亚普达科技

UPUS TECHNOLOGY

Lock Control Board
UPUS-SKB Serials
Technical Document
V3.0+

Version Information

NO.	Version	Date	Author	Content
1	V3.0	2022-08-08	Dw.Zhang	Create and write, apply the new command protocol
2	V3.1	2023-09-08	Dw.Zhang	Update the function code of the command

Catalog

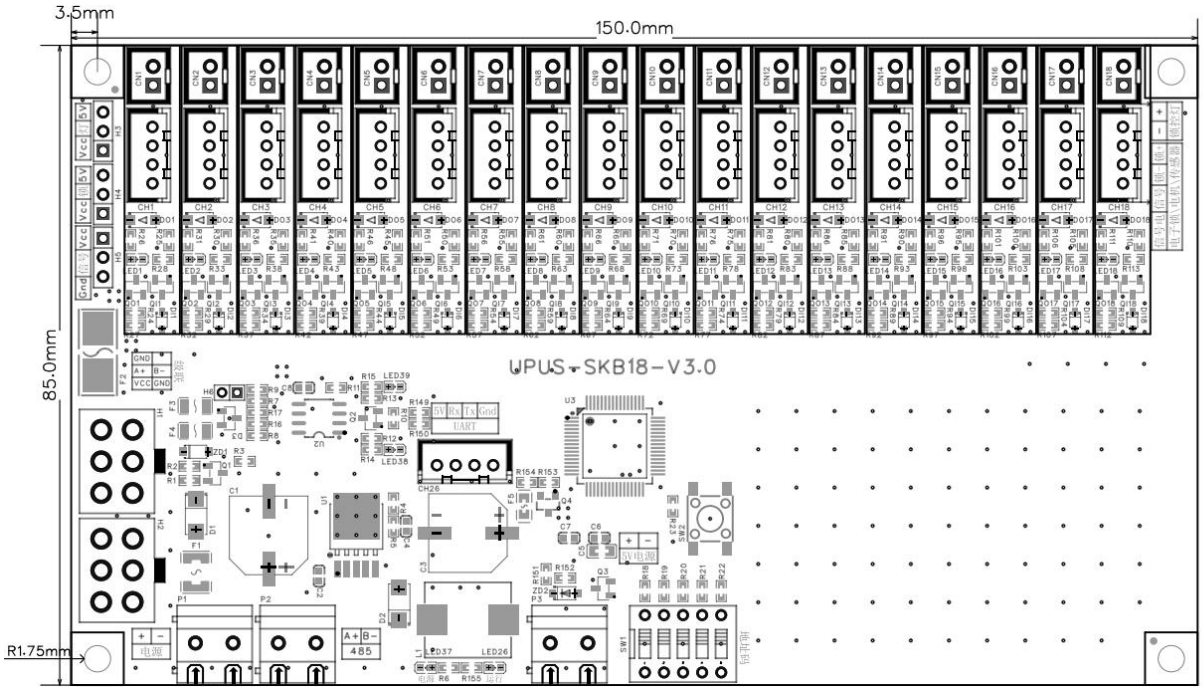
一、 Overview

This series of products can be used for electronic lock, lighting and other control. It can be used in networking through the RS-485 communication protocol. The device comes with a cascade port to facilitate user networking. The communication command protocol is simple and clear. This article will introduce it in detail to facilitate secondary development by users.

