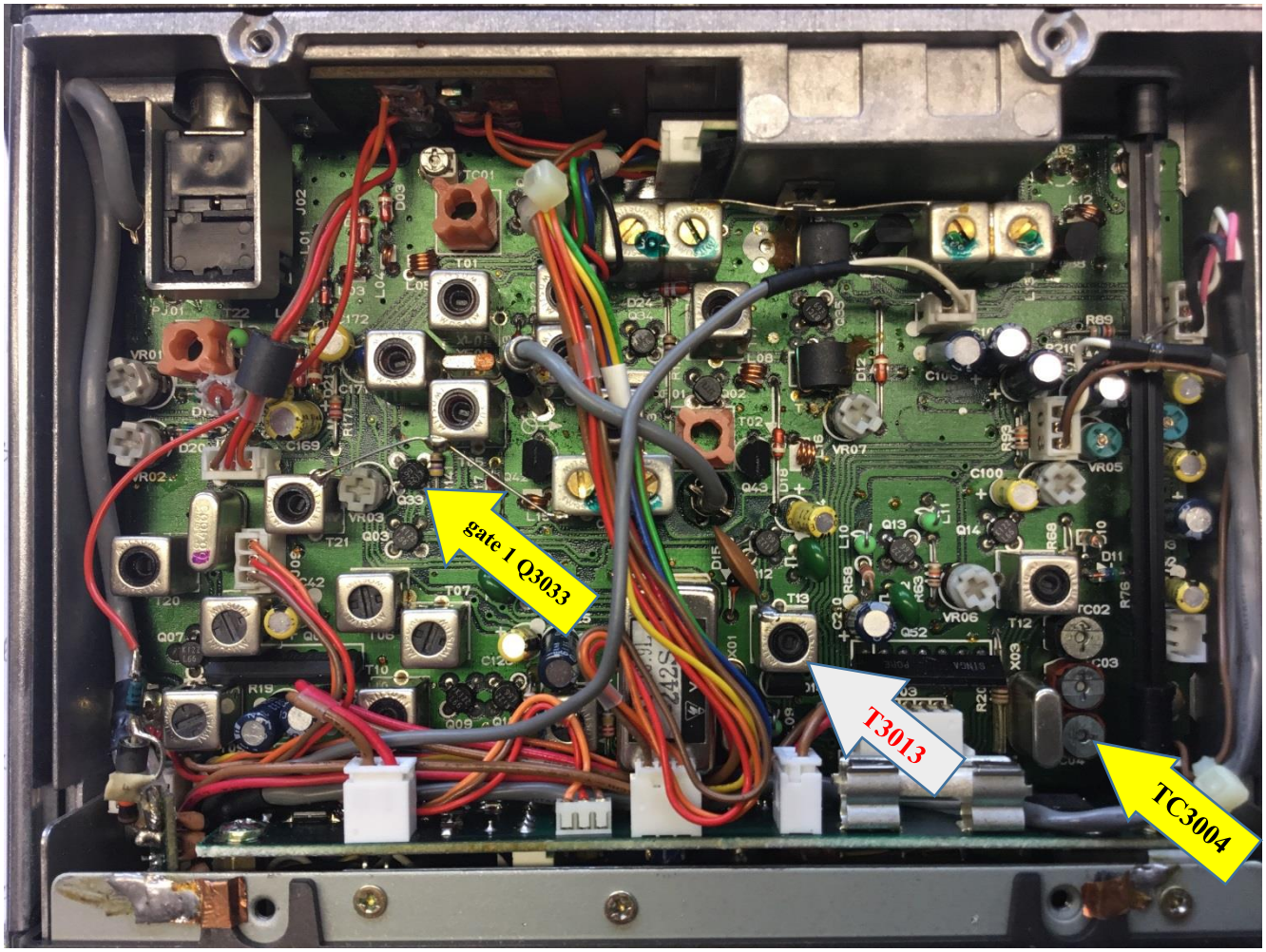

Fig. 5 (Main Board)

2) Second Oscillator

a) Touch the RF voltmeter to gate 2 of Q3003 for the following adjustment.

b) Adjust T3021 for maximum RF voltage. Remove the RF voltmeter.

c) Touch the frequency counter probe to gate 2 of Q3003 for the following adjustment.

d) Adjust T3020 for 68,488 500 MHz ± 10 Hz on the counter. Remove the counter.

