SANTONE

Santone module equipment

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Catalog

Preface

This standard specifies the RS485 and Ethernet interface communication protocol for module equipment of Fujian Santone Information Technology Co., Ltd.

This standard is applicable to the module equipment of Fujian Xintong Information Technology Co., Ltd. using RS485/232/422 or RJ45 Ethernet interface.

Abbreviation Notes

Abbreviations	annotation
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	March 16, 2020	Establish the first draft and formulate the basic monitoring protocol framework
	2021/11/16	Add the definition of the separation command of the bottom noise function, and the unified switch is 1 on 0 off
	2021/11/17	Add optical port monitoring command.
	2021/11/18	Add the call monitoring command.
	2021/11/23	Modify some command definitions and add the digital board lock command.
	2021/11/25	Adjust some command definitions, and add near end broadcast and far end report related commands.
	2021/12/23	Add complete machine module type definition, modify software version number definition, and modify module optical ID definition
	2022/3/2	Modify the definition of radio frequency switch and remote reading near end broadcast command
	2022/3/9	Add Ethernet port switch
	2022/3/10	Adjust the Ethernet port switch command number
	2022/3/25	Add complete machine forwarding protocol definition
	2022/4/5	Add relevant number of machine command

	2022/4/20	Modify the data format of optical delay value
	2022/5/12	Modify the definition of the whole machine forwarding description header
	2022/7/6	Add module factory status identification
	2022/7/11	Increase the number of IP commands available for reading the current device
	2022/7/21	Add command to read device temperature
	2022/9/5	Increase the optical port of the whole machine to send power commands
	2022/9/28	Add digital board fiber remote minimum delay measurement command
	2022/10/13	Modify the definition of carrier search power and channel frequency description
	2022/10/24	Modify definition of frequency point gain compensation value
	2022/10/28	Add digital board TX, RX attenuation user value command number
	2022/11/11	Modify the TX and RX attenuation user value command definition of the digital board
	2022/11/18	Increase write access to input broadband power
	2022/11/21	Add digital board low noise suppression deviation value, output center frequency point and signal frequency point command
	2022/11/28	Modify the description information of optical port status, and modify the definition of low noise suppression deviation value
	2022/12/2	Add command definition for acquiring spectrum data of receiving channel
	2022/12/26	Add relevant commands for fault simulation debugging
	2023/1/16	Modify the definition of broadband and narrowband bandwidth switching

Customer module information

Customer information	Module information	Module address	Support communication port	Remarks
			RS485&ETH	Serial port baud rate 115200Bps

一、Basic format and relevant agreements

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.

Start flag unit	Command unit	Verification Unit	End flag unit
0x7E	Command data (min: 8bytes)	CRC checksum (2 bytes)	0x7F

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

Protocol unit description:

1、Start/end flag unit

1 byte length, 0x7E represents the beginning of a complete command package, and 0x7F represents the end of a complete command package.

2、Command unit

It consists of command control head and command body:

a) 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. See the chapter Command Unit Description for details.

b) 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.

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 a complete packet, the receiver will generate a new CRC checksum according to the "command unit". If the CRC checksum is equal to the received checksum, it indicates that the packet is valid. Otherwise, the receiver will send back a "check error" response to the sender.

Relevant agreements:

1、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 ASCII character't '(0x5E).

Escape Range: in the protocol, all data except for the start flag and end flag.

Escape rules:

- Replace 0x5E with 0x5E and 0x5D;
- Replace 0x7E with 0x5E and 0x7D;
- Replace 0x7F with 0x5E and 0x7F.

Escape operation order:

a. Before sending the data packet, first set the CRC check value, and then perform escape processing;

b. After receiving the data packet, first perform anti escape processing, and then perform CRC verification.

2、Byte order

In the command unit, if the data of a certain part is composed of multiple bytes, the byte arrangement shall follow the principle of low bit first and high bit last.

3、Signed integer data

The sign bits of signed numbers are uniformly represented by complement.

4、Floating point number

Floating point number can be transferred in the following two ways:

a. Floating point number direct transfer:

The floating point number adopts IEEE-754 standard. In the protocol packet, the low byte comes first and the high byte comes last. For example: -12.5, which means 0XC1/0X48/0X00/0X00, send 0X00/0X00/0X48/0XC1 in the protocol package in turn.

b. Floating point number equal scale amplification:

The floating point number is magnified in equal proportion by * 1000 and rounded, and then transmitted as 32-bit (4-byte) integer data. (Note: There may be slight errors in calculation for equal scale amplification)

二、Command unit definition

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

Command control head					**Command Body**
Module address	Command Type	Command Number	Answer flag	Command Body Length	Command data
2Byte	1Byte	2Byte	1Byte	2Byte (maximum 1000)	Lengthen

（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.

The module address is represented by 2 bytes:

✧ The first byte represents the function code of the module:

Provide unique codes for modules with different functions In future development, function codes of other modules will be added according to actual needs.

Module type	Module function	number
Analog module	PA module	0x01
	LNA module	0x02
	DET module	0x03
Digital DPD	Digital power amplifier (all-in-one machine)	0x21
	DPD digital board	0x22
RF digital board	Subband digital board	0x41
	Frequency selection digital board	0x42
	Frequency shift digital board	0x43

Fiber RF digital board	Optical fiber sub band digital board	0x61
	Optical fiber frequency selection digital board	0x62
	Fiber optic FM digital board	0x63
complete machine	Digital analog machine	0xa1

The function code of the module is the inherent code of the equipment and cannot be modified in the equipment.

✧ The second byte represents the address code of the module:

Bit number	coding	meaning
BIT 7 uplink/downlink (optional)	0	Downlink module
	1	Uplink module
BIT 6 ～ 0		Module number: increase from 0.

The address code byte of the module can be completely defined by the customer. In a system or a complete machine, the address code of each device with the same function must be unique. In addition to the command of setting module address, other commands communicating with specific modules should have the address code of the corresponding module. The module device will compare the two bytes of the module address. If they do not match, they will not respond to the command request.

The above table definition is only an example. For example, the address code of the module can be used as the number of the same functional module in a system or a complete machine, or if the module is in uplink bit7, it can be set as 1, downlink bit7 can be set as 0, etc.

（2）Command Type

coding	meaning	Remarks
0x00	Query request initiated by upper computer	Initiated by upper computer software, etc
0x01	Setting request initiated by upper computer	Initiated by upper computer software, etc
0x02	Response of module equipment	Response information of

		module
0x80	Optical fiber machine forwards query request	Optical fiber near end unit is effective
0x81	Optical fiber whole machine forwarding setting request	Optical fiber near end unit is effective
0x82	Optical fiber whole machine forwarding response	Optical fiber near end unit is effective
0x10	Communication actively initiated by module equipment	Automatically initiated by the module, such as reporting
0x11	Response of upper computer	The upper computer response module automatically reports
0x12~0xff	hold	

As shown in the figure above, the data type is mainly used to determine the data direction of the protocol communication between the upper computer and the module. It is mainly divided into two categories, the monitoring request of the upper computer and the automatic report of the module. Among them, the monitoring request of the upper computer can be divided into two types: query and setting, but not all command numbers support query and setting, which should be specified according to the command number.

In the whole machine command type, in addition to the inherent 0x00, 0x01, 0x02, the transmission command type of the optical fiber whole machine is added. This command type is used for the upper computer to communicate with the remote computer indirectly through the near computer. Note: When using the forwarding command type, the original command body needs to define fixed forwarding description information to determine the forwarding destination and other relevant information. The forwarding header information is shown in the figure below.

The module with network port communication shall support the automatic reporting function of UDP, and if the upper computer needs to respond to the module after receiving the automatic reporting information, it shall respond to the module in the form of TCP.

（3）Command Number

The command number consists of two bytes, ranging from 0 to 65535. The command number will uniformly code all supported module equipment in this agreement. For the same function commands between different function modules, the same command number will be used to improve the compactness of the number. Special function commands of different function modules will be allocated separately. For the detailed command number, see the chapter of command number definition.

（4）Answer flag

For a unified command format, the response flag byte must exist in both the request command and the response command. As the primary initiator of the command, this field is filled with 0x0, and the passive receiver will not parse or process this field. The byte, as a command response responder, is used as a response flag to indicate whether the command request has been correctly executed. The specific definitions are as follows:

coding	meaning	Remarks
0x00	success	
0x01	Command number error	Received command not supported by module
0x02	Command data error	Command data exceeds the range supported by the module
0x03	Command body length error	The length of the command body does not match the corresponding command or the length of the command body exceeds the maximum value
0x04	operation failed	The module cannot control the module as required
0x05~0xff		hold

（5）Command Body Length

The actual length of the command data. The length of the command body is 2 bytes. The maximum length of the command body should not exceed 1024.

（6）Command data

1) The length and parsing method of command data are determined by the "Command Body Length", "Command Number", "Command Type" and "Module Function Number in Module Address" of the command control header. The specific definition of command data will be described in detail in the corresponding command number description.

2) Definition of complete machine forwarding description header

S/N	Parameter name	length	Subitem	Location	Description
1	Optical topology information	2	Near end machine optical slogan	Upper 8 bits	
			Optical access serial number	Lower 8 bits	
2	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			RF channel number	Lower 8 bits	
3	Data access mode	2	Low byte (digital board): 1: Whole machine forwarding High byte (sub module): 1: PA forwarding, 2: LNA forwarding, 3: DET forwarding, 4: PWR forwarding No forwarding when DP=0		
4	Forwarding communication packet ID	2	Communication count. Two consecutive packets with the same ID will be considered as the same request. Generated by the communication initiator, the receiver sends this value back to the initiator when responding.		

三、Protocol communication rules

1、Data verification or device address error

In protocol communication, if the data frame received by the device has data error of the start/end/CRC check unit or the device address in the command does not match, the device end will not respond to the upper computer.

2、Agreement authentication

Each module shall perform authentication after receiving the data packet.

Authentication processing includes 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 the corresponding error flag according to the actual situation.

3、Communication interaction principle

a.Ask and answer

When the upper computer actively communicates with the equipment, it adopts a question and answer mode (request, response). When the communication data frame received by the device has countless verifications and the device address is wrong, the device must respond to the request of the upper computer no matter whether the authentication or the device command execution is wrong.

The reliable communication mode with TCP connection must be adopted for network port communication.

b. Automatic reporting

- ✧ RS485/232/422 (asynchronous serial port): no automatic reporting function.

- ✧ Network port: The device side needs to provide the automatic reporting function of UDP connectionless mode when communicating with the network port. According to the specific project requirements, UDP automatic reporting is applicable to the functional requirements of opening station reporting, patrol reporting, heartbeat packet, etc.

4、Communication fault tolerance mechanism

There should be a certain degree of fault tolerance in the process of sending and receiving data packets. Due to different communication interfaces or communication methods, data of other frames or data generated by hardware interference may exist outside the start/end unit of the received protocol frame due to communication principles or hardware defects. Therefore, the received data frame must have the function of packet checking. After removing the interference data, the CRC check of the command data is performed. For example, if you use the TCP streaming communication mode on the network interface, packets may be stuck.

