5. MAINTENANCE

5.1 RF Circuitry main Test Points and Alignment Locations.

The RF circuitry contains many test points in order to facilitate troubleshooting and repair of circuitry when needed. The following Voltage Chart gives the main test points and the expected limits of levels. Also the conditions under which the measurements should take place are listed.

Voltage Chart for Main Test Points – RF Circuitry

Test Point	Mode/Remarks	Level
TP33	Tx and Rx depending on VCO setting*	3V - 7VDC
TP29	Tx	1,8V – 2,6VDC
TP28	Rx	1,8V – 2,6VDC
TP25	Tx	1,2V – 1,7V DC
TP22	Tx	+6dBm - +10dBm
TP20	Tx	4,5V – 5,1VDC
TP21	Rx	+2dBm - +5dBm
TP30	Tx and Rx	150mvrms – 270mvrms
TP45	Tx (Without drive at C145)	1,50V – 1,70V DC
TP46	Tx (Without drive at C145)	3,9V – 4,5VDC
TP48	Tx (Without drive at C145)	1,5V – 1,8VDC
TP47	Rx	5,6V – 6,2VDC
TP37	Rx	3,7V – 4,1VDC
TP41	Rx	4,8V – 5,2VDC
TP40	Rx (depends on signal strength received either at antenna terminal or at TP35)	1,5V – 5,0VDC

* VCO setting (voltage at TP33) depends on the band of frequencies that radio has to cover. The lower the frequency the lower the voltage. If only a few channels close in frequency are used adjust VCO coils for voltage to be approx. 5V.

5.2 Controller Circuitry Test Points

Various Test Points are provided in order to ensure the correct function of the Controller. The following chart lists them:

Test Point	Mode/Remarks	Level
TP16	Rx. Checks the demodulated received FFSK level for correct decoding under received signal (1,5KHz deviation)	650mV p-p
TP13	Rx. No RF present at antenna terminal	4,1V – 4,9V DC
TP15	Tx. FFSK output to modulate the VCO	2V – 2,5V p-p
TP7	Rx. Checks the sequence of "0" and "1" This sequence depends on the DC level received from the RSSI circuitry (U25 pin 1).	0 – 5V p-p
TP1	Rx. Checks the analogue DC voltage to the A/D converter (U2). This voltage depends on received signal strength.	1,5V – 5,0V DC

5.3 Alignment Procedures

5.3.1 Synthesiser Alignment Procedure

In the Synthesiser circuitry there are only 4 adjust / tuning points: R_{136}, U_{21}, L_{14} and L_{12}.

In order to align the Synthesiser, power the radio with its test jig and program the radio to the desired channels (frequencies).

a) Adjusting the Lock-Line voltage at TP_{32}.
The lowest limit for the Lock-Line voltage is 3,0VDC and the highest 7,0VDC. The lower the frequency the lower the voltage. If there are desired frequencies that are spread over a few MHz. choose first the lowest one and adjust L_{12} so that the voltage at TP_{32} is 3,0VDC. Switch to the other channels and make sure that the voltage does not exceed 7,0VDC.

Note: In case there is only one channel or a group of channels close in frequency adjust the voltage approx. 5,0VDC. Connect a 50Ω dummy load to antenna terminal and switch to Tx mode using the P.T.T. switch and repeat the above alignment procedure. This time adjust L_{14}.

b) Adjusting the RF Frequency Error.
Connect a 50Ω dummy load to the attenuator / antenna terminal. Connect the output of the attenuator to a calibrated frequency counter. Switch the radio to Tx mode and measure the frequency. Adjust the adjustment point on U_{21} to get the correct frequency i.e. zero error.

c) Adjust the Modulation (Frequency Deviation).
Repeat the connection procedure as in b) above but instead of measuring frequency measure FM modulation. Switch the test jig so that the radio produces modulation. Measure at the upper part of R_{135} that there is approximately 2V p-p of FFSK signal. Adjust R_{136} to get 1,5KHz deviation ± 0,5dB.

