Allflex Compact Reader
Model No. RS200-V2
FCC ID: NQY-930042

Theory of Operation

General Description

The RS200-V2 Compact Reader is a radio frequency identification (RFID) scanning device that activates and reads passive transponders which conform to International Standards Organization (ISO) 11784 and 11785 specifications. The Reader emits a transponder activation signal comprising a 134.2KHz sinusoidal unmodulated carrier in an 80 millisecond on / 30 millisecond off burst mode, and contains receive circuitry that amplifies, detects, and decodes binary coded information contained in the transponder. Decoded transponder information is subsequently conveyed to external data processing equipment via a standard RS232 serial data interface.

Block Diagram Description

The Compact Reader consists of a microcontroller device that performs communications, transponder decoding, and general housekeeping tasks. The microcontroller contains embedded oscillator circuitry operating in conjunction with a 17.1776 MHz crystal, which clocks the execution rate of software instructions. This microcontroller clock frequency is also used to derive the 134.2KHz intentionally radiated transmitter signal through a divide by 128 counter. The 134.2KHz output frequency is power amplified and applied to the Reader's integral transmit/receive antenna. The 134.2KHz activation signal is turned on and off in the aforementioned burst pattern by means of an on/off control line emanating from the microprocessor, and connected to the divide by 128 counter's reset line. In this fashion, when the Reader has power applied to it, and the Read button is depressed, the 134.2KHz activation signal is continuously generated in the 80/30 millisecond burst pattern.

The Reader can detect and decode the two types of transponders that are defined within the ISO Standards. The first transponder type, referred to as "HDX" accumulates energy from the Reader's activation signal during the 80 millisecond "on" interval, and following cessation of this signal, the HDX transponder transmits its internally stored binary coded information using a two frequency FSK modulation scheme during the 30 millisecond "off" interval. The second transponder type, referred to as "FDX-B", uses instantaneous energy received during the 80 millisecond activation signal "on" interval to back-scatter ASK modulate the 134.2KHz carrier signal with its internally stored binary coded information; the FDX-B transponder is dormant during the 30 millisecond "off" interval. Thus, HDX transponder information is received by the Reader while the activation signal is "off" and FDX-B transponder information is received by the Reader while the activation signal is "on".

HDX transponder signals are demodulated, resulting in digital data and synchronizing clock signals that are input to the microcontroller device, where an ensemble of algorithmic software procedures extract the transponder's binary coded information. This information is subsequently parsed and formatted in one of several possible formats, according to configurations specified by the user and stored internally in the microcontroller's non-volatile memory. The resulting transponder information is then display on a 2 line by 8 character liquid crystal display (LCD).

FDX-B transponder signals are extracted from simultaneous presence with the 134.2KHz activation signal through a series of detection, filtering, and amplification processes. Data and synchronizing clock signals are derived, and input to the microcontroller where an ensemble of algorithm software procedures, different from those used for HDX, extract the transponder's binary coded information. This information is subsequently parsed and formatted in one of several possible formats, according to configurations specified by the user and stored internally in

the microcontroller's non-volatile memory. The resulting transponder information is then display on a 2 line by 8 character liquid crystal display (LCD).

Upon successful detection of a valid transponder, the Reader momentarily flashes a red indicator light, and sounds an audible beeper. When a valid transponder is detected, the transponder activation signal is automatically shut off. In order to initiate another reading cycle, the operator must requires release and again depress the Read button.

A voltage regulator circuit generates a stable internal voltage for analog and logic circuitry. The Reader is designed to operate from an internal 9 volt alkaline disposable battery, which determines the 134.2KHz transmit power level. The Reader is activated upon pressing the read button, and automatically times out and powers off after 30 seconds of no reading activity. Alternately, the two menu scroll buttons can be simultaneously pressed to turn the power off manually.

Software Architecture

Embedded software code executed in the microcontroller device controls the Reader operation. Upon pressing the Read button to power on the reader, the microcontroller prepares itself for operation by recalling stored configuration parameters, and checking their validity. Software then awaits depression of the Read button in order to set the activation signal into operation, and to search for decodable data at the HDX and FDX-B data inputs. When valid transponder information is successfully decoded, this information is sent to the LCD readout, and the LED visual indicator and audible beeper are momentarily activated.

Schematic Diagram Notes

1. There are no specific circuits, devices, or techniques employed for limiting or controlling spurious electromagnetic emissions, other than good circuit and PCB design techniques, careful PCB layout, and PCB ground/power plane utilization.
2. The microcontroller clock crystal is a 0.01% tolerance, 50ppm stable device, and the 134.2KHz transmitter frequency is derived from this time base.
3. Spurious emissions are limited by internal voltage regulation that drives all logic and analog circuitry. Transmitter power is limited by the battery voltage, which is nominally 9.0 volts DC.
4. The transmitter/receiver antenna is integral to Reader's physical packaging, and is permanently connected to the Reader electronics module via soldered wires

*** End ***