What is an LNB – and what is it for?

Heinz Koppitz

Satellite signals are very weak. That's why we need a parabolic antenna to focus them and a low noise block, also known as LNB or sometimes LNBF, universal LNB or feedhorn mounted in its focal point to collect them. But what exactly happens inside this small component?

Eletronics

The low noise block is the actual heart of the satellite antenna. Basically, it's a cavity resonator which receives at one end the focused satellite signals that are reflected from the antenna and then processes these signals. Similar to an organ pipe it oscillates and triggers internal dipoles which convert the transmission energy into electrical signals. An additional electronic switch amplifies these signals before they are sent to the coax cable and converts them into a lower frequency in order to minimise signal loss in the cables.

Even though the descriptions may sound like there is a big difference between individual models, most currently used LNB types use the same technology, the major distinguishing factor being the noise figure which has been reduced to the theoretically lowest possible value of 0.3 dB in the most recent models. A universal LNB is used to divide the Ku band – which is predominantly used in Europe – into two partial frequency ranges.

Each LNB can only be used for a single frequency band, because the S, C and Ku bands each require different cavity resonators. There are also individual types for linear and circular signals, which mainly differ in the way the internal dipoles are arranged.

The power supply for the electronic switch is of particular interest. The power is provided by the receiver and transmitted over the coax cable. The coax cable therefore not only transmits the reception signals from the antenna to the receiver, but also the required operating power from the receiver to the LNB (together with additional control signals).

Switching features when changing channels

Transponders have one of two different polarisations (horizontal/vertical and left/right circular, respectively). That's why the receiver has to tell the LNB the polarisation for any given signal, so that the appropriate dipole can be activated. The voltage of the power supply takes care of this: 14 V activate the vertical polarisation, while 18 V activate the horizontal polarisation. Even though DiSEqC has developed into a very powerful control tool with more than 256 commands, it is still not used for switching between the polarisation levels.

A universal LNB features a second switching mode for the extended Ku band. Since the frequency range of satellite receivers is not wide enough the actual frequency range has to be split up into two partial ranges. Switching between these ranges is controlled by a 22 kHz signal which the receiver also sends to the LNB when selecting a certain channel. This 22 kHz signal is also used as carrier frequency for DiSEqC control commands in more complex system configurations. These DiSEqC commands serve for controlling multiswitches and antenna motors (see issue 189).

Various designs

There are several design types for different purposes. The table lists the most common LNB types for the extended Ku band and indicated how they are used:

Type	Connections	Fixed assembly	Motorised dish	Multifeed
Single LNB	One receiver	One satellite	Yes	2 – 4
Twin LNB	Two receivers	One satellite	No	2 – 4
Quad LNB	Four receivers	One satellite	No	2 – 4
Quattro LNB	Multiple users	One satellite	No	2 – 4
Octo LNB	Eight receivers	One satellite	No	2 – 4
Monoblock 2	Two receivers	Two satellites	No	2, fixed
Monoblock 4	Four receivers	Two satellites	No	2, fixed
Monoblock 8	Eight receivers	Two satellites	No	2, fixed

Single LNBs are suitable for individual reception. The reception principle of a single LNB is also included in flat antennas. If the receiver comes with DiSEqC 1.2 and features the commands required to control a motorised dish, a single LNB in combination with a dish motor allow you to receive signals from any number of satellites. This makes for a very elegant configuration, except for the time you have to wait until the antenna has moved to the right position when selecting a channel from a different (i.e. not currently tuned into) satellite.

All other designs are only suitable for fixed antennas. Twin, quad and octo LNBs are intended to support two, four or eight receivers. Each of these receivers is connected to the LNB with an individual coax cable, thus allowing signals to be received independently for each of these receivers.

A quattro LNB with a switched output delivers all four possible signal configurations (horizontal/vertical and low/high band) simultaneously and is not suitable to be connected directly to a receiver. Its output signals are connected to a switching matrix. With the help of matrix cascades and intermediate amplifiers it is then possible to connect any desired number of receivers to this system.

Multifeed for professionals

Multifeed means receiving signals from more than one satellite simultaneously with a fixed satellite antenna. The advantage of such a solution is that switching between satellites takes place very quickly. However, several disadvantages or restriction are associated with multifeed reception:

Due to the reduced reception efficiency it is necessary to go for a larger dish.

Not more than four satellites can be selected.

The possible orbital range comprises not more than +/- 10 degrees (less rather than more). Satellites must be spaced at least three degrees apart from each other

A DiSEqC command is required for switching between signals.

If more than one receiver is to be connected a signal matrix is required.

It can be difficult to properly adjust the antenna.

Practical monoblock LNB

This dual LNB is the simplest solution to achieve multifeed reception for two satellites. This design consists of two independent LNBs in a single case. The two LNBs can be automatically addressed with any DiSEqC 1.1 receiver. However, they are only available for satellites with a fixed 3-degree or 6-degree spacing. In Europe, for example, there are monoblock single, twin and quad LNBs for the Ku band, which have a pre-defined spacing of 6 degrees (for Astra1/Hotbird or Astra2/Astra3A, for example).