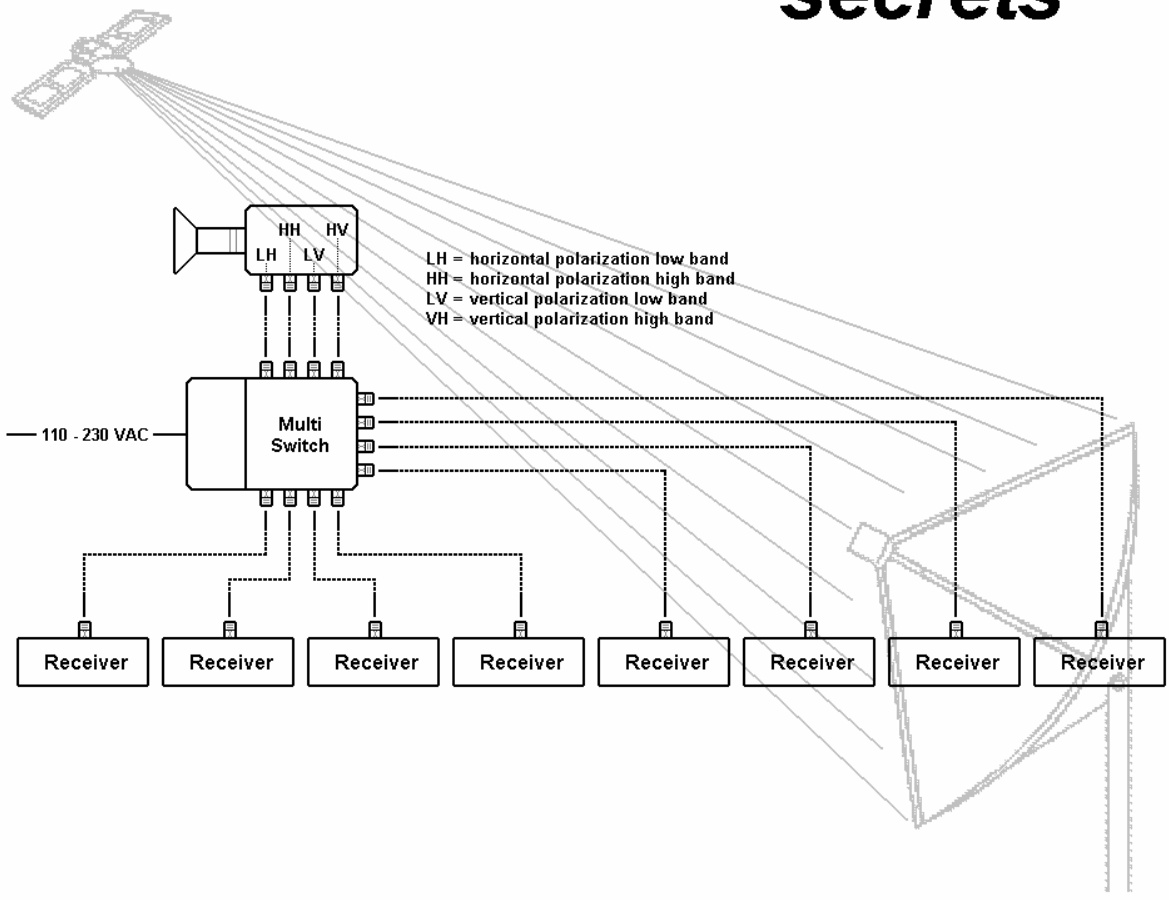
some SAT & LNB secrets



LNB
The LNB (Low Noise Block) sits on the end of an arm and faces the parabolic reflector ("dish") which focuses the signals from a satellite 24,000 miles away into the "feed horn" of the LNB. An LNB with an integrated feed horn is known as an LNBF.
An LNB is an amplifier which receives the radio signal from the satellite after it has been reflected by the satellite dish. In addition to amplifying the signal, the LNB also converts the signal to a frequency usable by the receiver. The signal from the satellite (10.7 – 12.75 GHz) travel well through the Earth's atmosphere, but not down the coaxial cable to the receiver. The LNB is there to down-convert this high frequency satellite signal into a lower frequency signal (950 – 2150 MHz) that does travel down the coaxial cable to the receiver.
The 10.7 – 12.75 GHz range is also known as the KU Band. The LNB type used to cover this frequency range is called the Universal LNB. The receiver controls the Universal LNB by voltage switching to select the polarity (V & H) and tone switching to select the lower or higher frequency ranges.