Repeat the modulation measurement at another desired RF channel (frequency) and make sure that it is again 1,5KHz ±0,5dB.

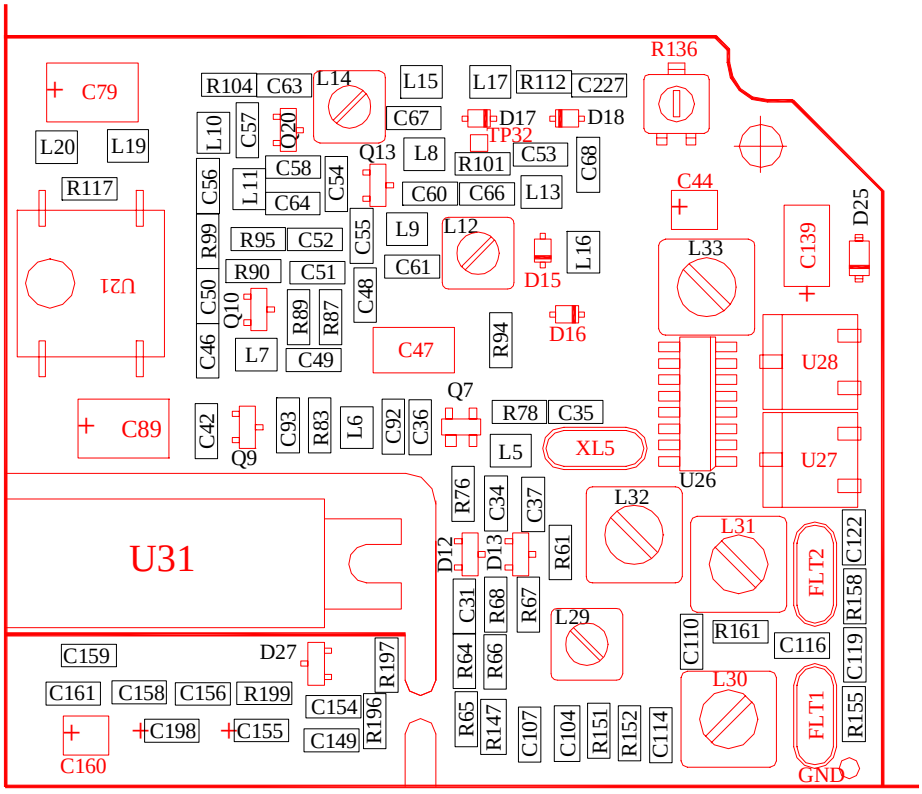
5.3.2 **Receiver Alignment Procedure**
Connect the radio as described in 5.2.1 above. With the radio on Rx mode monitor the SINAD at TP_{38} while injecting approx. –70dBm RF signal modulated by 1,0KHz tone, 1,5KHz deviation.
Adjust L_{30}, L_{31} and L_{33} for best SINAD. Reduce received signal gradually and keep monitoring the SINAD. Tune Front-End coils for maximum SINAD when signal is –110dBm. If necessary readjust coils L_{30}, L_{31} and L_{29}. Reduce further the incoming signal until the SINAD meter reads 12dB the incoming level should be between –113 and –116dBm.

Switch to another desired frequency and make sure that you get again 12dB SINAD or better for –113dBm of incoming RF signal.

Adjust potentiometer R_{162} to get approx. 70mV rms at TP_{138}.

Inject at antenna terminal –100dBm and adjust R_{171} to get 2,5VDC at TP_{40}.

5.3.3. Transmitter Alignment Procedure
The transmitter is a wideband type; as such it does not have any tuning trimmer components. The RF output power is determined by potentiometer R_{215}. In order to set the output power, switch the radio into Tx mode and turn R_{215} until the power meter connected to the antenna terminal displays the desired power at the frequency of interest.



SHOWING VCO. TUNING COILS:

L12 for Rx
L14 for Tx