FlorLink

Messaging Protocol

1 Description

This document describes the communications between the SmartHub™ and Florlink Zigbee endpoint devices such as call buttons, light towers, etc.

2 Packet Framing

There are two types of packets involved at the application level, Transmit Packets and Receive Packets. Other packets such as Transmit Status and Modem Status are exchanged at the Zigbee level and will not be discussed in this document. Transmit Packets can be sent by either the SmartHub or an Endpoint. At the recipient's end, the packet will appear as a Receive Packet.

The following descriptions of these packets is a reproduction of information that can also be found in Digi International's documentation for the XBee3 devices at

https://www.digi.com/resources/documentation/digidocs/90001539/#containers/cont_frame_descriptions.htm%3FTocPath%3DFrame%2520descriptions%7C_____0

2.1 Transmit Packet

Start Delimiter	**Length**	**Frame Type**	**Frame ID**	**MAC Address**	**Dest Network Address**	**Broadcast radius**	**Transmit Options**	**Payload**	**CRC**
1 Byte 0x7E	2 Bytes	1 Byte 0x10	1 Byte 0x01	8 Bytes	2 Bytes	1 Byte 0x00	1 Byte 0x00	Var	1 Byte

2.2 Receive Packet

Start Delimiter	**Length**	**Frame Type**	**MAC Address**	**Network Address**	**Receive options**	**Payload**	**CRC**
1 Byte 0x7E	2 Bytes	1 Byte 0x90	8 Bytes	2 Bytes	1 Byte	Var	1 Byte

2.3 Framing Values

Field	Size (Bytes)	Value(s)	Description
Start Delimiter	1	0x7E	The start-of-packet delimiter
Length	2	Length of the packet in bytes, excluding the start delimiter, Length, and CRC fields.	
Frame Type	1	0x10 for Transmit 0x90 for Receive	The frame type of the message
Frame ID	1	0x01	For correlating packets that arrive out of sequence. We don't use it and always set it to 0x01. Setting it to 0 means that no Zigbee-level ACK will be generated by the recipient.
MAC Address	8	Set to the MAC address of the target when transmitting. When sending to the coordinator, set to all zeroes. When receiving, it's automatically populated by the Zigbee layer with the MAC address of the sender.	
16-Bit Network Address	2	When transmitting to a single endpoint using 64-bit MAC addressing, or when addressing the coordinator with MAC address 0x0, this should be set to 0xFFFE. When receiving it will be populated with the 16-bit network address of the sender. To broadcast to all non-sleeping endpoints, set to 0xFFFD. To broadcast to all, including sleeping, endpoints, set to 0xFFFF.	
Broadcast Radius	1	0x00	0x00 is maximum hops. Present in all transmit packets, but affects only broadcast transmissions.
Transmit Options	1	0x00	Applies to Transmit Packets only. No options used.
Receive Options	1	Applies to Receive Packets only. Bit 0 indicates whether the packet was acknowledged at the Zigbee layer. See Digi docs for other bits.	
Payload	Variable	The payload data. See Section 3, Payload Framing.	
CRC	1		The CRC (checksum) of the packet

2.4 CRC (Checksum) Calculation

The checksum calculation is as follows:

Add all the bytes of the packet excluding the frame delimiter and the length.
Keep the lowest eight bits.
Subtract the result from 0xFF
The result is the CRC.

Example:

7E 00 0A **01 01 50 01 00 48 65 6C 6C 6F** B8

01 + 01 + 50 + 01 + 00 + 48 + 65 + 6C + 6C + 6F= 2**47**

0xFF - 0x47 = 0xB8

3 Payload Framing

Message ID	**Try**	**SW Version**	**Data**
1 Byte	1 Byte	2 Bytes	Variable

3.1 Payload Framing Values

Field	**Size (Bytes)**	**Description**
Message ID	1	The Message ID of the payload
Try	1	The number of retries sending the message. The first message sent is Try 0.
SW Version	2	The endpoint's microcontroller firmware version, in BCD.
Data	Var	Payload data

3.2 Message ID's

Message ID	Name	Description
0x40	Button Press	Sent by button to hub when a button is pressed.
0x41	Button press ACK	Sent by hub to button to ACK button press.
0x42	Button Cancel	Sent by button to hub when request is cancelled. Contains cancellation type (manual or timeout).
0x43	Button Cancel ACK	Sent by hub to button to ACK request cancellation.
0x44	Heartbeat	Sent by button to hub after receipt of each 0x41 Button Press ACK, and periodically if dry contacts enabled or periodic heartbeat is enabled. Contains battery voltage and dry contacts status. Heartbeats are not ACKed.
0x46	“Cancel Button” ACK	Sent by hub to button; causes button to immediately cancel request and return to idle state.
0x47	Light Tower Control	Sent by hub to light tower to set light and sound parameters.
0x48	Light Tower Message ACK	Sent by light tower to ACK light tower control message.

3.3 Payload Data Examples

The following payload data examples include the payload framing in the shaded cells.

3.3.1 Button Press

Message ID 0x40	**Try Num**	**Firmware Vn**	Pressed Button
1 Byte	1 Byte	2Bytes	1 Byte

Field	**Size (Bytes)**	**Values**	**Description**
Pressed Button	1	0x01 - Button 1 0x02 - Button 2 0x03 - Button 3 0x04 - Button 4	The button that was pressed

3.3.2 Button Press ACK

This message is received by the end point from the main hub in acknowledgment of a button press message.

Message ID 0x41	**Try Num**	**Firmware Vn**	Pressed Button
1 Byte	1 Byte	2Bytes	1 Byte

Field	**Size (Bytes)**	**Values**	**Description**
Pressed Button	1	0x01 - Button 1 0x02 - Button 2 0x03 - Button 3 0x04 - Button 4	The button being ACKed

3.3.3 Button Cancel

This message is sent to the SmartHub when a button call is handled. Either an associate turned off the button request, or the end point timed out waiting for an associate to turn off the button request.

