SANTONE

# S17P3V2.1 IF board local monitoring protocol

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# Catalog

## Preface

This protocol is based on the IF board local monitoring protocol V1.0 to further improve the protocol architecture and add new functions.

## Abbreviation Notes

| | |
|---|---|
| GSM | Global System for Mobile Communication |
| ICM | Self excitation cancellation module |
| RF | Radio Frequency |
| PA | Power Amplifier |
| LNA | Low Noise Amplifier |
| ALC | Automatic Level Control |
| ATT | Attenuation |
| ANT | Antenna |
| | |

Version History

| Version No. | modification date | Modify content |
|---|---|---|
| V1.0 | January 16, 2019 | Establish the first draft and formulate the IF board local monitoring protocol |
| | | |

# Chapter1 Basic format

The monitoring module interacts with other modules in the form of data package. A complete command package consists of four parts: start flag unit, command unit, CRC verification unit, and end flag unit.

Common format of information interaction command package between monitoring module and each module

| Start flag unit | Command unit | Verification Unit | End flag unit |
|---|---|---|---|

The details of each unit in the table are as follows:

## 1.1 Start flag unit

1 byte length, representing the beginning of a complete command package, fixed as a hexadecimal number 0X7E.

## 1.2 Command unit

It consists of command control head and command body. The command control header consists of 5 fields, including module address, data type, command number, response flag, and command body length, with a total length of 6 bytes. The parsing method and actual length of the command body are jointly determined by the "module address", "data type", "command number" and "command body length" of the control part.

## 1.3 Verification Unit

Check the "command unit" in the protocol (from the first byte of the "command unit" to the last byte), and use the 16 bit x16+x12+x5+1 (0x1021) recommended by CCITT. Generate a 2-byte CRC checksum (low byte first, high byte last). The sender must generate a 2-byte CRC checksum according to the "command unit". After receiving the complete data package, the receiver will generate a new CRC checksum according to the "command unit". If the new CRC checksum is equal to the received checksum, it indicates that the data package is valid. Otherwise, the receiver will send back a "check error" response to the sender.

## 1.4 End flag unit

1 byte length, indicating the end of a complete command packet, fixed as a hexadecimal number 0X7E.

**Note: If the data of a part is composed of multiple bytes, the byte arrangement should follow the principle of low bit first and high bit last.**

## 1.5 Character escape

Since the data is transmitted in hexadecimal mode, the judgment of the start flag and the end flag of the communication packet is affected to prevent the same data from appearing in the data. Data must be escaped during sending and receiving. The escape character used is the ASCII character't '(0X5E).

**Range: In the protocol, all data except for the start flag and end flag.**

**Escape rules: use 0X5E, 0X5D instead of 0X5E; Use 0X5E, 0X7D instead of 0X7E.**

In case of sending after escaping, the operation should be carried out in the following order: before sending the data packet, first set the CRC check value, and then perform escape processing; After receiving the data packet, first perform escape processing, and then perform CRC verification.

# Chapter2 Data transmission requirements

Asynchronous half duplex communication mode is adopted, with 8 data bits, 1 stop bit, no check bit, and data rate of 19200bps.

# Chapter3 Authentication

Whether it is a function module or a monitoring module, authentication processing must be carried out after receiving the data packet. Authentication processing includes the following steps: start/end flag verification, CRC verification, command number verification, and command data verification. If any of the above phases fails to pass the verification, the authentication is considered as failed, and the receiver should respond to the sender with an error flag according to the actual situation.

# Chapter4 Protection timer

The purpose of using protection timer is to ensure the reliable arrival of messages or commands in time sequence. This agreement stipulates that before receiving the reply, the main sender must set a protection timer with a timeout of 1 second. The response received before the timer timeout is a valid response, otherwise it is an invalid response or a transmission failure or module communication failure, or it is considered that the module does not exist during initialization.

