



(EN) OPERATING MANUAL

KEYPILOT RS232 VARIANTS

Read carefully before use.
Keep for future reference.

Last revision: 17.07.2023

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1. Introduction

This manual describes the functions and characteristics of the KeyPilot variant RS232. KeyPilot is used to record and control access to machines and systems. KeyPilot is easy to use and easy to integrate into control systems.

Please read this manual carefully before start-up and keep it where it is easily accessible for future reference.

1.1 Contact to the manufacturer

Heckner Electronics GmbH

Address: Säntisstraße 25
D-88079 Kressbronn am Bodensee

Telephone: +49 (0)7543 9620-600

E-Mail: info@KeyPilot.de

Internet: www.KeyPilot.de

1.2 Further information

Further information on KeyPilot RS232 and other variants can be found on the Internet at:

www.KeyPilot.de

1.3 Symbols and warning notices

The following illustrations are used in this operating manual for important warning notices:

DANGER



Hazard with a high degree of risk, which may result in death or serious injury.

WARNING



Hazard with medium degree of risk, which may result in death or serious injury.

CAUTION



Hazard with a low degree of risk, which may result in minor injuries.

ATTENTION



Hazard which may result in property damage.

2. Safety Instructions

2.1 Target audience

This document is intended primarily for electricians, technicians and engineers with experience in the design, installation, start-up and maintenance of industrial control systems.

2.2 Intended use

KeyPilot can be used to control and record access to protected parts and functions on machinery and equipment. The customer is responsible for assigning authorizations to keys and assigning keys to persons.

WARNING



KeyPilot is not a safety component within the meaning of the Machinery Directive.

- Do not operate where failure or malfunction could jeopardize the safety or health of a person within the working range of the unit.
- Please consult the manufacturer or your supplier if you are not sure whether KeyPilot is suitable for your application.

Observe national and international safety and accident prevention regulations when using KeyPilot.

The KeyPilot components are designed for installation in industrial switch cabinets and control panels.

Conversion or other modifications of the KeyPilot is not allowed.

2.3 Transport

ATTENTION



Improper handling may damage the KeyPilot.

- Use the enclosed packaging.
- Handle the KeyPilot with care.
- Avoid impacts, blows or falling.

2.4 Installation and Start-up

WARNING



Risk of injury, damage to the KeyPilot and damages to the environment of the KeyPilot due to improper electrical connection.

- The electrical connection must be made only by qualified specialist personnel.
- Electrical connections must be made only when de-energized.
- Please note the technical specifications of the device.
- Make sure the connections are made correctly and are tight.

ATTENTION



Reverse polarity electrical connection may damage the KeyPilot.

- Disconnect the power supply if the LED on the KeyPilot does not light up 5 seconds after switching on.
- Check the power supply.

ATTENTION



Exchanging components of the KeyPilot RS232 with those of other variants of the KeyPilot may damage the components or other connected systems.

- Exchange components between different variants only after consultation with the manufacturer or your supplier.
- When replacing a component, check whether the type description of the new component matches the one to be replaced.

2.5 Repair

Damaged components of the KeyPilot may be repaired only by the manufacturer. Please contact your supplier if needed.

2.6 Warranty

- The warranty period for KeyPilot is 12 months from the date of purchase. Except for damage caused by improper use.
- Never open the device without proper authorization. The opening of the housing will void the warranty claim.
- There is no warranty claim for damage to the KeyPilot caused by improper operation resulting from non-compliance with the operating instructions or by disregarding the above instructions.
- In principle, there is no liability for consequential damages.

3. System description

3.1 Scope of application

KeyPilot system is used for access control and for identifying users and those using a machine or plant.

Typical application

- User login and authorization for control panels and input systems.
- Access authorization for plants or plant components.

KeyPilot can be used everywhere where previously passwords or mechanical key switches have been used.

3.2 General function

The KeyPilot system basically consists of two parts. These are the respective reading station and the keys.

A key is placed on the reading station and held in place magnetically. The key is read out using the built-in contacts in the reading station. Each key has an individual identifier (ID). This ID is unique worldwide, is provided by the manufacturer and cannot be changed.

3.3 Reading stations

The reading stations are an essential part of the system. The key is held on the reading station by a magnet and is read out via the contacts.

Several variants are offered with different interfaces to the process. Depending on the interface to the process, the data is evaluated on the reading station or communicated to a higher-level controller via the communication interface.

The following sections provide an overview of all KeyPilot variants, including the KeyPilot RS232 variant described in this manual.

3.3.1 Switch variants

The switch variants are particularly suitable for all applications where no system-side data communication is possible or necessary at the place of use.

The key information is read out when the key is set up. An authorization matching is then carried out in the reading station and the switching output is switched according to the specified authorization. The original switching state is restored when the key is removed.

The following switch variants are available:

- **KeyPilot Level**

7 different authorization levels can be identified through three digital outputs.



Figure 1: Design of the level, RS232 and PROFIBUS variants

3.3.2 Communication variants

Instead of the switching outputs, these variants have a communication interface for direct integration into a machine control. The key information can be read into a control system via the respective communication interface and reused on a customer-specific basis. No authorization matching takes place in the device.

The communication variants are available in a compact design or with a remote reading head, depending on the communication interface. The key is held on the reading head using a magnet and is read out via the contacts. In case of devices with remote reading head this reading head is connected to the so-called electronics unit via a cable connection.



