S-6500F, Schlage Z-Wave Mortise Door Locks

Version: 1.1

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1. Introduction

Schlage Z-Wave Mortise Locks are electronic Mortise locks with Z-Wave Plus™ Communication.

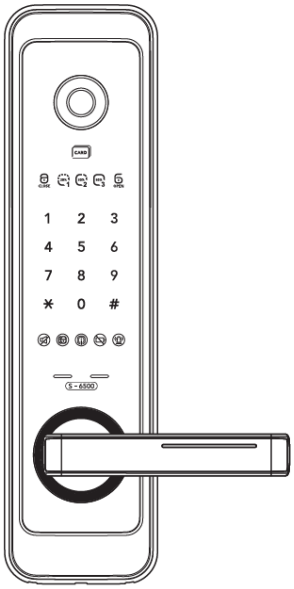
S-6500F lock must be used in conjunction with a Security Enabled Z-Wave™ Controller to fully utilize all implemented functions.

S-6500F lock supports the original Z-Wave Security Standard S0 and the new Security Standard S2 with SmartStart enabled

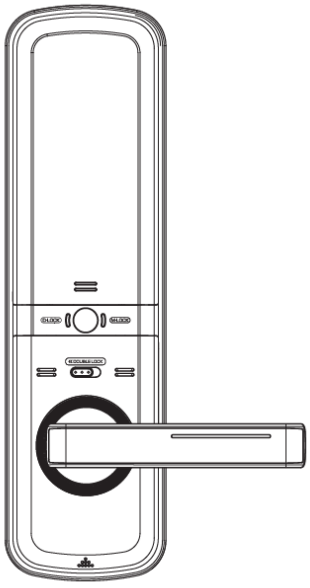
This product can be operated in any Z-Wave network with other Z-Wave certified devices from other manufacturers. All mains operated nodes within the network will act as repeaters regardless of vendor to increase reliability of the network.

2. Components

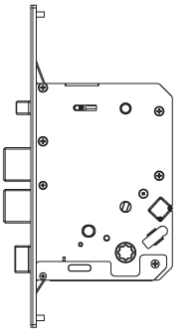
The lock has three major components. Front Assembly, Back Assembly, and Mortise Lock.



Front Assembly



Back Assembly



Mortise Lock

3. Z-Wave Specification

- Z-Wave hardware platform: ZM5202
- Z-Wave version: 6.81.03
- Z-Wave library type: 0x03 (slave_enhanced_232)
- Z-Wave Role Type: Listening Sleeping Slave
- Z-Wave Device Type: Door Lock Keypad
- Associated Category: Lock
- Z-Wave Plus: Yes
- Security S2 Classes: S2 Access Control
- SmartStart Compatible: Yes
- Manufacturer ID: 0x003B
- Product Type ID: 0x0003
- Product ID: 0x6500

4. Network Management Instructions:

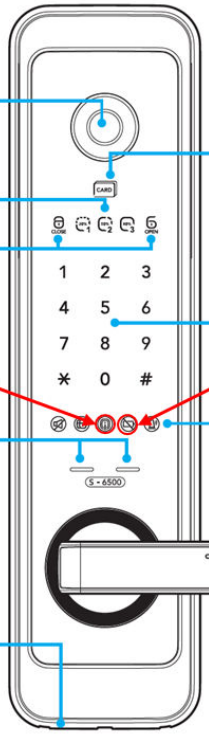
After the door lock is included NIF will not be triggered by user's inclusion process but NIF will be triggered by user's exclusion process.

Always power down e-lock before inserting the Z-Wave Module and then power up.

4.1 Add to Network

1. Place your Z-Wave Controller into the "Add" or Inclusion Mode (Refer the respective documentation for that specific home automation system or panel device for details).
2. Slide the battery cover upward.
3. Press the wireless button more than 3 seconds.
4. Press "1" on the keypad.
5. Press "6" on the keypad.
6. Press User Code on the keypad.
7. Press "#" on the keypad.
8. If RF LED flickers, inclusion has completed successfully.
9. If battery replace LED flickers(fail), try repeating steps 1-7.

1. Front Ass`y



Finger print sensor
Touch the registered fingerprint on sensor and then open the door.

Status indicator

Lock / Unlock lamp
Indicate lock / unlock status.

External emergency power supply terminal
when battery does not operate, product may be operated and unlocked by contacting 9V on terminal located outside.

Emergency key
open the door with emergency key by manual.

