

# Phil's SW Radio Picks

## VERSION 3 ©2008



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

### 1. DOUBLE-CONVERSION PLL-SYNTHESIZED

The charts *only* include double-conversion (image rejection and gain distribution) and PLL-synthesized (stability and memories) radios. Excluded were all poor performing single-conversion radios lacking SSB (ex. [E10](#), [E100](#), [YB-300PE](#), [YB-550PE](#), [YB P2000](#), [KA105](#), [RP300](#) and [ATS-404](#)), drifty analog tuned receivers with digital frequency counter displays (ex. [G1000A](#), [G1100B](#), [YB-50](#), [Mini 300PE](#), [S350DL](#), and [KA008](#)), and analog dial receivers. Charts are organized by **Size** in cubic inches. The '**Mem**' columns reflect only shortwave (SW) memories. Radio picks are show in **green**; negative attributes in **yellow**; and more serious negatives (ex. faulty quality control [QC]) in **red**.

### 2. SAM SIDEBAND-SELECTABLE SYNCHRONOUS AM

SAM detection inserts a carrier that 1) maintains phase with the incoming carrier and 2) in theory is present during selective fades (sideband and carrier dropouts). No detector can recover audio lost to a sideband dropout. Most real SAM detectors sound decent during **light** carrier fades. Much of the reduced distortion has nothing to do with SAM detection: it entails **bandwidth limiting** (suppression of one sideband) and using a 2-second release **slow-AGC** (fast-AGC is for scanning). SAM detectors limit bandwidth via audio phasing (sideband-selection); this results in good fidelity.

Diode detection of AM is forgiving of local oscillator instabilities: the carrier, akin to being a BFO, moves in step with the sidebands (perfect "synchronization"). During carrier dropouts signals appear over-modulated; however, during normal modulation diodes distort less than the best SAM detectors. Good SWL (shortwave listening) is possible in AM-mode using a trick presented below.

Radio	SAM	Audio	SSB	QC	Cost	Size	Mem	Knob	NiMH
KK-S500	POOR	FAIR	NO	GOOD	\$90	29	200	YES	YES
SW7600GR	FAIR	FAIR	YES	GOOD	\$146	45	100	NO	N/A
E1	GOOD	GOOD	YES	FAIR	\$500	214	1700	YES	N/A
7030+	FAIR	GOOD	YES	FAIR	\$1500	348	400	YES	N/A
RX340	FAIR	FAIR	YES	GOOD	\$4250	1240	100	YES	N/A

*Not being capable of charging NiMH batteries is denoted by "N/A".*

The [SW7600GR](#) is a classic: inexpensive SAM in a small package, good sensitivity, a slick antenna, good FM, and excellent SSB due to its audio phasing. The downside: audio is *tinny* and AC adapter runs \$20. The SW7600GR is an unusual mix of advanced features and hollow sound.

The [E1](#) is an alluring portable with its Drake designed SAM, audio phasing, PBT, and 10 Hz tuning steps. The easy-to-use E1 offers an informative display, great band scanning capabilities, separate tone controls, a whip antenna, FM BCB reception, and can be powered for ~71.4 hours using 4 "D" type alkaline batteries. The downside: no MW ferrite rod, **no carry handle**, and no 5-kHz knob tuning step. **Unfortunately the E1 has had some QC problems** including a safety recall, LCD failures, and adapter problems. The top performing E1 should be bought with a **warranty**.

The [KK-S500](#) has no SSB and a terrible SAM. The [7030+](#) has prior QC issues and its SAM produces low level *heterodynes* due to harmonic mixing at the "SYNC CAR MIXER". [Dallas Lankford](#) called the 7030+ SAM "**unacceptable**". [Dave Zantow](#) called the RX-340 SAM "**almost worthless**".

