**附件**：SilkID 命令详解 版本号：V2.0

MD\_ENROLL\_SCAN

在模块上通过按压指纹三次进行登记。在登记时，如果指定的用户工号不存在的情况下，会自动创建一个用户。

注意：在登记的过程中，可能会出现，指纹模板没有登记成功，但指定的用户被创建的情况，这属于正常情况。

Host发送登记命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x15 | User ID | NULL | NULL | # | 0x0A |

当模块收到此命令后，会进入登记状态，这时可以通过按压三次手指来登记一枚指纹模块。在按压时，每按一次手指，模块都会闪一下黄灯，并会向Host发送一条通知命令。成功登记后会闪一下绿灯.登记失败时，会闪一下红灯。

在模块上按压手指时，模块通知Host，其命令为

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x15 | User ID | NULL | 0x62 | # | 0x0A |

成功登记，模块返回命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x15 | User ID | NULL | 0x61 | # | 0x0A |

指纹登记失败的原因有多种，其失败后，模块返回的命令如下所示

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x15 | User ID | NULL | 0x63/FAIL | # | 0x0A |
| 0x70 | 0x15 | User ID | NULL | 0x86/EXIST\_FP | # | 0x0A |
| 0x70 | 0x15 | User ID | NULL | 0x76/INVALID\_ID | # | 0x0A |
| 0x70 | 0x15 | User ID | NULL | 0x6D/MEM\_FULL | # | 0x0A |
| 0x70 | 0x15 | User ID | NULL | 0x72/FP\_LIMIT | # | 0x0A |

MD\_ENROLL\_IMAGE\_X

指纹图像登记指纹，Host发送指纹图像到模块中进行登记指纹。对于指纹图像的传输，使用扩展通信协议格式。

注意：在登记的过程中，可能会出现，指纹模板没有登记成功，但指定的用户被创建的情况，这属于正常情况。

Host发送登记命令

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0x80 |  |
| Param | User ID |  |
| Size | 8 | 数据大小+校验值长度 |
| Flag | NULL |  |
| Checksum | # |  |
| End code | 0x0A |  |
| Data | # | 发送图像数据的大小 |
| Checksum of Data | # | 数据的校验值。 |

当模块收到命令后，会发达一个确认信息，并随后会已扩展协议格式进行图像数据的接收。模块回复确认命令如下

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x80 | NULL | NULL | 0x61 | # | 0x0A |

当以扩展格式接收图像数据时，如果模块每正确收到一个数据包，模块都会回复一个确认命令，其命令如下

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0x80 | Packet num | index | NULL | 0x83 | # | 0x0A |

如果模块收到的图像数据包错误，模块会回复数据包错误命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0x80 | Packet num | index | NULL | 0x82 | # | 0x0A |

模块成功收到图像后，登记成功，会返回下面的命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x80 | User ID | NULL | 0x61 | # | 0x0A |

通过图像登记指纹失败的情况有多种，其失败后，模块返回的命令如下。详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x80 | User ID | NULL | 0x63/FAIL | # | 0x0A |
| 0x70 | 0x80 | User ID | NULL | 0x76/INVALID\_ID | # | 0x0A |
| 0x70 | 0x80 | User ID | NULL | 0x6D/MEM\_FULL | # | 0x0A |
| 0x70 | 0x80 | User ID | NULL | 0x72/FP\_LIMIT | # | 0x0A |
| 0x70 | 0x80 | User ID | NULL | 0x6C/TIME\_OUT | # | 0x0A |

注意：在登记过程中，会根据首次发过来的用户工号进行相应的数据检查，当检查通过后，才开始准备接受图像。当成功收到图像后，在内部通过图像提取模板并登记时，如果登记失败，这时Flag为0x63,与此同时会通过Param返回相关错误代码。

MD\_SCAN\_IMAGE\_X

从模块获取手指的指纹图像。发送此命令后，需要用户在模块上按手指，当成功按下手指后，模块会以扩展协议发送指纹图像到Host.

