§2.1033(c)(10) Schematic Diagram: See Schematic Diagram Exhibit files, 7721-1.pdf and 7721-2.pdf.

Note: Component designations preceded by an 'X' are not present.

Description of Circuits:

Determining and Stabilizing the Frequency of the Transmitter

The frequency is determined by a Temperature Compensated Voltage Controlled Crystal Oscillator (TCVCXO), A2, Ademco part number K3945, which operates at 12 MHz and is compensated to a stability of ±2.5PPM over the temperature range of -30°C to +75°C.

A frequency synthesizer uses this 12 MHz as a source, and produces the RF output frequency on 14 channels in the range of 928.0125 MHz to 928.3375 MHz. The synthesizer is U10, Ademco part number N40-LMX1501. The programming of this chip originates with the on-board microprocessor, U4, and the channel information is stored in electrically programmable ROM U5. An output from U10-7 is filtered and processed thru comparator U33 to produce a logical "1" only when the loop is locked. The LOOPLOCK signal is fed to the microprocessor at U4-38, and inhibits the transmitter from being activated when it is not in a logical "1" state.

Suppression of Spurious Radiation

Each radio frequency stage of the transmitter after U15, a wide-band buffer, uses tuned circuits, comprised of a combination of distributed and lumped elements, which are designed to maximize power gain in the desired band of frequencies at 928 MHz, and minimize gain at frequencies where harmonic or subharmonic signals might exist. The entire radio frequency section of the transmitter is enclosed in a shield, with double-walled metalizing, which is mechanically connected to circuit ground by screws. The output of the final RF amplifier is also low-pass filtered by the structure shown on the schematic as "LOW PASS FILTER," which is made up of lumped capacitors at C139 and C140, as well as distributed microstrip line elements.

Phase-locked loop components, including time constants and VCO parameters, and modulation filtering, have been chosen so as to keep the spectrum and the occupied bandwidth within the prescribed limits.

Connections which originate within the shield structure are typically either filtered by ferrite or resistive elements combined with bypass capacitors, or at least with bypass capacitors, and the 12 MHz clock, which is also used by the microprocessor, U4, has its high-frequency edges rounded off by series elements R381 and Z51, a ferrite bead, traversing the unshielded portion of the circuit board.

To as great a degree as feasible, circuits have been kept compact, so as to minimize the area from which digital signals could be radiated, and most integrated circuits are bypassed to circuit ground near their power supply input.

Virtually the entire far side of the circuit board, which contains no components, is ground plane.

Limiting Modulation

Modulation amplitude is invariant, since it consists of a data stream of digital "1's" and "0's".

The modulation is adjusted at the factory via potentiometers R1 and R43. Before being applied to the TCVCXO, it is low-pass filtered by components R4 and C18, and in the path to the 928 MHz VCO, by components R45, C48, and R62, C80. Since the modulation level is constant, no means of "limiting" it are provided or necessary.

Limiting Power

The power output is determined by the capability of the output transistor, Q4 (Ademco part number N15-BLT94), and the DC bias applied to it. The collector voltage is regulated, and the bias is adjusted at the factory. It is actually not possible to get any significant power greater than 5 watts at the antenna port using this particular part, at this bias. Radios are specified to ship with power level between +6 and +7 dBW.