### 3. PORTABLES: SIDEBAND-SELECTED AM TRICK

**SIDEBAND-SELECTED AM** minimizes selective fading distortion and permits selection of the cleaner AM sideband (reduces adjacent interference). For **SIDEBAND-SELECTED AM** select: AM-mode, slow-AGC, a narrow filter (~4 kHz), and offset tune (or apply PBT) by plus (USB) or minus (LSB) *nearly* half the filter's bandwidth (~2 kHz). The audio will brighten as fidelity increases. The BBC at 5975 kHz is USB tuned at 5977 kHz and LSB tuned at 5973 kHz. Under *normal* selective fading **SIDEBAND-SELECTED AM** works well and is doable on portables with a narrow filter and 1-kHz steps. During some fading **SIDEBAND-SELECTED AM** is *superior* to SAM because there is no lock to be lost.

Radio	RF	BW	Step	SSB	Cost	Size	Mem	Knob	NiMH
KA1105	FAIR	1	1 kHz	NO	\$77	13	1000	YES	YES
KA11	FAIR	1	5 kHz	NO	\$50	13	1000	NO	N/A
KA1101	GOOD	2	5 kHz	NO	\$66	19	20	NO	YES
DE1102	GOOD	2	1 kHz	YES	\$64	22	133	NO	YES
ATS-606AP	FAIR	1	1 kHz	NO	\$120	26	54	NO	N/A
E5/G5	GOOD	2	1 kHz	FAIR	\$150	31	700	YES	\$18
DE1103	GOOD	2	1 kHz	YES	\$64	31	268	YES	YES
KA1121	GOOD	2	1 kHz	POOR	\$150	34	400	YES	YES
SW35	FAIR	1	1 kHz	NO	\$90	40	50	NO	N/A
YB-80	FAIR	1	1 kHz	POOR	\$160	52	18	YES	N/A
G4000A	GOOD	2	1 kHz	POOR	\$150	60	40	NO	N/A
ATS-505AP	FAIR	1	1 kHz	POOR	\$120	65	18	YES	N/A
ATS-909	GOOD	2	1 kHz	40 Hz	\$240	70	307	YES	N/A
KA2100	GOOD	2	1 kHz	\$33	\$100	229	30	YES	\$18
ATS-818ACS	FAIR	2	1 kHz	POOR	\$200	236	18	YES	N/A

The DE1102 and DE1103 are classics: earphones, AC adapter, rechargeable batteries, long wire antenna, wrist loop, and cloth pouch are included. They both have backlit buttons and worthy FM reception. The DE1102 is a miniature radio with good SSB, decent audio, and "automatic tune scanning" (populates memories). The downside: the DE1102 has SSB only in "Page 9" memories.

The DE1103 combines superior whip sensitivity with decent immunity to external antenna overload. The DE-1103 has "pause and continue" band scanning, a simulated analog display, and memories can be stepped through via the tuning knob. The downside: the DE1103 has no 5-kHz tuning knob step and the tuning knob doubles as the volume control (press "VOL" then turn dial).

The KA2100 is a stocky radio with good MW/FM/SW sensitivity, a big tuning knob, a large display, and powerful audio (5.0 Watts). The downside: it has no keypad, SSB is via an external unit, and only 10 hard-to-recall memories per 10 MHz segment. Knob twisters will like this radio.

The expensive ATS-909 has good SSB but poor whip sensitivity and easily breakable parts (stand and battery cover). The G4000A (was YB-400PE) has decent audio but poor SSB and needs six "AA" type batteries. The E5/G5 improved the DE1103's ergonomics but has fair SSB audio.

Radios which cannot do **SIDEBAND-SELECTED AM** (5-kHz steps or poor narrow filter) include the KA11, KA1101, ATS-606AP, SW35, and ATS-505AP. The mediocre ATS-818ACS requires 4 "D" and 3 "AA" batteries. The KA1121 has a tiny display and poor ergonomics. The YB-80 suffers from AC adapter hum. The KA1105 is a decent ultra-portable (13 in<sup>3</sup>) but only covers down to 5.8 MHz.

