



JRC NRD-345

Well, you lucky chaps, you must be important as potential short wave receiver purchasers for so many manufacturers to be making the investment in new designs to tempt money from your wallet. Latest on the scene is the NRD-345, and you don't need me to tell you that it must be from JRC and the latest in a long line of top quality h.f. receivers from this mammoth company, which was founded in 1915. Having just visited one of their manufacturing plants in Japan, I can tell you that they are big - far bigger than any of the other familiar names in the field. It has always surprised me that such a company would devote time and effort to make receivers for you and me, but thank goodness they do.

Simple But Subtle

Having in the past been the UK distributor for JRC, it gave me a twinge of nostalgia to see the familiar style of carton and logo, and unpacking the NRD-345 reassured me that JRC have lost none of their expertise in making a receiver look good. Simple, but subtle styling makes the NRD-345 look very attractive and the panel layout is exceptionally friendly, with the tuning knob slap bang in the middle and the minor controls located exactly where they should be around the panel. This is a receiver which anyone can use without reference to the instruction manual because each control is clearly labelled and each control has but a single function. This harks back to the decision taken at JRC when they produced the all conquering NRD-535, that they would not use any dual controls - what a good idea for those of us going down the inevitable pathway to being slightly bewildered. The NRD-345 is smaller than its larger brothers, but not so small as to be unusable. The front panel measures 250 x 100mm, which allows sensible spacing between the controls and the depth of 238mm means that the NRD-345 will sit comfortably even on a coffee table, for indeed it looks

attractive enough to be seen in domestic surroundings. The weight of 3.5kg won't cause any unexpected visits to the hernia specialist, but it's heavy enough to be stable in use. The modest weight is to some extent caused by having no internal power supply, the NRD-345 like most modern receivers uses an external 12V d.c. supply. The colour? What else could it be but satin black, which always looks good when you first take the unit out of the box, but this admittedly popular finish does show fingerprints easily, so for those of you who like eating chips out of newspaper, you had better wash your hands before touching the receiver. But that's enough, the NRD-345 is attractive, the right size and weight, and has the right upbringing, let's take a tour around the panel.

Quality

The starting point has to be the JRC badge, not because it's made by Fabergé (it's not) but because that badge denotes quality of manufacture. JRC have a much envied reputation for high production standards and it's well deserved, judging by the minimal fault returns on the thousands of JRC receivers I sold in the past. I see no reason why the NRD-345 should let that reputation down. The major front panel controls are related to tuning the receiver, and the main tuning knob is a good size and weight with a silky smooth feel to it. The tuning rates are initially set to default values at switch on, but are easily varied by the user at any time. The tuning step in use is shown by a small arrow alongside the appropriate digit of the frequency read out on the main display, and is changed by pressing the kHz and MHz buttons on the numeric keypad. Although the least significant digit on the display is 10Hz, the finest tuning step is actually 5Hz, which is small enough to give smooth tuning on any signals, even data which does require a very slow rate. Prodding the kHz button changes the tuning steps from 10(5)Hz to 100Hz, 1kHz and 10kHz,

then back to 10(5)Hz again, with the little arrow pointing to the step chosen on the display. Very neat and easy to use. The resultant tuning rate per knob revolution is shown in Table 1.

Table 1. Tuning Rate

Tuning Step	Change for one Revolution
(Hz)	(Hz)
10 (5)	250
(kHz)	(kHz)
100	5
1	50
10	500

You can see that, with only 250Hz per revolution, using the smallest step, the resultant tuning rate is impressively slow for pinpoint tuning, whilst the selection of the other tuning rates gives the ability to race up and down the spectrum with ease. I found myself using the 100Hz step most of the time for general tuning around, but when the going got tough I soon switched down to the finer resolution of 250Hz per turn of the tuning knob. Tuning can also be carried out by using buttons labelled with left and right arrows conveniently placed just above the tuning knob. These change the receiver frequency in the steps chosen by the use of the kHz button, even down to the finest 5Hz resolution, but it's a pity that 5kHz and 9kHz steps are not provided because they would have been ideal for short wave and medium wave channel hopping. The MHz button moves the little arrow to the MHz digit on the display and the tuning increments are then 1MHz.

