

uhf-satcom.com

DSN FAQ

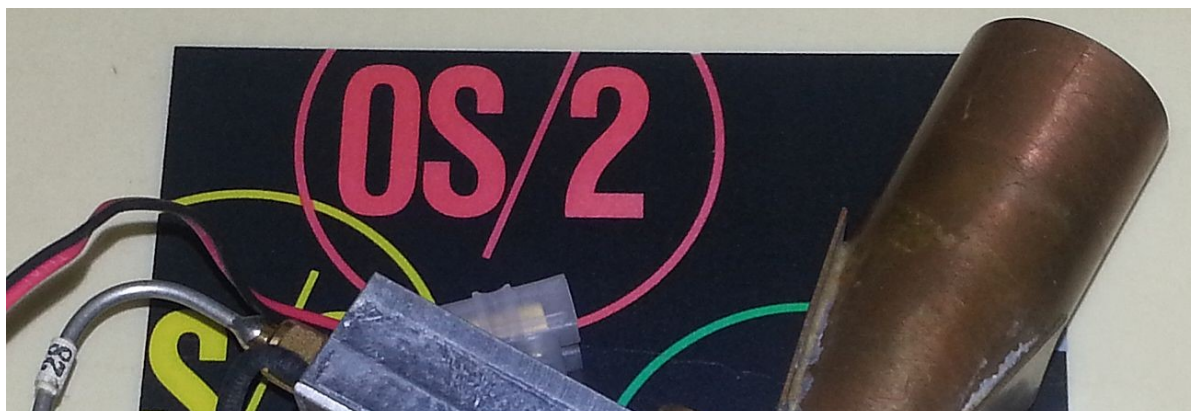
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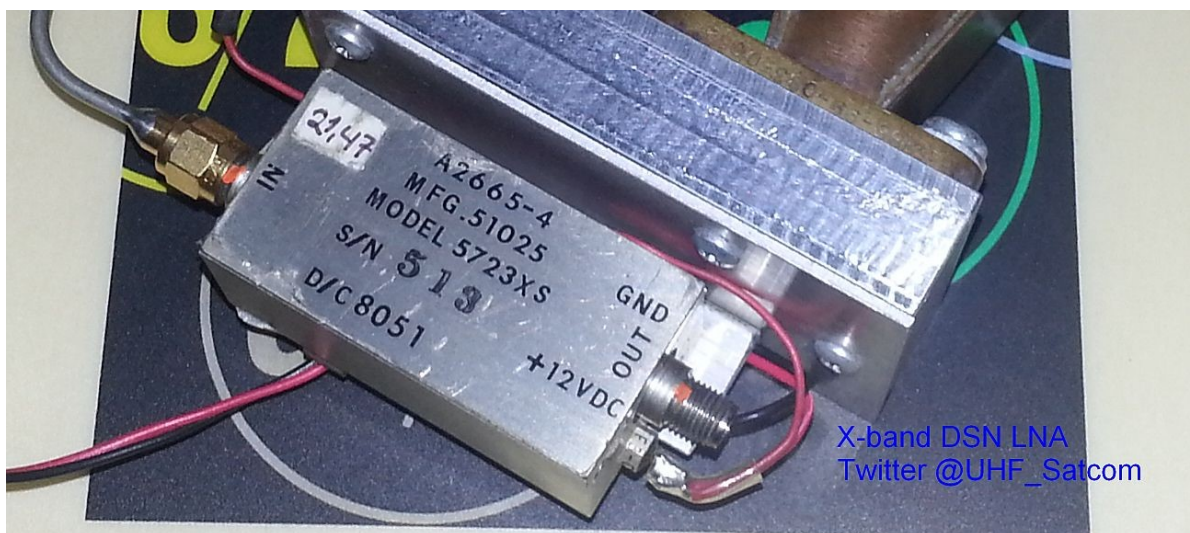
If you have a question on DSN reception / equipment please send it [here](#)

Q: Is a single two stage LNA enough gain for DSN reception? I've read somewhere on the UHF-Satcom site that some people have used a single LNA at the feed and another single stage amplifier just before the filter in the down converter. Do I really need two of these or is one enough?

A: Generally one preamplifier directly at the feed will suffice - as long as it has enough gain to overcome the connector losses, the losses in the coax that feeds the mixer, and the loss in the mixer. Using good quality new semi rigid like RG402 / UT141 will result in a loss of about 1.4dB per metre. If the feed has a cut-off frequency around 8GHz, then the image noise will be small so you can probably get away without the second.

A typical X-Band home-built LNA can be seen below:





Q: What is the minimum dish size that is useable to receive space probes like the MRO?

