

## Alignment Procedures

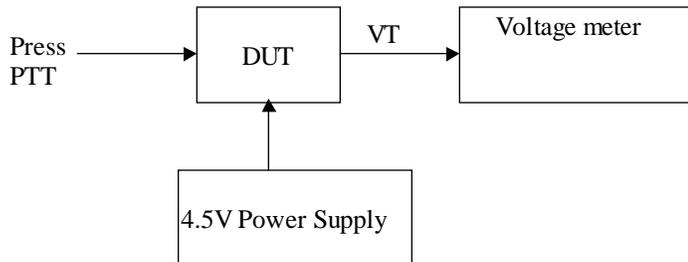
Both RX and TX sections of 60-4019 need to be aligned for optimum performance. Steps and testing equipment are listed as follows:

### A: Adjust VCO control voltage VT

The LO frequency is mainly controlled by the VD1, C203, L201, C204, C210 and C209, Initially the LO frequency is incorrect. By adjusting the air-coil L201, the LO frequency can be controlled.

1. Press PTT, adjust L201 until the voltage of VT point is  $1.4 \pm 0.1V$ .
2. Waxing to L201 and L202
3. Press PTT, slightly adjust L201 until the voltage of VT point is  $2.0 \pm 0.1V$ .
4. Re-waxing L201.
5. Cover and Solder the VCO shielding case
6. Press PTT, re-check the voltage of VT : it must be  $2.0 \pm 0.3V$ . Release PTT : it must be  $\geq 0.4V$ .
7. Cover the hole on the shielding case with the copper – sheet .

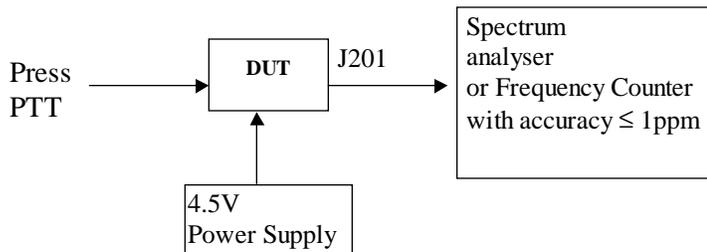
Tuning component: L201  
Equipment: Test jig with pin connected to VT  
Voltage meter  
Personnel: Skilful



### B. VCO output frequency and TX power

The reference frequency of the PLL is generated by the crystal X1. Since each crystal characteristic has a bit difference. We need to use the variable capacitor VC1 to control the accuracy of the PLL. We need to connect the board ANT output through connector J201 to the spectrum analyser to check the frequency accuracy ( $\leq 300Hz$ ) and TX power ( $\geq 15dBm$ ).

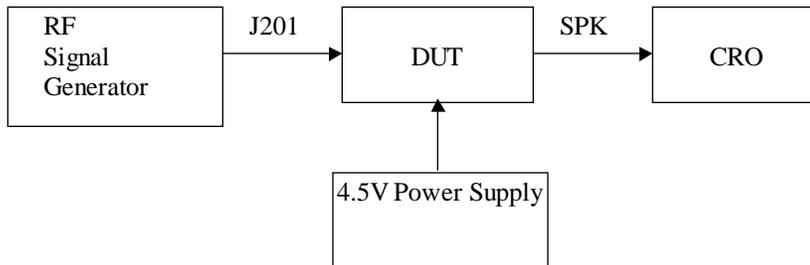
Tuning component: VC1  
Equipment: Spectrum analyser with high stability time base  
Personnel: Skilful



### C: Quadrature coil tuning

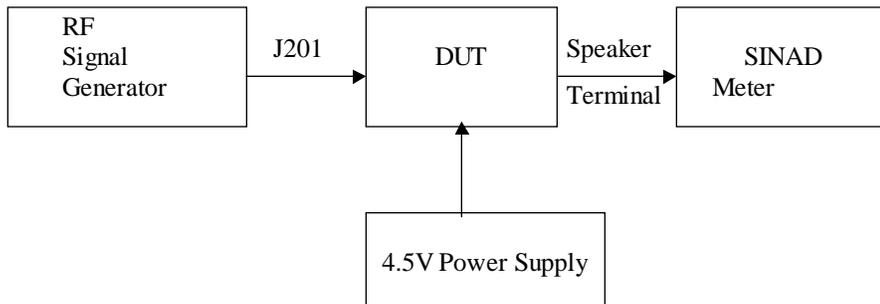
During the demodulation process, the audio signal is recovered by the quadrature coil L8. By adjusting the quadrature coil, the audio output with minimum distortion can be obtained. For reference, In MAX volume, adjust L4 get the MAX audio output, then turn the volume to a audio output as 0.6V, slightly adjust L4 to get the MAX audio output.

Tuning component : L8  
 Equipment: Test jig with pin connected to SPK  
 CRO  
 Signal generator with output set to the desired channel (with 1kHz internal modulation source and 1.5kHz FM deviation). The output level should set to 1mV.  
 Personnel: Non-skilful



D: RX sensitivity tuning  
 Adjusting L7 has effect on RX sensitivity. Input RF signal  $-110\text{dBm}$ , adjust L7 to reach the SINAD over  $21.5\text{dBm}$ .

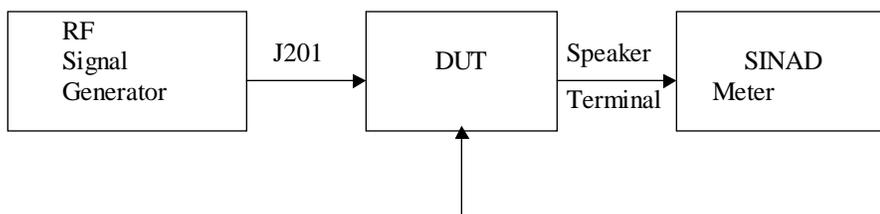
Tuning component: L7  
 Equipment: Test jig with pin connected to speaker terminals  
 Signal generator at  $-110\text{dBm}$  with 1kHz modulation source of 1.5kHz FM deviation.  
 SINAD meter  
 Personnel: Skilful



E: Squelch Control tuning

The squelch function of 60-4019 function is realised by rectifying the demodulated noise signal. If the rectified noise level is higher than the threshold. A logic level will be generated to the MCU to determine the on and off of speaker. Hence by adjusting the level input to the rectifier, the squelch level can be controlled. 60-4019 needs to adjust VR1 to set to a squelch level of about 12dB audio SINAD at about  $-120\text{dBm}$  RF input level. In such condition, the speaker should just be fully turned on.

Tuning component: Adjust VR1 to reach that the squelch SINAD @threshold is 9-12dB.  
 Equipment: Test jig with pin connected to speaker terminals  
 Signal generator at  $-120\text{dBm}$  with 1kHz modulation source of 1.5kHz FM deviation.  
 SINAD meter  
 Personnel: Skilful



4.5V Power Supply

F : Modulation

60-4019 has its internal build-in amplifier and limiter. Acoustic signal pick up by the microphone will be adjusted to the appropriate signal format before modulating the TX carrier. The FM deviation is required to be limited within 2.5KHz. By adjusting VR2, the FM deviation can then be controlled.

Tuning component: VR2

Equipment: Test jig with pin connected to T7

Communication test set or modulation analyser

Audio signal generator

Personnel:

Skilful

