Ultra High Stability LNB

LO Re-Alignment

08th JUN 2020

During the development of the Bullseye LNB we used the best components we could source and keep costs low and no matter what references you select they will all drift with time so the function to re-align the LO was built into the original design to enable digital control of the internal LO. The following document will outline the required steps to allow the Internal LO of the Bullseye LNB to be realigned and moved on the fly. LO is either a 9.75 or 10.6GHz LO and the internal circuits allow a certain amount of adjustment. A typical LNB can be altered approximately 230kHz @ 9.75GHz with a resolution of around 200Hz. Serial commands can move the LO in 1, 4 or 10X resolution steps and can be non-volatile or stored in the internal flash enabling the LO setting to be recalled on power cycling. The original factory calibration can be also be recalled back in to the USER memory. Note the LO is Low side so incrementing the LO results in a decrement of the L-band.

DISCLAIMER

Updating the LNB via the program port will invalidate any warranty and is done so at the risk of the end user.

There are certain command strings that will alter the internal algorithms of the compensation so please do not attempt to send random or arbitrary commands to the LNB. It is therefore highly recommended to buffer the serial data from any PC application with a secondary MCU to reduce the risk of issuing the wrong command directly to the LNB. This can easily be achieved with a simple MCU relaying and limiting the commands to the ones listed in the following pages or by having external switches controlling the MCU and relaying only the listed commands.

RF OUT FROM SAT & DC/22k

REF/PROGRAM PORT

LNB Controller Serial Protocol = 9600 Baud, 1 Start bit, 1 stop bit & No Parity& no handshaking.

Tone Box Commands
BIAS CONTROLLER ONLY

T = Tone On
t = Tone Off
V = 13V
v = 17V

Reset Commands:

R = Reboot Bias Tee

Frequency Adjust Commands
LNB WILL ACCEPT

Q = Decrement x 1
A = Decrement x 4
Z = Decrement x 10

W = Increment x 1
S = Increment x 4
X = Increment x 10

D = Min Frequency Offset
E = Max Frequency Offset
C = Mid Frequency Offset

Store Commands
LNB WILL ACCEPT

U = Store User Frequency in Memory
M = Recall User Frequency from Memory
P = Restore Factory Frequency to User Memory

NOTE: If you are constructing your own Programmer then go to next page)

LNB Controller Serial Protocol = 9600 Baud, 1 Start bit, 1 stop bit & No Parity, no handshaking.
Series 1k to LNB Program port & 15V/0V signaling