Couldn't Be Easier

Having mentioned the keypad, let's turn to that method of putting the receiver on to a wanted frequency. It couldn't be easier, just key in the frequency you want, terminating the entry with kHz or MHz as you prefer. For example, if you want to listen to 5975kHz that's what you

key in. If you prefer to use 5.975MHz instead, then that is, again, what you key in. A 'clear' button allows you to cancel any incorrect entry. The keypad is also used for time setting the clock and selection of memory channels. The keys are soft to the touch and operate easily, with a 'click' feel so that you know selection has been made, but I would like to have seen provision for a keypad on a flexible lead or an infra red link so that I could use it flat on the table (the keypad, not me!), because horizontal keys are so much easier to use - that's why computers don't have vertical keyboards. A further, and very interesting use for the keypad is the function of directly keying in short wave bands in metres rather than frequency. For the 41m band for example, you key in 41 followed by a poke at the 'mte' key. Sadly, in common with many manufacturers, JRC refer in their handbooks to wavelengths as 'metres' instead of the correct 'metres'. To read '41 meters' calls to mind a long line of AVO instruments side by side, 41 metres is clearly a measure of a wavelength. JRC have provided no less than 22 'mtr' bands from 160 to 10 metres covering both broadcast and amateur bands, with the mode and tuning rate automatically set for the chosen band. Now at this point, I had seen this idea before, and sure enough, I realised that the AOR AR3030 has exactly the same feature set up in exactly the same way, so either JRC have bought in the software design from the AOR designer, or they have pinched it - hardly likely with JRC's reputation. Having used the direct band access and found it very useful, I'm pleased that such a good design feature has been provided by both AOR and JRC. It also removes the need for me to remember the start and stop frequencies of the 41 metre band or any other broadcast band. Finally, two independent v.f.o.s are provided, each covering the entire tuning range of the receiver, with the usual facility to swap between them or equalise them in frequency. Very useful to use one

John Wilson has been looking at the latest receiver to come out of the JRC stable, the NRD-345

as a 'scratch pad' memory or to jump between two frequencies when listening to duplex radiotelephone channels. Both v.f.o.s incidentally also store mode, filter bandwidth, a.g.c. setting, noise blander on/off and r.f. attenuator on/off, so they are effectively two separate receivers.

Bright Display

The main front panel display is bright and easy to read with black characters on a yellow background. Frequency is shown to seven digits, the last being 10Hz (although the receiver tunes in 5Hz steps) and the display also shows all the subsidiary information about memory channels, v.f.o. A/B, noise blander on/off, r.f. attenuator setting, a.g.c. speed, mode in use, etc. Pressing either the 'clock' or 'timer' buttons changes the frequency read out to time read out, and I will just mention here that although the NRD-345 has a timer function to switch the receiver on and off at preset times, it does not provide any switching function to turn on an external tape recorder, so unattended recording is not possible unless you use a voice operated tape recorder. Strange omission from the otherwise comprehensive specification.

Alongside the display panel is a back-lit signal strength meter and it's a proper moving coil analogue meter, which waggles nicely, bringing pleasure to traditionalists like me. The calibration is in 'S' units from 0 to 9 with +10, 20 and 30dB above 9, but the numbers from 0 to 9 are 1, 3, 5 and 7 with no space for intermediate steps. Still, it works well and is very easy to read. To the right of the main tuning knob are push buttons for v.f.o. selection, mode and dial lock.

The NRD-345 has a goodly selection of reception modes including u.s.b., l.s.b., c.w., a.m., synchronous a.m. and FAX. When switching from u.s.b. to l.s.b., the receiver remains exactly on frequency and no-retuning is necessary. This makes it really easy to use exalted carrier reception of fading a.m. signals with selectable sidebands, but of course we also have synchronous a.m., so why not use that? Simply because JRC have fitted the synchronous a.m. system from big brother NRD-535, which uses the incoming carrier of the station being received and processes it to give reasonably constant amplitude before re-combining it with its sidebands in the s.s.b. product detector.

