



RAK7432/RAK7434 AT Command Manual

Overview

This document applies to Analog to LoRaWAN Bridge products. The supported product models include RAK7432/RAK7434.

AT Command Syntax

The AT command must start with `AT` or `at` and ends with `<CR> <LF>`.

AT commands can be divided into:

- **Read commands** - read the configuration or status of the device, which is in the format of `AT+<x>`
- **Write commands** - write/modify the device configuration, which is in the format of `AT+<x>=<m>:<n>`. The command name and parameters are separated by "=". If there are multiple parameters, the parameters are separated by ":".
- **Test commands** - is the test command executable, which is in the format of `AT+<x>=?`

The response format of the command is usually:

Condition	Response
Normal response with information	<code><Response><CR><LF>OK<CR><LF></code>
Normal response	<code>OK<CR><LF></code>
Response when an error occurs	<code>ERROR <Error code>:<Error packet><CR><LF></code>

NOTE

AT commands are not case-sensitive.

USB Configuration Interface

The devices are equipped with a standard USB interface for configuring via AT commands. The serial parameters are as follows:

Parameter	Value
Baud rate	115200
Data bit	8
Stop bit	1
Vrification	No

Common Errors

Error Code	Description
ERROR 1	Unsupported command
ERROR 2	Syntax Error
ERROR 3	Storage failure
ERROR 4	System busy
ERROR 5	Parameter format / number error
ERROR 6	Insufficient resources
ERROR 7	Parameter out of valid range

LoRaWAN Commands

1. AT+DEVEUI

This command reads or modifies the LoRaWAN Device EUI. The command takes effect after restart.

Operation	AT Command	Response
Read	AT+DEVEUI	<dev_eui> OK
Write	AT+DEVEUI=<device_eui>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+DEVEUI=?	OK

Parameter	Information
dev_eui	Device EUI: Hexadecimal characters, 16 bytes in length

2. AT+REGION

This command reads or modifies the Working Frequency Region/Band of the device. It will take effect after restart.

Operation	AT Command	Response
Read	AT+REGION	<region> OK
Write	AT+REGION=<region>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+REGION=?	OK

Parameter	Information
region	Supports frequency bands: EU433, CN470, CN470ALI, RU864, IN865, EU868, US915, AU915, KR920, AS923

3. AT+JOINMODE

This command reads or modifies the LoRaWAN Activation Mode of the device. It will take effect after restart.

Operation	AT Command	Response
Read	AT+JOINMODE	<mode> OK
Write	AT+JOINMODE=<mode>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+JOINMODE=?	OK

Parameter	Information
mode	Supported activation mode: ABP or OTAA

4. AT+PUBLIC

This command reads or modifies the LoRaWAN Public Settings of the device. The working mode is set to Public by default (1 value of the parameter). The modification will take effect after restart.

Operation	AT Command	Response
Read	AT+PUBLIC	<x> OK
Write	AT+PUBLIC=<x>	When the modification is successful: OK

Operation	AT Command	Response
		When modification fails: ERROR <code>:<packet>
Test	AT+PUBLIC=?	OK

Parameter	Information
x	Is the node working with the public LoRaWAN network?
0	Not working in Public mode
1	Working in Public mode

5. AT+CLASS

This command reads or modifies the LoRaWAN working Class of the device. Effective immediately after modification.

Operation	AT Command	Response
Read	AT+CLASS	<class> OK
Write	AT+CLASS=<class>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+CLASS=?	OK

Parameter	Information
class	Supported device Classes:
A	Class A

Parameter	Information
B	Class B
C	Class C

6. AT+APPEUI

The APPEUI parameter is valid when OTAA is activated. The modification will take effect after restart.

Operation	AT Command	Response
Read	AT+APPEUI	<app_eui> OK
Write	AT+APPEUI=<app_eui>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+APPEUI=?	OK

Parameter	Information
app_eui	Application EUI: Hexadecimal character, 16 bytes in length

7. AT+APPKEY

The APPKEY parameter is valid in OTAA Activation Mode. The modification will take effect after restart.

