ORION II

The original ORION transceiver is now discontinued.
A few original ORION transceivers with automatic antennna tuners installed are still available at $ 3599.00 plus shipping.
All non-tuner units have been sold.
Demo units of the original ORION with or without the automatic antenna tuner installed are available at a discount (1 year warranty) - please contact Ten-Tec's sales department at (800) 833-7373 or sales@tentec.com

ORION II shipments started December 13, 2005. At present we are backordered approximately 6 weeks for the ORION II.
Orders are shipped on a first in-first out basis with no charge made to your credit card until the day the item ships.
See below for further ordering instructions.

What is new about the ORION II ?

Super bright, TFT color display with CCFL backlighting.

New 32-bit control processor using the latest generation Freescale DragonBall Super VZ chip. Provides faster front panel control response and accelerated remote operation via RS-232. This new processor also provides the horsepower for a future planned "HIGH SPEED SWEEP" accessory. Features, price and availability of accessory to be determined.

All-new firmware from the ground up. DSP code is refined, crafted and compacted to levels unimaginable even two years ago. Provides faster (stock) sweep with finer resolution, enhanced DSP automatic notch and DSP noise reduction.

All-new suite of ORION II-specific roofing filters is arranged in one, single bank to allow user to select the absolute ideal roofing filter for mode, band conditions, and personal preference. The narrow (600 and 300 Hz) filters are now located in the same initial bank with all the rest. This new arrangement yields subtle improvement in dynamic range and the new filters have less passband ripple than any we've ever offered. ORION II comes standard with 20, 6, 2.4, and 1 kHz installed. Optional filters are 1.8 kHz (model 2000), 600 Hz (model 2001), 300 Hz (model 2002). That's not all - the optional filters cost less than before!

Mixing architecture for the analog stages has been rearranged to provide self-correction for frequency stability.

Digital mode operators will appreciate variable (programmable) line level output on rear panel completely independent of front panel controls.

ORION II now uses the popular 8 pin mic connector. This broadens the range of mikes and accessories readily available through the hobby for your use without finding or making adaptors.

Printed literature and pictures will be available in the near future.

ORION II began shipping in December 2005. We are taking orders now. As always, no charge will be made to your credit card for an order until the day the item(s) ship.

566 ORION II (no autotuner): $ 3995.00
566AT ORION II (with automatic antenna tuner): $ 4295.00
Optional roofing filters models 2000, 2001, 2002: $ 99.00 each

Orion II HF Transceiver

Pictures of original ORION shown. ORION II pictures and a closeup color screen shot will be posted in the near future. Updated 12/15/05.

The Ten-Tec Orion II represents an entirely new concept in high-performance HF transceivers. Our goal with this new groundbreaking design is to deliver the finest performance level to date from an amateur transceiver.

At the heart of the Orion II design is a pair of 32-bit floating-point ADI SHARC DSP processors. Using dual 32-bit devices provides much more processing "horsepower" than a transceiver using a single 32-bit DSP processor can provide. The result? **Absolutely unparalleled HF receiver performance, filtering, and flexibility.**

Full dual receive capability. An amateur-bands-only main receiver, (10 through 160 meters) utilizes both crystal and IF-DSP filtering. The sub receiver is IF-DSP and is general coverage from 500 kHz to 30 MHz. **Both receivers can be used simultaneously on any frequency, with no compromise in performance.** The two receivers can share a single antenna or each can be fed to a separate antenna. Receiver controls are available on both receivers. Bandwidth, AGC, PBT, Hi-Lo Cut, AF and RF Gain, attenuator, DSP NR and notch filtering are all selectable independently on each receiver.

Very high RX intercept points, superior dynamic range and an extremely low phase-noise synthesizer make the Orion II main receiver performance **unmatched** by any other HF transceiver.

590 receive IF-DSP bandwidth filters independently selectable on each of the main and sub receivers (100 Hz - 6000 Hz in 10 Hz steps). The main receiver also accomodates up to six crystal filters in the first I-F stage. Three of the six filters at 6.0, 2.4, and 1 kHz are standard. Optional filters for 1.8 kHz, 600 Hz, and 300 Hz can be added. These filters can be cascaded with any of the 590 selectable IF-DSP filters. The sub receiver has its own set of 590 filters that are selectable independent of the main receiver filtering. Rather than being limited to a single wide roofing filter at 15 or 20 kHz (compromising close-in receiver performance), **ORION II selectable crystal filters narrow the roofing bandwidth** to as

little as 250 Hz to avoid any compromise of close-in receiver performance caused by loud nearby signals. **No other transceiver does this.**

Programmable AGC response time for both receivers.. Conventional AGC settings of OFF, FAST, MED, and SLOW are provided, but the new programmable mode is groundbreaking. Users may build their own personal AGC characteristic by selecting threshold, hang and decay rates. More than **one million possible AGC combinations** can be selected in programmable AGC mode. Favorite programmed AGC settings can also be saved and instantly recalled by the operator. Each receiver can have its own AGC settings selected regardless of where the other receivers AGC setting is placed.