SPECIFICATION

Frequency Range:	100kHz to 30MHz			
Modes:	a.m., synchronous a.m., u.s.b., l.s.b., c.w. and FAX			
Architecture:	Double superheterodyne			
	First i.f. 44.855MHz			
Sensitivity:	s.s.b.	c.w.	FAX	a.m.
(MHz)	(dBµ)	(µV)	(dBµ)	(µV)
0.1 - 0.54	0	1	10	3.2
0.54 - 1.8	15	5.6	25	17.8
1.8 - 30	-10	0.3	6	2
S+N/N: 10dB; Modulation: 400Hz, 30% (a.m.)				
Selectivity:	WIDE: ≥ 4kHz (6dB); ≤ 10kHz (60dB) NARR: ≥ 2kHz (6dB); ≤ 6kHz (60dB) AUX*: ≥ 500Hz (6dB); ≤ 1.6kHz (60dB) * AUX bandwidth is with CFL-232 optional filter fitted.			
Image Rejection:	> 70dB			
IF Rejection:	> 70dB			
AGC:	< 10dB a.f. output variation for antenna input signal change from 3µV to 100mV < ±10p.p.m. after 5 to 60min warm-up period. < ±5p.p.m. per hour thereafter.			
Frequency Stability:	Speaker: 1W into 8Ω 10% distortion Line: 700mV 100kΩ load 10% distortion			
Audio Output:	12V d.c. 800mA			
Power:	250 x 100 x 238mm			
Size:	3.5kg			
Weight:				

Because the reinserted carrier is still the original in phase component of the incoming signal, there are no heterodyne howls as the system operates, and you are blissfully unaware that the synchronous detector is working until of course you realise that the selective fading effects have diminished. However, the minor drawback is that you do not have the facility to select sidebands when in 'Sync' mode and therefore cannot choose the least distorted sideband unless you revert to u.s.b./l.s.b. exalted carrier mode. But it works well in practice and is easy on the ear until you go some way off tune when reception becomes distorted - you are warned about this in the handbook.

The c.w. mode is set to give an 800Hz tone when the frequency of the receiver is zero beat with the incoming carrier, but no provision is made for tuning the b.f.o., so if you have an optional narrow c.w. filter fitted, it's 800Hz or nothing. In FAX mode, the receiver shows the incoming signal frequency when the receiver output tone is 1.9kHz centered on an 800Hz shift - all perfectly correct and tickety-boo.

All the modes work extremely well, with good quality recovered audio and absolutely no fuss about mode selection because the receiver is always showing the correct frequency. This is, I suppose, only to be expected from an experienced communications company like JRC, but not all

manufacturers take the same trouble over these details.

Alongside the buttons are the rotary controls for a.f. gain and tone. Both are standard analogue controls, which operate very smoothly with the tone control being a simple high frequency variable cut which can help when receiving noisy signals. Above the a.f. gain and tone controls are the two buttons selecting 'ATT' and 'AGC'. There is a single step 20dB attenuator fitted to the NRD-345, but I think that the receiver could benefit from two 10dB steps - see later. On first using the receiver I thought that the a.g.c. had simple slow and fast settings, but perusal of the manual told me how to enable an a.g.c. off setting as well. You know that I am in favour of being able to switch off the a.g.c., but it's no good unless you also have an r.f. gain control, and this is one omission I find very hard to take from JRC. For a receiver from such a company to come without an r.f. gain control is almost unforgivable, and the keen operators will miss it. Let's have the tone control removed and an r.f. gain control in its place, please.

Doing a swift *arabesque* to the other side of the tuning knob, we find the 'MEMO' and 'MR' (memory recall) buttons, together with the 'Filter' select button. The NRD-345 comes with two i.f. filters fitted as standard, a good nominally 2.3kHz narrow and a nominally 4kHz wide. An 'AUX' facility allows mounting of one of the superb JRC crystal filters

normally used in the NRD-535, and although most people will assume that this means a c.w. filter, in fact, the range covers five bandwidths from 200Hz to 2.4kHz. All these option filters are top class 455kHz multi-pole crystal units which means that they are amongst the best you can buy - they are also amongst the most expensive, but believe me, the performance is well worth it. However, the two filters already fitted are very good, with the narrow unit giving steep sided adjacent sideband rejection and the 4kHz wide filter providing pleasant a.m. quality with decent rejection to go with it.

