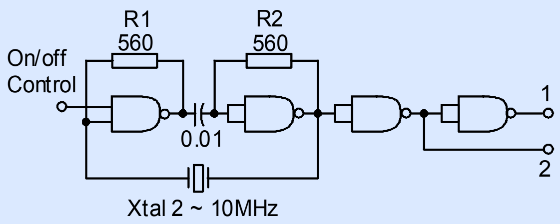
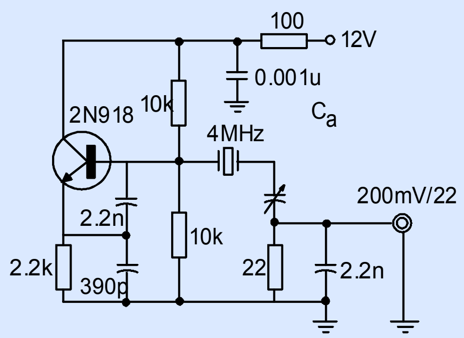
IC-Compatible Oscillator Circuit



IC-Compatible Oscillator Circuit

In this circuit, resistors R1 and R2 temperature-stabilise the NAND gates, and ensure that the gates are in a linear region for start-up. Capacitor C1 is a DC block and must have <0.1Ω impedance at the operating frequency. The crystal runs in series mode, so it is important that its series resistance is low. AT-cut crystals in the range 1MHz to 10MHz work well, giving a duty cycle of nearly 50%, with chip-limited rise times. The circuit starts well from 0° to 70°C.

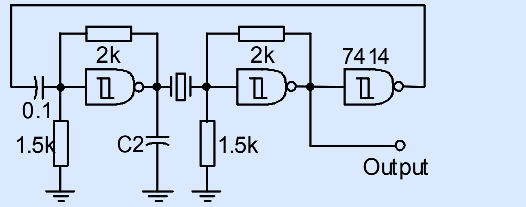
Low-Noise Crystal Oscillator



Low-Noise Crystal Oscillator

This oscillator delivers an output of high spectral purity without degrading stability. In addition to determining the oscillator frequency, the crystal is also used as a low-pass filter for the unwanted harmonics and as a bandpass filter for the sideband noise. The noise bandwidth is less than 100Hz. All higher harmonics are suppressed -60dB down for the third harmonic of the 4MHz fundamental oscillator frequency.

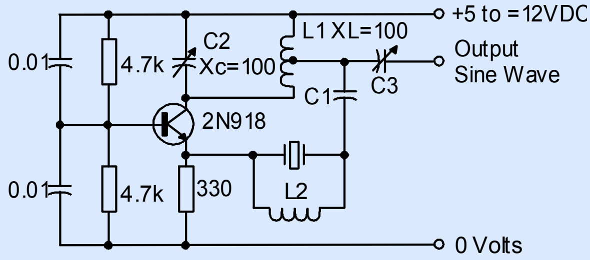
Schmitt Trigger Crystal Oscillator



Schmitt Trigger Crystal Oscillator

A Schmitt trigger provides good squaring of the output, and sometimes eliminates the need for an extra output stage. To prevent spurious oscillation ensure C2 = 1/1x104 (frequency is in Hz.)

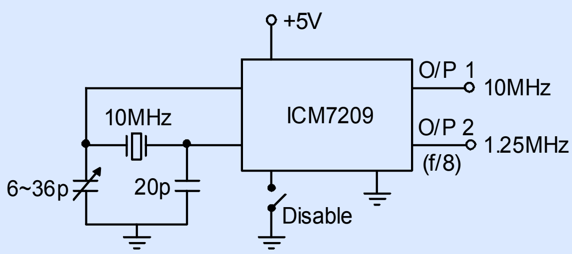
Overtone Oscillator 50MHz ~ 100MHz



Overtone Oscillator 50MHz ~ 100MHz

In this circuit the crystal is AT-cut and operates in overtone mode. L1 and C2 are tuned to the operating frequency, while L2 and the shunt capacitance of the crystal should resonate at the oscillator output frequency. (For example, L2 is approximately 0.5µH at 90MHz. This is necessary to tune out the crystal C0.) C3 is adjusted to match the oscillator output.