5、Protection timer

The purpose of using the protection timer is to ensure the reliable arrival of messages or commands in the protocol communication timing. The upper computer equipment monitoring software shall set a protection timer after sending a command to the module. The response received before the timer timeout is a valid response; Otherwise, it is an invalid response. At this time, the equipment monitoring software believes that the module is faulty or the upper computer equipment monitoring software believes that the module does not exist during initialization. Therefore, the processing speed of all modules to the upper computer command shall meet the requirements of this protocol: the protection time of the command is 1s.

四、Command number definition

The command number range will divide and reserve the command number of all modules, analog modules, digital modules, etc. The read/write permission of the command defines the settings and read permissions corresponding to the command number. ″ W ″: only settable,″ R ″: only readable,″ RW ″: both settable and readable.

1、Command Number

1）Basic commands

Command Number	read-write permission	meaning	Module
0xe5af	W	Module address	All modules
0xeaf5	W	Module software upgrade	All modules
0xef5a	RW	Module factory status identification	All modules
0x0011	R	Module software version number	All modules
0x0012	R	Module hardware version number	All modules
0x0013	RW	Module Description	All modules
0x0014	W	Module reset	All modules
0x0015	RW	Module switch	All modules supporting switch control
0x0016	R	Module Status	All modules
0x0017	W	Restore factory settings	All modules
0x0018	RW	Ethernet IP address setting	All modules/complete machines supporting Ethernet interface
0x0019	RW	NMS IP address setting	All modules/complete machines supporting network management
0x0020	RW	Ethernet port switch	All modules/complete machines supporting Ethernet interface
0x0021	R	Read the available IP address of	Devices with automatic

		the current device	mapping of networking IP
0x0022	R	Equipment temperature	All devices supporting temperature reading

Module General Command Table

Command Number	read-write permission	meaning	Module/module type
0x0100	RW	Single channel single DATT gain adjustment	Analog PA, LNA
0x0110	RW	RX receiving channel DATT	Digital DPD, RF digital board, optical RF digital board
0x0111	RW	RX receive channel DATT user value	
0x0120	RW	TX transmission channel DATT	
0x0121	RW	TX transmission channel DATT user value	

DATT Command Table

Command Number	read-write permission	meaning		Module/module type
0x0160	RW	Analog device ALC		PA, LNA
0x0170	RW	RX	ALC mean exp	Digital module
0x0171	RW		ALC search num	
0x0172	RW		ALC switch	
0x0174	RW		ALC offset datt	
0x0175	RW		ALC target	
0x0176	RW		ALC Delay time	
0x0177	RW		ALC control difference threshold	
0x0180	RW		ALC full parameters	

ALC Command Table

Command Number	read-write permission	meaning		Module/module type
0x0270	W	Maximum gain calibration		LNA module
0x0271	RW	Maximum gain		
0x0272	RW	Gain calibration parameters??		
0x0280	RW	Module shutdown in case of standing wave alarm		PA power amplifier
0x0320	RW	RX	Input broadband power	Digital module RF channel
0x0321	RW		Enter broadband power calibration value	
0x0330	R		Input ADC peak	
0x0334	RW		Bottom noise suppression (full)	
0x0335	RW		Bottom noise suppression threshold calibration value	
0x0336	RW		Bottom noise suppression switch	
0x0337	RW		High threshold of bottom noise suppression	
0x0338	RW		Low threshold of bottom noise suppression	
0x0339	RW		Bottom noise suppression threshold deviation value	
0x033c	RW		Center frequency point	
0x033d	RW		Channel frequency	
0x0344	RW		Subband bandwidth	
0x0348	RW		Channel IIR filter bandwidth	
0x034c	RW		Channel switch	
0x034d	RW		Bottom noise channel	

			switch	
0x0354	R		Carrier search	
0x0355	R		Carrier search power	
0x0356	RW		Carrier power calibration value	
0x0360	RW		Insertion frequency	
0x03c0	RW	TX	Output baseband gain	
0x03c4	R		Peak output (DAC)	
0x03c5	RW		Center frequency point	
0x03c6	RW		Signal frequency point	
0x03c8	R		output power	
0x03c9	RW		Transmit power calibration value	
0x03d0	RW		Plug switch	
0x0400	RW	Synchronization switch of uplink and downlink frequency points		
0x0406	RW	RF switch		
0x0410	RW	Wide and narrow bandwidth switching		
0x0420	R	Digital board locking status		
0x0430	R	Acquire spectrum data of receiving channel		
0x0500	RW	DPD mode		DPD module
0x0501	RW	DPD enable		
0x0502	RW	DPD bypass		
0x0503	R	DPD working status		
0x0504	RW	DPD synchronization		
0x0520	RW	DPD power amplifier switch		

Module/whole machine monitoring command table

Command Number	read-write permission	meaning	Module/module type
0x1000	RW	Module optical MAC address	Digital optical fiber equipment
0x1001	RW	Module optical ID address	

0x1002	RW	Near end machine	Optical networking mode	
	R	Remote computer		
0x1003	RW	AFC automatic optical synchronization switch (5662)		
0x1004	RW	AFC optical port selection		
0x1005	RW	Optical hardware delay		
0x1060	RW	Optical aperture	Optical port switch	
0x1061	R		Optical port status	
0x1062	R		SFP Status	
0x1070	RW		Near end machine	Remote delay value
0x1071	R			Far end actual arrival delay
0x1072	R			Optical ID topology
0x1073	R			Optical MAC topology
0x1076	R			Remote minimum delay
0x1080	R		Remote computer	Optical port synchronization information
0x10a0	RW	Near end machine		Near end broadcasting
0x10a1	R			Remote reporting
0x10a2~0x10bf				Broadcast/escalation extension
0x10e0	RW	Remote computer		Optical delay
0x10e1	RW			Optical data gain compensation value
0x10c0	R			Near end broadcasting
0x10c1	RW			Remote reporting
				Broadcast/escalation extension

2) Commissioning command

Command Number	read-write permission	meaning		Module/module type
0x8000	RW	Gain compensation at temperature		Analog power amplifier module
0x8002	RW	Gate voltage compensation at temperature		
0x8004	RW	Gate voltage compensation under power		
0x8006	RW	Reference value of grid voltage		
0x8008	RW	ALC compensation value		Power amplifier/LNA
0x8030	RW	DAC5662 temperature compensation		Digital module
0x8040	RW	RX channel	Gain compensation switch	
0x8041	RW		Temperature compensation switch	
0x8042	RW		DATT compensation switch	
0x8043	RW		Flatness compensation switch	
0x8044	RW		Frequency point compensation switch	
0x8060	RW		Gain compensation value	
0x8061	RW		Temperature compensation meter	
0x8062	RW		Flatness compensation coefficient	

0x8063	RW		Frequency point gain compensation value	
0x8064	RW		Baseband gain compensation value	
0x8180	RW	TX channel	Gain compensation switch	
0x8181	RW		Temperature compensation switch	
0x8182	RW		DATT compensation switch	
0x8183	RW		Flatness compensation switch	
0x81a0	RW		Gain compensation value	
0x81a1	RW		Temperature compensation meter	
0x81a2	RW		Flatness compensation coefficient	

Compensation command table

Command Number	read-write permission	meaning	Module/module type
0x82c0	RW	Length of front reverse power meter	PA, DET
0x82c1	RW	Front reverse power value	

Power meter

Command Number	read-write	meaning	Module/module type

	permissi on		
0x9000	RW	ALC test switch	Digital module
0x9004	RW	LO out of lock test switch	

Fault simulation test table

Command Number	read-write permissi on	meaning	Module/module type
0xa000	RW	DAC0 (AD9122)	Digital module
0xa001	RW	DAC1 (AD9122)	
0xa010	RW	Clock chip (AD9524)	
0xa014	RW	Quadrature modulator 0 (HMC1197)	
0xa015	RW	Quadrature modulator 1 (HMC1197)	
0xa024	RW	FPGA test control register	

Chip register debug command

3）Machine command

Command Number	read-write permissi on	meaning	Module/module type
0xb000	RW	DATT attenuation	complete machine
0xb010	RW	RF switch	
0xb020	RW	ALC	
0xb028	RW	ALC alarm threshold	
0xb030	R	Input power	
0xb038	RW	Input over power alarm threshold	
0xb039	RW	Input underpower alarm threshold	
0xb040	R	output power	
0xb048	RW	Output over power alarm threshold	
0xb049	RW	Output underpower alarm	

		threshold	
0xb050	R	Standing wave ratio	
0xb058	RW	SWR alarm threshold	
0xb060	R	Power amplifier temperature	
0xb068	RW	Power amplifier over temperature alarm threshold	
0xb070	R	Digital board locking status	
0xb080	R	Optical port connection status	
0xb082	R	Digital optical port synchronization status	
0xb084	R	Optical port receiving power	
0xb085	R	Optical port transmission power	
0xb086	RW	Optical port switch	
0xb088	RW	Optical receiver underpower alarm threshold	
0xb0a0	R	Overall temperature	
0xb0a8	RW	Whole machine temperature alarm threshold	
0xb0a1	R	Whole machine humidity	
0xb0a9	RW	Whole machine humidity alarm threshold	
0xb0b0	R	Alarm	
0xb0b2	RW	Alarm enable switch	

Whole machine monitoring command

4）User customized commands

User customized function command number range: 0xc000~0xd000.

2、Command data

The length and parsing method of command data are jointly determined by the "Command Body Length", "Command Number" and "Address" of the command control header.

2.1 General commands

2.1.1 Setting module address (0xe5af)

Set request/read response data:

S/N	Parameter name	lengt h	Subitem	Location	Description
1	Module function	1			
2	Module address	1			

Read request/set response data:

S/N	Parameter name	lengt h	Subitem	Location	Description
1	Module function	1			

When it is necessary to use RS485 to connect several identical functional modules in series in a complete machine (such as LNA module, power amplifier module, etc.), the module address should be set first in the production process of the equipment and then integrated into the complete machine. It is prohibited to set the module address of a class of equipment with the same module function code in the complete machine through RS485 serial port.

The module function code is fixed in the re equipment and cannot be modified. When the upper computer sends the address setting command, the module function in the command head should use the function code of the corresponding module. When the module receives the address setting command, the module will save the address code, and then send the command response to the upper computer with a new address code.

2.1.2 Module upgrade (0xeaf5)

S/N	Parameter name	length	Description
1	Upgrade Type	1	
2	Upgrade Package ID	2	Package number in data transfer subcontracting
3	Upgrade Subcontracting Data	<=1024	

Upper computer upgrade command

Module upgrade instructions can be used to upgrade different software/files. The specific upgrade type depends on the upgrade type definition table. Because the upgrade file is usually large, the upgrade file should be subcontracted in the protocol data transmission, and the subcontract

data should be numbered before transmission. Since too long data will lead to unstable communication and insufficient memory of embedded MCU, the maximum length of packet data for a single transmission is limited to 1024 bytes.