Figure 2: Design of the USB variant and the reading head of the PROFIBUS AL, PROFINET and EtherCAT variants

Following communication variants are available:

- **KeyPilot USB**
The ID can be read out via the USB interface. Keys with memory can be written and deleted. Reading stations with a USB interface are also used as set-up stations to store authorizations on other reading stations using a setup key.
- **KeyPilot RS232**
The ID can be read out via the RS232 interface. Keys with memory can be written and deleted.
- **KeyPilot PROFIBUS**
The ID can be read out via the PROFIBUS DP interface.
- **KeyPilot PROFIBUS AL**
Variants with remote reading head. The ID can be read out via the PROFIBUS DP interface.
- **KeyPilot PROFINET**
Variants with remote reading head. The ID can be read out via the PROFINET IO interface.
- **KeyPilot EtherCAT**
Variants with remote reading head. The ID can be read out via the EtherCAT interface.

3.4 Keys

Each key has a worldwide unique identifier (ID), which is provided by the manufacturer. This ID has 2^{48} different possibilities and cannot be manipulated. Using the ID the key is clearly identifiable. Thus, the owner of the key can be clearly determined and his actions can get logged.

Currently, the keys listed in the following table are supported:



Figure 3: Keys

Key type	Family code	Memory area
ID-only authorization key	01	-
Authorization key with memory area	14	256 B EEPROM
	23	4 kB EEPROM
Setup key with memory area	37	32 kB EEPROM
Evaluation key with memory area		

Table 1: Key types, family codes and memory areas

All key types can be used in the application and all different key types can be mixed.

The key type can be distinguished using the imprinted family code.



Figure 4: Meaning of lasered labeling of the key

4. Technical data

4.1 Type plate

The type plate is located on the backside of the reading station.

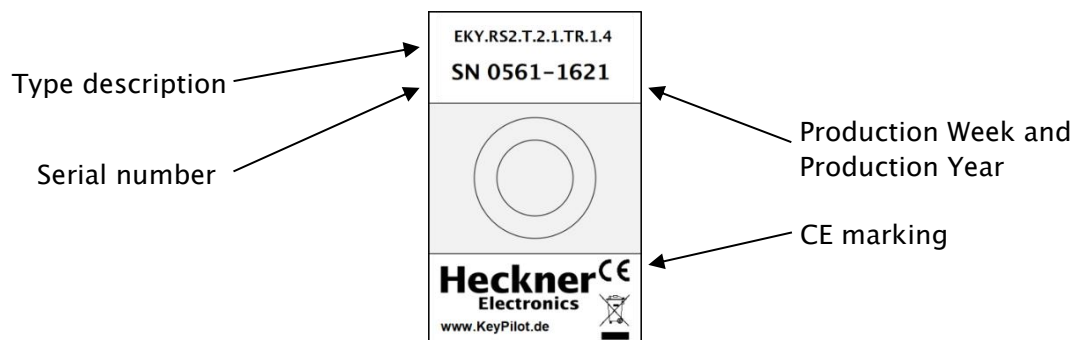


Figure 5: Type plate

4.2 Electrical specifications

Voltage power supply	9...36 V DC
Power consumption (typ.)	1 W
Operating temperature	-20...+70 °C
Galvanically isolated supply voltage	Yes
Galvanically isolated interface	Yes
Short-circuit-proof reading contacts	Yes
Bus data rate	9,6 \ 19,2 \ 38,4 kBaud

4.3 Protection class

Front side when installed	IP66
Backside	IP20

4.4 Mechanical specifications

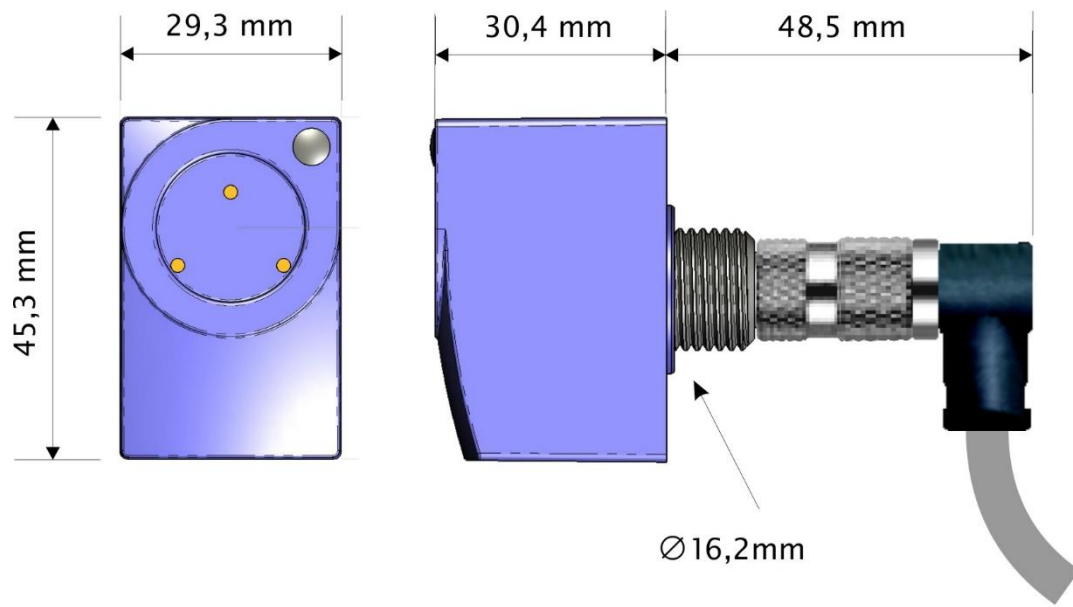
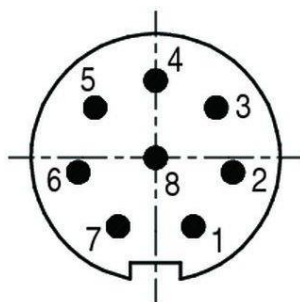


Figure 6: Dimensions

For mounting in installation openings with a diameter of 22.5 mm, a reducer ring is supplied for centering.