Three more buttons provide memory scan, memory skip and noise blander on/off. The blander works well, aided by the fact that it has a variable threshold set by a convenient rotary control alongside the on/off button. This performed entirely to my satisfaction, and although over ambitious use of the threshold control can sometimes result in signal distortion, I didn't notice this to any great extent, and the blander worked very effectively. Now what was it I had to remember? Oh yes, the memories.

Lurking inside the NRD-345 are 100 memory channels, each one storing frequency, mode, a.g.c. setting, r.f. attenuator setting, filter bandwidth and noise blander on/off. The memory contents are backed up by a lithium battery fitted internally, which has a stated life of about

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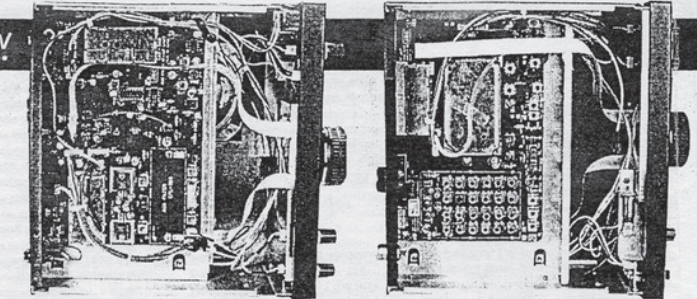
five years. Putting settings into any memory is extremely simple, as is recalling any channel and there are further enhancements in the provision of a memory scanning system which allows you to set the receiver to automatically scan through any or all of the memories, pausing on each one. There is no squelch or noise suppression system on the NRD-345 so the scan pauses on each selected channel for long enough to allow you to hear what is happening. The pause time can be selected between 1 and 9 seconds and there is a further feature which allows you to designate memory channels which you want to scan to skip over. By careful memory management, you could therefore have groups of, say, h.f. airband channels grouped together and scan only those, or a group of BBC World Service frequencies together and scan them continuously to check which frequency is providing the best reception. In common with the other facilities on the NRD-345, the memory system is really easy to use and does exactly what you want when you want.

Fouette To The Back

Having *arabesqued* across the front, let's now *fouette* to the back panel. Here we find an RS-232 connector, which gives you computer chaps full access to the internals of the receiver. Just about every function of the NRD-345 is available via the RS-232 port and the receiver also replies (not Hello Sailor again?) to confirm the settings you wanted changed have been changed. JRC even give a sample little program (why oh why can't we spell programme?) in the handbook to get you going. I have no doubt that the software demons will be writing lots of interesting tricks for the NRD-345 to do, so keeps your eyes on the advertisements. Joking apart, it's a fact that all the receiver functions can be controlled from the data port and the handbook gives complete details of every command and response given.

The antenna connector is a standard SO-239 socket for the 50Ω coaxial input, with a terminal block for the alternative high impedance long wire input and a switch to change from one to other. Three miniature jack sockets give external speaker, record output and FAX output, with the record and FAX levels being fixed and not affected by either the volume or tone controls on the front panel. All neat and comprehensive.

Looking inside one cannot fail to be impressed by the beauty of the construction. The r.f. and mixer stages are on one board,



with the i.f. and audio on another, separated by a substantial screened spine along the width of the receiver. You can't see much of the front panel gubbins because it is hidden behind an all-enveloping r.f. shield, which effectively removes any control processor noise from the sensitive r.f. bits. JRC do know how to make circuit boards of the very highest quality.

Technical Details

So, Dr. Frankenstein, let's get to the gory technical details. How did it perform under the operating table lights?

I measured the receiver noise floor at -135dBm with an intermodulation free dynamic range of 84dB and a 3rd order intercept point of -9dBm at 20kHz spacing using the nominal 2.3kHz i.f. filter (actual measured 2.6kHz).

