73 Review

Number 5 on your Feedback card

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The Azden PCS-7500H 6 Meter FM Transceiver

50 watts on 6 in an attractive, low-cost mobile.

Azden Corporation is the only manufacturer of monoband mobile FM transceivers for all the popular bands from 28 through 440 MHz and really has a corner on the market for 6 and 10 meter FM rigs. When given the opportunity to review the new PCS-7500H 6 meter FM rig, I was happy to jump right on it, since the 50 MHz band is full of FM simplex and repeater activity here in Southern California.

Six meters is a unique band that combines the propagation advantages of both VHF and HF. For line-of-sight (direct wave) work, 6 is not much different from 2 meters or 135 cm (222 MHz), although the longer wavelength produces less rapid signal strength flutter. Because a quarter-wavelength at 6 meters is about 4'9" long, peaks and nulls in signals are produced by considerably more movement than, say, at 2 meters, where a quarter-wave is only about 19". Tropospherically-enhanced propagation, especially "tropo ducting," occurs less on 6 than on 2 or the higher frequency bands, making those occasional DX contacts a bit more rare; however, the 50 MHz band does afford its users much more frequent sporadic-E ("E-skip") propagation, especially from May through July, and again in December, and 1,200-mile QSOs on 6 meters are not rare. Plus, 6 meters enjoys occasional F-layer propagation, producing contacts to several thousand miles with relatively low power during solar-cycle peaks. If you haven't tried 6 yet, it is surely an interesting band that has its share of die-hard users.

Overview

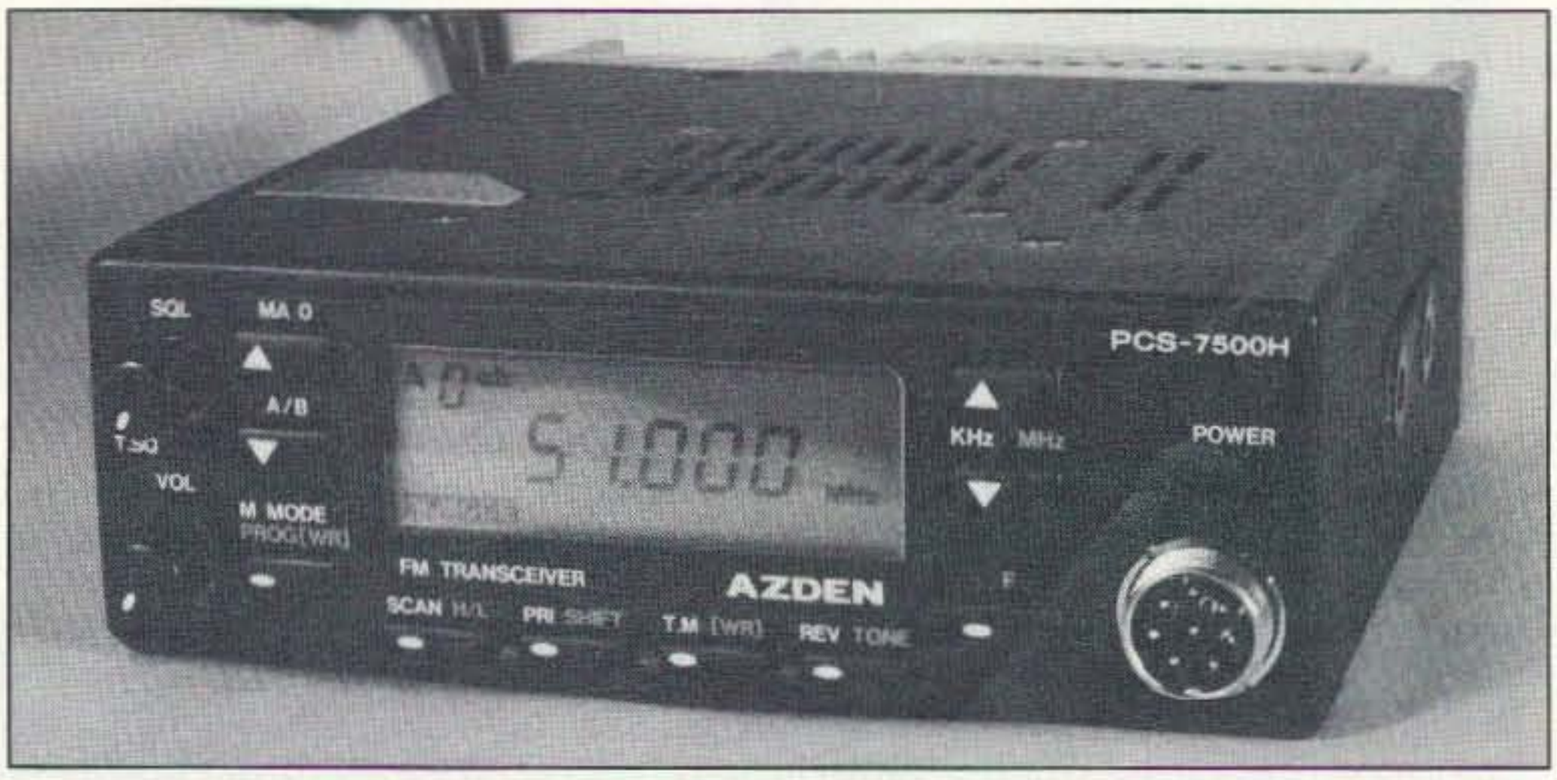
The first thing anyone notices about the PCS-7500H (or any of the new Azden PCS-7000 series) is how incredibly beautiful it is to look at. It is a fine-looking radio, with every single panel button illuminated with a dark orange glow for easy viewing. The LCD display screen is similarly backlighted and has a warm, inviting glow. Even the push-buttons on the DTMF ("touch-tone") microphone are all illuminated; a nice touch. The rig comes equipped with a convenient and sturdy mounting bracket, a PTT/DTMF microphone, a long DC power cable with the positive side fused, a connector disconnect point about eight inches from the rear of the radio, and all mounting hardware. It also comes with a CTCSS ("PL") encoder built in. The PCS-7500H is rated to produce 50 watts RF output power (with a 10 watt "low power" mode front-panel selectable), programmable frequency steps, and other features normally found on modern FM transceivers.