# Chapter5 Command unit

The command unit consists of command control head and command body, as shown in the following table:

Command unit composition format

| Command control head | | | | | Command Body |
|---|---|---|---|---|---|
| Module address | data type | Command Number | Answer flag | Command Body Length | Command data |
| 2Byte | 1Byte | 1Byte | 1Byte | 1Byte | Lengthen |

The relevant fields in the table are described as follows:

## 5.1 Module address

The address of each module in the equipment is unique. Each module only resolves commands whose module address is equal to its own address, and uses 2 bytes to represent the module address.

**The first byte represents the function code of the module: provide a unique code for modules with different functions.**

Module function code

| Module function | number |
|---|---|
| Intermediate frequency board | 0x07 |
| | |

**The second byte represents the address code of the module.**

This byte corresponds to the ID address of the IF board. The module type and address filtering are composed of the above two bytes, which can be modified on the webpage hardware configuration page.

## 5.2 data type

The communication data is mainly divided into two types, namely, active initiation data and response data.

Data type code

| coding | meaning | Remarks |
|---|---|---|
| 0X00 | Monitor the active initiation data | |
| 0X01 | Monitoring response | |
| 0X02 | Intermediate frequency | |

| | | |
|---|---|---|
| | board initiatively initiates data | |
| 0X03 | IF board response | |
| 0X04 ～ 0XFF | | hold |

This byte is not used at present, and 0x00 is fixed.

### 5.3 Command Number

The unique identification of the command is divided into three categories: parameter setting command, status query command and module debugging command. The command number in the response command is the same as the command number of the received command.

### 5.4 Answer flag

As the active initiator of the command, this field is filled with 0, and the passive receiver will not parse or process this field. If it is a reply message, this field is used as a reply flag. If this field is not 0X00, it indicates that the recently received command cannot be processed or has an error. The primary initiator will not parse or process the "Command Body" after receiving the response from the other party whose response flag is not 0X00. "Command Body Length" and "Command Body" are meaningful only when the response flag is 0X00.

Response flag code

| coding | meaning | Remarks |
|---|---|---|
| 0X00 | success | |
| 0X01 | Wrong command number | |
| 0X02 | Command data error | |
| 0X03 | Check error | |
| 0X04 | operation failed | |
| 0X05 | Other failures | |
| 0x06 | Data value size exceeds the application range | |
| 0X06 ～ 0XFF | | hold |

### 5.5 Command length

The actual length of command data, in bytes.

### 5.6 Command data

The length and parsing method are determined by the "Command Body Length" and "Command Number" of the command control head.

# Chapter6 Command number and function description

The command number is the unique identifier of the command, which is divided into two categories: parameter setting command and status query command. At the same time, it is divided into several modules according to functions: hardware functional status query and configuration; Hardware peripheral device parameter query and configuration; RX0/RX1 configuration query of receiving channel; Transmission channel TX0/TX1 configuration query; Near end machine configuration query; Remote machine configuration query.

Please pay attention to the green numbered items. Other numbering functions are not provided.

**Hardware peripheral device parameter query and configuration**

| Command Number | meaning | Data length | Function description | Parameter Description |
|---|---|---|---|---|
| 0x00 | Command error return type | 0 | No command number exists | |
| 0x01 | Query: version number | 9 | Software and fpga version number | |
| 0x02 | Query: temperature | 4 | | |
| 0x03 | Query: hardware status (module status) | 4 | Lock status | |
| 0x04 | Setting: AD5662 (fiber AFC automatic frequency calibration) | 3 | It is divided into automatic mode and manual mode | |
| 0x05 | Query: AD5662 | | | |
| 0x06 | Settings: AFC | 3 | AD5662 can be configured in automatic mode | |
| 0x07 | Query: AFC | | | |
| 0x08 | Setting: DATT | 6 | | |
| 0x09 | Query: DATT | | | |
| 0x0a | Settings: Restore factory configuration | 0 | | |
| 0x0e | Query: vcxo manual | 2 | | |
| 0x14 | Settings: restoring consistency | 0 | | |
| 0x19 | Setting: 5662 temperature compensation | 166 | | -40~125 ℃ |
| 0x1d | Settings: VCXO compensation enable, step, delay, reference value | 6 | | |
| 0x1e | Query: VCXO compensation enable, step, delay, | | | |