Precision Clock Generator



Precision Clock Generator

The CMOS IC directly drives 5 TTL loads from either of two buffered outputs. The device operates to 10MHz and is bipolar, MOS and CMOS compatible.

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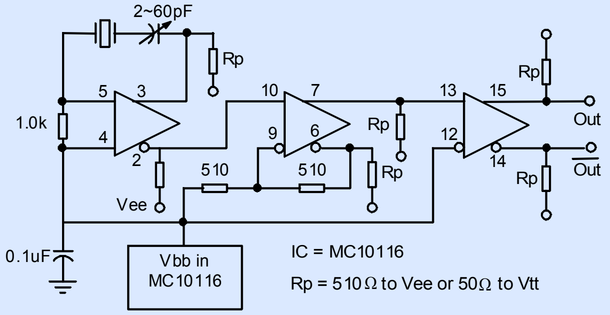
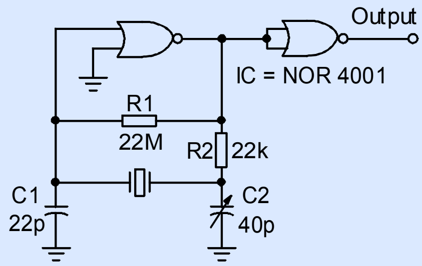
Fundamental Frequency Crystal Oscillator



CMOS Crystal Oscillator



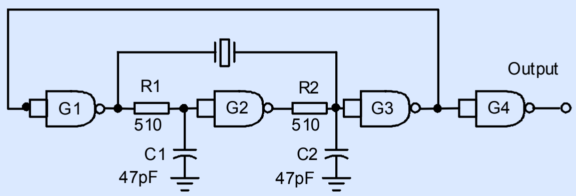
Fundamental Frequency Crystal Oscillator

For frequencies below 20MHz, a fundamental frequency crystal can be used and the resonant tank is no longer required. Also at this lower frequency range the typical MECL 10,000 propagation delay of 2ns becomes small compared to the period of oscillation, and it is necessary to use a non-inverting output. Therefore the MC10116 oscillator section functions simply as an amplifier. The 1.0kΩ resistor biases the line receiver near Vss and the 0.1μF capacitor is a filter capacitor for the Vbb supply. The capacitor, in series with the crystal, provides for minor frequency adjustments. The second section of the MC10116 is connected as a Schmitt-trigger circuit, ensuring good MECL edges from a slow, less than 20MHz input signal. The third stage of the MC10116 is used as a buffer and to give complementary outputs from the crystal oscillator circuit. The circuit has a maximum operating frequency of approximately 20MHz and a minimum of approximately 1MHz. Use a fundamental mode crystal.

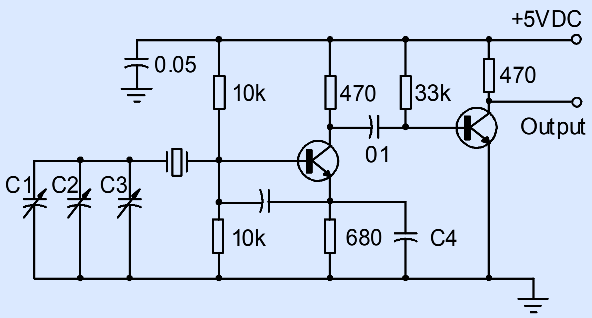
CMOS Crystal Oscillator

This circuit has a frequency range of 0.5MHz to 2.0MHz. The frequency can be adjusted to a precise value with trimmer capacitor C2. The second NOR gate serves as an output buffer.

Easy Start-up Crystal Oscillator



Temperature-Compensated Crystal Oscillator



Easy Start-up Crystal Oscillator

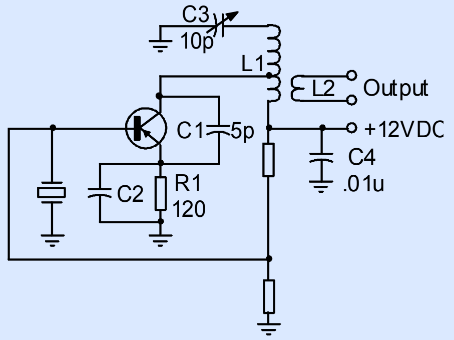
This is a low-cost, crystal-controlled oscillator using one TTL gate. Start-up is ensured by the connection of NAND gates G1, G2 and G3 into an unstable logic configuration and the high loop gain of the three inverters. Select the values of R1, R2, C1 and C2 so the oscillator operates at a frequency 70% to 90% higher than required with the crystal disconnected. For 1MHz to 2MHz operation a low-power 54L00 IC is recommended; for 2MHz to 6MHz, a standard 5400 type, and for 6MHz to 50MHz a 54H00 or 54S00.