Host发送读取命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x83 | 数据包大小 | NULL | NULL | # | 0x0A |

在Host向模块发送命令时，需要告诉模块对于图像数据，每一数据包的大小是多少。可以通过Param数据域来设置。如果Param的值为0，这时将会以4K的大小来传指纹图像的数据。注意这4K的大小只是纯指纹图像数据，不包括协议头和数据的校验值。

当模块收到获取图像命令后，会进入抓取指纹图像状态，这时等待用户在模块上按手指，如果成功检测到按手指的，这时模块会及时发送一条回复命令给Host，其回复命令如下

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x83 | Param | NULL | 0x61 | # | 0x0A |

随后对于指纹图像会以扩展格式发送。首先会发送图像相关信息到Host，基命令如下

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0x83 |  |
| Packet num | Num | 所有图像分多少次发送 |
| Index | NULL |  |
| Size | 32 | Data数据域的大小(28)+数据域校验值的长度（4） |
| Flag | NULL |  |
| Checksum | # |  |
| End code | 0x0A |  |
| Data | width,heigth,compressed,  encrypted,binary,img\_len,  template\_len | 自定义图像格式的前7个数据域的数据 |
| Checksum of Data | # |  |

当Host收到上面的命令后，需要回复一条其Flag域为0x83或者0x82，且Size域为0的命令，确认收到的数据是否正确。其回复的如下

回复收到正确的数据

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0x83 | Packet num | index | NULL | 0x83 | # | 0x0A |

回复收到错误的数据

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0x83 | Packet num | index | NULL | 0x82 | # | 0x0A |

当模块收到Flag为0x82的回复后，会退出发送过程，并会回复Host，其Flag为0x82的命令

当模块收到正确的回复后，随后模块就会根据图像的大小分包发送其图像数据，在模块每次发完后，Host都需要回复。其发送的命令格式如下

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0x83 |  |
| Packet num | Num | 图像分包合计数 |
| Index | 包索引，默认从1开始 | 第几次发送，其范围为1-Num |
| Size | 数据的大小+ 4(校验值的长度） |  |
| Flag | NULL |  |
| Checksum | # |  |
| End code | 0x0A |  |
| Data | 图像数据 |  |
| Checksum of Data | # | 数据的校验值。 |

模块发送图像失败的情况有多种，其失败时，模块返回的命令如下, 详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x83 | NULL | NULL | 0x6D/MEM\_FULL | # | 0x0A |
| 0x70 | 0x83 | NULL | NULL | 0x63/FAIL | # | 0x0A |
| 0x70 | 0x83 | NULL | NULL | 0x6C/TIME\_OUT | # | 0x0A |
| 0x70 | 0x83 | NULL | NULL | 0x81/CANCELED | # | 0x0A |

MD\_IDENTIFY\_IMAGE\_X

通过指纹图像进行识别用户。识别方式为1:N.

Host发送图像识别命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x81 | Image size | NULL | NULL | # | 0x0A |

模块收到图像识别命令后，会返回一个确认信息

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x81 | NULL | NULL | 0x61 | # | 0x0A |

紧接着模块会进入接受图像数据状态，这时采用扩展协议接收数据。模块正确接受到数据包时，会回复Flag为0x83的命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0x81 | Packet num | index | NULL | 0x83 | # | 0x0A |

如果收到的数据有误，会回复Flag为0x82的命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0x81 | Packet num | index | NULL | 0x82 | # | 0x0A |

正确接收图像后，指纹图像识别通过时，模块会向Host发送如下命令。并在Param域存放用户ID和指纹索引信息。用户ID为0xFFFF & Param, 指纹索引为(Param >> 16) & 0x0F。

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x81 | 用户信息 | NULL | 0x61 | # | 0x0A |

识别失败，其情况有多种，在识别失败时，模块返回下面命令中的其中一条命令, 详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x81 | Param | NULL | 0x63/FAIL | # | 0x0A |
| 0x70 | 0x81 | NULL | NULL | 0x6C/TIME\_OUT | # | 0x0A |
| 0x70 | 0x81 | NULL | NULL | 0x69/NOT\_FIND | # | 0x0A |

在失败返回时，在Param数据域返回出错原因。

MD\_DEL\_TMP

根据指定的用户工号和指纹索引来删除指纹模板

删除指纹命令。Param域数据为:(用户ID & 0xFFFF) | ((指纹索引 & 0x0F) << 16)

Flag域: DELETE\_ONLY\_ONE,表示只删除指定ID和指纹索引的指纹模板.当Flag为NULL时，删除指定用户ID的所有指纹

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x26 | 用户信息 | NULL | NULL | # | 0x0A |

删除成功，模块向Host发送如下命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x26 | Param | NULL | 0x61 | # | 0x0A |

删除失陈，模块向Host发送如下命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x26 | Param | NULL | 0x63 | # | 0x0A |

MD\_DEL\_ALL\_TMP

删除所有指纹模板.