| | | | | |
|---|---|---|---|---|
| | reference value | | | |
| 0x20 | Query: rx0 broadband power | 2 | | |
| 0x21 | Query: rx1 broadband power | 2 | | |
| 0x25 | Setting: dac0 | 24 | | |
| 0x26 | Query: dac0 | | | |
| 0x27 | Setting: dac1 | 24 | | |
| 0x28 | Query: dac1 | | | |
| 0x29 | Setting: 9524 | 96 | | |
| 0x2a | Query: 9524 | | | |
| 0x2b | Setting: 1197a | 72 | | 18 registers in total, 4 bytes each |
| 0x2c | Query: 1197a | | | |
| 0x2d | Setting: 1197b | 72 | | |
| 0x2e | Query: 1197b | | | |
| 0xc9 | Setting: test control register | 8 | | |
| 0xca | Query: test control register | | | |
| 0xcb | Setting: ETH IP address | 4 | | |
| 0xcc | Query: ETH IP address | | | |
| 0xce | Query: module equipment number | 2 | | |
| 0x16 | Setting: module equipment number | | | |
| 0x80 | Settings: broadband switching (digital frequency selection and subband selection) | 1 | 2 broadband, 3 narrowband | |
| 0x81 | Query: broadband switching | | | |

Command number description:

- Type of command error return: when the current command number does not exist, the returned reply command frame is 0x00.
- Version No.:

  The version number includes the fpga version number and software version number

  Fpga version number: year month day version number module type

  Software version number: year month day version number

  Note: Year is the last two digits. For example, the transmission parameter in 2017 is hexadecimal 0x11.

  Module type: near end machine 0x0a, remote end machine 0x0b.

- Temperature: the low order of the returned data is in the front and the high order is in the rear, which is 32-bit data. The calculation formula of ℃ is: when VAL>125000; ℃=((VAL * 2/1000)&0xff)/2; When VAL<=125000; ℃=VAL/1000.
- Hardware status:
  - 9524 locked state.
  - HMC1197A is locked.
  - HMC1197B locking status.
  - AFC lock status.

    1: Locking; 0: Loss of lock.
- AD5662: parameter (2byte)+mode (1byte); The modes are automatic: 0 manual: 1; The parameter is 0~65535
- AFC: mode (1byte)+automatic mode optical port (1byte)+manual mode optical port (1byte);

  Automatic mode optical port: ALL is 0; 1,2 is 1; 3 and 4 are 2.

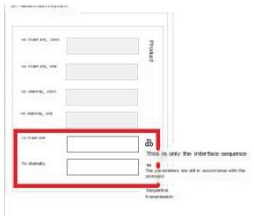
  Manual mode optical port: 1 is 0; 2 is 1; 3 is 2; 4 is 3.

  Note: the mode is divided into automatic mode: 0 and manual mode: 1;

  In automatic mode and manual mode, the selection of optical port is 0;

  In manual mode, the selection of optical port in automatic mode is 0;
- DATT: DATT has 6 channels in total. The range is 0~31.5, and every value change is 0.25DB step. The value passed by the protocol=the value displayed on the interface * 4.

  DATT distinction: the first parameter is RX0_ 0; The second parameter is RX0_ 1; The third parameter is RX1_ 0; The fourth parameter is RX1_ 1; The fifth parameter is TX1; The sixth parameter is TX0. (The test interface is provided. The 5 and 6 parameters are only the interface exchange transmission protocol).



- VCXO temperature compensation

VCXO temperature compensation configuration includes: the first byte is the enable switch (0 is off, 1 is on), the second byte is the step fixed value: 1, the third and fourth bytes are the delay fixed value 250, and the fifth and sixth bytes are the calibration values.