Operation	AT Command	Response
Read	AT+APPKEY	<app_key> OK

Operation	AT Command	Response
Write	AT+APPKEY=<app_key>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+APPKEY=?	OK

Parameter	Information
app_key	Application Key: Hexadecimal character, 32 bytes in length

8. AT+DEVADDR

The DEVADDR parameter is valid in ABP Activation Mode. The modification will take effect after restart.

Operation	AT Command	Response
Read	AT+DEVADDR	<dev_addr> OK
Write	AT+DEVADDR=<dev_addr>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+DEVADDR=?	OK

Parameter	Information
dev_addr	Device Address: Hexadecimal character, 8 bytes in length

9. AT+APPSKEY

The APPSKEY parameter is valid in ABP Activation Mode. The modification will take effect after restart.

Operation	AT Command	Response
Read	AT+APPSKEY	<apps_key> OK
Write	AT+APPSKEY=<apps_key>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+APPSKEY=?	OK

Parameter	Information
apps_key	Application Session Key: Hexadecimal character, 32 bytes in length

10. AT+NWKSKEY

The NWKSKEY parameter is valid in ABP Activation Mode. The modification will take effect after restart.

Operation	AT Command	Response
Read	AT+NWKSKEY	<nwks_key> OK
Write	AT+NWKSKEY=<nwkskey>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+NWKSKEY=?	OK

Parameter	Information
nwks_key	Network Session Key: Hexadecimal character, 32 bytes in length

11. AT+ADR

Turn on/off the LoRaWAN dynamic rate adjustment function of the device, which is “on” by default. The modification will take effect immediately.

Operation	AT Command	Response
Read	AT+ADR	<n> OK
Write	AT+ADR=<n>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+ADR=?	OK

Parameter	Information
n	Adaptive Data Rate
0	Disable ADR
1	Enable ADR

12. AT+DATARATE


Read/modify the LoRaWAN DataRate setting of the device, which is valid when the ADR function is turned off. The modification will take effect immediately.

Operation	AT Command	Response
Read	AT+DATARATE	<n> OK
Write	AT+DATARATE=<n>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>

Operation	AT Command	Response
Test	AT+DATARATE=?	OK

Parameter	Information
n	LoRaWAN DataRate
0 ~ 7	DataRate from 0 to 7 s is possible.

NOTE

The DataRate value and the default value are related to LoRaWAN regional parameters. Refer to [Appendix: DataRate list of each region](#)  in this document.

13. AT+CONFIRM

Turn on/off the LoRaWAN packet confirmation mechanic, which is set to be “on” by default. The modification will take effect immediately.

When the confirm function is enabled, the packets sent by the device will require the LoRa network server to send an ACK response. Unless a confirmation is received the device will resend the packet. For more information on the resending mechanic refer to **14. AT+RETRY**.

Operation	AT Command	Response
Read	AT+CONFIRM	<n> OK
Write	AT+CONFIRM=<n>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+CONFIRM=?	OK

Parameter	Information
n	Type of uplink packets
0	Unconfirmed uplink packets
1	Confirmed uplink packets

14. AT+RETRY

Set the maximum number of retry attempts of the same LoRaWAN message, that will be valid when the confirm function is enabled. The default value is 3. The modification will take effect immediately.

When $retry = n$ ($n! = 1$), if the device does not receive an ACK of a LoRaWAN message, it will resend the message until the ACK is received, or the retry counter expires.

Operation	AT Command	Response
Read	AT+RETRY	<n> OK
Write	AT+RETRY=<n>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+RETRY=?	OK

Parameter	Information
n	Max resend times
1 ~ 8	The number of retries can be between 1 and 8

15. AT+CHANNEL

When the LoRaWAN channel plan of the device is CN470 / US915 / AU915, it can be read/modified through this instruction. After execution of this command, all channels from “start ID” to “end ID” in

the instruction parameters are turned on, and the other channels are turned off. The modification will take effect after restart.

