The Palstar General Coverage Receiver

A Review from a MW DXer's Viewpoint by Gerry Thomas

When I first caught a glimpse of the new Palstar R30, I was intrigued. Here was a very small (for a desktop radio), $500 radio with none of the bells and whistles that usually adorn serious and wannabe serious receivers in the $500-$1000 price range. There was no keypad, no synchronous AM detection, no passband tuning, no notch, not even a tone control. All of this was fine with me because while the aforementioned (missing) features could make life easier for the DXer, they were, by no means, absolutely necessary for hearing tough DX. Maybe this manufacturer, Palstar, had put its money into the more important stuff---good sensitivity and selectivity, an above average front end, and solid stability (for good exalted carrier selectable sideband (ECSS) performance).

Figure Error! No text of specified style in document.**-1 -- the Palstar R30**

When Palstar sent me a block diagram of the R30, I was impressed... someone knew what they were doing... seven-pole filters in the front-end filter bank, a doubly balanced very low noise JFET mixer, discrete MOSFET IF amps, even a nice roofing filter (8 kHz bandwidth) at the 45 MHz first IF. The audio amp also seemed impressive---3-4 watts with very low distortion. The only potential trouble spot I saw was the single-loop frequency synthesis system. Poorly executed single loops often are plagued by excessive phase noise which leads to reciprocal mixing problems which result in lousy ultimate IF selectivity. Only a hands-on run-through would tell though.

General Description The R30 covers 100kHz-30MHz and is the first receiver offering from Bramco Palstar (of Piqua, OH), a company previously limited to manufacturing, among other things, amateur radio accessories (e.g., tuners, filters). Bramco Palstar also makes the Lowe HF-350, which is the R30 for the European market; the only difference is a 4kHz wide IF filter instead of the 6kHz American standard.)

Right out of the box, I was struck by the R30's clean lines and small size (three or four R30's could fit in a Drake R-8 cabinet). The cabinet is heavy sheet metal (black crinkle top, gray bottom) and measures 8.26" x 2.56" x 7.68"; weight without batteries is 2.2 lbs. A very heavy-duty chromed tilt bail allows upward tilting of the front of the radio and the front panel knob count is, uh, two: A 1-3/8" tuning knob with speed dimple and an on/off/volume knob. Seven BB-sized push buttons control memory (there are 100), mode (AM, LSB, USB), attenuator (10 dB), bandwidth (wide/narrow), AGC (fast/slow) and, to the right of the main tuning knob, up/down jump tuning. Even though the push buttons are small, they are well spaced so there is little chance of a "double push". Small red LEDs above the non-tuning buttons indicate button status. The LCD digital display has one-inch numerals and the frequency is displayed to 100 Hz; a switch on the back of the radio turns on the display light. An analog S-meter and 1/4" headphone jack rounds out the front panel.

The rear panel is pretty conventional with the standard 50-ohm (SO239) and high impedance compression terminals. Audio outputs include a 1/4" external speaker jack and an RCA "line" jack for recording as well as another RCA "mute" jack (for use with transmitters). Besides the aforementioned display light on/off switch, and a DC input jack, another jack is a DC output jack which is used for powering Palstar's optional outboard active antenna (Model AA30).

Operating the R30 Operating the R30 is pretty straightforward, although the multi-talented tuning knob requires a little bit of practice to become comfortable with. The tuning knob has two tuning rate ranges. In the "slow" mode, rotating the knob slowly tunes the radio in 20 Hz steps (adequate for SSB reception); rotating the knob more quickly shifts the tuning up to 100 Hz steps (one full knob rotation therefore changes from 2 kHz per rotation to about 8 kHz per rotation). A similar variable tuning rate scheme occurs with the "fast" tuning mode: 100 Hz per step changing to 500 Hz tuning steps. This works out to about 10 kHz/full knob rotation up to 20 kHz/a full rotation. Changing between the two speed modes occurs when the tuning knob is pushed in and released (there's tactile feedback but no indicator light). In addition to tuning, this knob walks through the memory channels (after the MEM button is pressed). Holding the knob in for 2 seconds disengages the tuning if you want to lock on a frequency. Tuning in larger jumps is accomplished by pressing the up/down buttons to the right of the tuning knob. The 100 non-volatile memories are selected by either the tuning knob or the up/down buttons. The rest of the controls on the front panel are intuitive.