Table 2: Reciprocal Mixing

Spacing from wanted signal (kHz)	Reciprocal mixing ratio (dB)	dBc/Hz (dB)
5	67	101
10	78	112
20	88	122
50	97	131
100	104	138

Stop yawning and listen! The NRD-345 is sensitive - possibly too sensitive for its own good, and certainly more sensitive than the other receivers in its category - but that's not necessarily a bad thing if you want to wrinkle out weak signals on 10 metres. However, on lower frequencies, you will find yourself making use of the r.f. attenuator and then you find that the single 20dB step is sometimes a bit harsh, which is why I said earlier on that two steps of 10dB would have been a better choice - or an r.f. gain control, did I hear someone cry? Put it into some context, it's better than my KWM-2, but not so bomb proof as the AR7030. It's better than the beloved TS-900 transceiver, which was hand-built by Kenwood to prove that they could make the best in the world, and how that world has changed with receivers like this. I wish that I had been able to do the tests

using one of the narrow c.w. filter options because that would have given a more impressive result, but you knew that didn't you?

Reciprocal mixing performance is not so good close in, but improves at wider spacing from the wanted signal. In this area, it's not as good as my KWM-2, but that's only to be expected when the KWM-2 uses a quartz crystal as the first conversion oscillator. Measurements were taken using the 2.3kHz filter.

The 'S' meter calibration was good, corresponding to a nominal 6dB per 'S' point across the scale, with S1 at 4μV. The receiver sensitivity for 12dB SINAD on s.s.b. using the 2.3kHz filter was a credible -126dB and on a.m. with 60% modulation -117dBm. As I have already remarked, this is probably too sensitive (who would ever have thought that a reviewer would say 'too sensitive'), but you always have the attenuator button...One niggle is the annoying habit of Japanese manufacturers to take it upon themselves to stick a 20dB attenuator in the medium wave tuning range from 1.8MHz to 540kHz and sure enough, JRC have

done it. Why? ostensibly to reduce intermodulation problems in the medium wave band, but if you happen to be a medium wave DXer and need that extra bit of gain, it's not much good having 20dB of attenuation forced down your throat. I'm sure someone will find a way of disabling it in due course.

Smooth AGC

The a.g.c. performance is smooth and bounce free, although I did notice an odd 'latch up' effect when brutalising the receiver with high levels of two tone test signals. Under some conditions, when increasing the input signal from S1, at about S3 the receiver gain would step up and remain up even though the input signal was reduced down to the original S1 level. Odd, but it only happened under test conditions and didn't cause any distress in real

operation. The audio output always sounded nice and clean whatever the signal levels, but that high sensitivity did make itself apparent when listening to signals below the a.g.c. threshold when the receiver background noise was slightly intrusive - of course that is offset by the fact that I was listening to signals at a fraction of a microvolt - not too many receivers can do that (as Michael Caine might have said). Lots more to say, but no space to say it, so let us hear the conclusion of the whole matter (Ecclesiastes Ch. 12, v.13):

The NRD-345 is a little honey of a receiver because it combines good (not great) performance with a logical, easy to control layout. The concept of a knob for each function is something JRC have clearly decided is to be one of their design aims and it pleases me no end. At the suggested retail price of £795 it sits in the hottest spot in Hades, competing with the AR7030 from AOR, the Lowe HF-250 Europa, and the yet to be tested Fairhaven receiver. The AR7030 is at the leading edge of r.f. performance and will not be bettered for a long time. It is, if you like, the Formula 1 Ferrari of the receiver world, and if you have the skills of Michael Schumacher it will dance to your music of time. The Fairhaven has still to be tested, and I hope I have the privilege in due course. The Lowe HF-250 Europa is starting to show its age, but the NRD-345 carefully steers its way through traffic to give the balanced drive and ease of use which you might expect from a Mercedes - and with the JRC background of reliability, the Mercedes - and with the JRC background of reliability the Mercedes analogy is quite apt.

I'm glad I don't have £799 pounds to spend on a new receiver, because it is becoming an increasingly difficult choice to make, so all I can say is that the NRD-345 is a strong contender for your approval and you should hot foot it to a decent dealer and try it out. Perhaps, since Nevada, 189 London Road, North End, Portsmouth PO2 9AE. Tel: (01705) 662145 were kind enough to lend me the unit for test, your first call should be there!