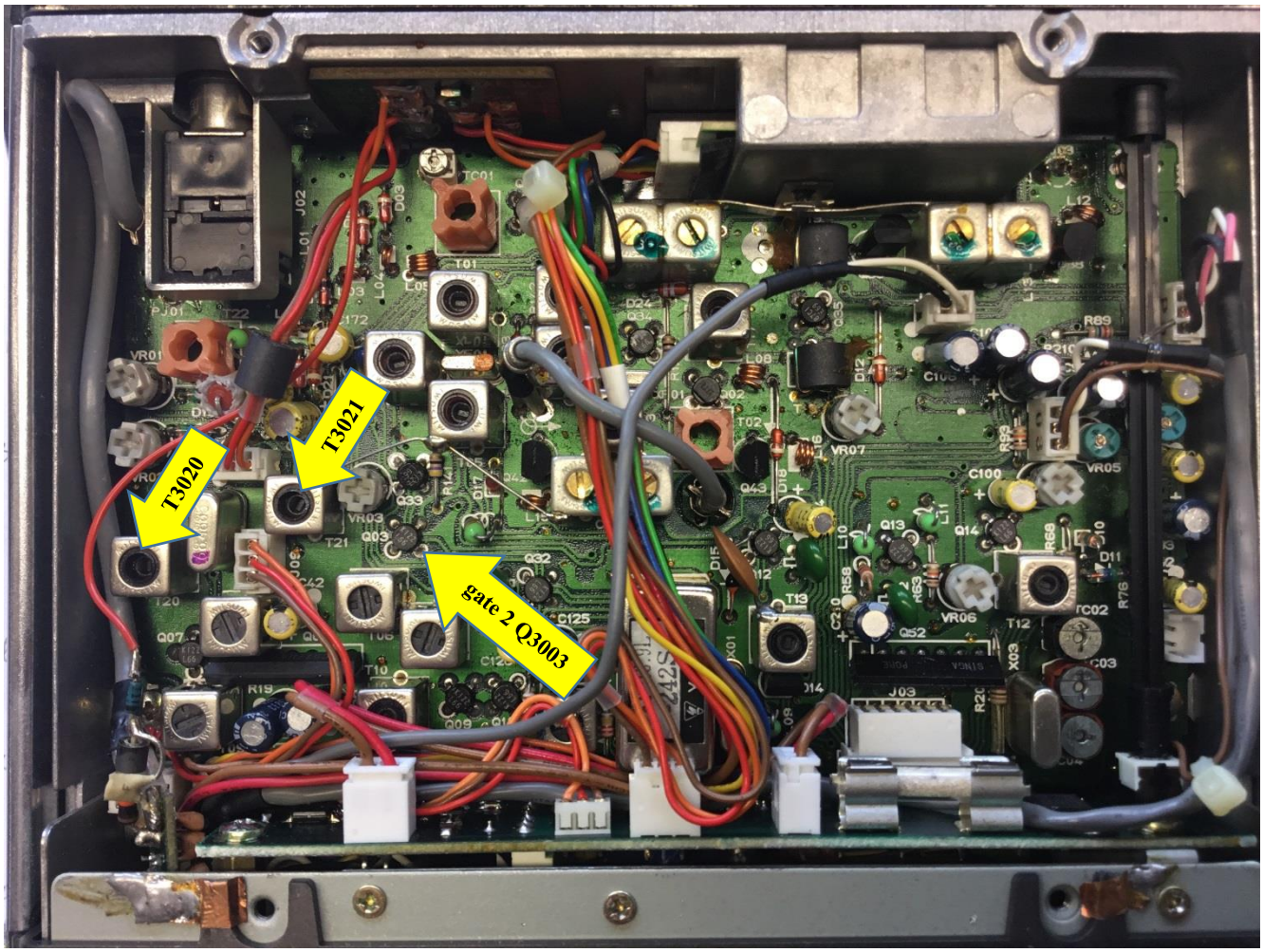

Fig.6 (Main Board)

3) RF and IF Transformers

a) Connect the RF signal generator, tuned to 435 MHz, to the ANT jack.

b) Set the transceiver to USB, and tune for peak on the signal. Then reduce the injection level just below the S-meter (AGC) threshold.

c) Connect the AF voltmeter to the EXT SP jack and adjust TC3001, CV3001 and CV3003 for maximum AF (adjust the VOL control as necessary to keep meter readings near mid-range).

d) Now set the injection level to -10dBµV and adjust **T3003**, **T3004**, **T3005**, **T3006**, **T3007**, **T3010**, **T3011** and **T3012** for maximum AF. Then remove the voltmeter.