**RX0/RX1 configuration query of receiving channel**

## RX0:

| Command Number | meaning | Data length | Function description | Parameter Description |
|---|---|---|---|---|
| *0x20* | *Query: broadband power* | 2 | | |
| 0x22 | Setting: central frequency point (selected frequency subband) | 4 | | |
| 0x35 | Setting: channel frequency point configuration (selected frequency subband) | 24 | | |
| 0x36 | Query: channel frequency configuration | | | |
| 0x37 | Settings: ALC | 12 | | |
| 0x38 | Query: ALC | | | |
| 0x39 | Query: Carrier search results (frequency selected subband) | 1 | | Send 3 to 1 |
| 0x3a | Query: Carrier power value after carrier search | 16 | | |
| 0x3b | Setting: compensation enable switch | 5 | | |
| 0x3c | Query: compensation enable switch | | | |
| 0x3d | Settings: gain compensation | 2 | | |
| 0x3e | Query: gain compensation | | | |
| 0x3f | Settings: temperature compensation table | 166 | | -40~125 ℃ |
| 0x40 | Query: temperature compensation table | | | |
| 0x41 | Setting: channel switch (frequency selective subband) | 8 | | |
| 0x42 | Query: channel switch | | | |
| 0x43 | Settings: filter compensation | 64 | | 32 parameters, 2 bytes for each parameter |
| 0x44 | Query: filter compensation | | | |

| | | | | |
|---|---|---|---|---|
| 0x45 | Settings: frequency point compensation | 12 | | Subband gain adjustment |
| 0x46 | Query: frequency point compensation | | | |
| 0x47 | Setting: Bottom noise (selected frequency subband) | 13 | | |
| 0x48 | Query: bottom noise | | | |
| 0x49 | Query: input power peak (input ADC peak) | 2 | | |
| 0x4b | Setting: ALC control difference threshold | 2 | | |
| 0x4c | Query: ALC control difference threshold | | | |
| 0x4d | Setting: baseband gain compensation | 2 | | |
| 0x4e | Query: baseband gain | 4 | | |
| 0x4f | Settings: carrier power and switch (frequency selective subband) | 1 | | |
| 0xeb | *Query: central frequency point* | 4 | | |
| 0xed | Query: subband bandwidth (frequency selective subband) | 6 | | |
| 0xd0 | Setting: Subband Bandwidth | 6 | | |
| 0xf1 | Query: Bottom noise channel switch (frequency selection subband) | 16 | | |
| 0xf2 | Setting: Bottom noise channel switch | | | |
| 0xf4 | Query: uplink noise suppression switch (frequency selective subband) | 1 | 1 ON 0 OFF | |
| 0xf5 | Setting: uplink noise suppression switch | | 1 ON 0 OFF | |
| 0xf6 | Query: uplink noise suppression threshold (frequency selective subband) | 4 | | |
| 0xf7 | Setting: uplink noise suppression threshold | | | |
| 0xfc | Query: uplink noise suppression threshold correction value (frequency selection subband) | 2 | | |
| 0xfd | Setting: uplink noise suppression threshold correction value | | | |
| 0x82 | Settings: mean exp, search num | 3 | Mean exp (1byte), search num (2byte) | |
| 0x83 | Query: mean exp, search num | | | |

| | | | | |
|---|---|---|---|---|
| 0x84 | Setting: frequency synchronization switch (frequency selection subband) | 1 | 0 on 1 off | |
| 0x85 | Query: frequency synchronization switch | | | |
| 0xed | Setting: rx0 iir bandwidth (variable bandwidth for sub band selection) | 24 | | 6 Carrier bandwidth |
| 0xf6 | Query: rx0 iir bandwidth | | | |