True diversity reception using both receivers. Both receivers can be simultaneously fed to two separate antennas on the same frequency and controlled using a single VFO tuning knob. Superior low-band DXing capability using two separate receive antennas, on two receivers, and transmitting on a third TX antenna. **Three antenna connections are provided:** Two SO-239 connectors for transceive or receive antennas, a third via phono connector for RX-only use.

Continuous real-time spectrum display allows monitoring of band activity. Selectable sweep ranges allow user-definable limits to the amount of spectrum being monitored with ORION II main receiver.

Virtually indestructable 100-watt PA. Over-voltage protection, current protection for final transistors and thermal shutdown are built-in. Rated 100% duty cycle, 100 watts output, no time limit with added optional model 310 cooling fan.

Superb SSB audio is yours at a touch of the AUDIO button. **Audio equalization is provided in both transmit and receive.** The transmit response can be adjusted to have more bass or more treble. Separately, receiver audio can be EQed for bass and treble response. **18 selectable SSB transmit bandwidths** to a maximum of 3.9 kHz are provided. See figures 3, 4, and 5 below for TX and RX equalizer graphs.

Ten-Tec's Panoramic Stereo receive feature. Listening with stereo headphones, you can turn PS receive on and hear signals in stereo. As you tune across the band, signals move from one side through center to the other side in your headphones. Better than so-called "binaural" reception, this unique Ten-Tec feature can be used in SSB modes as well as CW. You've got to hear it to believe it! See below for downloads of example .WAV files.

Adjustable rise and decay times for transmitted CW waveform. User adjustable at the touch of a knob from 3 to 10 mS in 1 mS steps for "hard" or "soft" keying according to your taste.

Nine adaptive DSP noise reduction filters let you select the right amount of NR for elimination of broadband hiss, noise, etc., plus DSP automatic notch for auto filtering of interfering carriers in SSB modes. Manual notch filter is also provided with greater than 60 dB of cut and with adjustable width.

Dual noise blankers. Both a traditional-style analog and an IF-DSP noise blanker are provided for suppression of line and other pulse-type EMI.

Heavy duty internal automatic antenna tuner (optional). Ten-Tec's internal auto tuner is no mere load trimmer - from 6 to 800 ohms may be matched (10:1 nominal SWR). Coax fed antennas only.

Voice keyer and CW memory keyer built-in. Program up to three voice messages and up to three CW messages for playback by pressing the SEND1, SEND2, and SEND3 buttons.

"60 METER READY"- the **ORION II** is ready to operate on the new 5 MHz allocation.

"Panic" on-the-fly reset button. Managed to get yourself confused by pushing buttons and turning knobs? Press and hold the RECALL button and the radio resets parameters to factory defaults without changing the mode or frequency of operation or having to turn off the transceiver.

Ten-Tec was first with **Flash-ROM update capability** with our Pegasus transceiver back in 1998. **ORION II** is also Flash-ROM updatable. To obtain the latest version of the transceiver, simply visit our firmware download website at www.rfsquared.com and download the software. Connect the radio to your computer via a serial port cable, and send the software to the radio. It's that easy!

MORE INFORMATION ON ORION II IS ALSO AVAILABLE:

This is the initial version of the ORION II operator's manual, written October 2005 that will be shipping with the ORION II. 64 page .pdf document - dialup access may take some time to be able to retrieve. The manual is a document in Adobe Acrobat (tm) .pdf format. You will need the Adobe Acrobat reader to view the document, available for download from the Adobe site by clicking here.

An instructional video on using the ORION is available now in DVD and VHS (NTSC) formats. The ORION segment is 44 minutes long. The $ 10 purchase price is refundable with the later purchase of an ORION or JUPITER transceiver. Sales page to order. PLEASE NOTE: This video features the original ORION, not ORION II. Many of the features of the two radios are identical. ORION II video planned for summer 2006.

January 2004 QST Product Review of the ORION (if you are an ARRL member). The ARRL review states that the ORION has the best close-in receiver performance of ANY transceiver they have measured, best low noise synthesizer phase noise performance ever measured, best suppression of unwanted keying sidebands (key clicks, et al, on CW) ever measured among other "bests" noted.

