DSP-7-PA

Controller for amateur radio power amplifiers with large 7" TFT touch color display

and many measurement functions, sensors and WiFi webinterface

Measurement coupler calibration

DSP-7 works with any power / SWR measurement coupler that provides a voltage linear to the measured power in dBm. The most commonly used chip is the Analog Devices AD8307. The output voltage of this chip must be set (by a voltage divider) to a maximum value of 2.4 volts. Then it can be used together with the DSP-7 controller. Besides ready-made couplers or kits like this one, also self-made couplers can be easily adapted to the DSP-7. In the following this adaptation is described.

Calibrating the DSP-7 and power / SWR measurement couplers:

Calibration is performed at two power levels. The best accuracy is achieved when one power level is as low as possible (min) and the other is as high as possible (max).

Tap CALIB to open the calibration menu.

The DSP-7 can handle three power / SWR measurement couplers simultaneously. Therefore, the display provides three settings for each of these couplers.

Overview:

Calibration is a very simple operation and can be done in a few minutes:

- Transmit at a low power, measure the output voltage of the measurement coupler . Then enter transmit power and voltage in the CALIBRATION menu.
- Do the same with a high (maximum) transmit power.
- Do this for all used couplers (up to three).

The calibration in detail:

! Connect a good 50 Ohm dummy load for calibration!

We have to tell the DSP-7 controller what voltage is generated by the coupler at two different power

levels. Then the controller can calculate all other values automatically.

For calibration, we need to enter the transmit power (in watts) and the voltage (in mV) generated by our coupler. We do this for the minimum possible power and for the maximum possible power.

To reliably measure the output power:

Before we can calibrate, we need to know the actual output power as accurately as possible. A normal power meter can be used, but these meters usually have an accuracy of only 10% or 20%. A much better way is to connect a 50 ohm dummy load and an oscilloscope in parallel. Then turn on the transmitter (FM mode) and measure the peak-to-peak voltage on the oscilloscope. The output power is: $P = Upp^2 / 400$

Example: We measure a peak-to-peak voltage of 200 volts at the dummy load. The power is then 200 * 200/400 = 100 watts.

Example: Calibrate the DSP-7 and the Power / SWR bridge connected to the antenna output of the amplifier:

1. Touch the line „Ant min“ and the column „TX Pwr [W]“ to select the input field for the minimum power (as in the picture above).
2. Use the arrow keys to enter the minimum power that the transmitter can generate. This example shows 3 watts.
3. Now touch the „Ant min“ line and the „Bridge [mV]“ column to select the voltage input field.
4. Switch the transceiver to TX (FM mode) and transmit with a power of 3 watts
5. the measurement of the coupler voltage is done automatically by DSP-7. Press the →VAL← button during transmission to accept the measured value.

Do the same for the maximum power.

Now you can do the same procedure for the other two couplers.

When everything is completed, press the MENUE button to finish. The values will be saved.

Optimize the precision of power and SWR measurements:

DSP-7 with AD8307 based couplers are very precise and work in a completely different league than conventional power meters.

To achieve the best possible precision, we need to think about 3 points:

1. Dummy Load. The resistance of the dummy load must be as close to 50 ohms as possible. A value between 48 and 52 ohms is fine, but many dummy loads are far from these values. Measure the resistance of the dummy load before calibration.
2. Measure the output power: This is best done with an oscilloscope. See above: „How to measure the output power reliably“.

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