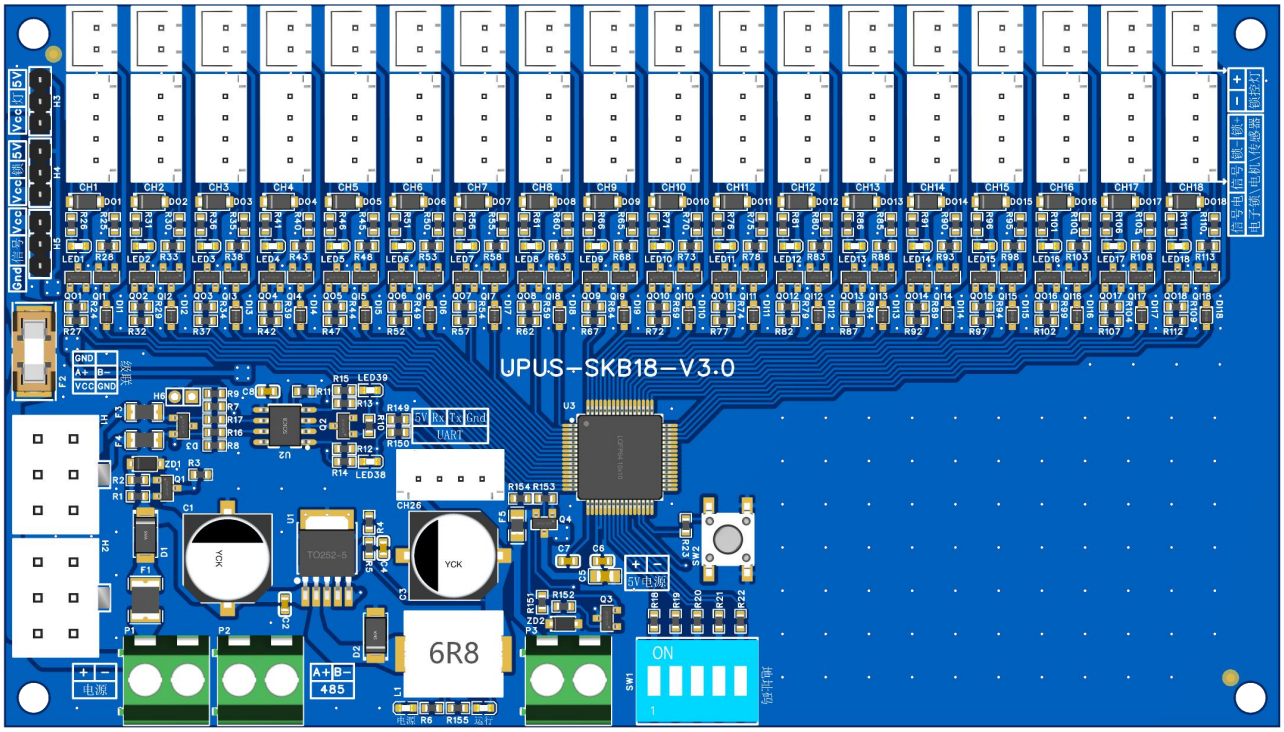
二、 Specification

1. UPUS-SKB18-V3.0

Dimension



Interface Description

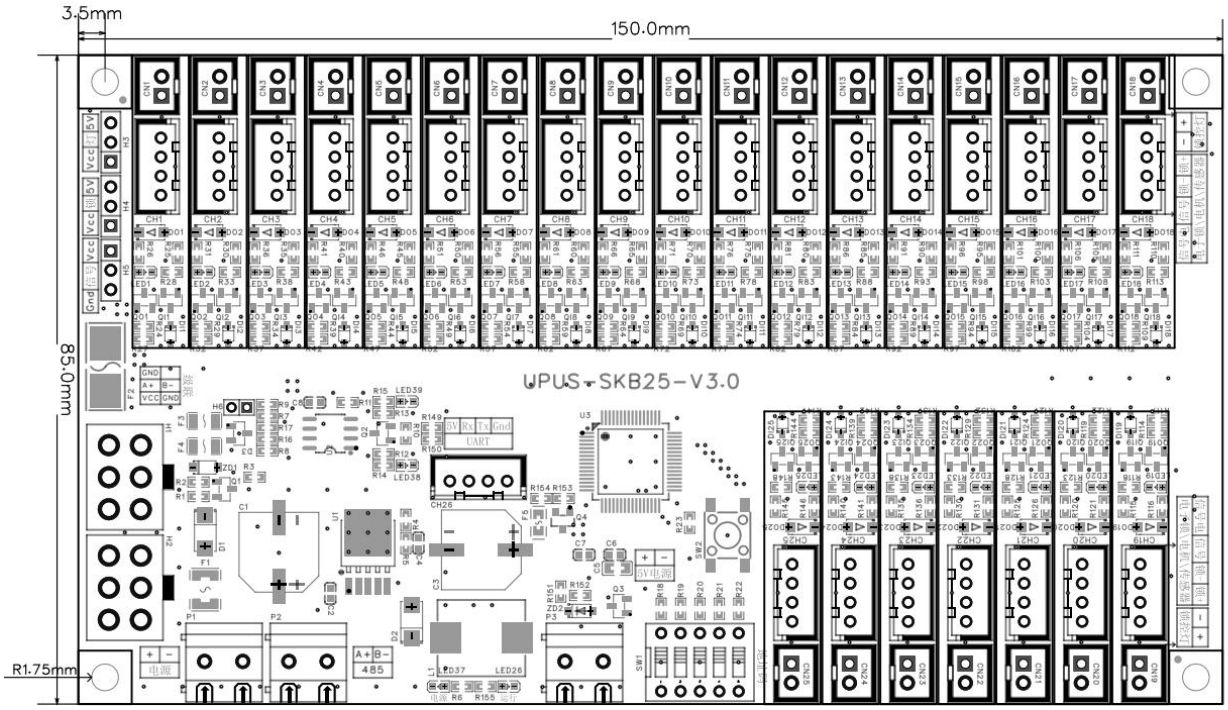


Electrical Characteristics

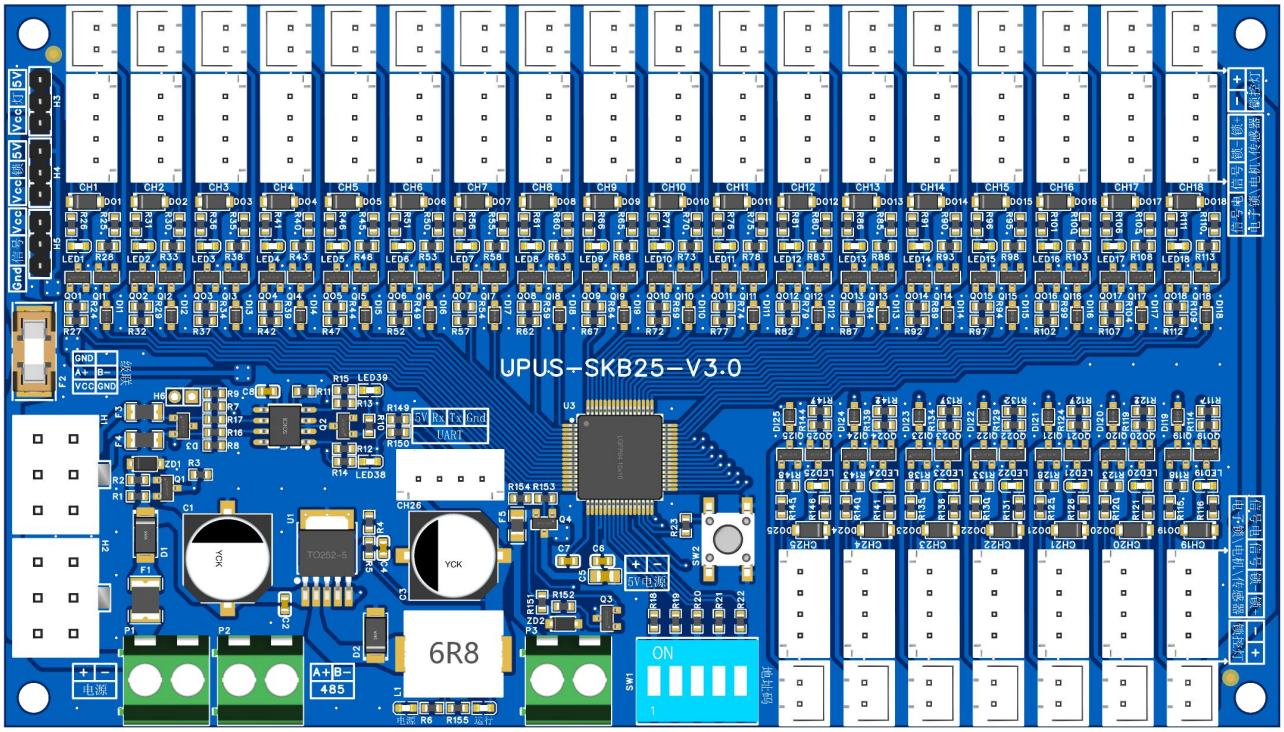
Input voltage VCC	DC 7V ~ 24V
Each lock, light terminal output voltage	5V or VCC
Each lock, light terminal output current	Maximum current：5A High current for short time：2A~5A Continuous working current：2A
Operating temperature	-20℃ ~ 70℃