Temperature-Compensated Crystal Oscillator

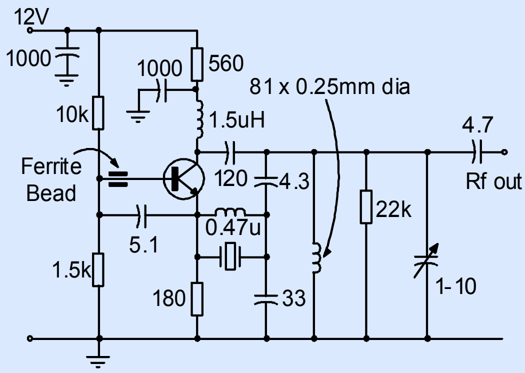
For a 5MHz AT-cut crystal, C = 3pF to 8pF (fine frequency trimmer) C2 = 4pF to 24pF N500 (temperature compensating) C3 = 8pF to 48pF N1500 (temperature compensating) and C4 = 120pF silver mica.

The different negative-coefficient capacitors are blended to produce the desired change in capacitance to counteract or compensate for the decrease in frequency of the 'normal' AT-cut characteristics of the crystal.

Overtone Crystal Oscillator



Overtone Crystal Oscillator



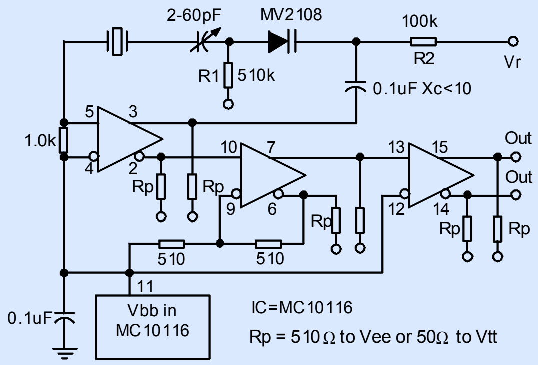
Overtone Crystal Oscillator

The crystal in this circuit is connected directly between the base and ground of the transistor. Capacitor C1 is used to improve the feedback due to the internal capacitances of the transistor. This capacitor should be mounted as close as possible to the case of the transistor. The LC tank circuit in the collector of the transistor is tuned to the overtone frequency of the crystal. The emitter resistor capacitor must have a capacitive reactance of approximately 90Ω at the frequency of operation. The tap on inductor L1 is used to match the impedance of the transistor collector. Usually, the placement of this tap is approximately one third from the cold end of the coil. The placement of the trap is a trade-off between stability and maximum power output. The output signal is taken from a link coupling coil, L2 and operates by transformer action.

Overtone Crystal Oscillator

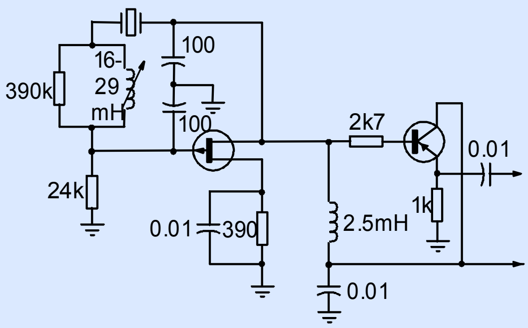
This design gives high reliability over a wide temperature range and uses fifth and seventh overtone crystals. The inductor in parallel with the crystal causes anti-resonance of the crystal C0 to minimize loading. This is a common technique with overtone crystals.

