Storm S40/S40i Theory of Operation and Tune-Up Procedure

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Theory of Operation

Product Overview

The S40/S40i products are access control devices where access is granted based on the presentation of a Contactless card and the entry of a PIN

Data output from the S40/S40i is via an industry standard Wiegand interface

The Contactless credential is read by a 13.56 MHz Contactless module supplied by the HID Global Corporation, an ASSA ABLOY AB company, of 15370 Barranca Parkway, Irvine, CA 92618, United States of America. This module outputs the Wiegand data directly

The PIN data is read by a separate microcontroller which has its own Wiegand interface. Wiegand can be wired ORed and thus the two outputs are connected in parallel.

The attached controller system is responsible for authenticating the credential and PIN data.

Operation

The product is designed to be powered from a 12V or 5V power supply. On-board power conversion is by linear regulators and supplies the HID Contactless module (part number SE3200AOO) and the microcontroller used for PIN entry. The microcontroller includes a watchdog and is able to monitor correct operation and if necessary reset the HID module via a power cycle. Connection to the product is via a 12 way connector and power, 0V and all data connections are via this connector. There are no special grounding requirements.
The HID module has a 50 ohm antenna output. This is coupled to a 50 ohm antenna integrated into the PCB of the product. The return loss of the coupled antenna is better than -12dB at 13.56MHz

In use the product is idle other than for the periodic energising of the modulation field in order to detect a card. If a card is detected then the HID module reads the card as appropriate for the card type and sends the required data over the Wiegand interface, and then returns to the idle state. If PIN is required then the cardholder must enter the PIN via the keypad of the product.

The HID Module used in the product is PN SE3200AOO:

Relevant supporting documentation

Further information about the HID module can be found in HID Document SE3200-902 *'iClass Module Hardware Developers Guide*'

Modulation Methods

The S40/S40i support two modulation methods at 13.56MHz with a data rate of 106kbps:

Type A: 100% ASK with Modified Miller encoded data

Type B: 10% ASK with NRZ encoded data (see Appendix)

Tune Up Procedure

The HID SE3200AOO module is delivered pre-tested for functionality from HID. There are no variable components within the product and the antenna tuning is fixed by design with high tolerance (1%) components.

The frequency and power output are fixed by the SE3200AOO module

The HID SE3200AOO module is conformally coated to prevent moisture induced tuning variation.

Therefore no tune-up procedure is required for the product. Performance is 100% tested at manufacture by the presentation of selected cards at the edges of the product read range.

This effectively tests that the product is behaving as expected and that there is good power delivery into the inbuilt antenna.

Appendix – Modulation Index vs Modulation Depth for ASK

Modulation Index	Modulation Depth
8%	85.2%
9%	83.5%
10%	81.8%
11%	80.2%
12%	78.6%
13%	77.0%
14%	75.4%

Table 2. Modulation Index Calculation vs. Modulation Depth