

# NEWCOMER'S

## Receiver parameters

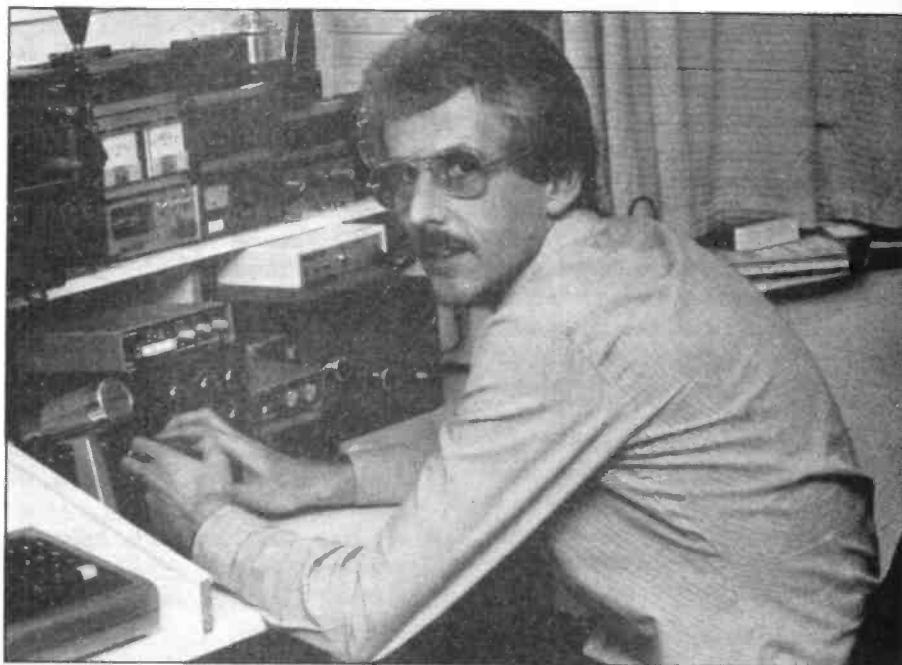
When you look through the technical reviews in *HRT* or read about receiver designs, you may well be coming across a number of terms used in describing performance, that are not familiar to you. Or, you may not be exactly sure what they are actually describing. Over the next few months we will take a look at some of these terms, and try to describe in plain language what each means.

Dynamic range is a term that has appeared more and more over the past few years and is very 'in' at the moment, with manufacturers claiming all sorts of figures up to 100dB+, although not always borne out in practice, as you will see from some of the lab results in this magazine and others.

What exactly do we mean by dynamic range? Well, simply put it is a measurement which tells us how well the receiver can cope with more than one strong signal being present at the input, without generating any unwanted spurious signals.

Some years ago, the accent on receiver specification was on sensitivity, with a sensitive receiver being judged as one which made a lot of noise when the aerial was connected, even when no signals were about! Unfortunately, this excessive front end gain did nothing for the dynamic range, and many of the bands covered probably contained more spurious signals than wanted ones.

The side effects of a poor dynamic range are mostly well known — Cross-modulation, where a wanted signal is modulated by another signal outside the immediate receiver passband is the best known. This may take the form of the wanted signal literally being modulated by spurious audio signals, or CW being heard on the wanted signal. Desensitisation is another effect — many of you will have met this when a local signal has come up further down the band, and wiped out the signal you were listening to. This effect mustn't be confused with a similar effect that can



occur when a very strong station comes up very close to your frequency — this is more likely to be due to poor skirts on the IF filter in the receiver, or 'bleedover' as it is now often known in other circles.

## IMD

One of the other parameters you will spot in the reviews are IMD products (InterModulation Distortion), normally of interest in the transmit section. IMD arising from the mixer in a receiver can also cause problems, and leads to spurious signals appearing in the band, when a strong signal appears somewhere else. Again, the cause is poor dynamic range, and it is the evaluation of this figure which is of interest.

Before we look at how the figures are defined and measured, there is another related measurement we must understand, and that is the Minimum Usable Sensitivity, which is related to the Noise Floor level of the receiver. Obviously, signals below the noise level of the receiver will not be heard, and those that are exactly at it won't be much better either. There are specialised techniques available

nowadays to extract signals from the noise, but these don't concern us here.

For practical purposes, the minimum usable sensitivity is conveniently defined as a signal 3dB above the noise floor level — this is a figure rather lower than the minimum sensitivity usually quoted by manufacturers, which is normally for a 10dB signal + noise/noise ratio. However, it sets the level at which we will be measuring our dynamic range.

## Measuring dynamic range

In order to actually measure dynamic range in the lab, we will need two high quality signal generators, free of any spurious outputs (as the whole purpose of the test is to measure some spurious signals), with which to generate two strong signals. These will be applied to the input of the receiver through a combining attenuator pad, to prevent interaction between the two generators. See Fig. 1. The two signals will be spaced from each other by a specified gap, usually 20 or 50kHz. With a ham-band receiver, the test is usually conducted at 14MHz, and