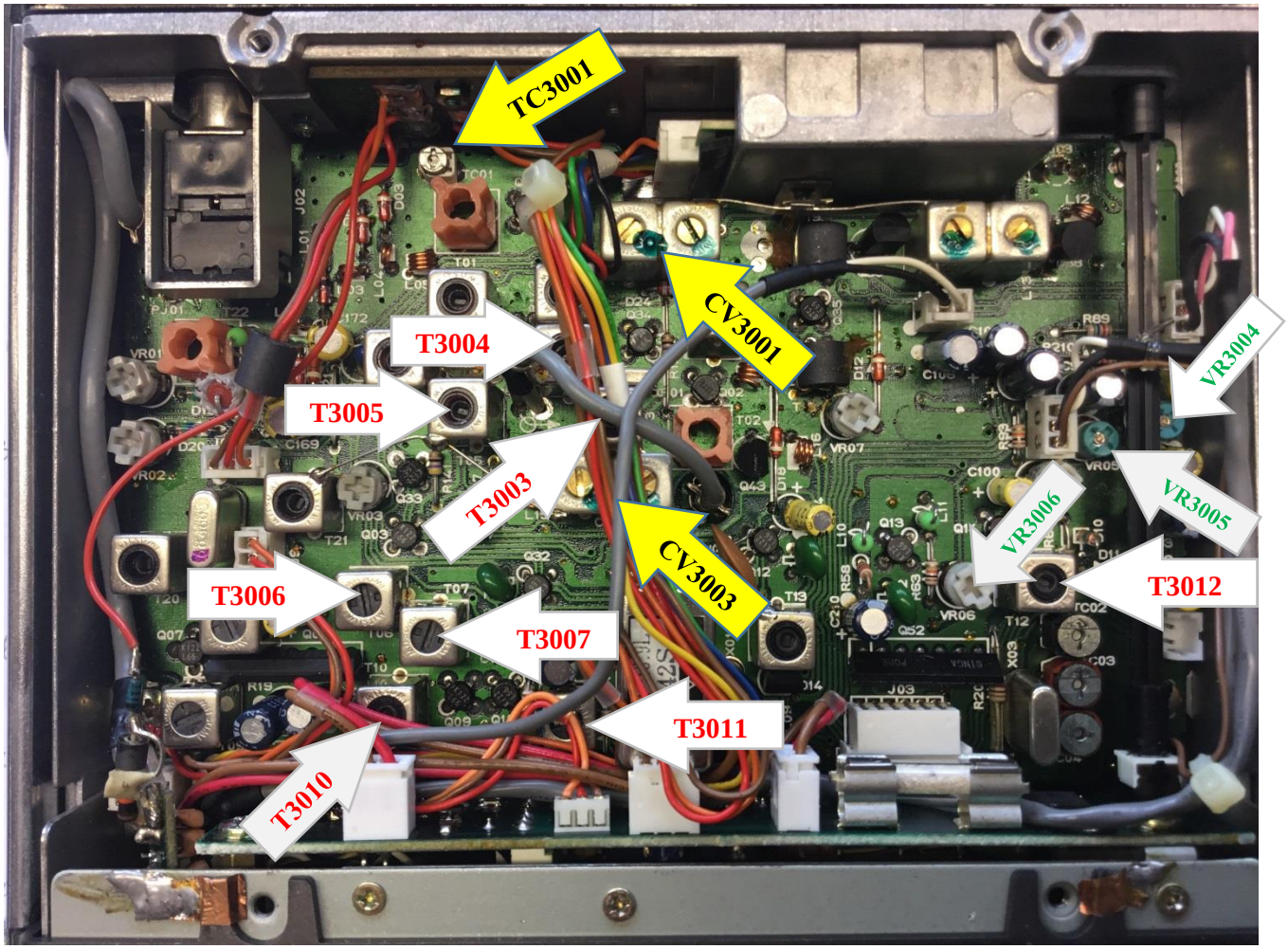

Fig. 7 (Main Board)

4) S-Meter Calibration

a) In USB mode, with -10dBµV injection, adjust **VR3004** for S-5 indication on the S-meter.

b) Adjust **VR3006** just to the point, where the S-meter reading begins to rise above S-5.

c) Increase injection to -4dBµV and readjust **VR3004** for S-1 deflection.

d) Increase injection to +16dBµV and adjust **VR3005** for S-9 deflection.

5) Noise Blanker Transformers

a) With +16dBµV injection at the ANT jack, connect the DC voltmeter to the exposed end of R3019 on the component side of the Main Unit.

b) Turn on the noise blanker and adjust T3008 and T3009 for minimum voltage.

c) Remove the voltmeter, and replace P4701 in PJ3003. (Ref. Fig. 4)