The PCS-7500H has good and bad points, and I'll try to discuss both fairly. I like thoughtful touches, with which the Azden is loaded. For example, they used a flat-blade automotive-style fuse in the DC power cable. Small point, but these have real advantages over the old-fashioned 3AG, AGC, MDL (etc.) glass cartridge fuses used in most other equipment: They can really handle a lot of current without thermal meltdown, are readily available at gas stations, and are very inexpensive. I also like the connectorized power cable, which uses an automotive-style molded connector set that has also proven its reliability in years of service. Its coaxial antenna cable receptacle, a standard "UHF" SO-239, is firmly mounted to the rear panel of the radio, not hanging on a short coax extension cable as in many modern mobile rigs. Its hand-held PTT microphone has a solid feel and produces excellent transmit audio. (More on this later.) Its receiver audio is full, loud and undistorted, and sounds better than many mobile rigs. And the rig is beautiful, especially at night when one can enjoy all the warmly lit controls. The Azden can accommodate any frequency "split" between transmit and receive, since each channel can be separately programmed (into memory) with TX/RX frequencies, and its 20 memories are adequate for 6 meters. As with all modern FM rigs, each memory will store frequency "split" and PL tone (if required).

I also like the built-in heat-sink fan in the PCS-7500H. It activates after a few minutes of continuous transmission at normal room temperature and helps maintain a "cool-to-the-touch" heat sink, undoubtedly prolonging the operating life of the final amplifier stage.

On the other hand, the Azden is full of quirks, some of which I found a bit annoying. First, the PCS-7000 series all seem to share one instruction manual, written around the PCS-7000(H) 2 meter rig. The PCS-7500H manual contains an "addendum" sheet (one page) which modifies the PCS-7000 manual to suit the 6 meter rig, but this means referring back and forth between two sets of information. And the original PCS-7000 manual contains mistakes and typographical errors. Most aren't meaningful, but I started to proofread the manual in search of errors and stopped when I found a dozen by the fourth page. This reminded me of how badly written the older Japanese equipment manuals used to be, before the manufacturers employed English-speaking technical writers to make them better.

Next, there is no easy way to use the rig with tone-activated (CTCSS) repeaters when in the "VFO" or "Direct" mode. PL-tones are easily programmed into memory, and once this is performed, tone-activated repeaters are easy to use; but if you're "scanning around" looking for activity in an unknown region and stumble across a tone-activated repeater not already in memory, there's no easy



way to access it without programming the required frequency, offset and tone data into memory first. Azden did provide me with an updated sheet entitled, "Error in Azden PCS-7000H Instruction Manual" which does describe how to use a PL tone in the "Direct" mode, but the procedure is so complicated it couldn't possibly be performed while driving.

The rig's 20 memory channels are stored in two banks of 10, called A0-9 and B0-9. No big deal, although simply calling them 0-19 or 1-20 might have been nicer. But the rig always "powers up" on memory A0, regardless of where you used it last. This is frustrating, especially since all my other modern FM transceivers "remember" where they were last used and "power up" on the last-used channel.

