Wallpad 485 communication protocol

1、 MODBUS communication: There are two types of products: master-slave polling mode and active sending mode. Hotel products default to master-slave polling mode, while smart home products default to active sending mode. The temperature control panel only has master-slave mode.

The networked intelligent panel reads and modifies internal registers through 485 communication, achieving remote monitoring and output control. The communication protocol refers to the MODBUS RTU communication format. Serial port settings: Baud rate 9600, check bit none, data bit 8, stop bit 1. The difference with MODBUS communication format: The length data in the panel return data is 2 bytes. If it needs to be changed to 1 byte, please indicate "communication data is 1 byte" when placing an order. It can be configured as a single byte through the 485 communication interface (see register 0x0023).

Note: The minimum interval between two instructions is 50ms.

1.1 Communication format:

Communication machine number	Command code	Data address	Communication data	CRC check
1Byte	1Byte	2Byte	nByte	2Byte

Communication machine number: refers to the address of the smart panel;
Command code: The command to read or change settings for communication between the upper computer and the panel.
Data address: The register address of the panel.
Communication data: When performing read and write operations on the switch panel, it refers to the number of read and write registers. If the data returned by the switch panel to the upper computer is related to the read data, please refer to the relevant instructions in "1.5 Communication Example (Communication Data in hexadecimal)".
CRC verification: The verification code can be calculated through software;

1.2 Communication device number: The address of the switch panel (unless otherwise specified, the address representation is in decimal).

1.2.1 Temperature controller product: 1-60255 is the broadcast address, default to 60;
1.2.2 Card insertion and power retrieval: 1-254, default to 30;
1.2.3 Switch panel: 1-42, 255 is the broadcast address, default 2,
Note: If the address is greater than 42, the absolute key value specified in the 100B register in the protocol is an invalid value. 1.2.4 255 is the broadcast address, which can only be written and cannot be read in broadcast mode. The slave returns no data.

Note: The method for changing the address can be found below. If the address needs to be fixed in advance, the address needs to be provided when placing an order. The provided address should indicate whether it is in decimal or hexadecimal. For example, in hexadecimal, it needs to start with 0x.

The fixed address can also be changed on-site through 485 according to needs. If it needs to be made non modifiable on-site, it needs to be indicated when placing an order

1.3 Command code: The command code for communication between the upper computer and the panel.

Command code	Operation content
03H	Reading panel data
06H	Change the data of the settings panel
83H	Error code returned by reading panel command error
86H	Error code returned by changing settings panel command error

Error code (communication data)

error code	meaning	illustrate
01H	Verification error	
02H	Operation error	
03H	Register Read Only	
04H	Register does not exist	
05H	invalid operation	
06H	Register is write protected	

1.4 CRC16-1 verification algorithm: The CRC verification code has specialized calculation software.

At the beginning of CRC, all 16 bits of the register are set to "1", and then two adjacent 8-bit bytes of data are placed in the current register. Only the 8-bit data of each character is used to generate CRC, and the start bit, stop bit, and parity bit are not added to CRC. During CRC generation, every 8 bits of data are XOR with the median in the register. The result is shifted one bit to the right (towards LSB direction) and filled with "0" in MSB to detect LSB. If LSB is "1", it is XOR with the preset fixed value. If LSB is "0", it is not XOR. Repeat the above process until the shift is 8 times. After completing the 8th shift, the next 8-bit data will XOR with the current value of the register. After all information processing is completed, the final value in the register will be the CRC value.

产生 CRC 的过程：

1. Set the 16 bit CRC register to FFFFH
2. XOR the first 8-bit data with the lower 8 bits of the CRC register, and place the result in the CRC register.
3. Move CRC register one bit to the right, fill MSB with zero, and check LSB
4. (If LSB is 0): Repeat for 3 and move one more bit to the right. (If LSB is 1): XOR CRC register with 0xA001
5. Repeat 3 and 4 until 8 shifts are completed, completing the processing of 8-bit bytes.
6. Repeat steps 2 to 5 to process the next 8-bit data until all bytes are processed.
7. The final value of the CRC register is the CRC value.
8. When putting the CRC value into the information, the low 8 bits are in the front and the high 8 bits are in the back.

1.5 Communication Example (The following communication data is in hexadecimal)

(1) Read individual address data, for example, the upper computer sends the following command:

Communication machine number	Command code	Data address	Communication data	CRC check
3C	03	00 33	00 01	70 E8

Example：3C 03 00 33 00 01 70 E8

Command explanation: Read the indoor temperature of the temperature controller panel with panel address 3C, register address 33H, and read 1 register

The lower computer returns the following data to prove successful reception and returns a temperature of 25 degrees

Communication machine number	Command code	data length	Communication data	CRC check
3C	03	00 02	00 19	14 4B

If communication is abnormal, return:

Communication machine number	Command code	Exception code	CRC check
3C	83	03	90 FD

(2) Read multiple consecutive address data, for example, the upper computer sends the following command:

Communication machine number	Command code	Data address	Communication data	CRC check
3C	03	00 29	00 10	91 23

Command explanation: Starting from reading register address 0029H, data from 16 (0010H) consecutive addresses is read. The lower computer returns normal data as follows:

Communication machine NO.	Command code	Data Length	Communication data	CRC check
3C	03	00 20	00 02 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 03 00 19 00 00 00 00 00 19 00 00 00 00	51 20

Communication data explanation: The returned data indicates that the temperature controller automatically operates at low wind speed, in cooling mode, with the fan turned off, the indoor temperature at 25 degrees Celsius, and the cooling set temperature value at 25 degrees Celsius. See register address mapping table.

