E1XM versus Sat800
VERSION 1 ©2005

The information below is not guaranteed to be free of errors.

1. First Impressions

The E1XM comes with a manual, CD-ROM, and 3-pronged thin-wired AC adapter. The unit is small, solidly built, and has a slightly rubber-like surface. The jacks, knobs, and buttons are all well laid out. Buttons are tiny but well spaced. The external antenna jack becomes hot with usage. The tuning knob moves easier than the other knobs but has no flywheel effect. *The Sat800 has a more substantial tuning knob* but the E1XM has better tuning step options. *The E1XM has no high impedance antenna input, no separate FM antenna input, and no carry handle.* It would have been nice if the E1XM included a carry pouch, headphones, and a PAL to SO-239 antenna adapter.

2. Display

The large 5.7" E1XM display (240 by 320 pixels) has three brightness levels (dim, medium, bright) and turns off after 10 seconds on batteries to conserve power. The unit can show a battery condition bar graph. The frequency is displayed in large rounded numbers in either kHz or MHz. In memory mode the contents of ten memories are displayed simultaneously. The time is always shown and becomes enlarged when the unit is off. There is a hinged rear panel for angled viewing. The user interface is extraordinary due to the informative display and numerous menu buttons. Keypad entry beeps can be turned off. *The display shows slight horizontal ghosting. Some of the indicators do appear larger on the Sat800 display.*

3. Portability

Size	Dimensions	Volume*	Weight	Antenna
E1XM	13.0" x 7.5" x 2.5"	244 ci	4.2 lbs	39.25"
Sat800	20.5" x 9.4" x 8.0"	1542 ci	14.2 lbs	56.75"

**Volume is in cubic inches.*

Power	Current* (lamp)	Hours** (lamp)	Minimum	Batteries
E1XM	210 mA (260 mA)	71.4 (57.7)	3.6 Volts	4 "D"
Sat800	510 mA (830 mA)	29.4 (18.1)	5.7 Volts	6 "D"

**For the E1XM subtract 35 mA for FM or add 140 mA for XM.*
***Duracell 15,000 mAH "D" alkaline batteries and 0.25 Watt audio.*

The Sat800 is over three times the weight and over six times the volume of the E1XM. The E1XM has twice the battery life; triple with continuous display lighting. The front mounted E1XM battery bay exposes a display contrast control and microprocessor reset button.

4. Clock

The E1XM has two 24-hour clocks (local and GMT) and two event timers (alarms). The clocks can be automatically set while the unit is off via NIST frequencies (WWV or WWVH) by using stored daylight savings and local time offsets. There is a 1 to 99 minute sleep timer and variable (5, 10, 20, or 30 minute) snooze for alarms. *The Sat800 has two clocks and two timers.*

5. Memories

The E1XM has 500 alphanumerically namable memories and 1200 country (any label, not just country names, may be assigned to each group of 10) memories. Up to fourteen characters (A-Z, 0-9, plus, minus, period, comma, space, backslash) can be selected for labels via the tuning knob. The frequency, AGC, bandwidth, SAM, and SSB settings are all stored. Memories can be stepped through via the tuning knob either individually or in pages of 10; or via paging keys (again by 10). Memories are non-volatile. Note: bands can also be stepped through using the tuning knob. *The Sat800 has only 70 memories.*

6. Audio

	External Audio Output (9V)	**Δ AGC per 90 dB ΔRF**
E1XM	3 Watts	2 dB
Sat800	2 Watts	6 dB

Both radios have 4” internal speakers. The E1XM can output 3 Watts of audio and accepts an auxiliary line input that goes through the bass, treble, and volume sections. The E1XM bass and treble knobs have center indents. *The Sat800 speaker gives more room filling sound.*

7. Extended Coverage

	Extended Frequency Ranges
E1XM	76-90 MHz (FM) 2.3325-2.3450 GHz (XM)
Sat800	118-137 MHz (VHF AIR)

Both radios cover 100 kHz to 30,000 kHz (LW/MW/SW) as well as 87 MHz to 108 MHz (FM). *The Sat800 includes VHF AIR* while the E1XM boasts XM satellite radio.

8. FM

FM	**Sensitivity @ 20 dB S/N**	**Image Rejection**	**Finest Tuning Step**
E1XM	4.00 µV (1.50 µV)	55 dB	20 kHz
Sat800	4.00 µV	50 dB	100 kHz

Number in parenthesis is using the E1XM “DX” switch.

FM reception is similar on the E1XM and Sat800. However, the E1XM has greater sensitivity, better image rejection, and finer tuning steps.