Frequency Adjust Commands
LNB WILL ACCEPT

Q = Decrement x 1
A = Decrement x 4
Z = Decrement x 10

W = Increment x 1
S = Increment x 4
X = Increment x 10

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Store Commands
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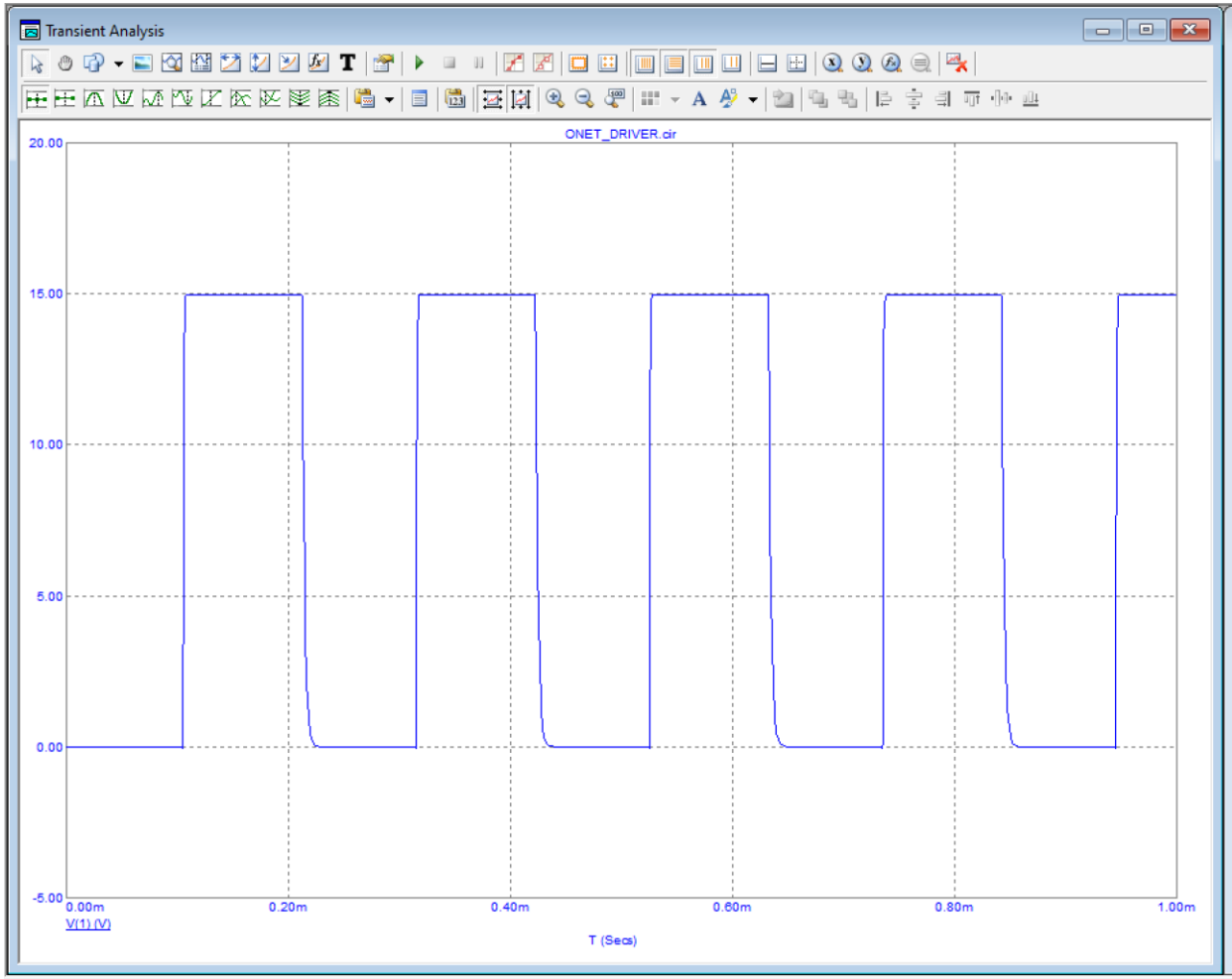
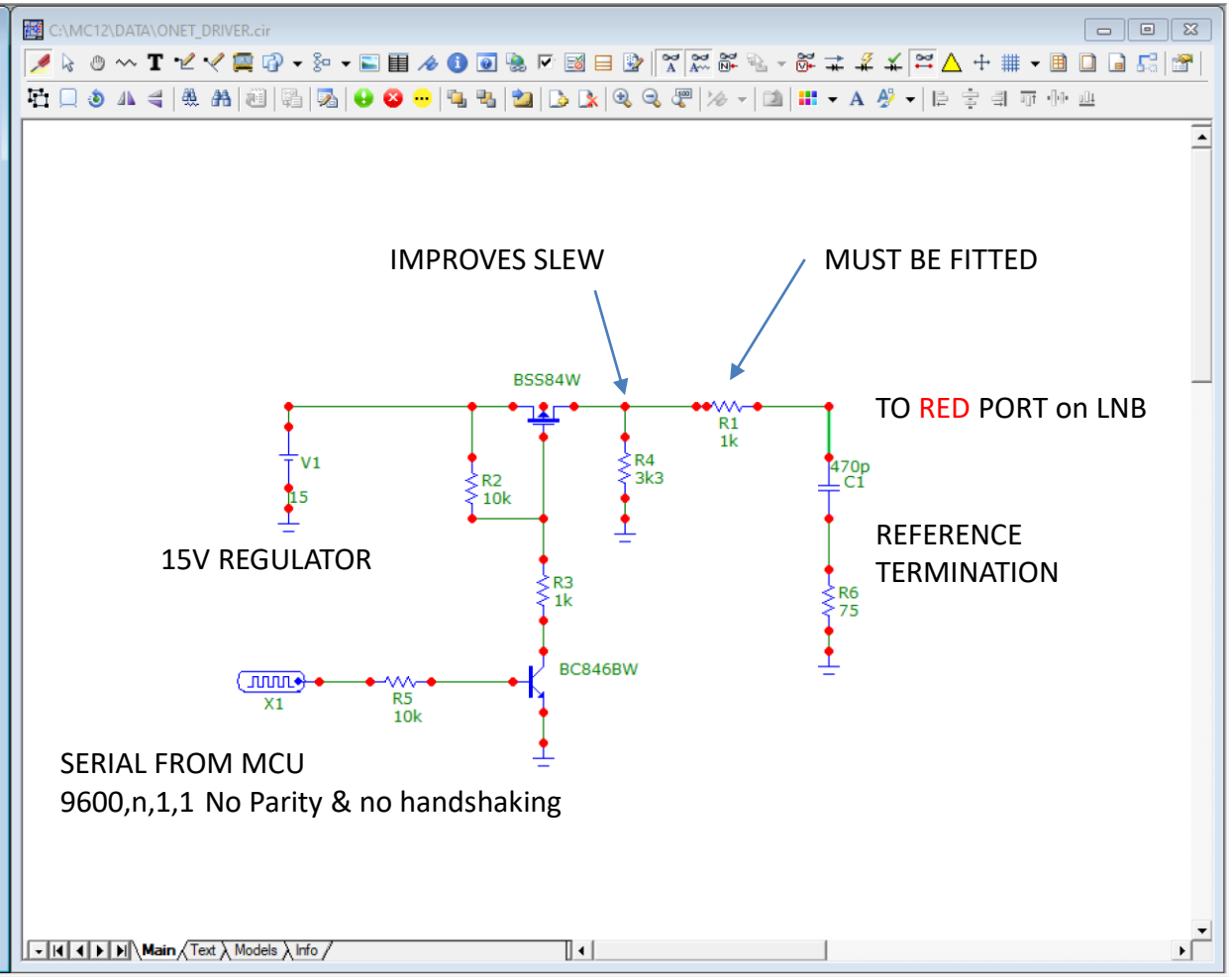
IF connecting direct to the Program Port on the LNB a 1k 5% or better resistor MUST be fitted in series with the serial driver

