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Technical Reference

NOTES ON THE NAME "WIEGAND"

The term "Wiegand" can be confusing because of the multiple ways in which it is used. This memo explains each of the ways.

Origin

John R. Wiegand (pronounced WEE-gand) came to the United States from Germany as a young man. In the 1970s, as a technician at Bell Telephone Laboratories, he discovered the principle that is now called the "Wiegand Effect". Wire from a magnetic alloy (iron, vanadium and cobalt) is mechanically processed in a twisting and de-twisting sequence. Then the wire's central core and outer shell have different magnetic properties. Magnets close to the wire cause the wire's core to change polarity rapidly while the shell maintains its original polarity. An electric coil near the wire, sensing the rapid change in polarity of the magnetic field, generates a sharp voltage pulse that can be processed as a Wiegand data bit.
This technology became widely used in access control starting in 1979.

1. Wiegand-Technology Cards and Tags

An array of parallel Wiegand wires (each 0.3 inch long) is laid on a strip that is laminated inside a card. If there are 26 wires in the array, in two rows representing binary-zero and binary-one values, the Wiegand reader's output is a series of 26 zeros and ones on the Data-0 and Data-1 transmission lines.

2. Wiegand Data Format

The original Wiegand cards and tags had a strip of 26 Wiegand wires, most commonly. The 26 data bits generated by the wires were assigned to a facility code or site code (8 bits), an ID number or personal identification number (16 bits), and two parity bits for error checking in the other 24 bits. This format was adopted by manufacturers of other access control cards. It is now the industry standard worldwide. The 26-bit code has been expanded to other numbers of bits up to 50 or more. If the larger formats are laid out similar to the basic 26-bit format, they too are referred to as "Wiegand format".

3. Wiegand-Protocol Electrical Interface

The original Wiegand reader design worked best when a zero bit appeared as a pulse on a Data-0 wire, and a one bit on a separate Data-1 wire – rather than combining positive pulses and negative pulses on a single data wire. The Wiegand pulses are negative-going from high level using TTL logic levels. The pulses have precise pulse width and interpulse timing. This unique type of electrical interface became the Wiegand interface, which was accepted by the Security Industry Association in the late 1980s as a standard freely available to all manufacturers of readers and systems.

Wiegand Interface and Wiegand Format in an Access Control System

The standard reader input port on almost every access control system is compatible with the reader's Wiegand interface. The system must be programmed for the Wiegand data format and the number of bits in the card's code. The host (a) counts the number of bits in the incoming code and compares this with the programmed number of bits, (b) checks that a bit in every time slot appears on only the Data-0 or the Data-1 line in each time slot (never on both at the same time), and (c) calculates that the parity bits are correct for the bit stream. Then the host splits the data bits into the fields for facility code and

ID number, and compares these fields against the system's cardholder database to decide if access should be granted.