

RS1xx LoRa Protocol

Sentrius™ RS1xx Sensor

Application Note

v2.2

1 INTRODUCTION

The goal of this document is to detail the messages sent between the RS1xx sensor and a LoRa network server.

2 SERVER-TO-SENSOR MESSAGES

2.1 Message Name: Generic Data Retrieval Notification

2.1.1 Notification

Method Name: GenericDataRetrieval

2.1.2 Notes

Message Length = 2 bytes.

Server Method: asGenericRequest

Direction: Downlink

2.1.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value
0	MsgType	Message type.	0x01	0x01	0x01	0x01
1	Options	Mote Response Options: 0 = None 1 = Send simple configuration next uplink. 2 = Send advanced configuration next uplink. 3 = Send firmware version next uplink.	0x00	0x00	0x00	0x03

2.1.2.2 Example Message

Sent MSB First.

01 00

2.2 Message Name: Set UTC Notification

2.2.1 Notification

Method Name: SetUTC

2.2.2 Notes

Message Length = 8 bytes.

Server Method: generateRTCDownlink

Direction: Downlink

2.2.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value
0	MsgType	Message type.	0x02	0x02	0x02	0x02
1	Options	Mote Response Options: 0 = None 1 = Send simple configuration next uplink. 2 = Send advanced configuration next uplink. 3 = Send firmware version next uplink.	0x00	0x00	0x00	0x03
2	RTC_Year	Year	0x00	0x11	0x00	0xFF
3	RTC_Month	Month	0x00	0x01	0x00	0x0C
4	RTC_Day	Day	0x00	0x01	0x00	0x1F
5	RTC_Hours	Hours (24-hour format)	0x00	0x05	0x00	0x17
6	RTC_Minutes	Minutes	0x00	0x0F	0x00	0x3B
7	RTC_Seconds	Seconds	0x00	0x1E	0x00	0x3B

2.2.2.2 Example Message

Sent MSB First.

02 00 11 01 01 05 0F 1E

Message Name: Sensor Config Notification

2.2.3 Notification

Method Name: Config

Message Length = 16 bytes.

Server Method: asSetSensorParameters

Direction: Downlink

"ReadSensorPeriod" determines the time between individual temperature and humidity readings. The "SensorAggregate" determines how many readings will be accumulated prior to sending a data packet to the gateway. For example if the "SensorAggregate" is set to 2, and the "ReadSensorPeriod" is set to 60 seconds, the data will be sent over LoRa 2 x 60 seconds or every 120 seconds. Increasing the SensorAggregate value has a very positive affect on battery life.

2.2.3.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x03	0x03	0x03	0x03	
1	Options	Mote Response Options: 0 = None 1 = Send simple configuration next uplink. 2 = Send advanced configuration next uplink. 3 = Send firmware version next uplink.	0x00	0x00	0x00	0x03	
2	Config_BatteryType	1 = Zinc-Manganese Dioxide (Alkaline). 2 = Lithium/Iron Disulfide (Primary Lithium).	0x00	0x01	0x01	0x02	
3	Config_ReadSensorPeriod	Period in seconds to read the sensor. 0 = Disabled	uint16_t	0x0000	0x000A	0x0000	0xFFFF
4	Config_SensorAggregate	Number of readings to aggregate before sending on LoRa.	0x00	0x01	0x01	0x0B	
5	Config_TempAlarmEnable	Enable temperature alarm.	bool		false	0	1
6	Config_HumidityAlarmEnable	Enable humidity alarm.	bool		false	0	1
7	Config_TempAlarmLimitLow	Temperature alarm limit - low.	int8_t	0x00	0x00	0xD8	0x55
8	Config_TempAlarmLimitHigh	Temperature alarm limit - high.	int8_t	0x00	0x32	0xD8	0x55
9	Config_RHAlarmLimitLow	Humidity alarm limit - low.	0x00	0x0A	0x00	0x64	
10	Config_RHAlarmLimitHigh	Humidity alarm limit - high.	0x00	0x50	0x00	0x64	
11	Config_LED_BLE	Flash period in seconds when in BLE connection. 0 = No flash.	uint16_t	0x0000	0x0000	0x0000	0xFFFF
12	Config_LED_LoRa	Flash period in seconds. 0 = No flash. 65535 = Tx/Rx debug mode (green = Tx, orange = Rx).	uint16_t	0x0000	0x0000	0x0000	0xFFFF

2.2.3.2 Example Message

Sent MSB First.