Upgrade process:

- ✧ **Trigger the device to enter the upgrade process: the first package of the upgrade command should specify the upgrade type, the upgrade package ID is 0, and there is no upgrade data.**
- ✧ The device responds correctly
- ✧ The second package specifies the upgrade type, the upgrade package ID accumulation, and the data of the first package of the upgrade package.
- ✧ The device responds correctly
- ✧ ..... All upgrade data are sent
- ✧ **Confirmation of file sending completion: for the last package of the upgrade command, specify the CRC check value of the entire upgrade file with the upgrade type, upgrade package ID of 0xffff, and upgrade data of 2 bytes. The check method is the same as that of the check unit. Wait for the equipment to respond (the equipment response time does not follow the time agreement of the timing protector).**
- ✧ The device checks and compares the CRC value of the received file, and responds to the upper computer.
- ✧ Upgrade succeeded

In the process of upgrading and sending the actual upgrade package data, if the device responds incorrectly, it should resend the data (up to 3 times). If there is any error in the equipment upgrade, the original version can be restored to continue running.

Upgrade Type	coding	Description
MCU software	0x1	MCU Software Upgrade with MCU as Control Chip
ARM software	0x2	Software upgrade of ARM CPU based on LINUX system
FPGA file	0x4	Upgrade of FPGA Bitstream File

Upgrade Type Definition Table

S/N	Parameter name	length	Description
1	Upgrade Type	1	
2	Upgrade Package ID	2	Package number in data transfer subcontracting
3	Upgrade Subcontracting	0	No subcontracting data

	Data		

Response to module upgrade command

2.1.3 Module factory status identification (0xef5a)

Set request/read response data:

S/N	Parameter name	length	Description
1	Factory status	1	Factory status: 1 Non factory status: 0

Read request/set response data: no command data

The purpose of module ex factory status identification is to identify that the internal parameters of the module are under the ex factory status of module design indicators. After debugging, the module must set this mark to 1 before leaving the factory. If the user needs to identify whether the module is in the factory state, read the identification. The user must also set the identification to 0 after modifying the module parameters.

2.1.4 Module software version number (0x0011)

Read request: no command data

Read response data:

S/N	Parameter name	length	Description
1	Software version number	12	Unsigned data

The software version number of the whole machine includes the digital board version number and FPGA version number.

Bytes 0~3- software version number: year, month, day, sub version number.

The 4th to 8th bytes - FPGA version number: year, month, day, sub version number, near and far end type: (near: 0xa or far: 0xb)

Bytes 9-11- kernel version number: year, month, day.

2.1.5 Module hardware version number (0x0012)

The same as the module software version number.

2.1.6 Module description (0x0013)

Set request/read response data:

S/N	Parameter name	length	Description
1	Module description data	N<128	String data

Read request/set response data: no command data

2.1.7 Module reset (0x0014)

There is no command data for the module reset command. After receiving the reset command, the module needs to respond to the upper computer before performing the system reset operation.

Set request/read response data: no command data

Read request/set response data: no command data

2.1.8 Module switch (0x0015)

Set request/read response data:

S/N	Parameter name	length	Description
1	switch	1	0: close module, 1: open module

Read request/set response data: no command data

2.1.9 Module status (0x0016)

Query module status: no command data. Different modules have different definitions of response command data to query module status.

2.1.9.1 Power amplifier module status response command data

Read request data: no command data

Read response data:

S/N	Parameter name	length	Subitem	position	describe
1	Module Status	1		BIT 7	Keep 0
				BIT 6	Keep 0
			APD enable status	BIT 5	0: APD closed, 1: APD open
			Power amplifier fault alarm	BIT 4	0: Normal; 1: Fault

			Standing wave ratio alarm	BIT 3	0: Normal; 1: Fault
			Over temperature alarm	BIT 2	0: Normal; 1: Fault
			Overpower alarm	BIT 1	0: Normal; 1: Fault
			Power amplifier status	BIT 0	1: On; 0, OFF
2	Detected reverse power	1			Signed number: dBm
3	Power amplifier temperature	1			Signed number: ℃
4	Power amplifier ALC value	1			Signed number: dBm
5	Standing wave ratio	1			Unsigned number
6	Power amplifier ATT	1			Unsigned number
7	Detected forward power	1			Signed number: dBm

Note: 1) The parameters filled in the SWR are the actual SWR × 10. If the actual standing wave ratio is 2.3, the parameter filled in the protocol package is 23.

2) The standing wave ratio alarm and over temperature alarm are the alarms prompted when the power amplifier module protects itself. If the alarm threshold is set unreasonably (too high) during repeater monitoring, the module itself will provide alarm indication. Therefore, the module supplier shall provide its self-protection alarm threshold (SWR alarm threshold ≥ 3; overtemperature alarm threshold ≥ 85 ℃).

3) Power amplifier fault: alarm is generated according to the input signal of power amplifier, gain change, current size and other factors.

4) For the detection range and accuracy requirements of forward power, standing wave ratio, power amplifier temperature, etc., please refer to the description of relevant module index requirements.

2.1.9.2 LNA module status response command data

Read request data: no command data

Read response data:

S/N	Parameter name	length	Subitem	position	describe
1	Module Status	1		BIT 7	Keep 0
				BIT 6	Keep 0
				BIT 5	Keep 0
				BIT 4	Keep 0
				BIT 3	Keep 0
				BIT 2	Keep 0
			LNA switch status	BIT 1	1: On; 0, OFF
			LNA fault	BIT 0	Alarm: 1/Normal: 0
2	ATT value	1			Current ATT value: dB
3	LNA maximum gain	1			Unsigned number: dB
Note: 1) Low noise amplifier fault alarm: the alarm is generated according to whether the input signal of the low noise amplifier exists, the change of gain, the size of current and other factors. 2) Requirements for maximum gain accuracy of the module: error ≤± 1dB.					

2.1.9.3 DET module status command data

Read request data: no command data

Read response data:

S/N	Parameter name	Length	Subitem	Location	Description
1	Module Status	1		BIT 7	Keep 0
				BIT 6	Keep 0
				BIT 5	Keep 0
				BIT 4	Keep 0
				BIT 3	Keep 0
				BIT 2	Keep 0
				BIT 1	Keep 0
				BIT 0	Keep 0
2	Detected power	1			Signed number: dBm
Note: 1) The output power detection value of the low noise amplifier and the RF signal power detection value of the disc are provided in the response to the DET module status					

query command; The power detection value of the power amplifier module is provided in the state query command response of the power amplifier module, and the power amplifier module cannot respond to the command of the DET module; The power detection value of the input power detection module is provided in the response to the query command of the input power detection module. The input power detection module cannot respond to the command of the DET module.

2) For the power detection range and accuracy requirements, please refer to the description of relevant module index requirements.

2.1.9.4 Digital module status command data

Read request data: no command data

Read response data:

S/N	Parameter name	length	Subitem	position	describe
1	Hardware status	1		BIT2~7	hold
			AFC lock	BIT 1	1. Lock; 0, unlocked (fiber synchronization)
			Module switch status	BIT 0	1. On; 0, OFF
	input	1	Each bit represents the status of an input channel		1. Self excitation; 0, normal
	Quadrature modulator	1	Each bit represents the state of the quadrature modulator on a channel		1. Lock; 0, unlocked (hmc1197)
	Clock chip	1	Each bit represents the lock status of a clock chip		1. Lock; 0, unlocked (ad9524)
2	Module temperature	1			Signed number: ℃

The bit1 of the non optical fiber digital module in the hardware state is invalid, and the default value is 0.

2.1.10 Restore factory settings (0x0017)

There is no command data for the factory reset command. After receiving the command, the module will restore the factory parameters, and then restart the device.

2.1.11 Ethernet IP address setting (0x0018, 0x0021)

Set request/read response data:

S/N	Parameter name	length	position	Description
1	IP address	4		Example: IP is 192.168.1.2
			Byte0	0xc0 (192)
			Byte1	0xa8 (168)
			Byte2	0x01 (1)
			Byte3	0x02 (2)

IP address is transmitted as 32-bit unsigned number, and low byte is transmitted first.

Read request/set response data: no command data

2.1.12 NMS IP address setting (0x0019)

Set request/read response data:

S/N	Parameter name	length	position	Description
1	IP address	4		Example: IP is 192.168.1.2
			Byte0	0xc0 (192)
			Byte1	0xa8 (168)
			Byte2	0x01 (1)
			Byte3	0x02 (2)

IP address is transmitted as 32-bit unsigned number, and low byte is transmitted first.

Read request/set response data: no command data

2.1.13 Ethernet port switch (0x0020)

Set request/read response data:

S/N	Parameter	length	position	Description

	name			
1	Network port switch	1		1: On, 0: Off

When the command opens the network port, set the IP address to the IP recorded in the system.

Read request/set response data: no command data

2.1.14 Equipment temperature (0x0022)

Read request data: no command data

Read response data:

S/N	Parameter name	length	describe
1	Temperature value	4	Floating point number, IEEE-754

2.2 DATT command

Since the attenuation range of the DATT device is 0 to 31.5, the corresponding attenuation steps of different models are 1 db, 0.5 db and 0.25 db. Therefore, for the DATT monitoring data, the integer data transmission is performed by * 8 times of the value.

2.2.1 Analog module DATT (0x0100)

Set request/read response data:

S/N	Parameter name	length	describe
1	DATT value	1	Value: actual attenuation value * 8

Read request/set response data: no command data

2.2.2 Digital module receiving channel DATT (0x0110)

Set request/read response data:

S/N	Parameter	leng	describe

	name	th	
1	Receiving channel	1	Unsigned number, channel number of RF link
2	DATT SN	1	(The nth DATT on the receiving channel) Unsigned number
3	DATT value	1	Value: actual attenuation value * 8

Note: DATT attenuation of digital module receiver is only effective when ALC is turned off!

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	DATT SN	1	(The nth DATT on the receiving channel) Unsigned number

0x0110 will directly act on the DATT device, that is, the actual attenuation value of the device. When setting, the user value will be cleared to 0. 0x0111 is the attenuation value set by the user. When the user sets the attenuation (0x111), the actual attenuation of the DATT device is 0x0110 recorded value+the user set value.

The reason for the distinction between 0x0110 and 0x0111 is to save the correct parameters of the module when it leaves the factory and meet the factory index requirements of the module.

2.2.3 Digital module receiving channel DATT user value (0x0111)

Set request/read request data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	DATT SN	1	(The nth DATT on the receiving channel) Unsigned number
3	DATT user	4	(dB) Floating point number, IEEE-754. The

	value		value is invalid when reading.

Read response/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	DATT SN	1	(The nth DATT on the receiving channel) Unsigned number
3	DATT user value	4	(dB) Floating point number, IEEE-754
4	DATT factory value	4	(dB) Floating point number, IEEE-754
5	DATT device value	4	(dB) Floating point number, IEEE-754

2.2.4 Digital board transmission channel DATT (0x0120)

Set request/read response data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link
2	DATT value	1	Value: actual attenuation value * 8

Read request/set response data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link

0x0120 will directly act on the DATT device, that is, the actual attenuation value of the device. When setting, the user value will be cleared to 0. 0x0121 is the attenuation value set by the user. When the user sets the attenuation (0x121), the actual attenuation of the DATT device is 0x0120 recorded value+user set value.