The Circuit The R30 is a double conversion superhet with a 45 MHz first IF and a 455 kHz second IF. A seven-pole filter bank with six ranges (.1-1, 1-2, 2-4, 4-8, 8-16, 16-30 MHz) provides front-end selectivity. After a selectable 10 dB attenuator and 30 MHz low-pass filter, RF and VCO frequencies (UHF/8) are mixed in a low-noise, doubly balanced JFET mixer to provide the 45 MHz first IF which is passed through a four-pole 45 MHz (8 kHz BW) roofing filter before MOSFET amplification. The second mixer (MOSFET) provides the 455 kHz signal to one of the two selected IF filters (Murata ceramics or Collins mechanicals; 6 kHz and 2.5 kHz; the Muratas are the higher grade CFR series (9-pole, I think) and the Collins filters are the new, compact torsional designs). AGC occurs after the second IF and rectification/product detection follows. Audio amplification is a fairly hefty 3-4 watts with very low (reported <1%) total distortion. Audio output is into a 3-inch top-mounted speaker (unfortunately rated at 800 mW).

Circuit layout is generally good with robust shielding and construction techniques. The majority of supporting components are those surface mount beasties (that make for compact radios but drive tinkerers nuts). Sensitivity on the latest models is reported to be 0.5 µV throughout the tuning range on AM, and .3 µV on SSB. The shape factor on the Collins filters is reported to be (and seems to be) quite good (i.e., <2:1).

All in all, the R30 seemed to be a well designed, ruggedly built receiver, and it was very sensitive with fine audio, but the first version that I received had several problems. First of all, due to an unfiltered AC adapter, 60 Hz harmonics wreaked havoc on the LW and MW bands (much less so on SW) making serious DX impossible. In addition, I noticed that the ultimate selectivity of both Collins filters was not what it should have been, and my locals were bracketed by spurious signals at multiples of 8 kHz from their assigned channels. I sent the radio back for servicing and received it back with the above problems solved.

When Palstar first agreed to supply an evaluation unit, I had hoped to compare it to both the new Grundig 800 Millennium and the Yaesu FRG-100, two radios in the same price range as the R30. Unfortunately, the Grundig still hadn't been released and the Yaesu had been recently discontinued. After a quick evaluation of the first sample R30, I came to the conclusion that it would be appropriate to compare it to some higher-end rigs. Therefore, I used my usual Drake R-8 and Japan Radio NRD-535D for performance comparisons.

Performance

Test Set-up Although I have the equipment to perform laboratory measurements of receivers, I have usually found careful "real world" listening tests to be more useful in determining a rig's DX-ability. Therefore, the three receivers were tested using either a 150' inverted-L wire antenna or a Quantum Loop MW ferrite rod antenna. An MFJ antenna switch box allowed quick A-B-C comparisons. Most MW comparisons were conducted during mid-day (when sensitivity differences could more easily be determined) and the cursory LW and SW sessions occurred during both daylight and nighttime hours.

The Radios

- Palstar R30. This was fitted with the two Collins IF filters. It was also production "Revision H" (plus the circuit changes that were made during the course of my review).
- Drake R-8 This is the first version of the respected R-8 series and has five IF filters (up to four useful for voice signals), synchronous AM detection ("synchro"), passband tuning (PBT), notch filter, noise blanker... all the bells and whistles. This is one of my two preferred desktop rigs for serious MW DX and is rated 5-stars by almost everyone. The pre-amp, however, is not operative on MW on this model. Original price of this radio was about $800; current models are just under $1200.
- NRD-535D This was Japan Radio's top-of-the-line semi-professional receiver until very recently. Besides having the same bells and whistles as the Drake, this "D" model also came with a 2 kHz narrow filter and a 4 kHz wide filter. It also had a variable bandwidth control ("BWC") that could further narrow some of the resident IF filters. This is 5-star receiver with an original price of $1799.