2. UPUS-SKB25-V3.0

Dimension



Interface Description

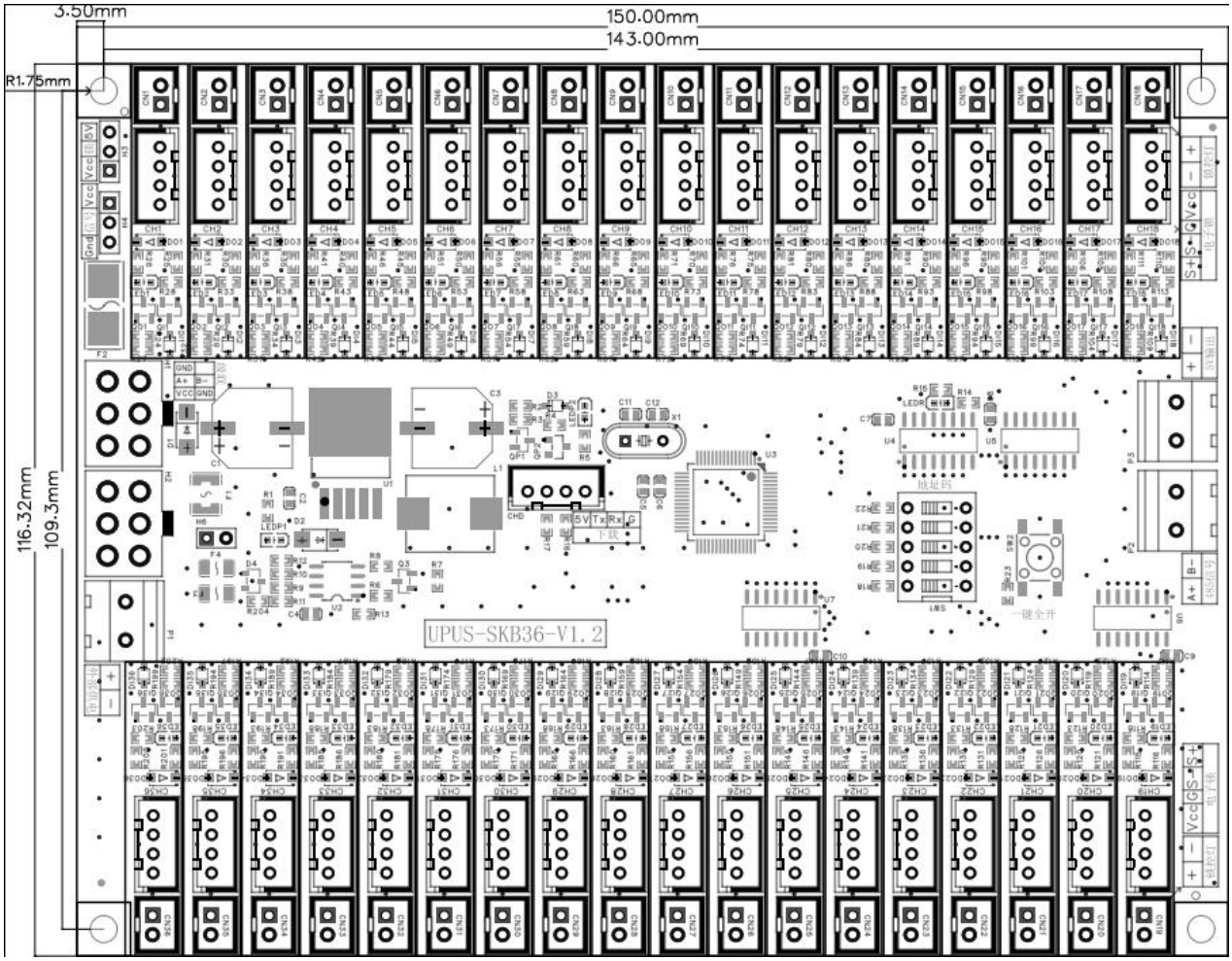


Electrical Characteristics

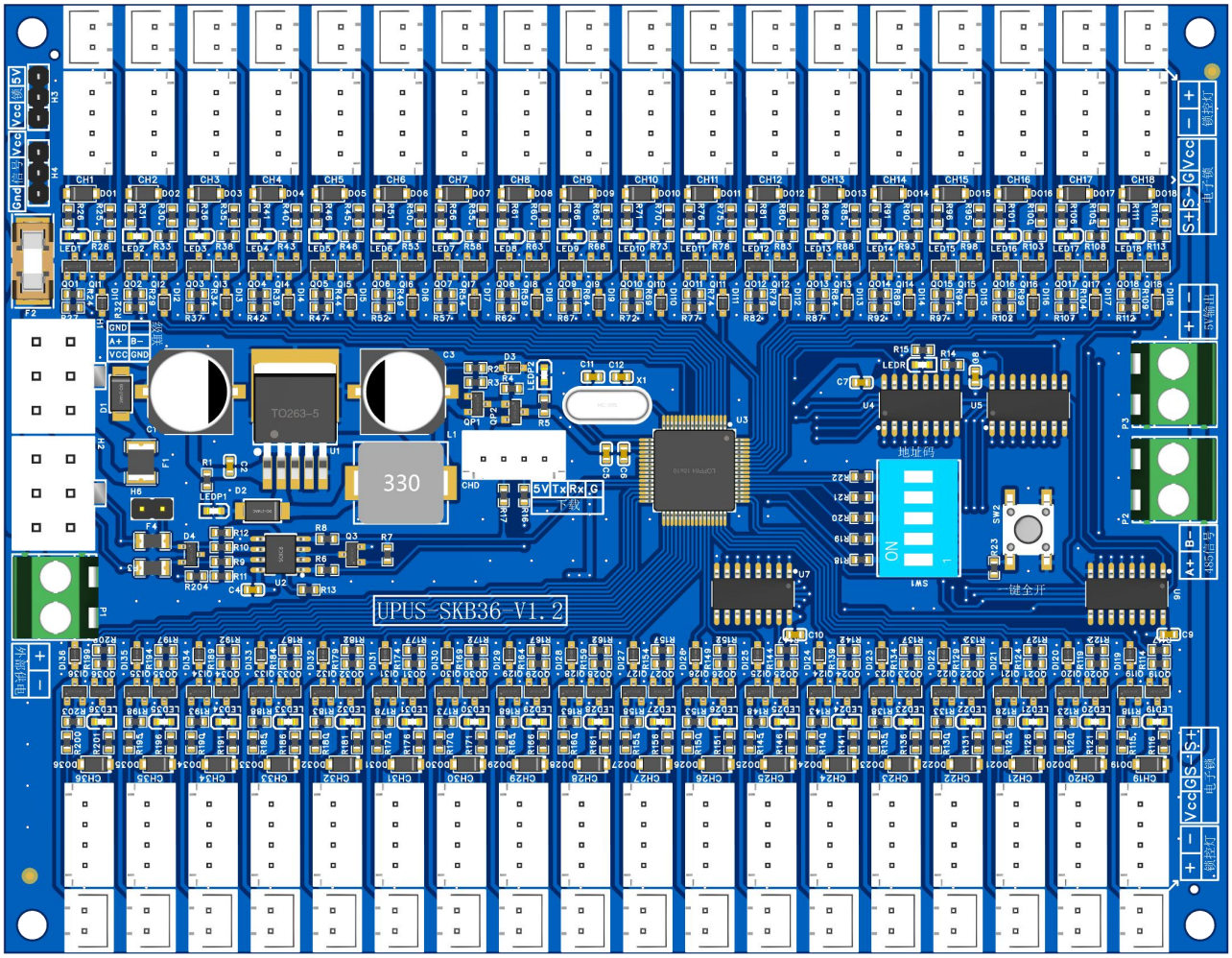
Input voltage VCC	DC 7V ~ 24V
Each lock, light terminal output voltage	5V or VCC
Each lock, light terminal output current	Maximum current：5A High current for short time：2A~5A Continuous working current：2A
Operating temperature	-20℃ ~ 70℃

3. UPUS-SKB36-V1.2

Dimension



Interface Description



Electrical Characteristics

Input voltage VCC	DC 7V ~ 24V
Each lock, light terminal output voltage	5V or VCC
Each lock, light terminal output current	Maximum current： 5A High current for short time： 2A~5A Continuous working current： 2A
Operating temperature	-20℃ ~ 70℃

三、 Instruction Protocol

*** The instruction data in the document are all hexadecimal data**

*** Multi-byte data are all in big-endian order (high byte first)**

1. Communication Port： RS-485

Default parameters： Baud rate：9600 Parity bit：N Data bit：8 Stop bit：1

The baud rate can be changed through instructions. For specific change methods, please refer to the write system configuration of the instruction protocol.

2. Instruction Protocol

The data structure of sending and receiving data is as follows：

Meaning	Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
Byte	1	1	1	1	1	A value equal to the data length	1

Command Header is fixed to 0x55

Type Code is fixed to 0xA1

Address Code dial code algorithm: from 1 to 5 in binary from high to low

5-bit binary algorithm, counting from the lowest bit (rightmost), the number in the bit is multiplied by the weight of the bit. The weight is the number of digits in 2 minus one.

