

VARIABLE GAIN 160-METER PREAMP

Tuned input and output offer increased performance

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After buying a new rig and getting on 160 meters with a shunt-fed tower for my antenna, I soon found myself in the position of most newcomers to top band; I was definitely an "alligator," all mouth and no ears. The shunt-fed tower is great for transmitting, but leaves a lot to be desired for receiving. Quiet is not one of the benefits of a vertical.

Beverage antennas were pretty much out of the question because I live on a fairly small lot (100' x 300'), so I tried the next best things — small shielded loops, snakes, and short low wires. I had quite a bit of success with the 6' shielded loop made of 1/2" hardline and a less than desirable preamp, still managing to work 75 DX countries my first season on the band.

As I looked over the problems I had with a lack of signal when using the loops and intermod on the other antennas, it seemed I needed a good bandpass filter with gain — in other words, a preamp with tuned input and output. After I tried four or five different preamp designs and found them to be lacking either in gain or selectivity, I decided to create my own.

I started with two high Q tuned circuits, matched them for 50 ohms, and then looked for an FET to supply the needed gain. Chuck, N8BYI, had some 3SK88 devices and suggested I try one of them. This device worked very well, producing high gain and a good noise figure.

Circuit description

The circuit (see Figure 1) is very basic, except for its unusual bias arrangement. This amplifier's gain is 27 dB typical, and the gain control covers the full range (or more) because of the bias. The 750-k resistor from gate 1 to gate 2 helps to increase the maximum gain. The resistor from gate 1 to the junction of the gain control pot and the 10-k resistor pull gate 1 up above the source slightly at minimum gain setting; this allows the minimum gain setting to be unity (gain of zero) or below, depending on the value of this resistor. Typical values are from 1 to 3 megs.

This arrangement is most beneficial when there are many

strong signals present (like during a contest) and you don't want any preamplification. Placing the amp in the circuit at low or minimum gain adds two high Q tuned circuits, which help selectivity and reduce or eliminate any intermod from broadcast stations or nearby hams.

The amplifier has back-to-back diodes to protect the input during transmit. My own transmit signal hasn't caused me any trouble with receiving antennas as close as 75 feet from my vertical. Tune the trimmers for "your" portion of the band; the bandwidth won't cover the full 200 kHz without swamping the tuned circuits at the expense of gain and selectivity. I tune mine for maximum at 1850 and can use it anywhere in the band with somewhat reduced gain at the high end, where I seldom operate.

This year I have five 800' Beverages, thanks to a friendly farmer and a 1-1/2" plastic pipe I had put under the road to gain access to 40 acres east of my QTH. I don't normally need the preamp with these antennas — except when signals are very weak. But there are times when the band is noisy, and the shielded loop and preamp "hears" better than the Beverages.