## RX1:

| Command Number | meaning | Data length | Function description | Parameter Description |
|---|---|---|---|---|
| 0x21 | Query: broadband power | 2 | | |
| 0x23 | Setting: center frequency point | 4 | | |
| 0x50 | Settings: channel frequency configuration | 24 | | |
| 0x51 | Query: channel frequency configuration | | | |
| 0x52 | Settings: ALC | 12 | | |
| 0x53 | Query: ALC | | | |
| 0x55 | Query: carrier search results | 1 | | Send 3 to 1 |
| 0x57 | Query: Carrier power value after carrier search | 16 | | |
| 0x58 | Setting: compensation enable switch | 5 | | |
| 0x59 | Query: compensation enable switch | | | |
| 0x5a | Settings: gain compensation | 2 | | |
| 0x5b | Query: gain compensation | | | |
| 0x5c | Settings: temperature compensation table | 166 | | -40~125 ℃ |
| 0x5d | Query: temperature compensation table | | | |
| 0x5f | Setting: channel switches | 8 | | |
| 0x60 | Query: channel switch | | | |
| 0x61 | Settings: filter compensation | 64 | | 32 parameters, 2 bytes for each parameter |
| 0x62 | Query: filter compensation | | | |
| 0x63 | Settings: frequency point compensation | 12 | | Subband gain adjustment |
| 0x64 | Query: frequency point compensation | | | |

| | | | | |
|---|---|---|---|---|
| 0x65 | Settings: bottom noise | 13 | | |
| 0x67 | Query: bottom noise | | | |
| 0x68 | Query: input power peak | 2 | | |
| 0x6a | Setting: ALC control difference threshold | 2 | | |
| 0x6b | Query: ALC control difference threshold | | | |
| 0x6c | Setting: baseband gain compensation | 2 | | |
| 0x6d | Query: baseband gain | 4 | | |
| 0x6e | Settings: carrier power and switch | 1 | | |
| 0xec | Query: central frequency point | 4 | | |
| 0xee | Setting: rx1 iir bandwidth | 24 | | 6 Carrier bandwidth |
| 0xf7 | Query: rx1 iir bandwidth | | | |

Command number description:

- Query baseband gain: 0~1byte compensation value, 2~3byte peak value.
- Input power (broadband power): (data [0] | data [1]<<8)/256.
- Channel frequency point configuration, central frequency point:

  Channel frequency configuration: 0 frequency off.

  4 bytes per channel. Step: 0.0125Mhz

  Setting method: setting value=frequency point value * 10000. If you want to set the channel frequency to 941.3Mhz, the setting value is 9413000

  Query method: frequency point value=return value/10000. If 8995000 is queried, the corresponding frequency point value is 899.5Mhz

- Subband Bandwidth: each channel corresponds to 2byte;.

  Setting method: setting value=bandwidth value * 10. If you want to set the channel bandwidth to 3Mhz, the setting value is: 30

  Query method: frequency value=return value/10. If 67 is queried, the corresponding bandwidth value is 6.7Mhz

- ALC:

  Mean exp (1byte): parameter range 0~255;

Search num (2byte): Parameter range: 0~65535;

Switch (1byte): open to 1; Off is 0;

Manual datt (1byte): the range is 0~63db, the step is 0.25db, and the transfer parameter needs * 4;

Offset datt (1byte), the transfer parameter must be * 4: range 0~31.5db;

Target (2byte): the precision is 0.125. When transferring parameters, the low order is decimal places, decimal places * 256, and the high order is integer digits. For example, 1.25 is converted to 0x40 0x01;

Delay time (4byte).

- RX0 compensation enable switch:

  1 is enable; 0 is disabled.

  There are five kinds of compensation, respectively: broadband gain compensation, temperature compensation, DATT compensation, flatness compensation, and channel frequency compensation.

- Broadband gain compensation:

  The range is val=0~1.99. The passed parameter is P=val * 16384. When val is 1, there is no gain; Gain amplification when val is greater than 1; When val is less than 1, the gain decreases.

- Temperature compensation: the temperature compensation range is -40 ℃~125 ℃, the compensation range is -6db~6db, and the transmitted parameter is P=val * 10+60.

- DATT compensation: just turn on the function to automatically compensate.

- Frequency point compensation:

  For the passed parameters, one channel occupies two bytes.

  Channel frequency point compensation value is used to realize channel gain adjustment, or channel ATT

  Setting method: Set_ Value=attenuation value * 100, attenuation value (db) range -10db~+5db

- Peak value of input power: when the peak value of input signal is greater than 1023, self excitation alarm is provided. Near end machine (RX0); Remote computer (RX0, RX1)

- Simulate self excitation:

SWITCH of RX0 RX1 ALC: OFF

MUNUAL DATE: 0

OFFSET DATE: 0 Other parameters remain unchanged.