注意：此命令一直返回成功回复

删除命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x27 | NULL | NULL | NULL | # | 0x0A |

删除成功，模块向Host发送如下命令.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x27 | NULL | NULL | 0x61 | # | 0x0A |

MD\_DEL\_DB

清空所有数据。当模块接收到此命令时，会删除所有的指纹模板、用户信息和指纹验证通过记录

注意：此命令会一直返回成功回复。

请求命令，Host向模块发送如下命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xF8 | NULL | NULL | NULL | # | 0x0A |

删除成功，模块向Host回复如下命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xF8 | NULL | NULL | 0x61 | # | 0x0A |

MD\_LOAD\_LOG\_X

Host从模块中读取所有的验证通过的记录。对于所有的记录以扩展协议传输

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xA4 | Data size | NULL | NULL | # | 0x0A |

在发送请求命令时，需要在Param域中设置数据包的最大长度。

当模块收到请求命令后，会回复Host，并告诉记录的大小。应答命令如下

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xA4 | Data size | NULL | NULL | # | 0x0A |

Param:在应答时，此参数的值为所有记录的大小

紧接着，模块会以扩展格式发送所有的记录，其送命令如下

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0xA4 |  |
| Packet num | Num | 所有记录分包合计数 |
| Index | 0 | 分包的索引数 |
| Size | Data size | 分包数据大小+ 4(校验值的长度） |
| Flag | NULL |  |
| Checksum | # |  |
| End code | 0x0A |  |
| Data | 数据 |  |
| Checksum of Data | # | 数据的校验值。 |

当Host收到数据后，根据收到数据的正确性，回复相关信息。

Host收到的数据正确，发送如下命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0xA4 | Packet num | index | NULL | 0x83 | # | 0x0A |

Host收到的数据错误，发送如下命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0xA4 | Packet num | index | NULL | 0x82 | # | 0x0A |

模块成功传输完所有数据，应答如下命令，详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xA4 | NULL | NULL | 0x61 | # | 0x0A |

模块在时发生错误，模块会应答下面命令的基中之一,详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xA4 | NULL | NULL | 0x6C/TIME\_OUT | # | 0x0A |
| 0x70 | 0xA4 | NULL | NULL | 0x63/FAIL | # | 0x0A |
| 0x70 | 0xA4 | NULL | NULL | 0x69/NOT\_FIND | # | 0x0A |
| 0x70 | 0xA4 | NULL | NULL | 0x82/DATA\_ERROR | # | 0x0A |

MD\_SET\_TIME

设置模块的时间

请求命令

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0x4A |  |
| Param | DD<<16 | MM<<8 | YY | 设置的日期。DD-天, MM-月, YY-年 |
| Size | 8 |  |
| Flag | NULL |  |
| Checksum | # |  |
| End code | 0x0A |  |
| Data | ss<<16 | mm<<8 | hh | 设置的时间.ss-秒，mm-分钟，hh-小时 |
| Checksum of Data | # | 数据的校验值。 |

设置成功

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x4A | NULL | NULL | 0x61 | # | 0x0A |

设置失败

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x4A | NULL | NULL | 0x63 | # | 0x0A |

MD\_GET\_TIME

读取模块当前的时间

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x4B | NULL | NULL | NULL | # | 0x0A |

读取成功

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0x4B |  |
| Param | DD<<16 | MM<<8 | YY | 设置的日期。DD-天, MM-月, YY-年 |
| Size | 8 |  |
| Flag | 0x61 | SUCCESS |
| Checksum | # |  |
| End code | 0x0A |  |
| Data | ss<<16 | mm<<8 | hh | 设置的时间.ss-秒，mm-分钟，hh-小时 |
| Checksum of Data | # | 数据的校验值。 |

注意:当以YYYY-MM-DD显示日期时，对于年份需要加上2000.