(3) Modify the address of the slave (thermostat panel), for example, the upper computer sends the following command:

Communication machine number	Command code	Data address	Communication data	CRC check
3C	06	00 20	00 01	4D 2D

Command explanation: Modify the address of the thermostat. The thermostat address register is 0020H, and the new address of the thermostat is changed to 01H.

The lower computer returns the following data to prove successful modification

Communication machine number	Command code	Data address	Communication data	CRC check
01	06	00 20	00 01	49 C0

Note: The address change is detailed in the attachment "Intelligent Switch Panel Configuration Process".

2. Thermostat register address mapping table (register is double-byte data，0x0000~0x0FFF)。

Thermostat communication machine number： 1----60， default address： 0x3C； 0XFF is Broadcast address。

Register address (Hexadecimal)	Register description
0020H	At present, the address of the thermostat is not open and cannot be modified through remote (ie 485 communication interface). It can only be accessed through the keys on the panel of the thermostat to modify the system. **How to change the address: In the off state**, press and hold the "M" + "▲" key combination for more than 5 seconds to enter the Thermostat communication address modification state, turn on the backlight, the screen displays the current Thermostat communication address value and flashes, then you can loosen Open the key combination.
0023H	Temperature controller configuration register address: BIT7: In the data format returned by the read command of the thermostat, 0-length is defined as double bytes, 1-length is defined as single bytes; Other bits default to 0;
0025H ~ 002FH	Spare register

0030H	Register Status， BIT0-BIT1 wind speed state definition: "00" low speed, "01" medium speed, "02", high speed, "03", closed; BIT2: cold valve status, 0-off, 1-open; BIT3: Thermal valve status, 0-off, 1-on; BIT4-BIT5 mode status definition: "00" cooling, "01" heating, "02", ventilation; BIT6: Standby; BIT7: 0-off, 1-on
0031H	Setting mode: "00" cooling, "01" heating, "02" ventilation Example: 3C 06 00 31 00 00 DC E8, cooling 3C 06 00 31 00 01 1D 28, heating 3C 06 00 31 00 02 5D 29, ventilation
0032H	Set wind speed "00"Low speed,"01"medium speed,"02",high speed ,"03",shut down，"04"automatic。 Add a configuration bit and turn off the fan after reaching the temperature. The following example： 3C 06 00 32 00 00 2C E8，Low speed 3C 06 00 32 00 01 ED 28，medium speed 3C 06 00 32 00 02 AD 29，high speed 3C 06 00 32 00 03 6C E9，shut down 3C 06 00 32 00 04 2D 2B，automatic
0033H	Room temperature℃ 3C 03 Read indoor temperature
0036H	Set Cooling temperature℃： 3C 06 Set the Cooling temperature to 22℃ 3C 03 Read cooling set temperature
0039H	On/off control, 00 off, 01 on 3C 06 Turn on 3C 06 Turn off
004CH	Set Ventilation temperature℃ 3C 06 Set Ventilation temperature to 22℃ 3C 03 Read Ventilation set temperature
004DH	Set heating temperature℃ 3C 06 Set the heating temperature to 22℃ 3C 03 Read heating set temperature

Note: The temperature setting range is 16-30℃。

3.Smart switch panel register address mapping table

(The register is double-byte data, 0x1000～0x1FFF, high order first).
Smart switch panel communication number: 1----42, factory default address: 0x02; 0XFF is the broadcast address. Note: If the address is greater than 42, the absolute key value of the 100B register description in the protocol is invalid.

<table>
<tr><td>Register address (hexadecimal)</td><td>Register Description</td></tr>
<tr><td>1000</td><td>[Note: This register is used for system configuration, the factory default is 02, if you do not need to modify it, the user can ignore it]
Panel address register, the default address is 0x02;
The panel address should not exceed (decimal) 42;
Command example:
02 06 10 00 00 01 4C F9 set to address 01
FF 06 10 00 00 01 59 14 set to address 1 (broadcast mode)</td></tr>
<tr><td>1003</td><td>Panel working mode configuration register, the default register data is 0;
<table>
<tr><th>Bit15..Bit6</th><th>Bit5</th><th>Bit4</th><th>Bit3</th><th>Bit2</th><th>Bit1</th><th>Bit0</th></tr>
<tr><td>—
—</td><td>Release the button to send data enble =1 to send =0, not to send</td><td>Button delay off LED = 1 enable delay = 0 no delay, the backlight is always on</td><td>Induction enable =1 enable =0 disable</td><td>The key is actively sent. =1 Actively send =0 master-slave polling</td><td>remote control bit =1 RCU mode</td><td>demo bit (local control), =1 demo mode</td></tr>
</table>
Command example:
02 06 10 03 00 01 BC F9 Demo Mode
02 06 10 03 00 07 3C FB button active sending, remote control bit, demo mode
02 06 10 03 00 1F 3C F1 Sensing enable, button delay off LED, button active sending, remote control bit, demo mode
BIT0 = 1, demonstration mode control, local control of the panel, mainly to show the sample to the customer for demonstration, that is, the panel can see the backlight control effect without going through the RCU.
Example: 02 06 10 03 00 01 BC F9 - Change the status indicator of the switch panel with address 02 to demo mode;
BIT1=1 represents the RCU mode: the indicator lights on the panel are controlled by the RCU.
BIT2 = 0 is the master-slave polling mode, and the host performs polling access control; 1 is the button to actively send the mode</td></tr>
</table>

