Wuxi Sicomm Communication Technologies, Inc

Packet Interface of SCT2400

Version: 1.2

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Change History

Version	Date	Change Descriptions
1.0	6/28/2018	Draft
1.1	11/30/2018	Interface physical description added
1.2	02/22/2019	5.10 5.27 5.30 Add Read Message Delete VOX Threshold

Interface physical description

The SCT2400 provides a UART interface as a communication interface to an external controller that may be used to configure and interrogate the status of the SCT2400. The UART interface is a universal asynchronous interface with a fixed configuration: baud rate is 38400 bit/s, stop bit is 2 bits, data bit is 8 bits, parity check is turned off.

UART connection pin configuration in SCT2400 is as below:

Pin	UART Interface Name	I/O	Function
G8	UART_TX	O	Host control interface,
G9	UART_RX	I	

Table 1 USART Pin Configuration

Contents:

    3

1 Syntax Description

Sicomm Radio is compatible with the AT command protocol as user control protocol, using a set of ASCII-based command line format instructions. The syntax format and processing flow are described below.

Serial port configuration:
- Baud rate: 38400
- Data bit: 8
- Stop bit: 2
- Parity bit: None
- Flow control: None

2 Syntax Format

2.1 Format Description

<>: Indicates it must be included
[]: Indicates it is an optional

2.2 Command Message

AT<+CMD>[operator][para1][,][para2][,][para3][,][para4]…<CR><LF>

AT: AT Command prefix

<+CMD>: Custom extended AT command name, starting with the character '+'

[operator]: Instruction operator, this document defines the following five types of AT commands according to different operators:
No instruction operator: Function AT Command
[?]: Query AT Command
[=]: Set AT Command
[=!]: Set AT command, and write the parameters to non-volatile memory in the external EEPROM (external on I2C bus)
[,]: Comma, parameter separator
[parax]: The AT command parameter format is a string, and the written content does not contain

double quotes "" or the string end prompt '\0'

[CR]: Enter, ASCII character 0x0D

[LF]: Line feed, ASCII character 0x0A

2.2.1 Function AT Command

[operator]: No instruction operator

[parax]: No parameters

Sample Instruction: AT+TEST<CR><LF>

Instruction Description: <+TEST> is a test command, the sample instruction is a test function

2.2.2 Query AT Command

[operator]: [?]

[parax]: No parameters

Sample Instruction: AT+SQL? <CR><LF>

Instruction Description: <+SQL> is the command to control the squelch level. The sample instruction is to query the current squelch level.

2.2.3   Set AT Command

a.

[operator]: [=]

[parax]: There is at least one parameter

Sample Instruction: AT+SQL=1<CR><LF>

Instruction Description: <+SQL> is the command to control the squelch level. The sample instruction is to set the squelch level to level 1.

b.

[operator]: [=!]

[parax]: There is at least one parameter

Sample Instruction: AT+SQL=!1<CR><LF>

Instruction Description: <+SQL> is the command to control the squelch level. The sample instruction is to set to squelch level 1, and save the setting to the non-volatile memory in the external EEPROM(external on I2C bus)

2.3 Response Message

+CME: Error response message default prefix (control message error)

<:>: colon is the connection used to respond to the specific content after the message

<err>: Response message error code, see Chapter 2.4

2.3.1 Function AT Command Response Message

Successful Response: <CR><LF>OK<CR><LF>
Failed Response: <CR><LF>+CME <:><err><CR><LF>

2.3.2 Query AT Command Response Message

Successful Response:
<CR><LF><+CMD><:>[para1][,][para2][,][para3]...<CR><LF><CR><LF>OK<CR><LF>
Failed Response: <CR><LF>+CME <:><err><CR><LF>

2.3.3 Set AT Command Response Message

Successful Response: <CR><LF>OK<CR><LF>
Failed Response: <CR><LF>+CME<:><err><CR><LF>

2.4 Response Message Error Code

Value	Meaning
-1	Undefined error
-2	Command unsupported
-3	Invalid operator
-4	Invalid parameter
-5	Operation not allowed