03 00 01 00 0A 01 00 00 00 32 0A 50 00 00 00 00

2.3 Message Name: Heater Control Notification

2.3.1 Notification

Method Name: HeaterControl

2.3.2 Notes

Message Length = 5 bytes.

Server Method: asSetHeater

Direction: Downlink

2.3.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x04	0x04	0x04	0x04	
1	Options	Mote Response Options: 0 = None 1 = Send simple config next uplink. 2 = Send advanced config next uplink. 3 = Send firmware version next uplink.	0x00	0x00	0x00	0x03	
2	Options_Si702x_Heater_Setting	Setting that controls the power sent to the heating element. See si7021 datasheet for more details.	0x00	0x00	0x00	0x0F	
3	Options_Si702x_Heater_Time	Time in seconds for the unit to turn on the heating element. 0 = Heater disabled.	uint16_t	0x0000	0x0000	0x0000	0xFFFF

2.3.2.2 Example Message

Sent MSB First.

04 00 00 00 00

2.4 Message Name: Backoff Notification

2.4.1 Notification

Method Name: Backoff

2.4.2 Notes

Message Length = 4 bytes.

Server Method: asRequestBackoff

Direction: Downlink

2.4.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x05	0x05	0x05	0x05	
1	Options	Mote Response Options: 0 = None 1 = Send simple configuration next uplink. 2 = Send advanced configuration next uplink. 3 = Send firmware version next uplink.	0x00	0x00	0x00	0x03	
2	BackoffPeriod	Amount of time in seconds to backoff the sensor.	uint16_t	0x0000	0x003C	0x0000	0xFFFF

2.4.2.2 Example Message

Sent MSB First.

05 00 00 3C

2.5 Message Name: Backlog Retrieval Notification

2.5.1 Notification

Method Name: BacklogRetrieval

2.5.2 Notes

Message Length = 6 bytes.

Server Method: asRequestBacklog

Direction: Downlink

2.5.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x06	0x06	0x06	0x06	
1	Options	Mote Response Options: 0 = None 1 = Send simple configuration next uplink. 2 = Send advanced configuration next uplink. 3 = Send firmware version next uplink.	0x00	0x00	0x00	0x03	
2	Backlog_PullReqNum	Number of records to send. Note: Alarm messages will be sent first. 0 = Cancel pull request.	uint16_t	0x0000	0x0001	0x0000	0xFFFF
3	Backlog_PullReqPeriod	How often to send a backlog LoRa packet (seconds).	uint16_t	0x0000	0x000A	0x0000	0xFFFF

2.5.2.2 Example Message

Sent MSB First.

06 00 00 01 00 0A

2.6 Message Name: Format Log Flash Notification

2.6.1 Notification

Method Name: FormatLogFlash

2.6.2 Notes

Message Length = 2 bytes.

Server Method: asFormatFlash

Direction: Downlink

2.6.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value
0	MsgType	Message type.	0x07	0x07	0x07	0x07
1	Options	Mote Response Options: 0 = None 1 = Send simple configuration next uplink. 2 = Send advanced configuration next uplink. 3 = Send firmware version next uplink.	0x00	0x00	0x00	0x03

2.6.2.2 Example Message

Sent MSB First.

07 00

2.7 Message Name: Set Alkaline Thresholds Notification

2.7.1 Notification

Method Name: SetAlkalineThresholds

2.7.2 Notes

Message Length = 14 bytes.

Server Method: asSetAlkalineThresholds

Direction: Downlink

2.7.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x08	0x08	0x08	0x08	
1	Options	Mote Response Options: 0 = None 1 = Send simple configuration next uplink. 2 = Send advanced configuration next uplink. 3 = Send firmware version next uplink.	0x00	0x00	0x00	0x03	
2	EightyPercent	80% threshold in mV.	uint16_t	0x0A96	0x0A96	0x0000	0xFFFF
3	SixtyPercent	60% threshold in mV.	uint16_t	0x0A14	0x0A14	0x0000	0xFFFF
4	FortyPercent	40% threshold in mV.	uint16_t	0x099C	0x099C	0x0000	0xFFFF
5	TwentyPercent	20% threshold in mV.	uint16_t	0x0898	0x0898	0x0000	0xFFFF
6	FivePercent	5% threshold in mV.	uint16_t	0x076C	0x076C	0x0000	0xFFFF
7	Offset	Offset from 20 degrees C in mV.	uint16_t	0x0064	0x0064	0x0000	0xFFFF

2.7.2.2 Example Message

Sent MSB First.

