# Phil's Tabletop Guide 2005
**VERSION 1 ©2005**

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

## 1. Introduction

This guide reviews the tabletop receivers and exposes their flaws. Each has a niche and overall performance is similar. The chart below is a summary. Significant negative attributes appear in yellow; positive in green; turquoise is used for emphasis.

| Feature | NRD545 | 7030+ | R8B | RX350 | Mod R75 | FRG100 | R30 | Sat800 |
|---|---|---|---|---|---|---|---|---|
| Maker | JRC | AOR | Drake | TenTec | ICOM | Yaesu | Palstar | Grundig |
| Price USD | $1800 | $1490 | $1470 | $1200 | $580 | $600 | $500 | $500 |
| Memories | 1000 | 400 | 1000 | 1024 | 100 | 52 | 100 | 70 |
| Keypad | YES | REMOTE | FLIMSEY | $140 | YES | NO | NO | FLIMSEY |
| Knob | GOOD | GOOD | LIGHT | GOOD | GOOD | LIGHT | LIGHT | GOOD |
| S-Meter | ANALOG | DIGITAL | ANALOG | DIGITAL | DIGITAL | ANALOG | ANALOG | ANALOG |
| Tone | YES | YES | YES | PBT | PBT | PBT | DETUNE | YES |
| FM-Mode | YES | YES | YES | YES | YES | $45 | NO | YES |
| Quality | GOOD | FAIR | GOOD | GOOD | GOOD | GOOD | FAIR | FAIR |
| Batteries | NO | NO | NO | NO | NO | NO | 10 "AA" | 6 "D" |
| Speaker | POOR | GOOD | POOR | POOR | POOR | POOR | POOR | GOOD |
| Conversion | triple | double | double | triple | triple | double | double | double |
| Extra MHz | - | - | - | - | 30-60 VHF | - | - | 118-137 AIR 88-108 FM |
| Weight | 16.5 | 4.9 | 13.0 | 12.0 | 6.6 | 6.6 | 2.2 | 14.6 |
| Volume | 944 | 348 | 901 | 788 | 320 | 301 | 163 | 1641 |

*Note: the 7030+ is priced better in Europe. Weight is in pounds; volume is in cubic inches.*

Each radio has an attenuator, variable AGC, and narrow (~2.35 kHz) filter. The R30 alone is missing squelch, scan, and a clock. Four cost significantly less: the R75, FRG100, R30, and Sat800. Three lack a direct frequency entry keypad: the RX350 [$140 extra], FRG100, and R30. Three have lightweight knobs: the R8B, FRG100, and R30. The 7030+ and R30 have undergone silent revisions. 7030+ failures include: buttons, speakers, jacks, encoders, power supply, J309 JFET, SD5400 mixer, etc. Each 7030+ has its individual quirks. R30 failures include: power switch, adapters, encoders, etc. The Sat800 has quality control issues and mediocre construction but is under warrantee for 1 year by R.L. Drake. The Sat800 is huge, the R30 is tiny; both can be battery operated. The 7030+ is sold in few stores in North America and the FRG100 has been discontinued.

## 2. Usage

Tabletops are used for two distinct reasons. SWL ("shortwave listening") is hour after hour listening to broadcast shows transmitted at high power (aids reception by portables). DX ("distance reception") is identifying low power or distant signals including amateurs and utilities (military, aviation, maritime, beacon).

| Signal | Type | Mode | Power | Usage | Publication |
|---|---|---|---|---|---|
| SWL | DSB | AM/SAM | High | major programs or news broadcasts | *Passport* |
| DX | SSB | SSB | Low | utilities, ham, pirate, clandestine | *WRTH* |

*Note: DSB and SSB are both amplitude-modulated emissions.*

## 3. SWL

All of the tabletops are capable of hearing SWL. However, for optimal listening, the receiver needs a good AGC, high fidelity, and synchronous detection (SAM). A slow AGC is critical for dealing with normal fading. SAM clears reception by inserting a carrier that maintains phase with the incoming carrier. SAM also reduces distortion caused by a rarer type of fading called selective fading. ECSS (tuning DSB signals as SSB) can be used for severe selective fading. Under ECSS the BFO does not require a carrier for lock but receiver stability and fine tuning steps are critical.

Since DSB offers two copies of the audio the sideband with the least interference can be selected via phasing or filter. The radios offering SAM can select a sideband; however, only the R8B and Sat800 include R. L. Drake's high-performance and easy to use design. The R75 can select a sideband in SAM mode by engaging the narrow 9-MHz IF SSB filter and applying PBT.