June 2004 RadCom review of the ORION (if you are an RSGB member). Peter Hart says "truly awesome" when discussing ORION's dynamic range.

Presentation on receiver performance given by receiver guru Rob Sherwood at the 2004 Dayton Hamvention, along with a receiver performance table representing 74 different transceivers. ORION ranks #1 of all receivers tested by Sherwood for close-in dynamic range.

Receiver performance table compiled from measurements done by Tom Rauch, W8JI of DX Engineering.

Jan/Feb 2004 National Contest Journal long review of the ORION written by noted DXer, UBA Belgian amateur radio society president and author of the definitive work on weak signal DX operation, "Low Band DXing", John Devoldere, ON4UN.

Side-by-side on-air test report from Germany by Bavarian Contest Club president DL8OH and BCC member DJ0IP. DL8OH's new ORION and other manufacturer's transceivers are tested A/B together. Posted on the BCC website. Written by DJ0IP (in English).

Review of the ORION published in the January 2004 issue of the German amateur magazine Funk Amateur. This document is in .pdf format, in German.

"Optimal uses for ORION receiver for weak-signal DXing and contesting" document by W4PA and KF6DX.

Detailed technical explanation of the design of ORION, written by Doug Smith, KF6DX

Thorough technical explanation of the programmable digital AGC system utilized in ORION.

Descriptive article on ORION synthesizer design written by designer and Ten-Tec CTO, Lee Jones, WB4JTR.

CW transmit occupied bandwidth and how the ORION's adjustable rise/fall time and "textbook" CW waveform helps eliminate annoying TX key clicks.

There are two .WAV files available as examples of Panoramic Stereo receive, and an explanation of how PS receive works. The examples were recorded live using the ORION II main receiver on 20 meter CW. Download area and download a .ZIP file containing all 3 items.

Model 566 ORION II Technical Specifications - claimed specifications are from actual measurements of production ORION II units done by the Ten-Tec engineering staff.

Unless noted, all measurements and specifications below done at 3.5 MHz

GENERAL:

Frequency range: 500 kHz-30 MHz sub RX; 1.79-2.01, 3.49-4.07, 5.1-5.42, 6.89-7.43, 10.09-10.16, 13.99-15.01, 18.06-18.175, 20.99-21.46, 24.88-25.01, 27.99-29.71 MHz TX and main RX.
Tuning Step Size: Selectable 1, 10, 100, 1k, 10k and 100 kHz
Frequency stability: +/- 3 ppm. TCXO equipped.
Antenna impedance: 50 ohms nominal.
Antenna connectors: 2x SO-239; 1xRCA female.
Modes: USB, LSB, AM, FM, CWUSB, CWLSB, AFSK; advanced Panoramic Stereo(tm).
IFs: IF1=9 MHz, IF2=455 kHz, IF3=14.0 kHz main; IF1=45 MHz, IF2=450 kHz, IF3=14.0 kHz sub.
Display: 320x240 TFT color screen with CCFL backlighting. Adjustable brightness. User selectability of several color screen layouts plus white/black, black/white "monochrome" modes.
VFOs: Receivers operate on any two bands simultaneously; either VFO may be assigned to transmitter using the A/B system.
Supply voltage: 13.8 Vdc nominal; reverse-polarity and over-voltage protection standard.
Operating temperature range: 0-50 degrees C
Dimensions (HxWxD): 5.25" x 17.0" x 18.75" (13.3 x 43.2 x 47.6 cm)
Weight: approx 20 lbs. (9.2 kg)
Construction: Al chassis, steel cabinet, glass-epoxy printed-circuit boards.
PC control port: EIA-232 standard, DE-9F.

THE FOLLOWING SPECIFICATIONS APPLY TO BOTH RECEIVERS:

Digital AGC system: Programmable AGC threshold; programmable hold and decay times, fixed attack. Independently selectable on each receiver.
RX audio equalizer: In addition to passband tuning, bass/treble boost/cut up to 6 dB/octave.
RX audio output power: 2 W into 4 ohms, < 3% THD. (see figure 8 below).
RX headphone output: Designed for 16-32 ohms headphone impedance.
Line-level output: 0 dBm into 600 ohms.
RX notch filter: IF DSP, adjustable width, depth > 50 dB, notch reflected on S-meter; multi-tone auto-notch, adjustable 0-9.
RX noise reduction: IF DSP, adjustable 0-9.