读取失败

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x4B | NULL | NULL | 0x63 | # | 0x0A |

MD\_SYS\_STATUS

读取系统的状态，当前模块一直返回忙状态。

注：此命令一直返回成功标志

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x14 | NULL | NULL | NULL | # | 0x0A |

应答成功

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x14 | 0x34 | NULL | 0x61 | # | 0x0A |

MD\_SYS\_RP

从模块中读取参数

Host请求命令

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0x13 |  |
| Param | NULL |  |
| Size | NULL |  |
| Flag | SID\_SAVE\_LOG,  SID\_AUTO\_ACK,  SID\_TIMEOUT,  SID\_FW\_VER,  SID\_BAUDRATE,  SID\_ENROLL\_FP,  SID\_FP\_COUNT,  SID\_USER\_COUNT,  SID\_LOG\_NUM,  SID\_LOG\_COUNT  SID\_BUILD\_NUM  SID\_MODULE\_ID | 根据参数ID读取相关值 |
| Checksum | # |  |
| End code | 0x0A |  |

读取成功回复

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x13 | Value | NULL | 0x61 | # | 0x0A |

读取失败回复

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x13 | NULL | NULL | 0x69 | # | 0x0A |

MD\_SYS\_WP

参数设置。此命令只设置内存中的参数，实际没有保存。如果需要保存，需要调用SYS\_SP命令

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x11 | Value | NULL | SID\_GPIO\_LEVEL  SID\_SAVE\_LOG  SID\_AUTO\_ACK  SID\_TIMEOUT | # | 0x0A |

Param域为实际的参数值.当Flag域为SID\_GPIO\_LEVEL时，表示控制绿色LED或者红色LED。

要控制绿灯其Param= (0x80<<8) | (second&0xFF),要控制红色其Param=(0x40<<8) | (second&0xFF)

设置成功回复

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x11 | NULL | NULL | 0x61 | # | 0x0A |

设置失败回复

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x11 | NULL | NULL | 0x69 | # | 0x0A |

MD\_SYS\_SP

保存参数。把参数值保存到文件

注意：此命令会一直返成功

请求保存命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x12 | NULL | NULL | NULL | # | 0x0A |

保存成功回复

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x12 | NULL | NULL | 0x61 | # | 0x0A |

MD\_DEL\_ALL\_USER

删除所有用户信息。在删除所有用记的同时，会删除所有指纹模板信息。

注意：此命令会一直返回成功

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xF5 | NULL | NULL | NULL | # | 0x0A |

删除成功回复

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xF5 | NULL | NULL | 0x61 | # | 0x0A |

MD\_DELETE\_USER

删除用户。根据指定的用户ID来删除用户，在删除用户的同时，会删除该用户的指纹模板。

注意：在删除用户时，会先删除该用户的指纹模板。在删除模板时，如果模块突然掉电，这时可能会出现用户没有删除成功或者删除了部分模板情况。因此对于发生此情况，可以再次调用命令来删除。

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xF3 | User ID | NULL | NULL | # | 0x0A |

删除成功，模块回复

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xF3 | User ID | NULL | 0x61 | # | 0x0A |

删除失败，模块回复

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xF3 | User ID | NULL | 0x63 | # | 0x0A |

MD\_LOAD\_USER\_X

下载模块中的所有用户信息到Host。在下载时以扩展协议传输。

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xA0 | NULL | NULL | NULL | # | 0x0A |

模块收到请求命令后，会及时回应，并告诉所有用户信息的大小，其回复命令如下

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xA0 | Data size | NULL | NULL | # | 0x0A |

Param为当前所有用户数据的大小

紧接着，模块会以扩展格式发送所有的用户信息，其送命令如下

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0xA0 |  |
| Packet num | Num | 所有记录分包合计数 |
| Index | 0 | 分包的索引数 |
| Size | Data size | 分包数据大小+ 4(校验值的长度） |
| Flag | NULL |  |
| Checksum | # |  |
| End code | 0x0A |  |
| Data | 用户数据 |  |
| Checksum of Data | # | 数据的校验值。 |

当Host收到数据后，根据收到数据的正确性，回复相关信息。

Host收到的数据正确，发送如下命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0xA0 | Packet num | index | NULL | 0x83 | # | 0x0A |

Host收到的数据错误，发送如下命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0xA0 | Packet num | index | NULL | 0x82 | # | 0x0A |

模块成功传输完所有数据后，回复如下命令，详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xA0 | NULL | NULL | 0x61 | # | 0x0A |

模块在时发生错误，模块会应答下面命令的基中之一,详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xA0 | NULL | NULL | 0x6C/TIME\_OUT | # | 0x0A |
| 0x70 | 0xA0 | NULL | NULL | 0x63/FAIL | # | 0x0A |
| 0x70 | 0xA0 | NULL | NULL | 0x69/NOT\_FIND | # | 0x0A |
| 0x70 | 0xA0 | NULL | NULL | 0x82/DATA\_ERROR | # | 0x0A |