When the device is working in one of the following bands this command can only be used for reading the parameters: EU433 / RU864 / IN865 / EU868 / KR920 / AS923.

Operation	AT Command	Response
Read	AT+CHANNEL	<id>:<freq>:<drmin>:<drmax> ... OK
Write (Only valid when Region is CN470 / US915 / AU915)	AT+CHANNEL=<startid>: <endid>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+CHANNEL=?	OK

Parameter	Information
id	Channel ID
freq	Center frequency of channel, unit: Hz
drmin	DataRate (Min)
drmax	DataRate (Max)
startid	Start channel ID
endid	Stop channel ID

16. AT+ADDCHANNEL

Add a LoRaWAN channel.

This instruction is valid when the working frequency band of LoRaWAN is EU433 / RU864 / EU868 / KR920 / AS923. The modification will take effect after restart.

Operation	AT Command	Response
Write	<code>AT+ADDCHANNEL=<freq>:<drmin>: <drmax></code>	When the modification is successful: <code>OK</code> When modification fails: <code>ERROR <code>:<packet></code>
Test	<code>AT+ADDCHANNEL=?</code>	<code>OK</code>

Parameter	Information
freq	Center frequency of channel, unit: Hz
drmin	DataRate (Min)
drmax	DataRate (Max)

17. AT+RMCHANNEL

Delete a LoRaWAN channel.

This instruction is valid when the working frequency band is EU433 / RU864 / EU868 / KR920 / AS923. The modification takes effect after restart.

Operation	AT Command	Response
Write	<code>AT+RMCHANNEL=<freq>:<drmin>: <drmax></code>	When the modification is successful: <code>OK</code> When modification fails: <code>ERROR <code>:<packet></code>
Test	<code>AT+RMCHANNEL=?</code>	<code>OK</code>

Parameter	Information
freq	Center frequency of channel, unit: Hz
drmin	DataRate (Min)
drmax	DataRate (Max)

18. AT+CHANMASK

Read the currently configured LoRaWAN Channel Mask. It is determined by the currently open channels. This instruction is “read-only”.

Operation	AT Command	Response
Read	AT+CHANMASK	<chanmsk> OK
Test	AT+CHANMASK=?	OK

Parameter	Information
chanmask	Channel mask: Hexadecimal string, right to left corresponding channel ID from low to high

19. AT+TXPOWER

The TXPOWER parameter is valid when the ADR function is turned off. The modification will take effect immediately.

Operation	AT Command	Response
Read	AT+TXPOWER	<txpwr> OK
Write	AT+TXPOWER=<txpwr>	When the modification is successful: OK

Operation	AT Command	Response
		When modification fails: ERROR <code>:<packet>
Test	AT+TXPOWER=?	OK

Parameter	Information
txpwr	Transmit power (dBm, floating-point) The value range is 0 ~ maxeirp, and the effective step size is 2dbm, that is, txpwr = maxeirp - 2 * n, and n is an integer greater than or equal to 0 The maxeirp is the Maximum EIRP (Equivalent Isotropic Radiated Power) defined for the specific band you are using in the LoRa Alliance documentation.

20. AT+PINGNB

Set the PingSlot Number in each Beacon Period for Class B mode. The number of ping slots determines the period of the downlink packet of the device. The modification will take effect after restart.

Operation	AT Command	Response
Read	AT+PINGNB	<N> OK
Write	AT+PINGNB=<N>	When the modification is successful: OK When modification fails: ERROR <code>:<message>
Test	AT+PINGNB=?	OK

Parameter	Information
N	PingSlot Number in Beacon Period: 1 2

Parameter	Information
	4 8 16 32 64 128

21. AT+LPTP

LoRa Private Transport Protocol (LPTP) is a RAK proprietary message splitting protocol, which can send data with a length exceeding the maximum permissible size, using multiple messages. As it is proprietary it only works with the RAK LoRa networks server built into our commercial gateways. It is “Off” by default. The modification will take effect immediately.

