

DMD20 Universal Satellite Modem Application Note

1.0 Introduction

The purpose of this application note is to provide information pertaining to the DMD20 Universal Satellite Modem.

2.0 Wide Band Modems Need an Adaptive Dynamic Range Receiver

In the past, modems had an input dynamic range that was independent of the data rate. This was due to the fact that it was easier to design an analog demodulator that had a fixed input range (for example -30 to -55 dBm). Users have gotten used to this even though it is not how satellite links actually work. In the past, modems had an input dynamic range that was independent of the data rate.

For example. Suppose there is a link that is operating at 10 Msymbols per second (10 Mb, 1/2 Rate, QPSK). Lets assume that the E_b/N_0 is 7 dB and the received signal level is -30 dBm. Without changing anything else in the link, lets change the symbol rate to 10 Ksymbols per second. What is the new input level? The answer is -60 dBm. Power changes by 10 times the log of the ratio of the symbol rates. If a modem is being used that has a fixed input range of -30 to -55 dBm, the gain of the down converter would have to be changed by +5 dB to bring the level up to the minimum required by the demodulator (refer to Figure 1). This unfortunately also increases the total adjacent power into the demodulator by +5 dB.

If the modem had an input range that was proportional to the symbol rate, nothing in the system would have to be changed to accommodate the data rate change. This is precisely the reason that the DMD20 Demodulator was designed to have an input dynamic range that is $10 \cdot \log(\text{symbol rate}) - 100, \pm 12 \text{ dB}$. At 10 Ksps, the range is $-60 \pm 12 \text{ dBm}$ (-48 to -72 dBm), while at 10 Msps, it is $-30 \pm 12 \text{ dBm}$ (-18 to -42 dBm). The total input range is -18 to -72 dBm over 10 Ksps to 10 Msps, much wider than the fixed demodulators (see Figure 2). As an added benefit, the allowable adjacent channel power changes with the symbol rate. The DMD20 can accept well over +50 dBc at 10 Ksps and appropriately lower as the symbol rate increases. It matches exactly what will occur on an operating satellite link.

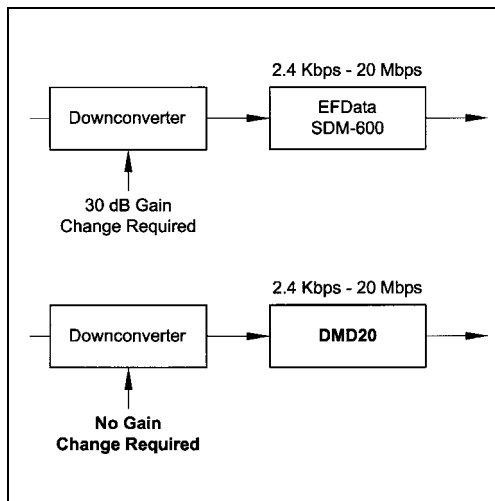


Figure 1.

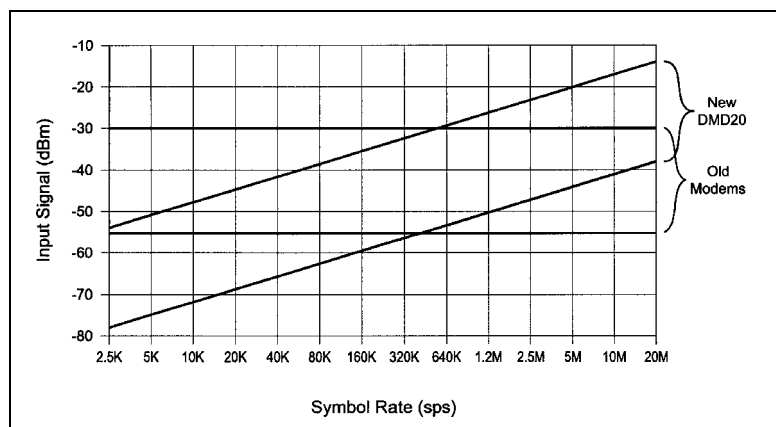


Figure 2.