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Encoder Modulator Decoder Demodulator Module Parameter Configuration Instructions

Version1.8

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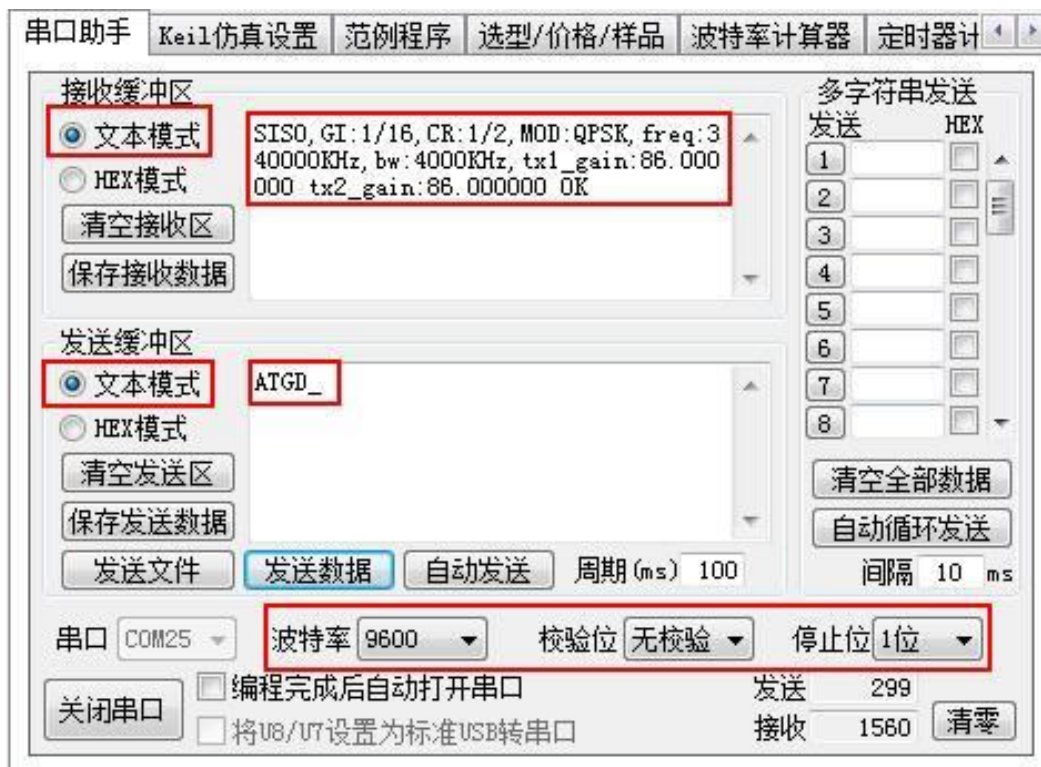
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update record:

update	date	description
1.0	2016-10-24	Initial version
1.1	2016-11-1	ATDR reply distinguishing module
1.2	2016-12-26	ATSE, ATGE add audio switch
1.3	2017-2-14	Add ATSP protocol
1.4	2017-2-28	add ATST, ATGT protocol
1.5	2017-3-27	ATGE command add AESfor status acquisition
1.6	2017-4-19	Added ATGB protocol
1.7	2017-5-18	AV and HDMI output control
1.8	2017-9-12	support for obtaining the current AV output standard
1.9	2018-3-15	Added ATSU, ATGUcommands
2.0	2019-6.25	Added ATOSD, ATSIP, ATGIP commands

Users may need to modify the configuration parameters of the module during the use of the COFDM modulator and demodulator module. In order to simplify the user's operation, we design the parameter configuration into a few simple AT commands. The user only needs to use the specified AT command and pass the corresponding parameters to complete the parameter setting of the COFDM module.

1.1 Command Introduction

The AT command for configuring COFDM module parameters starts with "AT" and ends with an underscore "_". Each AT command has several or no parameters, and each AT command has a return value. For details, please refer to the introduction of the following commands.