After simulating the original configuration value of the self excitation function, configure it back.

- ALC control difference threshold: the first byte enable value: Disable: 0; ENABLE: 1, the second byte is a parameter: when it is not enabled, the parameter value is 0; When enabled, the parameter range is 0~63db. Parameter description: When ALC is started, the threshold value is set. ALC is calculated only when the threshold value exceeds the set value.
- Carrier search result: send 3byte and return 1byte. Send: exp (1byte)+searchnum (2byte).
- Bottom noise:

MEAN EXP: set index 2~15 (1byte);

SEARCH NUM: 0~65535 (2 bytes);

FLOOR NOISE SWITCH: on: 1 off: 0 (1byte);

MANUAL: 32bit 1 on 0 off (4bytes);

High level of low noise suppression threshold: high threshold of low noise suppression unit: dBm, precision: 0.1dbm

2bytes, data [0]=(low noise suppression high threshold * 256&0xff), data [1]=(low noise suppression high threshold * 256>>8&0xff), read low noise suppression high threshold=(data [0] | data [1]<<8)/256

Low level of low threshold for bottom noise suppression: unit: dBm, precision: 0.1dbm

2bytes, data [0]=(low threshold value of bottom noise suppression * 256&0xff), data [1]=(low threshold value of bottom noise suppression * 256>>8&0xff), low threshold value of bottom noise suppression reading=(data [0] | data [1]<<8)/256

Low power cnt: 0~255 (1bytes)

- Carrier power and switch: 0 off 1 on.

- Threshold correction value: bottom noise suppression threshold correction value unit: dBm, accuracy: 0.1dbm

  2bytes, data [0]=(low threshold value of bottom noise suppression * 256&0xff), data [1]=(low threshold value of bottom noise suppression * 256>>8&0xff), low threshold value of bottom noise suppression reading=(data [0] | data [1]<<8)/256

- Channel switch: 0 on 1 off, 1 byte per channel.

**Transmission channel TX0/TX1 configuration query**

## TX0:

| Command Number | meaning | Data length | Function description | Parameter Description |
|---|---|---|---|---|
| 0x70 | Setting: TX0 compensation enable switch | 5 | | |
| 0x71 | Query: TX0 compensation enable switch | | | |
| 0x72 | Settings: gain compensation | 2 | | 0~1.99 |
| 0x73 | Query: gain compensation | | | |
| 0x74 | Settings: temperature compensation table | 166 | | -40~125 ℃ |
| 0x75 | Query: temperature compensation table | | | |
| 0x78 | Settings: filter compensation | 64 | | 32 parameters, 2 bytes for each parameter |
| 0x79 | Query: filter compensation | | | |
| 0x7a | Query: peak output power (DAC digital peak) | 2 | | |
| 0xe5 | Query: downlink output power | 2 | | |
| 0xe7 | Setting: gain power control ATT | 2 | | |
| 0xe9 | Setting: power offset | 4 | | |
| 0xea | Query: power offset | | | |
| 0xef | Query: gain power control ATT | 2 | | |
| 0xf3 | Query: input and output power | 8 | | |

## TX1:

| Command Number | meaning | Data length | Function description | Parameter Description |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 0x80 | Setting: TX1 compensation enable switch | 5 | | |
| 0x81 | Query: TX1 compensation enable switch | | | |
| 0x82 | Settings: gain compensation | 2 | | 0~1.99 |
| 0x83 | Query: gain compensation | | | |
| 0x84 | Settings: temperature compensation table | 166 | | -40~125 ℃ |
| 0x85 | Query: temperature compensation table | | | |
| 0x88 | Settings: filter compensation | 64 | | 32 parameters, 2 bytes for each parameter |
| 0x89 | Query: filter compensation | | | |
| 0x8a | Query: peak output power | 2 | | |
| 0xe8 | Setting: gain power control ATT | 2 | | |
| 0xf0 | Query: gain power control ATT | 2 | | |