Also, there's no VFO/memory knob of any kind on the Azden, nor may frequencies or memory channel numbers be entered directly with keypad strokes. The only way to go from, say, memory A3 to memory B5, is by using the "up" or "down" buttons (either on the front panel or on the PTT microphone) to go through all the memories in between. And if you depress the "up" or "down" button more than momentarily, the rig begins scanning through the memory channels very quickly, much too fast to stop on the channel of your choice. With the technology and chip sets available today, there's no reason for any channelized radio to not have "direct frequency entry" with keypad strokes. (That is, if you wish to "dial up" 52.525 MHz, you'd just depress 2-5-2-5 on the keypad, and the rig would go there instantly.) This used to be tricky in the old days, but can now be done with one $2 chip. In Azden's defense, however, I must admit that many modern FM mobile rigs still don't contain this feature. Darned if I know why not.

Another minor annoyance is that a user of the PCS-7500H must refer to a "Tone Code Table" when programming PL tone frequencies. That is, the CTCSS frequencies, of which there are 38 in common use, are not actually displayed by the Azden during the PL selection process. Instead, tones are selected and displayed by two-digit codes which might only be memorized by The Amazing Kreskin. Since I'm not so amazing, I had to constantly refer to a chart on page 14 of the instruction manual to determine which two-digit code corresponded to each PL tone frequency. For example, Code "19" corresponds to a CTCSS frequency of 127.3 Hz. Sid Wolin at Azden in New York did advise that the newer-generation PCS-7000 series (unavailable at this writing) would incorporate a new microprocessor which allowed direct PL frequency address and readout, as on their handie-talkies.

Programming the PCS-7500H takes some getting used to if you are more familiar with one of the other brands of equipment. It's not difficult, but might be too complex for use "on the fly" while driving. Again, to be fair, most of the mobile rigs I've used are too complicated to program without focusing complete attention on the task. But the Azden instruction manual makes the job sound more difficult than it is, with 12 paragraphs assigned to the description. The Azden is unique in that it only stores the memory data when you turn the rig off, and then back on. To quote from the manual, "Note: Be sure to turn off the power when you have completed programming. This procedure is required to get each setting programmed in and then to get out of the programming mode." Weird, but it works.

With all these quirks to write about, you may get the idea that I really don't like the Azden. This isn't true. I do like the rig, but it took more getting used to than it should have. In terms of performance, the Azden is an impressive package.

The Technical Side

One thing I like a lot is that Azden provides "full-sized" schematic diagrams for their rigs. They are clear and easy to read without a magnifying glass, and will be of value to those who like to perform modifications or do their own service work. The schematic for the PCS-7500H reveals the transmitter final power amplifier to be discrete (2SC2097), rather than a molded hybrid "brick" (modular) amplifier as used by most other manufacturers. I like the discrete approach better because it is more user-serviceable for reasonable cost. Should the PA "final" ever go out, it will be much cheaper to replace a $10 transistor than a $90 module. Not that I would expect the final to fail; the people at Azden assured me they've never seen one fail yet.

The PA circuit board also contains a discrete driver stage (2SC1972), the thermal detector which switches on a cooling fan if the heat-sink temperature gets too hot, the VSWR protection detector circuit (which shuts the transmitter down if a gross antenna mismatch occurs), and a bandpass filter circuit which is in line with the antenna to both the receiver and the transmitter. PA stage tuning is accomplished by a three-section low-pass matching network. One drawback to the discrete PA stage is its critical tuning: The PCS-7500H does deliver 50 watts as rated into a perfect 50 ohm resistive load, but power output falls off rapidly when the transmitter is faced with any mismatch at all. The antenna I used for most of my testing, a vertical with a measured VSWR of 1.5:1, only allowed the transmitter to deliver between 28 and 42 watts, depending on the operating frequency and exact nature of the mismatch. Some of the "brick" stages, while costly to replace, are more forgiving of mismatches.

The receiver's front end, a 3SK101 dual-gate MOSFET, is protected against transients by "back-to-back" signal diodes and features bandpass tuning of both its input and output to help reduce interference and intermodulation from adjacent services. The first RF mixer, another 3SK101 with an output of 14 MHz, is followed by a four-pole crystal filter whose output drives the IF SYSTEM integrated circuit, an MC3361D. The receiver's second IF at 455 kHz is filtered by a 15 kHz bandwidth ceramic filter, type KBF455R15A. The receiv-

er isn't razor-sharp, but suffices nicely with the 20 kHz channel spacing commonly used on 6 meters. One might think that a VHF rig with a first IF at 14 MHz could be easily interfered with by strong 20 meter signals, but I didn't find this to be a problem.