Press to actively send the key value to the host;
Example: 02 06 10 03 00 04 7C FA—configured to send active keys
The format of the key to actively send data is as follows:
Example: 02 03 00 02 08 02 62 38 , the key K2 is pressed to actively send data;
Panel address (1 byte 0x02) + read command (1 byte 0x03) + return data length (2 bytes 0x00-0x02) + absolute key value (1 byte 0x08) + key bit number (1 byte 0x02) + CRC check (2 bytes 0x62 0x38)
BIT3 = 1 switch panel sensing enable, indicating whether infrared sensing and touch sensing are enabled;
Example: 02 06 10 03 00 08 7C FF start panel sensing function
BIT4 = button backlight, status indicator delay off function, 0 - no activation, the character backlight remains on, 1 - activated, the button does not move within 15 seconds, the character backlight automatically turns off; customers can enable it according to their own needs. , if our built-in delay cannot meet the requirements, the panel delay function will not be activated, and the RCU will define its own desired delay function.
Example: 02 06 10 03 00 10 7C F5
BIT5 = Enable bit to send data when the button is released. This function requires BIT2 = 1 (button active mode) to work. It is mainly used for long-press function recognition such as dimming. =1, release the button to actively send data; =0, do not send any data;
Configuration example: 02 06 10 03 00 24 7D 22
The format of the data sent when the key is released is as follows:
Example: 02 03 00 02 08 00 E3 F9 , press the key K2 (code 08) to send data actively; release the flag data is red "00";

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Indicator backlight D1～D16 Display control: mainly refers to the relevant indicators on the switch panel such as aperture, status circle, character backlight, etc.

B15-B9	B8	B7	B6	B5	B4	B3	B2	B0
--	Backlight LED	--	--	Button 6 LED	Button 5 LED	Button 4 LED	Button 3 LED	Button 1 LED

1. When a bit is 1, the corresponding button LED is on, and when it is 0, the LED is off.
2. Bit0-5 are status indicators: they are synchronized with the lights on and off, and are controlled by the RCU. Aperture products
The white aperture of the product is the status indicator, the small circle or other graphic symbols of the status + backlight product (such as G2) is the status indicator, and the white backlight of the backlight product (that is, after changing the light) is the status indicator;
3. Bit8-character backlight indicator: The yellow character backlight on the switch button is mainly to facilitate users to find the corresponding button.

<table>
<tr><td></td><td>For non-variable backlight products, the backlight of characters on a certain key cannot be individually controlled to turn on or off. It can only be fully on or off; for products with variable backlight, after the white backlight is turned on, the yellow backlight will automatically turn off due to overlapping positions. ;
Note: When the smart panel is a product that changes backlight (such as yellow backlight to white backlight), since the position of the status indicator and character indicator overlaps, if you need to change the color of the backlight (such as the backlight changes from yellow to white), directly change the BIT0-6 can be set to 1. However, the character backlight bit BIT8 is the indicator display control bit. Set 1 to allow LED display, and set 0 to all LEDs off.
Command example:
02 06 10 08 00 01 CD 3B Button 1 LED on (other buttons LED and backlight off) - status + backlight
02 06 10 08 01 01 CC AB Button 1 LED turns white (other keys are backlit yellow) - backlit
02 06 10 08 00 01 CD 3B All LEDs (yellow and white) are off -- backlit
02 06 10 08 00 02 8D 3A Button 2 LED on (other buttons LED and backlight off) - status + backlight
02 06 10 08 01 01 CC AB button 1 LED on and backlight on (other buttons LED off) - status + backlight
02 06 10 08 00 03 4C FA Button 1 LED on and button 2 LED on (other buttons LED and backlight off) - status + backlight
02 06 10 08 00 3F 4C EB Button 1 to Button 6 LED on (backlight LED off) - status + backlight
02 06 10 08 01 00 CC AB backlight on, all key LEDs off - status + backlight
02 06 10 08 00 00 0C FB All key LEDs are off (including backlight) - status + backlight
In the above examples, except for the 2nd and 3rd examples (red fonts), the others are products with separate status and character backlights (such as products with apertures). Set to 1, as in the second example;</td></tr>
<tr><td>100B</td><td>key value register: Bit0～Bit5 correspond to key 1 to key 6 respectively. Bit8～Bit15 are absolute key values.
<table><tr><th>B15-B8</th><th>B7-B6</th><th>B5</th><th>B4</th><th>B3</th><th>B2</th><th>B1</th><th>B0</th></tr><tr><td>absolute key value</td><td>--</td><td>=0 button 6 bounces up,
=1 button 6 pressed.</td><td>=0 button 5 bounces up,
=1 button 5 pressed.</td><td>=0 button 4 bounces up,
=1 button 4 pressed.</td><td>=0 button 3 bounces up,
=1 button 3 pressed.</td><td>=0 button 2 bounces up,
=1 button 2 pressed.</td><td>=0 button 1 bounces up,
=1 button 1 pressed.</td></tr></table>BIT0~BIT7, corresponding to keys 1~8;</td></tr>
</table>

