A New Look at a Simple VFO/Exciter

Stable tuning with minimal parts.

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Some 20 years ago many experimenters became interested in the low frequency experimenter's band. To work this band, which ranges from 160 to 190 kHz, many so-called "LOWFERS" used self-excited oscillators to avoid the high cost of low frequency crystals.

As receiving techniques improved, including the use of extremely sharp filters, a stable transmitting frequency became necessary for serious communications.

When the CMOS 4000 series of Binary Ripple Counters (frequency dividers) became available, they permitted us to use high frequency crystals for control and provided divider outputs into the 160 to 190 kHz band. The 4024 and the 4040 were popular ICs using crystals in the 5120 to 6080 kHz range; using the "divide by 32" output would put you into the band. The frequency limitations on these CMOS 4000 series was 6 to 7 MHz.

Some years ago, the high speed 74HC series and 74HCT4000 series became available and these had an operational range up to 50 MHz. The pinout of the 74HC4024 and the 74HC or 74HCT4040 are identical to their CMOS 4020 and 4040 counterparts, with the exception that their operational voltage is 6 volts maximum, making them ideal for operating with a 5 volt regulator such as the 7805.

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I got the idea of using a 74HCT4040 with a VFO operating in the 20.48 to 24.32 MHz range and using the "divide by 128" output for 160 to 190 kHz. In this case, any drift in the oscillator would be lessened by 128 times. The end result was an extremely stable signal.

Next came the thought: Why not use this same principle to build a 160, 80 and 40 meter VFO/exciter? By using VFO tuning from 27.2 to 32 MHz, and by using "divide by 16" for 160, divide by 8 for 80 and divide by 4 for 40 meters, a stable VFO emerged.

Construction

I breadboarded several circuits and ended up with the version shown in Figure 1.

I intentionally used easily available disc ceramic capacitors to see how stable the VFO would be. Normally, silver micas and NPOs would be called for in a VFO. However, I was quite pleased with the stability after a short warm-up.

Since the oscillator is operating at a higher

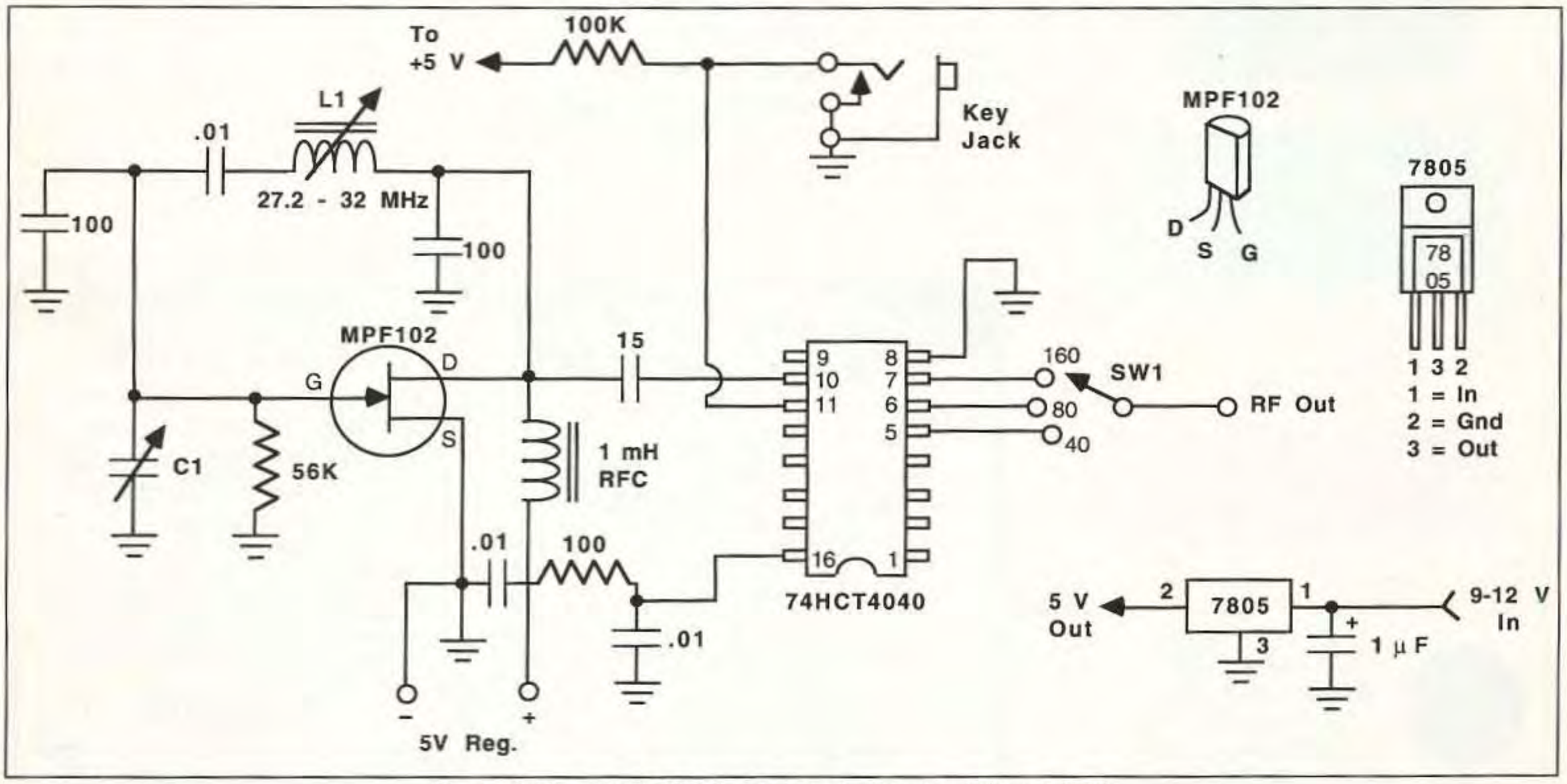

Figure 1. The simple VFO/exciter and voltage regulator circuits.