The transmitter uses what Azden proudly describes as "true FM" for modulation, and I guess it is, with the microphone amplifier stage directly driving the VCO variable-capacitance tuning diodes. However, I've never been able to tell the difference between "true FM" and "phase modulation," since, mathematically speaking, one is the reciprocal of the other and a phase-modulated signal, when integrated, becomes "FM."

I did have a problem with the unit as received, in that the transmitted modulation was tinny and distorted. Azden was surprised to hear this, and immediately shipped a new microphone, thinking that was likely to be the problem. It was, and the new microphone produced clear, crisp modulation that received compliments on the air. (I must say, Azden's service in this instance was remarkable. They must have shipped the new mike the day I called them on the telephone, because I received it the next day, 3,000 miles away!)

One thing I think is a bit "clunky" about the Azden is that it uses an old-fashioned relay for transmit-receive RF switching. Relays work fine, and Azden claims they've never had one fail, even in prolonged packet radio service, but their switching "turnaround" speed is rather slow compared with solid-state switches, and if the radio is used for packet, the user may have to re-set switching parameters in his TNC program. I was used to using 30 milliseconds (mS) or less in packet switching, but this is too fast for a relay. I'd recommend more like 300 mS for a relay-operated rig. There's not a lot of packet activity on six anyway, but if you really wanted to, you could home-brew a PIN diode modification fairly easily.

A listing of manufacturer's ratings vs. bench measurements made on the PCS-7500H is contained in the sidebar.

Summary

It took me a while to get used to the Azden. It does have quirks, as described earlier, that make it more troublesome to use than I'd like. But for an affordable, single-band 6 meter FM rig, it's almost the only game in town. Same goes for 10 meters, with the PCS-7800H. I understand the Southern California Six Meter Club, which actively promotes the use of this band, has ordered a great number of these radios for their members and they are well accepted. In speaking with local 6 meter repeater owners, I found they were all very aware of the Azden and were either using one personally or had at least had their hands on one. It does disturb me a bit that the transmitter power output falls off so sharply when connected to other than a perfect load, but since the FM subband on 6 meters is a narrow window of our spectrum (3 MHz), I suppose anyone with a lick of sense could tune his antenna to provide a good match if he had to.

The radio as reviewed is good. With the improvements Azden has planned, such as eliminating the two-digit PL tone codes, it will be even better. If they also rewrote the instruction manual, and had one specifically dedicated to the PCS-7500H, it would be better still. *[Factory Note: New and improved manuals are in the works.]* On a scale of one to 10, with a "10" being perfect, I'd rate the PCS-7500H a strong 8: a good rig for the money and, as I said earlier, maybe the only game in town for a modestly-priced 6 meter FM rig. 73

Manufacturer's Specifications vs. Bench Measurements

Variable	Specification	Measured
TX output power	50 watts (high)	47-52W (H)
RX sensitivity	<0.35µV/20 dB NQ	0.30µV/20 dB NQ*
Squelch sensitivity	<0.12µV threshold	0.10µV threshold
Selectivity	15 kHz/-60 dB	15 kHz/-57 dB
RX audio output	2W, 10% THD	2.2W, 10% THD
Power consumption	0.6A RX	0.5A RX
Frequency coverage	50.0-53.995 MHz	50.0-53.995 MHz

*Receiver Sensitivity is usually measured in µV/12 dB SINAD. For comparison purposes, the 0.35 µV/20 dB Noise Quieting would be a lower number if measured using SINAD. At 50 MHz, the difference in this specification for anything less than 1 µV is not critical.

Items unspecified by manufacturer, but noted:

Display window bar graph, number of bars illuminated for 50W TX output: 10. For 10W TX output: 3 to 10, varies with frequency and VSWR.

Display-window bar graph used as RX S-meter, number of bars illuminated vs. received signal level:

1 bar	=	0.9 µV	(-108 dBm)
2 bars	=	1.2 µV	(-106 dBm)
3 bars	=	1.4 µV	(-104 dBm)
4 bars	=	1.8 µV	(-102 dBm)
5 bars	=	2.0 µV	(-101 dBm)
6 bars	=	2.2 µV	(-100 dBm)
7 bars	=	3.0 µV	(-97.5 dBm)
8 bars	=	4.0 µV	(-95 dBm)
9+10 bars	=	5.5 µV	(-92 dBm)

Note: The 9th and 10th "bar" in the bar graph display illuminate together. Signal level change from "S1" (1 bar) to "S9+" (all 10 bars) is 16 dB. This makes the resolution extremely good for weak signal beam peaking, but results in "full-scale" readings for any reasonably strong signal. Not uncommon for FM receivers.