The address code is the value of the dialer + 1. When it is all off, the address code is 1, and when it is all on, the address code is 32.

Please refer to some sample pictures of the address code dialer below.

Eg：01101，Converted to decimal, it is：1*2（1-1）+0*2（2-1）+1*2（3-1）

+1*2（4-1）+1=1+0+4+8+1=14。

Function Code please check the description of function code

Data length is related to the function code. Different functions have different lengths. Please refer to the **function code description** for details**.**

Parity digit calculation method：

Command header xor Type code xor Address code xor Function code xor Data length xor Data

The xor above is the XOR or algorithm symbol

Some sample pictures of the address code dialer

3. Function Code Introduction

Functions Code	Corresponding Functions Introduction
DF	Broadcast addressing, the address code must use the broadcast address (FF)
DD	Read MCU ID
D9	Read task status
D0	Read system configuration
E0	Write system configuration
D1	Read channel status
E1	Write channel status (CH silk screen switch electrical control)
D2	Read channel signal status
E2	Unlock
E4	Motor control, run until the signal changes to the specified state and stop
E5	Motor control, run until the signal changes to the specified number of times and stop
E6	Motor control, running until the signal reaches the specified state and stops
A0	Automatically uploaded data

4. Detailed Usage of Function Code

1) **DF** Broadcast Addressing

Structure of instruction

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	FF	DF	00	NO	XX

Address Code Must use Broadcast address 0xFF

Returned data structure：

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	FF	DF	01	**Data**	XX

Data： Returns the address code of the control board

Eg：

Send： 55 A1 FF DF 00 D4

Return： 55 A1 FF DF 01 **01** D4

Analysis：

Address Code： 01

2) DD Read MCU ID

Structure of Instruction

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	DD	00	NO	XX

Address Code：The value corresponds to the address code dialer on the device

The returned data structure：

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	DD	07	**Data**	XX

Data： Return MCU ID

Eg：

Send：55 A1 01 DD 00 28

Return：55 A1 01 DD 07 **F7 84 C9 1C 01 EB 07** 64

Analysis：

MCU ID is：F784C91C01EB07

3) D9 Task Status

Structure of Instruction

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	D9	01	**Data**	XX

Address Code： The value corresponds to the address code dialer on the device

Data：structure

Task ID： 1 Byte

The returned data structure：

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	D9	0A	**Data**	XX

Data：structure

Task ID ： 1 Byte

Enabled status ： 1 Byte（00： task stopped； 01： Task running）

Task steps ：1 Byte（80：task completed；83：Timeout completed）

Remaining running time ： 2 Byte

Create task function code： 1 Byte

IO Number ： 1 Byte

Task target status ： 1 Byte （During motor tasks, this bit indicates the target status or times ）

Task duration or timeout ： 2 Byte

Eg：

Query the task status with task ID 0

Send： 55 A1 01 D9 01 **00** 2D

Return： 55 A1 01 D9 0A **00 00 80 00 00 E2 01 00 00 14** 51

Analysis：

Task ID	：	00
Enabled status	：	00（Enabled status）
Task steps	：	80（Task steps）
Remaining running time	：	0000（0）unit is 10ms
Create task function code	：	E2（Write unlock）
IO Number	：	01（No.1 channel）
Task target status	：	00（It is meaningless when writing the unlock function）
Task duration	：	0014（20）unit is 10ms

4) D0 Read System Configuration

Structure of Instruction

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	D0	00	NO	XX

Address Code： The value corresponds to the address code dialer on the device

The returned data structure：

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	D0	09	**Data**	XX

Data： Structure

Command Header ： 1 Byte （Fixed to： 55）

Type ： 1 Byte （Fixed to： A1）

soft address ： 1 Byte （Not enabled, filled in by default 01）

Baud rate ： 4 Byte

Unlocking time ： 1 Byte （Unit is 10ms， the bit value x10 = actual ms）

Mode + upload control bit： 1 Byte

Mode + upload control bit detailed explanation：

Upper 4 Bit：

0： Default answering mode (one send, one receive)；

1： Turn on task mode；

Low 4 Bit：

0： Turn off automatic upload；

1： Automatically upload messages when the signal is disconnected or low level；

2： Automatically upload messages when the signal is connected or high level；

Note： Automatic upload is mainly used when connecting to electronic locks. When enabling this function, attention should be paid to logic control. Multiple devices cannot send status on the 485 communication bus at the same time, otherwise it will cause data confusion, loss and other problems.

After automatic upload is enabled, the upload function code is A0. For detailed analysis, please refer to the instruction introduction.

Eg：

Send：55 A1 01 D0 00 25

Return：55 A1 01 D0 09 **55 A1 01 00 00 25 80 14 01** 69

Analysis：

Structure header ： 55

Type code ： A1

Soft address ： 01

Baud rate ： 00002580（9600）

Unlocking time ： 14（20*10=200ms）

Mode + upload control bit: 01 (0 response mode, 1 automatically uploads messages when the signal is disconnected or low level)

5) **E0** Write System Configuration

Structure of Instruction

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	E0	09	**Data**	XX

Address Code： The value corresponds to the address code dialer on the device

Data： Structure

Structure header ： 1 Byte （fixed to：55）

Type code ： 1 Byte （fixed to：A1）

Soft Address ： 1 Byte （the bit value x10 = actual ms））

Baud rate ： 4 Byte

Unlocking time ： 1 Byte （unit 10ms，the bit value x10 = actual ms））

Mode + upload control bit： 1 Byte

Mode + upload control bit detailed explanation：

Upper 4 Bit：

0：Default answering mode (one send, one receive)；

1：Turn on task mode；

Low 4 Bit：

0：Turn off automatic upload；

1： Automatically upload messages when the signal is disconnected or low level；

2： Automatically upload messages when the signal is connected or high level；

Note： Automatic upload is mainly used when connecting to electronic locks.