Message ID 0x42	**Try Num**	**Firmware Vn**	Button Terminated	Reason
1 Byte	1 Byte	2Bytes	1 Byte	1 Byte

Field	**Size (Bytes)**	**Values**	**Description**
Button Terminated	1	0x01 - Button 1 0x02 - Button 2 0x03 - Button 3 0x04 - Button 4	The button that was cancelled
Reason	1	0x01 - Associate 0x02 - Timeout	The reason for cancellation.

3.3.4 Button Cancel ACK

This message is sent by the main hub to the end point to let the endpoint know it has received a Button Cancel message.

Message ID 0x43	**Try Num**	**Firmware Vn**	Button Terminated
1 Byte	1 Byte	2Bytes	1 Byte

Field	**Size (Bytes)**	**Values**	**Description**
Button Terminated	1	0x01 - Button 1 0x02 - Button 2 0x03 - Button 3 0x04 - Button 4	The button being ACKed

3.3.5 Heartbeat

The heartbeat message serves several purposes, and can be configured for various operational modes in the endpoint firmware. The heartbeat contains the endpoint's battery voltage, and in the case of a "dry-contact" endpoint, the status of the contact inputs. A periodic heartbeat message can be used to maintain an endpoint's position in the coordinator's "child table", if sent more frequently than the child table timeout, thus eliminating the re-joining time required when the endpoint is not in the child table.

Heartbeat messages do not expect an ACK from the SmartHub.

Single-button call buttons send a heartbeat message immediately after receiving a "Button Request Release ACK" message (Message ID 0x41) from the SmartHub.

Four-button call buttons with dry contact inputs enabled send heartbeat messages periodically (typically every 60 seconds) in order to ensure that the SmartHub always has accurate contact inputs status information.

Both the single-button and four-button can be configured to send periodic heartbeats regardless of dry contacts being enabled or not.

Message ID 0x44	**Try Num (always 0x00)**	**Firmware Vn**	**Contacts Status**	**Battery Voltage**
1 Byte	1 Byte	2 Bytes	1 Byte (lower four bits show the status of the four contact inputs: 0= open, 1=closed.	2 Bytes in BCD format

It is up to the SmartHub to decide when an endpoint's battery voltage is low enough that a low-battery notification should be published. V2 call buttons can operate down to 1.9V, whereas v3 buttons should have their batteries replaced on reaching 2.3V.

3.3.6 “Cancel Button” Functionality

In some instance, such as those where an associate may be summoned to an area based on camera data rather than by a call button, a call button is deployed not for guest use, but instead for associates to register that they’ve responded to such a summons. To support this use case, a call button can be defined in the SmartHub portal as a “Cancel Button”. When such a button is pressed, its button press message will be ACKed by the hub with a Cancel Button ACK message rather than by a Button Press ACK, on receipt of which the button will immediately return to its idle state.

This functionality would typically only be used with a single-button call button, but it’s incorporated in the four-button firmware as well.

Message ID 0x46	**Try Num**	**Firmware Vn**	Button Pressed
1 Byte	1 Byte	2 Bytes	1 Byte

Field	**Size (Bytes)**	**Values**	**Description**
Button Pressed	1	0x01 - Button 1 0x02 - Button 2 0x03 - Button 3 0x04 - Button 4	The button being ACKed

3.3.7 Light Tower Control Message (Preliminary)

The light tower consists of a sound module variable and a number of light modules. In the unit shown here, which is our tentative choice for production, the sound module is in the base module, so we're going to assign "Level 1" to always be the sound module. The number of light levels is TBD and may vary from installation to installation, as may the order of the colors.

Unless the addressed level is set to 0, a Light Tower Control Message affects only one level at a time; it is necessary to send multiple messages to change the status of multiple levels, and only the status of the level being addressed is changed by the message. If Level is set to 0, <u>all</u> levels (including the sound module) are assigned the passed parameters. This is convenient for turning everything off with one message.

Message ID 0x47	**Try Num**	**Firmware Vn**	Tower Level	Period	Duration
1 Byte	1 Byte	2 Bytes	1 Byte	2 Bytes	2 Bytes

Field	**Size (Bytes)**	**Description**
Tower Level	1	The tower level being addressed, numbered bottom-to-top starting from the lowest level = 1, which is the sound module. If this field is 0, the passed parameters are applied to <u>all</u> levels.
Period	2	If flashing or beeping is desired, set this to a non-zero number of milliseconds to determine the repetition rate. If set to 0, the addressed module will maintain a steady state.
Duration	2	If set to 0, the addressed module will be Off. If non-zero and Period = 0, the addressed module will be steadily On. If non-zero and Period is non-zero, Duration determines the duration of each flash or beep, in milliseconds.

3.3.8 Light Tower Message ACK

Sent by the Light Tower to the Hub to ACK a Light Tower Control Message

Message ID 0x48	**Try Num**	**Firmware Vn**	Tower Level Addressed
1 Byte	1 Byte	2Bytes	1 Byte

Field	**Size (Bytes)**	**Values**	**Description**
Tower Level Addressed	1	0x00 – tower max level	The tower level addressed by the message being ACKed

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Revision History

Date	Engineer	Comment
Sept-12-2016	Ken Dussinger	Initial Release
Sept-14-2016	Ken Dussinger	Added SW version to the message header. Added JSON message structure to the individual messages
Oct-11-2016	Matt Klepadlo	Reworked Message Spec to follow a binary serial protocol
22 May 2020	Julia Truchsess	Reformatted the entire document Updated to new Heartbeat message format Added Cancel Button ACK Added Light Tower Control