4.5 Pin assignment



No.	Assignment	Wire color ¹
1	Serial interface RxD	yellow
2	Supply voltage GND	grey
3	Supply voltage +9...36V	white
4		-
5		-
6	Serial interface GND	brown
7	Serial interface TxD	green
8		-

Table 2: Pin assignment

¹ Color definitions only apply to factory-made prefabrication

5. Preparation

5.1 Scope of Delivery





Description	Figure
Reading station	
Plastic nut M16x1.5	
Reducer ring 16.2 mm to 22.2 mm	
Quick Reference Guide	

Table 3: Scope of Delivery

5.2 Packaging

The packaging has been designed to protect the KeyPilot during transport by freight carrier or parcel delivery service. Nevertheless, please check all supplied components for damage after unpacking.

The packaging must be disposed of separately according to the applicable rules for cardboard and plastic.

5.3 Installation

A mounting hole with a diameter of 16.2 mm is sufficient for mounting of the KeyPilot reading station. The mounting in holes with 22.3 mm diameter is possible with the enclosed reducer ring.

Procedure:

1. Insert the reading station into the mounting hole from the front. The thread of the reading station must protrude on the back of the mounting hole.
2. If necessary, place the reducer ring between the thread and the mounting hole.
3. Tighten the reading station with the plastic nut.

5.4 Connection

WARNING



Risk of injury, damage to the KeyPilot and damages to the environment of the KeyPilot due to improper electrical connection.

- The electrical connection must be made only by qualified specialist personnel.
- Electrical connections must be made only when de-energized.
- Please note the technical specifications of the device.
- Make sure the connections are made correctly and are tight.

Pre-assembled connecting cables in various lengths are available separately for connecting the KeyPilot reading station.

Procedure:

1. Trim the open end of the connecting cable. The cable may be shortened to the required length.
2. Connect the output cables to a suitable communication partner.
3. Connect the supply lines to a suitable power supply.
4. Plug the connection cable to the reading station and tighten.

5.5 Configuration

The KeyPilot RS232 is intended for reading the key information of a currently present key. Nevertheless, it can also be used for transferring authorizations to other KeyPilot reading stations.

The authorizations are configured using the KeyPilot Manager software. This can be downloaded free of charge from manufacturer's website at www.KeyPilot.de. Using the KeyPilot RS232 and a setup key, the configuration created with the KeyPilot Manager can be transferred to other reading stations and read out.

Please contact the manufacturer or your supplier if you need help with the configuration.

6. Operation

6.1 Function description

The key is attached on the reading head of the KeyPilot using a magnet. The key data is read out via the contacts.

Communication from PC with the KeyPilot RS232 is possible in one of three different operation modes. Switching between these modes is done by commands (see chapter 6.3 Commands).

6.1.1 Polling-Mode

While in Polling-Mode, the communication partner must check the presence of a key by cyclic requests. On request, the KeyPilot delivers a data record, consisting of the key's family code, ID and CRC. If all values in the data record are zero, then there is no key present.

6.1.2 Event-Mode

In Event-Mode, the KeyPilot delivers a key data record autonomously, as soon as a key is present on the reading head. There is also a message as soon as the key is gone.

6.1.3 Setup-Mode

Setup-Mode is used by the KeyPilot Manager software for reading and writing setup-keys. It's also possible to create an evaluation key. Please find the details on usage and functions of KeyPilot Manger in the corresponding manual

6.2 RS232 Transfer Protocol

Data transmission is done in ASCII-HEX format. For example, the value 0xAF is transferred as 0x41 (,A') and 0x46 (,F').

Default settings of the interface are:

- baud rate: 9600 Baud
- 8 data bits
- 1 stop bit
- no parity
- no handshake (flow control)

Baud rate can be increased via command "cbr" or via an appropriately prepared setup key to 19200 Baud or 38400 Baud.

Example for transfer of command "ver":

Direction	Transferred Bytes	Payload
Send	0x76, 0x65, 0x72	"ver"
Receive	0x0D, 0x0A, 0x56, 0x65, 0x72, 0x73, 0x69, 0x6F, 0x6E, 0x3A, 0x0D, 0x0A, 0x32, 0x2E, 0x34, 0x0D, 0x0A	"\r\n Version:\r\n 2.4\r\n"

Table 4: Communication example

6.3 Commands

Command	Description
ses	Write setup-key: command writes pages with 64 bytes
sbs	Write authorization-key: command writes pages with 32 bytes
les	Read setup-key: reads memory of a setup-key
lbs	Read authorization-key: reads memory of a authorization-key
key	Read key: retrieval of family code, ID and CRC
ver	Read firmware version number
cbr	Change baud rate
sto	Deactivate communication timeout
ems	Enable Setup-Mode
eml	Disable Setup-Mode
evs	Permanently enable Event-Mode. Following events will be emitted: <ul style="list-style-type: none"> • “key present” including ID of present key • “key removed”
evl	Permanently disable Event-Mode
ron	Show red LED for one second
gon	Show green LED for one second
off	Reset command “ron” or “gon”

Table 5: KeyPilot commands

6.3.1 Command ses

Using this command, memory of keys with family code 37 can be written. A page size of 64 bytes is used for these keys. Writing starts always at the beginning of the memory.