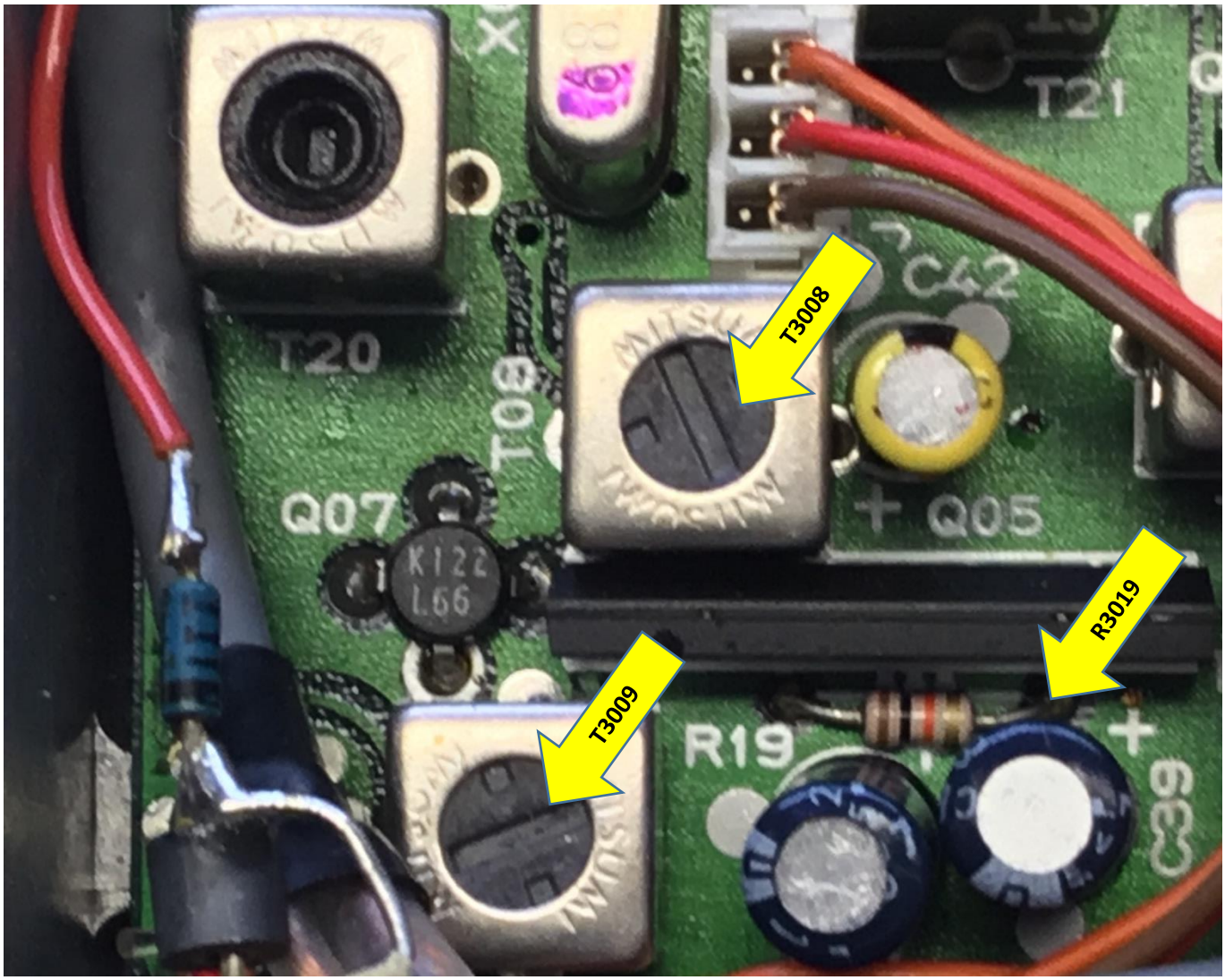

Fig. 8 (Main Board)

C. PLL Unit, Part II

The RF signal generator must be connected to the ANT jack for all steps.

1) D-to-A Converter Linearity

a) Tune the signal generator to 435 MHz and set for 0dBµV injection.

b) Set the front panel controls to USB, 25Hz steps, 434,9985 MHz.

c) Slowly adjust the tuning knob back and forth arround 434,9985 MHz and 434,9984 MHz while listening to the beat of the injected carrier.

d) Adjust VR404, if necessary, for smooth transition between the 25 Hz tuning steps.