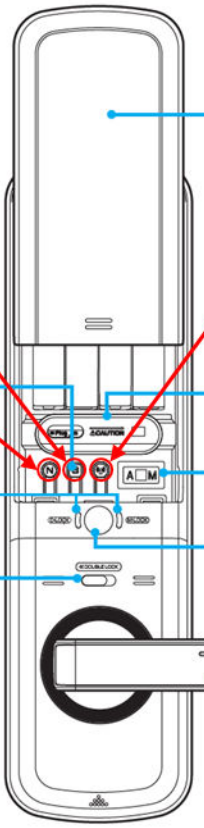
Card / Fob touch plate
Touch the registered Card / Fob to open the door.

Touch type numeric pad

Window icon

Handle
Can open the door by pushing down it after pressing PIN code or touching Card / Fob or fingerprint.

2. Back Ass`y



Battery cover
Push up to open the battery cover.

[N], [S], [ ] Button

Indicator lamp

[Double lock function]
Slide switch

Communication pack socket

Auto / Manual mode switch

Manual locking button
Button to lock the door by manual at manual locking mode.

Handle
Can open the door at anytime only by pulling down this handle.

4.2 Remove from Network

1. Place your Z-Wave Controller into the “Remove” or Exclusion Mode (Refer the respective documentation for that specific home automation system or panel device for details).
2. Slide the battery cover upward.
3. Press the wireless button more than 3 seconds.
4. Press “2” on the keypad.
5. Press “6” on the keypad.
6. Press User Code on the keypad.
7. Press “#” on the keypad.
8. If RF LED flickers, exclusion has completed successfully.
9. If battery replace LED flickers, try repeating steps 1-7.

4.3 Factory Reset of the Lock

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

When Master code was already registered

1. Remove batteries (power off).
2. Press “N” and “S” buttons at the same time and hold.
3. Insert batteries (power on).
4. Release “N” and “S” buttons.
5. Press 3-digit Master code.
6. Press “#” on the keypad.
7. Press “8” on the keypad.

When Master code was not registered yet

1. Remove batteries (power off).
2. Press “N” button and “S” button at the same time and hold.
3. Insert batteries (power on).
4. Release “N” and “S” buttons.
5. Press 3-digit Master code to register.
6. Press “#” on the keypad.
7. Press previous 3-digit Master code.
8. Press “#” on the keypad.

5. SmartStart

S-6500F lock is a SmartStart enabled Z-Wave Plus lock and can be automatically included with a SmartStart enabled Z-Wave Plus Controller on power up.
S-6500F lock can be added into a Z-Wave network by scanning the Z-Wave QR Code present on the product (inner side of battery cover) with a controller providing SmartStart inclusion. No further action is required and the SmartStart product will be added automatically.

5.1 Identification of the QR code/DSK on the Product

The DSK of this QR code is **"30252-44054-31996-47271-63700-60034-02425-09967"**. This DSK is used in the sample for certification.

The QR code will be printed on the plug-in Z-Wave module as shown in the picture below:

The plug-in module should be inserted in the Communication pack socket. To locate it, remove the battery cover as shown in the image below

5.2 Identification of the QR code/DSK on the Product and on the packaging

Since the lock uses a plug-in Z-Wave module that can be removed, the packaging will not contain any information about the DSK/QR code. It will, however, contain a Z-Wave Plus logo on the packaging, as shown below.

PLUS
S/N : E25190300469

SCHLAGE
S-6500
DIGITAL TOUCHPAD
DOOR LOCK
PLUS
S/N : E25190300469

6. Command Classes supported

Command Class	Ver.	Support/ Control	Non-Secured Added	Secured Added	
				Non- Secured Command Class	Secured Command Class
Application Status	1	S	✓	✓	✓
Association	2	S			✓
Association Group Information	1	S			✓
Basic	1	S			✓
Battery	1	S			✓
Configuration	1	S			✓
Device Reset Locally	1	S			✓
Door Lock	2	S			✓
Firmware Update Meta data	3	S			✓
Indicator	1	S			✓
Manufacturer Specific	1	S			✓
Notification	8	S			✓
Power level	1	S			✓
Security 0	1	S	✓	✓	
Security 2	1	S	✓	✓	
Supervision	1	S	✓	✓	✓
Time	1	S & C	✓	✓	✓
Transport Service	2	S	✓	✓	
User Code	1	S			✓
Version	2	S			✓
Z-Wave Plus Info	2	S	✓	✓	

6.1 Application Status Command Class V1

Refer Z-Wave Management Command Class Specification

6.1.1 Application Busy Command

If a Z-Wave command to unlock or lock the door lock while the keypad is active, the lock responds with an Application Busy Command to indicate that it cannot currently process that request. Note that other Z-Wave commands are processed normally even when the keypad is active. The status sent is always 0x00 (try again later).