The difference between 0x0120 and 0x0121 is to save the correct parameters of the module when it leaves the factory and meet the requirements of the module's ex factory indicators.

2.2.5 Digital module transmission channel DATT user value (0x0121)

Set request/read request data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link
2	DATT user value	4	(dB) Floating point number, IEEE-754. The value is invalid when reading.

Read response/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	DATT user value	4	(dB) Floating point number, IEEE-754
3	DATT factory value	4	(dB) Floating point number, IEEE-754
4	DATT device value	4	(dB) Floating point number, IEEE-754

2.3 ALC command

2.3.1 Analog device ALC command (0x0160)

S/N	Parameter name	length	describe
1	ALC value	1	Signed number

The modules to process this command are: LNA, power amplifier module. The company requires the ALC of LNA and PA modules to be adjusted manually, and the monitoring software does not send ALC setting commands to the modules. If the module needs to adjust the ALC value electrically, use this command to set

the respective ALC value according to the characteristics of each module during module commissioning.

2.3.2 Digital ALC command

Query ALC: no command data.

2.3.2.1 ALC mean exp (0x0170)

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	ALC mean exp	1	Unsigned number (2~15)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

2.3.2.2 ALC search num (0x0171)

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	ALC search num	2	Unsigned number (0~65535)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

2.3.2.3 ALC switch (0x0172)

Set request/read response data:

S/N	Parameter	leng	describe

	name	th	
1	Receiving channel		Unsigned number, channel number of RF link
2	ALC switch	1	ALC switch; 1: On; 0: Off

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

2.3.2.4 ALC offset datt (0x0174)

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	ALC offset datt	1	Value: actual attenuation value * 8 (as defined by DATT)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

2.3.2.5 ALC offset target (0x0175)

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	ALC target	4	ALC control target value, (dBm) floating point number, IEEE-754

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

2.3.2.6 ALC Delay time (0x0176)

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	ALC Delay time	4	Unsigned 32 digits

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

2.3.2.7 ALC difference threshold (0x0177)

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Enable switch	1	1. On; 0, OFF
3	Threshold value	1	0~63db

When starting ALC, set the threshold value. ALC will be calculated only when the threshold value exceeds the set value.

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving	1	Unsigned number, channel number of RF link

	channel		

2.3.2.8 All ALC parameters (0x0180)

ALC full parameter read-write is used to write or read all ALC parameters at one time, so as to reduce the number of communications when reading and writing all ALC parameters.

Set request/read response data:

S/N	Parameter name	length	position	describe
1	Receiving channel	1		Unsigned number, channel number of RF link
2	Mean exp	1		Unsigned number (2~15)
3	Search num	2		Unsigned number (0~65535)
4	Switch	1		ALC switch; 1: On; 0: Off
5	Offset datt	1		Value: actual attenuation value * 8 (as defined by DATT)
6	Difference threshold	2	Byte0	Switch: 1, on; 0, OFF
			Byte1	Threshold value: 0~63db
7	Offset target	4		ALC control target value, (dBm) floating point number, IEEE-754
8	Delay time	4		Unsigned 32 digits

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

2.4 Module monitoring command

2.4.1 Simulation part

2.4.1.1 LNA maximum gain calibration (0x0270)

LNA maximum gain calibration command: no command parameter.

LNA maximum gain calibration command response: no command parameter.

After receiving the command, the module will set the ATT of the module to 0 to test the maximum gain of the module.

2.4.1.2 LNA maximum gain (0x0271)

S/N	Parameter name	length	describe
1	Maximum gain of module	1	Unsigned number, db
2	Set ATT value	1	ATT value to be preset to ensure maximum gain

In the system design, the maximum gain of each module is fixed. This command is designed to solve the discreteness of the module gain. To ensure the consistency of the maximum gain of each module, use this command to set the pre fade value of each module. The attenuation value is the actual attenuation value. The module needs to correct this value to control the gain of the module.

2.4.1.3 LNA gain calibration (0x0272)?

2.4.1.4 Close the module in case of PA standing wave alarm (0x0280)

S/N	Parameter name	length	describe
1	Enable switch	1	1. On; 0, OFF

Turn off the power amplifier function enabling control in case of standing wave ratio alarm. After enabling, the module shall be able to turn off the RF signal output of the output port.

2.4.2 Digital part

2.4.2.1 Input broadband power (0x0320)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Input power	4	(dBm) Floating point number, IEEE-754

The receiving channel is used to specify the channel number of the RF link. For example: RX0:0, RX1:1.

Note: This command should only have read permission. The purpose of adding the set permission is to stack the relevant offset input by the whole machine to the digital board, so as to facilitate the whole machine debugging and low-noise suppression.

2.4.2.2 Input broadband power calibration value (0x321)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number
2	Calibration value	4	(dBm) Floating point number, IEEE-754

There is a certain deviation between the read value of the power in the device and the actual value, so the offset calibration value should be set to the system when the device is debugged and calibrated so that the read power value can be displayed accurately.

2.4.2.3 Input ADC peak value (0x0330)

Read request: no command data

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

Response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Input ADC peak	2	Unsigned number

Input ADC peak value is used to monitor the signal size of ADC input terminal. Used for debugging.

2.4.2.4 Bottom noise suppression (0x0334)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Mean exp	1	Unsigned number: 2~15
3	Bottom noise suppression switch	1	1. On; 0, OFF
4	Suppress trigger accumulation value	1	Unsigned number: 0~255
5	Search num	2	Unsigned number: 0~65535
6	Upper threshold	4	Power value dBm: floating point, IEEE-754
7	Lower threshold	4	Power value dBm: floating point, IEEE-754

The inhibition trigger cumulative value is also a threshold value. Since the signal is variable, in order to reduce the sensitivity of the bottom noise suppression, the bottom noise suppression function will not be triggered until the number of times outside the upper and lower thresholds reaches the trigger cumulative value.

2.4.2.5 Bottom noise suppression threshold calibration value (0x0335)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

Set request/read response data:

S/N	Parameter name	length	describe

1	Receiving channel	1	Unsigned number, channel number of RF link
2	Calibration value	4	(dBm) Floating point number, IEEE-754

The calibration value of the low noise suppression threshold is used to directly adjust the bias of the low noise suppression detection signal, and adjust the accuracy of the low noise signal suppression. This value is independent of the input broadband power offset value.

2.4.2.6 Remote uplink noise suppression switch (0x0336)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Bottom noise suppression switch	1	1. On; 0, OFF

2.4.2.7 Remote uplink noise suppression high threshold (0x0337)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	threshold	4	Power value dBm: floating point, IEEE-754

Lower threshold means that when the signal is less than the threshold value, it is regarded as a noise signal, and the signal is filtered out. When

the signal is higher than the high threshold, the signal is considered as a useful signal for release.

2.4.2.8 Remote uplink noise suppression low threshold (0x0338)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	threshold	4	Power value dBm: floating point, IEEE-754

Lower threshold means that when the signal is less than the threshold value, it is regarded as a noise signal, and the signal is filtered out. When the signal is higher than the high threshold, the signal is considered as a useful signal for release.

2.4.2.9 Bottom noise suppression threshold deviation value (0x0339)

Read request data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

Set request data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Deviation value	4	(dBm) Floating point number, IEEE-754

Set/read request response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Deviation value	4	(dBm) Floating point number, IEEE-754

3	Current threshold	4	(dBm) Floating point number, IEEE-754

The significance of the calibration value of the low noise suppression threshold is that when the received signal is very small, it will be inaccurate to calculate the broadband power through ADC sampling. Use this value to compensate the accuracy of the suppression threshold. However, when the signal is large enough to calculate the ADC power accurately, the corresponding error will be generated.

The deviation value is the deviation corresponding to the input broadband power. When the input broadband power is calibrated, it is still inaccurate relative to the small signal input power. This value is used to compensate for the accuracy of low noise suppression caused by inaccurate calculation of small signal power.

This command and the command 0x0335 are two different ways to process the accuracy of low noise suppression.

2.4.2.10 Center frequency point (0x033c)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Center frequency point	4	Floating point number, IEEE-754

The central frequency point is the central frequency point of the RF input. The FPGA IF data processing does not know or care about the RF receiving frequency. Therefore, the FPGA digital processing of the frequency shifting

device only makes the relative offset value relative to the IF center frequency point when defining the channel frequency point.

2.4.2.11 Channel frequency point (0x033d)

Read request/set response data: when the channel number is 0xff, read/set all channel frequency points

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number (special value: 0xff)

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number (special value: 0xff)
3	Channel frequency point/frequency point number	N * 4byte (N: number of channels)	Floating point number, IEEE-754

The digital processing module has multiple channels, the number of channels N is determined according to the actual project, and the channel number is from 0 to n. The channel frequency point is actually offset from the central frequency point in 2.2.4.6 in the software. The value of No. 3 in the protocol is divided into two different ways: directly fill in the frequency value of the frequency point (for example, 932.5MHz) and fill in the relative number value of the frequency point (for example, the value of the GSM-R project is 1~21). Different projects may be set in different ways. In the frequency value mode, the module software must calculate the offset value relative to the center frequency point and then set it in FPGA. Relative offset value=(channel frequency point - center frequency point)/minimum step. The minimum step is defined by FPGA.

2.4.2.12 Subband bandwidth (0x0344)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number
3	Bandwidth value	4	(MHz) floating point number, IEEE-754

2.2.2.13 Channel IIR filter bandwidth (0x0348)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number
3	Filter bandwidth	4	(MHz) floating point number, IEEE-754

2.4.2.14 Channel switch (0x034c)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number (special value: 0xff)

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

2	Channel number	1	Unsigned number (special value: 0xff)
3	Channel switch	4	Boolean (1: on, 0: off)/32 bit unsigned number

The switches of each channel in the receiving channel can be monitored by the above command. To reduce the number of commands monitoring multiple channels at the same time, when the value of channel number is 0xff, the switch value is the unsigned number indicated by bit. Therefore, when the channel number is 0xff, the switches of up to 32 channels (channels 0 to 31) can be monitored simultaneously. The specific controllable channel number depends on the specific project!

2.4.2.15 Bottom noise channel switch (0x034d)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number (special value: 0xff)

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number (special value: 0xff)
3	Bottom noise channel switch	4	Boolean (1: on, 0: off)/32 bit unsigned number

The switches of each channel in the receiving channel can be monitored by the above command. To reduce the number of commands monitoring multiple channels at the same time, when the value of channel number is 0xff, the switch value is the unsigned number indicated by bit. Therefore, when the channel number is 0xff, the switches of up to 32 channels (channels 0 to 31) can be monitored simultaneously.