9. MW

The E1XM lacks a directional ferrite MW antenna. The radio is still quite capable on MW. Serious portable MW DX would likely be done without an internal ferrite: instead opting for a 34” square air-core air-capacitor tuned loop (see NRC or IRCA) or Quantum QX loop. Ironically *the Sat800 contains a small ferrite rod* but the radio is too large to easily turn and null stations. Sadly the $70 BCL-2000 has a larger ferrite than either of these $500 radios.

10. SW

Sensitivity	SSB 10 dB S/N	AM/SAM 10 dB S/N
E1XM	0.50 µV (0.25 µV)	4.00 µV (2.00 µV)
Sat800	0.50 µV	2.00 µV

Numbers in parenthesis are using the E1XM "DX" switch.
Note: S1 and S2 represent 0.20 µV and 0.40 µV respectively.

The "DX" switch which slightly reduces battery life is necessary to boost E1XM AM/SAM sensitivity levels to those of the Sat800. Filter selectivity appears equal: the wide E1XM -6 dB filter rating of 7 kHz is similar to what was measured on the Sat800.

SW	Image Rejection	Finest Tuning Step	5 kHz IP3
E1XM	70 dB	10 Hz	-20 dBm
Sat800	60 dB	50 Hz	-20 dBm

Image rejection is better on the E1XM and tuning steps are finer at 10 Hz. The E1XM tuning knob steps on SW are 10 Hz, 100 Hz, and 1 kHz. *There is no 5 kHz tuning knob step on the E1XM.* The E1XM appears to have the same IP3 as the Sat800; however, to get equal AM/SAM mode sensitivity requires usage of the +10 dB post BPF amplifier which will degrade IP3 to -30 dBm. Fortunately the E1XM is quite sensitive without the DX switch: this is good because using the amplifier increases the likelihood of first mixer overload. Hopefully *Passport 2006* will publish other specifications such as synthesizer phase noise, dynamic range, blocking, ultimate rejection, and SAM mode distortion.

11. Block Diagram

	First IF	Post BPF	Post 2nd mixer	Synthesis
E1XM	45.000 MHz	+10 dB amp ("DX")	amp-filter-amp	2 DDS & 1 PLL
Sat800	55.845 MHz	-20 dB attenuator	filter-amp-amp	3 PLL

The E1XM uses a different first IF frequency and instead of an attenuator has a +10 dB selectable RF amplifier ("DX" switch controlled) following the band pass filters. The order of the 2nd mixer's IF filter and one of its amps is reversed. E1XM frequency synthesis utilizes Direct Digital Synthesis (DDS). *The Sat800 uses Phase Locked Loop (PLL) synthesis.*

12. Seek Function

The E1XM has an excellent seek function that works in both VFO and memory modes. Seek makes it easy to find new stations or active memory stations. The S-meter (S1 through S9+60 dB) is calibrated and used by seek to stop on signals above the threshold set by the squelch knob. The E1XM digital S-meter is so good that it rivals the analog Sat800 S-meter. The LW and SW bands are scanned in 5 kHz steps; MW in 9 or 10 kHz (selectable) steps; and FM in 200 kHz steps. Seek on SW covers 105 kHz per second; consequently, the largest band, 19 Meters, takes under 7 seconds to seek. Squelch muting can be turned off so sound is heard during seek.

There is also a tagged memory scan (T-Scan) function which operates in two ways: memories above squelch can be stopped on for as long as the carrier is above threshold or stopped on for only five seconds.

The E1XM squelch allows for quiet VFO operation: frequencies below threshold (ex. stations gone off air) are muted. The squelch value is seen as segments (there are 20 bars) below the multi-segmented S-meter. *The Sat800 squelch only works on the VHF AIR band. Searching for stations on the Sat800 using the 100 Hz tuning knob steps or by stepping through the band is fairly tedious.*

13. SAM

The E1XM SAM has a ±1 kHz lock range as well as USB, LSB, and DSB settings. This mated with three IF filters (7.0/4.0/2.3 kHz), a good AGC (slow/fast/auto), tone controls (bass/treble), and a large speaker allow for excellent SW listening. The E1XM AGC "auto" setting selects slow except while tuning. The E1XM and Sat800 SAM units are comparable although DSB on the E1XM can come in handy. *The Sat800 exhibits slight hum in SAM mode.*

14. PBT and Enhanced SSB

The E1XM has a ±2 kHz PBT. Under AM/SAM the PBT functions similar to detuning. The E1XM offers 30 dB more opposite sideband rejection than the IF filter alone in SSB mode. This is accomplished via the audio phasing networks whose primary function is selection of a sideband in SAM mode. Using this "Enhanced SSB" with the PBT allows simulation of filters smaller than 2.3 kHz. The audio output is narrowed by using LSB and positive PBT or USB and negative PBT. *The Sat800 does not have PBT.*

15. SSB

Good SSB reception (ham or utility) is possible on the E1XM by using "Enhanced SSB" with the PBT. The PBT can often attenuate adjacent noise. Morse code reception is aided by using these two tools as well. *The Sat800 is not as capable on SSB* as the E1XM.

