

Card Reader Theory of Operation

All of the card readers are composed of two major sections. There is the RF section operating at either 125KHz or 13.56MHz, and the Host Interface and Configuration section. The physical interface to the Host is either USB or RS232.

RF Section

The frequency of operation depends on the type of card that is to be read but is fixed for any particular card reader. This is due to space constraints in providing a tuned antenna for any particular operating frequency band.

All of the card readers rely on a “back-scatter” modulation technique. The RF field produced by the reader is actually supplying power to the card that is being read. Once the card is powered from the RF field, data communication takes place by modulating the carrier in different ways particular to the card technology in use. The reader directly modulates the carrier when it is transmitting to the card and the card responds by “loading” its antenna circuit with the modulation data and thus reflecting this “detuning” into the reader antenna circuit. The “loaded” reader antenna circuit sees amplitude changes representing data these changes are processed to recover the response data from the card.

The RF section is powered from a switched 5V source that is under control of the Host Interface microprocessor. The power is switched off during startup and when the USB puts the Host Interface into a low power “standby” or “sleep” mode.

The RF section microprocessor communicates with the Host Interface section microprocessor via digital interface lines connecting the two.

Host Interface Section

This section receives data from the RF section that represents either a non-solicited card ID (usually over “Wiegand” format data lines) or is a more elaborate two-way asynchronous data exchange when commands must be issued to the RF section to get an appropriate response. This two-way data exchange is used to read from and write to certain card types that are capable of storing user information. These cards are all in the 13.56MHz group.

The Host Interface microprocessor communicates to the Host (usually a PC or printer) directly thru a USB peripheral operating at either 12Mbps (full speed) or 1.5Mbps (slow speed) or thru a UART peripheral that is connected to a RS232 level-shift circuit. Only one of these interfaces is active for any particular reader model.

The Host Interface micro may be configured by the Host to control various behaviors (display LED and beeper), timing parameters, and card ID return format. The exchanged data may also include card data (read and write) and overhead commands to the RF micro that set up card data access such as key exchanges and card data location.