nextbike

Nextbike GmbH

Nextbike Electric Lock

Instruction Manual

09.01.2015

Read me first

- o Before using the device, please read the entire manual and all safety instructions to ensure safe and proper use.
- o The descriptions in this manual is based on the default settings of the device.
- o The images and screenshots used in this manual may differ from the actual product.
- o The contents of this manual may differ from the product, or from software provided, software versions are individually created based on the requirements of the particular bicycle rental system.
- o Formatting and delivery of this manual is based on nextbike operating systems.
- o Functions of this on-boardcomputer may be different from those provided with the bicycles - functions vary by region or hardware specifications.
- o Please keep this manual for future reference.

Table of contents

1.   Summary

The nextbike electric lock is an electronic system used in a bike rental system, to lock and unlock bicycles in a rack at central rental places. The complete system contains of one terminal and several racks.

A trigger switch recognizes the presence of a bicycle. Via RFID reader ID of each bike is read. An electromechanical locking mechanism locks the front wheel securely or releases it for usage. A buzzer and a led give the customer feedback about the status.

The communication between the lock unit and terminal is done via a fail-safe bidirectional data bus. The power supply is provided from the terminal. The power supply is low-power optimized, because the whole system is battery and solar powered. A RJ45-connector and –cable is used for connecting the systems.
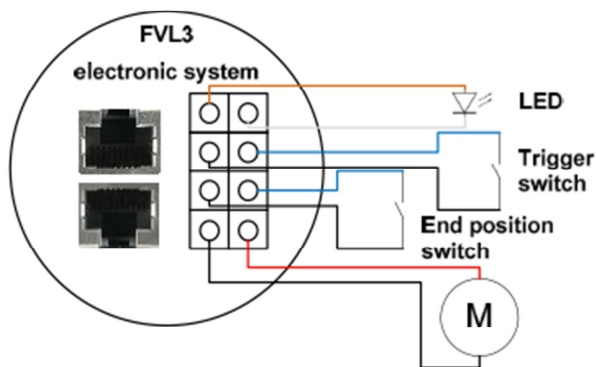
Electronics such as mechanics are realized vandal-proof and weather resistant. Due to the electronic is put in a small cup and potted with a compound. All connectors are partially filled with Vaseline.
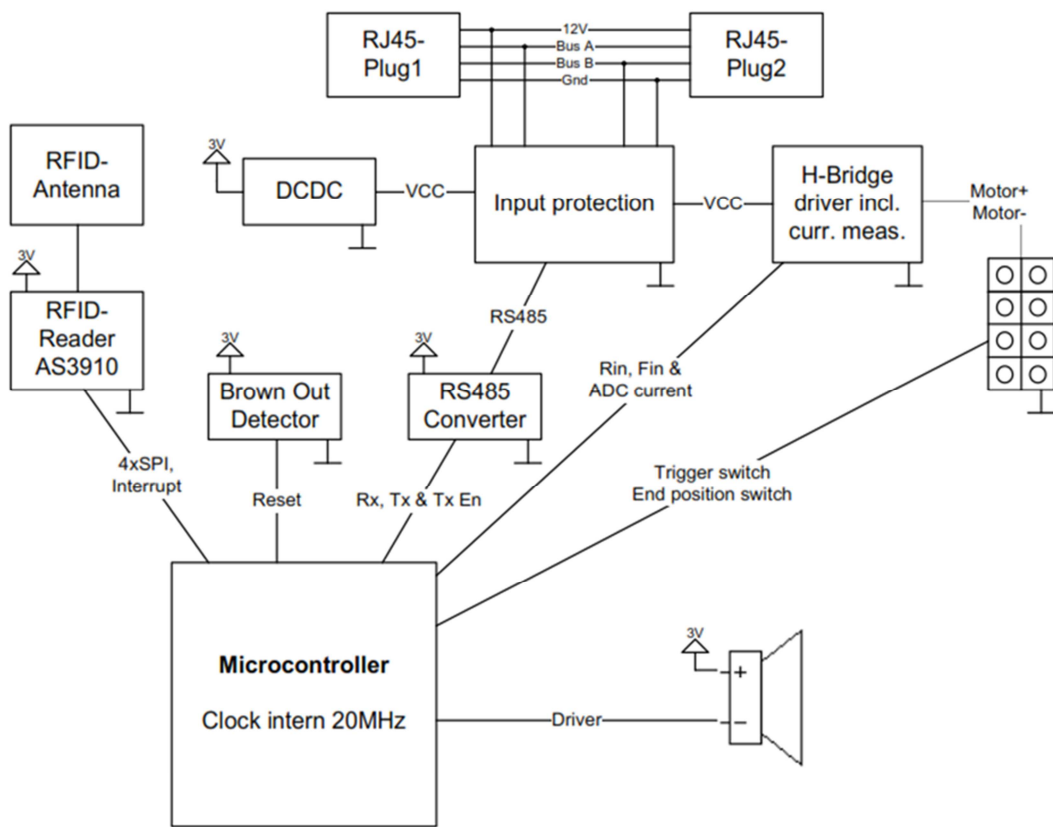
2.   Applications

o   Bicycle rental/return

3. Hardware Description

3.1   Design

3.2   Block Diagram

3.3 Microcontroller

A low-power microcontroller provides a bus node, it checks the input and output components and minimizes the power consumption of the unit.

The bus address and other specific parameters must be stored in non-volatile memory.

The firmware of the controller must be updatable during operation. Updates run via the data bus.

The firmware and the parameters are protected by 16 bit CRC.

