FIRST ALERT

INFORMATIONAL GUIDE

ZCOMBO Z-Wave™ Specification

Version: 12.0
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INFORMATIONAL GUIDE

TABLE OF CONTENTS

1 DOCUMENT DETAILS 3

1.1 REVISION HISTORY 3

2 SYSTEM OVERVIEW 4

2.1 MANUFACTURER SPECIFIC REPORT 4
2.2 VERSION REPORT 4

3 Z-WAVE SPECIFIC DETAILS 5

3.1 LIST OF SUPPORTED COMMAND CLASSES 5
3.2 PARAMETERS SUPPORTED VIA CONFIGURATION COMMAND CLASS 5
3.2.1 SuperVision report timeout 5
3.2.2 SuperVision retry count 5
3.2.3 SuperVision wait time 5
3.3 LIST OF SUPPORTED EVENTS OVER NOTIFICATION COMMAND CLASS 6
3.4 ASSOCIATION GROUP 6
3.5 SMARTSTART INCLUSION 7
3.6 DSK LOCATION ON THE PRODUCT 7

4 SUPPORTED EVENTS AND OPERATIONS IN ZCOMBO DEVICE 8

4.1 LEARN MODE 8
4.2 WAKE-UP NOTIFICATION 8
4.3 TEST ALARM 9
4.4 SMOKE ALARM 9
4.5 CO ALARM 11
4.6 MALFUNCTION DETECTED 12
4.7 CO END-OF-LIFE(EOL) 12
4.8 HEARTBEAT 13
4.9 BATTERY REPORT 13
4.10 FACTORY RESET 14

FIGURE 1: ZCOMBO DEVICE 4
FIGURE 2: SMOKE ALARM STATE MACHINE 10
FIGURE 3: CO ALARM STATE MACHINE 12

1 Document Details

1.1 Revision History

Date	Version#	Details of change
1.0	11-Oct-19	Initial version
2.0	24-Nov-19	Certification review comments resolved
3.0	4-Dec-19	Removed Basic CC, Added Association Group info, Default Wake-up interval
4.0	9-Dec-19	Added SuperVision command class and Configuration Command Class
5.0	26-Dec-19	Added Smoke silence and CO silence
6.0	29-Jan-20	Additional information for Heartbeat, Battery level, Notification_Get support
7.0	10-Feb-20	Additional information for Wake-up Notification, EOL message
8.0	14-Feb-20	Added SmartStart related information; Updated Wake-up interval parameters
9.0	19-Feb-20	Added the list of supported events over Notification Command Class
10.0	19-March-20	Updated Wake-up interval parameters
11.0	28-May-20	Added Z-Wave marketing Trademark Added DSK location chapter Added factory reset information
12.0	15-Dec-20	Updated the Product ID.

2 System Overview

ZCOMBO a battery-operated smoke and carbon monoxide alarm. ZCOMBO has active smoke and CO detector sensors which constantly keeps monitoring for the level of Smoke and CO. ZCOMBO has the ZM5202 Z-Wave module to communicate over Z-Wave wireless protocol.

Figure 1: ZCOMBO device

2.1 Manufacturer Specific report

- Manufacturer ID: 0x0138
- Product Type ID: 0x0001
- Product ID: 0x0058

2.2 Version report

- Firmwar0 version: Major version number of Z-Wave firmware <1 byte>
- Firmwar0 subversion: Major version number of Z-Wave firmware <1 byte>
- Number of addition firmware: 1
- Firmware1 version: Major version number of host firmware <1 byte>
- Firmware1 subversion: Minor version number of host firmware <1 byte>
- Hardware version: 0x02 <1 byte>

3 Z-WAVE SPECIFIC DETAILS

3.1 List of Supported Command classes

Below is the list of supported Command Classes with the supported version and the security level.

Command Class	Version	Required Security Class
Association	2	highest granted
Association Group Information	1	highest granted
Battery	1	highest granted
Device Reset Locally	1	highest granted
Manufacturer Specific	2	highest granted
Multi Channel Association	3	highest granted
Notification	8	highest granted
Powerlevel	1	highest granted
Security 2	1	none
Supervision	1	none
Transport Service	2	none
Version	3	highest granted
Wake-up	2	highest granted
Configuration	1	highest granted
Z-Wave Plus Info	2	none

3.2 Parameters supported via Configuration Command Class

ZCOMBO support the following parameters which are configurable via the Configuration Command Class (0x70) Ver. 1 and older versions.

3.2.1 SuperVision report timeout

ZCOMBO will send the message over SuperVision Command Class and it will wait for the SuperVision report from the Controller for the SuperVision report timeout time.

3.2.2 SuperVision retry count

If the SuperVision report is not received within the SuperVision report timeout time, the ZCOMBO will retry sending the message again. Upon exceeding the max retry, the ZCOMBO device will send the next message available in the queue.

