BIO RECOGNITION SYSTEMS

TECHNICAL TIPS

PRODUCT: BioLock/BioScan

Subject: Wiegand format connections

Date: 24th January 2008
Revision: 1

The Wiegand interface is a de-facto serial data and wiring standard commonly used in many security applications to connect sensors to control systems. However many variations exist so that a "standard" Wiegand interface cannot be assumed in all cases.

For a Wiegand interface to operate correctly, the *electrical* format, *timing* parameters and *data format/sequence* must ALL be correct.

Electrical Format

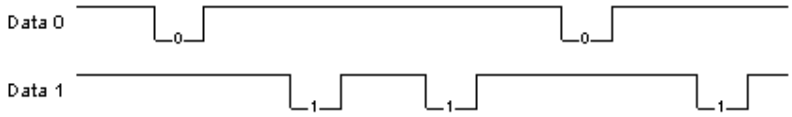
A Wiegand interface uses at a minimum three wires[1], a ground wire and two data wires (often called Wiegand 0 and Wiegand1, or Data0 and Data1). Note that the ground wire should generally be used – there are circumstances in which for instance systems have a common ground that is provided via a common power supply, but BioLocks in general have an isolated power supply so a ground connection should almost always be provided.

A typical Wiegand interface may successfully communicate at up to 500 feet (150 meters). Distances longer than a few feet/meters may require slower data rates to successfully communicate. For more details of wiring arrangements for Wiegand and other cabling for BioLocks, please see Tech Tip number 2 (Cabling).

When no data is being transmitted, both Data0 and Data1 are in a high-voltage state (+5V). When a zero is being transmitted, Data0 is pulsed to a low (near-

[1] Note that some implementations use a 5-wire format, in addition having a power wire (to power a remote reader) and an LEDCTL that signals the status of the light contained in some readers (off, red, green etc). These additional wires have no function in a typical BioLock implementation.

zero) voltage; when a one is being transmitted, Data1 is pulsed to a low voltage (relative to ground).



The sequence of data used on a Wiegand interface, and the timing of the pulses, is known as a Wiegand format or protocol.

The electrical characteristics of the Wiegand device (typically a card-reader) may either be TTL voltage levels, or open-collector outputs (with an internal resistor pulling the data lines to the +5V level). If two Wiegand-format devices are both open-collector (and have the same and correct Wiegand timing and data formats), they may be connected in parallel.

This may be useful for applications such as using both a BioLock or BioScan and a prox-card reader in parallel (rather than connected separately) with an access-control panel (likely reasons for doing so might be to avoid dual cabling, or with access control systems with limited numbers of reader connections). In this form of connection, both the BioLock and card reader would not be able to operate (transmit) at the same time.

Note that both BioLock Standalone and BioScan can accept Wiegand inputs, so a prox reader or similar Wiegand device can be used as an input and managed by the BioLock Standalone or BioScan as single-door controllers (rather than managed by a full access control system).

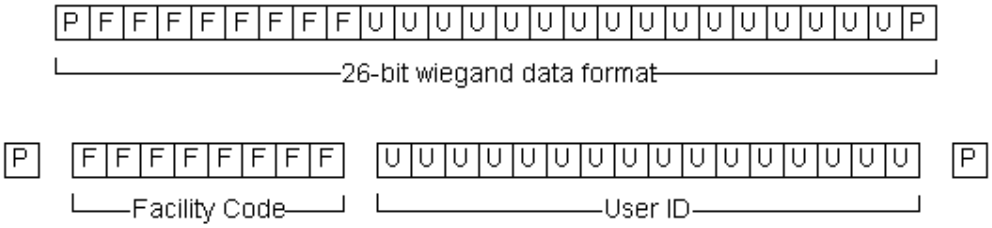
Timing Parameters

The typical pulse width for the “standard” Wiegand format is 50 microseconds with an inter-pulse spacing (“pulse interval”) of 1 millisecond (1,000 microseconds).