3 Processing Flow

The AT command protocol takes the form of command + response. Most commands require the receiver to return a response message after processing. If a new command is received again during the previous command processing, it will be silently discarded without returning any message, as shown below:
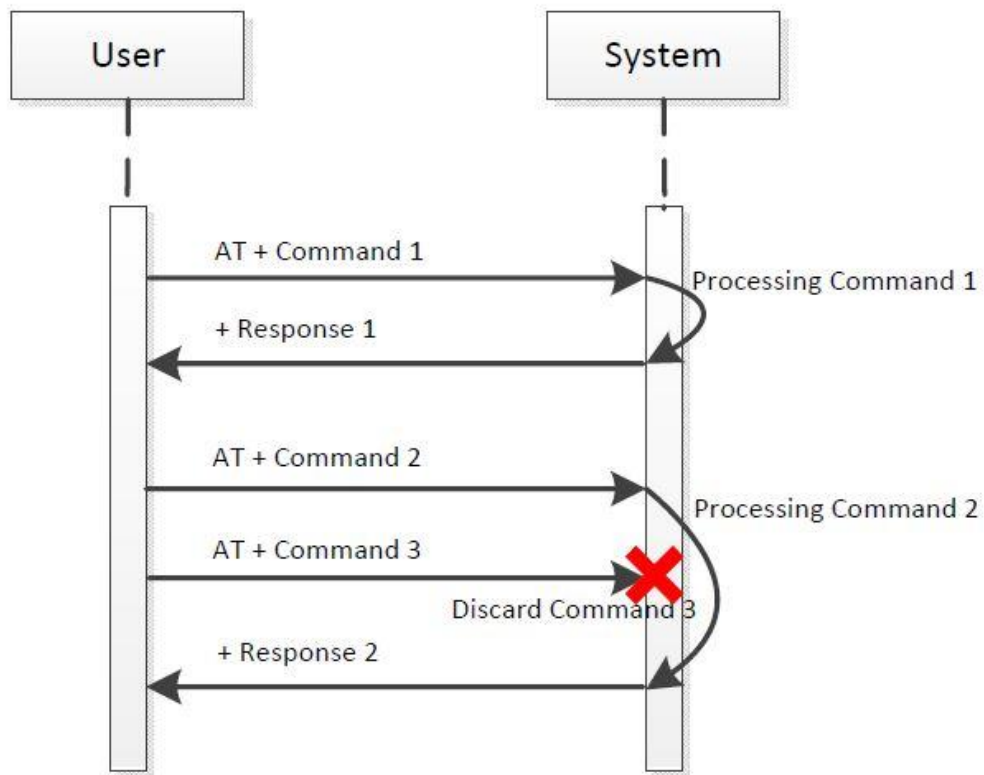
4 Format Example

Example 1: Function AT command returns a success message
Command Message: AT + TEST
Response Message: Ok

Example 2: Function AT command returns an error message
Command Message: AT + TEST
Response Message: +CME: -1

Example 3: Query AT command
Query the speaker state on or off:
Command Message: AT + SPK?
Response Message: +SPK: on

Example 4: Set AT Command.
Set SQ level to 1:
Command Message: AT + SQL = 1
Response Message: OK

Example 5: Set AT command and write to non-volatile memory in the SCT2400

Set SQ level to 1 and write to non-volatile memory in the SCT2400

Command Message: AT + SQL =! 1

Response Message: OK

Example 6: Automatically report the registered call state

Command Message: AT + CALLSTATE&on

Response Message: OK

5 Sicomm Extended AT Command Set

Parax string: the written content does not contain double quotes "" or the string end prompt '\0', and it is case sensitive.

NA: the command format is not supported

NULL: there is no operator or parameter

5.1 +KEY 1

+CMD	Operator&Para	Description
+KEY 1	NULL	NA

	?	Query KEY 1 current state
		
		Query response message format: **+KEY1**: **<Para>**
		
		  Para: **up** KEY 1 is raised
		  Para: **down** KEY 1 is pressed

	=Para	Para: **down** Set KEY 1 pressed Para: **up** Set KEY 1 raised
	=!	NA

5.2 +KEY 2

+CMD	Operator&Para	Description
+KEY 2	NULL	NA
	?	Query KEY 2 current state

		Query response message format:　　**+KEY2**: **<Para>**
		Para: **up**　　KEY 2 is raised Para: **down**　　KEY 2 is pressed
	=Para	Para: **down**　　Set KEY 2 pressed Para: **up**　　Set KEY 2 raised
	=!	NA