3.2.3 SuperVision wait time

Before retrying the message, ZCOMBO will wait for the SuperVision wait time. Actual wait time is calculated using below formula,

Wait time = SuperVision wait time base-value + random-value + (attempt-count x 5 seconds)

- The random value shall be a time between 100 and 1100 milliseconds

Parameters Description	Parameter	Size / level	Min Value	Max Value	Default Value
SuperVision report timeout	0x01	2	500 ms	5000 ms	1500 ms
SuperVision retry count	0x02	2	0	5	1
SuperVision wait time	0x03	2	1 sec	60 sec	5 sec

ZCOMBO supports the CONFIGURATION_GET (0x05) command to get the value of configurable parameters. Upon receiving the valid CONFIGURATION_GET command, the ZCOMBO device will send the values via CONFIGURATION_REPORT (0x06) command. ZCOMBO supports the CONFIGURATION_SET (0x04) commands to set the valid values of the configurable parameters. If the 'default' flag is set in the CONFIGURATION_SET (0x04) command, the ZCOMBO will set the parameter value to its default value and will ignore the requested value for the parameter.

If the CONFIGURATION_GET command received for the non-supported parameters, the ZCOMBO will send the CONFIGURATION_REPORT of the first supported parameter (SuperVision report timeout).

If the CONFIGURATION_SET command received with the default bit set, the ZCOMBO will ignore the size and the parameter value field and will set the default value for the supported parameters. If the CONFIGURATION_SET command received with default bit clear and with the invalid parameter, size or value, the ZCOMBO device will ignore the request and will not update the parameter.

Parameter values will be stored in the EEPROM and can be retained on power-up event. Parameter values will be set to default on Factory reset and Exclusion operations.

3.3 List of supported events over Notification Command Class

Event of device	Notification Type	Notification Event
Test detected	0x01	0x03
Test clear	0x01	0x00
Smoke detected	0x01	0x02
Smoke clear	0x01	0x00
Smoke silence	0x01	0x06
CO detected	0x02	0x02
CO clear	0x02	0x00
CO silence	0x02	0x06
CO End-Of-Life detected	0x02	0x05
Malfunction detected	0x09	0x01
Malfunction clear	0x09	0x00
Heartbeat	0x09	0x05

3.4 Association Group

The alarm supports one association group (Lifeline) and sends its alarms to that group. The Z-Wave network controller may be set in this group. It's not recommended to modify this association group. All the critical events in the list of supported events over Notification Command Class will be triggered from the Lifeline association group.

- Group ID: 0x01
- Group Name: “Lifeline”
- Max nodes: 1
- Profile ID: 0x0001
- Endpoint: 0

3.5 SMARTSTART Inclusion

SmartStart enabled products can be added into a Z-Wave network by scanning the Z-Wave QR Code present on the product with a controller providing SmartStart inclusion. No further action is required and the SmartStart product will be added automatically within 10 minutes of being switched on in the vicinity of the network.

3.6 DSK LOCATION ON THE PRODUCT

Device Specific Key (DSK) to be available at the time an S2 device is added to a Z-Wave network.

The QR code and the 5-digit DSK PIN can be found on the product nameplate which is located on the back of the product. The Full DSK string can be found on the product insert, available inside the product packaging.

4 SUPPORTED EVENTS AND OPERATIONS IN ZCOMBO DEVICE

ZCOMBO supports the following events. On occurrence of an event, ZCOMBO device will send the Z-Wave message to the Z-Wave controller.

1. Learn Mode
2. Wake-up Notification
3. Test alarm
4. Smoke alarm
5. CO alarm
6. Malfunction
7. CO End-Of-Life (EOL)
8. Heartbeat
9. Battery report
10. Factory reset

The ZCOMBO does not support the Notification_Get request sent from the Z-Wave Controller.

4.1 Learn Mode

Learn mode will be started by powering up the ZCOMBO device with the test button held down. After the conclusion of learn mode (or timeout), the ZCOMBO device will remain awake for 25 seconds. The ZCOMBO device supports both classic and NWI (network wide inclusion) modes. When entering learn mode, the ZCOMBO device will go into classic mode for 5 seconds. If classic inclusion does not start before the 5 second timeout, the ZCOMBO will fall back to NWI mode.
Note: Learn mode can be used for both inclusion and exclusion.

4.2 Wake-up Notification

On power-up (without pressing the test button), the ZCOMBO will send the Wake-up Notification. The ZCOMBO will wait for 10 seconds to receive the Wake-up No more information message from the Z-Wave controller. If the message received, the ZCOMBO will go into the sleep mode immediately, else the ZCOMBO device will go into the sleep mode after 10 second timer expire in idle mode (No ongoing communication with the Z-Wave Controller).