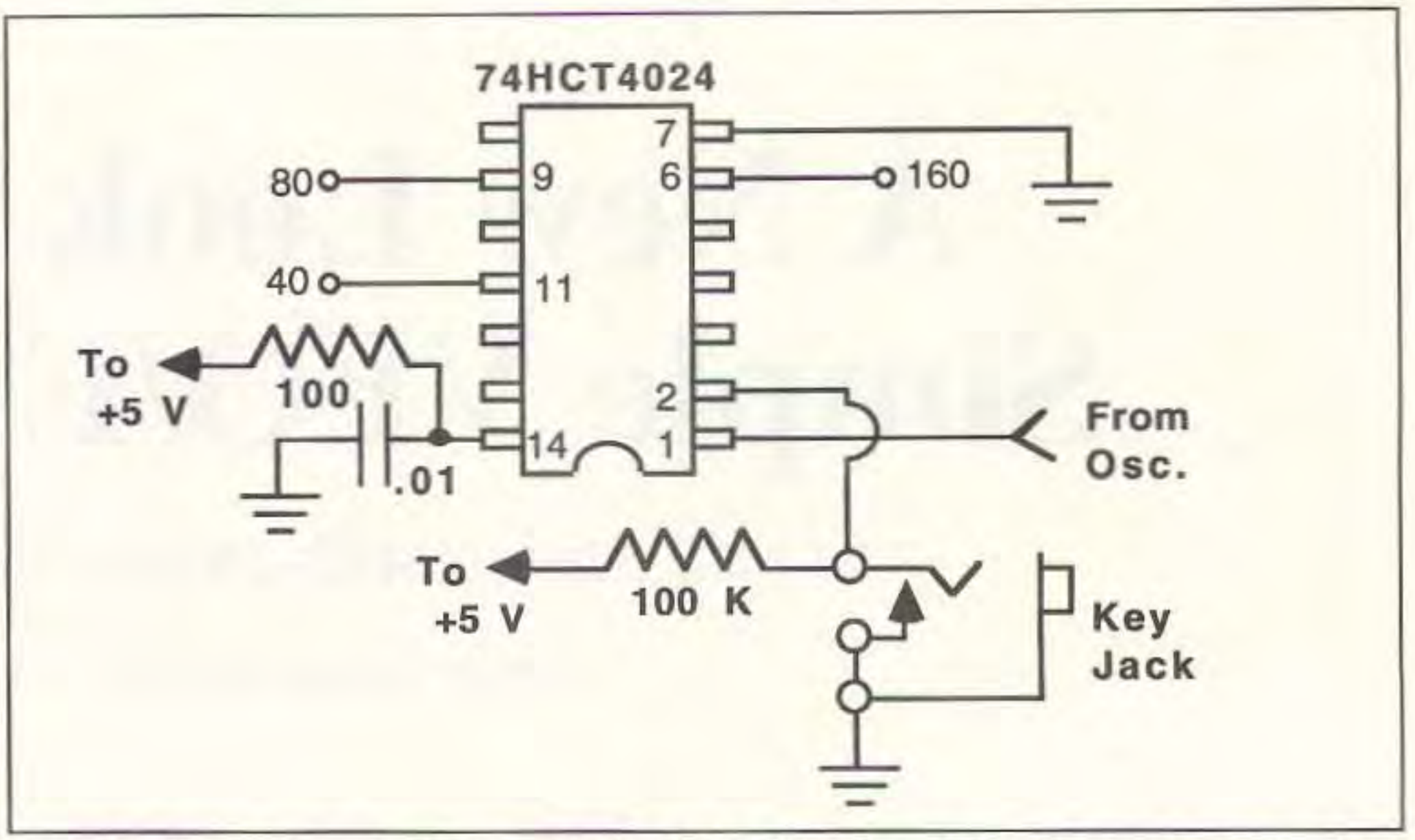

Figure 2. Pinout for substituting with the 74HC4024. Note: When the key is used and up, plus bias is applied to Pin 2 which disables the device. When the key is down, Pin 2 is grounded and the chip becomes active. This also applies to the 74HCT4040 at Pin 11.

frequency than the used frequency, it can be left running and that helps the stability.

Due to the light coupling and apparent stable load on the oscillator with the key in either the up or down position, keying is very clean.

The only difficult part is getting the proper tuning range using the slug and tuning capacitor C1. If you don't have access to a frequency counter, I suggest that you take the "divide by 16" output from pin 7 and tune your receiver to the 1500 to 2000 kHz range. Use a good variable capacitor of 50 to 75 pF for C1. Tune the receiver to 1850 kHz and with the tuning capacitor at mid-range, and adjust the slug in L1 to zero beat. The tuning capacitor should now be able to tune 1700 to 2000 kHz. If the capacitor is too large, you can add a trimmer capacitor in series with same and adjust the tuning to suit.

I suggest that, when you're satisfied with the tuning range, a vernier drive be used for C1. Actually, a fixed capacitor for C1 could be used and the tuning accomplished by using the slug adjustment.

For those who wish to substitute a 74HC4024, the pinout is shown in Figure 2.

As with any VFO, sound construction should be used and the circuit should be enclosed in a shielded cabinet. 73

Parts Description

C1	See text.
L1	9 turns #22 solid insulated hook-up wire wound on a 5/16" diameter slug tuned form for a 3/4" winding length.
Capacitors	All High "Q" disk types with values as shown.
Resistors	All 1/4 watt.
SW-1	Rotary switch, three positions used.
Key jack	To suit your key plug.