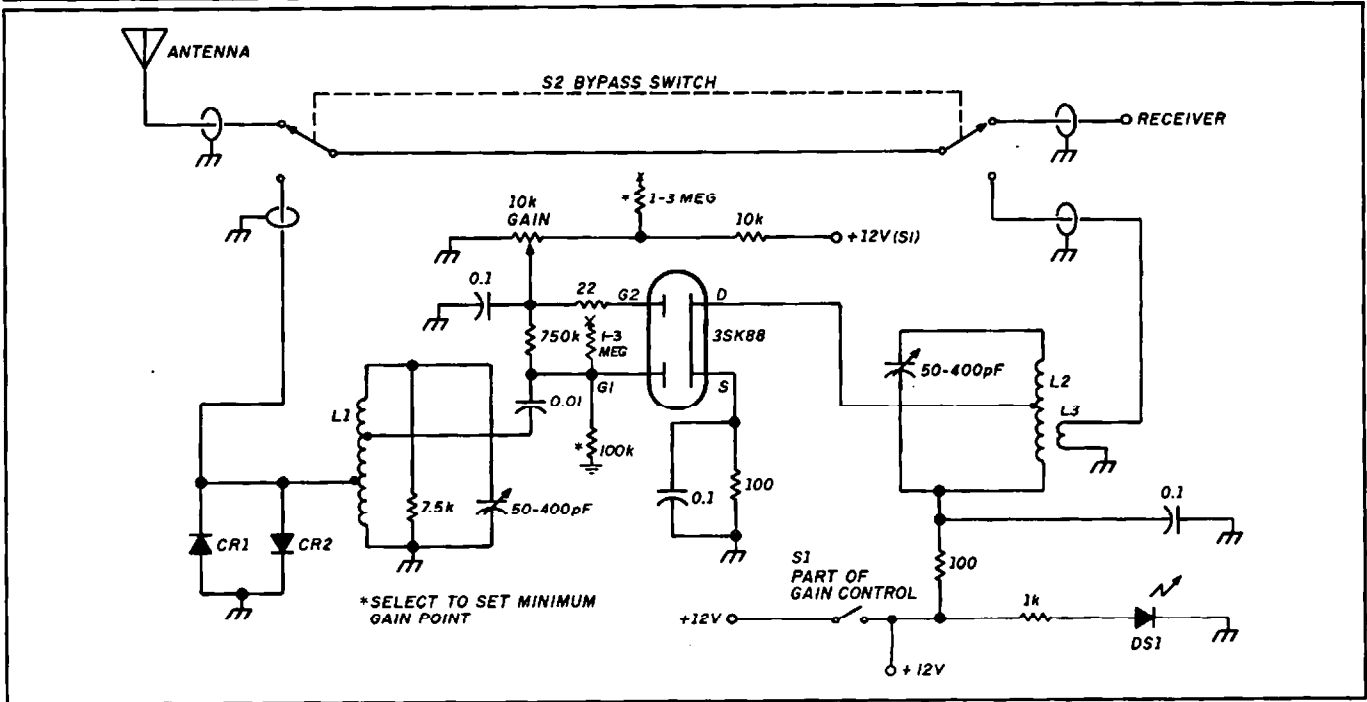
Construction

I built the preamp in a homebrew chassis 4 x 5 x 1-1/2 inches and painted it to match my Ten-Tec Corsair II transceiver. See Figures 2 and 3 for foil pattern and component placement guide.* I used miniature coax on the bypass

PARTS LIST

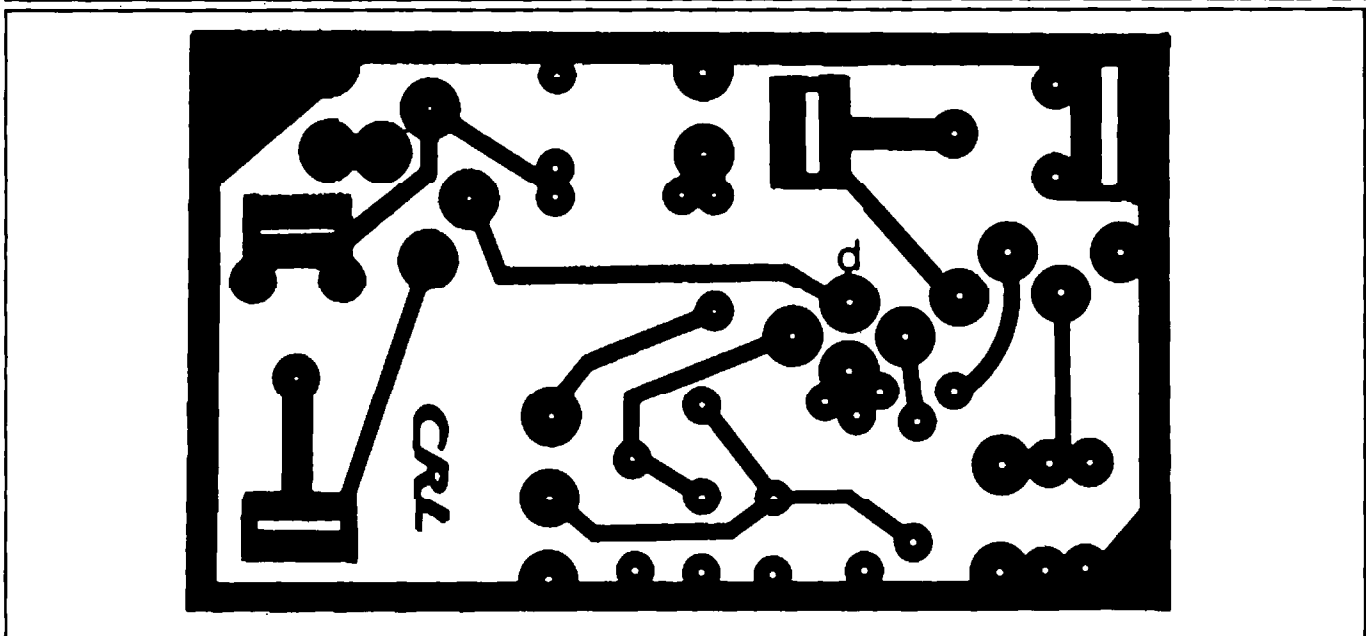
C1,C2	Arco 429 compression trimmer
CR1,CR2	Silicon signal diodes or hot carrier for input protection (The 3SK88 already has built in protection, but this provides added safety.)
L1,L2	FT50-61 toroid core (Amidon, Micro-metals) L1, 22 turns tap at 11, 2 L2, 22 turns tap at 11 L3, 2 turns over L2
Q1	Nec 3SK88 or equivalent (ECG455)
R1	10-k pot with switch, Radio Shack 271-215A. All other resistors, 1/4-watt carbon composition; capacitors are 0.1- μ F ceramic disc.
S2	DPDT miniature toggle switch for bypass (switch around)
DS1	LED to indicate power on RCA phono jack for power in
Misc	Two connectors (your choice) for input and output