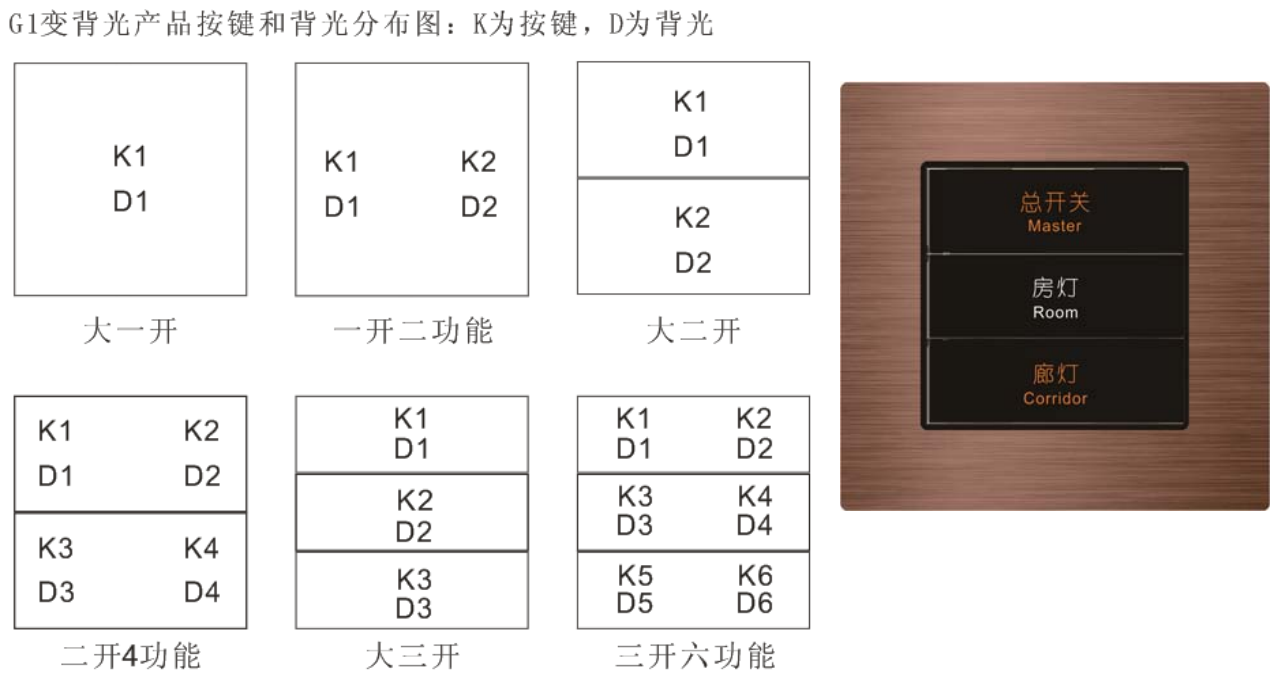
	Read the key value, the key 1 is pressed, the panel address is 02. Host computer send: 02 03 10 0B 00 01 F1 3B Panel return: 02 03 00 02 07 01 27 C9 (absolute key value is 7) Note: In master-slave polling mode, after the key is released, the key value will be automatically reset after 2 seconds; The read command of the machine is automatically cleared; Active sending mode, if the key value does not need to be stored in the register, that is, the key is sent immediately and cleared immediately, and the order is marked; Absolute key value = (Panel address - 1) * 6 + key number (Key number: the key number of key 1 is 1, the key number of key 2 is 2... and so on, this byte can realize the unified coding of the keys of all panels.)
100E	To restore the factory default registers: Writing 0x0000 to this register will restore the panel to factory settings. Command example: FF 06 10 0E 00 00 F9 17 Note: This command restores the factory parameters, you need to send the save command (see 100F register command description) to save it in the EEPROM, or wait 30 seconds for the panel to automatically save;
100F	[Note: This register is used for system configuration. If the user does not modify the system configuration (such as modifying the panel address), they do not need to pay attention] Save the control register: Write 00FE to this register and the panel will save the configuration. Every time you modify the system configuration (such as modifying the panel address), you must send a save command, and the panel will save the settings, or the panel will automatically save after 30 seconds. Command example: 02 06 10 0F 00 FE 3C BA
1310 ～ 131F	Key K1~K16 status bits (0: off, 1: on, 2: long-press sign, FF key stuck sign) 1310 corresponds to the state of key K1, the host can read this register to get it. Automatically clear key value register 100B after reading; Note: Long press the logo only after more than 2 seconds. Reference light aperture example: Long press for more than 1 minute, the default button is stuck, the button value is cleared to 0, and the long-pressed flag is cleared to 0 (until the microcontroller detects that the button has bounced, it will re-detect whether the button is in the long-pressed state, that is, temporarily shielded). The active sending mode does not have this data, can it be increased?