This command is sent when the lock was woken up by manual operation from its sleep state, be it by keypad, Thumb turn, or inside buttons. The Busy status will be sent to Z-Wave Controller till the local operation on the lock is in progress. However, Z-Wave Controller can retry ideally after 5~12 sec. after receiving the Application Busy Status.

6.1.2 Application Rejected Request Command

The lock would send the Application Reject Request Command in case of Z-Wave Controller trying to disable the Power Management (Battery Notifications) by Notification Command Class as these notifications cannot be disabled.

6.2 Association Command Class V2

Refer Z-Wave Management Command Class Specification

The association command class is used to create association groups which allow the lock to push unsolicited notifications (notifications, door lock state changes, etc.) to the gateway, bridge or other device.

The following command classes are associated for unsolicited reports:

1. Battery
2. Device Reset Locally Notification
3. Door Lock (Door Lock Operation Report Command)
4. Notifications (only those with status = active, for a list of notification with status active by default)
5. User code enrollment and delete (User ID, User ID status, User code)

Max Nodes Supported for each Grouping Identifier

Grouping Identifier	Max Nodes Supported
1 (Lifeline)	2

As per the Command Class Specification, the lock shall respond to any group ID as if it were the first (and only) group.

6.3 Association Group Information Command Class V1

Refer Z-Wave Management Command Class Specification

6.3.1 Association Group Name

Parameter	Value
Grouping Identifier	0x01
Name Length	0x08
Group Name	“Lifeline”

6.3.2 Association Group Info

Parameter	Value
Grouping ID	0x01
Mode	0x00

Profile	0x0001(AGI_PROFILE_GENERAL, AGI_GENERAL_LIFELINE)
Reserved	0x00
Event Code	0x0000

6.3.3 Association Group Command List

Parameter	Value
List Length	0x0C
Command Class 1	0x80 (COMMAND_CLASS_BATTERY)
Command Class 1 Command	0x03 (BATTERY_REPORT)
Command Class 2	0x70 (COMMAND_CLASS_CONFIGURATION)
Command Class 2 Command	0x06 (CONFIGURATION_REPORT)
Command Class 3	0x5A (COMMAND_CLASS_DEVICE_RESET_LOCALLY)
Command Class 3 Command	0x01 (DEVICE_RESET_LOCALLY_NOTIFICATION)
Command Class 4	0x71 (COMMAND_CLASS_NOTIFICATION)
Command Class 4 Command	0x05 (NOTIFICATION_REPORT)
Command Class 5	0x63 (COMMAND_CLASS_USER_CODE)
Command Class 5 Command	0x03 (USER_CODE_REPORT)
Command Class 6	0x62 (COMMAND_CLASS_DOOR_LOCK)
Command Class 6 Command	0x03 (DOOR_LOCK_OPERATION_REPORT)

6.4 Basic Command Class V1

Refer Z-Wave Application Command Class Specification

6.4.1 Basic Set Command

As per Section 5.6.4.3.1.1 of SDS10242-29 Z-Wave Device Class Specification, Basic Set Command is ignored (no action taken) to avoid unintentional lock operation.

6.4.2 Basic Report

Basic Values Reported

Value	Description
0x00	Unsecured
0x01 – 0xFD	Unsupported
0xFE	Unknown/Unhanded
0xFF	Secured

Reported Door Lock Mode is related to Door status switch condition. Correlation between door status switch, deadbolt and value to be reported is depicted in below table.

Door status switch	Deadbolt	Value to be reported
Pressed	Extended	Secured
Pressed	Retracted	Unsecured

Released	Extended	Unsecured
Released	Retracted	Unsecured
Pressed	Jammed	Unknown
Released	Jammed	Unknown

6.5 Battery Command Class V1

Refer Z-Wave Management Command Class Specification
The level is reported from 20 – 100%. Below 20% coincides with dead batteries and the lock does not operate once it reaches this level.
When battery level is equal to or below than 50% e-lock reports “replace battery soon” and when battery level comes to equal to or below than 20% door e-lock reports “replace battery now”. Battery status will be updated only when keypad touch or button press happens.

6.6 Configuration Command Class V1

Refer Z-Wave Application Command Class Specification

Refer your controller or gateway documentation for directions to set these parameters.