The function of the bottom noise channel switch is the same as that of the channel switch in 2.4.2.10, which is to switch the signal of a channel. The

difference is that the position of the signal switch in the digital processing link is different. It is used for debugging. This function has nothing to do with bottom noise suppression.

2.4.2.16 Carrier search (0x0354)

Read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	search result	1	1. End of search; 0, searching

Read request data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Mean exp	1	Unsigned number (2~15)
3	Search num	2	Unsigned number (0~65535)

Carrier search is used to determine whether there is a signal in the filter bandwidth, so after carrier search, you can read the carrier search power value to determine whether the corresponding channel is composed of signal and signal size.

This command will trigger the FPGA to move the calculated power result to the carrier search power register, so the carrier search result will indicate whether the data transfer is over. Typical values: Mean exp=10, Search num=32. These two parameters are used to determine the bandwidth and statistical duration during power calculation.

2.4.2.17 Carrier search power (0x0355)

Read request data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number (special value: 0xff)

Read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number (special value: 0xff)
3	Carrier power	4/4*N	Floating point number, IEEE-754

The read of carrier search power can only be read safely after 0x0354 carrier search ends. When the channel number is a special value 0xff, the response carrier power is the carrier power value of all channels.

2.4.2.18 Carrier power calibration value (0x0356)

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Calibration value	4	(dBm) Floating point number, IEEE-754

2.4.2.19 Insertion frequency point (0x0360)

Near end machine command

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link
2	Channel number	1	Channel number, unsigned
3	Insertion frequency	4	(MHz) floating point number, IEEE-754

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

2	Channel number	1	Channel number, unsigned

The socket function is to switch the downlink signal, and there will be socket receiving channels on the near end machine. The near end machine can make the socket channel work at different frequencies by setting the socket channel. The inserted signal will be transmitted to the remote machine, which will switch the inserted signal through the inserted switch. The system supports multiple channel interpolation functions, and the number of interpolation channels is determined by the hardware.

2.4.2.20 Output baseband gain (0x03c0)

Set request/read response data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link
2	Gain value	4	(0~1.99) floating point number, IEEE-754

Change the signal gain on baseband data. When the gain value is 1, the signal gain is 0. When the gain value is greater than 1, the signal gain is amplified, and when the gain value is less than 1, the signal gain is reduced.

Read request/set response data: no command data

2.4.2.21 RF switch (0x03c1)

Read request/set response data:

S/N	Parameter name	length	describe
1	RX channel	1	Distinguish RF channels by bit (bit0~7: channels 0~7) Channel value (1: valid, 0: invalid)
2	TX channel	1	

Set request/read response data:

S/N	Parameter name	length	describe
1	RX channel	1	Distinguish RF channels by bit (bit0~7: channels 0~7) Channel value (1: valid, 0: invalid) Switch value (1: on, 0: off)
2	TX channel	1	
3	RX channel switch value	1	

4	TX channel switch value	1	

The channel RF switch command can independently or simultaneously control the RF switch of receiving and transmitting channels.

2.4.2.22 Output peak value (0x03c4)

Read request:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link

Response data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link
2	Output peak	2	Unsigned number

2.4.2.23 Center frequency point (0x03c5)

Read request/set response data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link

Set request/read response data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link
2	Center frequency point	4	Floating point number, IEEE-754

The central frequency point is the central frequency point of the RF output. The FPGA IF data processing does not know or care about the RF receiving frequency. Therefore, the FPGA digital processing of the frequency shifting device only makes the relative offset value relative to the IF center frequency point when defining the channel frequency point.

2.4.2.24 Channel frequency point (0x03c6)

Read request/set response data: when the channel number is 0xff, read/set all channel frequency points

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number (special value: 0xff)

Set request/read response data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number (special value: 0xff)
3	Channel frequency point/frequency point number	N * 4byte (N: number of channels)	Floating point number, IEEE-754

The central frequency point received and transmitted by the frequency shift module is inconsistent with the channel frequency point, so the command is distinguished.

2.4.2.25 Output power (0x03c8)

Read request:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link

Response data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link
2	output power	4	(dBm) Floating point number, IEEE-754

2.4.2.26 Output power calibration value (0x03c9)

Read request/set response data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF

			link

Set request/read response data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link
2	Calibration value	4	(dBm) Floating point number, IEEE-754

2.4.2.27 Plug switch (0x03d0)

Remote machine command

Read request/set response data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number, the channel number defined by the near end machine

Set request/read response data:

S/N	Parameter name	length	describe
1	send aisle	1	Unsigned number, channel number of RF link
2	Channel number	1	Unsigned number, the channel number defined by the near end machine
3	Plug switch	1	1: On, 0: Off

The channel number here indicates the number of the near end machine insertion channel, not the channel number of the frequency selection channel. When the insertion function is turned on, all the output signals of the selected frequency channel will output the inserted signals.

2.4.2.28 Up and down synchronization switch (0x0400)

Read request/set response data: no command data

Set request/read response data:

S/N	Parameter name	length	describe
1	Up and down synchronization switch	1	1. On; 0, OFF

2.4.2.29 Broadband/Narrow Bandwidth Switching (0x0410)

Read request/set response data: no command data

Set request/read response data:

S/N	Parameter name	length	describe
1	Bandwidth switching	1	0: Wireless broadband 1: Wireless narrowband 2: Fiber broadband 3: Fiber narrowband

This command is mainly used for testing. When switching to broadband mode, digital processing will skip the narrowband filter.

2.4.2.30 Digital board locking status (0x0420)

Read request data: no command data

Read response data:

S/N	Parameter name	length	position	describe
1	Lock status	1	BIT0	Clock lock
			BIT1	AFC locking (valid with optical fiber digital board)
			BIT4	LO 0 locked
			BIT5	LO 1 locked

2.4.2.31 Acquire spectrum data of receiving channel (0x0430)

Read request:

S/N	Parameter name	length	describe
1	Spectrum sampling type	1	(0~7)
2	Maximum data length per frame	1	Unsigned number, maximum 255
3	Total Frames	1	Total number of transmission frames according to the sampling type and the maximum length of each frame
4	Current read frame number	1	(1~total frames)

Read response data:

S/N	Parameter name	length	describe
1	Spectrum sampling type	1	(0~7)
2	Maximum data length per frame	1	Unsigned number byte, maximum 255
3	Total Frames	1	Total number of transmission frames according to the sampling type and the maximum length of each frame
4	Current read frame number	1	(1~total frames)
5	Spectrum data	N	N<=maximum length of each frame

Two bytes of spectrum data represent a frequency point value. The data is the number of fixed points. The data value=(2-byte data)/8 (dbm). This value is not calibrated and has a fixed offset deviation from the actual power value. The spectral resolution depends on the sampling point data. If the data length is 4096, the data resolution is (sampling bandwidth/4096) Mhz.

Spectrum sampling type:

Type=0: RX0 Data length 4096 * 2,

Type=1: RX0 link data length 2048 * 2,

Type=2: RX0 link data length 1024 * 2,

Type=3: RX0 link data length 512 * 2;

Type=4: RX1 link data length 4096 * 2,

Type=5: RX1 link data length 2048 * 2,

Type=6: RX1 link data length 1024 * 2,

Type=7: RX1 link data length is 512 * 2.

Note: 4096 * 2 means a total of 4096 points are sampled, each point has 2 bytes, and a total of 4096 * 2 bytes of data.

Flow of obtaining spectrum data:

1) Trigger to grab spectrum data

Read request data: data [0]=type, data [1]=maximum data length per frame, data [2]=0, data [3]=0.

Read response data: data [0]=type, data [1]=maximum data length per frame, data [2]=total frames, data [3]=0. Respond correctly.

2) Read spectrum data

Read request data: data [0]=type, data [1]=maximum data length per frame, data [2]=total frames, data [3]=currently read frame number.

Read response data: data [0]=type, data [1]=maximum data length per frame, data [2]=total frames, data [3]=currently read frame number, data [4~n]=spectrum data

3) Repeat steps 1) and 2) above to read back all spectrum data (1~total frames) completely, and end.

2.4.2.32 DPD mode (0x0500)

Set request/read response data:

S/N	Parameter name	length	describe
1	DPD mode	1	1. Manual; 0, Auto

Read request/set response data: no command data

The operation of DPD is divided into automatic mode and manual mode. In automatic mode, the DPD function is on by default. In manual mode, the DPD function can be turned on/off manually.

2.4.2.33 DPD enable (0x0501)

Set request/read response data:

S/N	Parameter name	length	describe
1	DPD enable	1	1. On; 0, OFF

Read request/set response data: no command data

The DPD enable command is only available in the DPD manual mode. It is used as the interface of manual switch DPD.

2.4.2.34 DPD bypass (0x0502)

Set request/read response data:

S/N	Parameter name	length	describe
1	DPD enable	1	1. Access; 0, bypass

Read request/set response data: no command data

The DPD bypass is used to allow signals to bypass the DPD processing module directly. When DPD enable is turned off, only DPD signal processing is disabled, and the signal will pass through the DPD processing module.

2.4.2.35 DPD working status (0x0503)

Read response data:

S/N	Parameter name	length	describe
1	DPD working status	1	1. Normal; 0, abnormal

Read request: no command data

2.4.2.36 DPD synchronization (0x0504)

Set request/read response data:

S/N	Parameter name	length	describe
1	Search num	2	Unsigned number
2	Sync delay	2	Unsigned number
3	Check values	2	Unsigned number

Read request/set response data: no command data

DPD synchronization is used to set the parameters related to the synchronization algorithm.

2.4.2.37 DPD power amplifier switch (0x0520)

Set request/read response data:

S/N	Parameter name	length	describe
1	DPD power amplifier switch	1	1. On; 0, OFF

Read request/set response data: no command data

This command is only used in the DPD digital board and power amplifier integration module.

2.5 Optical port monitoring command

2.5.1 Module optical MAC address (0x1000)

Read request/set response data: no command data

Set request/read response data:

S/N	Parameter name	length	describe
1	Optical MAC address	4	Unsigned number

2.5.2 Module optical ID address (0x1001)

Read request/set response data: no command data

Set request/read response data:

S/N	Parameter name	length	describe
1	Optical ID address	8	Unsigned number 64 digits

The optical ID is a 64 bit unsigned number, which has two purposes. 1. The lower 16 bits are used as the unique identifier of the device in the optical networking topology. 2. The whole 64 bits are used as the ex factory equipment number of the module equipment. This value should be set when leaving the factory to ensure uniqueness and up counting!

2.5.3 Optical networking mode (0x1002)

Read request/set response data: no command data

Set request/read response data:

S/N	Parameter name	length	describe
1	Optical networking mode	1	It includes automatic switching, selecting light 1, 2, selecting light 3, 4, and interleaving and stacking corresponding to parameters 0, 1, 2, and 3 respectively.