08 00 0A 96 0A 14 09 9C 08 98 07 6C 00 64

2.8 Message Name: Set Lithium Thresholds Notification

2.8.1 Notification

Method Name: SetLithiumThresholds

2.8.2 Notes

Message Length = 14 bytes.

Server Method: asSetLithiumThresholds

Direction: Downlink

2.8.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x09	0x09	0x09	0x09	
1	Options	Mote Response Options: 0 = None 1 = Send simple config next uplink. 2 = Send advanced config next uplink. 3 = Send firmware version next uplink.	0x00	0x00	0x00	0x03	
2	EightyPercent	80% threshold in mV.	uint16_t	0x0B86	0x0B86	0x0000	0xFFFF
3	SixtyPercent	60% threshold in mV.	uint16_t	0x0B40	0x0B40	0x0000	0xFFFF
4	FortyPercent	40% threshold in mV.	uint16_t	0x0AF0	0x0AF0	0x0000	0xFFFF
5	TwentyPercent	20% threshold in mV.	uint16_t	0x0A5A	0x0A5A	0x0000	0xFFFF
6	FivePercent	5% threshold in mV.	uint16_t	0x0834	0x0834	0x0000	0xFFFF
7	Offset	Offset from 20 degrees C in mV.	uint16_t	0x0096	0x0096	0x0000	0xFFFF

2.8.2.2 Example Message

Sent MSB First.

09 00 0B 86 0B 40 0A F0 0A 5A 08 34 00 96

3 SENSOR-TO-SERVER MESSAGES

3.1 Message Name: Send Temp RH Data Notification

3.1.1 Notification

Method Name: SendTempRHData

3.1.2 Notes

Message Length = 11 bytes.

Server Method: asTempAndRh

Direction: Uplink

Note there is no timestamp in this message. The server will have to assume the time it receives this message is the timestamp, and this should almost always be within a few seconds of the actual time.

A "Sensor Configuration Error" in the Options byte means that the sensor is operating in North America at DR0, where the maximum LoRa payload is 11-bytes, but it is configured with an aggregate count > 1, which results in a payload greater than 11-bytes. In this case the sensor will store the data it can't send to FLASH. The server should change the sensor aggregate count in this case.

3.1.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x01	0x01	0x01	0x01	
1	Options	Options Bitmask: 0 = Server response is LoRa ack. 1 = Server to send UTC to sensor. Since LoRa messages are initiated by the sensor this will happen on the next time the sensor talks to the server. 2 = Sensor configuration error. 4 = Sensor has alarm condition.	0x00	0x00	0x00	0x0F	
2	HumidityDecimal	Decimal value of humidity measurement in %.	0x00	0x1E	0x00	0x64	
3	HumidityInteger	Decimal value of humidity measurement in %.	0x00	0x01	0x00	0xFF	
4	TempDecimal	Decimal value of temperature measurement in C.	0x00	0x41	0x00	0xFF	
5	TempInteger	Integer value of temperature measurement in C.	int8_t	0x00	0x19	0xD8	0x55
6	BatteryCapacity	Index for percentage of battery capacity remaining. 0 = 0-5% 1 = 5-20% 2 = 20-40% 3 = 40-60% 4 = 60-80% 5 = 80-100%	0x00	0x05	0x02	0x00	

7	AlarmMsgCount	Number of backlog alarm messages in sensor FLASH.	uint16_t	0x0000	0x0000	0x0000	0x0FF0
8	BacklogMsgCount	Number of backlog non-alarm messages in sensor FLASH.	uint16_t	0x0000	0x0000	0x0000	0x0FF0

3.1.2.2 Example Message

Sent MSB First.

01 00 1E 01 41 19 02 00 00 00 00

3.2 Message Name: Send Temp and RH Aggregated Data Notification

3.2.1 Notification

Method Name: SendTempRHAggregatedData

3.2.2 Notes

Server Method: *asTempAndRhAggregate*

Direction: Uplink

The length of this message is variable.

The MsgType, NumberReadings, Timestamp, and Options= 11 bytes.

The Temperature and Humidity = 4 bytes.

Message Length = NumReading * 4 + 11. Since NumReadings max is 10: 10 x 4 = 40. 40 + 11 = 51.

