Wrap Desk Deactivator
Theory of Operation

Introduction

The Wrap Desk Deactivator (WDD) is an accessory product normally used with the "P" and "T" family of RF anti-theft (EAS) systems. These systems are generally installed in retail stores to protect merchandise from theft. The main elements of the system are the "P" or "T" series detection system installed near the store exit and the tags, which are attached to the items to be protected. Tags brought within a certain distance from the detection system cause an audible alarm to be generated. At the point of sale, the tags are removed from the merchandise or deactivated by the store clerk as the items are paid for, allowing the customer to take the merchandise past the system without causing an alarm. The "WDD" described in the following, is a small tag detection system, which is placed near the checkout to help the clerk identify items, which may have a tag that is not readily visible.

General Principle of Operation

The WDD operates on the same principle as a radar system. A transmit signal within the 7.5 to 8.9MHz band generated within is radiated into the detection or deactivation zone. The tag, which is a passive device containing a spiral antenna and a tuning capacitor, is a resonant circuit tuned within the 7.6 to 8.8 MHz band. The tag absorbs energy from the field produced by the WDD and re-radiates the field at the tag's resonant frequency. This re-radiated field is detected by an antenna and processed to produce an alarm.

Circuit Description

Overall Architecture

The system is comprised of four basic sections: the transmitter electronics, the receiver electronics, the antenna pad and the power supply. The transmitter and receiver electronics are contained in a metal enclosure and the external pad is connected to it. The power is supplied from an external wall plug in transformer. DC supply voltages of +12V and +5V are then regulated and provided to the active circuitry.

Transmitter Electronics

The transmitter derives its basic timing and frequency control from U21, which is an 8-bit processor that operates on an 8MHz crystal. The main transmit carrier generating device is U7, a single chip Direct Digital Synthesis (DDS) IC that operates on a 40MHz clock module and is controlled by the processor. The DDS transmit carrier frequency is

passed to the transmitter amplifier, a low pass filter and then to the antenna.

A zero crossing detector starts a sequence of events that occurs at the same frequency as the AC line voltage. The sequence starts with a 7uS transmitter burst at a fixed frequency followed by a 43uS delay. This sequence occurs eight times, each time at a fixed frequency of 7.5, 7.7, 7.9, 8.1, 8.3, 8.5, 8.7, and 8.9MHz. The worst case duty cycle for the transmitter is 100*(7E-06 * 60 (line frequency)) = 0.042%

Receiver Electronics

During the time between each transmitter burst, the re-radiated field from the tag is passed to the receiver IC U4 which is a 100dB demodulating logarithmic amplifier IC. The detected output is amplified by U7, passed to U4 where it is sampled and fed to the comparator input on U21. If the signal from the tag has the same Q as that expected from a tag, the alarm is generated.