Multiple devices cannot send status on the 485 communication bus at the same time, otherwise it will cause data confusion, loss and other problems.

After automatic upload is enabled, the upload function code is A0. For detailed analysis, please refer to the instruction introduction.

The returned data structure：

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	E0	09	**Data**	XX

The returned data is consistent with the sent data. If it is inconsistent, the configuration fails.

Eg：

The protocol header, type code are fixed and must be 55 A1

Address code : Set to 01 (customized, not yet enabled)

Baud rate ： 9600

Unlocking time ： 200ms

Mode+Upload ： All off

Send：55 A1 01 E0 09 **55 A1 01 00 00 25 80 14 00** 58

Return：55 A1 01 E0 09 **55 A1 01 00 00 25 80 14 00** 58

Analysis：

The received data is consistent with the sent data, and the configuration is successful.

6) D1 Read Channel Status

Structure of Instruction:

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	D1	01	**Data**	XX

Address Code： The value corresponds to the address code dialer on the device

Data： Structure

Channel No.（CH silk screen number）： 1 Byte（If it is 0, it means reading the status of all channels.）

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	D1	XX	**Data**	XX

The returned data structure：

Data： Structure

Channel NO. ：1 Byte（The channel ID is 0, indicating the status of all channels）

Status data :Data length-1 Byte

Status data analysis：

When channel ID is 0：

The status data is the status of all channels. After converting the status data to binary, each bit from left to right represents the status of one channel. 0 means power off and 1 means power on. The number of valid digits needs to correspond to the actual number of hardware channels. For example, for a 25-channel lock control board, the returned status data is 4 bytes of data. After conversion to binary, it is 32-bit data. Because the lock control board has 25 channels, only the first 25 bits are valid. , others are invalid.

When channel ID is not 0：

The status data is the status of the corresponding channel number, 0 means power off, 1 means power on, no need to convert to binary.

Eg：

Read the status of channel No. 1

Send：55 A1 01 D1 01 **01** 24

Return：55 A1 01 D1 02 **01 00** 27

Analysis：

Channel NO. ：01

Status ：00（Blackout）

Read the status of all channels（25-channel controller）

Send：55 A1 01 D1 01 **00** 25

Return：55 A1 01 D1 05 **00 80 00 00 00** A1

Analysis：

Channel NO. ：00（The status of all channels）

Status ：80000000

Convert state to binary：1000 0000 0000 0000 0000 0000 0000 0000

It’s a 25-channel control board, only the 25 digits counted from the left are valid.

1000 0000 0000 0000 0000 0000 0 000 0000

Only the first digit is 1 ： Power-on state

The other channels are 0 ： Power-off state

The last 7 digits of data are invalid

7) E1 Write Channel Status

Structure of Instruction:

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	E1	02	**Data**	XX

Address Code： The value corresponds to the address code dialer on the device

Data： Structure

Channel No.（CH silk screen number）： 1 Byte

Target state： 1 Byte

The returned data structure：

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	E1	02	**Data**	XX

Data： Structure

Channel No. ： 1 Byte

Status data ：1 Byte（0 is power-off，1 is power-on，E5 is incorrect channel ID）

Eg：

Write the state of channel 1 is powered on

Send： 55 A1 01 E1 02 01 01 16

Return： 55 A1 01 E1 02 01 01 16

Analysis：

Channel NO. ： 01

Status ： 01（power-on）

Consistent with what was sent, successful

8) D2 Read Channel Signal Status

Structure of Instruction:

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	D2	01	**Data**	XX

Address Code： The value corresponds to the address code dialer on the device

Data： Structure

Channel No. (CH silk screen number)：1 Byte（The channel ID is 0, indicating the status of all channels）

The returned data structure：

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	D2	XX	**Data**	XX

Status：Structure

Channel NO. ：1 Byte（The channel ID is 0, indicating the signal status of all channels）

Status data ：data length-1 Byte

Status data analysis：

When channel ID is 0：

The status data is the signal status of all channels. After converting the status data to binary, each bit from left to right represents the status of one channel, 0 means on (high level), 1 means off (low level). The number of effective digits needs to correspond to the actual number of hardware channels. For example, for a 25-channel lock control board, the returned status data is 4 bytes of data. After conversion to binary, it is 32-bit data. It should be

because the lock control board has 25 channels, so only the first 25 bits are Valid, others are invalid.

When channel ID is not 0：

The status data is the signal status corresponding to the channel number, 0 means on (high level), 1 means off (low level), no need to convert to binary.

Eg：

Read the signal status of channel NO.1

Send：55 A1 01 D2 01 **01** 27

Return：55 A1 01 D2 02 **01 01** 25

Analysis：

Channel NO. ：01

Status ：01（Off or low level）

Read the signal status of all channel numbers (25-channel lock control board)

Send：55 A1 01 D2 01 **00** 26

Return：55 A1 01 D2 05 **00 FF FF EF 80** 4D

Analysis：

Channel NO. ：00（Indicates the signal status of all channels）

State ：FFFFEF80

Convert state to binary：1111 1111 1111 1111 1110 1111 1000 0000

Because it is a 25-channel lock control board, only the 25 digits counted from the left are valid.

