NACT TUTORIAL 3T
FREQUENCY RESPONSE CALIBRATION

Applies to: NAT and NACT MODES

Prerequisites: Tutorials 0, 1, and 2

This tutorial takes you through the process of generating and capturing calibration data to account for variations in of the DDS output level at different frequencies using only the touch screen, the keyboard is not used. The calibration data can be saved in EEPROM and reloaded every time the NAT is powered up. This calibration sequence also normalizes the power readings such that they reflect the absolute power readings one would observe if the DDS were outputting a constant RF power level of one milliwatt. Some basic Signal Generator mode operations are also described.

The requirements for this tutorial are:

- NAT running firmware Version 3.0 or later.

- Logarithmic RF Power Meter such as the RF Power meter designed by W7ZOI and W7PUA used by the PHSNA.

To operate in NAT mode you will also need the following:

- PHSNA Arduino UNO/NANO based controller.

You will also need all interconnecting cables and power sources.

For this tutorial, the RF signal is connected direct to the RF Power Meter input, there is no DUT requirement. For NACT mode it is assumed you have completed the steps in tutorials 1 (RF POWER METER SETUP and 2 (RF POWER METER SLOPE AND INTERCEPT). For NAT mode it is assumed that the equivalent PHSNA procedures have been completed.

or
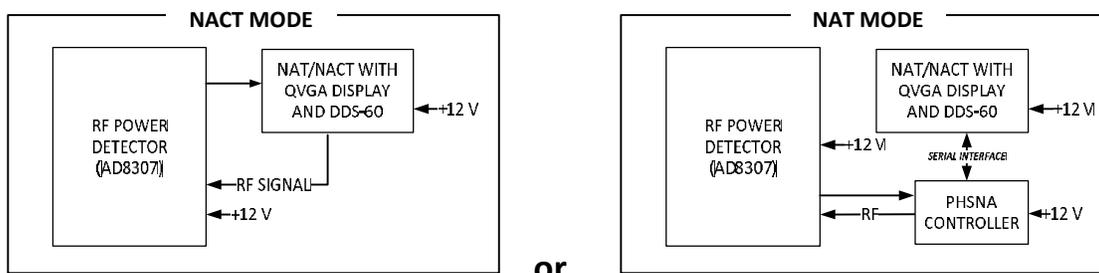
Legend:
   CMND   Bold, italics, underline => Permanent buttons along bottom of display.
   CTRL-C   Bold, italics => Something displayed in a menu or the ***Num Pad***.

1. Connect the DDS-60 output direct to the RF Power Meter input, no DUT.

2. Power on all components.

3. Create a PLX data form as follows:

    a. Tap **CMND** to enter Command mode.

    b. Tap **Fnx** then **F7** to display the data entry form

4. Set up the F1 PLX form to cover a frequency range of 1 MHz to 31 MHz with 50 KHz frequency increments and op modes specified for NAC (Network Analyzer Controller, if appropriate) and Signal generator modes.   Enter the following on the form using the **Num Pad**. For each item, tap the right side of the line to be edited. This will display the Num Pad. Tap the numbers to be entered and tap the **Down Arrow**.

    page one:

    TITLE – 3
    FILE NAME – leave blank
    FREQ LO – 1000
    FREQ HI – 31000
    FREQ ST – 50000
    Tap **Page Down** after entering FREQ ST to go to page two.

page two:

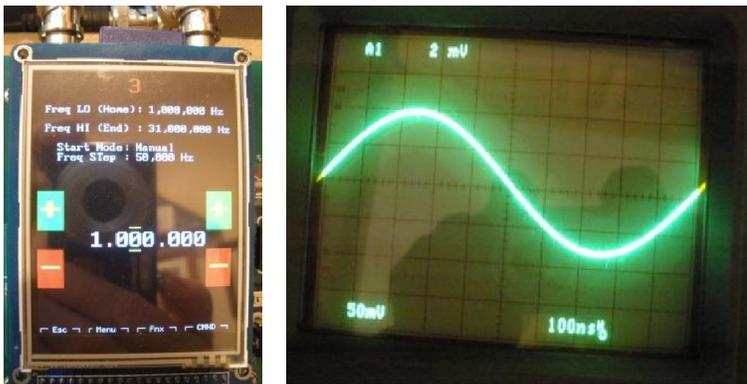AUTO DELAY(ms) – 0
XTAL PREFIX – leave blank
OP MODES – 5
   also specify NAC op mode ('6') if appropriate.