The configuration class is used to read and write values to configure the lock. The table below defines the values used for these parameters. The read/write column indicates whether the parameters are read/write or read only. Any attempt to set a read only parameter is ignored. Any attempt to read a non-implemented parameter is ignored.

Value format (hexadecimal vs signed decimal)

The Values in the table below include hexadecimal and signed decimal values. Controllers may require either hexadecimal or signed decimal format. For more information on what format is required please review the documentation for your controller.

Parameter	Description	Read / Write	Size (bytes)	Byte	Value (hex)	Value (decimal)	Value Description	Association
Hex: 0x03 Decimal: 3	Beeper	R/W	1	1	0x00	0	Disable Beeper	Yes
					0xFF	-1	Enable Beeper (default)	

Parameter	Description	Read / Write	Size (bytes)	Byte	Value (hex)	Value (decimal)	Value Description	Association
Hex: 0x06 Decimal: 6	User Slot Bit Field (Occupied slots)	R	2	1 - 2	0x0000 – 0x03FF	0 – 1,023	User slots 1 – 10 This parameter is best used and understood in hexadecimal (default: 0x03 or 3)	No
				1	0x00 – 0xFF	-128 – 127	User Slots 8 – 1 (MSB – LSB) 8,7,6,5,4,3,2,1	
				2	0x00 – 0x03	0 – 3	User Slots 10 – 9 (MSB – LSB) N/A, N/A, N/A, N/A, N/A, N/A, 10, 9	
Hex: 0x05 Decimal: 5	Auto Lock	R	1	1	0x00	0	Disable Auto Lock (default)	Yes
					0xFF	-1	Enable Auto Lock	
Hex: 0x12 Decimal: 18	Get Bootloader Version	R	1	1	0x00 – 0x7F	0 – 127	Get the version of the bootloader	No

6.7 Device Reset Locally Notification Command Class V1

Refer Z-Wave Management Command Class Specification

Lock will indicate the Z-Wave plus Controller that it is going to reset when the FDR is initiated. After sending out this notification Lock erases the Node ID and Home Id and rest of the configurations to return to Factory State.

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

Refer the section 4.3 Factory Reset of the Lock

6.8 Door Lock Command Class V2

Refer Z-Wave Application Command Class Specification

Door Lock Mode

Value	Description
0x00	Unsecured
0x01 – 0xFD	Unsupported
0xFE	Unknown/Unhanded
0xFF	Secured

Reported Door Lock Mode is related to Door status switch condition. Correlation between door status switch, deadbolt and value to be reported is depicted in below table.

Door status switch	Deadbolt	Value to be reported
Pressed	Extended	Secured
Pressed	Retracted	Unsecured
Released	Extended	Unsecured
Released	Retracted	Unsecured
Pressed	Jammed	Unknown
Released	Jammed	Unknown

Both fields Lock Timeout Minutes and Lock Timeout Seconds report 0xFE (unsupported) as this feature is not included. The operation type field always reports 0x01 (constant operation). Door handle modes are not supported and always report as 0x00.

Door Condition

This door lock doesn't have latch sensor so, latch bit value in door condition is always 0.

Latch	Door Position Switch	Deadbolt	Value to be reported (Bit 2: Latch, Bit 1: Deadbolt, Bit 0: Door Position Switch)
Pressed	Pressed	Retracted	Bit 2: 0, Bit 1: 1, Bit 0: 1
Pressed	Pressed	Extended	Bit 2: 0, Bit 1: 0, Bit 0: 1
Pressed	Released	Retracted	Bit 2: 0, Bit 1: 1, Bit 0: 0
Pressed	Released	Extended	Bit 2: 0, Bit 1: 0, Bit 0: 0
Released	Pressed	Retracted	Bit 2: 0, Bit 1: 1, Bit 0: 1
Released	Pressed	Extended	Bit 2: 0, Bit 1: 0, Bit 0: 1
Released	Released	Retracted	Bit 2: 0, Bit 1: 1, Bit 0: 0
Released	Released	Extended	Bit 2: 0, Bit 1: 0, Bit 0: 0

In case of motor jammed state, it is considered that deadbolt is retracted(unlocked). So, in that case deadbolt bit value is 1.