5.3 +KEY 3

+CMD	Operator&Para	Description
+KEY 3	NULL	NA
	?	Query KEY 3 current state Query response message format:　　**+KEY 3**: **<Para>** Para: **up**　　KEY 3 is raised Para: **down**　　KEY 3 is pressed
	=Para	Para: **down**　　Set KEY 3 pressed Para: **up**　　Set KEY 3 raised
	=!	NA

5.4 +KEY 4

+CMD	Operator&Para	Description
+KEY 4	NULL	NA
	?	Query KEY 4 current state Query response message format:　　**+KEY 4**: **<Para>** Para: **up**　　KEY 4 is raised Para: **down**　　KEY 4 is pressed
	=Para	Para: **down**　　Set KEY 4 pressed Para: **up**　　Set KEY 4 raised
	=!	NA

5.5 +VBATLV Battery Voltage Level

+CMD	Operator&Para	Description
+VBATLV	NULL	NA
	?	Query battery voltage level Query response message format: **+VBATLV**: **\<Para\>** Para range **1 to 5**, corresponding from level 1 to level 5. The voltage range corresponding to each level can be adjusted, tentatively as follows: Level 1: volt<=3.6v Level 2: 3.6v<volt<=3.7 v Level 3: 3.7v<volt<=3.8 v Level 4: 3.8v<volt<=3.9v Level 5: 3.9v<volt
	=	NA
	=!	NA

Useful if indicating battery voltage as an icon on a display

5.6 +VBATVAL   Battery Voltage Value/Low battery threshold

+CMD	Operator&Para	Description
+VBATVAL	NULL	NA
	?	Query the battery voltage value Query response message format **+VBATVAL:\<Para\>** Para is the decimal voltage value in string form, unit is millivolts (mv)
	=Para1,Para2	Set voltage threshold Para1: **lowbat_threshold**, low voltage threshold Identification Para2: Low voltage threshold (range: **1-65535**)
	=!	Set the voltage threshold, power fail safeguard Para1: lowbat_threshold low power threshold Para2: Low power threshold (range: 1-65535) in millivolts (mv)

5.7 +MODELNAME Model Name

+CMD	Operator&Para	Description
+MODELNAME	NULL	NA
	?	Query the radio model name
	=	NA
	=!	NA

5.8 +CH Channel

+CMD	Operator&Para	Description
+CH	NULL	NA
	?	Query current channel number Query response message format: **+CH:\<Para\>** Para is a decimal value in string form indicating the channel number.
	=Para	Switch channel Para is a decimal value in string form indicating the channel number, the range of values is tentatively set 1-16 **AT+CH,** the setting command will shield the hardware circuit signal of the channel knob. If you need to use the channel knob again, you need to activate the hardware circuit signal detection function by the "AT+CHANKNOB=on" command.
	=!	NA

5.9 +CHANKNOB   Channel Knob Signal Detection

+CMD	Operator&Para	Description
+CHANKNOB	NULL	NA
	?	NA
	=Para	Para: **on,** Turn on the channel knob hardware circuit signal detection Para: **off,** Turn off the channel knob hardware circuit signal detection
	=!	NA

5.10 +ZONE

+CMD	Operator&Para	Description
+ZONE	NULL	NA
	?	Query current zone number Query response message format, +**ZONE**:**<Para>** Para is a decimal value in string form, Indicating the zone number, starting from 0 **0:** Zone 1
	= Para	Switch Zone Para is a decimal value in string form, indicating zone number, range : **0 ~ (Zone_Max_Num-1)**
	=!	NA

5.11 +RXFREQ Receiving Frequency

+CMD	Operator&Para	Description
+RXFREQ	NULL	NA
	?	Query current channel receive frequency Query response message format +**RXFREQ**:**<Para>** Para is a decimal value in string form, unit is **Hz**
	=Para	Set the current channel receive frequency, the unit is Hz Eg. Set Para to 2400125000, it means that receiving frequency of the current channel is set to 2400.125MHz.
	=!Para	Set the current channel receiving frequency, power fail safeguard

