Operational Description

System Overview

The system is used as an electronic tag reading system for animal identification purposes on farms, markets/sales and abattoirs.

This design is used for identifying cattle whilst they move along passageways. Each animal to be identified must be tagged with a low frequency half-duplex transponder. These are usually in the form of ear tags.

The system comprises a 'walkthrough antenna and a control box. The antenna is a cubic structure made from either galvanised or stainless steel tubes. This antenna structure houses three pairs of transmit/receive loop antennae. These are connected to the control box via coaxial cables. The control box is a stainless steel enclosure housing a power supply circuit, the TIRIS tag reader module and the antenna multiplex circuit. The box also has connections for line voltage and communications data.

During operation a tagged animal walks through the antenna. The reader module transmits a carrier to the tag which uses this signal to charge an internal capacitor. When sufficient charge is built up, the tag responds to the reader module with a unique identity code. The reader module then decodes this and outputs it via the RS232-C communications interface. This can then be captured by a computer.

System Breakdown

The complete system comprises four individual blocks of circuitry. The operation of each of these blocks is described below:

Power Supply

The line voltage of 115VAC is first filtered and fused. It is then transformed to 15 volts by a 50 VA isolation transformer. The 15 volts AC is then rectified and smoothed before being regulated to a steady 13.6 volts DC. (for the reader module).

TIRIS Reader Module

The reader module is a commercially available tag reading system from Texas Instruments. It works on a half duplex system whereby it continually switches between transmit and receive modes. The transmission burst at 134.2KHz lasts for 50 ms. This is followed by a receive period of 20mS and then a wait/sync period of 20mS. The transmission is used as a charge burst to charge the animal tag's internal storage capacitor. When charged, the tag responds, by which time the reader has switched to receive mode. The tag responds with 134.2KHz signal that is frequency modulated with a unique identity code using frequency shift keying (fsk) with a bandwidth of 20KHz.

The reader has an RS232-C communications interface port used to transfer the tag code to an external computer.

The reader has two status indicators that are mounted on the front panel of the control box. The red LED flashes on whenever the reader goes into transmit mode. Under normal operation this LED flashes at a rate of approx. ten a second. The green LED flashes once for each successful tag read.

The antenna pairs are matched to the reader output by the addition of the parallel tuning coil. The coil has an adjustable ferrite slug that enables each system to be individually tuned to give maximum performance.

Multiplex Circuit

The single antenna output from the reader module must be switched continually between the three pairs of antennas. This is done by taking the ACTIVE pulse signal from the reader module and dividing it by three using a divider logic chip. These three sequential outputs are then used to sequentially turn on three separate opto-isolated MOSFET switches. Each of these MOSFETs switches a pair of antennas. The opto MOSFETs are paired in parallel to cut down on signal losses.

Antenna

The antenna consists of three pairs of parallel loops. Each of the pairs is switched on in turn via the multiplex circuit and the opto MOSFETs. This ensures that whichever orientation the tag is in it will be read by at least one pair of antennas.