16. ECSS: Tuning DSB as SSB

ECSS is important for DX due to SSB sensitivity and the lack of the need for lock. The fine 10 Hz E1XM tuning steps allow for good ECSS reception. *The Sat800 often experiences warble.* The difference is more noticeable on music. Occasionally ECSS on the E1XM sounded better than SAM on the Sat800. This occurred during tough fading where the Sat800 SAM sounds loud and filled with treble. ECSS rarely pumps on fades. The PBT also proved useful on ECSS.

17. The New King

Radio	Cost	Memory	SAM	Filters	Steps	PBT	Sensitivity	5 kHz IP3
E1XM	$500	1700	Drake	3	10 Hz	YES	0.25 µV	-20 dBm
SW77	$470	162	Sony	2	50 Hz	NO	0.16 µV	-37 dBm
ICF2010	$350	32	Sony	2	100 Hz	NO	0.15 µV	-21 dBm

The ICF2010, SW77, and E1XM are all capable SW listeners due to their SAM units. A cursory sensitivity test of the ICF2010 or SW77 against the E1XM may cause one to prematurely dismiss the E1XM. The real advantage of the E1XM is on SSB (ECSS): this portable has the tuning steps of an R8B and the stability of an FRG-100. Note: E1XM size (volume) is 60% larger.

Like the R8B, the E1XM PBT mated with audio phasing works similar to the twin-PBT on the R75: each allows the simulation of multiple SSB filters. The R75 has the advantage of 1 Hz tuning steps and deeper attenuation afforded by the second IF filter. However, the E1XM audio phasing is so good close-in that even 10 Hz steps allow for reception without warble. *Audio phasing mated with PBT and 10 Hz tuning steps is a huge step forward for portables.*

Tune either Sony to a ham signal with adjacent noise (QRM). Using the E1XM select the 2.3 kHz IF filter and apply PBT. The audio can often be narrowed so that signal remains while the QRM is attenuated. The fine 10 Hz steps allow for natural sounding speech. If SAM reception is poor due to harsh fading simply try ECSS (SSB). Using the E1XM select the 7.0 kHz IF filter and then tune in 10 Hz steps until sound is natural. Some are hesitant to use ECSS due to prior experiences with portables lacking the tuning steps, stability, and adjacent attenuation to allow for good audio.

In many ways the E1XM even puts tabletops to shame. The E1XM SAM betters what is offered by the stock NRD-545, RX-350, R75, FRG-100, and R30. The E1XM speaker betters the ones found on the NRD-545, R8B, RX-350, R75, FRG-100 and R30. The E1XM has 1700 memories, an excellent display, a built-in antenna, and 76-108 MHz FM coverage. The E1XM makes a better first radio than the R75 unless there are plans for large antennas or extensive SSB listening.

Press the E1XM "POWER" button, press "MEMORY", set the SQUELCH to S7, press "SEEK". Then watch the unit quickly and silently search down the memories, highlighting the current one, until it stops on a memory whose signal is S8 or greater. The display shows simultaneously: time, S-meter, current frequency, meter band; the names and frequencies of 10 memories; as well as AGC, bandwidth, PBT, SAM, and SSB settings.

18. Comments

The Drake engineered E1XM is destined to become a classic. It is a compact Sat800 with numerous extra goodies. Impressive E1XM attributes include its small size, build quality, clean audio, Drake designed SAM, three IF filters, good AGC, 10 Hz tuning steps, PBT, Enhanced SSB, 1700 memories, Seek function, huge display, well written manual, and excellent user interface. If the rest of the technical numbers pan out I can see *Passport 2006* giving the E1XM portable over 4 1/2 stars. *The E1XM was well worth the wait and the $500 price tag.* Drake deserves a medal.

Photographs

E1XM Front

E1XM Back with Hinged Rear Panel

Battery Bay*

Manual, CD-ROM, and AC Adapter

**black circle is display contract control: beneath it is the microprocessor reset hole.*

E1XM and Sat800 Front

E1XM and Sat800 Top

E1XM and Sat800 Side

E1XM Box

HAPPY LISTENING

Contact

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Alexander wept as there were no more worlds left to conquer.