

Narrative Description of the Operation of MS Sedco's, Model ID20 Vehicular Motion Sensor

The Model ID20 Vehicle Motion Sensor, manufactured by MS Sedco, is a field disturbance sensor intended for operation under FCC Rules and Regulations, Part 15. Attached to this description is the schematic and block diagrams to aid in understanding the operating principles.

Beginning at the left side of the block diagram, Block #1 is designated as the transceiver. This is a 10.525GHz DRO based module that transmits the microwave energy and also incorporates the 2 receiving mixer diodes. The transceiver provides the initial signals which are present when the ID20 is detecting a moving target. The 2 mixer diodes are positioned in the microwave cavity such that a phase difference of 60° to 90° occurs between the 2 signals when motion is being detected. If the motion of the detected target is travelling towards the sensor then the channel 2 signal will lead the channel 1 signal by about 90°. If the motion is away from the sensor then the channel 1 signal will lead the channel 2 signal by about 90°.

These Doppler signals are coupled through capacitors C4, C14, resistors R3, and R27 to transistors Q4 and Q5. Q4 and Q5 are preamplifier circuits (Blocks 2 & 3) with a gain of 26db. This amplified signal is then coupled to IC2c and IC2d amplifiers through R6, R30, C6 and C16. IC2c has a user variable gain from 18 to 49db (Block 4). Gain is controlled by the rotation of potentiometer VR1. The amplifiers are represented by Blocks 5 & 7. This gain selection controls the effective sensing range of the unit.

The amplified signals are then coupled from the output of IC2c and IC2d through C9, C18, R9 and R33 to IC2b and IC2a (Blocks 8 & 9) which are voltage comparator circuits. These comparators are designed to convert the amplified Doppler Shift signals into a squarewave output of constant amplitude whenever the input sinusoid has a level exceeding the one established by voltage dividers R10, VR2, & R13 for IC2b (Block 8) and the self biasing voltage divider of R35 and R36 for IC2a (Block 9).

The Doppler Signals from IC2a and IC2b (Blocks 8 & 9) are coupled to the directionality detection circuit consisting of C12, Q1 & Q2 (Block 11) through switch SW2 (Block 10). SW2 allows the user or installer to select the direction of the traffic that the ID20 will respond to.

The squarewave output from Block 11 is coupled through R15 to squarewave shaper circuits IC6a and IC6b (Block 12). R15 is pulled up to +5 volts so that the 8 volt signal from the directionality circuit is not directly coupled to the microprocessor, IC5 (Block 13).

The microprocessor monitors and analyzes the squarewave signal from the directionality circuit to determine validity of the bit time duration & cycle time. If the target is moving in the proper direction and speed, the processor causes the Relay (K1) & LED (D3) to be energized. (Block 14). The time duration of the relay being energized after the unit is no longer detecting motion is set via the potentiometer VR3 and its range is from 0 to 5 seconds.

The power supply for the ID20 (Block 6) consists of diode bridge DB1, filter capacitors C1 & C2, Switching voltage regulator IC1 and its associated components D1, L2, R1 & R2. IC3 & IC7 supply regulated voltage to the Microprocessor and Linear processing circuits respectively.