



# SL-50R9 Access controller

User manual

Board revision: R9  
Firmware version: 1.0X

## 1 General description

The SL-50 is a simple, low-cost access controller based on Dallas iButtons or (with certain restrictions) RF cards.

When the unit reads a user's ID badge, a relay is activated if the badge ID code is in the unit's table. Editing the unit's access table can be done with a PC program and, in the case of iButtons, with a MASTER iButton, which means no PC is necessary.

- the SL-50R9 has an access table capacity of 62 iButtons or RF cards
- iButton can be added or deleted from the table with a MASTER iButton
- RF cards and iButtons can be added or deleted from the table using a PC
- the MASTER iButton must be set with a PC

## 2 Hardware

### 2.1 The board

Board dimensions are: 177x46 mm.

The PCB has the following components:

- microcontroller for reading the iButtons and controlling the outputs
- serial EEPROM for storing the ID codes of active badges (and the MASTER)
- relay output for electric door strike,
- relajni output for alarm system,
- 3 voltage-free inputs (door sensor, alarm, egress input),
- AC regulator and lead-acid battery charger,
- 3 LEDs for signalling events
- Jumpers for relay options, shorting the sensor input and iButton/ RF card selection

The PCB overview is shown in fig. 1.

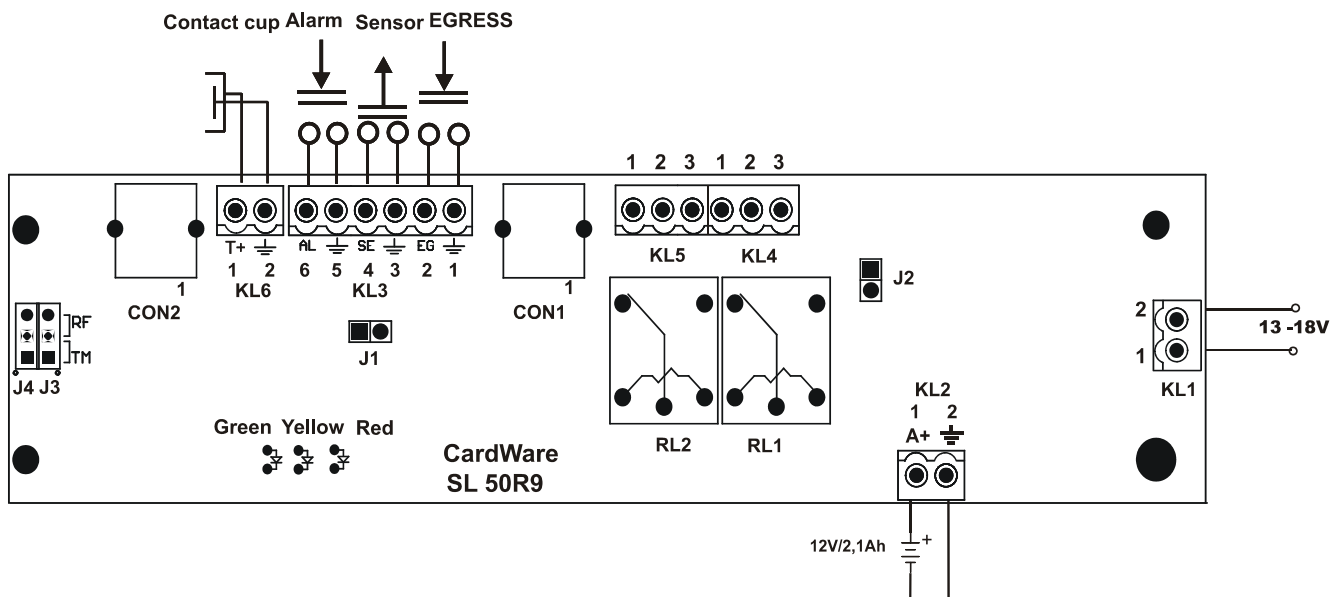


Fig. 1

### 2.2 Connectors, screw terminals and jumpers

#### 2.2.1 CON1 RS-232 (TEL 4/6)

1. RXD
2. TXD
3. 12V (100mA max.)
4. GND

### 2.2.2 CON2 reader module (TEL 4/6)

1. GND
2. LED1 (12V via 1k2)
3. LED2 (12V via 1k2)
4. TD (Touch Data, inner contact of iButton cup)

See the settings for J3 and J4 if using this connector. These jumpers invert the polarity of the LED signals, which is how readers with on-board electronics get their supply voltage.

### 2.2.3 KL1 power supply

1. AC
2. AC

Voltage requirements are 13VAC or 18VDC.

