Aftermarket Upgrade Heatsink Alternatives for the Elecraft® KX3 Transceiver

A Comparative Performance Assessment

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The Elecraft® KX3 has a well-deserved reputation for design and performance excellence. Its mix of built-in features and optional accessories make it a superb entry-level or backup rig. And as expected, its small size and light weight make it a popular choice for SOTA, backpacking, camping, etc. What's more, its receiver specs rank among the best available at any price!

Perhaps the only criticism of this little radio is that – under some conditions – its maximum transmit power is limited by its propensity to overheat. This issue is particularly serious above 30 MHz using 100% duty cycle modes like Olivia and FM. However, it can also plague lower duty cycle modes below 30 MHz.

Unfortunately on 6 meters the solution is not as simple as reducing output power, because transmit Power Amplifier (PA) efficiency falls off rapidly as power is reduced. Fortunately this shortcoming can be mitigated easily enough by replacing the original heatsink with one that's more effective – and several aftermarket products are available, which are intended to fill this role. They include …

Vendor	Model	Web / email Address
Simply Better Manufacturing	Cooler KX Lite™ Cooler KX Plus™	www.ve7fmn.ca
John Tomasik, KB8UHN	-	heatsinkkb8uhn@gmail.com
Pro-Audio Engineering	PAE-Kx31	www.proaudioeng.com

Methodology

A few months ago, I set about devising a straightforward and intuitively meaningful way of comparing the performance of these offerings. My hope was that the results of my testing would assist other KX3 owners in determining which of these heatsinks best met their needs. Coming up with a suitable way to accomplish this was particularly challenging, due to the one-degree-Celsius PA temperature resolution provided by the KX3 firmware.

I considered three schemes in my quest for one that would produce conclusive and repeatable results, while not overstressing my radio:

1. Plot PA temperature over time, under carefully chosen and monitored conditions.
2. Determine what transmit power level would result in some pre-determined PA temperature.
3. Transmit at 0.5 Watts on 6 meters using a 100% duty cycle mode until the PA temperature stabilized; then do the same thing at 5.0 Watts on 20 meters. (Repeat as necessary.)

Detailed Procedure

The scheme I used entailed transmitting on 6 meters at 0.5 Watts until the firmware-reported PA temperature was unchanged for 60 seconds, and then transmitting on 20 meters at 5.0 Watts, until the PA temperature was unchanged for 60 seconds. This was repeated three times in quick succession, and the last round's quiescent PA temperatures were used as the final results.

Notes:

- No thermal grease was used.
- Testing was conducted in "still air" at an ambient temperature of 25 ±0.5° C.
- My choice of 100% duty cycle modes was FM.
- My bench supply was set for 13.80 Volts.
- My RF dummy load is certified to 3 GHz.

The following table (which is sorted by performance) summarizes the results of my testing.

Heatsink	**Band** *(meters)*	**Transmit Power** *(Watts)*	**Quiescent PA Temperature** *(° C)*			**Benefit** *(° C)*	**Average** *(° C)*
			Round 1	**Round 2**	**Round 3**		
Cooler KX Plus™	6	0.5	45	47	48	-6	-5.5
	20	5.0	44	45	45	-5	
Cooler KX Lite™	6	0.5	45	47	49	-5	-4.5
	20	5.0	44	45	46	-4	
PAE-Kx31	6	0.5	45	47	49	-5	-4.5
	20	5.0	44	45	46	-4	
KB8UHN	6	0.5	49	50	52	-2	-1.5
	20	5.0	46	47	49	-1	
Factory Original	6	0.5	52	54	54	-	-
	20	5.0	49	49	50	-	

Conclusions

The Cooler KX Plus™ provides the greatest cooling benefit, although the Cooler KX Lite™ and PAE-Kx31 – which performed identically – did almost as well. The heatsink that's produced by KB8UHN provides a negligible cooling benefit of about 1.5° C versus the original heatsink. In contrast, the cooling benefit of the "winning" heatsink is about 3.7 times greater than this.

For the Record

I have no financial interest in any of these products, and performed this testing solely for the benefit of the KX3 user community, and to satisfy my own curiosity. Also:

- I purchased a Cooler KX Lite™ earlier this year.
- KB8UHN donated one of his heatsinks for this evaluation.
- The Cooler KX Plus™ and PAE-Kx31 were both provided by VE7FMN.
- WB2ART contributed a ¼" combination wrench, to facilitate swapping heatsinks.