The stock $500 R75 has a too-fast AM/SAM AGC, poor fidelity, and broken SAM. Design flaws and their fixes are well documented at the *R75 Yahoo Group*. ICOM made electrically minor errors that severely degraded SWL performance. The R75 uses the Motorola C-QUAM® stereo decoder chip [0.3% THD and ± 3 kHz lock range]. Kiwa Electronics (*www.kiwa.com*) can modify an R75 for $80 as follows for optimal SWL:

| Price | Kiwa R75 Mod | Fixes |
|---|---|---|
| $45 | Synchronous Detector Upgrade | SAM and AGC |
| $35 | High-Fidelity Audio Filter Upgrade | Fidelity |

The stock $500 R75 can also be mated to *Robert Sherwood*'s (*www.sherweng.com*) $550 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 [plus $45 for installation]. This potent yet *affordable* combination of high performance DX rig and high performance SAM has received some glowing reports.

| SWL and DX | Radio | Cost |
|---|---|---|
| KILLER COMBO | Sherwood SE-3 / ICOM R75 | $1175 |

The NRD545 and RX350 are slow to gain and have difficulty maintaining SAM lock. The NRD545 has poor audio: hiss, unnatural sound, DSP burps/clicks, and low volume. The RX350 has firmware bugs which can cause the unit to freeze; resets, unfortunately, erase the memories. The FRG100 and R30 do not have SAM.

| Feature | NRD545 | 7030+ | R8B | RX350 | Mod R75 | FRG100 | R30 | Sat800 |
|---|---|---|---|---|---|---|---|---|
| Price | $1800 | $1490 | $1470 | $1200 | $580 | $600 | $580 | $500 |
| SAM | FAIR | AOR | Drake | BROKEN | Motorola (Kiwa) | NO | NO | Drake |
| Audio | POOR | GOOD | GOOD | GOOD | GOOD (Kiwa) | GOOD | GOOD | GOOD |

*Note: the R75 requires modification for optimal SWL usage.*

Below is a list of published SAM mode "overall distortion" values.

| Feature | RX340 | 7030+ | R8B | Sat800 |
|---|---|---|---|---|
| Price | $3950 | $1490 | $1470 | $500 |
| SAM Distortion | 2.6% | 2.0% | 0.6% | 2.4% |

## 4. SWL Recommendations

For optimal SWL the Drake R8B is the clear winner. *Passport* states that the R8B "gets everything right". However most would be happy with a modified R75 or Sat800 at one third the price. Note that *Passport* rated the modified R75 better than the Sat800 without testing the SWL enhancing High-Fidelity Audio Filter modification. The SE-3 enhanced R75 is also an option. *Other tabletops can be mated to the Sherwood SE-3 as well.* The 7030+ offers Sat800 level SAM distortion at triple the cost. The other radios have poor or missing SAM. Ironically the Sat800 has less SAM distortion than the professional $3950 RX340. The Sat800 is ideal for beginners and non-technical buyers as it is easy to use and comes with a built-in antenna and good speaker. The unit should however be examined for defects. Note that the Eton E1XM will likely replace the Sat800.

| SWL Distinction | Radio | Cost |
|---|---|---|
| BEST PERFORMER | Drake R8B | $1470 |
| BEST VALUE | Modified ICOM R75 | $580 |
| KILLER COMBO | Sherwood SE-3 / ICOM R75 | $1175 |
| EASIEST | Grundig Sat800 | $500 |

## 5. DX

All of the tabletops are capable of hearing DX. However, for optimal monitoring radios need great SSB: fine tuning steps, good filters, and multiple tools. On weak stations SAM is difficult to use: even the Drake and AOR designs emits hiss and have trouble gaining lock. The RX350 alone has a small bandscope; unfortunately, the entire display is pixilated and ghosts. The R75 alone has dual pre-amps and twin-PBT.

| Specification | NRD545 | 7030+ | R8B | RX350 | R75 | FRG100 | R30 | Sat800 |
|---|---|---|---|---|---|---|---|---|
| Price | $1800 | $1490 | $1470 | $1200 | $500 | $600 | $580 | $500 |
| Tuning Step (Hz) | 1 | 2.7 | 10 | 1 | 1 | 10 | 20 | 50 |
| Stability (ppm) | 2 | 1 | 5 | 1 | 1 | 10, 2 ($95) | 5 | 10 |
| Filters | 998 | 4 | 5+ | 34 | 4+ | 3 | 2 | 3+ |
| Optional Filters | NO | YES | NO | NO | YES | YES | NO | NO |
| Sensitivity (µV) | 0.32 | 0.19 | 0.25 | 0.35 | 0.16 | 0.25 | 0.50 | 0.50 |