2.5.4 AFC automatic optical synchronization switch (0x1003)

Read request/set response data: no command data

Set request/read response data:

S/N	Parameter name	length	describe
1	AFC synchronization switch	1	1. Open (automatic); 0, Off (Manual)
2	Manual	2	Unsigned number (0~65535)

	parameters		

This command is used to control the output voltage of the DAC 5662. In the automatic mode, the AFC algorithm is started, and the 5662 output voltage is automatically controlled for optical fiber synchronization. The manual mode is to manually control the optical fiber synchronous clock. Set the automatic optical synchronization switch to ON (in the automatic mode), and the manual parameters are invalid parameters, which will not be analyzed at the module end.

2.5.5 AFC optical port selection (0x1004)

Read request/set response data: no command data

Set request/read response data:

S/N	Parameter name	length	describe
1	AFC optical port automatic selection switch	1	1. Open (automatic); 0, Off (Manual)
2	Synchronous optical port	1	The following parameter descriptions

The AFC mode command is only valid when the AFC optical synchronization switch in 2.5.4 is turned on (in AFC mode). When the AFC optical port automatic selection switch is turned on, the optical synchronous clock can choose to automatically come from all optical ports/12 optical ports/34 optical ports. When the AFC optical port automatically selects to close, the source optical port of the optical synchronization clock shall be specified.

Parameter synchronization optical port:

0x1: Manual selection of optical port 1

0x2: Manual selection of optical port 2

0x3: Manual selection of optical port 3

0x4: Manual selection of optical port 4

0x10: Automatic selection from all optical ports

0x11: Automatic selection from 1/2 optical port

0x12: Automatic selection from 3/4 optical port

2.5.6 Optical hardware delay (0x1005)

This command is a near terminal command!

Set request/read response data:

S/N	Parameter name	length	describe
1	Optical hardware delay	4	Floating point number, IEEE-754

No read request/set response data

2.5.7 Optical port switch (0x1060)

Set request/read response data:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number
2	switch	1	1. On; 0, OFF

Read request/set response data:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number

2.5.8 Optical port status (0x1061)

Read request:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number (special value: 0xff)

Read response data:

S/N	Parameter name	length	position	describe
1	Light slogan	1		Optical port number, unsigned number (special value: 0xff)
2	Optical port status	1*N	BIT7~BIT2	hold
			BIT1	1. Optical port transmission failure; 0, optical port transmission is normal (SFP

				access can be judged)
			BIT0	1. Optical port reception failure; 0. Optical port reception is normal (optical fiber connection can be judged)

When the optical port number is the corresponding optical port number, the hardware parameter of the optical port is the status parameter (1byte) of the corresponding optical port. When the optical port number is a special value of 0xff, it indicates that the status parameters of all optical ports should be read at once, and N optical ports on the hardware will return N * 1byte data.

2.5.9 SFP Status (0x1062)

Read request:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number (special value: 0xff)

Read response data:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number (special value: 0xff)
2	Status parameters of light head	N * (4+4+4) 48 or 12 bytes in total	(4byte) Temperature: floating point, IEEE-754 (4byte) Optical transmission power (uw): floating point, IEEE-754 (4byte) Optical receiving power (uw): floating point, IEEE-754

When the optical port number is FF, four optical ports can be read, 48 bytes in total.

Dbm=(10.0 * log10 (uw) -30.0);

When the optical port number is the corresponding optical port number, the hardware parameter of the optical port is the status parameter (12byte) of the corresponding optical head. When the optical port number is a special value of 0xff, it indicates that the status

parameters of all optical ports should be read at one time, and N * 12byte data will be returned if there are N optical ports on the hardware.

2.5.10 Remote terminal delay value (0x1070)

This command is a near end machine command, which sets the delay value of the far end uniformly from the near end!

Set request/read response data:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number
2	Remote access serial number	1	Unsigned number (special value: 0xff)
3	Delay value	4/64	(us) Floating point number, IEEE-754 (0: minimum delay)

Read request/set response data:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number
2	Remote access serial number	1	Unsigned number (special value: 0xff)

When the access sequence number is 0xff, the current N is 16. That is, when the access serial number is 0xff, the read/set delay data is all manually set values of 16 remote computers under the optical port (regardless of the number of remote computers actually accessed under the optical port).

When setting or reading the set delay value, if the value is 0, it means that the delay of the remote machine uses the minimum delay value, which is equal to the value obtained by the 0x1076 command. This value is automatically calculated by the module according to the length of the fiber and the hardware delay. When this value is not set to 0, the module will judge according to the minimum delay value. If it is less than the minimum delay value, an error will be returned. Read the manual setting value that only indicates the optical

fiber delay of the corresponding remote machine, and the actual delay should be obtained through the 0x1071 command.

Because the delay of optical fiber data transmission to the remote machine will increase with the length of optical fiber stretching. Therefore, in engineering, in order to synchronize the signals of all remote machines, the automatic delay function can be used in the near end machine to set the delay of all remote machine signals to be consistent. The size of the automatic delay value is greater than the minimum delay value of the last remote machine accessed under the current optical port. The value is converted from the local machine to the internal specific delay parameter and sent to all remote machines, and the remote machine executes the delay buffer of data.

2.5.11 Far end actual arrival delay (0x1071)

This command is a near terminal command!

Read request:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number
2	Remote access serial number	1	Unsigned number (special value: 0xff)

Read response data:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number
2	Remote access serial number	1	Unsigned number (special value: 0xff)
3	Actual arrival delay value	4*N	(us) Floating point number, IEEE-754

When the access sequence number is 0xff, the current N is 16 at most. That is, when the access serial number is 0xff, the read/set delay data is the actual arrival delay value of the remote terminal that has been accessed under the optical port.

2.5.12 Optical ID topology (0x1072)

This command is a near terminal command!

Read request:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number

Read response data:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number
2	Number of remote computers	1	Total number of remote computers connected to the optical port N
3	Remote machine IDs	N*2	Remote machine ID array in access order

The optical ID topology indicates the access of the remote machine on the specific optical port of the near end machine.

2.5.13 Optical MAC topology (0x1073)

This command is a near terminal command!

Read request:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number

Read response data:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number
2	Number of remote computers	1	Total number of remote computers connected to the optical port N
3	Remote MACs	N*4	MAC array of remote machine in access order

The optical MAC topology indicates the access of the remote machine on the specific optical port of the near end machine, similar to the optical ID topology.

2.5.14 Minimum remote delay (0x1076)

This command is a near terminal command!

This command is used to measure the minimum optical delay value under the actual optical fiber connection. The user's delay setting for the remote machine must be greater than this value.

Read request:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number
2	Remote access serial number	1	Unsigned number (special value: 0xff)

Read response data:

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number
2	Remote access serial number	1	Unsigned number (special value: 0xff)
3	Minimum delay	4*N	(us) Floating point number, IEEE-754

When the access sequence number is 0xff, the current N is 16 at most. That is, when the access serial number is 0xff, the read/set delay data is the minimum delay value of the remote terminal that has been accessed under the optical port.

2.5.15 Optical port synchronization information (0x1080)

This command is a remote command!

Read request: no command data

Read response data:

S/N	Parameter name	length	describe

1	Near end machine optical slogan	1	Optical port number of the accessed near end machine, unsigned number
2	Remote machine optical slogan	1	Number of optical ports synchronized between remote and near end computers, unsigned number
3	Remote optical port access serial number	1	Remote optical port access serial number

This command is used for the remote machine to query the access of the optical port to the near machine. If the optical port access serial number is 0, it indicates that the optical access fails.

2.5.16 Near end broadcasting (0x10a0)

Set request/read response data:

S/N	Parameter name	length	describe
1	Data Offset	1	Offset address of data (0~127)
2	Data length	1	Data length read/set
3	data	Max128	Unsigned number

Read request/set response data:

S/N	Parameter name	length	describe
1	Data Offset	1	Offset address of data (0~127)
2	Data length	1	Data length read/set

Near end machine broadcasting is used as a path for optical fiber interaction between near and far end machines. It is written by the local computer and read by the remote computer. The maximum settable data size is 128 bytes.

2.5.17 Remote end machine reads local end machine broadcast (0x10c0)

Read response data:

S/N	Parameter name	length	describe
1	Optical port grouping	1	Group 0 (optical port 0, optical port 1) Group 1 (optical port 2, optical port 3)
2	Data Offset	1	Offset address of data (0~127)

3	Data length	1	Data length read/set
4	data	Max128	Unsigned number

Read request data:

S/N	Parameter name	length	describe
1	Optical port grouping	1	Group 0 (optical port 0, optical port 1) Group 1 (optical port 2, optical port 3)
2	Data Offset	1	Offset address of data (0~127)
3	Data length	1	Data length read/set

Near end machine broadcasting is used as a path for optical fiber interaction between near and far end machines. It is written by the local computer and read by the remote computer. The maximum settable data size is 128 bytes. The data broadcast by the remote terminal to the near terminal can come from different optical port packets. That is to say, different optical port packets may be connected to different near end computers and transmit broadcast data of different near end computers. For example, interwoven networking.

2.5.18 Near end machine reads remote machine report (0x10a1)

Read response data: (read only by near end machine)

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number
2	All remotely reported data	128	8 bytes * 16 sets (1 trailer 16)

Read request: (read only by near end machine)

S/N	Parameter name	length	describe
1	Light slogan	1	Optical port number, unsigned number

The near end machine reads the data reported by the remote machine as a path for optical fiber interaction between the near end machine and the remote

machine. The near end machine can read the data of all 16 devices under a single optical port at one time. Each device has 8 bytes, 128 bytes in total.

2.5.19 Remote machine reads and writes remote machine report information (0x10c1)

Set request/read response data:

S/N	Parameter name	length	describe
1	Report data	8	Unsigned number 8byte

No read request/set response data

2.5.20 Near and far end machine broadcast/report extension (0x10a2~0x10bf, 0x10c2~0x10df)

Near end broadcasting and remote reporting can provide users with autonomous and flexible near and far communication channels. However, in a specific application environment, this channel can be directly used inside the digital board to provide users with specific information of near end reading remote end or far end reading near end, without directly opening (0x10a0, 0x10c0, 0x10a1, 0x10c1) commands. Extended command number range: 0x10a2~0x10bf, 0x10c2~0x10df.

2.5.21 Optical delay of remote terminal (0x10e0)

This command is a remote command!

Set request/read response data:

S/N	Parameter name	length	describe
1	Optical channel number of remote terminal	1	Optical channel number, unsigned number
2	Delay mode	1	1. Automatic; 0, Manual
3	Manual delay value	2	(us) Unsigned number

Read request/set response data:

S/N	Parameter name	length	describe
1	Optical channel	1	Optical channel number, unsigned

	number of remote terminal		number

Remote machine optical channel definition:

Optical port 1 and 2 are optical port channel 1

Optical port 3 and 4 are optical port channel 2

The automatic delay value of the remote machine is provided by the near machine, but the remote machine can choose whether to use it or not. The remote terminal can shield the automatic delay of the near terminal and manually adjust its own signal delay value.