Sensitivity It is one thing to measure sensitivity in a laboratory setting with spectrally pure signals under carefully controlled conditions and quite another to hook up a broadband antenna feeding thousands of signals to the front-end. This is particularly true in the MW band where RF pollution is rampant. For these comparisons I intentionally chose very difficult-to-hear stations that were not being bothered by interference from nearby stations.

For the record, on MW, the R30 specs report a .5uV sensitivity on AM; .3uV on SSB. By comparison, the 535D's specs read 6.3uV on AM and 2uV on SSB; and the Drake states <3.0 µV, AM and <1.0 µV, SSB. (It should be noted that ionospheric/atmospheric noise levels on MW rarely get below 3µV so values below that are, theoretically, of limited value.) Sensitivity specs for SW were much more comparable although the R30 still held a slight edge, for the most part.

The target stations were WQTM-540, a 50 kWer about 350 miles to the southeast, WRZN-720, A 10kWer about 300 miles to the southeast, 950 R. Reloj, Cuba, reported to be 1-5 kW at 750 miles, and WTIR-1680, a 10 kW station about 350 miles to the southeast
Using a “longwire” antenna, the differences between the three radios were so small as to be virtually insignificant. With these extremely tough signals (which were necessary to show any difference at all), the R30 exhibited marginally better sensitivity on the low end. Perhaps the most telling was WRZN-720 where some audio was detectable (but not readable) on the R30 but not on the other two. Let me rush to state, though, that the preceding ratings were gathered on one atmospherically fairly quiet spring day that happened to occur in the middle of my testing. I have pages of comparisons on less quiet days where there were no ratable differences between the three radios at all. I decided to re-run the sensitivity tests using a tuned loop antenna. A tuned loop is inherently quieter because of its narrower bandwidth and its response to only the magnetic portion of the RF wave. The loop I chose, of course, was the Quantum Loop.

Across the band, the R30 gave stronger, more readable signals. This is due not only to, I suppose, somewhat better raw sensitivity but also to better audio. The R30's signals always sounded fuller, stronger, cleaner and easier to read than the others. Note that the 535D had a slight disadvantage with the loop because its fluorescent display gave off a slight hash that degraded the signal somewhat no matter how much I tried to re-position the loop (I turned off the 535D when testing the R30 and R8).

Selectivity This is usually where the men and boys part company. Many an otherwise fine receiver falls short on this important variable and requires the installation of aftermarket, higher quality filters. The R30 comes with high quality filters (either the Collins mechanicals or the upper level Murata ceramics), so that's a good start. But compared to the R8's 6/4/2.3/1.8 kHz IF filters and the 535D's 12/4/2/1 kHz filter array, filter choices are sparse. In addition, the Drake and Japan Radio offerings had passband tuning (PBT), synchronous AM detection ("synchro"), and notch controls, all potentially useful in producing a readable signal in tight quarters. In addition, the 535D was fitted with a "bandwidth control" (BWC) feature that allowed the 4/2/1 filters to be narrowed even further (but deep skirt selectivity was not good enough to reduce sideband splatter).