5.12 +TXFREQ   Transmitting Frequency

+CMD	Operator&Para	Description
+TXFREQ	NULL	NA
	?	Query current channel transmit frequency Query response message format +**TXFREQ**:**<Para>** Para is a decimal value in string form, unit is **Hz**
	=Para	Set the current channel transmit frequency, the unit is Hz Eg. Set Para to 2400125000, it means that transmitting frequency of the current channel is set to 2400.125MHz.
	=!Para	Set the current channel transmitting frequency, power fail

		safeguard

5.13 +TXPWR   Transmit Power

+CMD	Operator&Para	Description
+TXPWR	NULL	NA
	?	Query transmit power level
		Query response message forma +**TXPWR**: **<Para>**
		Para: SCT2400 transmit power level, range [**-18 ~ +13**]
	=Para	Set SCT2400 transmit power
		Par: transmit power level value, range [**-18 ~ +13**]
	=!Para	Set SCT2400 transmit power
		Para: transmit power level value, range [**-18 ~ +13**]
		Power fail safeguard

5.14 +DFRCALLID DFR Call Type and ID

+CMD	Operator&Para	Description
+DFRCALLID （**DFR channel only**）	NULL	NA
	?	Query DFR call type and call ID
		Query response message format:
		+**DFRCALLID**: **<Para1>,<Para2>**
		Para1 is call type
		Para1: **individual**, Individual Call
		Para1: **group**, Group Call
		Para1: **all**, All Call
		Para2 is Call ID, decimal
	=Para1,Para2	DFR channel only
		Para1 is call type
		Para1: **individual**, Individual Call
		Para1: **group**, Group Call
		Para1: **all**, All Call
		Para2 is Call ID, decimal
		The value of the non-all call ID range is **1 ~254**.
		All call ID is **255**
	=!Para1,Para2	Set DFR call type and call ID
		Power fail safeguard

5.15 +DFRGID   DFR Receiving Group ID

+CMD	Operator&Para	Description
+DFRGID **(DFR Channel Only)**	NULL	NA
	?	Query DFR receiving group ID Query response message format: **+DFRGID**: **\<Para1\>,\<Para2\>,\<Para3\>, ……** Para1: number of receiving group ID Para2,Para3,…… decimal ID value corresponding to each receiving group, the number of parameters is determined by Para1 Response example: +DFRGID:5,11,22,33,44,55 5 receiving group IDs, each group ID is 11, 22, 33, 44, 55
	=Para1,Para2	Para1 is the group number, ranging from **1 to 32** (up to 32 receiving group IDs, this value is related to the platform) Para2 is the DFR receiving group ID, which ranges from **1 to 254**
	=!	NA

5.16 +DFROWNID DFR Local ID

+CMD	Operator&Para	Description
+DFROWNID **(DFR Channel Only)**	NULL	NA
	?	Query DFR local ID Query response message format, **+DFROWNID**: **Para** Para is DFR local ID
	=Para	Para is DFR local ID, decimal, value range **1~254**
	=!Para	Set DFR local ID, power fail safeguard

5.17 +REBOOT

+CMD	Operator&Para	Description
+REBOOT	NULL	Radio reboot
	?	NA
	=	NA
	=!	NA

5.18 +SENDSMS   Send Message

+CMD	Operator&Para	Description
+SENDSMS **(Digital Channel** **Only)**	NULL	NA
	?	NA
	=Para	Para is a text message string sent with the maximum length of 300 ASCII characters. Eg.AT+SENDSMS=abc123: send text message "abc123"
	=!	NA

5.19 +READSMS   Read Message

+CMD	Operator&Para	Description
+READSMS （**Digital Channel** **Only**）	NULL	NA
	?	Query received message Query response message format +**READSMS：Content** Content is string Note：The maximum length is 300 Bytes
	=	NA
	=!	NA

5.20 +SPK   Speaker

+CMD	Operator&Para	Description
+SPK	NULL	NA
	?	Query the current switch state of the speaker Query response message format: +**SPK**: **Para** Para: **on** speaker is on Para: **off** speaker is off
	=Para	Para: **on** turn on speaker Para: **off** turn off speaker
	=!	NA

5.21 +MIC Microphone

+CMD	Operator&Para	Description
+MIC	NULL	NA
	?	Query the current switch state of MIC Query response message format: **+MIC**: **Para** Para: **on** MIC is on Para: **off** MIC is off
	=Para	Para: **on** Turn on MIC Para: **off** Turn off MIC Para: **disconnect** Radio MIC is disconnected Para: **connect** Radio MIC is connected
	=!	NA