FIGURE 1



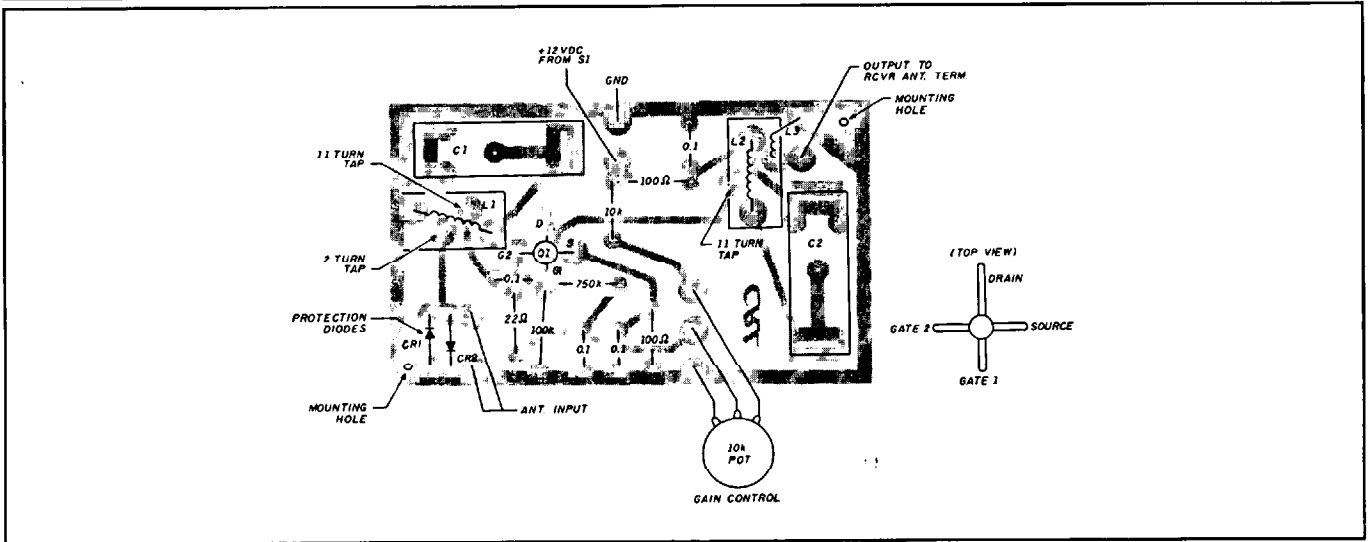
Schematic of the 160-meter pre-amp.

FIGURE 2



PC board foil pattern.

FIGURE 3



Component placement guide.

switch. Although the bypass isn't necessary, it's a feature I wouldn't leave out. The circuit board is mounted on two small threaded standoffs. Stick-on rubber feet and rub-on transfer decals give the project a "professional" appearance. The LED indicating power on is also nice, but not necessary.

Chuck Lewis, N8BYI, has kits available for \$29.95 plus \$2 shipping and handling. For more information, contact N8BYI at 4925 Vermont Lane, Fort Wayne, Indiana 46815; phone (219)749-2324. [77]

Editor's Note: Those who want an 80-meter pre-amplifier should substitute either an FT50-63, or T50-3 core. Use the same number of windings as for the 160-meter pre-amp. *Although a 7.5-k resistor is shown across the input tank circuit, it is not on the pc board artwork. This resistor was added to the circuit to broaden the bandwidth and provide a more constant 50-ohm match at the input. The circuit will work without the 7.5-k resistor with only slightly reduced bandwidth. Ed.

KD9SV Preamp User's Notes

Whether it's a bigger transmitting antenna, full legal power, or a way to improve my Beverage array, I'm always looking for an edge over my competition on 160 meters. Late last fall, KD9SV sent us a prototype 160-meter preamplifier to try out before he completed this article.

There are several important parameters that need to be examined when evaluating a preamp: is it prone to self-oscillation, can it handle both in and out-of-band strong signals, and does it induce any great amount of noise to the receiver?

One of the toughest tests you can give any piece of equipment is to use it during a major DX contest. I put KD9SV's preamp on line just before the CQWW CW, and ARRL 160-meter contests and it performed without fault. The circuit is well designed and isn't prone to self-oscillation. It never "folded up" in the presence of strong adjacent in-band signals. The tuned front end effectively eliminates any

problem with out-of-band stations. (KD9SV lives close to several AM broadcast stations and operates without problems.)

In casual operation after the contest, I did A-B comparisons with my other preamp to evaluate performance from a "known" standard. This design induces little additional noise in the circuit. The variable gain control is also a nice addition that lets you maximize gain without adding too much noise to the receiver.

The acid test was trying to dig out weak signals. This preamp performed extremely well in all cases. Stations that were barely audible on the vertical or unamplified Beverages were perfectly Q5 when I turned on the preamp. The only gripe I have about this preamp is that it's a single band unit. However, the overall improvement in operation is worth the minor inconvenience. I suspect I'll build another preamp for 80 meters sometime this summer.

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