2.5.22 Optical data gain compensation (0x10e1)

Set request/read response data:

S/N	Parameter name	length	describe
1	Optical channel number of remote terminal	1	Optical channel number, unsigned number
2	Compensation value	4	(0~1.99) floating point number, IEEE-754

Read request/set response data:

S/N	Parameter name	length	describe
1	Optical channel number of remote terminal	1	Optical channel number, unsigned number

Optical data gain compensation is to compensate the signal gain in the digital domain. When the compensation value is 1, it is not compensated. Less than 1 is negative gain, and more than 1 is positive gain.

2.6 Compensation command

2.6.1 Analog module compensation command

2.6.1.1 Gain compensation at temperature (0x8000)

Read request/Set response data/Set request/Read response data:

S/N	Parameter name	length	describe
1	Compensation mode	1	0= ATT 补偿方式；1=电压补偿方式

2	Current temperature	1	Number of symbols: unit ℃
3	Compensation temperature point	1	Number of symbols: -30~90 ℃
4	Gain compensation value at temperature	2	ATT compensation mode: number of symbols, 0 ～ 31 dB Voltage compensation mode: unsigned number, voltage value unit mV

1) The current temperature data in the write command is invalid, and the module does not parse it.

2) The current temperature value in the read command is the actual temperature of the single byte signed number module in ℃

3) The compensation temperature point in the read/write command is a single byte signed number. The value range is -30~90, in ℃. The unit is 10 ℃.

4) Definition of gain compensation value at temperature in read/write command:

- In ATT compensation mode, it is a 2-byte unsigned number in dB.
- Voltage compensation mode: 2-byte unsigned number, before low byte and after high byte, in mV.

2.6.1.2 Gate voltage compensation at temperature (0x8002)

Read request/Set response data/Set request/Read response data:

S/N	Parameter name	length	describe
1	Grid voltage serial number	1	Unsigned number: serial number of grid voltage to be compensated (1,2,3,4...)
2	Current temperature	1	Number of symbols: unit ℃
3	Compensation temperature point	1	Number of symbols: -30~90 ℃
4	Gate voltage compensation value at temperature	2	Unsigned number, voltage unit mV

The current temperature data in the write command is invalid, and the module does not parse it. The current temperature value in the read command is a single byte signed number. The actual temperature unit of the module is ℃. The compensation temperature point in the read/write command is a single byte signed number. The value range is -30~90, and the unit is ℃. 5 ℃ is a point.

The gate voltage compensation value under the temperature in the read/write command is a 2-byte unsigned number with a value range of 0~1000. The unit is mV before the low byte and after the high byte.

2.6.1.3 Gate voltage compensation under power (0x8004)

Read request/Set response data/Set request/Read response data:

S/N	Parameter name	length	describe
1	Grid voltage serial number	1	Unsigned number: serial number of grid voltage to be compensated (1,2,3,4...)
2	Current power	1	Number of symbols: dBM
3	Compensated power point	1	Unsigned number: 0~100dBM
4	Grid voltage compensation value under power	2	Unsigned number: 0~1000 mV

The current power data in the write command is invalid, and the module does not parse it. The current power value in the read command is a single byte signed number. The actual output power of the module is in dBM. The compensation temperature point in the read/write command is a single byte unsigned number. The value range is 0~100, and the unit is dBM. 1 dBM is one point.

The gate voltage compensation value under the temperature in the read/write command is a 2-byte unsigned number with a value range of 0~1000. The unit is mV before the low byte and after the high byte.

2.6.1.4 Gate voltage reference value (0x8006)

Read request/Set response data/Set request/Read response data:

S/N	Parameter name	length	describe
1	Grid voltage serial number	1	Unsigned number: serial number of grid voltage to be compensated (1,2,3,4...)
2	Reference value of grid voltage	2	Unsigned number: 0~5000 mV

The gate voltage reference value at the temperature in the read/write command is a 2-byte unsigned number with a value range of 0~5000. The unit is mV before the low byte and after the high byte.

2.6.1.5 ALC compensation value (0x8008)

Read request/Set response data/Set request/Read response data:

S/N	Parameter name	length	describe
1	ALC compensation value	1	Number of symbols: -100~100

2.6.2 Digital module compensation command

2.6.2.1 DAC5662 temperature compensation (0x8030)

Set request/read response data:

S/N	Parameter name	length	describe
1	Compensation value	166	Unsigned number

The temperature compensation range of DAC5662 is -40~125 ℃. Each degree is a compensation value, one compensation value is 1 byte, and a total of 166 bytes.

Read request/set response data: no command data

2.6.2.2 RX channel gain compensation switch (0x8040)

Set request/read response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number
2	switch	1	1. On; 0, OFF

Read request/set response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number

2.6.2.3 RX channel temperature compensation switch (0x8041)

Set request/read response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number
2	switch	1	1. On; 0, OFF

Read request/set response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number

2.6.2.4 RX channel DATT compensation switch (0x8042)

Set request/read response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number
2	switch	1	1. On; 0, OFF

Read request/set response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number

2.6.2.5 RX channel flatness compensation switch (0x8043)

Set request/read response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number
2	switch	1	1. On; 0, OFF

Read request/set response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number

2.6.2.6 RX channel frequency point compensation switch (0x8044)

Set request/read response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number
2	switch	1	1. On; 0, OFF

Read request/set response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number

2.6.2.7 RX channel gain compensation value (0x8060)

Set request/read response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number
2	Compensation value	4	(0~1.99) floating point number, IEEE-754

Read request/set response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number

The compensation here is the compensation in the digital field. When the compensation value is 1, it will not be compensated. If the compensation value

is less than 1, it will be negative gain. If the compensation value is greater than 1, it will be positive gain. Conversion formula of compensation db value: db=20log (compensation value).

2.6.2.8 RX channel temperature compensation table (0x8061)

Set request/read response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number
2	Compensation value	166*4	(0~1.99) floating point number, IEEE-754

The temperature compensation range of RX channel is -40~125 ℃. Each degree is a compensation value (0~1.99), and a compensation value is 4 bytes, 166 * 4 bytes in total. Conversion formula of compensation db value: db=20log (compensation value).

Read request/set response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number

2.6.2.9 RX channel flatness compensation coefficient (0x8062)

Set request/read response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number
2	Compensation coefficient	16*32	Signed number

Read request/set response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number

The flatness compensation coefficient is 32 16 bit signed numbers.

2.6.2.10 RX channel frequency point gain compensation (0x8063)

Set request/read response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number
2	Channel number	1	Unsigned number
3	Compensation value	4	Floating point number, IEEE-754, unit:

			db Value range: -10~6

Read request/set response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number
2	Channel number	1	Unsigned number

The receiving channel can be divided into multiple channels. The module can compensate the overall gain of the receiving channel, or have different gain compensation for each channel. This command is generally used in modules such as digital frequency selection and frequency shift. This compensation is digital domain compensation. When the compensation value is equal to 0, it will not be compensated. If it is less than 0, it will be attenuation. If it is greater than 1, it will be positive gain amplification. The compensation db value can be a decimal value.

2.6.2.11 RX channel baseband gain compensation (0x8064)

Set request/read response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number
2	Channel number	1	Unsigned number
3	Compensation value	4	(0~1.99) floating point number, IEEE-754

Read request/set response data:

S/N	Parameter name	length	describe
1	RX channel number	1	Unsigned number
2	Channel number	1	Unsigned number

This command is similar to the frequency point gain compensation, but the difference is that the baseband gain compensation command is generally used for the digital sub band selection module. In the sub band selection module, if the sub band bandwidth is relatively wide (for example, 10M), there is only one channel in the RX channel, which is generally called the broadband module. If the subband bandwidth is relatively small, it has multiple channels like the frequency selection module.

2.6.2.12 TX channel gain compensation switch (0x8180)

Set request/read response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number
2	switch	1	1. On; 0, OFF

Read request/set response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number

2.6.2.13 TX channel temperature compensation switch (0x8181)

Set request/read response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number
2	switch	1	1. On; 0, OFF

Read request/set response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number

2.6.2.14 TX channel DATT compensation switch (0x8182)

Set request/read response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number
2	switch	1	1. On; 0, OFF

Read request/set response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number

2.6.2.15 TX channel flatness compensation switch (0x8183)

Set request/read response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number
2	switch	1	1. On; 0, OFF

Read request/set response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number

2.6.2.16 Gain compensation value of TX channel (0x81a0)

Set request/read response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number
2	Compensation value	4	(0~1.99) floating point number, IEEE-754

Read request/set response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number

The compensation here is the compensation in the digital field. When the compensation value is 1, it will not be compensated. If the compensation value is less than 1, it will be negative gain. If the compensation value is greater than 1, it will be positive gain. Conversion formula of compensation db value: db=20log (compensation value).

2.6.2.17 TX channel temperature compensation table (0x81a1)

Set request/read response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number
2	Compensation value	166*4	(0~1.99) floating point number, IEEE-754

The temperature compensation range of RX channel is -40~125 ℃. Each degree is a compensation value (0~1.99), and a compensation value is 4 bytes, 166 * 4 bytes in total. Conversion formula of compensation db value: db=20log (compensation value).

Read request/set response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number

2.6.2.18 TX channel flatness compensation coefficient (0x81a2)

Set request/read response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number
2	Compensation coefficient	16*32	Signed number

Read request/set response data:

S/N	Parameter name	length	describe
1	TX channel number	1	Unsigned number

The flatness compensation coefficient is 32 16 bit signed numbers.

2.7 Analog module power meter

2.7.1 Length of front reverse power meter (0x82c0)

Set request/read response data:

S/N	Parameter name	length	describe
1	Power meter length	1	BIT7: 1, forward; 0, Reverse
			BIT6~0: 0~24 (number of points)

Considering the limitation of EEPROM and other resources in the module, the company's module can have up to 25 points in a table.

Read request/set response data:

S/N	Parameter name	length	describe
1	Power meter length	1	BIT7: 1, forward; 0, Reverse
			BIT6~0:=0

2.7.2 Front reverse power value (0x82c1)

Set request/read response data:

S/N	Parameter name	length	describe
1	Power meter length	1	BIT7: 1, forward; 0, Reverse
			BIT6~0: 0~24 (number of points)
2	Power value	1	Number of symbols: dBm
3	Voltage value	2	Corresponding to the voltage, 2-byte unsigned integer with a ratio of 100. That is, 1234 means the voltage is 12.34V

In the setting command, the serial numbers 0 to 24 are arranged in the order of increasing voltage value. Considering the limitation of CPU resources in the module, one point in the power meter can be set/read at a time, and the maximum number of points in one meter of our module is 25.

Read request/set response data:

S/N	Parameter name	length	describe

1	Power meter length	1	BIT7: 1, forward; 0, Reverse
			BIT6~0: the nth point read/set

2.8 Fault simulation test command

The setting data of the fault simulation debugging command will not be stored by the module, and the default value will be restored after the module is powered on again!