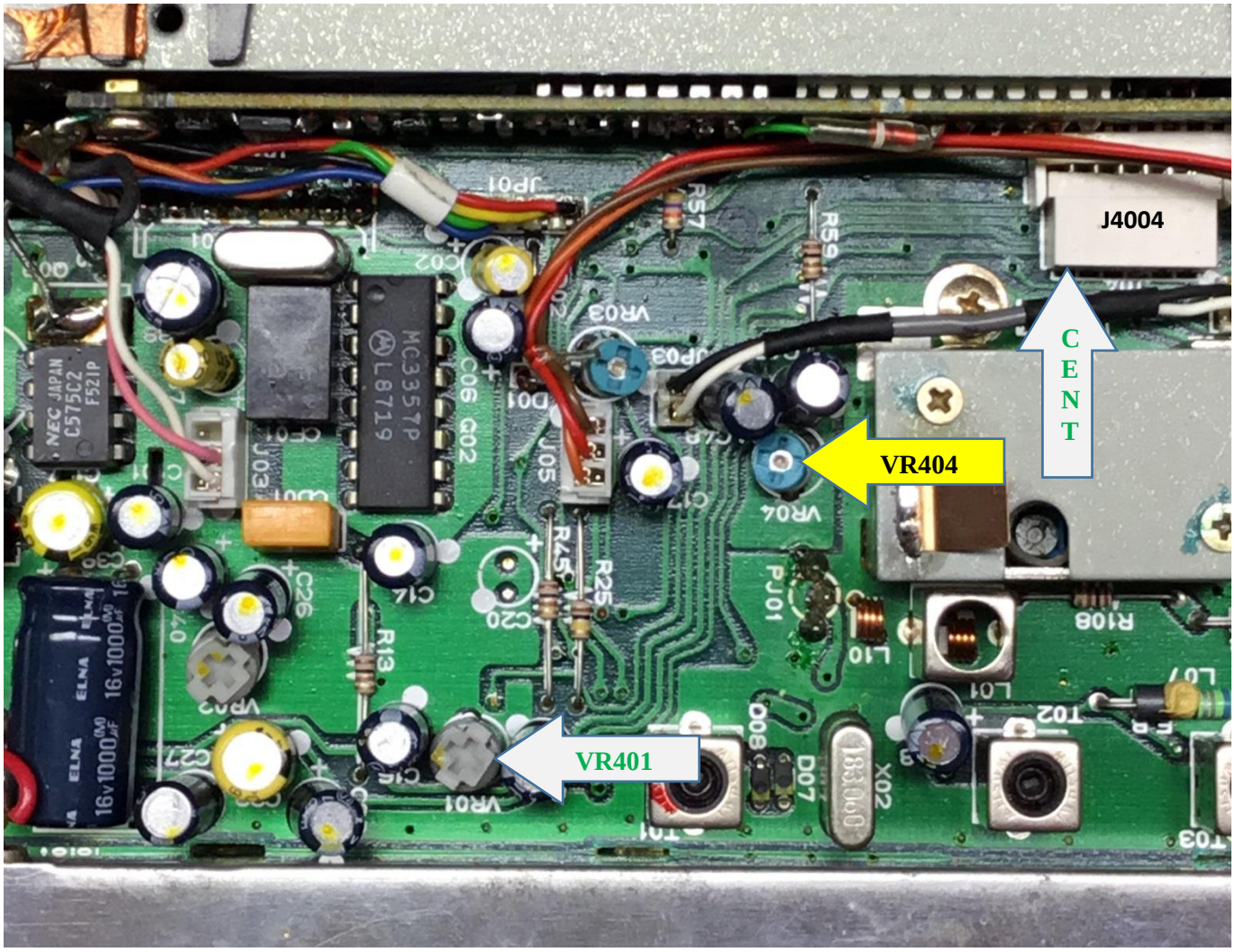

Fig. 9 (PLL/PA Board)

2) FM Discriminator Center Detection

a) Select the FM mode and tune the transceiver to 435,000 MHz.

b) Connect the DC voltmeter (10V range) to the **CENT** pin of J4004.

c) Tune the signal generator to 435,001 500 MHz.

d) Turn **VR401** fully clockwise and then counterclockwise just over the threshold where voltage on the meter drops to zero.

e) Referring to Figure 9, raise the signal generator frequency gradually to confirm that the voltage rises to 5V within 1,5 to 4,0 kHz above the display frequency.

f) Disconnect all test equipment.

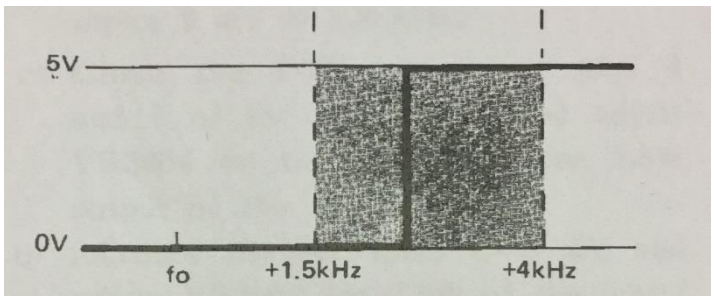

Fig. 10 Discriminator Center Detection

D. Main Unit, Transmitter

Note: Remove plug P4701 from PJ3003 (RF Out) on the Main Unit for all of the steps in this section (D). (ref. Fig. 4)

1) Tx IF Transformers

a) Set the transceiver to USB mode and tune to 435 MHz.

b) Connect a 50 Ohm resistor across PJ3003 and connect the RF voltmeter (Power-Meter, Spectrum-Analyzer) across the resistor.

c) Connect the AF generator to pin 8 (center pin) of the MIC jack and inject 1 mV@1,5 kHz.

d) Close the PTT line (short pins 6 and 7 of the MIC jack) and adjust T3014, T3015, T3016, T3017 and CV3002 for maximum deflection on the RF voltmeter.

