Low Noise Blocks: Why So Many?

By Brian B Donaldson, 23 May, 2011

Recently I was asked why there are three Low Noise Blocks (LNB) in the box with the Block Up Converter. I explained that each LNB is numbered to represent each of the three International Telecommunication Union (ITU) regions. I received that 1000 yard stare telling me I had better explain.

The world is divided into three communication zones. Each zone, or region, has specific requirements for up to, if not possibly more, 30 different types of radio services (For the United States, see http://www.ntia.doc.gov/osmhome/allochrt.pdf). These allocations do not match everywhere in the world, so each region has its own frequency plan.

The three regions are:

ITU Region 1
Encompasses Europe, Africa, parts of the Middle East to Iran, and all of the former Soviet Union.
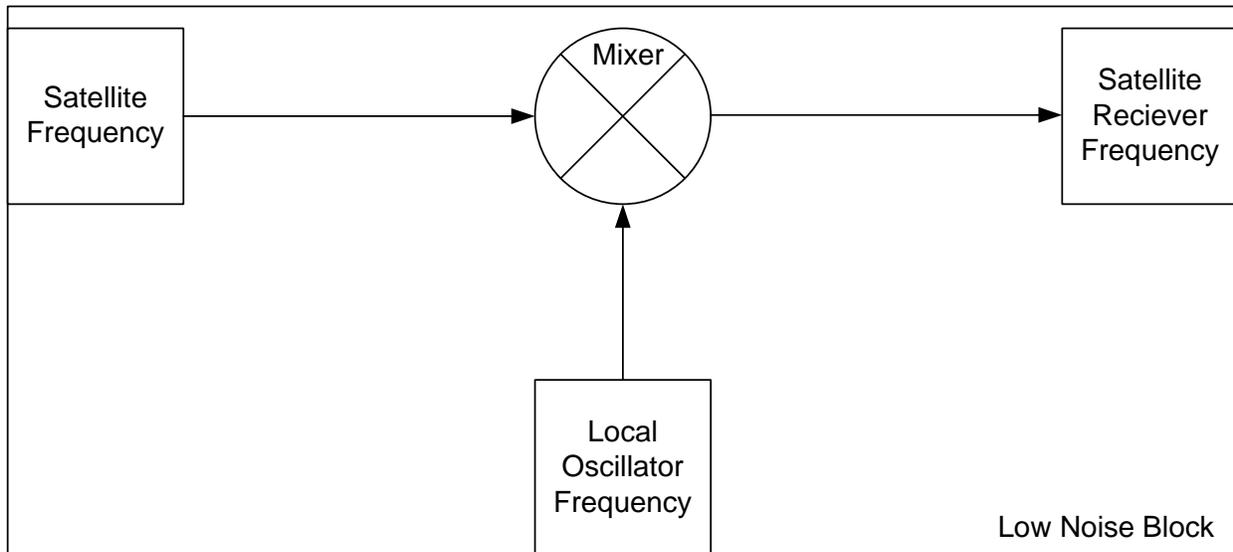
ITU Region 2
All of the Americas

ITU Region 3
Asia-Pacific, Australia/New Zealand, Japan and everything west to the Iran-Turkey border.

After I explained this, I was then asked if Afghanistan was in ITU Region 3 why are we using LNB #1? Because the satellite that we are using happens to be a European satellite that beams into ITU Region 3. Is that legal? Sure is, as long as one region has landing rights into another region's boarders, it is legal. There are not too many countries that forbade landing rights as long as the content is not subversive that the culture receiving the information. This is an entirely different discussion.

So then if there are three different ITU regions and three different LNBs, then what makes them, well, different? Each LNB has what is called a Local Oscillator (LO) which is built into the unit. This LO is used to "mix" with a specific range of frequencies that are used in the different ITU regions.

Note: in the above drawing, there are more "things" like filters and amplifiers. This is just a simplistic illustration for the purpose of our discussion.

ITU region 1 uses a LO frequency of 10,000,000,000 hertz, or 10 Giga hertz, or 10 GHz. The region uses frequencies from 10.95 GHz to 11.7 GHz to broadcast from satellite to earth stations in their region. When the satellite frequency meets the LO frequency they subtract from each other and the remainder is sent to your satellite receiver. In the case of region 1, 10.95 GHz – 10 GHz = .950 GHz, or 950 MHz. Most satellite receivers are tuned from 950 MHz to 1450 MHz, or extended to 1700 MHz.

ITU region 2, the Americas, uses a LO frequency of 10.750 GHz. The authorized frequency plan for this region is 11.7 GHz to 12.2 GHz. That is a 500 MHz spread. Most satellites use 500 MHz as the total bandwidth of all the satellite transponders. Most transponders are 36 MHz wide. So we see that 11.7 GHz – 10.75 GHz = 950 MHz. The same number we got from the ITU region 1 math.

ITU region 3, Asia-Pacific area, uses a LO frequency of 11.3 GHz. Their authorized downlink range is from 12.25 GHz to 12.75 GHz, which is also 500 MHz wide. 12.25 GHz – 11.3 GHz = 950 MHz.

So we now see why we have so many LNBs in the box. Next time someone asks why, we can now give them an explanation to the why.

For a comprehensive list of all satellites, their locations, uplink and downlink frequencies, and translation frequencies, please visit
http://www.miteq.com/technotes/MITEQ%20TECH%20NOTE%2025T066.PDF

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