MD\_READ\_USER

读取单个用户信息

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xF2 | User ID | NULL | NULL | # | 0x0A |

读取成功，模块回复如下命令

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0xF2 |  |
| Param | User ID |  |
| Size | Sizeof(TUser)+4 | 用户结构长度+校验数据大小 |
| Flag | 0x61 |  |
| Checksum | # |  |
| End code | 0x0A |  |
| Data | User Data | 用户数据 |
| Checksum of data | # | 用户数据的校验值 |

当读取用户失败时，模块返回如下命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xF2 | User ID | NULL | 0x69 | # | 0x0A |

MD\_ADD\_USER

增加和修改用户信息。模块收到此命令后，会根据传过来的用户信息，来查找该用户是否已存在，如果存在则修改，不存在则增加。

Host发送请求命令

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0xF1 |  |
| Param | NULL |  |
| Size | Sizeof(TUser)+4 | 用户结构长度+校验数据大小 |
| Flag | 0x61 |  |
| Checksum | # |  |
| End code | 0x0A |  |
| Data | User Data | 用户数据 |
| Checksum of data | # | 用户数据的校验值 |

用户增加或者修改成功后，回复如下命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xF1 | NULL | NULL | 0x61 | # | 0x0A |

用户增加或者修改失败，会回复如下命令之一，详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xF1 | NULL | NULL | 0x6D/MEM\_FULL | # | 0x0A |
| 0x70 | 0xF1 | NULL | NULL | 0x68/PARAM\_ERROR | # | 0x0A |
| 0x70 | 0xF1 | NULL | NULL | 0x63/FAIL | # | 0x0A |

MD\_ENROLL\_TMP

上传指纹模板到模块中。在上传模板的时，如果用户ID不存在，模块会自动创建一个新的用户信息

注意：在模块收到指纹板块后，再增加期间，如果模块突然掉电，可能会出现模板没有增加成功，但已创建了新的用户的情况。

Host发送请求命令

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0x17 |  |
| Param | User ID | 用户ID值 |
| Size | Data size | 指纹数据+校验数据大小（4Bytes） |
| Flag | 0  0x84 | 0-None  0x84-CHECK\_FINGER(检查指纹是否已存在) |
| Checksum | # |  |
| End code | 0x0A |  |
| Data | Template Data | 指纹数据 |
| Checksum of data | # | 指纹数据的校验值 |

成功执行，模块返回如下命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x17 | UserID+  index | NULL | 0x61 | # | 0x0A |

当成功增加后，Param的值为用户ID和指纹索引，其组织方式为：index<<16 | userID

执行失败，模块会返回如下命令之一，详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x17 | NULL | NULL | 0x86/EXIST\_FP | # | 0x0A |
| 0x70 | 0x17 | NULL | NULL | 0x76/INVALID\_ID | # | 0x0A |
| 0x70 | 0x17 | NULL | NULL | 0x6D/MEM\_FULL | # | 0x0A |
| 0x70 | 0x17 | NULL | NULL | 0x63/FAIL | # | 0x0A |
| 0x70 | 0x17 | NULL | NULL | 0x72/FP\_LIMIT | # | 0x0A |

MD\_DEL\_TMP

删除用户的指纹模板。根据指定的用户ID和指纹索引来删除指纹模板

Host请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x26 | UserID+Index | NULL | 0  0x77 | # | 0x0A |

Param域的值为用户ID和指纹索引的值，其组织方式为：index << 16 | user ID

Flag域，用于控制如何删除指纹模板。当值为0时，表示该用户的所有指纹模板，当值为0x77（DELETE\_ONLY\_ONE）时,只删除指定索引的指纹模板.

