

## G1SLE MK2 Repeater Controller Alignment.

Alignment of the Mk2 controller is relatively simple, it is advised that before aligning the controller you fit it to your repeater according to the instructions in the 'G1SLE Mk2 Repeater Controller Connections' document, you will also need to program your controller according to the instructions in 'G1SLE Mk2 Repeater Controller Programming'

To align your controller you will require:-

Repeater with controller connected.

Oscilloscope suitable for audio frequency use.

Frequency counter for audio frequency use.

Signal generator inc. 2 x modulation sources able to generate CTCSS tones and 1kHz tone.

Deviation meter able to operate at the repeaters TX frequency.

RF power meter able to measure the repeaters TX power.

Once your controller is fitted to the repeater and programmed with your callsign etc. switch on the repeater with the 'progmode' jumper open.

Using the oscilloscope find a square wave on pin 5 of the NE567.

Adjust the 'Set 1750Hz' preset to achieve 1750Hz on the counter.

If the waveform is unstable temporarily disconnect the unmuted discriminator input from the controller.

The next step is RSSI adjustment, this assumes your receiver has a signal strength output that ranges somewhere between 0 and 5 volts with higher voltage corresponding to stronger signal.

Apply signal to the receiver at the level below which you require a 'weak' signal report. Use your oscilloscope to look for a low level on pin 27 of the 89s5252, adjust the 'Set Lo' preset to the point where the level abruptly falls to near zero.

Next increase the signal level to the level above which you require a 'strong' signal report. Move your oscilloscope to pin 26 of the 89s5252 and adjust the 'Set Hi' preset to the point where the level abruptly falls to near zero.

Now apply 1kHz. modulation to the signal generator at full deviation (5 or 2.5kHz.).

Check the waveform at pin 10 of the FX805, it should be free from any distortion, particularly check for clipping and if clipping is present reduce the audio level from the receiver so that the waveform remains undistorted even at full deviation.

Once distortion free audio is being fed to the FX805 check the waveform on pin 11 of the FX805, this is the filtered audio out to the transmitter, again it should be free from distortion and clipping.

Now move on to the waveform on pin 11 of the 25 way D connector, this is the buffered output to the transmitter, adjust the TX AF Gain preset to achieve a level similar to that on Pin 12 of the 25 way D, again checking for distortion and clipping. This procedure will ensure that the through audio path is free from distortion and of roughly unit gain.

You should now apply modulation to your signal generator at the repeaters normal access CTCSS tone frequency with suitable deviation (250 or 500Hz), switch the 1kHz modulation source off for now.

Adjust the controllers CTCSS level preset to achieve the desired CTCSS deviation on the modulation meter (250-500Hz). Now turn on the 1kHz modulation source and set it to maximum deviation

Adjust the transmitters line sensitivity control for maximum sensitivity, now set the transmitters deviation control for the required max deviation (2.5 or 5kHz).

Reduce the 1kHz modulation level to 60% (1.5 or 3.0kHz), now adjust the transmitters line sensitivity to achieve a deviation of 60% (1.5 or 3.0kHz).

Check that deviation on the transmitter tracks the deviation of the signal generator 1kHz modulation from zero up to full deviation.

Some loss of linearity at close to maximum is normal and acceptable, adjust the transmitters line sensitivity control, deviation control and if necessary the controllers TX AF Gain preset to achieve the best compromise between gain at low levels and compression at high levels, with care most well designed repeaters will closely track from zero up to close to maximum deviation.

Now set the signal generator CTCSS tone to the repeaters low power tone, verify that the transmitter switches to low power while ever the low power CTCSS is present and that it returns to high power when the low power CTCSS tone is removed.

Finally we will set the pip tone levels, to ease this adjustment a test mode is provided, to access the TX pip level testmode power up the controller and then short the progmode jumper. The transmitter should key up sending a constant tone.

Adjust the controllers 'set high level pip tones' preset for the desired pip tone level for beacons and pips sent when the repeater is not receiving traffic. I would suggest 30 to 40% of maximum deviation as a reasonable starting point. Now short the controllers network key input to ground, the pip tone level for beacons sent when the repeater is passing traffic may now be set using the 'set low level pip tones' preset, this level will typically be 10 to 20% of full deviation.

Remove the progmode jumper.

The repeater is now ready for installation.