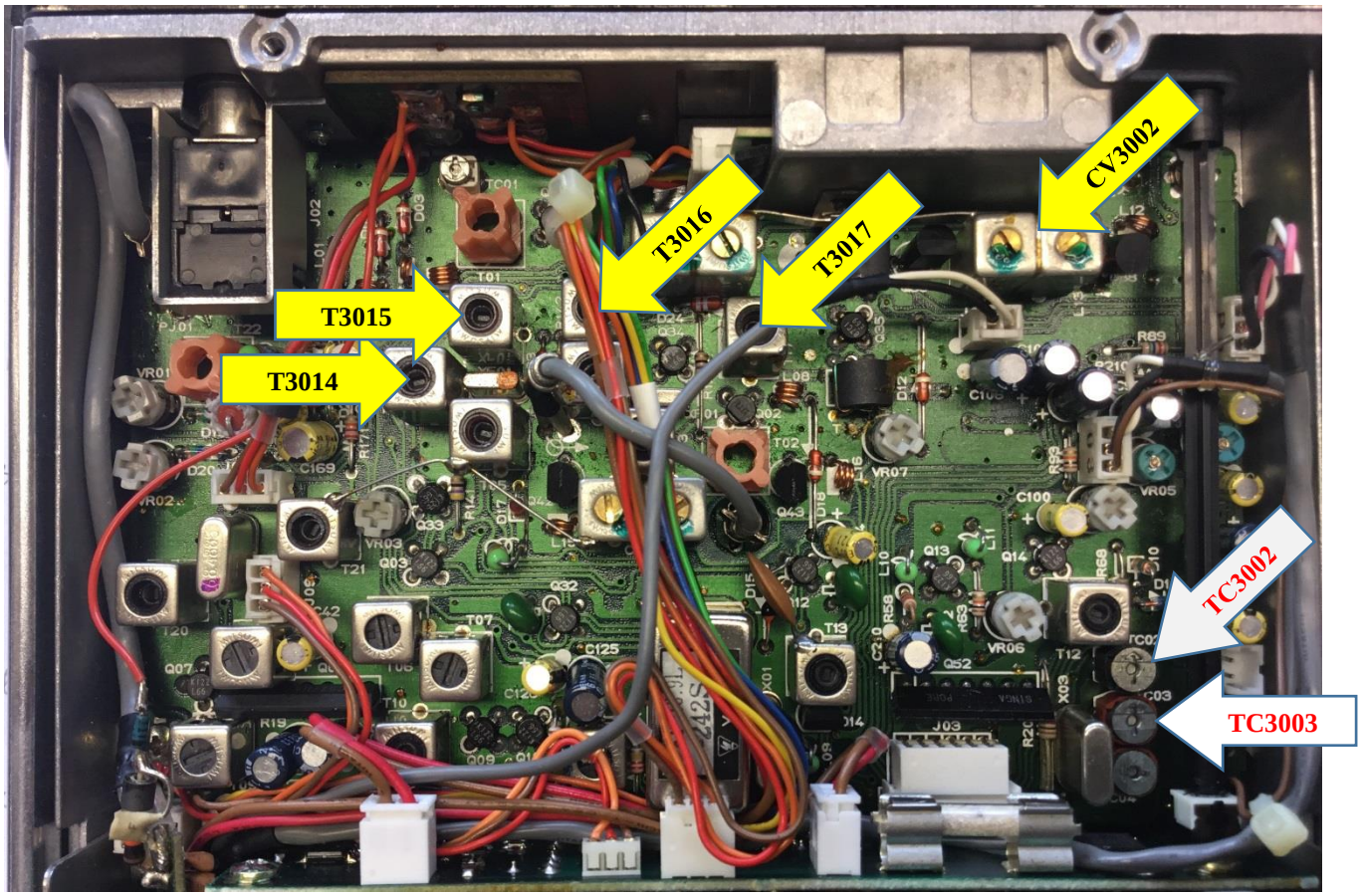

Fig. 11 (Main Board)

2) SSB Carrier Frequency

Perform these steps only after aligning the last step (1)Tx IF Transformers). Setup is the same.

a) Retune the AF generator to 300 Hz and note the deflection on the voltmeter.

b) Now retune the AF generator to 2700 Hz and compare the voltmeter deflection with that at 300 Hz. If the voltage is different, adjust **TC3003** while switching the AF generator between 300 Hz and 2700 Hz.

c) Select the LSB mode and repeat a) and b), adjusting **TC3002** if necessary.

d) Remove the test equipment, but do not replace P4701 in PJ3003 if you will be proceeding to the next section.