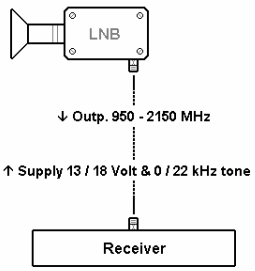
Polarity:
Two different stations can be use the same frequency by having one station sent vertically (V) and the other horizontally (H). A Universal LNB has two sets of probes within it, where one set is aligned horizontally and the other is aligned vertically. If the receiver supplies around 13 volts to the LNB the LNB will return the signal from the vertical probe, if the receiver supplies around 18 volts to the LNB the LNB will return the signal from the horizontal probe.

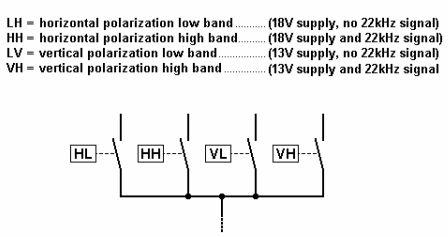
Low and High Band (tone) switching
The satellite frequency range is divided into a high and low frequency range, which the receiver selects by switching a 22 kHz signal on and off (off = low band, on = high band).

Local Oscillators (L.O.)
There are two different Local Oscillators in a Universal LNB. One is set at 9.75 GHz (used to down-convert the low band) and the second is set at 10.6 GHz (used to down-convert the high band).

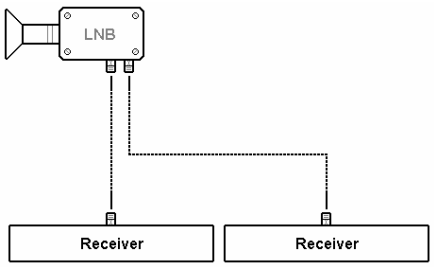
Down-Converting
The lowest frequency sent by the satellite is 10.7 GHz, down-converted by 9.75 GHz (L.O.) means that this signal will be sent to the receiver at 950 MHz and the highest frequency sent by the satellite is 12.75 GHz, down-converted by 10.6 GHz (L.O.) means that this signal will be sent to the receiver at 2150 MHz. All receivers that support the Universal LNB has to support a tuning range of 950 to 2150 MHz in order to receive the satellite frequency (downlink frequency) range from 10.7 to 12.75 GHz. The formula to set the decoders frequency is the downlink frequency minus the local oscillator frequency.

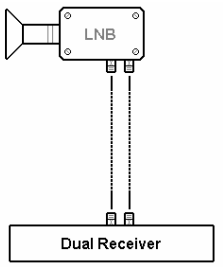
Universal LNB
A Universal LNB requires a 22 kHz signal to switch its local oscillator (L.O.) to 10.6GHz "high band", otherwise it uses its 9.75GHz oscillator “low band”. Polarization switching is controlled by the supply voltage. 13 volts gives vertical and 18 volts gives horizontal polarization.



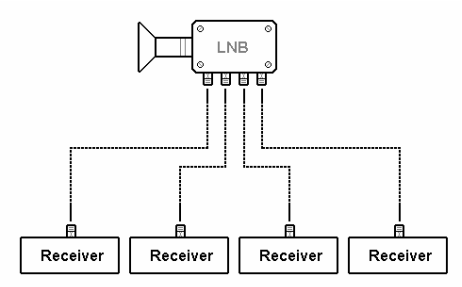


Universal Twin LNB
This LNB can feed two separate receivers or one dual-receiver. Each receiver has independent control of polarization and band via 13/18 volt and 22 kHz on/off switching.