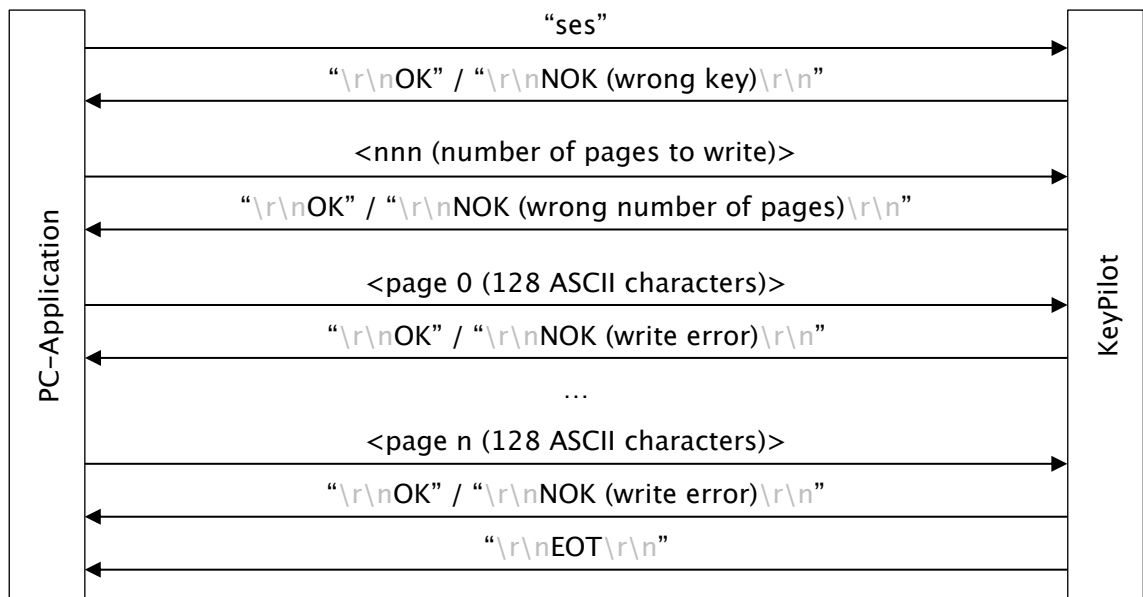


Figure 7: Command sequence ses

6.3.2 Command sbs

Using this command, memory of keys with family code 14 or 37 can be written. A page size of 32 bytes is used for these keys. Writing starts always at the beginning of the memory.

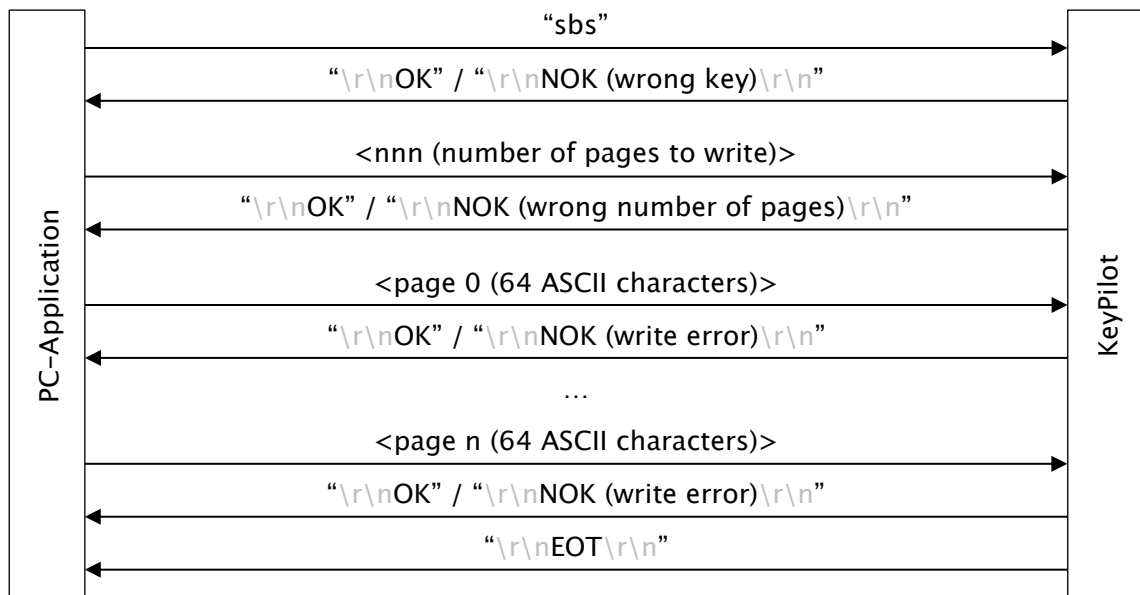


Figure 8: Command sequence sbs

6.3.3 Command les

Using this command, memory of keys with family code 37 can be read. A page size of 64 bytes is used for these keys.