4、 Address mapping table for high-frequency card insertion and power retrieval registers

(Registers are double byte data, 0x0200 to 0x02FF, with high bits in front).
High frequency card insertion (room card frequency is 13.56MHz), power on communication phone number: 1-- --254, factory default address: 0x01; 0X00 is the broadcast address.

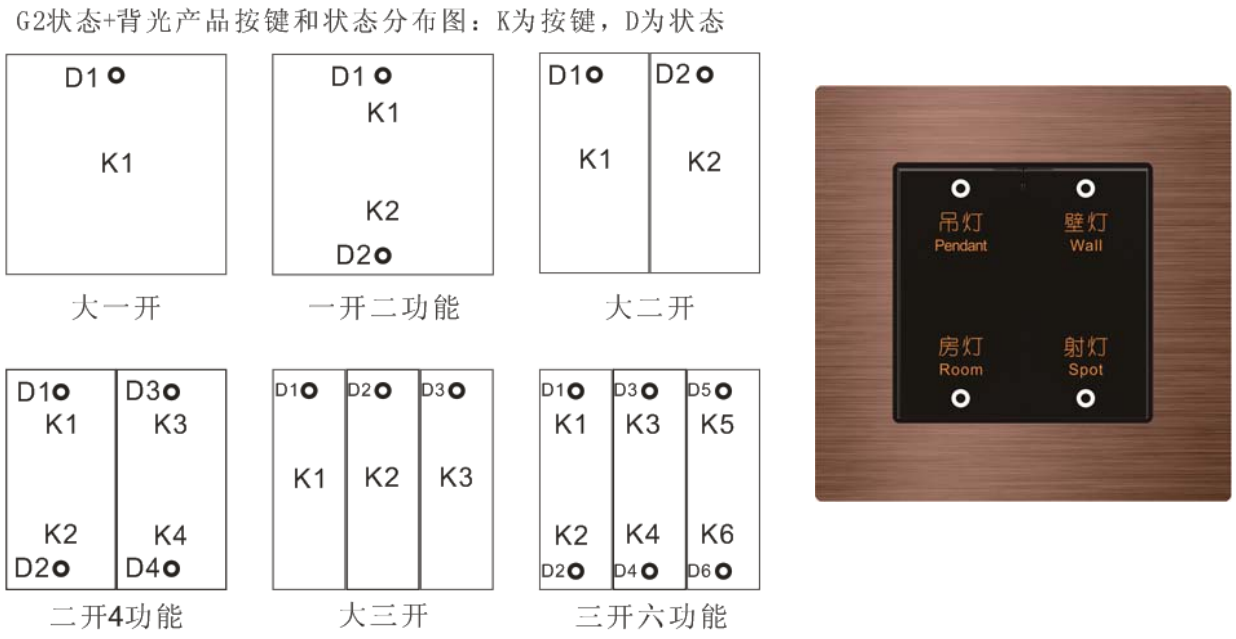
Register address (hexadecimal)	Register Description	Read write Allowed
0200	Device address register, default register data is 0x01 Instruction instance: 01 06 02 00 00 02 09 B3 Set to address 02 00 06 02 00 00 02 08 62 Set to address 02 (broadcast mode) 00 06 02 00 00 01 48 63 Set to address 01 (broadcast mode)	read/ write
0201	Device status register,=0000 No card,=0001 Card insertion Detect the no card signal three times, when removing the card. Send every 5 seconds with a 10 second delay. Instruction instance: Upper computer sends read instructions:01 03 02 01 00 01 D4 72 If there is no card, return:01 03 00 02 00 00 E4 0A If there is a card, return:01 03 00 02 00 01 25 CA	read only
0202	Card Type 1-255, 0 For no card 00=departure status, 01=main control card, 02=building number card, 03=floor card, 04=cleaning card (server card), 05=engineering card (maintenance card), 06=guest card, 07=privilege card (administrator card) Instruction instance: Upper computer sends read instructions:01 03 02 02 00 01 24 72 If there is no card, return:01 03 00 02 00 00 E4 0A The main control card returns:01 03 00 02 00 01 25 CA The guest card will be returned:01 03 00 02 00 06 64 08	read only
0203	Card number 0-255 Instruction instance: Upper computer sends read instructions:01 03 02 03 00 01 75 B2 If the card number is 0, return:01 03 00 02 00 00 E4 0A If the card number is 255, return:01 03 00 02 00 FF A4 4A	read only
0204	Device proactive register,=0000 device status passive polling,=0001 device status active sending (only sending card type and card number), Instruction instance: Set as passive polling: 01 06 02 04 00 00 C9 B3 Set to actively send: 01 06 02 04 00 01 08 73	read/ write