### 4. TABLETOPS: PRECISION ECSS TRICK

**PRECISION ECSS** quickly and accurately tunes the BFO to within 2-Hz of the station's carrier. This is ECSS: tuning AM signals as SSB. Small tuning steps (1-Hz) and high stability ( $\pm 1$  ppm) are ideal: stations are quite stable. ECSS requires no carrier lock and works well on faint signals (DX). For **PRECISION ECSS** select: SSB-mode, a slow AGC, wide filter (~6 kHz) [both sidebands are heard simultaneously], and tune in 1-Hz steps until there is no "flutter" [aka no discrepancy between the BFO and station carrier]. Afterwards engage a normal SSB filter (~2.5 kHz) for program listening.

Under *heavy* selective fading **PRECISION ECSS** is *superior* to SAM because audio is disturbed less during carrier drops. SSB mode (**ECSS**) is utilized for reception of low powered signals (called DX: *distance reception*) due to higher sensitivity and lack of need for lock (SAM is not ideal). DX radios preferably have fine tuning steps, high stability, good filters, and multiple tools. DX varies constantly: reception depends on many factors such as the antenna, time, location, skill, luck, etc.

DDS-SYNTHESIZED MULTIPLE-CONVERSION TABLETOP RECEIVERS						
Feature	RX340	746Pro	7030+	R75-12	E1	R30CC
Steps in Hz	1	1	2.7	1	10	20
±ppm/hr	1	1	1	1	10	5
Filters	57	102	4 <sup>□</sup>	4+ <sup>□*</sup>	3+ <sup>*</sup>	2
Sideband Selection	16-bit ADC DSP	24-bit ADC DSP	FILTER	FILTER	FILTER PHASING	FILTER
Quality Control	GOOD	GOOD	FAIR	GOOD	FAIR	FAIR
Cost	\$4250	\$1500	\$1500	\$500	\$500	\$660
Sensitivity	0.25 µV	0.16 µV	0.19 µV	0.16 µV	0.25 µV	0.50 µV
DR	POOR	GOOD	GOOD	GOOD	FAIR	GOOD
PBT	YES	DUAL	YES	DUAL	YES	NO
DSP NR	YES	YES	\$240	YES	\$240	\$240
Noise Blanker	YES	YES	\$340	YES	NO	NO
Notch	YES	YES		YES	NO	NO
RF Gain	YES	YES	YES	YES	NO	NO
Attenuator	YES	YES	YES	YES	NO	YES
Memories	100	100	400	99	1700	100
Display	FAIR	GOOD	FAIR	GOOD	GOOD	FAIR
Tuning Knob	GOOD	GOOD	GOOD	GOOD	LIGHT	LIGHT
Keypad	YES	YES	REMOTE	YES	YES	NO
Speaker	POOR	POOR	GOOD	POOR	GOOD	POOR
RS232	YES	YES	YES	YES	NO	NO
Size (inches <sup>3</sup> )	1240	665	348	317	214	163

<sup>□</sup>Accepts an additional 455-kHz IF filter: ex. Collins mechanical with 100 dB ultimate rejection.

\*The R75 twin-PBT and E1 phasing-PBT allow the analog simulation of multiple filter bandwidths.

The **R75** stands out for DX due to its 1 Hz tuning steps, ±1 ppm stability, dual-PBT, high sensitivity, numerous DX tools, and build quality. *WRTH* named the R75 “*Best Value Tabletop*” back when it cost \$1040; and *Passport* calls the R75 “*first-rate for unearthing tough utility and ham signals*”. The R75, achieving many bandwidths via the twin-PBT, needs no additional filters.

The **RX340** has poorer blocking, ultimate rejection, and dynamic range than the R75. DXer *Jan Alvestad* found his modified R75 to have better sensitivity and audio quality than the RX340.

The **7030+** has no bandpass filters (increased mixer trash), no DDS shielding, some SSB *hiss*, and prior QC problems. The noise blanker and notch cost an additional \$340. *Jan Alvestad* found his modified R75 to have superior sensitivity and a better frontend (BPFs) than the 7030.

The **E1** is a capable portable but its build quality (mechanical encoder, buttons, overall) is not equal to tabletop standards. Display contrast, IP3 values, and DX tools are better on the R75. The E1 has no DSP noise reduction, no CPU control, and has been plagued with some **QC issues**.