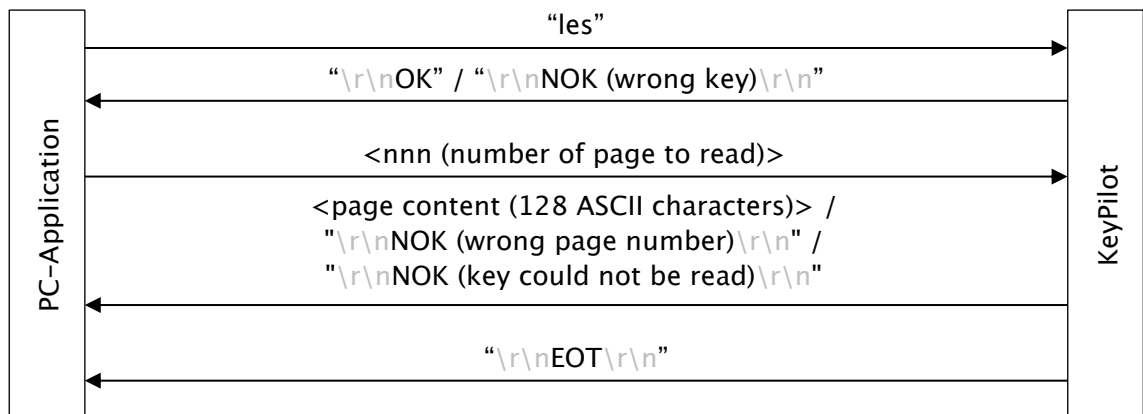


Figure 9: Command sequence les

6.3.4 Command lbs

Using this command, memory of keys with family code 14 or 23 can be read. A page size of 32 bytes is used for these keys.

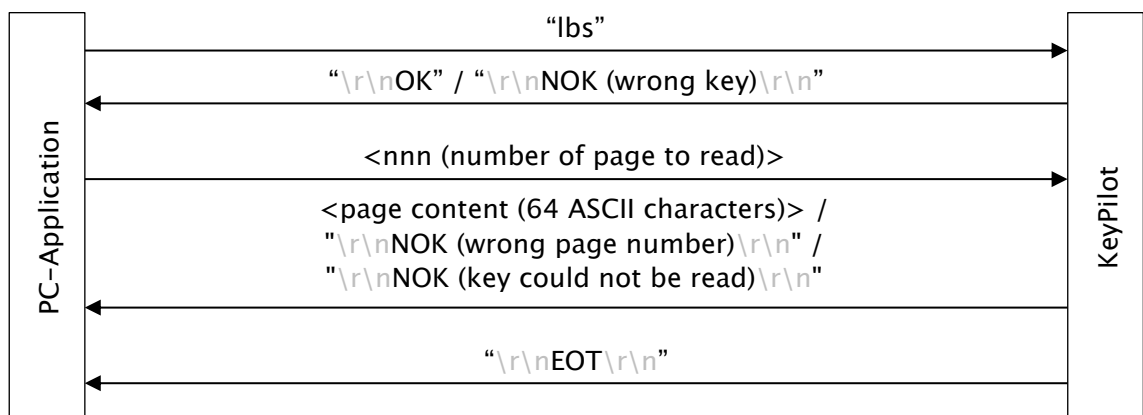


Figure 10: Command sequence lbs

6.3.5 Command key

This command delivers the identification data of the currently present key.

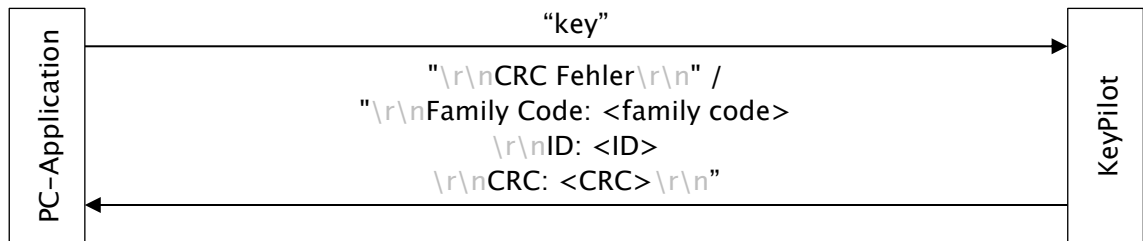


Figure 11: Command sequence key

6.3.6 Command ver

This command delivers the firmware version of the KeyPilot.

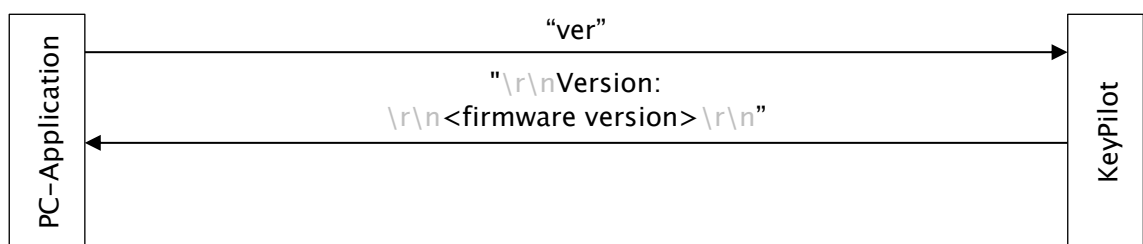


Figure 12: Command sequence ver

6.3.1 Command cbr

This command allows changing the baud rate of the RS232 interface.