E. PA Unit

Note: Plug P4701 must be disconnected from PJ3003 during this procedure. (Ref. Fig. 4)

a) Connect the dummy load to the ANT jack.

b) Temporarily remove the jumper between the terminal posts TP3 and TP4 and connect a milliammeter across these posts.

c) Close the PTT line and adjust VR4702 for 150 mA ± 10 mA on the milliammeter.

d) Remove the meter and replace the jumper between the posts TP3 and TP4.

e) Temporarily remove the jumper between the terminal posts **TP1** and **TP2** and connect a milliammeter across these posts.

f) Close the PTT line and adjust **VR4701** for 20 mA ± 2 mA on the milliammeter.

g) Remove the meter and replace the jumper between the posts TP1 and TP2.

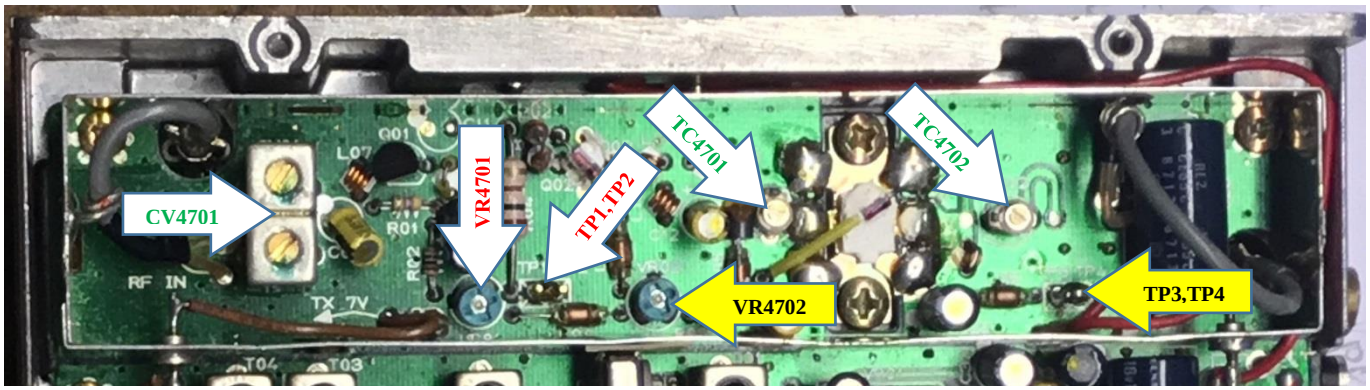

Fig. 12 (PA Board)

2) Interstage Matching Trimmers

a) Connect plug P4701 (if removed earlier) to PJ3003. (Ref. Fig. 4)

b) Connect the wattmeter and dummy load to the ANT jack.

c) Select the FM mode and set the transceiver to 435 MHz.

d) Close the PTT line and adjust filter **CV4701** and trimmers **TC4701** and **TC4702** for maximum RF output.

F. Miscellaneous Transmitter Adjustments

1) ALC and PO Meter Calibration

a) With the wattmeter and dummy load connected to the ANT jack and the transceiver set to 435 MHz, select the USB mode.

b) Connect the AF generator to pin 8 (center pin) of the MIC jack and inject 2 mV @ 1,5 kHz.

c) Close the PTT line (short pin 6 and 7 of the MIC jack) and adjust VR3008 on the Main Unit for 2,8 W output on the Wattmeter.

d) Increase the AF level to 6 mV and adjust VR3002 for 2,8 W on the wattmeter.

e) Adjust VR3001 so that the meter on the transceiver deflects to the center of the green zone.

f) Select F-LOW power and adjust VR3003 to 0,3 W on the wattmeter. Select full power and repeat step d).

