

Looks

I first saw a prototype of the Orion at the 2002 HamCom in Dallas. I liked the looks. When I saw the specs I liked the radio even better. I picked up my new Orion in mid-June 2003. My first impression has not changed—clean layout, knobs and controls positioned just where they should be, good-sized tuning knobs with a good feel. In a couple of words, “It all fits my hands and fingers.” It does not have the look of mass consumer electronic gadgets. This is a sober and very functional radio, which is what I like.

Software Updates and Response

Maybe the greatest innovation included with the Orion is the concept of a top-notch radio with firmware updates via the Internet. This makes it possible to provide continuous and free of charge improvements. That’s the technology of today. It also made it possible for Ten-Tec to release a product early in 2003 that perhaps was not 100% complete, but at the same time avoided making us eager contesters and DXers wait another six months for the radio. It also is undoubtedly the best way for Ten-Tec to get live feedback from the field. Some (very few) people seem to complain that Ten-Tec is regularly improving the Orion. Those who don’t like this idea may be better off waiting a little longer until all the wrinkles have been ironed out and all sensible suggestions of customers have been incorporated. I decided to go ahead and get one of the earlier Orions and thus become a part of the improvement process. Contacts with Ten-Tec have been excellent. Jack, K4JU, Doug, KF6DX, Gary, AC4DL, and Scott, W4PA, were all very responsive to my comments, suggestions and even complaints!

Response to my suggestions was swift, and in a matter of weeks a great number of the suggestions I made were implemented. I was happy to be an informal Beta tester for their firmware updates, and I spent many hours trying to make things go wrong. At the end, the software became so solid I had difficulty making anything go wrong! I’ve heard of a few people who did not like the concept of firmware updates; they obviously do not understand the power of this advanced concept. My reaction—let the firmware upgrades come, I know each time it marks a further improvement to the product.

Some ergonomic shortcomings, mainly in the radio control software that were part of the first few firmware releases, have all been taken care of. I did



The author with his new Orion.

not return my Orion for these shortcomings. I decided to be part of the ongoing improvement process for this product, and add my inputs. This way the final Orion has a little bit of myself in it!

The Manual

The original manual was not great (I am polite), but that’s now been taken care of. Since September 22 anyone can download the latest manual from the Ten-Tec Website. Scott, W4PA, took care of that. The manual covers just about every aspect of the radio. Of course, the radio is so flexible there are literally hundreds of ways you can set it up to do exactly what you want it to do. I assume that users on the Ten-Tec reflector will make lots of these configurations available. As indicated in the manual, the Orion is indeed a substantially different radio from what we have known so far. It is no secret that the first thing that attracted me is the excellent dynamic range particularly at very close signal spacing, which should be a real asset for low band DXing and contesting. Ten-Tec implemented the DXers’ and contesters’ wishes that were published in the 3rd edition of my *Low Band DXing* book¹. Many manufacturers seemed to ignore the inputs from DXers and contesters until recently.

Testing Basic Specs at W8JI

After I picked up my unit in the US in early June, I drove to the home of Tom, W8JI, and we tested the dynamic range and sensitivity (MDS) in his well-equipped lab. What we found was within measurement error of what Ten-Tec publishes. In other words—excellent! We also had a really close look at the transmitted CW waveform, and it is excellent as well. Now at least and at last I can be

on CW without having to fear someone calling me with a “you have key clicks” comment.

I have been playing with the Orion in a few contests, where it gets really crowded, especially on 40 meters. Amazing—in between signals, the band sounds quiet. No blurps, beeps and other alien weak signals that sometimes sound like CW using a different code. What you hear is what’s really there! The narrow front-end filters really do their job. My radio has got all of them.

The AGC Issue

The use of the AGC (with the programmable settings) requires a good understanding of how the radio works. Of course Ten-Tec could have left out the programmable settings, and could have fixed us up with just three or four “fixed” standard settings. After discussing this at great length, Ten-Tec decided to make all settings programmable, a sign of confidence that Ten-Tec trusts that their customers will take the time to understand the radio and use its capabilities to the fullest extent!

Ten-Tec has a section in their latest manual explaining how to set the AGC variables (also available on their Web site). Make sure you study this and fully understand it before starting to play around with changing the three variables involved.

We have read on various reflectors that in the beginning some hams started experimenting with the AGC without knowing what they were doing and were disappointed. They fooled themselves, I am afraid. I must admit it’s easy to be fooled, as the lowest setting of the AGC threshold does not, as a rule, give you the best sensitivity! I found that approximately 2.0 to 3.0 μV is a good starting

point to experiment. It's not because you hear more noise at 0.4 μ V that you have a better S/N ratio! On the same issue of sensitivity: I have done hundreds of A/B tests between my old radio (the most popular brand with low-band DXers and contesters) and the Orion (at the same time, not with 1 or 2 weeks in between!) and I have never found the Orion not to hear a weak CW signal that I could hear on the "old radio" on any band. To the contrary! I was listening to CW signals, not to carriers (I'm not really interested in "working" steady carriers or broadcast harmonics).