### 2.2.4 KL2 battery

1. V+ (13.7V/1,5A max)
2. GND

Connect a sealed lead-acid battery to this screw terminal. The battery is trickle-charged with a constant voltage of around 13,7V. If you wish to use the SL-50 PCB in an environment where a stabilised, clean 12VDC voltage is available, you can use this screw terminal to connect this supply voltage to the unit.

KL1 should not be connected in this case.

### 2.2.5 KL3 voltage-free inputs

1. GND
2. EGRESS
3. GND
4. SENSOR
5. GND
6. ALARM

These voltage-free inputs are connected to 5V via a 5k6 resistor. Shorting them to the neighbouring GND pin will change the input's state.

A description of each input follows:

#### **Sensor input**

This is used to connect a reed sensor or microswitch that monitors the state of the door.

The input should be shorted when the door is shut and open when the door is opened.

If the sensor input is not used, it should be shorted using J1.

To conserve energy, the relay output for the electric door strike (RL1) is deactivated as the sensor is opened (door open). If the sensor input were left open, the relay would never be activated because the controller would think the door is already open.

### **EGRESS input**

A short to GND on this input has the effect of activating the door strike relay (RL1). The relay activation duration will be according to the parameter setting for RL1 or until the door is opened (sensor input). The egress input does not have to be shorted during this time, a brief low pulse is enough.

This input should be used with a push-to-make button.

The red LED will light up when the egress input is activated.

### **ALARM input**

A short to GND on this input causes the alarm relay (RL2) to be activated for the duration set by the RL2 parameter.

RL2 is also activated when the sensor input (door) is opened but RL1 is not active. This is termed an alarm condition because the door was either forced open or opened by a key.

#### **2.2.6 KL4 door strike relay - RL1**

Screw terminal KL4 pins have different functions depending on the J2 jumper

J2 not shorted (voltage-free output):

1. C – common contact
2. NO – normally open contact
3. GND

Don't use voltages higher than 24V!

J2 shorted:

1. +12V in the active state of RL1
2. +12V
3. GND

- There is a 30V varistor between pins 1 and 3.
- The voltage on pins 1 & 2 (when J2 is shorted) is via self-healing fuse F2 (2,5A).

### **RL1, door strike relay**

Is activated in the following cases:

1. when an 'active' iButton or RF card is read (active = in the table)
2. when the egress input is shorted to GND.

The relay active duration will, in both cases, be determined by the user-settable RL1 parameter, unless the door is opened before that. In this case, RL1 will be deactivated immediately.

The RL1 duration parameter can be set to: 0.5s, 1s, 2s, 4s, 8s, 16s, 32s or 64s.

The red LED will light up when RL1 is activated.

### 2.2.7 KL5 alarm relay – RL2

This relay can only be used as a voltage-free output.

1. NC – normally closed contact
2. C – common contact
3. NO – normally open contact

### RL2: alarm

This relay is activated in the following cases:

1. the sensor input is open (door open), but the door strike relay **RL1** is not active.
2. the alarm input is shorted to GND

The RL2 duration parameter can be set to: 0.5s, 1s, 2s, 4s, 8s, 16s, 32s or 64s.

The red LED will light up when RL2 is activated.

### 2.2.8 J1 sensor jumper

When this jumper is set, the sensor input is shorted to GND. Set this jumper if the sensor input is not used, otherwise RL1 will never be activated.

### 2.2.9 J3, J4 reader module LED polarity selection

The reader module connector CON2 has two LED signals that are normally used to drive the anodes of two LEDs when the SL-50 is used with an iButton reader box such as the TK-2.

If reader modules with their own processors are used (such as RF readers) the modules' power supply is obtained from the LED signals, which are inverted to be normally ON and only OFF when signalling.

These two jumpers invert the LED polarity.

- set both jumpers to the TM position to use simple iButton readers (TK-2,TK-4)
- set both jumpers to the RF position to use readers with electronics (RF, PIN code etc.)

### 3 Editing the table with a Master iButton

If iButtons are used as ID badges, it's possible to edit the access tables with a so called MASTER iButton. Any iButton can be promoted to a MASTER with the Comm50 program.

#### Erasing the whole table

- Touch and hold the MASTER iButton to the reader cup for around 4 seconds. The green LED will be on during this time.
- After around 4 seconds the yellow and red LEDs will turn on and the table erase process is started. The yellow and green LEDs will turn off in about 1s, the red LED will turn off a little later, when the table has been erased. The MASTER itself is not erased, of course.
- If the MASTER iButton is removed before the 4 second duration, the green LED will be on for around 15 seconds (MASTER mode) and then it will turn off (exit MASTER mode).