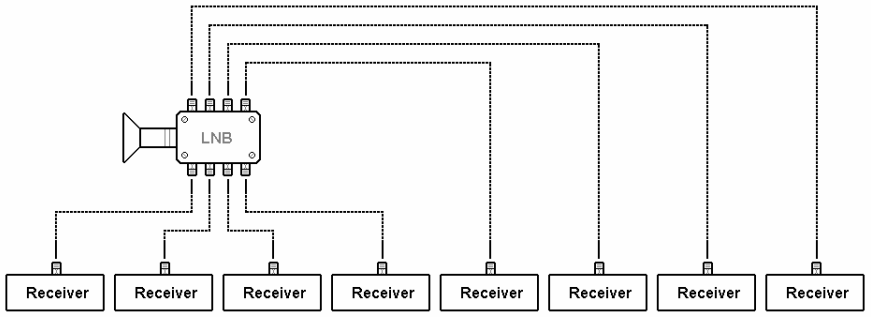




Quad Universal LNB
This LNB can feed four separate receivers or two dual-receivers. Each receiver has independent control of polarization and band via 13/18 volt and 22 kHz on/off switching.

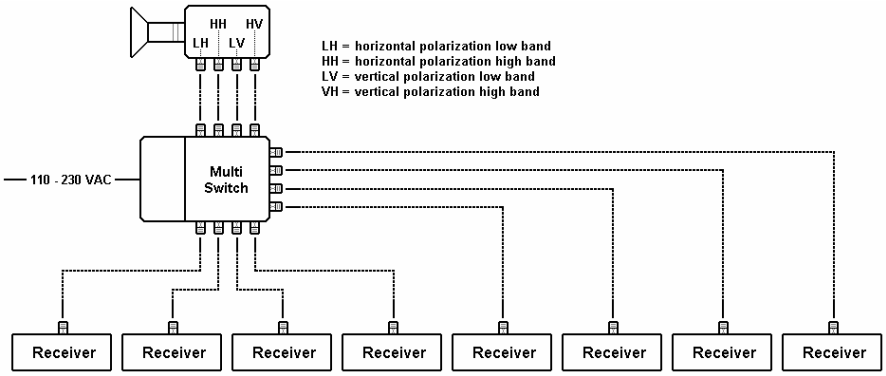


Octo Universal LNB
This LNB can feed eight separate receivers or four dual-receivers. Each receiver has independent control of polarization and band via 13/18 volt and 22 kHz on/off switching.



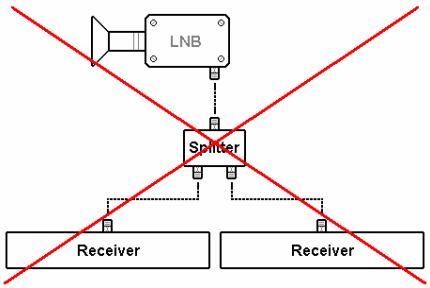
Quattro universal LNB

This LNB has four fixed outputs and is used only in distribution systems. One LNB supplies a multi-switch-unit that can provide 4, 8 or 16 outputs for separate receivers. Each receiver has independent control of polarization and band via 13/18 volt and 22 kHz on/off switching. The outputs of this LNB should not connect directly to a receiver.



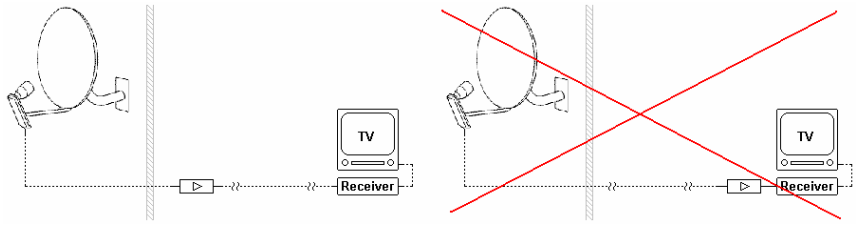
Splitter

It is possible to split the feed from one Universal LNB to two tuners, but it won't work properly. The use of a Universal LNB with more outputs (twin or quad) is strongly recommended, because the Universal LNB selects vertical polarization when fed with 13 volts and horizontal polarization when fed with 18 volts and the Universal LNB selects high band when fed with 22 kHz tone and low band otherwise. If two or more receivers are connected via a splitter to a Universal LNB, they will be fighting for control. Usually "high band" and "horizontal polarization" will win.