Attachment: Location diagram of buttons and indicator lights on the panel: K1-K6 is the button, and D1-D6 is the status indicator light. Figure 1: Definition of key and indicator light serial numbers on the G1 backlight changing panel (physical image shows the effect of large three openings)



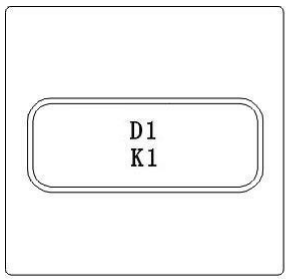
Note: Due to the overlap between the status indicator light and the character indicator light, in order to achieve the effect of changing backlight, BIT8 must be set to 1

Figure 2: G2 Status+Backlight Panel Key and Indicator Light Number Definition (Physical Image is a 2-way 4-way Function Effect Picture)

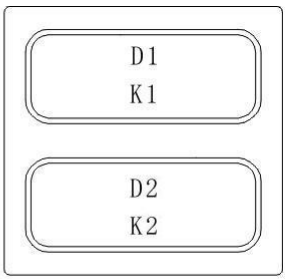


Note: Dots D1-D6 are status indicator lights (or other graphic symbols), and the backlight of the button at K1 position is character backlight. The status indicator light can be controlled separately, and the backlight of key characters cannot be controlled separately, but can only be controlled as a whole.

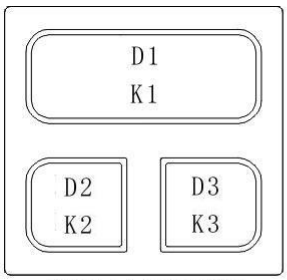
Figure 3: Definition of aperture numbers for U-shaped aperture panel buttons and indicator lights of G7 (physical effect image shows 3 keys (large 1/small 2)



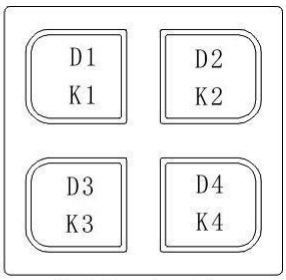
大一开正面图



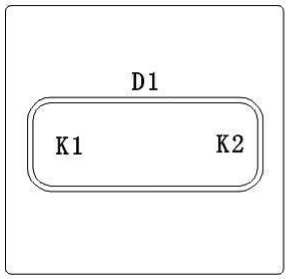
大二开正面图



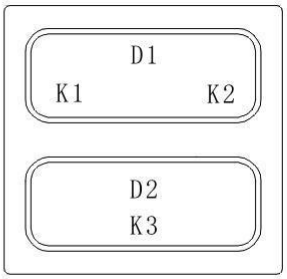
3键(大1/小2)正面图



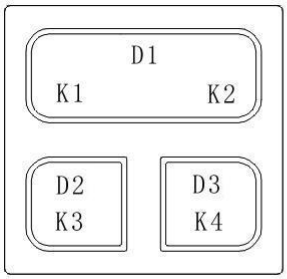
4键开关（小2 / 小2）正面图



小2（小2-大光圈）



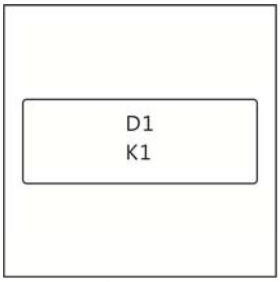
3键开关（小2-大光圈 / 大1）



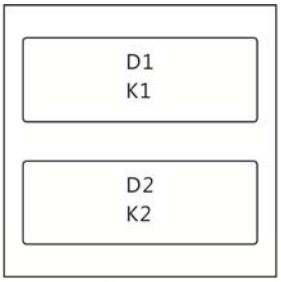
4键(小2-大光圈/小2)

Note: The D1-D4 aperture is the status indicator light, and the button backlight at K1 position is the character backlight. The status indicator light can be controlled separately, and the backlight of key characters cannot be controlled separately, but can only be controlled as a whole.

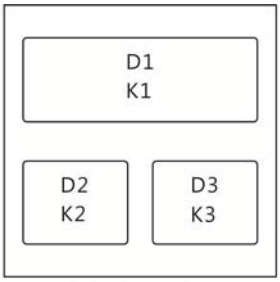
Figure 3: Definition of aperture numbers for G6 backlight panel buttons and indicator lights (physical effect image shows 3 keys (large 1/small 2)



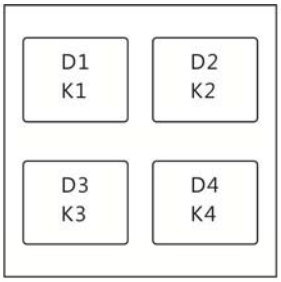
大一开



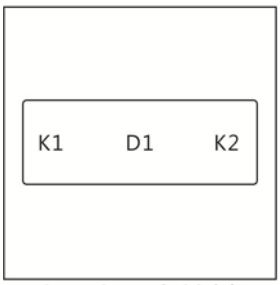
大二开



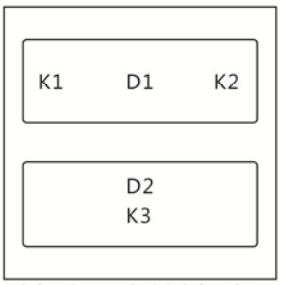
3键(大1/小2)



