# THEORY OF OPERATION AND
# CIRCUIT DESCRIPTION
# MODEL 974-315LM
# 4 FUNCTION, REMOTE CONTROL TRANSMITTER

(Please refer to enclosed schematic drawing: 195D1620)

The four-channel learning transmitter consists of a low power RF oscillator which doubles as a square-law detector (Q4 and associated components), an audio band amplifier (Q2 and associated components), a
digital encoder (U1, U2, and associated components), a power latching circuit (Q1, Q3, and associated components), a switch-mode boost voltage converter (L1, Q5, and associated components), and on/off switches.

The RF oscillator, Q4, is of the grounded base type. C8, C5, C7, and the copper loop set the center frequency of the oscillator at 315 MHz. C4 and C13, with the internal capacitance of Q4, establish feedback levels and harmonic suppression. R10, R11, and R12 establish dc operating conditions on Q1 and help improve temperature stability when transmitting, with R9 being held at a tri-state (floating) condition by U2. U2 and related components generate a digital code. This code is used in the companion receiver to identify a particular transmitter or function. R29 and R30 are used for harmonic suppression.

To make the unit receive, R9 is held high and R10 at a tri-state (floating) condition by U2. Q4 is thus biased to a dc level, which is insufficient for oscillation. Incoming RF signals are square-law detected by Q4 and associated components and amplified by Q2 and associated components. The signal is detected by a comparator at pin 9 of U2, with the reference being a DC voltage, set by R1 and R2, at pin 10 of U2.

When transmitting or receiving a radio code, the unit maintains its power through Q1, Q3, and associated components. When a button is depressed, Q1 is biased on supplying power to U2. U2 then biases Q3 on, thus keeping Q1 active for as long as necessary.

When transmitting a radio code, the unit generates a 9 volt power supply for the RF circuit from its 3-6V source through the switching voltage converter formed by L1, Q5, and associated components. Q5 is periodically switched on, causing current flow through L1 at a rate, which increases linearly. When Q5 is switched off, a high voltage is generated across L1 due to instantaneous change in inductor current. This voltage is transferred across D1 and stored in C15. D3 and R24 form a feedback, which goes into pin 8 of U2, providing U2 with information about the actual voltage of the RF supply.