A: It is possible to use dishes under 1m, but the signals will be extremely weak and really only visible in an FFT display program such as Spectran. If you aim for a dish of 1.2m to 1.8m as a minimum, signals will still be weak, but most likely copyable in CW bandwidth. As a rule of thumb, use the biggest dish you can lay your hands on!

The 1.8M antenna in use at UHF-Satcom.com can be seen below during a Yutu / Chang'e'3 tracking session:



Q: How hard is it to align the dish on a space probe?

A: This all depends on the size of the dish. For example with the 1.8m dish, you have to point within a degree or two. This is easy with a calibrated azimuth dish mount and by using an digital spirit level for the elevation. The parameters from JPL Horizons are accurate and can be relied on to be correct.

Q: What about tuning in the signal? How critical is it?

A: The tuning is fairly critical, but really you need a local oscillator that you can trust as being stable and on a known frequency. The most simple method is to build a 10MHz ovened oscillator (such as the [G8ACE ovened reference oscillator](#)), and lock it to GPS (with a [G4JNT GPSDO](#)), or buy a Rubidium frequency standard.

Remember with an 8GHz Local oscillator, the 10MHz reference is multiplied up 800 times, this means that a 10Hz error in your 10MHz oscillator will result in a 8KHz error at 8GHz meaning that you will not receive the weak signal from the space craft!

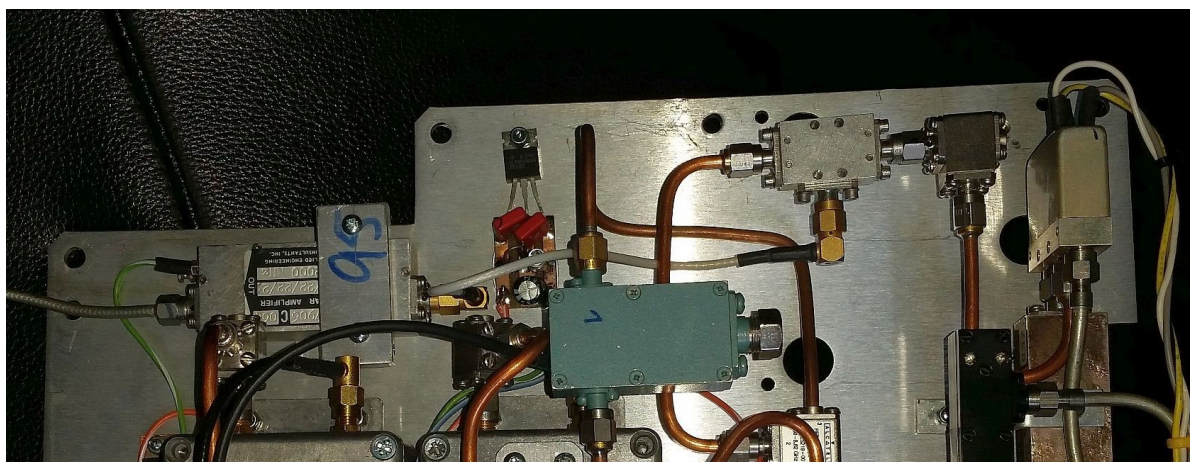
Q: I am interested in building a DSN receive system. How easy is it to source information on building a local oscillator of 7GHz, or is there a source of second hand 7Ghz oscillators that are accessible to home brewers?

A: The easiest option is to look on eBay for the 8GHz oscillators from the likes of m/a-com, continental microwave and frequency west. These usually require a 100MHz reference signal to lock the main cavity to, the output of which is then multiplied up to 7 or 8 GHz depending on the filters in the phase locked oscillator block. It should also be possible to modify the ['multi-8' frequency multiplier from F6BVA](#) to give a 7 or 8 GHz output. DB6NT also sells an off the shelf down converter for 8.4GHz, details [here](#). Local oscillators from DF9NP are highly recommended, details [here](#)

An older converter used is shown below; this used a pair of brick PLL oscillators driven by a GPS derived 100MHz signal source:



This is the current dual-band X-Band converter in use at UHF-Satcom; a pair of DF9NP PLL oscillators running at 3.5GHz and 4GHz, both of which are doubled using a FET doubler followed by a tight filter to give 7GHz and 8GHz LO's which are switched into the mixer. Front end filters are switched giving access to mil-sat or DSN bands:





Q: I need to source a low noise amplifier for 8.4GHz, where can I get one.

A: There are several options, DB6NT of Kuhne electronics in Germany does a very very nice waveguide input version. In the UK, G3WDG makes and sells a SMA connectorised version, details [here](#).