In-Line Amplifier

The main purpose of an in-line-amplifier is to overcome losses in a long cable. If there is more than 100 feet of double-shielded cable between the LNB and receiver, an amplifier may help. If the signal is weak when receiver is connected close to the LNB (with a short cable) then an in-line amplifier will not help. The in-line-amplifier will give no benefit as it amplifies only what is there → signal plus noise. The amplifier must always be near the input end of a long cable. If it is fitted at the output end, the amplifier is boosting the signal and the noise it has picked up.

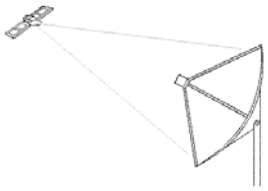


There are two types of in-line-amplifier available, compensated line amplifiers and uncompensated line amplifiers. Physically compensated line amplifiers may look identical to the uncompensated types; the difference is that with compensated amplifiers the gain of the device increases as the frequency increases. Compensated amplifiers are designed to improve signal levels that have been degraded by coax cable loss. The cable loses more signal strength at higher frequencies (2000 MHz+) than at lower frequencies (950 MHz). The compensated amplifier is recommended to overcome the losses in long cables, the uncompensated type to increase a signal that is to be split or divided.

Rule of thumb: 1 feet coaxial cable attenuates a signal at 2150MHz by approximately 0.1 dB.
An amplifier of about 20 dB gain compensates the signal loss of 200 ft cable.

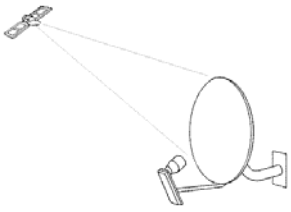
Prime Feed Focus Dish Antenna

The Prime Feed Focus Dish, which is a parabolic dish with the LNB mounted centrally at the focus. Because the LNB is mounted centrally, it means that a lot of the incoming signals are blocked by the LNB. Its efficiency of 50% is low compared with the other types. The Prime Feed Focus dishes are mainly used for antennae with diameters over 4 feet. Because of its relatively larger surface, the parabolic antenna is less sensitive to small directional deviations and there is a better chance of receiving signals outside the normal footprint.



Offset Dish Antenna

The Offset Dish Antenna has its LNB mounted to the side of the dish. Because the LNB no longer obstructs the signal path from the satellite, the dish has a better performance than the above mentioned Prime Feed Focus Dish. This allows the dish diameter to be smaller. Another advantage of this type of dish is that it can be positioned almost vertically, whereas the Prime Feed Focus dish needs to be positioned more obliquely.



Dual Offset Dish Antenna.

The Dual Offset Dish Antenna is an improvement on the Offset Dish antenna and has an even better performance. Its efficiency is about 80%. The main feature of this antenna is that it has two dishes: a larger receiving dish and a smaller dish facing the opposite direction which collects the signals from the larger dish and directs it to the LNB.

Dish Antenna Sizes

The size of the dish required depends upon whether you live in a central footprint area or in an outlying area.

2 – 2 ½ feet: …wide opening angle (comparable with wide angle lens) and therefore easy to install and tune.
…not very selective, with possibility of interference if the number of satellites is increased.
…not very sensitive, but sufficiently sensitive to receive satellites in central receiving areas.

3 feet: …acceptable, practical intermediate size between large and small dishes.

4 – 5 feet: …small opening angle, difficult to tune.
…very selective, and therefore little chance of interference.
…much more sensitive than the small dish (hence better quality). Is also suitable to receive satellites which orbit further below the horizon and therefore transmit weaker signals.
…wind resisting construction required due to the size of the dish.

Mounting Dishes

Before mounting a dish, there are some aspects to be taken into consideration. The dish antenna must have a clear path to the skies. There should not be any obstacles between the dish antenna and the satellite, such as buildings and constructions. The dish must be able to "see" the satellite.

An antenna needs to be aligned in two planes, namely horizontally and vertically. It should make an upright angle of 30 degrees. This upright angle is called the elevation of the dish in the vertical plane. The azimuth angle is the position in the horizontal plane and determines how much the dish needs to be turned to the east or the west in order to receive the signals from the desired satellite. After the first alignment, the dish needs to be fine-tuned by trial and error, until the best signal is received.

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