COFDM module.TTL level, 3.3VFor detailed serial port configuration, refer to the figure below. Please use tools such as "Serial Debug Assistant" to send AT commands to the COFDM module, pay attention to the use of text, for example:

1.2   command classification

1.3

AT commands for configuring COFDM module parameters, mainly divided into the following two categories:

Query Commands	ATDR, ATGD, ATGE, ATGI , ATGR, ATGT, ATGB, ATGU, ATGIP
Setting Commands	ATSD, ATSG, ATSM, ATSE, ATSI, ATSO, ATSR, ATSP, ATST, ATSU,ATOSD, ATSIP

setting commands can be divided into:

Power-off Saving Commands	ATSD, ATSE, ATSI, ATSO, ATSR, ATSP, ATST, ATSU, ATSIP
Power-off Not Saving Commands	ATSG, ATSM, ATOSD

are classified according to configuration objects as follows:

Sender Configuration Commands	ATDR, ATSD, ATGD, ATSG, ATSM, ATSE, ATGE, ATSI, ATGI, ATSO, ATSP, ATST, ATGT, ATSU, ATGU, ATOSD
Receiver Configuration Commands	ATDR, ATSR, ATGR, ATSP, ATST, ATGT, ATGB, ATSIP, ATGIP

1.4   Command Details

1.4.1   Ping Command

Format	**The ATDR_**
Parameter	not
Use	for the integrated system to check whether the serial port is connected and identify the connected modules.
Return value	RCB returns "device profile" string
	SUE1 returns "ATDRSUE1 OK" string
	SHD1 returns "ATDRSHD1 OK" string
Remark	query command

1.4.2   set device command

Format	**ATSD $(mimo), $(gi), $(code_rate), $ (constellation), $(freq(KHz)), $(bw(KHz)), $(tx1_gain), $(tx2_gain)_** Example: ATSD0,1,0,0,800000,8000,86.0,86.0_
Parameter	One Antenna/Dual antenna mimo: 0 mimo disable; 1 mimo enable
	Guard interval GI: 0 1/32; 1 1/16; 2 1/8; 3 1/4
	Convolution code rate: 0 1/2; 1 2 /3; 2 3/4; 3 5/6; 4 7/8;
	Constellation: 0 QPSK; 1 QAM16; 2 QAM64;
	Some Models carrier frequency freq(KHz) 200000~2700000(200MHz~2.7GHz, 1KHz step)
	Some Models carrier center frequency freq(KHz) 750000~930000(750MHz~930MHz,

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	1KHz step)
	Some Models channel bandwidth bw(KHz) 2000~8000(2MHz~8MHz, 1KHz step)
	Some Models channel bandwidth bw(KHz) 2000~8000 (2MHz~8MHz, 1KHz step)
	Transmitting antenna 1 gain tx1_gain 0.0~89.75dB, 0.25dB stepping
	Transmitting antenna 2 gain tx2_gain 0.0~89.75dB, 0.25dB setpping
Return Value	such as: ATSD0,1,0,0,800000,8000,86.0,86.0_ SISO,GI: 1/16, CR:1/2, MOD: QPSK, freq:800000KHz,bw:8000KHz,tx1_gain:86.000000 tx2_gain:86.000000 OK
Note	setting command, save when power off. Different bandwidths, guard intervals, convolution code rates, and constellations correspond to data rate calculation formulas Air interface rate Rate(MBps) = (BandWidth(MHz) * 8.0/7.0) / (1+GI) * 1512/2048*log2(constellation point) * code_rate * 188/204. Taking 8MHz bandwidth as an example, different guard intervals, convolution code rates, data rates corresponding to constellations and required receiving SNR