The **R30CC** offers good audio, an analog s-meter, and is ideal for portable DX using large antennas. However, its 10 “AA” batteries are hard to replace and last only ~8.1 hours. The R30CC is missing squelch, scan, and clock functions. The R30CC has no CPU control and some **QC issues**.

*Guy Atkins* compared his modified R75 with his custom professional Racal **RA6790GM**. He found the R75 “*more flexible in tough DX situations than the RA6790GM*”. He noted that the R75 was easier to operate, better on severely overlapping frequencies, and able to peak crucial voice frequencies via the twin-PBT for best intelligibility. Guy stated that: “*the stock filtering and twin-PBT are a powerful combination*”. The RA6790GM receiver sold new for about \$6000 in the 1980’s.

## 5. DISCUSSION

I recommend the DE1102, DE1103, KA2100, E1, and R75 ( $\pm$ SE-3). Six tabletops have been discontinued lately: the R8B, RX-350, Sat800, FRG100, NRD545, and R75-02 (SAM version). Upcoming portables include the S-2000, KK-S7600L, and RP3100; the later two have SAM-mode.

SAM detectors in the RX-340, 7030+, SW7600GR, and KK-S500 regularly lose lock during *heavy* carrier fades. The E1 is the champion of maintaining lock. ECSS on the E1 is top-notch due to its mix of phasing and 10-Hz steps. Regrettably, the E1 has some QC issues like its Satellit 800 brethren. Performance on the Drake-engineered E1 is top notch. SW7600GR audio is *tinny* but its SAM is similar to more costly units which can whistle, hiss, and strain to gain and maintain lock. Most SAM units do not live up to one inside the R8B. Tuning tricks make SAM more superfluous.

AM-mode can reduce selective fading distortion by using a slow-AGC with an offset-tuned narrow filter (**SIDEBAND-SELECTED AM**). Consumers are unaware that many SAM detectors function no better than this simple tuning trick. Ideal portables consist of the DE1102 for SWL and DE1103 for DX. The KA2100 is good for MW DX. Makers should add a U/L labeled button that shifts the LO without varying the display frequency: slow-AGC and narrow filter would automatically be chosen.

DSP-IF receivers offer numerous digital bandwidths; nonetheless, their 8-bit "mechanical" sound is not ideal for SWL. The 746Pro has *higher* dynamic range (70 dB @ 2 kHz) and contains a *better* [24-bit ADC] DSP-IF receive section than the RX340, NRD545, or WJ-8711A. If DSP-IF is a must get the 746Pro. Look for potential ham deals: the unit is known for transmit section failures.

The R75 is an idyllic tabletop with its 1-Hz tuning and  $\pm$ 1 ppm stability (**PRECISION ECSS**). If SAM is a must, the R75 can be mated to Robert Sherwood's ([www.sherweng.com](http://www.sherweng.com)) \$570 SE-3 MK III D High-Fidelity Phase-Locked AM Product Detector via the \$35 Dual IF SE-3 Mod and \$45 BUF-3 Output Amp [\$45 for installation]. The \$1195 combination of SE-3 and R75 is economical compared to a similarly equipped 7030+ (notch, NB, and DSP NR) at  $\sim$ \$2080. The SE-3 SAM is one of the best SAMs ever implemented. The R75 mated with SE-3 SAM remains a *potent combo*.

Antennas are vital for good reception. Homebrew amplified tuned-loops work well in urban locations. They lower NF, reduce mixer trash, and can be rotated to attenuate local noise sources.

Radio Pick	Cost	Distinction	Comments
Sony SW7600GR	\$146	VALUE SAM	TINNY AUDIO
Eton E1	\$500	BEST SAM	GET WARRANTY
Degen DE1102	\$64	VALUE SWL	MINIATURE
Degen DE1103	\$64	VALUE DX	PERFORMER
Redsun KA2100	\$100	LARGE MW FM DX	GOOD SW DX
ICOM IC-R75-12	\$500	TABLETOP DX	$\pm$ SE-3 SAM
ICOM IC-746Pro	\$1500	TABLETOP DSP-IF	8-BIT AUDIO

## REFERENCE

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Wealth consists not in having great possessions, but in having few wants.