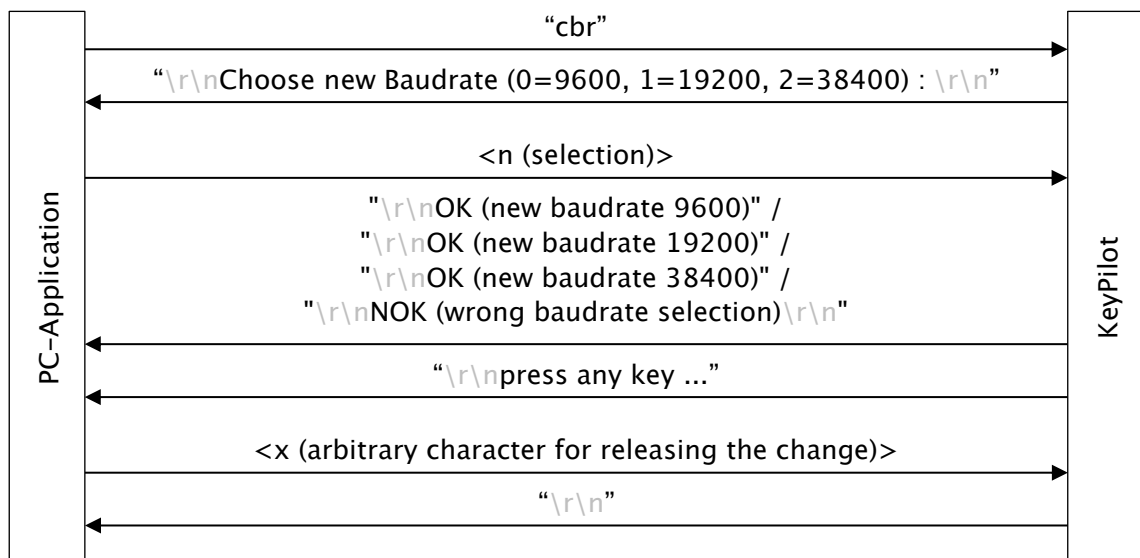


Figure 13: Command sequence cbr

6.3.2 Command sto

This command suppresses the communication timeout of the USB interface. This suppression can only be disabled by means of a power-on reset.

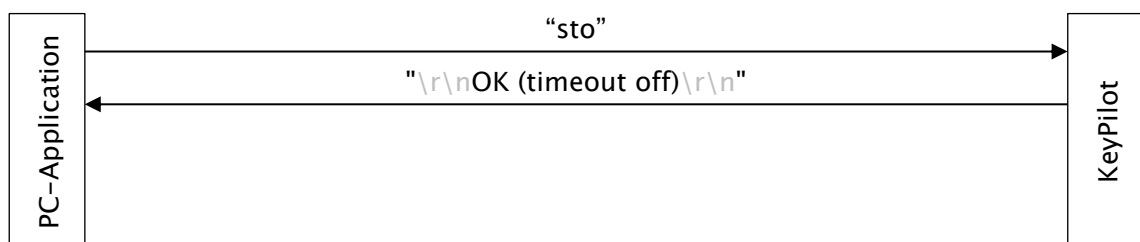


Figure 14: Command sequence sto

6.3.3 Command ems

This command enables the Setup-Mode. While in Setup-Mode, keys will not be evaluated and no event messages will be emitted.

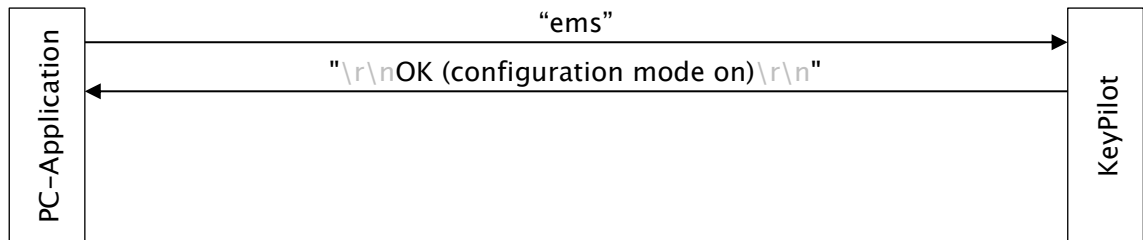


Figure 15: Command sequence ems

6.3.4 Command eml

This command disables the Setup-Mode.

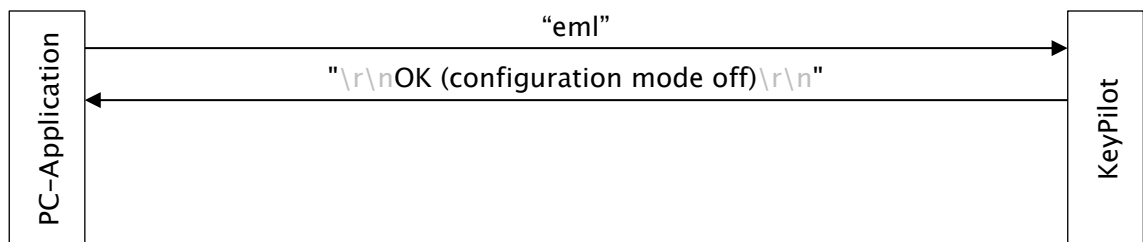


Figure 16: Command sequence eml

6.3.5 Command evs

This command enables the Event-Mode and stores this setting in the EEPROM of the reading station. While in Event-Mode, a message will be emitted on USB interface as soon as a valid key is detected or removed.