- TX0 TX1 compensation enable switch: provides gain compensation, temperature compensation, DATT compensation and flatness compensation. When configuring switch enabling, 5 parameters are transferred according to the corresponding position of RX0 transmission mode. The corresponding position of channel frequency point compensation not provided shall be filled with 0 for transmission. Example: Turn on gain compensation, temperature compensation, DATT compensation, flatness compensation. The passed parameters are: 1 1 1 1 0.
- Gain compensation: Refer to RX0 gain compensation.
- Temperature compensation: Refer to RX0 temperature compensation.
- Output power: Refer to RX input power.
- Gain power control ATT: byte0 input, byte1 output. Unit: dbm.

  Input Yes to adjust the input power ALC control point.

  Output is to adjust output power. 0.25db step.

  Setting method: setting value=attenuation value * 4. If the original value is 15.5db, to modify the input ALC control point (originally -10dbm, now -11.5dbm is required), the attenuation value needs to be 13db (15.5-1.5), and the setting value is: (15.5-1.5) * 4; The output directly adjusts the output power,

Query Method: Actual Value=Return Value/4.

- Power offset: byte 0 uplink input, byte 1 downlink input, byte 2 uplink output, byte 3 downlink output;

  Complement transmission.

**Near end machine configuration query**

| Command Number | meaning | Data length | Function description | Parameter Description |
|---|---|---|---|---|
| 0x90 | Settings: optical port switch | 4 | Switch optical port signal<br>On: 0 Off: 1 | |
| 0x91 | Query: optical port switch | | | |
| 0x92 | Settings: Network Mode Configuration | 1 | | |
| 0x93 | Query: network mode configuration | | | |
| 0x94 | Setting: MAC address | 4 | | Each MAC address corresponds to hexadecimal |
| 0x95 | Query: MAC address | | | |
| 0x96 | Settings: device ID | 2 | | Range 1~65535 |
| 0x97 | Query: Device ID | | | |
| 0x98 | Setting: delay of reaching the target position | 64 | | |
| 0x99 | Query: delay of reaching the target position | | | |
| 0x9a | Query: optical port status | 1 | | |
| 0x9b | Query: Optical port 1 device ID topology | 16 | | |
| 0x9c | Query: actual delay of optical port 1 device | 16 | | |
| 0x9d | Query: optical port 1 MAC address topology | 32 | | |
| 0x9e | Query: Optical port 2 device ID topology | 16 | | |
| 0x9f | Query: actual delay of optical port 2 device | 16 | | |
| 0xa0 | Query: optical port 2 MAC address topology | 32 | | |
| 0xa1 | Query: Optical port 3 device ID topology | 16 | | |
| 0xa2 | Query: actual delay of optical port 3 device | 16 | | |
| 0xa3 | Query: optical port 3 MAC address topology | 32 | | |
| 0xa4 | Query: Optical port 4 device ID topology | 16 | | |
| 0xa5 | Query: actual delay of | 16 | | |

| | | | | |
|---|---|---|---|---|
| | optical port 4 device | | | |
| 0xa6 | Query: optical port 4 MAC address topology | 32 | | |
| 0xa7 | Query: optical module hardware parameters | 32 | | |

- Network mode configuration: including automatic switching, selective light 1, 2, selective light 3, 4, interleaving and stacking corresponding to parameters 0, 1, 2 and 3 respectively.
- Optical port status:

  Fb_ State [0] 1: Optical port 0 is disconnected 0: Optical port 0 is normal

  Fb_ State [1] 1: Optical port 1 is disconnected 0: Optical port 1 is normal

  Fb_ State [2] 1: Optical port 2 is disconnected 0: Optical port 2 is normal

  Fb_ State [3] 1: Optical port 3 is disconnected 0: Optical port 3 is normal

  Fb_ State [4] 1: Optical port 0 transmission failure 0: Optical port 0 transmission normal

  Fb_ State [5] 1: Optical port 1 transmission failure 0: Optical port 1 transmission normal

