loss may be as low as 0.3dB or so, but I have measured some well known Japanese black boxes with over 4dB loss in the same route, which explains why the average noise figure of these black boxes is as bad as 7dB or so. So it is much better to put the preamp outside the rig, but this may involve marked losses in the two relays required to bypass the preamp on transmit, unless you use good quality ones. The main loss, of course, will be the relay on the aerial side of the preamp, so use the best one you can afford in this position. A good relay will only lose perhaps 0.05dB on 2m. If your rig has a large loss on the input circuit, and has the legendary 7dB noise figure, and the preamp/relay combination has a 1.2dB noise figure, then you will need around 16dB gain if you want to see almost all of the noise figure improvement given by the preamp. This will degrade your RFIM performance by a colossal 35dB or so on the average rig, which is dreadful. It is vital, therefore, to be able to switch your preamp in and out so that you can choose which is best in any circumstance. You may, of course, buy a preamp which has automatic RF sensing, in which case you will not need to incorporate wiring to the rig which changes the relays over, etc. But you may have a very long and lossy lead to your aerial. It is not unusual to have a loss of 3dB or so, in the coax lead, especially if you have rummaged around your junk boxes for various bits of coax, and have connected them up with umpteen SO239/PL259 back-to-backs to make the lead long enough. (I assisted one young amateur only last week who had done just this, and what was even worse, used plugs designed for CB use, which were very lossy on 145MHz!) The answer to this problem on receive is to put the preamp at the masthead. Now you've got an overall cable and receiver input loss of 10dB, ie. the cable loss plus the input noise figure. You'll need at least 18dB to overcome these losses almost completely.

Noisy neighbours

Fortunately, or unfortunately, whichever way you look at it, the actual band noise on 2m is equivalent to a noise figure of at least 3dB, and sometimes a lot higher, particularly if you've got 10 neighbours, who all have thermostats on the go which are out of sync with one another. I reckon

Wood and Douglas PA4

that you won't gain much by improving your overall system noise figure to better than 2.5dB or so, unless you really are working in the middle of the night, and trying to receive a very weak station, with no other amateurs close to your frequency, with no local interference, and you are not pointing at the Crab nebula! Joking apart, you'll only need a significantly better noise figure for meteor scatter, moonbounce or satellite reception. I have a 1dB noise figure early SSB Products preamp at my masthead, and 1dB cable loss into a Microwave Modules 2m transverter which has a measured noise figure of 2.1dB, and I can notice only the minutest difference to the readability of the weakest signals when I switch on my masthead preamp. For this reason you will probably only need (in the example mentioned) 15dB gain. If your black box is a little better, and you are using UR67, or even better, H100 cable, then a 12sB gain might be sufficient, and even 10dB gain will give you a marked improvement. Don't forget that the lower the gain, the less will be the deterioration in overall RFIM performance.

Unfortunately, we've not yet finished with the discussion of problems encountered when adding preamps. Its bandwidth can be very important indeed in some locations, and out-of-band signals may be a dreadful nuisance if they are strong, since they may generate IM products within the 2m band. This is highly dependent on the performance of the main rig. If you live out in the country, and you do not have any police transmitters lurking around in the band 146MHz to 150MHz, nor any strong signals below 144MHz, then you won't have to worry. Living in Finchley, I am surrounded by police FM transmitters just above 2m, and a bad rig is soon shown up by intermod. products appearing on various FM channels. This can be most annoying, some rigs being virtually perfect, whilst others are diabolical. If the preamp has an overall flat bandwidth of tens of MHz around 2m, then you may be in a lot of trouble. One that starts falling in gain at the band edges fairly rapidly, but also preserves its noise figure reasonably across the 2m band is going to be a lot better. You will need to weigh up, therefore, the bandwidth, gain and noise figure, as well as the preamp's own IM performance, before you make your final choice. Most preamps are much better than the rigs which they feed, so the preamp RFIM performance is only going to be a fairly important factor if the main rig is bomb proof.

Transmitter power

Another important consideration is the relationship between overall receive performance, and the power used on transmit taken at masthead. Most stations run at least 10W PEP output, which will be, say, 5 to 8W at the aerial. If you are running a barefoot low power rig which is providing only a watt or two at the masthead, then you will not need a masthead preamp, unless you want to work other low power stations, or your rig is in desperate need of a deaf aid (you'd be surprised just how many rigs need this). If you are running anywhere from 50W to 400W at the masthead, then the likelihood is that you will be running more power than many other people, so you will need a good sensitive receiving system to pick them up if they are weak. Perhaps the chap the other end has a very deaf receiver, and if so, then you'll probably be all right! Sometimes a very good system sensitivity can be a boon, even if you have low power. Suppose you