指纹删除成功，模块返回如下命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x26 | UserID+Index | NULL | 0x61 | # | 0x0A |

指纹删除失败，模块返回如下命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x26 | UserID+Index | NULL | 0x63 | # | 0x0A |

MD\_DEL\_ALL\_TMP

删除所有用户的指纹模板

注意：此命令会一直返回成功

Host请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x27 | NULL | NULL | NULL | # | 0x0A |

删除成功返回如下命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x27 | NULL | NULL | 0x61 | # | 0x0A |

MD\_READ\_TMP\_X

根据指定的用户ID和指纹索引，下载其指纹模板。在模板传输时，以扩展协议传输。

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x89 | UserID+Index | NULL | 0-忽略指纹索引  1-根据指纹索引下载 | # | 0x0A |

Param域的值为用户ID和指纹索引的值，其组织方式为：index << 16 | user ID

当模块收到请求命令后，则先返回如下命令，告诉Host指纹的大小

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x89 | Template size | NULL | 0x61 | # | 0x0A |

Param的值为指纹模板的大小，其数据组织形式为：Param=(模板的合计数 << 16 | 模板大小)，当读取一枚指纹时，其Param为指纹数据的实际大小，当有多枚指纹传输时，其Param的值为指纹模板最大长度1664\*指纹枚数。

紧接着模块通过扩展格式发送指纹数据，其命令如下

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0x89 |  |
| Packet num | Num | 所有记录分包合计数 |
| Index | 0 | 分包的索引数 |
| Size | Data size | 数据大小+ 4(校验值的长度） |
| Flag | NULL |  |
| Checksum | # |  |
| End code | 0x0A |  |
| Data | 指纹数据 |  |
| Checksum of Data | # | 指纹数据的校验值。 |

当Host收到数据后，根据收到数据的正确性，回复相关信息。

Host收到的数据正确，发送如下命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0x89 | Packet num | index | NULL | 0x83 | # | 0x0A |

Host收到的数据错误，发送如下命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0x89 | Packet num | index | NULL | 0x82 | # | 0x0A |

模块成功传输完所有数据后，回复如下命令，详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x89 | NULL | NULL | 0x61 | # | 0x0A |

模块发生错误时，模块会应答下面命令的其中之一,详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x89 | NULL | NULL | 0x6C/TIME\_OUT | # | 0x0A |
| 0x70 | 0x89 | NULL | NULL | 0x63/FAIL | # | 0x0A |
| 0x70 | 0x89 | NULL | NULL | 0x69/NOT\_FIND | # | 0x0A |
| 0x70 | 0x89 | NULL | NULL | 0x82/DATA\_ERROR | # | 0x0A |

MD\_LOAD\_TMP\_X

从模块中下载所有指纹模板到Host.以扩展协议传输指纹模板。

Host请求命令如下：

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xA2 | Pakcet size | NULL | NULL | # | 0x0A |

Param为分包传输的包大小

当模块收到请求命令后，会回复所有指纹模板的大小，其回复命令如下

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xA2 | Pakcet size | NULL | 0x61 | # | 0x0A |

紧接着模块通过扩展格式发送指纹数据，其命令如下

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0xA2 |  |
| Packet num | Num | 所有记录分包合计数 |
| Index | 0 | 分包的索引数 |
| Size | Data size | 数据大小+ 4(校验值的长度） |
| Flag | NULL |  |
| Checksum | # |  |
| End code | 0x0A |  |
| Data | 指纹数据 |  |
| Checksum of Data | # | 指纹数据的校验值。 |

当Host收到数据后，根据收到数据的正确性，回复相关信息。

Host收到的数据正确，发送如下命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0xA2 | Packet num | index | NULL | 0x83 | # | 0x0A |

Host收到的数据错误，发送如下命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0xA2 | Packet num | index | NULL | 0x82 | # | 0x0A |

模块成功传输完所有数据后，回复如下命令，详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xA2 | NULL | NULL | 0x61 | # | 0x0A |

模块发生错误时，模块会应答下面命令的其中之一,详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xA2 | NULL | NULL | 0x6C/TIME\_OUT | # | 0x0A |
| 0x70 | 0xA2 | NULL | NULL | 0x63/FAIL | # | 0x0A |
| 0x70 | 0xA2 | NULL | NULL | 0x69/NOT\_FIND | # | 0x0A |
| 0x70 | 0xA2 | NULL | NULL | 0x82/DATA\_ERROR | # | 0x0A |

MD\_VERIFY\_SCAN

1:1指纹验证。Host调用此命令时，需要传输User ID到模块，模块收到此命令后，等待用户按手指从而进行1:1的验证

Host请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x18 | UserID | NULL | 0x61 | # | 0x0A |

1:1验证成功，模块返回如下命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x18 | UserID | NULL | 0x61 | # | 0x0A |