#### Adding a new iButton to the table

- Touch the MASTER to the cup briefly, so that the green LED goes on (MASTER mode).
- Now touch the iButton you wish to add to the table. If the iButton code has been added to the table, the yellow and red LED will flash briefly and all three LEDs will turn off
- If the table is full, i.e. the iButton has not been added, the green LED will turn off.

#### Deleting an iButton

- Touch the MASTER to the cup briefly, so that the green LED goes on (MASTER mode).
- Now touch the iButton you wish to delete from the table. If the iButton code has been deleted from the table, the yellow LED will flash briefly and the green LED will turn off

If the iButton you want to delete is not in the table, this operation will add it (the red LED will flash too) and it will later be able to activate RL1. Only if you repeat the procedure, will the iButton be deleted from the table.

The procedure for adding and deleting iButtons is basically the same. If the touched iButton is found in the table it is deleted, if not, it is added.

After adding or deleting an iButton, you should immediately check the results by touching it again to the reader cup and checking if it activates RL1.

If the iButton is in the table, RL1 will be activated and the yellow, red and green LEDs will flash.

If the iButton is not in the table, RL1 will not be activated and only the yellow and green LEDs will flash.

## 4 Communication

The communication parameters are: 2400Bd, 8B, NP.

Communication has two functions:

- sending commands to the SL-50R9; these commands pertain to the editing of the ID table and parameters
- logging events

### 4.1 Commands

#### 4.1.1 'S' Show

The SL-50R9 sends a list of the ID codes in its table

```
<'S'>          ←      PC
<CR><LF>(HN)<':'><' '>(CRC)(B1)(B2)(B3)(B4)(B5)(B6)(FC)
<CR><LF>(HN)<':'><' '>(CRC)(B1)(B2)(B3)(B4)(B5)(B6)(FC)
...
<CR><LF>(HN)<':'><' '>(CRC)(B1)(B2)(B3)(B4)(B5)(B6)(FC)<'*'>    →      PC
```

where:

<'\*'> - indicates the end of transmission

(HN) – index of the ID code in the table (necessary for deletion)

If the table is empty, only the <'\*'> is sent.

#### 4.1.2 'D' Delete

Deletion of a specific ID code from the table

```
<'D'>          ←      PC
<CR><LF><'D'>    →      PC
<HNh>          ←      PC    (higher nibble of the index)
<HNh>          →      PC    echo
<HNI>          ←      PC    (lower nibble of the index)
<HNI>          →      PC    echo
<'*'>          →      PC    deletion done
```



#### 4.1.3 'A' Add/ Delete

Add or delete an ID code

This command does the same thing as the add/delete procedure with the MASTER. If the ID code is in the table, it is deleted, if not it is added.

```

<'A'> ← PC
<CR><LF><'#'> → PC
(CRC)(B1)(B2)(B3)(B4)(B5)(B6)(FC) ← PC (ID = 16 ASCII characters)
if the ID is not in the table, the SL-50R9 returns the following:
(CRC)(B1)(B2)(B3)(B4)(B5)(B6)(FC) <' '><'a'><'*'> → PC (echo, ID added)
if the ID is already in the table, the following is returned:
(CRC)(B1)(B2)(B3)(B4)(B5)(B6)(FC) <' '><'d'><'*'> → PC (echo, ID deleted)

```

#### 4.1.4 'O' Open

Activate the door strike relay (RL1) for the duration set in the RL1 parameter (0,5s to 64s).

#### 4.1.5 'C' Clear

Clear the whole ID table. The MASTER ID is not affected.

```

<'*'> → PC

```

#### 4.1.6 'M' Show Master

Sends the ID code of the current MASTER

```

<'M'> ← PC

```

If the stored code has a valid iButton CRC, the following is returned:

```

<CR><LF>(CRC)(B1)(B2)(B3)(B4)(B5)(B6)(FC) → PC

```

If the CRC is bad (empty or erased EEPROM)

```

<CR><LF><'!'> → PC

```

#### 4.1.7 'N' New master

Used to set a new MASTER ID via the RS-232 port

```

<'N'> ← PC
<CR><LF><'#'> → PC
(CRC)(B1)(B2)(B3)(B4)(B5)(B6)(FC) ← PC (new ID code, 16 ASCII chars)
(CRC)(B1)(B2)(B3)(B4)(B5)(B6)(FC)<' '><'a'><'*'> → PC

```

#### 4.1.8 'T' Read Param

Reads the 8-byte parameter block:

```
<'T'>                ←      PC
<CR><LF>(P1)(P2)(P3)(P4)(P5)(P6)(P7)(P8)    →      PC
```

