AN APPLICATION NOTE DESCRIBING
A HIGH-SPEED PHASE-COHERENT FSK GENERATOR

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Introduction:

This application note is a companion paper to the one entitled "A High-Speed RF Modem" also being presented to this conference. It describes a phase-coherent FSK generator built entirely with readily-available components and requiring only a frequency counter for set-up.

Circuit Description:

Figure 1 shows the circuitry used for our particular application. One quarter of a 74LS00 is configured as a 2.2 MHz crystal oscillator, driving two buffers, one between the oscillator and a divide-by-440 MC145151 stage having a 5KHz output (to drive phase-locked loops used elsewhere in the RF modem) and the other feeding an MC12013 dual-modulus divider chip.

This chip divides its input signal by 11 when its pin 9 is brought low, and divides by 10 when than pin is held high. The output at pin 2 is thus either 200KHz or 220KHz, depending only on the voltage level at pin 9. This output is amplified by a 2N2222 stage and then applied to the last quarter of the 74LS00, configured as an RTS gate. When RTS is high, the gate is enabled, and the 200KHz (or 220KHz) signal is applied to one of the inputs of a MC1496 doubly balanced mixer. The other input is fed with a 10.490MHz signal (shown on this schematic as a crystal oscillator for the sake of clarity, but in the actual modem generated by a frequency synthesizer.)

The output of the MC1496 is amplified by a single 2N4401 stage and applied to a 10.7MHz KVG crystal filter with a 40KHz bandwidth, The output of the filter is buffered by means of a 2N2222 emitter follower stage.

Motorola uses a MC12013 in an RF Modem with a data rate of 1.5Megabits (!), and we should thus have no fear that our packet system will reach the upper limits of that chip in the near future!

Should a total frequency shift of only 10KHz be desired, a divider-by-2 stage should be inserted between the 2.2MHz oscillator and the MC12013 dual-modulus stage. The output would now be 100KHz and 110KHz, and if the same type of 10.7MHz output filter is to be used, the crystal for the oscillator will have to be cut for operation at 10.595MHz. Similarly, a 40KHz total frequency shift can be obtained by using a 4.4MHz reference oscillator and a 10.280MHz L.O., etc.

Conclusion:

This circuitry functions as soon as built, and requires no adjustment whatsoever (apart from adjusting the 2.2MHz trimmer capacitor.) If an L.O. crystal oscillator is used, it should be "rubbed" (by means of the 50pF trimmer capacitor shown connected between the crystal and ground) to the precise design frequency (in our case 10.490MHz) to keep the frequency shift centered in the passband of the crystal filter.

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