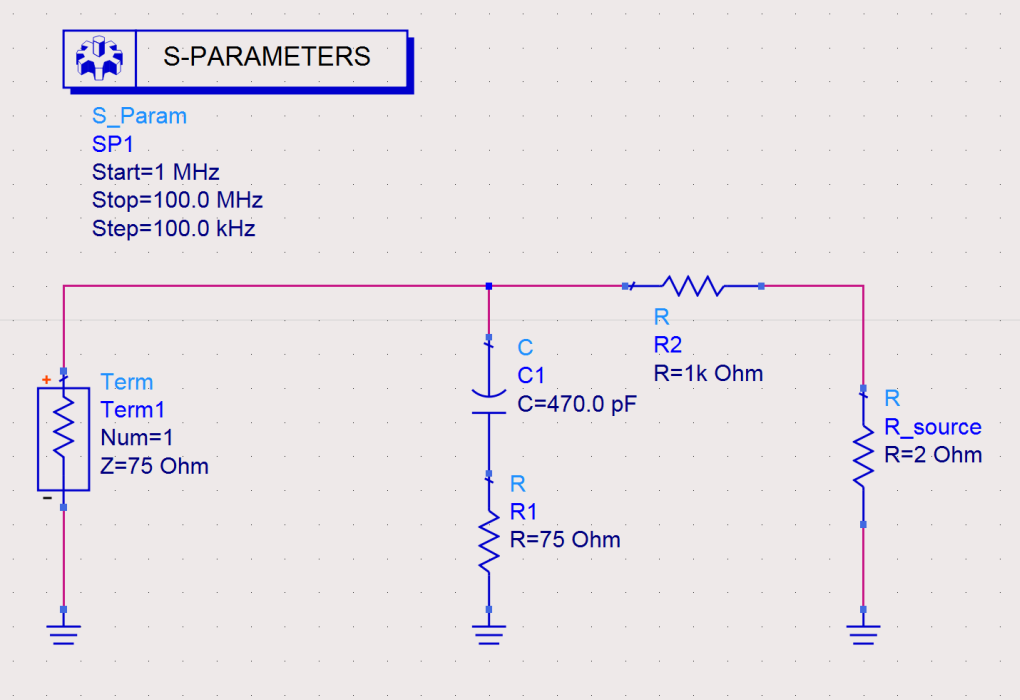
RECOMMENDED DRIVER/LEVEL SHIFTER/TERMINATION