The ZCOMBO will also send the Wake-up notification on configured Wake-up interval. If the ZCOMBO detects any Z-Wave event, it will send the event to the Z-Wave Controller and it will reset the Wake-up timer. Mostly the ZCOMBO device will send the Wake-up notification along with the Heartbeat message. Find the more Heartbeat details in the Heartbeat section.

Following are the Wake-up interval parameters,

- **DEFAULT_SLEEP_TIME**: 4200 seconds (70 minutes)
- **MIN_SLEEP_TIME**: 4200 seconds (70 minutes)
- **MAX_SLEEP_TIME**: 4200 seconds (70 minutes)
- **STEP_SLEEP_TIME**: 0

If the Wake-up interval set request received for value < MIN_SLEEP_TIME, the ZCOMBO device will set the Wake-up interval to MIN_SLEEP_TIME. If the Wake-up interval set request received for value > MAX_SLEEP_TIME, the ZCOMBO device will set the Wake-up interval to MAX_SLEEP_TIME.

4.3 Test alarm

When there is no alarm condition and the Test button is pressed for 3-5 seconds, the ZCOMBO will send the following Z-Wave message to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Notification Type	Notification Event
Notification (0x71)	Test(0x01)	0x03

When the Test is completed, the ZCOMBO will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Notification Type	Notification Event	Event Parameters length	Event Parameters
Notification (0x71)	Test(0x01)	0x00	0x01	0x03

4.4 Smoke alarm

When the Smoke is detected, the ZCOMBO will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Notification Type	Notification Event
Notification (0x71)	Smoke(0x01)	0x02

When the Smoke is clear, the ZCOMBO will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Notification Type	Notification Event	Event Parameters length	Event Parameters
Notification (0x71)	Smoke(0x01)	0x00	0x01	0x02

When the level of Smoke is below the threshold value and the silence button on the ZCOMBO is pressed, the ZCOMBO device will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Notification Type	Notification Event	Event Parameters length	Event Parameters
Notification (0x71)	Smoke(0x01)	0x06	0x01	0x02

Note: If the Smoke is silenced via the silence button but the Smoke is still present, after 15 minutes of the silence period the ZCOMBO will send the Smoke alarm again.

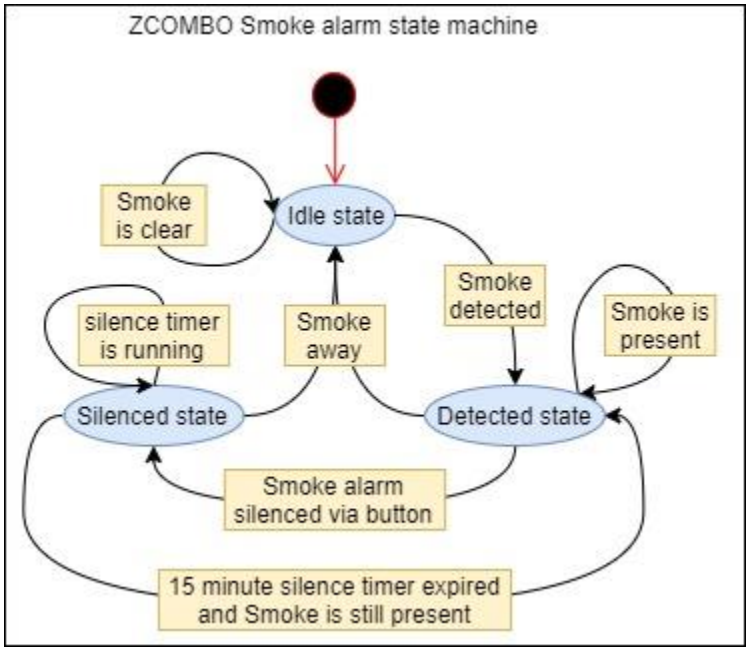

Figure 2: Smoke alarm state machine

4.5 CO alarm

When the CO is detected, the ZCOMBO will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Notification Type	Notification Event
Notification (0x71)	CO(0x02)	0x02

Note: CO alarm trigger time depends upon the level of CO.

When the CO is clear, the ZCOMBO will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Notification Type	Notification Event	Event Parameters length	Event Parameters
Notification (0x71)	CO(0x02)	0x00	0x01	0x02

When the silence button on the ZCOMBO is pressed, the ZCOMBO device will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Notification Type	Notification Event	Event Parameters length	Event Parameters
Notification (0x71)	CO(0x02)	0x06	0x01	0x02

Note: If the CO is silenced via the silence button but the CO is still present, after 4 minute of the silence period the ZCOMBO will send the CO alarm again.