Operation	AT Command	Response
Read	AT+LPTP	<x> OK
Write	AT+LPTP=<x>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+LPTP=?	OK

Parameter	Information
x	LPTP status
0	disabled
1	enabled

Data Acquisition Setting Commands

1. AT+AINPERIOD

The command is used to read or modify the analog data acquisition reporting period. The value is in seconds and the default value is 600s.

Operation	AT Command	Response
Read	AT+AINPERIOD	<N> OK
Write	AT+AINPERIOD=<N>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+AINPERIOD=?	OK

Parameter	Information
N	Analog acquisition cycle
5 ~ 43200	The value is in the range of 5 ~ 43200 seconds

2. AT+AINVALUERANGE

Read or modify the actual values represented by the minimum and maximum values of the analog interface range. The analog data read by the system will be linearly converted and reported over LoRaWAN.

The default values are:

4-20 mA interface: 4-20

0-5 V interface: 0-5

Operation	AT Command	Response
Read	AT+AINVALUERANGE	1:<MIN>:<MAX> 2:<MIN>:<MAX>
Write	AT+AINVALUERANGE=<channel>:<MIN>: <MAX>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+AINVALUERANGE=?	OK

Parameter	Information
CHANNEL	The analog input interface (AIN1=1/AIN2=2)
MIN VALUE	Allowed range [-300,300]
MAX VALUE	Allowed range [-300,300]

3. AT+AINLPMODE

Set the analog data interface in low-power operation mode. When the low-power operation mode is enabled the power output and the analog data input interface will be turned off while there is no acquisition.

Operation	AT Command	Response
Read	AT+AINLPMODE	<N> OK
Write	AT+AINLPMODE=<N>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+AINLPMODE=?	OK

Parameter	Information
N	AINLPMODE status
0	disabled
1	enabled

4. AT+AINWARMUP

When the analog data interface is working in low power consumption mode, the device needs to turn the acquisition circuit and warm up the sensor before data acquisition. The command allows setting the warm-up time. The value is in milliseconds (ms), and the default value is 1000 ms.

Operation	AT Command	Response
Read	AT+AINWARMUP	<N> OK
Write	AT+AINWARMUP=<N>	When the modification is successful: OK When modification fails: ERROR <code>:<packet>
Test	AT+AINWARMUP=?	OK

Parameter	Information
N	Warm-up time, ms

5. AT+AINREAD

Read the current analog input interface data.

Operation	AT Command	Response
Read	AT+AINREAD	<N> OK

Parameter	Information
channel	Analog input channel ID
1	AIN1
2	AIN2

System-Related Commands

1. AT+TIMEZONE

With this command, the time zone of the device is set.

Operation	AT Command	Response
Read	<code>AT+TIMEZONE</code>	<code><TZ></code> <code>OK</code>
Write	<code>AT+TIMEZONE=<TZ></code>	When the modification is successful: <code>OK</code> When modification fails: <code>ERROR <code>:<message></code>
Test	<code>AT+TIMEZONE=?</code>	<code>OK</code>

Parameter	Information
TZ	UTC time zone: -12 ~ 12

2. AT+VERSION

Read the firmware version of the device.

Operation	AT Command	Response
Read	<code>AT+VERSION</code>	When the modification is successful: <code>
<a>..<cccc></code>

Operation	AT Command	Response
		OK When modification fails: ERROR <code>:<packet>

Parameter	Information
a.b.cccc	Firmware Version, for example “1.1.0050”

3. AT+SYSLOGLVL

Read or set the system log level. The module turns off the system log output by default. The user can modify the log output level through this command. The modification takes effect immediately after setting.

Operation	AT Command	Response
Read	AT+SYSLOGLVL	<TZ> OK
Write	AT+SYSLOGLVL=<level>	OK
Test	AT+SYSLOGLVL=?	OK

Parameter	Information
level	Output log level
0	does not output any logs
1 ~ 6	log with output level less than or equal to the value

4. AT+ECHO

Turns local echo of the AT command-line interface on/off. Echo is turned off by default. It takes effect immediately after modification and is automatically turned off after a restart.