*Note: the R75's twin-PBT allows simulation of multiple filters. The R8B and Sat800 have phasing.*

Fine tuning steps of 1-Hz and stability of 1-ppm are ideal for DX. Fine tuning can be achieved via DDS (Direct Digital Synthesis) or PLL (multi-loop or fractional N synthesizer). JND (Just Noticeable Difference) for the human ear is 1.5 Hz at 500 Hz meaning we can detect a difference between a 500.0 Hz and 501.5 Hz tone. JND varies with frequency: JND is 2.9 Hz at 1000 Hz, 5.8 Hz at 2000 Hz, and 8.7 Hz at 3000 Hz. An ECSS (tuning DSB signals as SSB) trick involves using a wide (~6 kHz) filter on SSB and tuning in 1-Hz steps until there is no "flutter" [dead on]. After which the normal SSB filter (~2.35 kHz) can be engaged for monitoring. The human ear acts as a mechanical spectrum analyzer: it responds to the amplitude of the harmonic components but not their phase.

The NRD545 and RX350 are capable of numerous bandwidths via DSP IF. Unfortunately both units have inadequate ADC lines [18-bit NRD545; 16-bit RX350] on their DSP units. Ultimate rejection and dynamic range suffer. The R75 achieves numerous bandwidths via twin-PBT. Any SSB filter from ~400 Hz to ~2400 Hz can be simulated without the drawbacks of DSP IF using low resolution ADC inputs. Placing the filters over one sideband of a DSB signal allows simulation of ~800 Hz to ~4800 Hz. The R75 does not need any additional optional ICOM filters. The R8B comes with a potent filter setup: five LC filters and phasing. Internally the R8B has a single 50 kHz filter network that is manipulated by deQing, like the old "4" line.

| Feature | NRD545 | 7030+ | R8B | RX350 | R75 | FRG100 | R30 | Sat800 |
|---|---|---|---|---|---|---|---|---|
| PBT | YES | YES | YES | YES | DUAL | NO | NO | NO |
| RF Gain | YES | YES | YES | FAIR | YES | NO | NO | NO |
| Noise Blanker | YES | $330 | GREAT | FAIR | YES | YES | NO | NO |
| Notch Filter | AUTO | | YES | AUTO | AUTO | NO | NO | NO |
| DSP Noise Reduction | YES | NO | NO | YES | YES | NO | NO | NO |
| RS232 Control | YES | YES | YES | YES | YES | $90 | NO | NO |

The FRG100, R30, and Sat800 are missing basic DX features including PBT, RF-gain, and notch filter. Notch filters eliminate single-pitched noise (heterodynes). Noise blankers, missing on the R30 and Sat800, block impulse noise. DSP noise reduction can make searching for signals more enjoyable and protect hearing. The NRD545 and RX350 use IF DSP while the R75 uses an AF DSP [$140 value, free with coupon]. Aftermarket DSP noise reduction units cost $230 and up.

## 6. DX Recommendations

For DX the ICOM R75 is an excellent choice. Note that *WRTH* awarded 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 DSP IF receivers above are unimpressive: they all have flawed SAM units and inadequate ADC resolution leading to poor dynamic range. Whereas the 24-bit ADC $1550 ICOM 746Pro has excellent dynamic range and a SAM unit that never loses lock. The 746Pro transceiver is a *better* radio than the RX340, NRD545, and RX350. DXer and radio aficionado *Dallas Lankford* called the 746Pro's SAM "outstanding".

| Feature | RX340 | NRD545 | 746Pro | RX350 |
|---|---|---|---|---|
| Maker | TenTec | JRC | ICOM | TenTec |
| Price (keypad) | $3950 | $1800 | $1550 | $1340 |
| SAM | FAIR | FAIR | GOOD | BROKEN |
| ADC | 16-bit | 18-bit | 24-bit | 16-bit |
| Dynamic Range | 46 dB @ 5 kHz | 68 dB @ 5 kHz | 70 dB @ 2 kHz | POOR |
| Filters | 57 | 998 | 51 x 2 | 34 |
| Sensitivity (µV) | 0.25 | 0.32 | 0.16 | 0.35 |

| DX Distinction | Radio | Cost |
|---|---|---|
| BEST DSP IF RECEIVER | ICOM 746Pro | $1550 |