5.22 +LEDIND   LED Instruction Lock State

+CMD	Operator&Para	Description
+LEDIND	NULL	NA

	?	Query the current deposit state of LED
		Query response message format: **+LEDIND**: **Para1,Para2**
		Para1: **g_on** Green light is deposited and will not be affected by Radio
		         g_off Green light is not deposited and will be affected by Radio
		
		Para2: **r_on** Red light is deposited and will not be affected by Radio
		         r_off Green light is not deposited and will be affected by Radio

	=Para1,Para2	Para1 LED type Para1: **gled** green light Para1: **rled** red light Para2 Deposit state Para2: **on** Under deposit Para2: **off** Not under deposit
	=!	NA

5.23 +GLED   Green Light

+CMD	Operator&Para	Description
+GLED	NULL	NA
	?	NA
	=Para	Para: **on** Turn on green light Para: **off** Turn off green light
	=!	NA

5.24 +RLED Red Light

+CMD	Operator&Para	Description
+RLED	NULL	NA
	?	
	=Para	Para: **on** Turn on red light Para: **off** Turn off red light
	=!	NA

5.25 +PTTCALL CALL

+CMD	Operator&Para	Description
+PTTCALL	NULL	NA
	?	NA
	=Para	Para is used to control the start and stop Radio calls. Para: **start** Start calling Para: **stop** Stop calling
	=!	NA

5.26 +RMTCTRL   Remote Control

+CMD	Operator&Para	Description
+RMTCTRL **(Digital Channel Only)**	NULL	NA
	?	NA
	=Para<,Para1> Set Para1, only when Para is monitor.	Para: **open** Transmit remote open Para: **close** Transmit remote kill Para: **monitor** Transmit monitor followed by Para1 Para: monitor time (Value range from 1 to 7, matched with time 1-5s 2-10s 3-20s 4-30s 5-60s 6-120s 7-180s) Para: **alert** Transmit alert Para: **check** Transmit check
	=!	NA

5.27 +PWRSAVE   Power Saving Mode

+CMD	Operator&Para	Description
+PWRSAVE	NULL	NA
	?	NA
	=Para1<,Para2>	Para1 is used to set power saving function on and off Para2 is used to configure sleep time ratio, when Para1=off turns off power saving function, there can be no Para2 Para1: **on** Turn on power saving mode Para2: **1:1** Para2: **1:2** Para2: **1:3** Para: **off** Turn off power saving mode
	=! Para1<,Para2>	Para1 is used to set power saving function on and off Para2 is used to configure sleep time ratio, when Para1=off turns off power saving function, there can be no Para2 Para1: **on** Turn on power saving mode Para2: **1:1** Para2: **1:2** Para2: **1:4** Para: **off** Turn off power saving mode

5.28 +UARTMODE   UART Debugging Mode Selection

+CMD	Operator&Para	Description
+UARTMODE	NULL	NA
	?	NA
	=Para	Para is for UART debug mode selection Para: **off** Turn off UART debug mode Para: **baseband** Baseband command debug mode Para: **character** Character command debug mode
	=!	NA

5.29 +CHIP   Chip register read and write command

+CMD	Operator&Para	Description
+CHIP	NULL	NA
	?	NA
	=Para1,Para2,Para3<,Para4>	Para1 is read and write identification Para1: **read** Read command, (the read command does not contain the Para4 read command response "Reg_Value = xx", xx is the register value) Para1: **write** Write command Para2 is the exteral codec chip name Para2: **es8388s** (The current firmware only support es8388s for reading and writing, other chips may be added at a later date) Para3 is the register address, the hexadecimal number represented by the character must be an even number of characters (the first character is padded with 0). For example, register 15 should be written as 0F eg:0F, indicating reg_15(0x0F) Para4 is the register value, the hexadecimal number represented by the character must be an even number of characters (the first character is padded with 0). For example, the value is 10, written as 0A, which is indicating that the written value is 10 (decimal).
	=!	NA