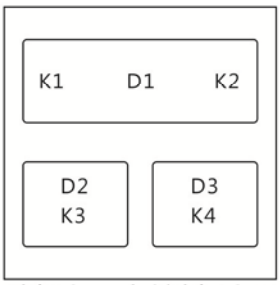
4键(小2/小2)



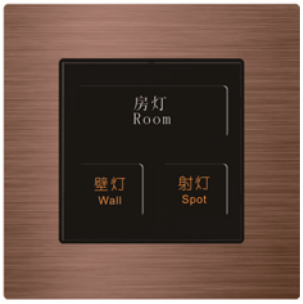
小2(小2-大按键)



3键(小2-大按键/大1)



4键(小2-大按键/小2)

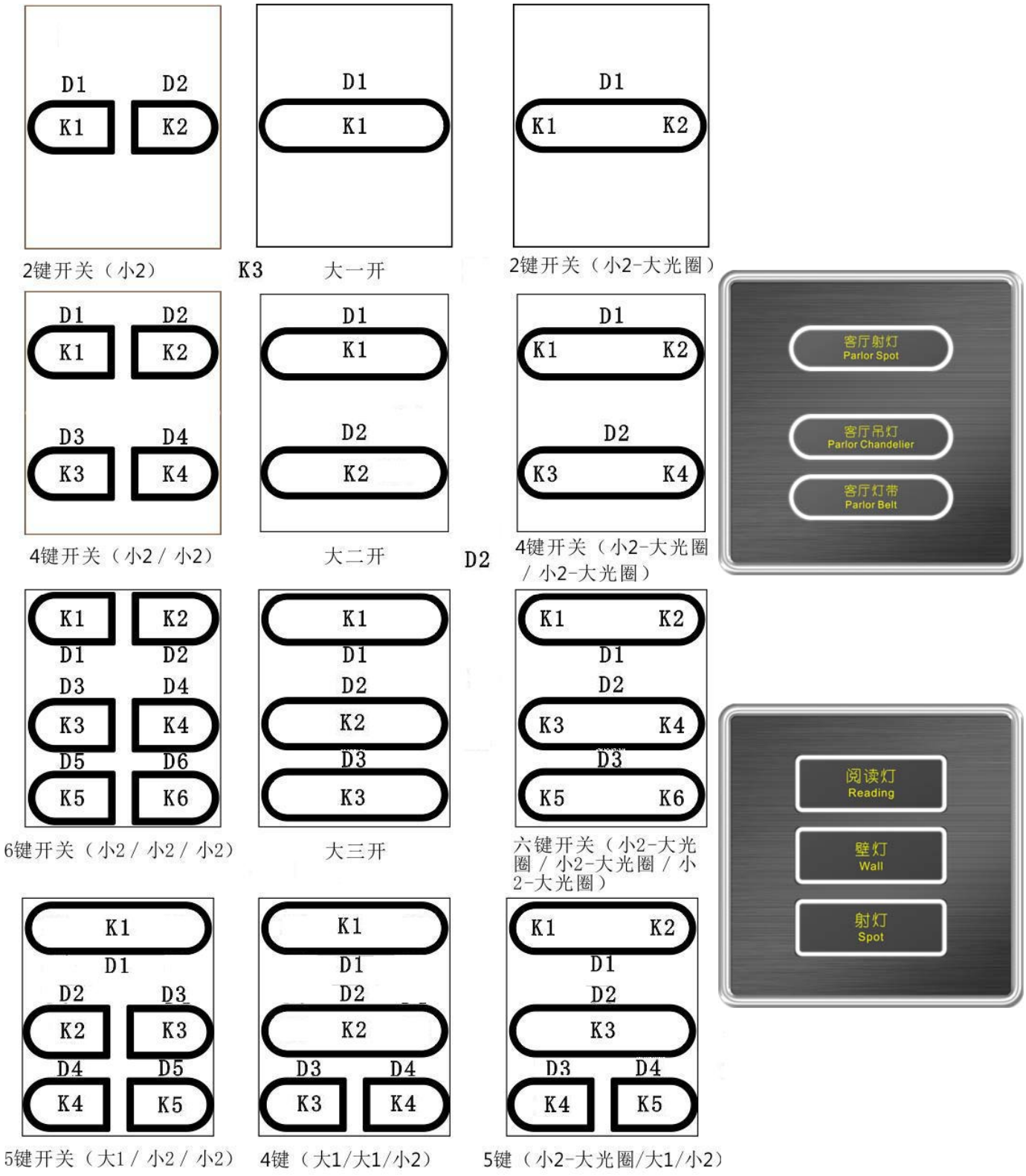


3键(大1/小2)-效果图

Note: D1-D4 is the status indicator light, and K1-K4 is the button. Due to the overlap of status indicator lights and character indicator lights, in order to achieve the effect of changing backlight, BIT8 must be set to 1

In the actual effect picture, the room light is the effect picture after changing the backlight. The actual color is subject to the actual product, and there is a color difference in the picture.