Constel-lation	Code rate	Required C/N (dB) for BER = 2×10^{-4} after Viterbi QEF after Reed-Solomon (see note 2)			Bitrate (Mbit/s) (see note 3)			
		Gaussian Channel (AWGN)	Ricean channel (F_1)	Rayleigh channel (P_1)	$\Delta/T_U = 1/4$	$\Delta/T_U = 1/8$	$\Delta/T_U = 1/16$	$\Delta/T_U = 1/32$
QPSK	1/2	3,5	4,1	5,9	4,98	5,53	5,85	6,03
QPSK	2/3	5,3	6,1	9,6	6,64	7,37	7,81	8,04
QPSK	3/4	6,3	7,2	12,4	7,46	8,29	8,78	9,05
QPSK	5/6	7,3	8,5	15,6	8,29	9,22	9,76	10,05
QPSK	7/8	7,9	9,2	17,5	8,71	9,68	10,25	10,56
16-QAM	1/2	9,3	9,8	11,8	9,95	11,06	11,71	12,06
16-QAM	2/3	11,4	12,1	15,3	13,27	14,75	15,61	16,09
16-QAM	3/4	12,6	13,4	18,1	14,93	16,59	17,56	18,10
16-QAM	5/6	13,8	14,8	21,3	16,59	18,43	19,52	20,11
16-QAM	7/8	14,4	15,7	23,6	17,42	19,35	20,49	21,11
64-QAM	1/2	13,8	14,3	16,4	14,93	16,59	17,56	18,10
64-QAM	2/3	16,7	17,3	20,3	19,91	22,12	23,42	24,13
64-QAM	3/4	18,2	18,9	23,0	22,39	24,88	26,35	27,14
64-QAM	5/6	19,4	20,4	26,2	24,88	27,65	29,27	30,16
64-QAM	7/8	20,2	21,3	28,6	26,13	29,03	30,74	31,67

NOTE 1: Figures in italics are approximate values.
NOTE 2: Quasi Error Free (QEF) means less than one uncorrected error event per hour, corresponding to BER = 10^{-11} at the input of the MPEG-2 demultiplexer.
NOTE 3: Net bit rates are given after the Reed-Solomon decoder.

1.4.3 set gain command

Format	ATSG$(tx1_gain),$(tx1_gain) _ Example: ATSG85.0,85.0_
Parameter	tx1_gain: Transmitter 1 gain
	tx2_gain: Transmitter 2 gain
Use	To dynamically adjust the output power. If the signal SNR/RSSI of the receiver is high, the output power can be reduced through the remote control link. When the SNR/RSSI of the end signal is low, increase the output power (transmitter)
return value,	Example: ATSG85.0,85.0_ set gain 85.000000 85.000000 OK
Remark	setting command, power off will not save.

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1.4.4 set modulation mode command

Format	ATSM$(gi), $(code_rate), $(constellation)_
	Example: ATSM1,1,2_
Parameter	Gard interval GI: 0 1/32; 1 1/16; 2 1/8; 3 1 /4;
	Convolution code rate: 0 1/2; 1 2/3; 2 3/4; 3 5/6; 4 7/8;
	Constellation: 0 QPSK; 1 QAM16; 2 QAM64
Use	Dynamically adjust the air interface rate, the air interface rate can be increased when the distance is short, and the air interface rate can be reduced when the distance is long (transmitter)
Return Valurate	Example:
	ATSM1,1,2_
	GI:1/16, CR:2/3, MOD: QAM64, OK
Remark	setting command, power off will not save.

1.4.5 get device status command

Format	ATGD_
Parameter	No
Use	query the current number of transmit antennas, guard interval, convolution code rate, number of constellations, transmit frequency, bandwidth, gain parameters (transmitter)
Return Value	Example:
	ATGD_
	SISO, GI:1 /16, CR: 1/2, MOD: QPSK, freq: 800000KHz, bw: 8000KHz, tx1_gain: 86.000000 tx2_gain: 86.000000 OK
Remark	query command

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1.4.6 set encoder command

Format	ATSE$(llc),$(rt),$(bitrate) ,$(gop),$(audio)_ Example: ATSE0,0,0.0,0,0_
Parameter	Enhanced data reliability option llc: 0 disable; 1 enable (requires the receiving end to enable this option at the same time, use in pairs, because more redundant data is added to enhance reliability, the video bit rate of the transmitting end should be set when this option is turned off half of)
	Real-time priority/quality priority rt: 0 image quality priority; 1 real time priority;
	Bitrate: 0 let system decide; >0 specify bitrate(float)
	I frame interval gop: 0 let system decide; >0 specify gop
	Audio encoding option audio: 0 disable; 1 enable
Use	Used to set encoding parameters (Transmitter)
return value	Example: ATSE0, 0,0.0,0,0_ MODE:0,RT:0,bitrate: 0.0Mbps,gop:0,audio:0,OK
Remark	setting command, save when power off.