The 7030+ has a high IP mixer but it alone is also missing the bandpass filters which keep trash out of the first mixer. AOR also stopped using DDS shielding due to PCB stress causing carrier oscillator failures: noise has increased. The 7030+ has minor SSB hiss. The wide shape factor LC filters which give the R8B its mellow SWL audio do little for its DX capabilities. The R75, 7030+, and FRG100 can accept Collins 455 kHz IF mechanical filters with over 100dB of ultimate rejection. *WRTH* gave the R75 higher marks than the R8B for mechanical design, construction quality, and ergonomics. The FRG100, R30, and Sat800 are missing many important DX features. Ironically the R75 has better blocking, ultimate rejection, and dynamic range than the professional $3950 RX340. The R30 is ideal for portable LW/MW/SW DX; however, it consumes batteries and five screws must be removed to replace them.

| DX Distinction | Radio | Cost |
|---|---|---|
| BEST PORTABLE | Palstar R30 | $500 |

DXer *Jan Alvestad* compared his custom R75 with the 7030 and RX340. He found the R75 had superior sensitivity, a better frontend than the 7030, and better audio quality than the RX340. DXer *Guy Atkins* compared his custom R75 with his custom Racal RA6790GM (a $6000 rig from the 1980's). He found the R75 "more flexible in tough DX situations than the RA6790GM". He noted 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. As far as optional filters he noted: "the stock filtering and twin-PBT is a powerful combination; it's only in the toughest of DX conditions that the replacement filters [INRAD] really show their worth."

No radio clearly beats all the rest as far as DX. Propagation varies from minute to minute. Reception often depends not on the radio but on operator skill, luck, skip, geographic location, time-of-day frequency patterns, gray-line reception, sunspot activity, solar cycles, etc. The antenna is more critical to performance than which tabletop. Experienced DXers know that the tabletops are very similar. These receivers all share a similar topology: multiple-conversion super-heterodyne.

| DX Distinction | Radio | Cost |
|---|---|---|
| BEST PERFORMER | NONE | - |
| BEST VALUE | ICOM R75 | $500 |
| EASIEST | Drake R8B | $1470 |

## 7. SWL and DX Recommendations

For both SWL and DX consider the ICOM 746Pro, modified ICOM R75, Sherwood SE-3 enhanced ICOM R75, or Drake R8B. Anyone considering an RX340, NRD545, or RX350 should look at the 746Pro. Anyone considering a 7030+ should look at the R8B. Anyone considering a Sat800, FRG100, or non-portable R30 usage should look at the R75.

| SWL and DX | Radio | Cost |
|---|---|---|
| BEST DSP IF RECEIVER | ICOM 746Pro | $1550 |
| BEST VALUE | Modified ICOM R75 | $580 |
| KILLER COMBO | Sherwood SE-3 / ICOM R75 | $1175 |
| BEST SWL AND EASIEST DX | Drake R8B | $1470 |

## 8. Pictures

*Below are pictures of each unit with mention of some individual quirks.*

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>RX350<br>DUAL VOLUME AND RF-GAIN KNOB</td><td>NRD545<br>ONLY 10-Hz DISPLAY RESOLUTION</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>RX340<br>POOR DYNAMIC RANGE</td><td>746Pro<br>TRANSMIT SECTION FAILURES</td></tr>
</table>

| | |
|---|---|
|  |  |
| **7030+**<br>HEX SCREWS STIP EASILY<br>TREE MENU SYSTEM<br>LARGE BIRDIES | **R8B**<br>VOLATILE MEMORIES, BASSY AUDIO, FUSSY PBT<br>DIAL ENCODER FAILURES, POWER SUPPLY HEAT<br>CW OFFSETS AND WIDE CW FILTER SHAPE |
|  |  |
| **FRG100**<br>CHUFFS WHEN TUNED RAPIDLY | **R30**<br>MINIATURE BUTTONS, SPEAKER VIBRATES RADIO |
|  |  |
| **Sat800**<br>NO BAND SCANNING | **R75**<br>PLASTIC COVERED SMALL SPEAKER |

## Thanks

I wish to thank my good friend Pete Gianakopoulos.

## Contact

Please direct all comments to just_rtfm@<NOSPAM>yahoo.com. dr phil :)

May the immortals fill your cup with joy!