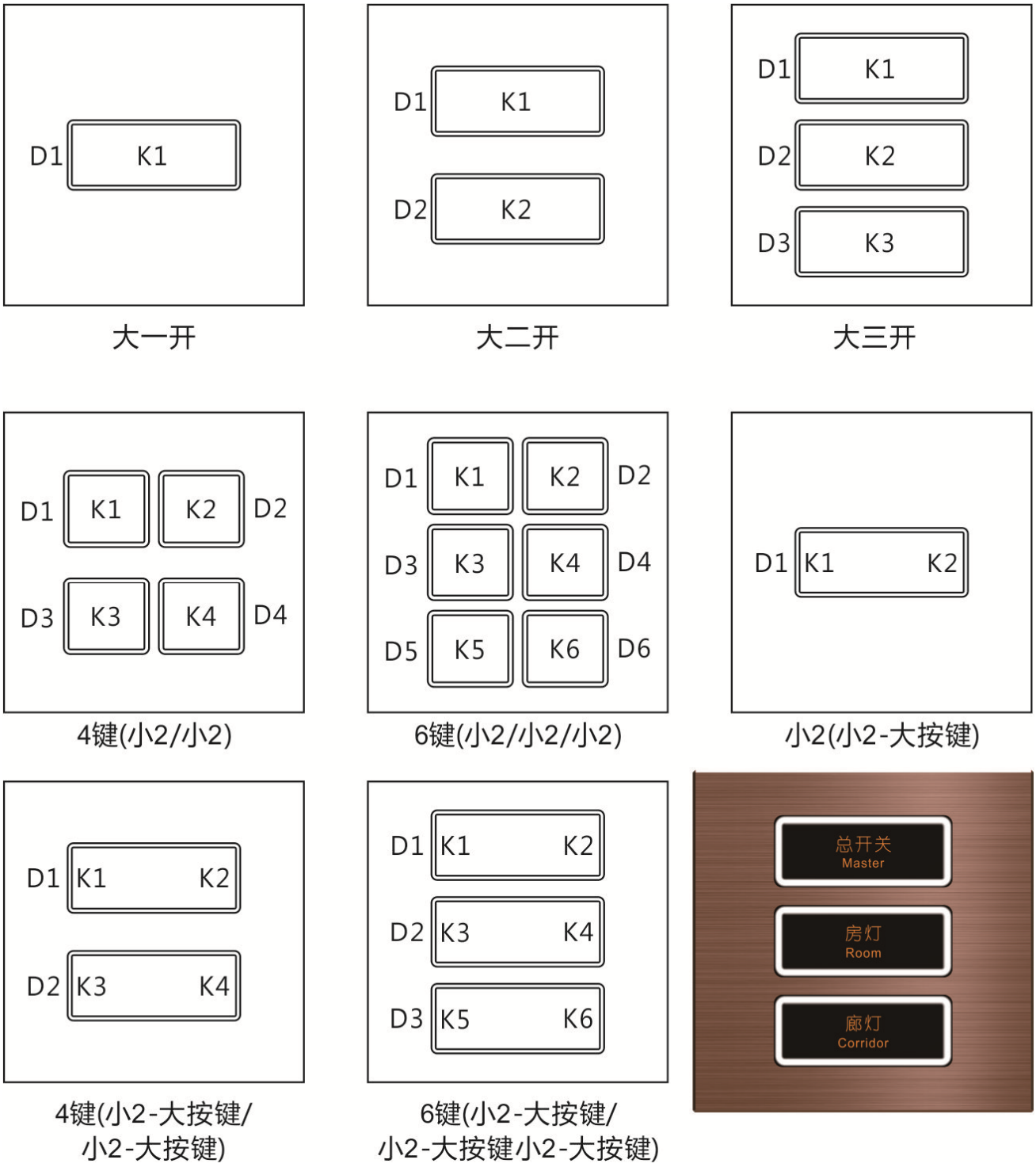
Figure 4: Definition of aperture numbers for V8-Z elliptical and square apertures, panel buttons, and indicator lights



Note: The D1-D6 aperture is the status indicator light, and the button backlight at K1 position is the character backlight. The status indicator light can be controlled separately, and the backlight of key characters cannot be controlled separately, but can only be controlled as a whole.

The rendering shows the lighting effect of elliptical and square large three openings. The actual color is based on the actual product, and there is a color difference in the image.

Figure 5: Definition of aperture numbers for V8-Z6 and V9-Z panel buttons and indicator lights with aperture



Note: The aperture is the status indicator light, and the backlight of the K1 position button is the character backlight. The status indicator light can be controlled separately, and the backlight of key characters cannot be controlled separately, but can only be controlled as a whole.

The actual effect picture is a large three fold, with a white aperture. The actual color is subject to the actual product, and there is a color difference in the picture.

Figure 5: Definition of Key and Indicator Number for V8-Z6 and V9-Z Variable Backlight Panel

Note: Due to the overlap between the status indicator light and the character indicator light, in order to achieve the effect of changing backlight, BIT8 must be set to 1

The physical effect picture is a large three opening, and the room light is the effect picture after changing the backlight. The actual color is subject to the actual product, and there is a color difference in the picture.