It is important that this packet be 51 bytes or less since the max EU packet across datarates is 51 bytes in length.

A "Sensor Configuration Error" in the Options byte means that the sensor is operating in North America at DR0, where the maximum LoRa payload is 11-bytes, but it is configured with an aggregate count > 1, which results in a payload greater than 11-bytes. In this case the sensor will store the data it can't send to FLASH. The server should change the sensor configuration.

The timestamp is the time of the last sensor reading. The server will have to use the sensor read period parameter (part of the device configuration) to calculate the timestamps of the remaining data.

3.2.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x02	0x02	0x02	0x02	
1	Options	Options Bitmask: 0 = Server response is LoRa ack. 1 = Server to send UTC to sensor. Since LoRa messages are initiated by the sensor this will happen	0x00	0x00	0x00	0x0F	

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
		on the next time the sensor talks to the server. 2 = Sensor configuration error. 4 = Sensor has alarm condition.					
2	AlarmMsgCount	Number of backlog alarm messages in sensor FLASH. A value of 255 means there are 255 or more alarm messages on the device.	0x00	0x00	0x00	0xFF	
3	BacklogMsgCount	Number of backlog non-alarm messages in sensor FLASH.	uint16_t	0x0000	0x0000	0x0000	0x0FFF0
4	BatteryCapacity	Index for percentage of battery capacity remaining. 0 = 0-5% 1 = 5-20% 2 = 20-40% 3 = 40-60% 4 = 60-80% 5 = 80-100%	0x00	0x05	0x02	0x00	
5	NumberReadings	Number of sensor readings in packet.	0x00	0x01	0x00	0x0A	
6	Timestamp	Seconds since Jan 1 2015.	uint32_t	0x00000000	0x00000064	0x00000000	0xFFFFFFFF
7	HumidityDecimal	Decimal value of humidity measurement in %.	0x00	0x1E	0x1E	0x64	
8	HumidityInteger	Decimal value of humidity measurement in %.	0x00	0x01	0x01	0xFF	
9	TempDecimal	Decimal value of temperature measurement in C.	0x00	0x19	0x19	0xFF	
10	TempInteger	Integer value of temperature measurement in C.	int8_t	0x00	0x41	0xD8	0x55

3.2.2.2 Example Message

Sent MSB First.

02 00 00 00 00 02 01 00 00 00 64 1E 01 19 41

3.3 Message Name: Send BackLog Message Notification

3.3.1 Notification

Method Name: SendBackLogMessage

3.3.2 Notes

Message Length = 10 bytes.

Server Method: *asBacklogTempAndRh*

Direction: Uplink

The "Timestamp" is the time the sensor data was sampled.

3.3.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x03	0x03	0x03	0x03	
1	Options	Options Bitmask: 0 = Server response is LoRa ack. 1 = Server to send UTC to sensor. Since LoRa messages are initiated by the sensor this will happen on the next time the sensor talks to the server. 2 = Sensor configuration error. 4 = Sensor has alarm condition.	0x00	0x00	0x00	0x0F	
2	Timestamp	Seconds since Jan 1 2015.	uint32_t	0x00000000	0x00000064	0x00000000	0xFFFFFFFF
3	HumidityDecimal	Integer value of humidity measurement in %.	0x00	0x1E	0x00	0xFF	
4	HumidityInteger	Decimal value of humidity measurement in %.	0x00	0x01	0x00	0x64	
5	TempDecimal	Decimal value of temperature measurement in C.	0x00	0x41	0x00	0xFF	
6	TempInteger	Integer value of temperature measurement in C.	int8_t	0x00	0x19	0xD8	0x55

3.3.2.2 Example Message

Sent MSB First.

03 00 00 00 00 64 1E 01 41 19

3.4 Message Name: Send BackLog Messages Notification

3.4.1 Notification

Method Name: *SendBackLogMessages*

3.4.2 Notes

Server Method: asBacklogTempAndRhAggregate

Direction: Uplink

The length of this message is variable.

The MsgType, NumberReadings, and Options = 3 bytes.

The Timestamp, Temperature, and Humidity = 8 bytes.

Message Length = NumReading * 8 + 3. Since NumReadings max is 6: $6 \times 8 = 48$. $48 + 3 = 51$.

It is important that this packet be 51 bytes or less since the max EU packet across datarates is 51 bytes in length.