5.30 +VOLUME   Volume

+CMD	Operator&Para	Description
+ VOLUME	NULL	NA
	?	NA
	=Para1,Para2,Para3	Para1: **voice**, Adjust call volume Para1: **beep**, Adjust beep volume Para1: **mic**, Adjust MIC gain Para2: **digital**, Adjust the digital gain (No digital gain can be adjusted when Para1=beep) Range **0-65535** Para2: **codec**, Adjust codec gain Para3: Parameter Range： <table><tr><th>Para1</th><th>Para2</th><th>Para3</th></tr><tr><td rowspan=2>voice</td><td>digital</td><td>0 ~ 65 35</td></tr><tr><td>codec</td><td>0 ~ 7 ^(注1)</td></tr><tr><td rowspan=2>beep</td><td>digital</td><td>0 ~ 65535</td></tr><tr><td>codec</td><td>不支持</td></tr><tr><td rowspan=2>mic</td><td>digital</td><td>0 ~ 65535</td></tr><tr><td>codec</td><td>0 ~ 8 ^(注2)</td></tr></table>Note 1： 0:+6dB 1: +3dB 2: 0dB 3: -3dB 4: -6dB 5: -9dB 6: -12dB 7: -15dB Note 2： 0: 0dB 1: +3dB 2: +6dB 3: +9dB 4: +12dB 5: +15dB 6: +18dB 7: +21dB 8: +24dB
	=!	NA

5.31 +FREQCALI SCT2400 Transmit Frequency Calibration Register Configuration

+CMD	Operator&Para	Description
+FREQCALI	NULL	NA
	?	NA
	=Para	Set the frequency calibration register value Para：Frequency calibration register value, Range 0-12 Calibration method: First configure the frequency calibration register value with the **AT+FREQCALI=Para**, then use the **AT+TXCONTWAVE=on** to enable continuous transmission and see the frequency error on the spectrum analyzer. When obtaining the register value within the better deviation range, use **AT+FREQCALI=! Para** save to EEPROM
	=!	Set the frequency calibration register value and save it in EEPROM Para: Frequency calibration register value Range 0-12

5.32 TXCONTWAVE SCT2400 continuously transmitting

+CMD	Operator&Para	Description
+TXCONTWAVE	NULL	NA
	?	NA
	=Para	Para is used to enable or disable the SCT2400 continuous transmission. Para:on Turn on continuous transmission Para:off Turn off continuous transmission
	=!	NA

5.33 + +BER SCT2400 BER Test

+CMD	Operator&Para	Description
+BER	NULL	NA
	?	NA
	=Para	Para is used to enable or disable the SCT2400 bit error rate test function. Para:on Turn on BER test Para:off Turn off BER test
	=!	NA

5.34 +VOXTHRESHOLD   VOX Threshold

+CMD	Operator&Para	Description
+ VOXTHRESHOLD	NULL	NA
	?	Query VOX start-up and shut-down value of threshold (high or low) Query response message format: **+VOXTHRESHOLD**: **Para1,Para2** Para1: VOX**,** if start-up threshold (high) VOX detection energy is greater than this value, turn on VOX call (value range **1-65535**) Para2: VOX**,** if shut down threshold (low) VOX detection energy is less than this value, turn off the VOX call (value range **1-65535**)
	=Para1,Para2	Para1: VOX, if start-up threshold (high) VOX detection energy is greater than this value, turn on VOX call (value range **1-65535**) Para2: VOX, if shut-down threshold (low) VOX detection energy is less than this value, turn off the VOX call (value range **1-65535**) Para1>Para2
	=!	NA

5.35 +TEST   TEST Mode

+CMD	Operator&Para	Description
+ TEST	NULL	NA
	?	NA
	=Para1,Para2	Para1:codec Test the audio path associated with codec The Para2:loop 2400 baseband loops the ADC data of the external codec directly to the DAC output of the codec, and turns on the audio amplifier. Para2: 1ktone Control MCU and send a 1kHz Tone sound to the external codec DAC, and turns on the audio amplifier Para2: 1kbeep Control MCU and generate a 1kHz continuous beep tone and turns on the audio amplifier Para2:off Sleep codec, restore normal receiving mode, turn off audio amplifier
	=!	NA

5.36 +HELP   Help Command

+CMD	Operator&Para	Description
+HELP	NULL	Output all supported AT command names
	?	NA
	=	NA
	=!	NA
	&	NA

6 AT Special Command

6.1 AT Echo Command

ATE1   Turn on echo function

ATE0   Turn off echo function