Data Sequences

The original Wiegand format had one parity bit, 8 bits of facility (or site) code (i.e. starting at the second bit in the sequence, and with a length of 8 bits), 16 bits of ID/user code (i.e. starting at the 10th bit with a length of 16 bits), and a stop/parity bit for a total of 26 bits (see below). The first parity bit is calculated from the first 12 bits of the code and the trailing parity bit from the last 12 bits. However many inconsistent implementations and extensions to the basic format exist.

Author	Andy Saunders
Record ID	TT013080124001.as



Perhaps the next most common Wiegand format has an ID code lengthened by an additional 10 bits, to make a 36-bit overall format.

The facility code of 8 bits (with the most significant bit – MSB – generally transmitted first) allows for up to 256 distinct site codes (in many cases, one or more facility codes may be reserved for special purposes, therefore leaving 255 or less site codes available). The use of a site code is to prevent cards intended for use on a particular site being used on another site (perhaps for a different organisation).

The ID code of 16 bits (again with the most significant bit – MSB – generally transmitted first) allows for up to 65,536 distinct ID codes for users (in many cases, one or more ID codes may be reserved for special purposes, therefore leaving 65,535 or less user codes available).

The parity bits are used as simple quality checks for the accuracy of the transmitted binary data. In the “standard” format, the leading parity bit (even) is linked to the first 12 data bits. If the 12 data bits result in an odd number, the parity bit is set to one to make the 13-bit total come out even. The final 13 bits are similarly set to an odd total.

Proprietary Formats

Many other Wiegand formats exist (often regarded as proprietary by their vendors). They may have different numbers of data bits (ranging from perhaps 4 to 44), may have bit positions scrambled, may have different (or no) parity bits and with possibly some of the data bits set high or low at a fixed location in the format.

Non-standard formats may be used by an access-control vendor to add additional features to their product line, to add security assurance (so that standard cards may not be used to gain improper access) or simply to oblige customers to purchase cards and readers from the same vendor.

BRS has implemented several proprietary Wiegand output formats (for example, the GE Interlogix format). In general, proprietary formats require the consent of

an access-control panel vendor to release details of the proprietary format, which may or may not be available. Contact BRS for more information.

BioLock/BioScan Wiegand Outputs

BioLocks operating in network mode have their Wiegand output settings controlled by the PC application. Settings can be changed in the “Options” menu, under “Wiegand Settings”.

BioLocks operating in Standalone mode have their Wiegand output settings controlled from the built-in web server. Settings can be changed in the “Wiegand” page, under “Advanced Output Configuration”.

If using a Standalone BioLock in both network and standalone modes, both the above settings will need to be made (and should generally be identical).

For setting BioScan Wiegand outputs, please refer to the BioScan “Getting Started” manual. Briefly, an administrator will need to verify their finger to enter the “Admin” menu, then select the “Comms” sub-menu, then the “Wiegand Out” sub-menu and then set individual parameters.

BioLock/BioScan Wiegand Inputs

The BioLock Standalone can read “standard” 26-bit non-proprietary Wiegand formats. The Wiegand input first has to be enabled (check box on the Wiegand page of the built-in BioLock web server), and the appropriate site/facility code entered (note that this can be different to any output site/facility code).

There are no timing settings for the Wiegand input, as the BioLock reconstructs the Wiegand code in a very tolerant fashion. Please contact BRS if you have a requirement for non-“standard” Wiegand inputs.

The Wiegand input connection is made via the blue (W0 or Data0) and white (W1 or Data1) wires of the BRS-supplied wiring harness (these wires may also be labelled “Tamper” or “Aux” as they are dual-function). As mentioned near the beginning of this note, do not forget to also run a ground wire as well (connected to one of the SIOB ground terminals).

BioScans also can accept a Wiegand input. Please refer to the BioScan “Getting Started” manual for details of how to preset the BioScan firmware to enable Wiegand inputs. Briefly, an administrator will need to verify their finger to enter the “Admin” menu, then select the “Comms” sub-menu, then the “Wiegand In” sub-menu and then set individual parameters.

The physical Wiegand connection is made to screw terminal connector labelled J523 on the BioScan I/O Board marked W0, W1 and GND. If power is also required for a reader, 5V and 12V is available from the same connector.

FURTHER INFORMATION:

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