A "Sensor Configuration Error" in the Options byte means that the sensor is operating in North America at DR0, where the maximum LoRa payload is 11-bytes, but it is configured with an aggregate count > 1, which results in a payload greater than 11-bytes. In this case the sensor will store the data it can't send to FLASH. The server should change the sensor configuration.

The "Timestamp" is the time the sensor data was sampled.

3.4.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x04	0x04	0x04	0x04	
1	Options	Options Bitmask: 0 = Server response is LoRa ack. 1 = Server to send UTC to sensor. Since LoRa messages are initiated by the sensor this will happen on the next time the sensor talks to the server. 2 = Sensor configuration error. 4 = Sensor has alarm condition.	0x00	0x00	0x00	0x0F	
2	NumReading	Number of sensor reading backlogs in packet.	0x00	0x01	0x01	0x06	
3	Timestamp	Seconds since Jan 1 2015.	uint32_t	0x00000000	0x00000064	0x00000000	0xFFFFFFFF
4	HumidityDecimal	Integer value of humidity measurement in %.	0x00	0x1E	0x00	0xFF	
5	HumidityInteger	Decimal value of humidity measurement in %.	0x00	0x01	0x00	0x64	
6	TempDecimal	Decimal value of temperature measurement in C.	0x00	0x41	0x00	0xFF	
7	TempInteger	Integer value of temperature measurement in C.	int8_t	0x00	0x19	0xD8	0x55

3.4.2.2 Example Message

Sent MSB First.

04 00 01 00 00 00 64 1E 01 41 19

3.5 Message Name: Send Sensor Config Simple Notification

3.5.1 Notification

Method Name: `SendSensorConfigSimple`

3.5.2 Notes

Message Length = 10 bytes.

Server Method: `asSensorConfigSimple`

Direction: Uplink

A "Sensor Configuration Error" in the Options byte means that the sensor is operating in North America at DR0, where the maximum LoRa payload is 11-bytes, but it is configured with an aggregate count > 1, which results in a payload greater than 11-bytes. In this case the sensor will store the data it can't send to FLASH. The server should change the sensor configuration.

The "SensorAggregate" setting will aggregate or collect sensor data every "ReadSensorPeriod" and only send them over LoRa when the "SensorAggregate" number is reached. For example if the "SensorAggregate" is set to 2, and the "ReadSensorPeriod" is set to 60 seconds, the data will be sent over LoRa 2 x 60 seconds or every 120 seconds. This has a very positive affect on battery life.

3.5.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x05	0x05	0x05	0x05	
1	Options	Options Bitmask: 0 = Server response is LoRa ack. 1 = Server to send UTC to sensor. Since LoRa messages are initiated by the sensor this will happen on the next time the sensor talks to the server. 2 = Sensor configuration error. 4 = Sensor has alarm condition.	0x00	0x00	0x00	0x0F	
2	BatteryType	1 = Zinc-Manganese Dioxide (Alkaline). 2 = Lithium/Iron Disulfide (Primary Lithium).	0x00	0x01	0x01	0x02	
3	ReadSensorPeriod	Period in seconds to read the sensor. 0 = Disabled	uint16_t	0x0000	0x0000	0x0000	0xFFFF
4	SensorAggregate	Number of readings to aggregate before sending on LoRa.	0x00	0x01	0x01	0x0B	
5	TempAlarmEnabled	False = Disabled. True = Enabled.	bool		False	0	1
6	HumidityAlarmEnabled	False = Disabled. True = Enabled.	bool		False	0	1

3.5.2.2 Example Message

Sent MSB First.

05 00 01 00 00 01 00 00

3.6 Message Name: Send Sensor Config Advanced Notification

3.6.1 Notification

Method Name: SendSensorConfigAdvanced

3.6.2 Notes

Message Length = 16 bytes.

Server Method: asSensorConfigAdvanced

Direction: Uplink

A "Sensor Configuration Error" in the Options byte means that the sensor is operating in North America at DR0, where the maximum LoRa payload is 11-bytes, but it is configured with an aggregate count > 1, which results in a payload greater than 11-bytes. In this case the sensor will store the data it can't send to FLASH. The server should change the sensor configuration.

The "SensorAggregate" setting will aggregate or collect sensor data every "ReadSensorPeriod" and only send them over LoRa when the "SensorAggregate" number is reached. For example, if the "SensorAggregate" is set to 2, and the "ReadSensorPeriod" is set to 60 seconds, the data will be sent over LoRa 2 x 60 seconds or every 120 seconds. This has a very positive affect on battery life.