1111 1111 1111 1111 1110 1111 1 000 0000

Only bit 20 is 0: on (high level) state

The other 24 channels are 1: Off (low level) state

The last 7 digits of data are invalid

9) E2 Unlock

Structure of Instruction:

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	0xXX	E2	01	**Data**	XX

Address Code： The value corresponds to the address code dialer on the device

Data： Structure

Channel No. (CH silk screen number)：1 Byte（When it is 0, it means all locks are opened）

The returned data structure：

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	E2	XX	**Data**	XX

Data： Structure

Channel NO. ：1 Byte（The channel ID is 0, indicating the status of all channels）

Status data ： data length-1 Byte

Status data analysis：

When channel ID is 0：

If the task mode is enabled, the status data at this time is the task ID. After obtaining the task ID, query the task ID and perform subsequent processing according to the "enabled status" and "task step" of the task. For example, the enabled status returned after task query is 00 (task stopped) and the task step is 80 (task completed). At this time, the task execution is completed. The signal status of all channels can be obtained by reading the channel signal status through D2 and setting the channel ID to 0 (reading the signal status of

all channels). Please refer to the corresponding instructions for analysis.

When the task mode is not enabled, the status data is the signal status of all channels. After converting the status data to binary, each bit from left to right represents the status of one channel, 0 is on (high level), 1 is off (low level) . The number of effective digits needs to correspond to the actual number of hardware channels. For example, for a 25-channel lock control board, the returned status data is 4 bytes of data. After conversion to binary, it is 32-bit data. Because 25-channel lock control board has 25 channels, so only the first 25 bits are Valid, others are invalid.

When channel ID is 0:

The status data is the signal status corresponding to the channel number, 0 means on (high level), 1 means off (low level), no need to convert to binary.

Eg：

When task mode is enabled：

Task ID is returned only when all locks are opened. When a single lock is opened, it is consistent with the task mode not being enabled.

Unlock all locks (25-channel lock control board)

Send：55 A1 01 E2 01 **00** 16

Return：55 A1 01 E2 02 **00 00** 15

Analysis：

Channel NO. ：00（Indicates the signal status of all channels）

Task ID ：00

When task mode is not enabled：

Unlock channel No. 1

Send：55 A1 01 E2 01 **01** 17

Return：55 A1 01 E2 02 **01 01** 15

Analysis：

Channel NO. ：01

Status ：01（off or low level）

Unlock all locks (25-channel lock control board)

Send：55 A1 01 E2 01 **00** 16

Return：55 A1 01 E2 05 **00 FF FF EF 80** 7D

Analysis：

Channel NO. ：00（Indicates the signal status of all channels）

State ：FFFFEF80

Convert state to binary：1111 1111 1111 1111 1110 1111 1000 0000

Because it is a 25-channel lock control board, only the 25 digits counted from the left are valid.

1111 1111 1111 1111 1110 1111 1 000 0000

Only bit 20 is 0 : on (high level) state

The other 24 channels are 1: off (low level) state

The last 7 bits of data are invalid.

10) E4 Motor Control, Running until Signal Changes to the Specified State and Stops

Structure of Instruction:

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	E4	03	**Data**	XX

Address Code： The value corresponds to the address code dialer on the device

Data： Structure

Channel No. ： 1 Byte

Overtime time： 1 Byte （Unit is 100ms, that is, the bit value x100=actual ms）

Stop signal ： 1 Byte （00： High level or on， 01： Low level or off）

The returned data structure：

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	E4	02	**Data**	XX

Data： Structure

Channel NO. ： 1 Byte

Execution report ： 1 Byte

01： Execution completed

03： Overtime

E2： There is a task being executed and the creation cannot be continued

Task ID is returned when task mode is enabled

Eg：

Motor control, channel No. 1, 5000ms timeout, stop when the signal changes to high level (connected)

Send：55 A1 01 E4 03 **01 32 00** 21

Return：55 A1 01 E4 02 **01 01** 13

Analysis：

Channel NO. ：01

Status ：01（Execution completed）

When task mode is enabled

Motor control, channel number 1, 5000ms timeout, stops when the signal changes to high level (connected).

Send：55 A1 01 E4 03 **01 32 00** 21

Return：55 A1 01 E4 02 **01 00** 12

Analysis：

Channel NO. ：01

Task ID ：00

If you want to know the task results, please query the task execution results through D9 Read Task Status. For details, please refer to the D9 Read Task Status command.

11) E5 Motor Control, Running until Signal Changes to the Specified Times and Stops

Structure of Instruction:

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	E5	03	**Data**	XX

Address Code： The value corresponds to the address code dialer on the device

Data：structure

Channel No. ： 1 Byte

overtime time ： 1 Byte （unit 100ms， that is, the bit value x100=actual ms）

Times of signal changes： 1 Byte

The returned data structure：

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	E5	02	**Data**	XX

Data： Structure

Channel NO. ： 1 Byte

Execution report ： 1 Byte

01： Execution completed

03： Overtime

E2： There is a task being executed and the creation cannot be continued

Task ID is returned when task mode is enabled

Eg：

Motor control, channel number 1, 5000ms timeout, signal change 6 times and stop.