1.4.7 get encoder command

Format	ATGE_
Parameter	No
Use	querying encoding parameters (sending end)
Return Value	Example: ATGE_ MODE:0, RT:0,bitrate:4.0Mbps,gop:10,audio:0,aes:0, OK
Remark	1. Query command 2. Aes means the current encryption status: 0 disable; 1 enable

1.4.8 get input command

Format	ATGI_
Parameter	No
Use	query the current camera input parameters (transmitter)
Return Value	Example: ATGI_ input_size: 1080p, input_rate: 60fps, sensor_type: hdmi,OK
Remark	query command

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1.4.9 set input command

Format	**ATSI$(input_size),$(input_rate) _** Example: ATSI1080,25_
Parameter	input resolution input_size: 0 let the system detect; >0 specify input size
	input frame rate input_rate: 0 let the system detect; > 0 specify input fps
Use	to specify the input resolution and frame rate to meet some special signal sources, or some special application needs (transmitter)
Return Value	Example: ATSI1080,25_ input_size:1080p,input_rate: 25fps, OK
Remarks	1、 After the user specifies the input resolution and frame rate through this command, the system will no longer detect the signal source (**use with caution**). 2、 The user can restore the default through the following command: ATSI0,0_ 3、 Set the command and save it after power-off.

1.4.10 set output command

Format	**ATSO$(output_size),$(output_rate) _** Example: ATSO720,30_
Parameter	Transmitter: encoding output resolution output_size: 0 equal to input_size; >0 specify output size Receiver: HDMI output resolution (720, 1080)
	Transmitter: encoding output frame rate output_rate: 0 equal to input_rate; >0 specify output_rate (fps) Receiver: HDMI output frame rate 720p supports frame rate (50, 60); 1080p supports frame rate (24, 25, 30, 50, 60)
Use	Transmitter: Used to specify the encoding output resolution and frame rate to meet the requirements of certain applications for zooming and frame reduction Receiver: used to configure the resolution and frame rate of HDMI output
Return Value	Example: ATSO720,30_ output_size: 720p, output_rate: 30fps, OK
Remarks	1. For HDMI input only, this command is invalid for AV input 2. Output_size <= input_size; output_rate<=input_rate 3. Set the command and save it after powering off.

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1.4.11 set input sources command (switch HDMI / CVBS input)

Format	ATSU$(vin),$(ain)_ Example: ATSU0,1 _
Parameter	Video input selection VIN: 0 let system detect; 1 force CVBS input; 2 force hdmi/SDI input Audio input selection AIN: 0 let system detect; 1 force analog input
Use	Used to meet specific application requirements (Example: HDMI/SDI input video, MIC input audio)
Return Value	Example: ATSU0,1_ ATSU0,1 OK
Remark	setting command, power-off save.

1.4.12 get user command

Format	ATGU _ Example: ATGU_
Parameter	No
Use	to query user-specific configuration
Return Value	Example: ATGU_ ATGU0,1 OK
Remark	query command return parameter description please refer to ATSU command

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1.4.13 set receiver command

Format	**ATSR $(freq), $(bw), $(llc), $(cvbs)_** Example: ATSR320000,6000,0,0_
Parameter	DR2C carrier frequency freq(KHz) 200000~860000(200MHz~860MHz, 1KHz step) DR900 carrier center frequency freq(KHz) 200000~1600000(200MHz~1.6GHz, 1KHz step)
	DR2C channel bandwidth bw(KHz) 2000~8000(2MHz~8MHz, 1KHz step) DR900 channel bandwidth bw(KHz) 3200~8000(3.2MHz~8MHz, 1KHz step)
	Enhanced data reliability option llc: 0 disable; 1 enable (it is required that the transmitter should also enable this option at the same time, and use it in pairs. Since more redundant data is added to enhance reliability, the video bit rate of the transmitter should be set to when this option is turned off half of)
	AV output system cvbs: 0 pal; 1 ntsc
Use	to set the receiver parameter
Return Value	example: ATSR320000,6000,0,0_ ATSR320000,6000,0,0 OK
Remark	setting command, save when power off.

