

JUMA-TRX2 DDS / Control Board adjustments OH2NLT 22.08.2007

Before you get on the air no DDS board adjustments are really necessary. I/Q balance adjustment is however recommended. Software calibrations or adjustments are for fine tuning your JUMA-TRX2 meters and displays.

I/Q balance trimmer

With trimmer R42 in the DDS board I/Q balance can be fine adjusted. I/Q balance has direct influence to the unwanted sideband rejection. Theoretically digital signals driving the mixer switch should be phased 90 degrees off each other. Order of I signal and Q signal (which is leading) selects LSB or USB. This switching is done in the main board. Practical circuits are not perfect and require I/O balance fine-tuning to get best possible unwanted sideband attenuation.

Adjustment is simple:

Select your favorite operating band and feed about S9 (50uV) CW signal to the antenna connector. Switch to other sideband. Signal should disappear. Adjust R42 to find minimum value. You may perform this check / adjustment also with other frequencies (bands). Adjustment is not exactly the same for all the frequencies and you may have to compromise in which suits best for your listening needs. Find steady strong carrier from the air to do the adjustment if you do not have a signal generator.

I/Q balance affects also TX unwanted sideband rejection. It is enough to do this adjustment with RX but if you wish you could check TX sideband rejection with dummy load and another receiver.

Software adjustments (calibrations)

There are several adjustments or calibrations done in the DDS board control software. Calibration values are stored in the dsPIC30F6014A microcontroller non-volatile memory (EEPROM). In the very first startup when the EEPROM memory is "empty" default values are written in to the EEPROM. These default values are so close that you can operate JUMA-TRX2 without doing any calibration adjustments. If you like to fine tune your JUMA-TRX2 continue reading.

Calibration adjustments

- Set reference oscillator frequency
- Power supply voltage meter
- Indicator tones (Beep) length
- S-meter scaling
- FWD Power meter scaling
- Drain current (ID) meter scaling
- Return to the "factory default" values

Selecting Service Mode (do the calibrations)

When powering on JUMA-TRX2 keep PWR button pressed until you see the text *Service Mode* on the LCD display. Release button. Now you are in the Service Mode.

With DISPLAY button you can walk through calibration menus

With FAST button you can save your calibration values and switch to the normal operating mode

If you want to leave Service Mode without saving do the normal Power Off with PWR button

Set reference oscillator frequency

When doing this calibration JUMA-TRX2 should be in its normal operating temperature.

Method 1.

Measure 30MHz-reference oscillator output with precision frequency counter. Multiply result with six (AD9851 internal clock frequency) and dial this value in with VFO knob. For example: If you measure 29.999.850Hz multiply this with 6 = 179.999.100Hz and dial this value in. Default value is 180.000.000Hz

Method 2.

Listen to a exactly known carrier frequency. Change between LSB and USB. Adjust JUMA-TRX2 VFO so that LSB and USB sounds are at the same pitch. Read JUMA-TRX2 frequency display, compare it with known frequency and calculate correction factor for JUMA-TRX2 DDS clock frequency.

Power supply voltage meter

Measure JUMA-TRX2 supply voltage with accurate DVM. With VFO knob adjust the voltage reading on the LCD display as close to the DVM reading as possible. Calibration value is also shown on the LCD display. Default Cal multiplier (scaling value) is 132.

Indicator tones (Beep) length

You can adjust JUMA-TRX2 user interface indicator tone length. Long beep is always ten times longer than short. If you dial in 0 (zero) no tones are played. Maximum value is 100ms. Default value is 50ms.

S-meter scaling

S-meter adjustment is an iterative process where main board AGC threshold trimmer R53 and S-meter scaling values are adjusted to get correct and accurate S-meter reading. Please see main board adjustment procedure for details. If necessary you can check DDS S-meter board operation by applying 1VDC voltage to J3-pin8. S-meter should read S9 with this voltage.

When this adjustment is done correctly your JUMA-TRX2 S-meter shows true S-units and decibels.

FWD Power meter scaling

With this adjustment you can fine tune JUMA-TRX2 output power display to show actual RF power output. Connect accurate wattmeter and dummy load to your JUMA-TRX2. Select first TUNE mode and then PWR meter display. Push PTT and read JUMA-TRX2 display and the external Wattmeter.

Example:

External meter reads 9W and JUMA meter 8W and calibration value is 23. Divide $9/8 = 1,125$ and correct calibration value with this. New calibration value $23 * 1,125 = 25,875$. Go back in the Service Mode and dial in new calibration value 26. Save this and recheck the readings.

Drain current (ID) meter scaling

This adjustment is not necessary but if you like to check and calibrate your JUMA-TRX2 PA ID current display do following:

First select TUNE mode and then ID current display. Push PTT, read JUMA-TRX2 ID current display and measure voltage across R17 or R21 in the PA board. Calculate drain current from the voltage = U / R . If you measured 0,209v divide it with R17 and R21 value. $0,209V / 0,11R = 1,9A$. If necessary correct ID scaling Cal mult value. Procedure is same as in power meter scaling.

See also PA board tuning instructions. Particularly bias current adjustments.

Return to the "factory default" values

In case you want to return to the "factory default" values select on the LCD display:

Push FAST long =

Factory defaults

And press FAST button about five seconds.