#### 4.1.9 'J' (Write Param)

Writes the 8-byte parameter block:

```
<'J'>                ←      PC
<CR><LF><'#'>        →      PC
(P1)(P2)(P3)(P4)(P5)(P6)(P7)(P8)          ←      PC
(P1)(P2)(P3)(P4)(P5)(P6)(P7)(P8)<' '><'a'><'*'> →      PC
```

#### Notation used:

<NN>                    means one ASCII character i.e. <CR> = 10H  
 (XX)                    one byte as two ASCII characters  
                          i.e. (45H) = ('4') + ('5') = 34H + 35H  
                          The higher nibble is sent first.  
 (CRC)                    CRC byte of the iButton code  
 (B1) do (B6)            HEX bytes of the iButton code (B1 = MSB)  
 (FC)                    Family Code i.e. two-digit HEX byte on the right of the iButton. Designates the type of  
                          the iButton  
                          (e.g. the family code for DS1990A is 01H)

## 4.2 Event logging

The SL-50R9 sends a series of characters via the RS-232 port to log each event. These characters are sent as soon as the event occurs, which means that they will be lost if there is nothing on the other end of the RS-232 cable to receive and store them in a file.

### **<5500000186BD1501**

An iButton with this ID code has been read.

### **<D**

The door (sensor input) was opened without an iButton or the egress input.

These two characters are repeated about 4 times per second while the door is open.

### **>A**

The alarm relay (RL2) has been activated (alarm button or alarm condition)

These two characters are repeated about 4 times per second while RL2 is active

### **>O**

The door strike relay (RL1) has been activated

### **>ON**

The door strike relay (RL1) has been activated and has timed out and deactivated without the door (sensor) having been opened.

### **<C**

The door strike relay (RL1) deactivated

### **Examples:**

### **<260000000BB50806+>O**

An iButton with the given ID was touched, the CRC was OK (this is indicated by the '+' behind the ID code). The door realy was activated and later deactivated due to the opening of the door (sensor).

(The door was opened before RL1 was deactivated.)

### **<260000000BB50806+>ON**

Same as before, but the door wasn't opened.

### **Logging access table editing with a MASTER iButton**

A touched MASTER iButton is designated with an 'M' after the ID code. Adding or deleting an iButton is marked with an 'a' or 'd' like in the ADD command.

### **<91000000040FDB09M 5600000207DBCE01 d\***

A MASTER iButton with the following code 91000000040FDB09 was touched. After that an iButton with the code 5600000207DBCE01 was touched and deleted from the table.

**<91000000040FDB09M 5600000207DBCE01 a\***

Same as before, but the iButton was added, not deleted.

**<91000000040FDB09M \***

The whole table was deleted with a MASTER.

## 5 Memory mapa of the EEPROM

The EEPROM memory is organised as 64 8-byte blocks. All of the blocks, except no. 63, contain ID media codes.

The blocks are used as follows:

Block 0: MASTER

Block 1 .. 62: ID table

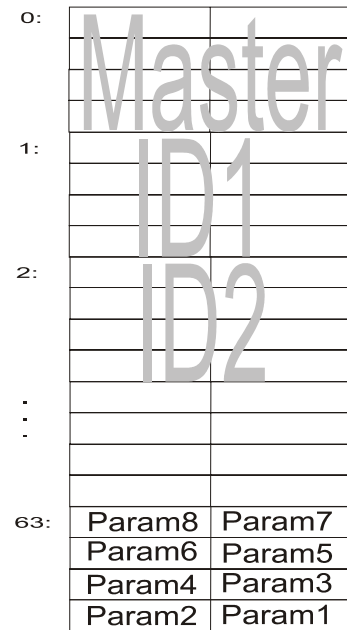
The contents of these blocks is the following:

	high	low
+0	FC	B6
+1	B5	B4
+2	B3	B2
+3	B1	CRC

Block 63: parameters

Param 1/2 RL 1/2 time

XXXXXX000	0,5s
XXXXXX001	1s
XXXXXX010	2s
XXXXXX011	4s
XXXXXX100	8s
XXXXXX101	16s
XXXXXX110	32s
XXXXXX111	64s



The parameter block contains the relay-active duration configurations for RL1 and RL2.

Of the 8 byte parameters, only two are used currently:

param 1: RL1 time

param 2: RL2 time

The relation of param1 and param2 values to relay active times can be seen from the table.

## 6 Technical data:

Relay rating:	24VDC/2,5A
Power consumption:	100mA max (no relays active, iButton reader)
Max. IDs in table:	62 + MASTER
Battery charger:	trickle charge, constant voltage (13,7V) with 1.5A current limit