Operation	AT Command	Response
Write	<code>AT+ECHO=<n></code>	When the modification is successful: <code>OK</code> When modification fails: <code>ERROR <code>:<packet></code>

Parameter	Information
n	Local echo
0	Disabled
1	Enabled

5. **AT+RESTART** Reboot the device.

Operation	AT Command	Response
Write	<code>AT+RESTART</code>	<code>Null</code>

6. AT+FACTORY

The command restores the device to the factory settings. This operation will last for about 60 seconds. Do not cut off the power supply of the device before it automatically restarts.

Operation	AT Command	Response
Write	<code>AT+FACTORY</code>	<code>Null</code>

7. AT+SYSTIME

Show the real running time.

Operation	AT Command	Response
Write	<code>AT+SYSTIME</code>	<code><time></code> <code>OK</code>

Parameter	Information
time	Timestamp in UNIX format, in seconds

8. AT+DATETIME

Show the synchronized with the LoRaWAN Network Server time. Needs LoRaWAN1.0.3 specification support from the server side.

Operation	AT Command	Response
Read	AT+DATETIME	<datetime> OK

Parameter	Information
datetime	Date / Time in YYYY/MM/DD hh:mm:ss

9. AT+SYSINFO

This command gives the system information about the device.

Operation	AT Command	Response
Read	AT+SYSINFO	<model> <sn> <version> <vendor> <copyright> OK

Parameter	Information
model	Model info
sn	Product SN info

Parameter	Information
version	Firmware version
vendor	Manufacturer info
copyright	Copyright info

Event Notification

When the working state of the module changes, an event notification will be output through the AT command-line interface. The event notification format is:

```
EVENT:[EVENT_ID]:[EVENT_MSG]:<ADDITIONAL_INFO>
```

Event	Description
EVENT_ID	Event ID
EVENT_MSG	Event name
ADDITIONAL_INFO	Additional information - Optional Some events need to output additional information. Multiple additional information sets are separated by ":"

The module supports the following event notifications:

ID	EVENT_MSG	Description
0	STARTUP	System startup complete
1	JOIN_NETWORK	Successful join to the LoRaWAN network
2	LEAVE_NETWORK	Unsuccessful join to the LoRaWAN network
5	SYSTEM_WAKEUP	System wakeup

ID	EVENT_MSG	Description
6	RESTART	System restart

1. **STARTUP Event** - Appears after system initialization.

- **Message format:**

```
EVENT:0:STARTUP
```

No additional information.

2. **JOIN_NETWORK Event** - LoRaWAN network activation successful. It appears after OTAA joins successfully.

- **Message format:**

```
EVENT:1:JOIN_NETWORK
```

No additional information.

3. **LORA_LEAVE_NETWORK Event** - In OTAA activation mode, if eight consecutive uplink-confirmed packets do not receive a response, the LORA_LEAVE_NETWORK event will be triggered. After the LORA_LEAVE_NETWORK event is triggered, the module will stop sending LoRaWAN messages and start OTAA activation again.

- **Message format:**

```
EVENT:2:LEAVE_NETWORK
```

No additional information.

4. **SYSTEM_WAKEUP Event** - A module in a low-power state can be awakened by receiving input from the AT command line interface. After wakeup, the module will no longer enter low-power mode. If you want the module to enter low power mode again, use the command:

```
AT+SLEEP\r\n
```

- **Message format:**

```
EVENT:5:SYSTEM_WAKEUP
```

5. **RESTART Event** - Triggered before the module restarts.