2.8.1 ALC test switch (0x9000)

Set request/read response data:

S/N	Parameter name	length	describe
1	Receiving channel		Unsigned number, channel number of RF link
2	ALC switch	1	ALC switch; 1: On; 0: Off

Read request/set response data:

S/N	Parameter name	length	describe
1	Receiving channel	1	Unsigned number, channel number of RF link

2.8.2 LO simulation unlock test switch (0x9004)

Set request/read response data:

S/N	Parameter name	length	describe
1	LO No		Unsigned number, channel number of RF link
2	Loss of lock switch	1	LO lockout switch; 1: On; 0: Off

Read request/set response data:

S/N	Parameter name	length	describe
1	LO No	1	Unsigned number, LO hardware number

2.9 Chip register debugging command

2.9.1 DAC0 (AD9122) (0xa000)

2.9.2 DAC1 (AD9122) (0xa001)

2.9.3 Clock chip (AD9524) (0xa010)

2.9.4 Quadrature modulator 0 (HMC1197) (0xa014)

2.9.5 Quadrature modulator 1 (HMC1197) (0xa015)

2.9.6 FPGA test control register (0xa024)

2.9 Complete machine command

2.9.1 DATT attenuation (0xb000)

Set request/read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	
2	DATT value	1			Value: actual attenuation value * 8

Read request/set response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	

2.9.2 RF switch (0xb010)

Set request/read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	
2	switch	1			1: On, 0: Off

Read request/set response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	

2.9.3 ALC (0xb020)

Set request/read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	
2	ALC value	4			ALC control target value, (dBm) floating point number, IEEE-754

Read request/set response data:

S/N	Parameter name	length	Subitem	position	describe

1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	

2.9.4 ALC alarm threshold (0xb028)

Set request/read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	
2	ALC alarm value	4			ALC alarm value, (dBm) floating point, IEEE-754

Read request/set response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	

2.9.5 Input power (0xb030)

Read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole	2	Up and down	Bit8	0: Down, 1: Up

	machine		selection		
			Channel No	Lower 8 bits	
2	Power value	4			(dBm) Floating point number, IEEE-754

Read request:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	

2.9.6 Input Overpower Alarm Threshold (0xb038)

Set request/read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	
2	Overpower threshold	4			(dBm) Floating point number, IEEE-754

Read request/set response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower	

				8 bits	

2.9.7 Input underpower alarm threshold (0xb039)

Set request/read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	
2	Underpower threshold	4			(dBm) Floating point number, IEEE-754

Read request/set response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	

2.9.8 Output power (0xb040)

Read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	
2	Power value	4			(dBm) Floating point number, IEEE-

					754

Read request:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	

2.9.9 Output Overpower Alarm Threshold (0xb048)

Set request/read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	
2	Overpower threshold	4			(dBm) Floating point number, IEEE-754

Read request/set response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	

2.9.10 Output underpower alarm threshold (0xb049)

Set request/read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	
2	Underpower threshold	4			(dBm) Floating point number, IEEE-754

Read request/set response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	

2.9.11 Standing wave ratio (0xb050)

Read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	
2	Standing wave ratio	4			(dBm) Floating point number, IEEE-754

Read request:

S/N	Parameter name	length	Subitem	position	describe

1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	

2.9.12 SWR alarm threshold (0xb058)

Set request/read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	
2	Standing wave ratio threshold	4			(dBm) Floating point number, IEEE-754

Read request/set response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	

2.9.13 Amplifier temperature (0xb060)

Read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of	2	Up and	Bit8	0: Down, 1: Up

	the whole machine		down selection		
			Channel No	Lower 8 bits	
2	Temperature value	4			(dBm) Floating point number, IEEE-754

Read request:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	

2.9.14 Power amplifier over temperature alarm threshold (0xb068)

Set request/read response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up
			Channel No	Lower 8 bits	
2	Over temperature value	4			(dBm) Floating point number, IEEE-754

Read request/set response data:

S/N	Parameter name	length	Subitem	position	describe
1	RF channel of the whole machine	2	Up and down selection	Bit8	0: Down, 1: Up

			Channel No	Lower 8 bits	

2.9.15 Digital board locking status (0xb070)

Read response data:

S/N	Parameter name	length	describe
1	Number of digital board	1	All digital boards in the whole machine are numbered by 0~N
2	Lock status	1	This lock includes the OR value of all locked items. 1 is locked and 0 is unlocked

Read request:

S/N	Parameter name	length	describe
1	Number of digital board	1	All digital boards in the whole machine are numbered by 0~N

2.9.16 Optical port connection status (0xb080)

Read response data:

S/N	Parameter name	length	describe
1	Optical port number	1	All optical ports in the whole machine are numbered by 0~N
2	Connection status	1	This lock includes or values of all locked items, 1 connected, 0 disconnected

Read request:

S/N	Parameter name	length	describe
1	Optical port number	1	All optical ports in the whole machine are numbered by 0~N

2.9.17 Digital optical port synchronization status (0xb082)

Read response data:

S/N	Parameter name	length	describe
1	Optical port number	1	All optical ports in the whole machine are numbered by 0~N
2	Synchronization status	1	This lock includes the OR value of all locked items. 1 is synchronized and 0 is out of step

Read request:

S/N	Parameter name	length	describe
1	Optical port number	1	All optical ports in the whole machine are numbered by 0~N

2.9.18 Optical port receiving power (0xb084)

Read the response data: when the optical port number is 0xff, read the data of all optical ports

S/N	Parameter name	length	describe
1	Optical port number	1	All optical ports in the whole machine are numbered by 0~N (special value: 0xff)
2	Optical receiving power	4*N	(dBm) Floating point number, IEEE-754

Read request:

S/N	Parameter name	length	describe
1	Optical port number	1	All optical ports in the whole machine are numbered by 0~N (special value: 0xff)

2.9.19 Optical port transmission power (0xb085)

Read the response data: when the optical port number is 0xff, read the data of all optical ports

S/N	Parameter name	length	describe
1	Optical port number	1	All optical ports in the whole machine are numbered by 0~N (special value: 0xff)
2	Optical power	4*N	(dBm) Floating point number, IEEE-754

Read request:

S/N	Parameter name	length	describe
1	Optical port number	1	All optical ports in the whole machine are numbered by 0~N (special value: 0xff)

2.9.20 Optical port switch (0xb086)

Set request/read response data:

S/N	Parameter name	length	describe
1	Optical port number	1	All optical ports in the whole machine are numbered by 0~N
2	Optical port switch	1	1 ON, 0 OFF

Read request/set response:

S/N	Parameter name	length	describe
1	Optical port number	1	All optical ports in the whole machine are numbered by 0~N

2.9.21 Optical receiver under power alarm threshold (0xb088)

Read response data:

S/N	Parameter name	length	describe
1	Optical port	1	All optical ports in the whole machine are

	number		numbered by 0~N
2	Optical receiving underpower threshold	4	(dBm) Floating point number, IEEE-754

Read request:

S/N	Parameter name	length	describe
1	Optical port number	1	All optical ports in the whole machine are numbered by 0~N

2.9.22 Whole machine temperature (0xb0a0)

Read response data:

S/N	Parameter name	length	Subitem	position	describe
1	Temperature value	4			(dBm) Floating point number, IEEE-754

No data in read request

2.9.23 Whole machine temperature alarm threshold (0xb0a8)

Set request/read response data:

S/N	Parameter name	length	describe
1	Temperature threshold	4	(dBm) Floating point number, IEEE-754

Read request/set response: no data

2.9.24 Humidity (0xb0a1)

Read response data:

S/N	Parameter name	length	Subitem	position	describe
1	Temperature value	4			(dBm) Floating point number, IEEE-754

No data in read request

2.9.25 Whole machine temperature alarm threshold (0xb0a9)

Set request/read response data:

S/N	Parameter name	length	describe
1	Humidity threshold	4	(dBm) Floating point number, IEEE-754

Read request/set response: no data

2.9.26 Alarm (0xb0b0)

Read response data:

S/N	Parameter name	length	position	describe
	ALC alarm	2	High 8-bit uplink, low 8-bit downlink	Bit by bit indication, 1: alarm, 0: normal
	Input overpower alarm	2	High 8-bit uplink, low 8-bit downlink	Bit by bit indication, 1: alarm, 0: normal
	Input underpower alarm	2	High 8-bit uplink, low 8-bit downlink	Bit by bit indication, 1: alarm, 0: normal
	Output over power alarm	2	High 8-bit uplink, low 8-bit downlink	Bit by bit indication, 1: alarm, 0: normal
	Output underpower alarm	2	High 8-bit uplink, low 8-bit downlink	Bit by bit indication, 1: alarm, 0: normal
	Standing wave ratio alarm	2	High 8-bit uplink, low 8-bit downlink	Bit by bit indication, 1: alarm, 0: normal
	Power amplifier over temperature	2	High 8-bit uplink, low 8-bit downlink	Bit by bit indication, 1: alarm, 0: normal

	alarm			
	Optical port connection alarm	2	16 bit	Bit by bit indication, 1: alarm, 0: normal
	Optical port synchronization alarm	2	16 bit	Bit by bit indication, 1: alarm, 0: normal
	Optical power alarm	2	16 bit	Bit by bit indication, 1: alarm, 0: normal
	Digital board locking alarm	1	8 bits	Bit by bit indication, 1: alarm, 0: normal
	Whole machine temperature alarm	1	0 or 1	1: Alarm, 0: Normal
	Whole machine humidity alarm	1	0 or 1	1: Alarm, 0: Normal
	Tube tripping alarm	1	0 or 1	1: Alarm, 0: Normal

Bit by bit indication: bit bit 0~N corresponds to corresponding number 0~N.

No data in read request

2.9.27 Alarm enable switch (0xb0b2)

Set request/read response data:

S/N	Parameter name	length	position	describe
	ALC alarm	2	High 8-bit uplink, low 8-bit downlink	Bit indication, 1: on, 0: off
	Input overpower alarm	2	High 8-bit uplink, low 8-bit downlink	Bit indication, 1: on, 0: off
	Input underpower alarm	2	High 8-bit uplink, low 8-bit downlink	Bit indication, 1: on, 0: off
	Output over power alarm	2	High 8-bit uplink, low 8-bit downlink	Bit indication, 1: on, 0: off
	Output underpower alarm	2	High 8-bit uplink, low 8-bit downlink	Bit indication, 1: on, 0: off
	Standing wave ratio alarm	2	High 8-bit uplink, low 8-bit downlink	Bit indication, 1: on, 0: off
	Power amplifier	2	High 8-bit uplink, low	Bit indication, 1: on, 0:

	over temperature alarm		8-bit downlink	off
	Optical port connection alarm	2	16 bit	Bit indication, 1: on, 0: off
	Optical port synchronization alarm	2	16 bit	Bit indication, 1: on, 0: off
	Optical power alarm	2	16 bit	Bit indication, 1: on, 0: off
	Digital board locking alarm	1	8 bits	Bit indication, 1: on, 0: off
	Whole machine temperature alarm	1	0 or 1	1: On, 0: Off
	Whole machine humidity alarm	1	0 or 1	1: On, 0: Off
	Tube tripping alarm	1	0 or 1	1: On, 0: Off

Bit by bit indication: bit bit 0~N corresponds to corresponding number 0~N.

Read request/set response: no data