  Fb_ State [6] 1: Optical port 2 transmission failure 0: Optical port 2 transmission normal

  Fb_ State [7] 1: Optical port 3 transmission failure 0: Optical port 3 transmission normal
- Time delay to reach the target position: the transfer value=val/0.016, and each device corresponds to a 2 byte time delay value, with the low order in the front and the high order in the rear.
- Query device MAC topology: four optical ports query corresponding topology information respectively; 32 bytes for each optical port topology data, and 4 bytes for each device topology MAC
- Query topology ID: four optical ports query corresponding IDs respectively; Each optical port provides 16 bytes. Every two bytes correspond to a device ID in the device order
- Query the actual delay: four optical ports query the corresponding delay respectively; Each optical port provides 16 bytes. Every two bytes correspond to one device delay in device order, val=transfer value * 0.5208
- Hardware parameters of optical module: including the temperature of four optical ports, received optical power, and transmitted optical power. 32 bytes, refer to the following table for the order

| | | |
|---|---|---|
| Fb0_ Temp | 4byte | temperature |
| Fb0_ Rx_ Pwr | 2byte | Received power |
| Fb0_ Tx_ Pwr | 2byte | Transmission power |
| Fb1_ Temp | 4byte | temperature |
| Fb1_ Rx_ Pwr | 2byte | Received power |
| Fb1_ Tx_ Pwr | 2byte | Transmission power |
| Fb2_ Temp | 4byte | temperature |
| Fb2_ Rx_ Pwr | 2byte | Received power |
| Fb2_ Tx_ Pwr | 2byte | Transmission power |
| Fb3_ Temp | 4byte | temperature |
| Fb3_ Rx_ Pwr | 2byte | Received power |
| Fb3_ Tx_ Pwr | 2byte | Transmission power |

Power=transfer value * 0.1,

Temperature=transfer value * 0.001.

**Remote machine configuration query**

| Command Number | meaning | Data length | Function description | Parameter Description |
|---|---|---|---|---|
| 0xb0 | Settings: optical port switch | 4 | | Reference near end machine |
| 0xb1 | Query: optical port switch | | | |
| 0xb2 | Settings: network mode (not provided) | 1 | Refer to the near end machine for mode type | No settings are provided temporarily |
| 0xb3 | Query: network mode | | | |
| 0xb4 | Setting: MAC address | 4 | | Reference near end |
| 0xb5 | Query: MAC address | | | |

| | | | | |
|---|---|---|---|---|
| | | | | machine |
| 0xb6 | Settings: device ID | 2 | | Reference near end machine |
| 0xb7 | Query: Device ID | | | |
| 0xb8 | Setting: delay | 6 | | |
| 0xb9 | Query: delay | | | |
| 0xba | Settings: gain compensation | 4 | | |
| 0xbb | Query: gain compensation | | | |
| 0xbc | Query: optical port status | 1 | | Reference near end machine |
| 0xbd | Query: near end port location | 1 | Direct display of decimal value | |
| 0xbe | Query: Channel 0 optical network mode | 1 | The mode corresponds to the configuration mode of the near end machine | |
| 0xbf | Query: Channel 1 optical network mode | 1 | | |
| 0xc0 | Query: optical module hardware parameters | 32 | | Reference near end machine |
| 0xfe | Query: own topology ID | 1 | | |

- Delay: The delay configuration is divided into two channels, each channel contains the configuration mode and delay value. Six byte parameters need to be passed.

  The first byte is channel 1 mode

  The second byte is channel 2 mode (used in interweaved networking mode, not used in other modes)

  The third and fourth bytes correspond to the delay value of channel 1

  The fifth and sixth bytes correspond to the delay value of channel 2 (used in interweaved networking mode, not used in other modes)

  When the mode is manual mode, the delay value needs to be configured (refer to the near terminal delay conversion method for the delay value conversion method); When the mode is automatic, the delay value is 0.

- Gain compensation of optical port: it includes two channels, two bytes are required respectively, and the configured value range is 0~1.99. For conversion method of configuration value, refer to RX0 gain compensation conversion method