1：1验证失败，会应答以下命令之一

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x18 | NULL | NULL | 0x6C/TIME\_OUT | # | 0x0A |
| 0x70 | 0x18 | NULL | NULL | 0x63/FAIL | # | 0x0A |

MD\_DEL\_ALOG

删除所有验证通过记录

注意：此命令会一直返回成功

Host请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x9E | NULL | NULL | NULL | # | 0x0A |

删除成功，模块回复如下命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x9E | NULL | NULL | 0x61 | # | 0x0A |

MD\_SCAN\_TEMPLATE

扫描指纹模板。调用此命令时，模块等待用户在指纹采集器上按手指后host从模块中读取该指纹模板，模板最大长度为2K。执行此命令前，需将系统命令0x50的参数值设置为0x30，然后模块等待用户按压手指。host需要一直调用此命令来读取指纹模板。

注意：模块的指纹识别有两种方式。第一种是在模块中识别，第二种是模块生成指纹模板通过host进行识别。

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xFC | NULL | NULL | NULL | # | 0x0A |

读取成功。

注：此命令模块会一直返回成功标志。

|  |  |  |
| --- | --- | --- |
| 数据域 | 值 | 说明 |
| Start code | 0x70 |  |
| Command | 0xFC |  |
| Param | NULL |  |
| Size | size | size-指纹模板长度，最大为2K  NULL-无指纹模板 |
| Flag | 0x61 | SUCCESS |
| Checksum | # |  |
| End code | 0x0A |  |
| Data |  |  |
| Checksum of Data | # | 数据的校验值。 |

MD\_RESET

模块复位。

注：此命令一直返回成功标志

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xD0 | NULL | NULL | NULL | # | 0x0A |

应答成功

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xD0 | 0x34 | NULL | NULL | # | 0x0A |

MD\_DISCONNECT

断开连接。模块支持232和usb通信。模块同一时刻只能通过其中一种方式与host进行通信，因此模块在进行切换通信方式时必须断开当前的通信方式，若不断开，下种方式将无法连接。

注：此命令一直返回成功标志

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xCC | NULL | NULL | NULL | # | 0x0A |

应答成功

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xCC | 0x34 | NULL | NULL | # | 0x0A |

MD\_ENABLEDEVICE

启用模块。当使用此命令后，在验证模式下模块将向host发送指纹比对结果信息。

注：此命令一直返回成功标志

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xFB | NULL | NULL | NULL | # | 0x0A |

应答成功

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xFB | 0x34 | NULL | NULL | # | 0x0A |

MD\_DISABLEDEVICE

禁用模块。当使用此命令后，在验证模式下模块将不向host发送指纹比对结果信息。

注：此命令一直返回成功标志

请求命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xFA | NULL | NULL | NULL | # | 0x0A |

应答成功

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0xFA | 0x34 | NULL | NULL | # | 0x0A |

MD\_UPDATE\_FW

升级固件。在升级处理中先发送固件大小到模块，当模块回复确认后，Host紧接着以扩展数据格式进行数据传输。

Host发送升级固件命令

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x72 | firmware size | NULL | NULL | # | 0x0A |

模块收到升级固件命令后，会返回一个确认信息

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x72 | NULL | NULL | 0x61 | # | 0x0A |

紧接着模块会进入接受升级固件包数据的状态，这时采用扩展协议接收数据。模块正确接受到数据包时，会回复Flag为0x83的命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0x72 | Packet num | index | NULL | 0x83 | # | 0x0A |

如果收到的数据有误，会回复Flag为0x82的命令

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Startcode | Command | PacketNum | Index | Size | Flag | Checksum | End code |
| 0x70 | 0x72 | Packet num | index | NULL | 0x82 | # | 0x0A |

正确接收升级固件包数据后，升级成功时，模块会向Host发送如下命令。

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x72 | Param | NULL | 0x61 | # | 0x0A |

识别失败，其情况有多种，在识别失败时，模块返回下面命令中的其中一条命令, 详见Flag域

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start code | Command | Param | Size | Flag | Checksum | End code |
| 0x70 | 0x72 | Param | NULL | 0x63/FAIL | # | 0x0A |
| 0x70 | 0x72 | NULL | NULL | 0x6C/TIME\_OUT | # | 0x0A |

注：升级过程中亮黄灯表示模块正在接收升级包，亮绿灯表示模块已接收完host发给模块的升级包数据。