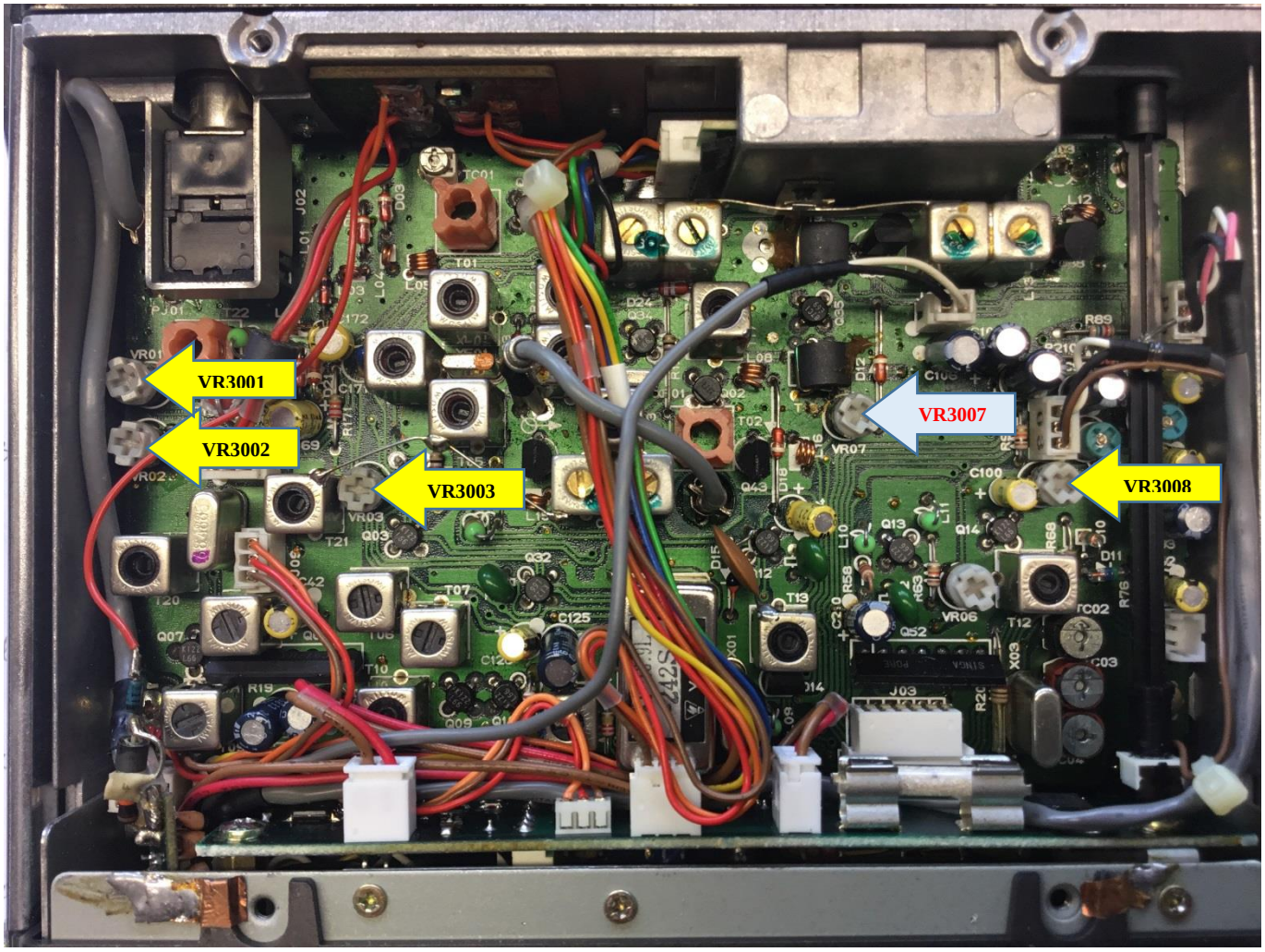

Fig. 13 (Main Board)

2) FM IDC (Deviation Control)

a) Connect the linear detector / deviation meter with the dummy load to the ANT jack. Select the FM mode.

b) Set the AF generator (step b) above) for 30 mV @ 1 kHz.

c) Close the PTT line and adjust **VR3007** for ± 4,5 kHz (±100 Hz) deviation.

d) Remove all test equipment.

G. Frequency Fine Adjustments

a) With the counter and dummy load connected to the ANT jack set the transceiver to 435,000 MHz and F-LOW power.

b) Connect the AF generator to pin 8 (center pin) of the MIC jack and inject 2 mV @ 1,0 kHz.

c) Set the mode to USB, close the PTT line (short pin 6 and 7 of the MIC jack) and adjust T401 on the PLL/PA Unit for exactly 435,001 000 MHz ± 50 Hz on the counter. (Ref. Fig.3)

d) Set the mode to LSB, close the PTT line (short pin 6 and 7 of the MIC jack) and confirm that the frequency is 434,999 000 MHz ± 50 Hz on the counter.

e) Set the mode to FM, close the PTT line (short pin 6 and 7 of the MIC jack) and adjust T3013 on the Main Unit for exactly 435,000 000 MHz ± 100 Hz. (Ref. Fig.5)