Send：55 A1 01 E5 03 **01 32 06** 26

Return：55 A1 01 E5 02 **01 01** 12

Analysis：

Channel NO. ：01

State ：01（Execution completed）

When task mode is enabled

Motor control, channel number 1, 5000ms timeout, signal change 6 times and stop.

Send：55 A1 01 E5 03 **01 32 06** 26

Return：55 A1 01 E5 02 **01 00** 13

Analysis：

Channel NO. ：01

Task ID ：00

If you want to know the task results, please query the task execution results through D9 Read Task Status. For details, please refer to the D9 Read Task Status command.

12) E6 Motor control, Running until Signal Reaches the Specified State and Stops

Structure of Instruction

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	E6	03	**Data**	XX

Address Code： The value corresponds to the address code dialer on the device

Data： Structure

Channel NO. ： 1 Byte

Overtime time： 1 Byte （unit is 100ms，that is, the bit value x100=actual ms）

Stop signal ： 1 Byte （ 00: High level or connected, 01: Low level or disconnected）

Returned data structure：

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	E6	02	**Data**	XX

Data： Structure

Channel NO. ： 1 Byte

Execution report ： 1 Byte

01： Execution completed

03： Overtime

E2： There is a task being executed and the creation cannot be continued.

Task ID is returned when task mode is enabled

Eg：

Motor control, channel number 1, 5000ms timeout, stop when the signal is high

level (on).

Send：55 A1 01 E6 03 **01 32 00** 23

Return：55 A1 01 E6 02 **01 01** 11

Analysis：

Channel NO. ：01

Status ：01（Execution completed）

When task mode is enabled

Motor control, channel number 1, 5000ms timeout, stop when the signal is high level (on).

Send：55 A1 01 E6 03 **01 32 00** 23

Return：55 A1 01 E6 02 **01 00** 10

Analysis：

Channel NO. ：01

Task ID ：00

If you want to know the task results, please query the task execution results through D9 Read Task Status. For details, please refer to the D9 Read Task Status command.

13) A0 Automatically Uploaded Data

Uploaded instruction structure

Command Header	Type Code	Address Code	Function Code	Data Length	Data	Parity
55	A1	XX	A0	02	**Data**	0xXX

Data： Structure

Channel NO. ： 1 Byte

Signal status ： 1 Byte （0 means on (high level), 1 means off (low level)）

Example for automatically upload data ：

55 A1 01 A0 02 **01 00** 56

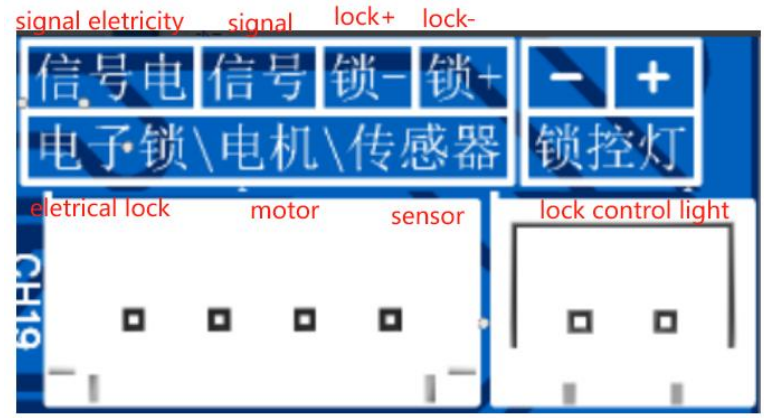
Analysis：

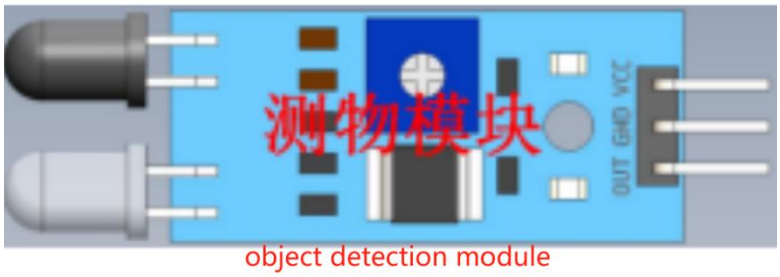
Channel No. ： 01

Status ： 00 （on or high level）

5. Instructions for Using Peripherals of Lock Control Board

Through the D2 read channel signal status command, the status of the peripheral module can be collected. The connection method is electronic lock\motor\sensor lock+ is connected to the peripheral VCC, lock- is connected to the GND of the peripheral, and the signal is connected to the OUT of the peripheral, as shown in the figure:





object detection module

If the signal pin and Signal electricity of the electronic lock\motor\sensor terminal is connected or the signal pin is high level, the return signal is 0x00, otherwise it is 0x01.

Eg： When using a 5V infrared object detection module, then select the lock

voltage jumper cap of the 36-channel lock control board to connect 5V to the lock section, and switch to the 5V output for connection use.

The object detection module VCC is connected to the lock +, GND is connected to the lock - (if it needs to work for a long time without control, H5 jumps to Gnd and signal, and the GND of the module is connected to the signal electrical pin), and OUT is connected to the signal pin.

When need to detect an object, use the E1 command to power on the connected channel, and read the channel signal status command through D2 to obtain the status. When do not need to detect the object, you can use the E1 command to turn off the power supply of the channel to save power and extend the electrical life.

If the long-term working plan of H5 jumper to GND is used, there is no need to use E1 command control.