This setting is permanent and stays enabled after a power-on reset.

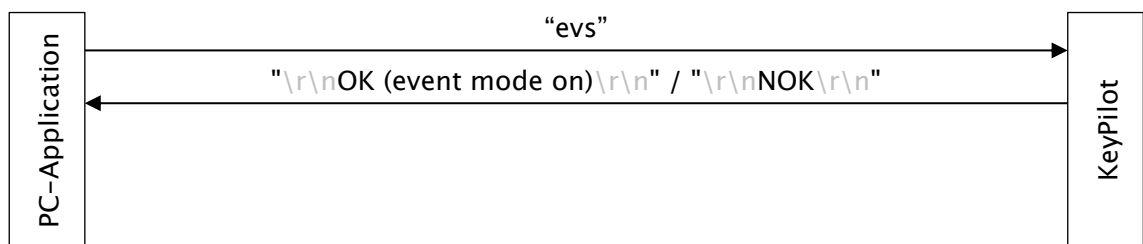


Figure 17: Command sequence evs

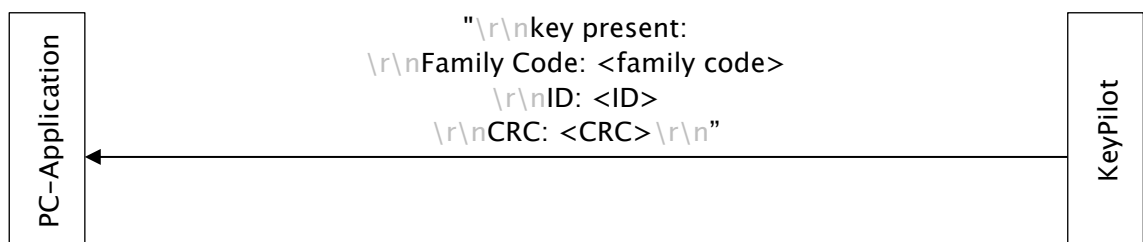


Figure 18: Schlüssel erkannt

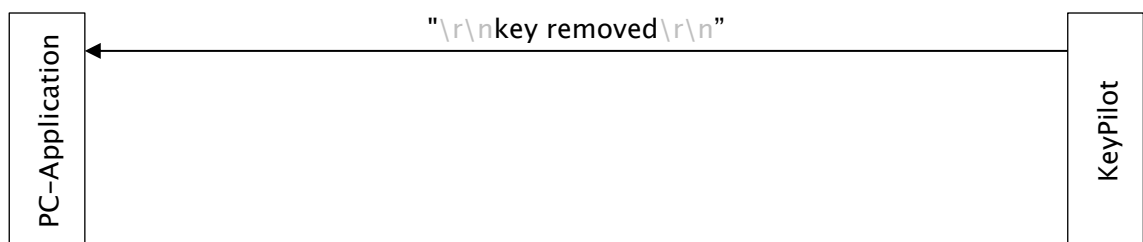


Figure 19: Schlüssel abgezogen

6.3.6 Command evl

This command disables the Event-Mode and stores this setting in the EEPROM of the reading station. After that, no further messages will be emitted when a key is detected or removed. This setting is permanent and stays disabled after a power-on reset.

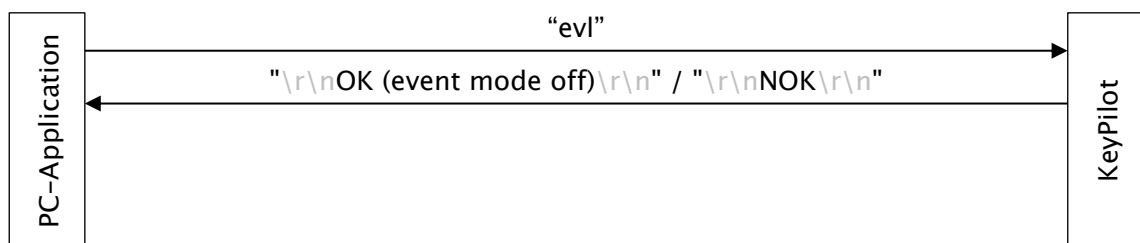


Figure 20: Command sequence evl

6.3.7 Command ron

By means of this command, the LED switches to red for one second. This effect only takes place if the KeyPilot is in state “ready” or “key successfully read”. If there’s no further LED command, the LED returns to its original state after one second.

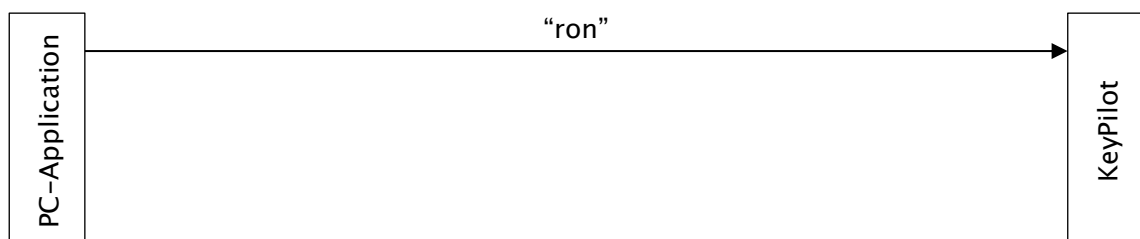


Figure 21: Command sequence ron

6.3.8 Command gon

By means of this command, the LED switches to green for one second. This effect only takes place if the KeyPilot is in state “ready” or “key successfully read”. If there’s no further LED command, the LED returns to its original state after one second.