- **Message format:**

EVENT:6:RESTART

LoRaWAN Data Format Definition

The basic message format is defined as follows:

Channel ID 1	Type 1	Data 1	Channel ID 2	Type 2	Data 2
1Byte	1Byte	nBytes	1Byte	1Byte	nBytes

The data adopts big-endian byte order, that is, the high byte is in Uplink

Message Data Format

The channel ID: analog input interface ID, interface AIN1: 0x01, interface AIN2: 0x02

type: fixed value 0x02, indicating analog input data.length of this type of data is 2 bytes of data: the analog input value of this channel*100. Length 2 bytes, signed integer,

- Parsing example:

0x010401EF02040474

Channel ID 1	type 1	data 1
0x01	0x04	0x01EF
AIN1	analog input data	0x01EF=495=>4.95

Channel ID 2	type 2	data 2
0x02	0x04	0x0474
AIN2	analog input data	0x0474=1140=>11.4

Downlink Control

Basic structure message:

Channel ID 1	type	data
1Byte	1Byte	nBytes

Remote Modification Configuration Channel

Channel ID: 0x80

Supported parameter types:

- Data reporting cycle, 2 bytes, unit is second
- Low power consumption mode, 1 word Section
- Acquisition circuit warm-up time, 2-byte

Parsing example:

0x8001003C

Set the data reporting period to 60 seconds

60 = 0x003C

Cannel ID 1	type	data
0x80	0x01	0x003C

Appendix: Data Rate of Each Region

EU433/RU864/EU868/AS923

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
0	LoRa: SF12 / 125 kHz	250
1	LoRa: SF11 / 125 kHz	440

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
2	LoRa: SF10 / 125 kHz	980
3	LoRa: SF9 / 125 kHz	1760
4	LoRa: SF8 / 125 kHz	3125
5	LoRa: SF7 / 125 kHz	5470
6	LoRa: SF7 / 250 kHz	11000
7	FSK: 50 kbps	50000
8 ~ 15	RFU	

CN470/KR920

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
0	LoRa: SF12 / 125 kHz	250
1	LoRa: SF11 / 125 kHz	440
2	LoRa: SF10 / 125 kHz	980
3	LoRa: SF9 / 125 kHz	1760
4	LoRa: SF8 / 125 kHz	3125
5	LoRa: SF7 / 125 kHz	5470
6 ~ 15	RFU	

US915

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
0	LoRa: SF10 / 125 kHz	980
1	LoRa: SF9 / 125 kHz	1760
2	LoRa: SF8 / 125 kHz	3125
3	LoRa: SF7 / 125 kHz	5470
4	LoRa: SF8 / 500 kHz	12500
5 ~ 7	RFU	
8	LoRa: SF12 / 500 kHz	980
9	LoRa: SF11 / 500 kHz	1760
10	LoRa: SF10 / 500 kHz	3900
11	LoRa: SF9 / 500 kHz	7000
12	LoRa: SF8 / 500 kHz	12500
13	LoRa: SF7 / 500 kHz	21900
14 ~ 15	RFU	

AU915

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
0	LoRa: SF12 / 125 kHz	250
1	LoRa: SF11 / 125 kHz	440
2	LoRa: SF10 / 125 kHz	980

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
3	LoRa: SF9 / 125 kHz	1760
4	LoRa: SF8 / 125 kHz	3125
5	LoRa: SF7 / 125 kHz	5470
6	LoRa: SF8 / 500 kHz	12500
7	RFU	RFU
8	LoRa: SF12 / 500 kHz	980
9	LoRa: SF11 / 500 kHz	1760
10	LoRa: SF10 / 500 kHz	3900
11	LoRa: SF9 / 500 kHz	7000
12	LoRa: SF8 / 500 kHz	12500

IN865

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
0	LoRa: SF12 / 125 kHz	250
1	LoRa: SF11 / 125 kHz	440
2	LoRa: SF10 / 125 kHz	980
3	LoRa: SF9 / 125 kHz	1760
4	LoRa: SF8 / 125 kHz	3125
5	LoRa: SF7 / 125 kHz	5470

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
6	RFU	RFU
7	FSK: 50 kbps	50000
8 ~ 15	RFU	RFU

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