



AMSAT-DL universal RX converter for Es'hail-2/QO-100

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Note: kit comes without tin box (111x74mm), photo only for illustration



Description

The universal downconverter is proposed to be used with a non-modified Twin Ku-Band PLL LNB with a Low-Band LO of 9750 MHz. The AMSAT-DL transponders on Es'hail-2 are downconverted to center frequencies of 739.175 MHz (Narrowband, NB) and 745 MHz (Wideband, WB). The described RX converter converts both signals into frequency bands, which are more suitable for use by radio amateurs. It is based around a local oscillator producing a frequency of 595 (default) or 594 MHz (Option). The signal is connected to two separate receive paths. The narrowband receive path features a 600 MHz lowpass followed by an amplifier and a mixer producing $739.175 - 595 = 144.175$ MHz, which is separated from the mixer image by another lowpass filter. The wideband receive path has the same 600 MHz lowpass followed by an identical mixer. Here the upper mixer image ($745 + 595$ MHz = 1340 MHz) is selected with an SAW filter.

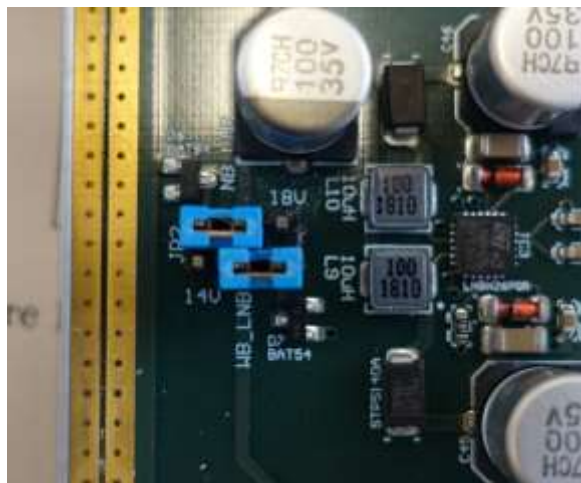
An additional feature of the RX converter are integrated 14/18V power supplies for the twin LNB

Final assembly

4 coax sockets need to be installed by the user. Assuming the AMSAT-DL logo to be upright, F-sockets need to be installed in the upper left and the lower left and right corner. The 4th socket in the upper right corner is a BNC socket for the 2m narrowband signal. Typically, the ground-pins of all sockets are nickel coated which needs to be removed with a file or sandpaper for easier soldering. Use a hot powerful soldering iron as each socket will take some time to heat up due to its thermal mass.

In addition 2 pinheaders need to be fitted, a 2x3 header on the left side (JP2) and a 1x3 header on the right side (REF). Don't heat them too long as they easily melt away. After installation, place jumpers on the headers as shown:

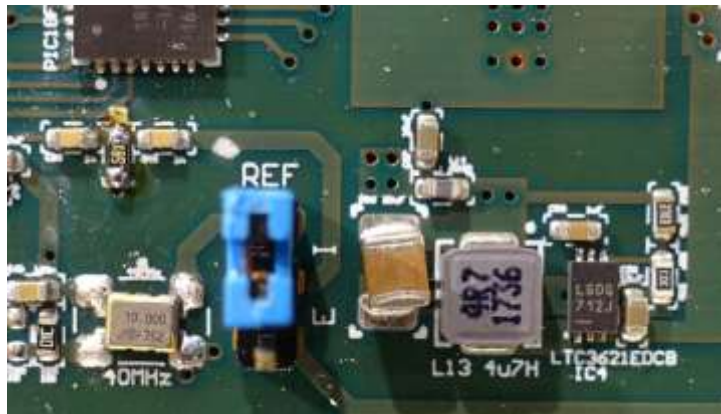
JP2:



This sets the narrowband LNB channel (top jumper, left position) to vertical polarization (14V) and the wideband LNB channel (bottom jumper, right position) to horizontal polarization (18V). This should be adequate for most users in Europe. Users in South America or South East Asia may want to swap this configuration.



REF:



The REF jumper in the upper position connects the internal TXCO to the LO. This should be fine for most users. Users with ultra stable references (Rubidium or GPSDO) may use the lower position and add a SMA socket on the right side of the PCB.

CAUTION: specification for 10 MHz input is 1-10 dBm into 50 Ohm (3.3 Vpp max.). Take care about extra low jitter (excellent phase noise) of the external 10 MHz reference as any impurities will be amplified by $595 / 10 \text{ MHz} = 59.5$!

Connect the positive power supply 8-16 V (typ 12 V / 110 mA without LNB attached) to the lower hole in the top right corner below the BNC socket. Connect GND to any location on the PCB edge.

Operation

When powered on, you should see 3 LEDs just left of the BNC socket.

From left-to-right:

Condition	LNB Power Good	PLL Locked	Power present
OK	ON	ON	BLINK
Fault	OFF	OFF	OFF

So in one sentence: if everything is fine, you will have left and middle LED lit and the right one blinking.

If left LED is off, check LNB power connections. Probably a short in the coax cable or fault LNB.

If middle LED is off, check if REF jumper is in upper position.

If right LED is off, check if power connected (other LEDs will be off as well..).

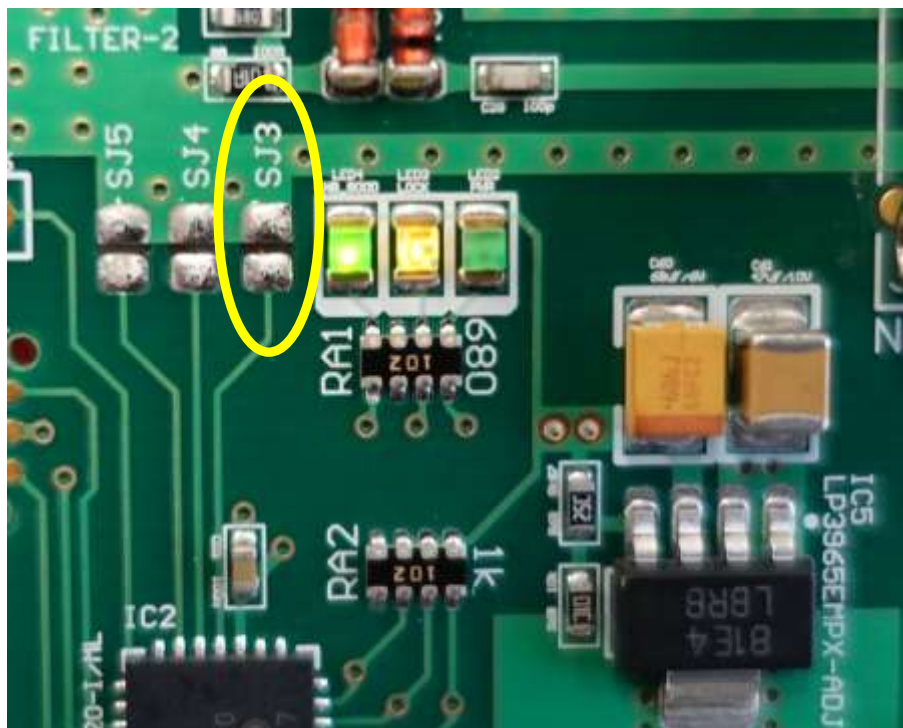


OPTION: change LO to 594 MHz

In special occasions, the user might prefer a LO of 594 MHz, this results in the NB signals to be placed at 145.175 MHz and the WB signals around 1339 MHz.

To use 594 MHz LO frequency:

- disconnect power
- short the solder joint SJ3, just left of the LED, with soldering iron and a blob of solder
- reconnect power



The LO frequency should be now 594 MHz.