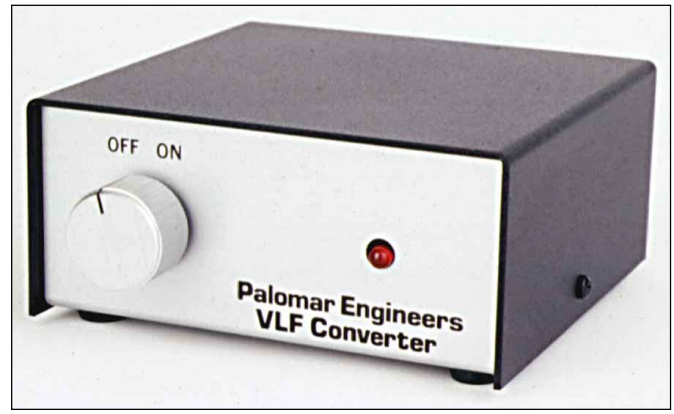
Palomar Engineers VLF Converter

There isn't much to the Palomar VLF converter—and that is one of its strong points. This little 2 × 4.25 × 4.25-inch unit is designed for the easiest installation possible. You connect your antenna to the SO-239 input, then attach a coaxial jumper between the converter output connector (another SO-239) and your radio. There is one switch on the front panel labeled **ON** and **OFF**, along with a red LED to indicate the **ON** state. The converter doesn't have a power supply. Instead, there is a clip on the rear panel for a 9-V battery.

The Palomar converter is simple on the inside as well. Incoming signals are first subjected to a 3-stage low-pass filter, which is essential to block overload from nearby AM broadcasters. After the low-pass filter the VLF signals reach a mixer stage composed of a 1496 mixer IC and a crystal-controlled oscillator designed around an MPF102 transistor. If you purchase the model VLF-A the oscillator/mixer combo converts 10 to 500 kHz to 3510 to 4000 kHz. In the VLF-S (the model tested for this review) the conversion output is 4010 to 4500 kHz. So, with the VLF-S in line, 4010 kHz becomes 10 kHz, 4020 kHz is 20 kHz, and so on.

As is often the case with receive converters of this type, the frequency conversion can be inaccurate. This is usually caused by an oscillator running at the wrong frequency. It turned out that my VLF-B was receiving about 7 kHz above what my IC-706 display was indicating. When my transceiver displayed 4053, for example, I was really listening at 60 kHz rather than 53 kHz. There is no frequency adjustment inside the Palomar converter, so I simply added 7 kHz to whatever I saw on the 706's display. A small trimmer capacitor across the crystal might be a worthwhile addition to allow users to adjust for display inaccuracies.

It's worth mentioning that the converter's **ON/OFF** switch functions as a bypass, connecting your radio directly to the antenna when the switch is in the **OFF** position. The switching arrangement isn't designed to handle any sort of RF power, so I wouldn't recommend transmitting through it!



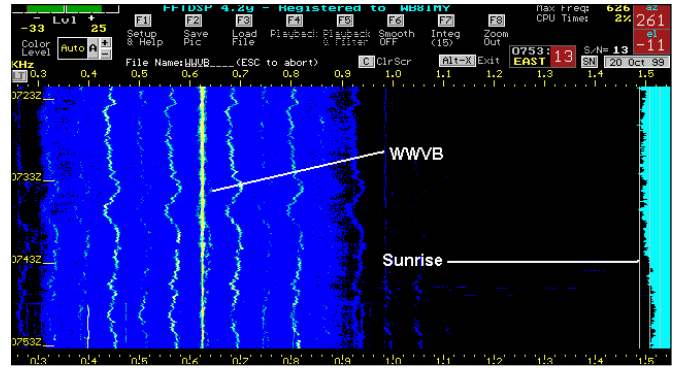


Figure 1—WWVB's 60-kHz signal under the DSP microscope using AF9Y's *FFTDSP* software (http://www.webcom.com/af9y/radio10.htm). The bright line represents WWVB. The white area along the right margin of the image represents the varying signal strength. Notice the drop in strength with local sunrise.

On-Air Performance

I installed the Palomar converter ahead of my ICOM IC-706 transceiver, using my 125-foot long-wire antenna, and subjected it to many evenings of listening. One of my first stops was at 60 kHz where I heard the time-code transmissions from WWVB, the National Institute of Standards and Technology station in Fort Collins, Colorado. With 50 kW of power, WWVB blankets the country with its signal.

ARRL Lab Measurements: Palomar VLF-B Converter

Current consumption: <20 mA
L.O. Accuracy: 6.9 kHz error
Conversion gain: 0 dB to –14 dB (loss), frequency dependent
Conversion gain over frequency:

Frequency (kHz)	*Gain (dB)*	*Frequency (kHz)*	*Gain (dB)*
10	–7	200	–2
20	–5	250	–5
50	–4	300	–9
100	–2	400	–12
150	0	500	–14

Using AF9Y's *FFTDSP* software, I ran my computer throughout an entire night to profile WWVB's signal. You can see a portion of the results in Figure 1. In the Amateur Radio section of my Web site at **http://home.att.net/~wb8imy/home.htm** I've also posted a short WAV audio file of the WWVB signal received with the Palomar VLF converter.

Above 200 kHz there were quite a few navigation beacons sending their two and three-letter Morse identifications. I switched between the Palomar converter and my IC-706 several times while monitoring distant beacons. Despite the lack of conversion gain performance, the difference was astonishing. In many cases I couldn't hear the *navaids* at all with the IC-706, but they were clearly audible when received through the Palomar converter.

Bottom Line

There are strange and fascinating things going on below 500 kHz. The Palomar VLF converter offers a cost-effective way for you to eavesdrop using your present ham transceiver.

Manufacturer: Palomar Engineers, PO Box 462222, Escondido, CA 92046; tel 760-747-3343; **http://www.Palomar-Engineers.com**. Suggested list price: $89.95. QST

Next Short Take

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