3.6.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x06	0x06	0x06	0x06	
1	Options	Options Bitmask: 0 = Server response is LoRa ack. 1 = Server to send UTC to sensor. Since LoRa messages are initiated by the sensor this will happen on the next time the sensor talks to the server. 2 = Sensor configuration error. 4 = Sensor has alarm condition.	0x00	0x00	0x00	0x0F	
2	BatteryType	1 = Zinc-Manganese Dioxide (Alkaline). 2 = Lithium/Iron Disulfide (Primary Lithium).	0x00	0x01	0x01	0x02	
3	ReadSensorPeriod	Period in seconds to read the sensor. 0 = Disabled, sensor will not be read.	uint16_t	0x0000	0x0000	0x0000	0xFFFF

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
4	SensorAggregate	Number of readings to aggregate before sending on LoRa.	0x00	0x01	0x01	0x0B	
5	TempAlarmsEnabled	True = Temperature alarms enabled. False = Temperature alarms disabled.	bool		False	0	1
6	HumidityAlarmsEnabled	True = Humidity alarms enabled. False = Humidity alarms disabled.	bool		False	0	1
7	TempAlarmLimitLow	Temperature alarm limit - low in C.	int8_t	0x00	0x00	0xD8	0x55
8	TempAlarmLimitHigh	Temperature alarm limit - high in C.	int8_t	0x00	0x32	0xD8	0x55
9	HumidityAlarmLimitLow	Humidity alarm limit - low in %.	0x00	0x0A	0x00	0x64	
10	HumidityAlarmLimitHigh	Humidity alarm limit - high in %.	0x00	0x50	0x00	0x64	
11	LED_BLE	Flash period in seconds when in BLE connection. 0 = No flash	uint16_t	0x0000	0x0000	0x0000	0xFFFF
12	LED_Heartbeat	Flash period in seconds. 0 = No flash 65535 = LED in LoRa Tx/Rx mode, Green = Tx, Orange = Rx.	uint16_t	0x0000	0x0000	0x0000	0xFFFF

3.6.2.2 Example Message

Sent MSB First.

06 00 01 00 00 01 00 00 00 32 0A 50 00 00 00 00

3.7 Message Name: Send FW Version Notification

3.7.1 Notification

Method Name: SendFWVersion

3.7.2 Notes

Message Length = 11 bytes.

Server Method: asFwVersion

Direction: Uplink

A "Sensor Configuration Error" in the Options byte means that the sensor is operating in North America at DR0, where the maximum LoRa payload is 11-bytes, but it is configured with an aggregate count > 1, which results in a payload greater than 11-bytes. In this case the sensor will store the data it can't send to FLASH. The server should change the sensor configuration.

3.7.2.1 Parameters

Index	Name	Description	Type	Default Value	Example Value	Min Value	Max Value
0	MsgType	Message type.	0x07	0x07	0x07	0x07	
1	Options	Options Bitmask: 0 = Server response is LoRa ack. 1 = Server to send UTC to sensor. Since LoRa messages are initiated by the sensor this will happen on the next time the sensor talks to the server. 2 = Sensor configuration error. 4 = Sensor has alarm condition.	0x00	0x00	0x00	0x0F	
2	Year	Version year.	0x00	0x11	0x00	0xFF	
3	Month	Version month.	0x00	0x01	0x01	0x0C	
4	Day	Version day.	0x00	0x01	0x01	0x1F	
5	VersionMajor	Version major.	0x00	0x01	0x00	0xFF	
6	VersionMinor	Version minor.	0x00	0x00	0x00	0xFF	
7	PartNumber	Part number of firmware.	uint32_t	0x00000000	0x00493E6F	0x00000000	0xFFFFFFFF

3.7.2.2 Example Message

Sent MSB First.

07 00 11 01 01 01 00 00 49 3E 6F

4 REVISION HISTORY

Version	Date	Notes	Approver
1.0	17 Dec 2017	Initial Release	Jonathan Kaye
2.0	16 March 2018	Updated to latest messages	Chris Hofmeister
2.1	11 April 2018	Corrected message type values, put them in numeric order	Mark Monson
2.2	3 August 2018	Updated to new template. Updates to BatteryCapacity.	Seokwoo Yoon