However, having been a DXer since way before the advent of PBT and synchro, I knew that there were ways to come close to the performance of these modern technologies by less sophisticated means. For example, Passband Tuning--In the AM mode, you can effect about the same result simply by tuning a kHz or two away from the carrier frequency in a direction opposite the interference. (Ceramic filters are usually better for this than mechanicals because their generally less steep skirts permit tuning a little farther away before losing the carrier.) In the SSB mode (e.g., when using ECSS), when you can't tune away from the carrier

without losing intelligibility, PBT can be a big plus though. "Synchro"--Synchronous AM detection can be a real boon... sometimes, especially if you can select a sideband. With very weak signals (i.e., DX), however, oftentimes the signal is too weak to result in a lock. Other times, even with stronger signals, the results are less than spectacular. Occasionally, the gods will be smiling, and pressing the synchro button will result in a dramatically improved signal (the offering to the gods that leads to this happy occurrence remains a mystery to this DXer, though).

Results very similar to synchro can be obtained (especially with the R30) via ECSS and a slow AGC... sometimes this method on SW showed an even greater reduction in "pumping"/distortion than the synchro mode in the other radios. Notch--Tuning away from the heterodyning signal in the AM mode or switching to a narrower filter will often eliminate a het. Switching to a sideband away from the problem signal will do the same. Low frequency hets require a notch filter, however.

The point of the preceding is to say that some of the R30's potential selectivity shortcomings can be overcome, to varying degrees, by using careful tuning techniques. In the selectivity comparisons that follow, I pulled out all the stops for each radio to produce the best possible signal, using whatever trick, technique, or control available.

Representative target stations using the Quantum Loop (nulling was no help in any of these situations) were 590/591 WDIZ Panama City, FL/Santa Clara, Cuba. The Cuban was off frequency again affording an opportunity to check close-in selectivity. WDIZ puts an S-9+10 signal into Pensacola while the Cuban is much weaker. A 1 kHz het was audible. The others were 1000 WDXE, a 1kWer about 50 miles W that is usually severely bothered by local splasher WRNE-980, and 1440 WRBE that is tough to hear next to local WBSR-1450.

The het on 590 kHz was eliminated by using either the notch filter on the R8 or 535D or by switching to LSB on any of the radios. Tuning to 587.3 kHz in the AM mode also eliminated the het. Trying to hear the Cuban on 591 kHz was valuable in that it provided information for those of us who DX the foreign split frequencies. I was amazed to get any readable audio at all but all three radios produced a readable signal using ECSS, the PBT aiding clarity somewhat. PBT in the ECSS mode proved of use again on WDXE providing a very slightly cleaner signal than the R30. WRBE-1440 illustrates the slight contribution of the BWC (band width control) on the 535D. Using just about the whole array of available tools, the BWC allowed the 535D to nudge ahead of the others by cleaning up the signal just a little bit more.

With regard to selectivity, then, the R30 with its quality Collins filters showed that it belonged in the same league as the R8 and 535D. It was never better than either radio but when it was worse, it wasn't worse by much. And I never encountered a case where the R30 failed to produce intelligible audio when the others were producing a readable signal. Also, even though the filters on the R30 are selectable independent of mode, I always found that using ECSS produced a better signal than the narrow Collins in the AM mode. It is also clear from the preceding results that having PBT available for use in the ECSS mode is of value and that it is largely responsible for the R8's and 535D's slight superiority in some situations.

Dynamic Variables Frequency stability on the R30 is rock solid. Drift is virtually nil after a very brief warm-up; ECSS signals stayed dead-on for hours. Dynamic range is reported to be >90 dB (but at 50 kHz) and the third-order intercept point is specified as +15 dBm (at the standard 20 kHz spacing). I experienced no overloading problems at my location while using the 150' antenna but would be anxious to see how well the R30 does with a mile-long Beverage antenna. (I wouldn't be surprised if the R30 did quite well with a Beverage given its lack of an RF amplifier, JFET first mixer, and reported third-order intercept point.) Spurs/images have been reported to be present but I encountered none that interfered with my listening. Speaking of images, while checking out the R30 on the tropical band, I tuned past 2480 kHz and heard American oldies music... "My first image!" I thought. Wrong. It was a harmonic of KDGO-1240 Durango, CO (and was audible on all three radios).