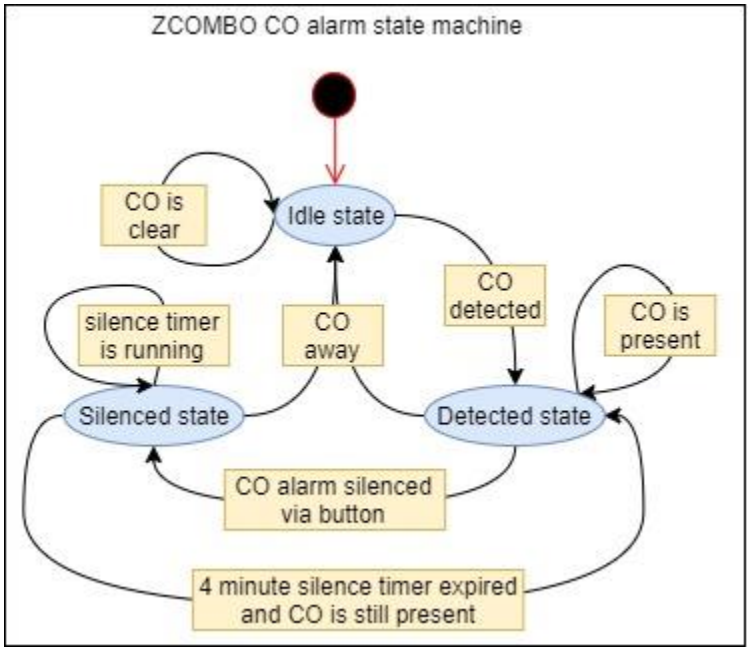

Figure 3: CO alarm state machine

4.6 Malfunction Detected

When the Smoke sensor malfunction is detected, the ZCOMBO will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Notification Type	Notification Event
Notification (0x71)	System(0x09)	0x01

When malfunction condition is clear or the silence button the ZCOMBO device is pressed, the ZCOMBO device will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Notification Type	Notification Event	Event Parameters length	Event Parameters
Notification (0x71)	System(0x09)	0x00	0x01	0x01

4.7 CO End-Of-Life(EOL)

When the CO sensor End-Of-Life is detected, the ZCOMBO will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Notification Type	Notification Event
Notification (0x71)	CO(0x02)	0x05

The ZCOMBO device CO sensor has a life of 7.5 years. Upon detecting the CO sensor End-Of-Life, the ZCOMBO device will send the CO End-Of-Life event after 1 minute of power-on and then at an interval of every 5 hours.

4.8 Heartbeat

On every power up event and at an interval of approximately every 1 hour, the ZCOMBO will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Notification Type	Notification Event
Notification (0x71)	System(0x09)	0x05

Note: The Hearbeat message will be sent in the standby condition only. When the ZCOMBO is in the alarm detected or alarm silenced mode, it will not send the Hearbeat message.

4.9 Battery Report

On every power up after approximately 1 min and upon the battery level changed, the ZCOMBO will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Identifier	Battery Level
Battery (0x80)	Battery report	0x4F to 0x64 (Hex)

If the battery level is <75%, the ZCOMBO will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

When the battery voltage is <77%, the ZCOMBO will start beeping and will blink the LED to indicate the low battery.

Command Class	Identifier	Battery Level
Battery (0x80)	Battery report	0xFF

Following table contains the mapping of the different battery voltage and the battery level.

Battery voltage	Battery level	Z-Wave reporting over Battery Command Class
3.3 V	100 (0x64)	0x64
3.2 V	100 (0x64)	0x64
3.1 V	100 (0x64)	0x64
3.0 V	100 (0x64)	0x64
2.9 V	98 (0x62)	0x62
2.8 V	95 (0x5F)	0x5F
2.7 V	91 (0x5B)	0x5B
2.6 V	87 (0x57)	0x57
2.5 V	83 (0x53)	0x53
2.4 V	79 (0x4F)	0x4F
2.3 V	75 (0x4B)	0x4B
2.2 V	71 (0x47)	0xFF
2.1 V	67 (0x43)	0xFF
2.0 V	64 (0x40)	0xFF
1.9 V	60 (0x3C)	0xFF
1.8 V	56 (0x38)	0xFF

4.10 Factory reset

When the ZCOMBO is powered up with the test button held down for 10+ seconds, the ZCOMBO will reset all Z-Wave settings and leave the network. Upon factory reset, the ZCOMBO device will turn of the power LED for ~1 second and will long beep the HORN. The ZCOMBO device will send the following Z-Wave message content to the Z-Wave Controller. If the S2 security is enabled, the message will be encapsulated inside the SuperVision Command Class.

Command Class	Identifier
Device Reset Locally (0x5A)	0x01

Note: Please use this procedure only when the network primary controller is missing or otherwise inoperable.