Bandwidth

One of the great assets of the Orion is the continuously variable IF bandwidth. If the band is not too crowded or if there is not too much QRN you may want to use 800 or 1000 Hz bandwidth on CW. Otherwise you can crank it down all the way to 250 or 150 Hz. Great thing is that at 150 Hz bandwidth there still is not a trace of ringing. Noise content in such a small bandwidth becomes very low, but you must be tuned right on the spot! On SSB it is a joy sometimes to listen to good audio with 3 or 4 kHz bandwidth. Sounds much like AM. With the PBT you can really adjust everything until it just sounds right. Flexible, smooth and easy. The measured bandwidths and resulting shape factors are shown in Table 1.

Although the shape factor at narrow bandwidths may not look spectacular, I have found this set-up, with which CW ringing is totally absent, to be the smoothest and most efficient way of obtaining the most suitable selectivity for every individual situation. Ten-Tec has informed me that they will change the display so that the narrowest bandwidth displays 150 and not 100 Hz.

Noise Reduction

The digital noise reduction function works extremely well, a dramatic change from what I had experienced in my previous radio.

Notch Filters

Another nice feature is that we have two notch filters available—a DSP automatic notch for carriers on SSB, and a manually adjusted notch filter (both

notch frequency and bandwidth are adjustable) for use in CW! Yes, a notch can sometimes be very handy on CW, too.

Panoramic Stereo Receiver

The Panoramic Stereo receive feature is great fun. If using stereo phones, signals move from one side through center to the other side in your headphones as you tune across the band. This helps reduce fatigue when working long hours on CW. It should also be useful in quickly working multiple callers in a pileup.

Using the Orion on CW

The Orion is a real joy to use when transmitting CW providing a beautiful waveform and good keying characteristics. With the continuously variable bandwidth down to 150 Hz, it is also a real delight on receive. The built-in keyer works very well, and the legendary Ten-Tec fast break-in (QSK) works as well as ever.

W8JI found out, and I can confirm this, that for weak signal CW reception especially in presence of noise (QRN) it seems best to select the roofing filter manually to 250 Hz and then set the DSP bandwidth in the range of 500 to 800 Hz.

Using the Orion on SSB

I have been receiving nothing but excellent audio reports on SSB, even from the experts on 14,178 kHz! The fact that you can adjust almost anything in software makes it possible to obtain good audio with a very wide range of microphones. Digital audio enhancement is provided, allowing adjustment of the "transmit filter" bandwidth from 1000 Hz (yes!) to 3900 Hz. The low end roll off can be set to start between 50 and 300 Hz, for example. If you have it set all wrong the audio can indeed sound bad, but once you find the proper settings success is guaranteed. Ten-Tec has published a list of settings for the most common microphones in the manual. I think it would be good if they added the Heil HC-4 and HC-5 elements, as well as the Heil Pro Goldline microphone.

Using the Orion on FSK

The Orion has true *frequency* shift keying (FSK) capabilities, not the dual

audio tone arrangement found on many rigs. In FSK mode reception, the tones are automatically set for the high tones set. RTTY copy is flawless with bandwidths down to 150 Hz!

PSK31

If you are a PSK fan, you can look at 5 kHz of FSK signals, or narrow the bandwidth down to 150 Hz, and just have one signal going to your sound card. If you narrow the bandwidth down to 150 Hz, you will also *hear* the PSK signal. I've heard people saying that with PSK31 we can work signals we cannot hear at all. This is not quite true, because the sound card uses a very narrow bandwidth. If we use the Orion's similar bandwidth we can definitely hear the PSK signals.

Receive Audio

The sound from the (large) built-in speaker is much better than from any other transceiver I have had. There is plenty of volume as well. The headphone audio works very well, even with low sensitivity headphones.

The second receiver

The Orion has two receivers that sound identical (not like in another two-radio transceiver I had where one radio sounded like the *good* one and the other like the *cheaper* one). The second receiver uses exactly the same DSP IF. The only differences between the main receiver and the secondary receiver are that the secondary does not have the narrow roofing filters, and that the second has a higher first IF frequency to make general coverage reception feasible.

The Ten-Tec manual suggests that diversity reception is possible with the Orion. It is not really what I call true diversity reception. True diversity reception, in my opinion, is only possible if both receivers are phase locked and the phase delay through both receivers is nearly identical. This is not the case in the Orion. Listen to the same signal through both receivers using the same VFO, and you hear the warble (flutter, rapid fading) caused by the phase difference. This warble is always there and to me this makes real diversity reception impossible. This does not mean that under certain circumstances you may not find a benefit in using different antennas on the 2 receivers on (almost) the same frequency. While Ten-Tec doesn't claim that both receivers are phase locked, they think that there are advantages when using a vertical and horizontal antenna or two horizontal antennas separated by at least a wavelength with the Orion using two radios in a single audio amplifier. They claim

Table 1

Nominal BW (Hz)	-6dB BW (Hz)	-60dB BW (Hz)	Shape factor
100	150	440	2.9:1
250	240	470	1.95:1
500	510	820	1.6:1
1000	980	1160	1.2:1
1600	1580	1880	1.2:1
2400	2300	2650	1.15:1
3000	2930	3270	1.12:1
4000	3960	4280	1.08:1

that some of their customers have found this form of diversity with non phase-locked receivers useful.