MAIN RECEIVER:

SSB sensitivity: <0.18 uV for 10 dB SINAD at 2.4 kHz BW, pre-amp on typical;
<0.5 uV for 10 dB SINAD at 2.4 kHz BW, pre-amp off typical.
AM sensitivity: <1.50 uV for 10 dB SINAD at 6.0 kHz BW, 30% modulation, 1 kHz, pre-amp off.
FM sensitivity: <2.50 uV for 12 dB SINAD at 15 kHz BW, 3-kHz deviation, 1 kHz, pre-amp off.
Selectivity: 590 built-in DSP filters from 100-6000 Hz, SSB, CW; 4 & 6 kHz AM, 15 kHz

FM (-3 dB points, typical). Four 9-MHz-IF crystal filters standard, 15 kHz, 6 kHz, 2.4 kHz, 1.0 kHz; three others optional, 1.8 kHz, 500 Hz and 250 Hz.
IP3: +25 dBm typical, 20-kHz spacing at BW=2.4 kHz, pre-amp off; +24 dBm typical, 5-kHz spacing, BW=500 Hz, pre-amp off. (see Figure 1 below).
IMD3 dynamic range: 101 dB typical, pre-amp off, 20-kHz and 5-kHz spacing.
IP2: +75 dBm typical.
LO phase noise: -136 dBc/Hz typical from 0.5-20 kHz. (see Figure 2 below)
Image rejection: >70 dB.
IF rejection: >70 dB.
Other spurious response rejection: >90 dB, dF>1 MHz.
Internal birdies: None stronger than specified sensitivity.
Current drain: 2 A typical, audio reduced.
RIT range: +/- 10 kHz.
S-meter: S-9=50 uV.
Recovery time: < 20 ms
Noise blankers: Hardware, on/off and software, adjustable 0-9; operate together or separately.

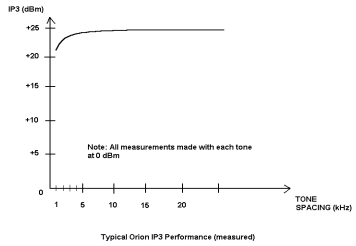

Figure 1. ORION typical third-order intercept performance (measured) - Click on image to enlarge.

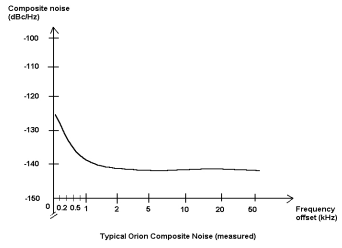

Figure 2. ORION typical LO phase noise graph (measured) - Click on image to enlarge.

SUB RECEIVER:

Sensitivity: 0.35 uV typical for 10 dB SINAD at 2.4 kHz BW, SSB mode.
Selectivity: 590 filters built in from 100-6000 Hz, SSB, CW; 4&6 kHz AM; 15 kHz FM (-3 dB points, typical).
IP3: +5 dBm typical, 20-kHz spacing.
IP2: +71 dBm typical.
Image rejection: > 70 dB.
IF rejection: > 70 dB.
S-meter: S-9=50 uV

Recovery time: < 20 ms.
Noise blanker: Software, adjustable 0-9.

TRANSMITTER:

Power output: Adjustable 5-100 W, +/- 1 dB, ALC controlled.
Duty cycle: 100% intermittent service; continuous with user-supplied cooling fan.
Microphone input impedance: >10 kohms at 1 kHz.
Microphone sensitivity: 5 mV for full power output; internal gain adjustment; dc available for electrets.
Speech processor: RF compression 0-9.
Line-level input: -6 dBm into 600 ohms for full output.
TX bandwidth: 100-3900 Hz in 10-Hz steps.
TX frequency response: 50-3900 Hz max -6 dB points, adjustable.
TX equalizer: Up to 6 dB/octave bass/treble boost/cut.
TX speech monitor: Audio taken after filtering, processing.
SSB carrier suppression: > 50 dB.
Unwanted sideband suppression: > 60 dB at 1 kHz.
Harmonic and spurious outputs: > 50 dB below 100 W; > 40 dB below 5 W.
T/R switching: PTT or VOX on SSB, AM, FM, AFSK; adjustable QSK on CW; adjustable rise and fall times on CW 3-10 ms;
CW keyer speed range: 5-50 wpm; adjustable weighting.
CW offset: Programmable 300-1000 Hz in 10 Hz steps. Sidetone pitch automatically matches selected offset.
XIT range: +/- 10 kHz
FM deviation: +/- 5 kHz peak nominal.
Current drain: 25 A max.