3.4 RFID Reader

The RFID reader AS3910 is used to read the ISO14443 tags at the front wheel of the bicycle. The lock module is located in a metal construction and so antenna is optimised for working in this environment.

3.5 Acoustic Signal and LED

An acoustic signal and a green LED indicates to the user locking and unlocking of the bike.

3.6 Interface for communication and power supply

The RS485 bus for data communication between the lock modules and the terminal has the following characteristics:

o Fail safe
o Bidirectional
o Low-Power optimized
o Maximum 20 modules and one terminal
o Maximum 10m to terminal, 15m complete system
o Power supply via bus cable
o Data protection with 16 bit CRC

3.7 Bicycle detection

Detecting an inserted bike by cyclic RFID queries requires too much energy. So instead a small switch is closed by a knob mounted at the bicycle fork.

3.8 Housing

The actual body of the whole system is the rack coming from customer. Electronic module, switches and motor unit are mounted into this rack. Additionally electronic module is potted.

4.   Further Characteristics

4.1.   Operational conditions Degree of protection IP 52. Temperature range between 14 ℉ and 122 ℉.

4.2.   Quality management
The product development and if necessary production is ensured by a quality management system according to DIN EN ISO 9001.

5.   Specification

Content	Electric lock specification
Dimensions	Roller – Dimension: 45 mm x Height: 38 mm
Weight	150 g
Storage temp.	- 4 ℉ to 40 ℉
Operation temp	14 ℉ to 122 ℉
Degree of protection	IP 52.
Sockets	2 x RJ45
Humidity	5% - 85% non-condensing

6.   Usage

6.1 Locking and Unlocking

The electromechanical locking and unlocking is controlled by the terminal.

In open and in closed state, no electrical energy is required for this. Therefore the actuator is a bi-stable system. In case of a breakdown of the power supply the lock remains in its current state.

Regardless of the control command it must be possible to determine the current lock status. On the one hand, several attempts can be made to close the lock (e.g. due to pulling the wheel too early). On the other hand, the correct state of the lock is always returned.

For means of safety an end position switch is included, that indicates a complete closed lock.
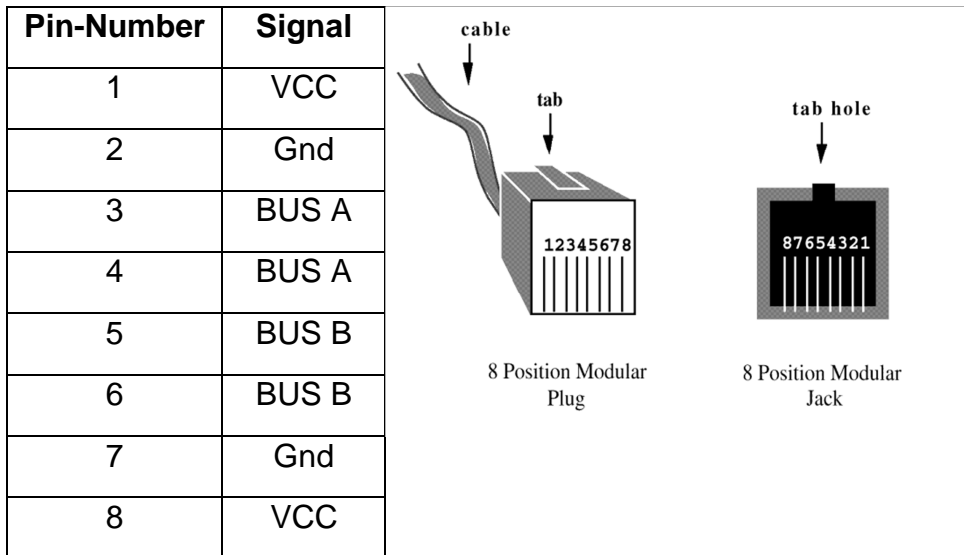
6.2 Power supply

Power is supplied via the bus cable from the terminal. The lock modules have a power management with optimized low-power modes to minimize power requirements.

The power supply is designed immune to interference, so that the state of the lock unit will not be affected by fault conditions.

The modules are arranged in a line topology. So the resistance of the supply line increases with the distance from terminal. In order to avoid potential trouble with the locking mechanism, reserves for the supply can be included. In final system an additional line of low electrical resistance can be connected from terminal to the furthest module. So a ring is built up on the supply line. Additionally in every module a capacity is included and buffers the module and the supply line.

For connecting terminal and FVL3 RJ45-cables are used.

Pin-Number	Signal
1	VCC
2	Gnd
3	BUS A
4	BUS A
5	BUS B
6	BUS B
7	Gnd
8	VCC

cable

tab

tab hole

12345678

87654321

8 Position Modular Plug

8 Position Modular Jack

7.   Cautions

o   Please comply with the instruction to maximize the unit life.
o   Keep the unit interior dry. Any liquid, i.e. rain, may destroy or damage the inside circuitry.
o   Don't expose the unit to temperatures outside aforementioned temperature range.
o   Please handle the unit with care. Excessive vibration or shaking might damage the unit.
o   Clean the unit with a clean cloth, don't use any chemicals or detergent.
o   Don't disassemble or refit unit.
o   Please use charger provided by manufacturer only. Using other chargers might resolve in damaging the unit.
o   Don't disassemble or refit unit.
o   Only qualified personnel should service the device. Faulty installation or service may be dangerous and may invalidate any warranty applicable to the device.
o   Any changes or modifications to electric lock not expressly approved in this document are not acceptable.

8.   FCC-statements

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.