Two Transmitter Outputs

With two transmitter outputs, you can almost configure the Orion as a two-radio contest station using two amplifiers. This does not mean that the Orion has two transmitters, you transmit either to output A or to output B. The Orion has two band-data output connectors, one corresponding to each output connector, and this make it possible to have automatic antenna and amplifier switching. Two TX-EN lines (one for each output) can be used to inhibit the transmitter in full QSK or also when using a complex antenna switching system where such an RX-inhibit line is used to prevent transmitting on the wrong antenna or while antennas are being switched.

Firmware Upgrades

Upgrading firmware takes less than five minutes. The new upgrades are announced on www.rfsquared.com. You download a small program (*update.exe*) from this site into a directory on the PC controlling the Orion. The Orion, connecting to your PC via a serial port, will not only take care of the communication with your contesting or logging program, it will also talk to the Ten-Tec flash update utility program (*Update.exe*). When a new firmware update is available, save it in the same directory where you saved *update.exe*. Follow the instructions in the manual, and in a few minutes you have a new, latest model Orion! Great feeling!

Suggestions and Shortcomings

On the negative side: the voice memory keyer is much too slow in saving to memory (not useful at all in a contest).

I also would like to see the possibility of different external T/R delays for SSB and CW. Now you can set one delay for output A (going to amplifier A) and another one for output B (going to amplifier B). Having separately adjustable delays for SSB and CW should only be a minor software change, I would think.

It would also be nice if the user could, from his PC, upload *his* frequency, mode and bandwidth definitions as a one-time task, without having to control the radio from a PC on a permanent basis. An operator could then just enter a frequency from the Orion keyboard and it would select the corresponding standard bandwidth, based on his stored frequency, mode and bandwidth table. We understand this cannot be a standard definition since band-planning differs in different IARU regions, and even with individual operators' preference.

I know that Ten-Tec has considered these wishes, and that not all of them can be on the top of their priority change list at the same time. I also know they do listen to their customers and try to learn from them to make a better product. Wise strategy! By the time you read this, some of these "wishes" are very likely to have become true. Bill, W4ZV, eminent top-band DXer, worded it very well on the Internet: "*KUDOS to Ten-Tec for LISTENING to actual users! Japanese manufacturers must surely be watching the success Elecraft and Ten-Tec are having by incorporating real time user feedback into their products. If they don't soon start doing the same, I believe they will all be history in a few years.*"

Even as I write the final lines of this report I think I have found one or two very minor control software glitches, which I know Ten-Tec will correct in one of their next firmware upgrades. It's great not having to be worried about such issues, as the people are there at Ten-Tec to solve them and the system is in place to provide every customer with the solution almost in real time. This is what I always dreamed about!

Learning Curve

In the beginning you may undoubtedly feel a little lost in the programming screens, although they are laid out in a very logical way, and are easy to understand. Thankfully they show real words, no cryptic code needs to be deciphered! But there are so *many* things you can adjust. This will go away after a few weeks, and you will soon feel like a king

on his throne being able to control just about all the issues of this wonderful radio.

Hardware

When you open the Orion, your first reaction will likely be: is that all? It indeed looks like an almost empty box. No inch thick bundles of wires, just a few (mostly coaxial) cables. The rest of the interconnections are done by the backplane into which all the boards plug. I always jokingly say that I can pack my sandwiches and my shoes inside the Orion, and it would still accommodate more. Another nice thing is its weight: 20 lbs (9 kg). Required power is 13.8 V at 25 A. There is no built-in power supply.

Conclusion

I have always dreamed of the ideal low-band DX and contest machine, and I must say that Ten Tec has come very close to my wildest dreams. Congratulations to Ten-Tec for a wonderful **[NCJ]** product and for excellent service and customer care. The way Ten-Tec tries to satisfy the wishes of its customers is more than exemplary. The Orion transceiver clearly scores very near maximum on whatever scale you can imagine. My order for a second Orion for my two-radio contesting station is out and I can't wait to get it! I will be proud to have a two radio contesting station with what seem to me to be the best radios on the market at this time. Keep in mind that the sunspot cycle is on its way down. As a result the low bands will become more and more appealing. The Orion may well make the difference.

The Orion in Europe

As of early October 2003, the Orion cannot be sold in the EC market, since it has no CE label as yet. I have been informed that the certification procedure is now underway and it will soon be fully legal to buy, possess and operate an Orion in the EC countries. I understand that the CE-certification may be a fact well before the end of this year, so potential European customers can put the Orion on their Christmas shopping list. **[NCJ]**