5. Tap *Enter* to save the form to EEPROM.

6. Tap *Fnx* then *F7* to activate the form.
   You should now see the sig gen screen and the DDS output should be 1 MHz.
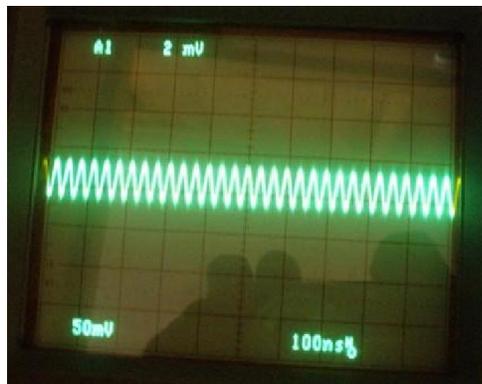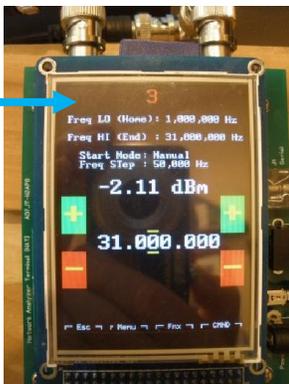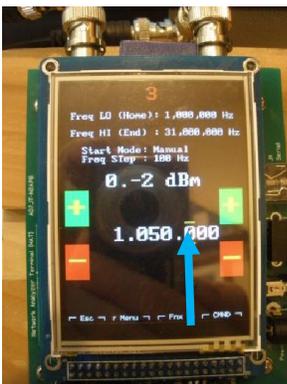
7. Tap the empty space below the frequency display and you should see the current dBm reading displayed with no change in frequency.

8. Tapping anywhere on the Freq Hi line will change the frequency to 31 MHz (note the change in signal amplitude).

9. Tapping the *plus* and *minus* buttons will increment and decrement the frequency by the FREQ ST amount (initially 50000 Hz). Tapping on a digit in the frequency display will scale FREQ ST such that the most-significant digit will be the selected position in the frequency display and will move the yellow markers on the frequency display to that position.

10. Tap **_Esc_** to exit Sig Gen mode then **_CMND_** to enter Command mode then **_Fnx_** and **_F7_** to bring up the 3 PLX form. Tap anywhere on the right side of the page to bring up the **_Num Pad_** then tap **_Page Down_** to go to page two.

11. Tap the right side of the OP MODES line to bring up the **_Num Pad_**. If necessary, tap the **_Left Arrow_** and **_Right Arrow_** to position the cursor under the 5. Tap **_Del_** to delete the Signal generator op mode. Tap **_Enter_** to save the change.
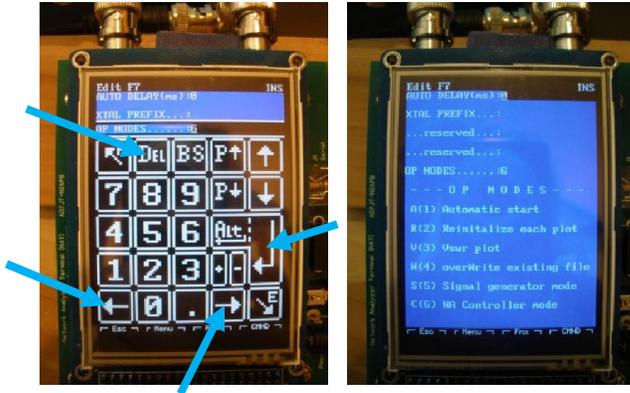
12. Tap **_Fnx_** and **_F7_** to activate the form. If NAC op mode is specified (6), you should see the same thing as in step 6 above. Otherwise you will see the PLX directives in the display text area.

13. In NAC op mode you will need to tap the empty space below the frequency display to start a scan (see Step 7 above); otherwise, the scan will start automatically. The frequency will sweep from FREQ LO to FREQ HI recording the dBm for each step and then plot the result. (The scan is so fast I cannot get a picture of the display during the scan). The plot shows the frequency response of the DDS. This is the calibration curve for your test setup.
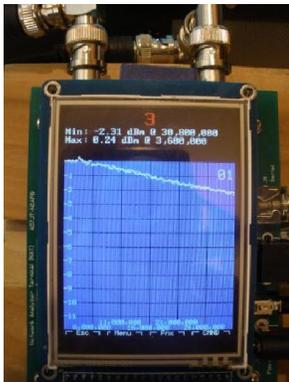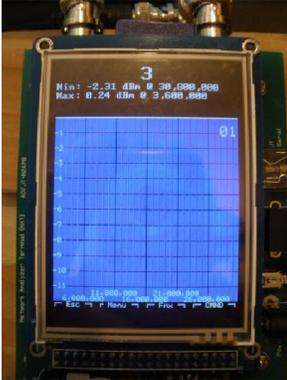
14. Tap **_Esc_** twice to go to Terminal mode and tap **_Menu_** and **_CTRL-C_** to capture the calibration data in the calibration data buffer and save it to EEPROM. The calibrated calibration curve will then be plotted (A straight line at 0.00 dBm).

15. Tap **_Esc_** twice to go to Terminal mode and tap **_Menu_** and **_ALT-C_** to clear the calibration data in the calibration data buffer and the EEPROM and to un-calibrate the data in the data buffer. You should see the same plot as in step 13.

16. Tap **_Esc_** twice to go to Terminal mode and tap **_Menu_** and **_CTRL-C_** to capture the calibration data in the calibration data buffer and save it to EEPROM and to calibrate the data in the data buffer. You should see the same plot as in step 14.

17. Tap **_Esc_** twice to go to Terminal mode and end the tutorial.

Your NAT is now calibrated for general use such as testing and evaluating filters and attenuators. For use with specialized test fixtures such as crystal test fixtures and Return Loss Bridges, the NAT will need to be recalibrated to account for test fixture insertion loss and any non-linearity inherent in the test fixture.