Performance on the Other Bands I didn't spend a lot of time on LW but when I did venture down there, I noted a hefty supply of beacons. Given the fact that Palstar didn't reduce the sensitivity in this range, I would expect the R30 to be pretty hot on LW. On the tropical bands, the R30 always seemed to provide signals with a greater "presence"--stronger, cleaner than the other radios... WWV-2500 kHz seemed like it was in the room with me instead of locked in the radio... (I'm sorry, but that's the best way I can explain it, hi). Program listening on SW was very good with the 6kHz filter but I found that I preferred the 2.5 kHz Collins in the ECSS mode with a slow AGC setting... audio was smooth with a minimum of fading and distortion.

I particularly liked the R30 on the HF utilities. Audio, again, was cleaner and the R30 seemed to have a sensitivity advantage (even though specs were much closer than on MW). For example, while listening to transatlantic flights working ground stations, several times I was able to hear the transmissions of really distant planes on the R30 but not on the other two radios. The R30 became my favorite radio for long-term channel monitoring.

Audio Quality This is one of the R30's strong points and is mainly responsible for my preferring it for extended listening sessions. Even with the little 3" speaker, the audio sounds inexplicably full and clean. Unfortunately, as noted earlier, the 3-4 watt audio amp is feeding its signal into a speaker with a maximum power rating of 800 mW so distortion can occur if you crank up the volume control. An external speaker, however, can fill the room. The only radio that sounded better was the 535D when it was in its 12 kHz IF position and using its external speaker. The highs were sparkling and the sound was full. With a 12 kHz bandwidth though, this combination can only be used on stations in the clear.

Battery Life The R30 runs on 12 VDC (via adapter) or on 10 AA penlight batteries mounted internally. I measured its current drain at about 300 mA with the display light off and about 500 mA with the light on (at normal listening levels). With the 10 fresh alkalines yielding 15+ volts, the question was, "What was the minimum operating voltage of the R30?" After seven hours of continuous play, a barely discernable audio distortion occurred; this at 10.2 V. After 8-1/2 hours, the voltage had dropped to 9.14 V, and within minutes the R30 went silent. Performance was virtually unchanged until seconds before it died. So, the operating voltage range of the R30 is about 9-15 VDC and a fresh set of alkalines should last about 8-9 hours; enough for one, long DX session. The new, high capacity NiMH penlights offer a viable, and cheaper in the long run, alternative to the alkalines since the R30 runs great all the way down to about 10 V.

Concluding Statements So there you have it... whew! This is undoubtedly one of the most difficult reviews I've ever undertaken. The radios were so close in DX performance, for the most part, that hours and hours were spent searching for

situations that could differentiate among them. In the end, though, I think I can conclude that the Palstar R30 (in its most recent version) has great potential for digging out that tough DX, especially on those ultra-quiet winter nights that we covet so much.

As I see it, the R30 will appeal to two opposite ends of the radio hobbyist spectrum. Serious DXers and DXpeditioners will appreciate the R30's tough signal performance and small size. Novices and those intimidated by knob and button arrays will select the R30 for its simplicity. I think that both groups will be satisfied with their choice. But if you want the latest and greatest gizmos and doodads in your radio... look elsewhere. Palstar put its money where it counts, in performance; and I put my money where my mouth is... after completing this review, I bought an R30.

The Palstar R30 is presently available in three configurations: R30 with Murata 6kHz and 2.5 kHz IF filters, R30 with Murata 6kHz and Collins 2.5 kHz IF filters, R30 with Collins 6 kHz and 2.5 kHz filter. (Palstar, Inc, 9676 N. Looney Rd, Picqua, OH 45356; (937) 773-6255, email: paul@palstar.com website: http://palstar.com)

Note: If you decide to purchase an R30, try to get one manufactured after March 2000. This will ensure that you will get the 500 kHz up/down tuning and the latest circuit changes. Also, beware of reviews of R30's manufactured before March 2000.