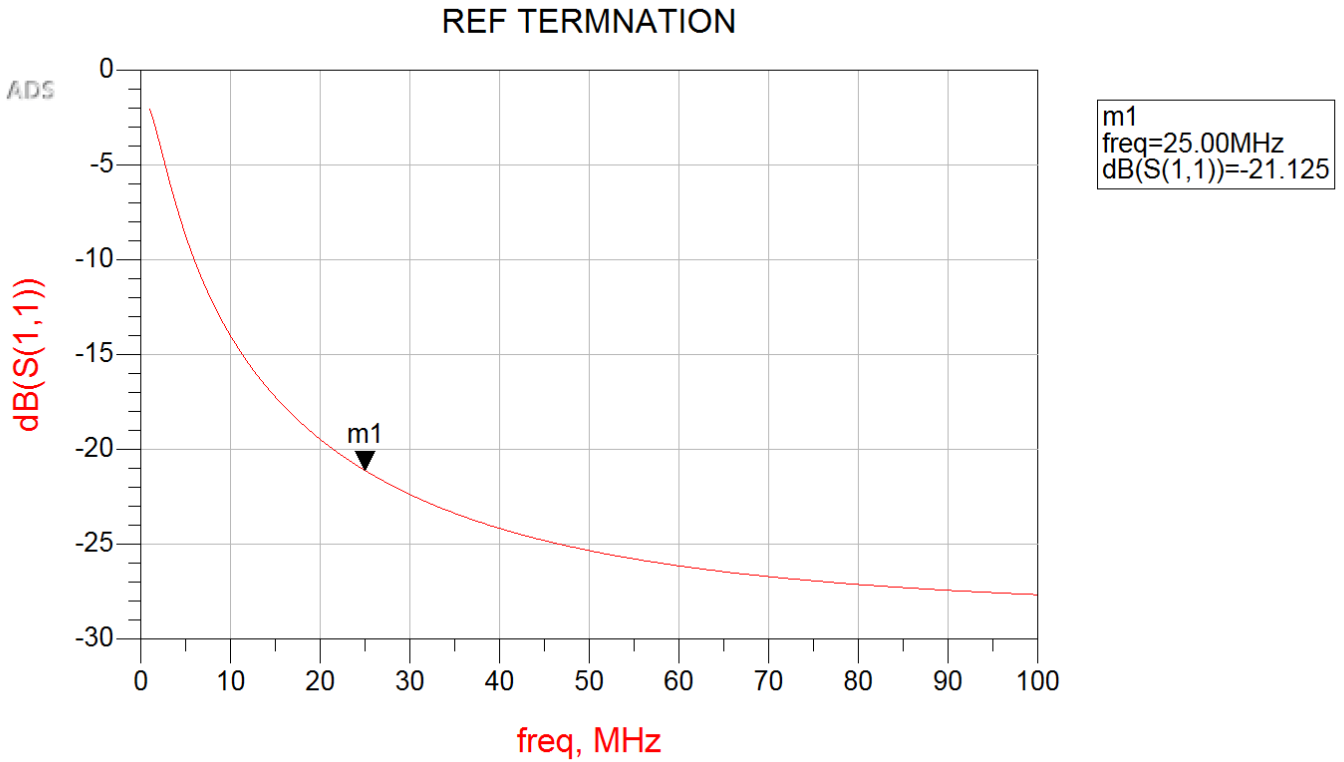




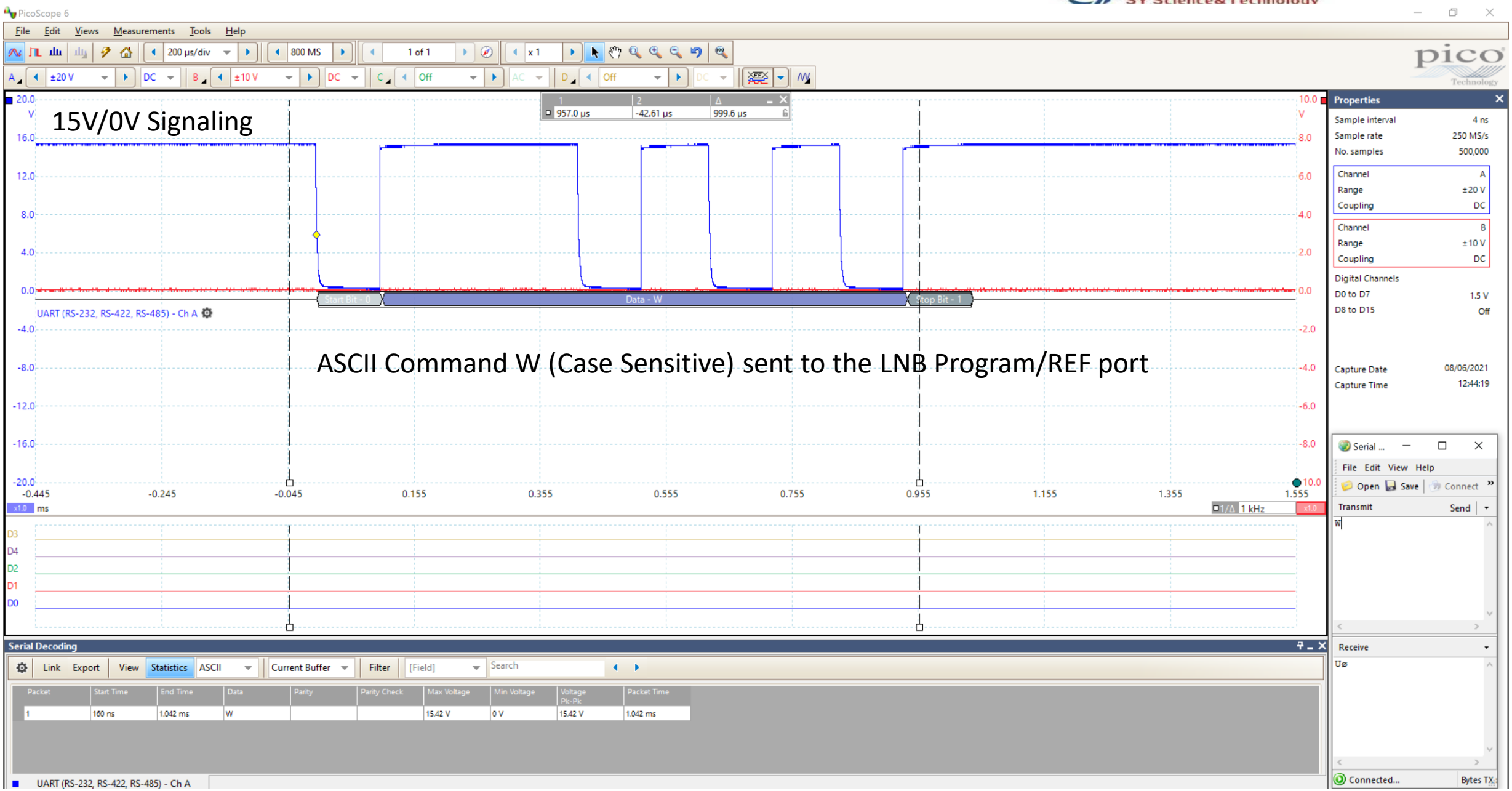
15V +/-1V voltage source is needed and this can be a linear regulator or even a simple Zener Diode regulator. Its recommended to use a FET as the series switch and to fit a load (R4) to improve the slew rate on the falling edges. R1 is the required 1k resistor and C1/R6 provide a termination to the internal reference to reduce any pulling and pushing of the reference. Keep C1 below 1nF so it doesn't degrade the slew of the data.

TERMINATION SIMULATION





Decoded Serial measured before the 1k resistor



The LNB will accept the case sensitive ASCII commands presented however the level needs to be 15V/0V with clean edges as the routines in the LNB are bit banged, excessive slew may cause issues with reception. Internally a complex network couples off (approx. 25 – 30dB) the reference so there is no real requirement for termination at 25MHz but is recommended for best performance, an external 1k 5% resistor MUST be added before any reference diplexer to setup the levels internal to the LNB. The program port is rugged and direct connection to 21V will not damage the programmer port. The 15V supply and external 1k resistor is used to set the exact threshold levels for the LNB MCU is just another safety mechanism.

During manufacture we align the LO with a GPS locked Ku CW source and once tuned to the exact frequency (within the resolution of the LO stepping) the values are copied to 2 independent sectors in memory. One sector is the User Cal and the other is the Factory Cal. Commands can be issued to move the LO and are non volatile until the command U is issued, where the current LO Offset values and calculated constants are written to the USER flash sector. The factory CAL sector remains unaltered and on reboot the User CAL will be loaded at all times. In the event that the original factory value is ever needed then issuing command P will copy the factory CAL sector back into the User Flash sector and the original factory calibration is recovered.

There are ***obviously*** commands to overwrite and setup the user calibration and issuing these will invalidate any warranty to spec. There is no reason to ever change these constants as the internal algorithms will be impacted corrupting stability and temperature dependance and once changed cannot be recovered, so please don't fire random commands at the LNB in an event to play around with them you are likely only going to brick the device. We record all values referenced to serial numbers so if units are returned we will know they have been overwritten and the LNB will be recycled and not returned so be warned….

Have Fun!

SY team

END OF PRESENTATION

THANKS!