Figure 22: Command sequence gon

6.3.9 Command off

With this command, the effect of a previous command “ron” or “gon” will be terminated prematurely.

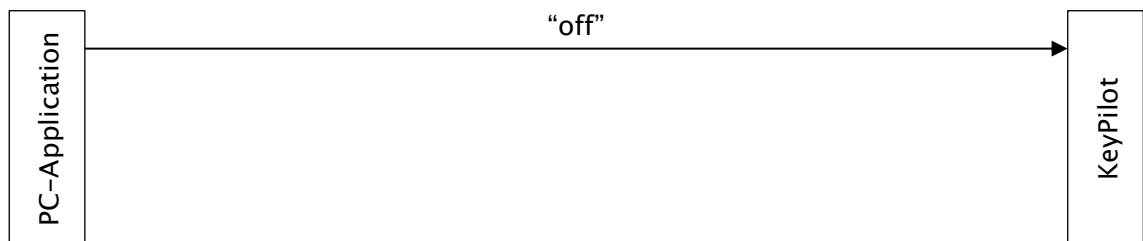


Figure 23: Command sequence off

6.4 Status display

The two-colored LED on front of the reading station indicates the operating status of the KeyPilot.















Display		Meaning
	Permanently off	No or faulty power supply or device is defective.
	Single flash GREEN	Normal operation and no key detected.
	Blinking GREEN (5 Hz)	Key is read out.
	Blinking GREEN (1 Hz)	Key read out successfully.
	Steady GREEN light	LED status controlled by command.
	Single flash RED	Device not in operating state: <ul style="list-style-type: none"> no configuration available incorrect configuration data incomplete setup process
	Blinking RED (5 Hz)	Key is written, e.g. by command ses or sbs.
	Blinking RED (1 Hz)	Error when reading a key. Absence of an issued key indicates a non-specific error, e.g. through short-circuiting of the contact surfaces.
	Steady RED light	LED status controlled by command.
	Single flash ORANGE	Setup-Mode is active.
	Blinking ORANGE (1 Hz)	RS232 communication error, e.g. timeout.
	Steady ORANGE light	Setup-Mode is active and a key is present.
	Blinking GREEN/RED (5 Hz)	Key is written, e.g. when reading the reading station with an evaluation key.
	Blinking GREEN/RED (1 Hz)	Key written successfully.

Table 6: Status LED

7. Maintenance

7.1 Cleaning

For reliable operation of the KeyPilot, the contact surfaces of the reading station and the key must be kept clean. Remove any soiling if you experience problems reading the key. Reading station and key can be cleaned using common cleaning agents. Avoid using corrosive detergents.

7.2 Maintenance

The components of the KeyPilot do not require any special maintenance.

7.3 Repair

Damaged components of the KeyPilot may be repaired only by the manufacturer. Please contact your supplier if needed.

8. Decommissioning and disposal

8.1 Disassembly

WARNING



Risk of injury and damage in the environment of the KeyPilot due to unconnected electrical wiring.

- The electrical connection may be changed only by qualified personnel.
- Electrical connections must be made only when de-energized.
- Make sure that disconnected connecting cables do not remain unprotected (insulate).

In case you want to remove the KeyPilot from your system, proceed as follows:


1. Switch off the power supply.
2. Disconnect the connection cable at the back of the reading station and remove.
3. Disconnect the connection cable from other control components to remove it. Simple cutting of the cable should be avoided.
4. To disassemble the reading station unscrew the plastic nut. The reading station can then be pulled out of the mounting hole.

8.2 Disposal

All components of the KeyPilot (reading station and keys) must be disposed of in accordance with the statutory regulations for electronic devices.

The packaging must be disposed of separately according to the applicable rules for cardboard and plastic.

9. CE declaration of conformity



EU-Konformitätserklärung

Produktbezeichnung: **KeyPilot**

Typen: **EKY.PDP.T, EKY.PDP.A
EKY.RS2.T, EKY.RS2.E
EKY.SWI.T
EKY.LVL.T
EKY.USB.T, EKY.USB.E**

Hersteller: **Heckner Electronics
Säntisstrasse 25
88079 Kressbronn am Bodensee**

Die hier genannten Baugruppen sind entwickelt, konstruiert und gefertigt in
Übereinstimmung mit der

**RICHTLINIE 2014/30/EU DES EUROPÄISCHEN PARLAMENTS UND DES
RATES vom 26. Februar 2014 zur Harmonisierung der Rechts-
vorschriften der Mitgliedstaaten über die elektromagnetische
Verträglichkeit.**

und erfüllen die Vorschriften der

**Richtlinie 2011/65/EU des Europäischen Parlaments und des Rates vom
8. Juni 2011 zur Beschränkung der Verwendung bestimmter
gefährlicher Stoffe in Elektro- und Elektronikgeräten.**


Folgende Normen wurden angewandt:

DIN EN 55022; VDE 0878-22:2011-12, (CISPR 22:2008, modifiziert); Deutsche
Fassung EN 55022:2010

DIN EN 55024; VDE 0878-24:2011-09, (CISPR 24:2010); Deutsche Fassung EN
55024:2010

Kressbronn, den 27.01.2015

Unterzeichnet:



(Franz Kleiner, Geschäftsführer)

Figure 24: CE declaration of conformity

Heckner Electronics GmbH

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