1.4.14 get receiver command

Format	**ATGR_**
Parameter	**No**
ATGR_	the receiving end parameter
Return Value	Example: ATGR320000,6000,0,aes:0,cvbs:0 OK
Remark	1、 Query command 2、 Aes parameter indicates the current encryption status: 0 disable;1 enable 3、 CVBS parameter Indicates the current AV output standard: 0 pal;1 ntsc

1.4.15 get bit error rate command

Format	**ATGB_**
Parameter	No
Use	querying the bit error rate and signal strength of the dual antennas at the receiving end
Return Value	Example: ATGB_ ATGB ber1:0.00% ber2:0.00% RSSI1 :54 RSSI2:53 Lock1:1 Lock2:1 OK
Remarks	1、 query commands 2、 ber1 and ber2 respectively indicate the bit error rate of each antenna, ranging from 0.0% to 100.0% 3、 RSSI1 and RSSI2 respectively indicate the signal strength of each antenna, ranging from 0 to 100 4、 Lock1 and Lock2 respectively indicate the signal locking status of each antenna (1 Represents signal lock)

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1.4.16 set password command

Format	ATSP$(password), $(password)_
	Example: ATSP123456, 123456_
Parameter	AES key password: 6-digit password (ASCII)
	AES key password: 6-digit password (ASCII) (repeat it for confirmation)
Use	Used to set the AES key of the transceiver (transmitter and receiver)
Return Value	Example:
	ATSP123456
	ATSP123456 OK
Remark	1. When the password is all 0, AES encryption is turned off.
	2. Set the command and save it after power off.

1.4.17 set data transfer command

Format	ATST$(baud rate), $(parity)_
	Example: ATST115200,0_
Parameter	Baud rate baud rate: 1200、2400、4800、9600、19200、38400、57600、115200
	Check Code: 0: None; 1: Odd; 2: Even
Use	Used to set the baud rate and parity bit of the serial port for data transparent transmission
Return Value	Example:
	ATST115200,0_
	ATST115200,0 OK
Remarks	Set command

1.4.18 get data transfer Command

Format	ATGT_
Parameter	No
Use	Used to query the baud rate and check code
Return Value	Example:
	ATGT_
	ATGT115200,0 OK
Remarks	query command

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1.4.19 set ip address command

Format	**ATSIP$(ip), $(ip)_** Example: ATSIP192.168.1.215,192.168.1.215_
Parameters	Local IP address
	Local IP address (repeat to confirm)
Use	Used to set the receiver IP address
Return Value	Example: ATSIP192.168.1 .215,192.168.1.215_ ATSIP192.168.1.215 OK
Remarks	1. After setting the IP address, the receiving end needs to be restarted to take effect.. 2. Set the command and save it after power off.

1.4.20 get ip address command

Format	**ATGIP_** Example: ATGIP_
Parameter	No
Use	to query the current IP address of the receiving end
Return value	Example: ATGIP_ ATGIP192.168.0.215 OK
Remark	1、 query command

1.4.21 OSD overlay protocol

Format	**ATOSD$(idx), $(x), $(y), $(str)_** Example:ATOSD0,40,20,height: 100m_
Parameter	IDX index: 0~7 (supports OSD overlay for 8 areas) x-coordinate: 0~1919 Y coordinate: 0~1079 str: the string to be displayed at the corresponding coordinates (the space symbol is used to clear the display)
Use	on the video screen. OSD information
Return value	No
Remarks	1. The user specifies the x and y coordinates of the OSD display according to the maximum 1920x1080 pixels, and the system will correct the coordinates according to the actual display situation. 2. The '_' character cannot be contained in the str parameter

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