

DR5000 Reader Description and Theory of Operation

The DR5000 Reader is designed to work with Blackboard's SA3000 Door Access System and third-party access control systems. The reader supports NXP contactless smart cards and mobile phones (credentials) with Near Field Communication (NFC) technology. When a card or phone is placed near the reader, a poll operation is performed. The reader then interrogates the credential to determine if it contains the Transact Campus provisioned data.

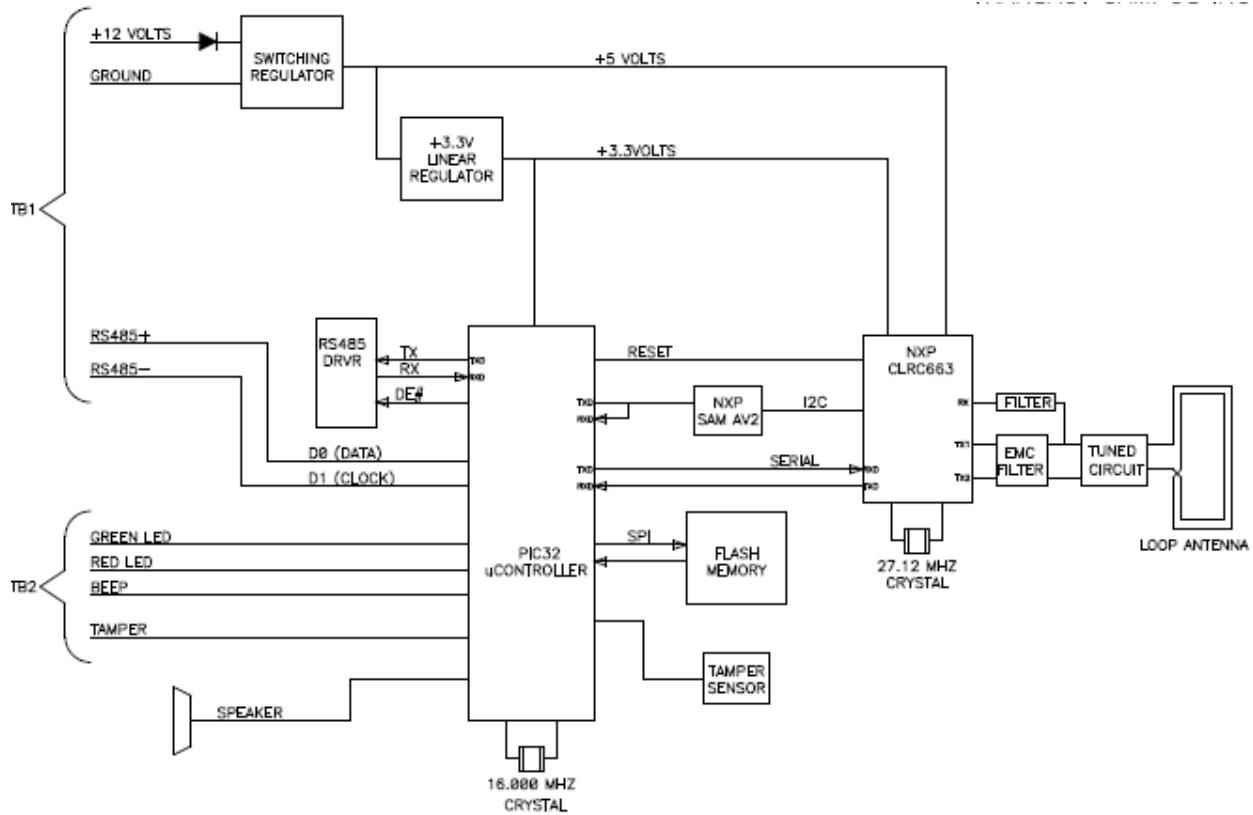
The DR5000 reader has a two-piece housing manufactured from a PC/ABS plastic. Inside the housing is a single circuit board, which has an integrated loop antenna. The circuit board is encapsulated using a hot melt over-molding process. This protects the electronics when the device is used in outdoor applications. The two-piece plastic housing is ultra-sonically welded with the over-molded circuit board sandwiched between the two pieces. Near the top of the housing is translucent lens. This provides visual feed-back to provide read and access information to the User when a contactless card or phone has been presented.

A hardware kit is included with the DR5000 and contains a mounting plate, terminal blocks and loose hardware. The mounting plate can be installed on a mullion or wall. In addition, it can be installed on an optional trim plate with a single electrical gang box. The DR5000 reader is secured to the mounting plate using a tamper proof screw.

The DR5000 reader has two 4-pin headers which provide for +12 Volt Power and ground, RS-485 communication, and signals to support third-party controllers which with Wiegand interface.

Circuit Board

The DR5000 Reader supports Near Field Communication (NFC) in the unlicensed radio frequency ISM band of 13.56 MHz. The reader operates in the passive communication mode and supports ISO 14443A/MIFARE® and FeliCa™ contactless cards. In addition is support mobile phones with NFC technology. The NXP CLRC663 NFC transceiver is controlled by software from a Microchip PIC32 microcontroller. The two devices communicate over a serial UART. A block diagram of the circuitry is shown below:



Circuit Operation

The CLRC663 uses an external crystal for a clock source. The crystal has a resonance frequency of 27.12 MHz. This clock is divided by 2 to generate the 13.56MHz carrier frequency. The signal delivered on pin TX1 and pin TX2 is the 13.56 MHz energy carrier modulated by an envelope signal. The data signal on the 13.56 MHz carrier uses 8% - 14% Amplitude-Shift-Keying (ASK) and is Manchester coded at a baud rate of 212 Kbits/second. A series inductor and parallel capacitor provide a low-pass filter. Additional series and parallel capacitors are used for tuning and impedance matching the loop antenna. Series resistors are used to control the quality factor of the antenna. The capacitors and the resistors are used to achieve the required 13.56 MHz resonance frequency for appropriate signal shaping according to ISO/IEC 14443. The loop antenna is integrated in a PWB and was designed to have maximum area within the reader form factor. The dimensions of the antenna are 1.7" x 3.1". The read range is approximately 2 inches. The signal to the receiver is AC-coupled and filtered at the RX pin of the CLRC663.