The NRD 525 - Some problems and cures.

The NRD 525 is an excellent receiver and fairly often advertised on the second hand market at reasonable prices. Its front end is well designed with a tuned preselector giving good premixer selectivity, and the first mixer though simpler than that of the later models shows as good a performance. Using home built test gear constructed from designs in the ARRL Handbook, I measured an intermodulation rejection ratio of 89dB which is almost identical to that of the 545 reviewed by Chris Lorek. It has however two weak points. It comes with only two filters as standard, the AM filter measuring 5.5kHz at -6dB giving rather woolly audio, and the ultimate rejection of around 65dB is barely adequate.

I decided to look at the ultimate rejection problem to find its cause and to see whether any improvement was possible. The obvious reason seemed to be coupling through the inductors used to L-match the IF filters, despite being mounted orthogonally by the makers. I replaced these with toroids which are effectively self screening, but was surprised to find very little measurable difference, and the mechanical filter did not seem to appreciate the high Q load. Quite by chance I found that moving the position of L3 altered the ultimate rejection, the optimum position being at about 60 degrees to the board. Replacing L3 with a toroid of the same inductance worked well, but an almost identical result was obtained by simply screening the inductor with an old IFT can. There is plenty of room around L3 to drill the board to accommodate the solder lugs, and no modification to the circuit itself is involved. This simple change improved the ultimate rejection by some 9-10 dB.

The second problem with the receiver concerns the lack of alternative filters. There are two empty filter slots, but these are designed for JRC's own crystal filters which come at premium prices and are only available for narrow bandwidths. One of these slots is bypassed as standard to allow the 12kHz FM filter to be used on AM. Although the audio is excellent through this filter, it is far too wide to be useful on the SW bands. I decided to modify the IF board to accept ceramic filters using the same L-matching system. A look through the catalogues produced the Murata CFG, CFJ and CFS series readily available in this country.

The CFJ455K8 from Cirkit seemed ideal as a CW and narrow SSB filter, and when mounted on the IF strip gave a -6dB bandwidth of 1.5kHz and 2.6kHz at -60dB. After the modification described it measured 4.3kHz at -80dB.

For a wide AM filter I used the CFG455H. Although this is nominally 6kHz it measured 8.1kHz at -6dB and 12.6kHz at -60dB. At -80dB it measured 13.8kHz. These are very good figures for its size and price, but can be bettered. This is the best filter available in the UK as far as I know but remained the weakest link in the chain.

The final stage in improving AM reception was to add selectivity at the FL2 position (situated under the metal screening box). As the set is used on AM and SSB for 99% of the time, a 12kHz filter seemed unnecessary. I therefore replaced the original LFB12 with a Murata CFU455HT which is a direct replacement pin for pin. This when cascaded with the CFG455HT in the Aux. position gives superb AM selectivity with a -6dB figure of 7.9kHz and 10.9 kHz at -60dB. The -80dB figure is 12.4kHz.

The audio is crisp and clear without interference from adjacent channels most of the time. On occasion the original AM filter is used with passband shift to clean up the signal, though this is rarely necessary. As a bonus, replacing FL2 with the narrower filter improves the ultimate rejection, though it is difficult to measure accurately due to phase noise.

The narrower bandwidth on FM (measuring 8.4kHz at -6dB) is barely noticeable in practice and well worth the sacrifice to provide the excellent AM performance. Operation of the noise blanker, for which FL2 provides the delay, was not affected.

For those wanting a narrower AM filter the CFS455J works well and gives 4kHz at -6dB, 6.7kHz at -60dB and 7.5kHz at -80dB. Others tried were a CFJ455K5 (2.7kHz at

-6dB, 4.4kHz at -60dB and 6.7kHz at -80dB) and an Icom FL44A crystal filter which does not require L-matching (2.6kHz at -6dB, 3.8kHz at -60dB and 5.9kHz at -80dB). The crystal filter was less useful than the mechanical original as the wider nose was less effective with passband shift and the steep sides showed a slight tendency to ring. It may well be that the official filters are better in this respect.
The new ceramic filters are mounted in the available slots by first pushing a thin piece of Blue-tack against the board. The filter to be used is then pressed into the Blue-tack to form a template through which the board can be carefully drilled. C55 and C56 in the FL5 position, and C60 and C61 in the FL6 position are then either removed physically which is tricky, or electrically which can be done more easily by carefully scraping away the copper foil around their earthy ends, thus isolating them from the circuit. Inductors, 220uH to match 1K5 impedance, or 330uH to match 2K0, are then hard wired from the crystal filter circuit board solder pads to the ceramic filters, taking care to mount them at right angles to each other to minimise stray coupling. 270p ceramic capacitors are then soldered directly to the filter pins to complete the L-matching. Remember to clear copper from the input and output filter pins to prevent these shorting to earth. The earth pins and case earths are soldered to the copper foil having scraped away the coating and tinned the underlying copper.
These relatively simple modifications change the NRD525 from a very good receiver to a truly great one with four filter bandwidths measuring 1.5kHz, 2.35kHz, 5.5kHz and 7.9kHz at -6dB with shape factors of 1.7, 2.0, 1.46 and 1.39 respectively, as well as improving the ultimate rejection figure. The change in FM bandwidth is a small price to pay for the excellent audio and AM skirt selectivity.
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Addendum: Since writing the original article I have made a further improvement by replacing FL2 with a Murata CFW455HT. This has the same nose selectivity as the CFU455HT but much deeper skirts typically down to -85dB before widening out to -70dB ultimate rejection. This compares with -45dB for the CFU455HT. The modification is quite tricky to do however and I solved the problem of possible leakage around the filter by making a tiny sub board of double clad printed circuit board into which the CFW455HT is soldered. Three pins then allow the sub board to plug directly into the FL2 space. A steady hand and some very precise drilling is called for but the results are excellent. Selectivity is as follows:

Bandwidth	-6dB selectivity	-60dB selectivity	-80dB selectivity
Narrow	1.44 kHz	2.56kHz	4.85kHz
Inter	2.31kHz	4.62kHz	5.88kHz
Wide	5.55kHz	7.93kHz	10.38kHz
Aux	7.45kHz	10.53kHz	11.81kHz