Voltage-Controlled Crystal Oscillator



Nominal Frequency MHz	Deviation +ppm	-ppm
1.000	57.0	48.0
1.8432	95.5	80.3
10.000	197.4	202.8
15.000	325.4	322.9

VXO Crystal Oscillator



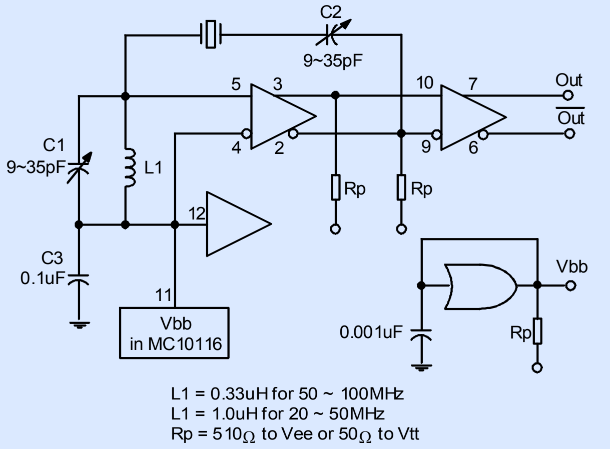
VXO Crystal Oscillator

This circuit provides a stable VXO using 6MHz or 8MHz crystals. Frequency pulling on either side of series resonance is achieved by use of the capacitor and inductor.

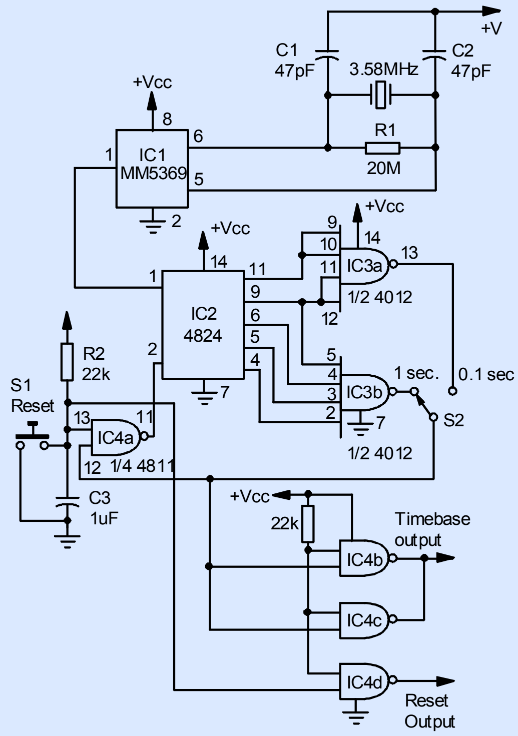
Voltage-Controlled Crystal Oscillator

A voltage-variable capacitance tuning diode is placed in series with the crystal feedback path. Changing the voltage on Vr varies the tuning diode capacitance and tunes the oscillator. The 510kΩ resistor, R1, establishes a reference voltage from the feedback loop and 0.1μF cap. C2 provides AC coupling to the tuning diode. The circuit operates over a tuning range of 0 to 25V. It is possible to change the tuning range from 0 to 25V by reversing the tuning diode D1.Centre frequency is set with the 2-60pF trimmer capacitor. The table above shows measured deviation for several tested crystals.

Overtone Crystal Oscillator



Crystal Timebase



Overtone Crystal Oscillator

This circuit uses an adjustable resonant tank circuit to ensure operation at the desired crystal overtone. C1 and L1 form the resonant tank circuit, which, with the values specified as a resonant frequency, are adjustable from approximately 50MHz to 100MHz. Overtone operation is accomplished by adjusting the tank circuit frequency at or near the desired frequency. The tank circuit exhibits a low impedance shunt to off-frequency oscillations and a high impedance to the desired frequency, which allows feedback from the output. Operation in this manner guarantees that the oscillator will always start at the correct overtone.

Crystal Timebase

An on-board oscillator and a 17 stage divider compose IC1. By connecting a standard 3.58MHz, television colour-burst crystal as shown, an accurate source of 60Hz squarewaves is generated at the ICs output, pin 1. Those pulses are then fed to IC2, a 4024 seven-stage ripple counter. Its outputs are connected directly to different gates in IC3, which is a dual four-input NAND gate. Depending upon which position pulse-select switch S2 occupies, one of those gates will provide an output/reset pulse of the selected width.

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