6.9 Firmware Update Meta Data Command Class V3

Refer Z-Wave Management Command Class Specification

Parameter	Value
Manufacturer ID	0x003B
Firmware 0 ID	0x4790
Firmware Upgradable	0xFF
Number of Firmware Targets	0x01
Max Fragment Size	0x14 in S0, 0x1C in S2
Firmware 1 ID	0x4791

Parameter	Value
Wait Time	0x003C (For Host Processor firmware upgrade) 0x00FC (For ZM5202-Wave firmware upgrade)

6.10 Indicator Command Class V1

Refer Z-Wave Management Command Class Specification

The Z-Wave Controller can Turn ON or OFF the Buzzer on the Z-Wave lock using Indicator Set Command Class. Once the Buzzer is turned ON with Indicator Set Command, the Audible sound will be ON for 180 seconds or the Indicator Set command to Turn OFF.

Indicator Set Values:

Value	Description
0x00	Buzzer OFF
0xFF	Buzzer ON

6.11 Manufacturer Specific Command Class V1

Refer Z-Wave Management Command Class Specification

Parameter	Value
Manufacturer ID	0x003B
Product Type ID	0x0003
Product ID	0x6500

6.12 Notification Command Class V8

Refer Z-Wave Application Command Class Specification
Refer Z-Wave Notification Command Class, list of assigned Notifications

The table below contains all the version 3 alarm types supported by the lock which is a subset of the types supported by the command class standard. All values not included in the table are unsupported or reserved.

Z-Wave Notification Type		Z-Wave Alarm Event		Description	Default Status	V1 Alarm	V1 Level
Access Control	0x06	Manual Lock Operation	0x01	Device transitioned to the locked state due to manual interaction	Active	0x15	0x01
		Manual Unlock Operation	0x02	Device transitioned to the unlocked state due to manual interaction		0x16	0x01
		Keypad Lock Operation	0x05	Device transitioned to the locked state due to keypad interaction		0x12	0 (User ID = 0)
		Keypad Unlock Operation	0x06	Device transitioned to the unlocked state due to keypad interaction		0x13	User #
		Auto Lock Locked Operation	0x09	Device automatically returned to the locked state by the auto lock function		0x1B	0x01

Z-Wave Notification Type		Z-Wave Alarm Event		Description	Default Status	V1 Alarm	V1 Level
		Z-Wave Lock Operation	0x03	Device transitioned to the locked state due to Z-Wave interaction		0x18	0x01
		Z-Wave Unlock Operation	0x04	Device transitioned to the unlocked state due to Z-Wave interaction		0x19	0x01
		Lock Jammed	0x0B	Lock could not reach the desired position after three attempts. This is also sent if the lock is moved to an unknown region with the thumb turn. This is the general bolt movement error message. This is reported as unknown state.		0x09	0x00
		Keypad temporarily disabled	0x10	Three invalid user codes were entered. The lock disables the keypad for 3 minutes.		0xA1	0x01
Power Management	0x08	Replace battery soon (Reports this notification equal to or lower than 50%)	0x0A	Sent once when lock transitions to low battery	Active	0xA7	0x01

Z-Wave Notification Type		Z-Wave Alarm Event		Description	Default Status	V1 Alarm	V1 Level
		Replace battery now (Reports this notification equal to or lower than 20%)	0x0B	Sent once when lock transitions to critical battery (lock will no longer operate)		0xA9	0x01
System	0x09	System HW Failure	0x01	A HW fault is detected in the lock	Active	0x09	0x00

- For Keypad Lock/Unlock Operation Notifications, the event parameter sent is the user code that was accepted at the lock. All notifications are version 8.
- The lock busy notification is not sent; the application status command class is used instead.
- The notification set command allows the different notification types to be enabled or disabled. Setting the status to 0x00 disables and 0xFF enables that alarm type. See above table for the default state of each notification.
- The Power Management Notifications cannot be disabled for the product. If attempted to disable, Application Reject Request Command will be sent from the Lock.
- An alarm report is sent to the nodes in the association group when the event occurs if it is enabled. All fields (including Notification Type and Notification Level) are set to 0x00. Only fields included in the above Table.
- If the lock was unable to move to the desired position, the lock responds with a “lock jammed” notification.
- **Keypad Temporarily Disabled** - The only other persistent notification event is Keypad Temporarily Disabled (3 invalid user codes were entered). This event will expire after 3 minutes. There is no way to remotely clear this event.
- **Replace Battery Soon and Replace Battery Now** notifications - The persistent notification event is replacing battery soon or replaces battery now. When battery level is below 50%

the notification event Replace Battery Soon will be sent unsolicited. And when battery level is below 20% the notification event Replace Battery Now will be sent unsolicited.

6.13 Power level Command Class V1

Refer Z-Wave Network-Protocol Command Class Specification

6.14 Security 0 Command Class V1

Refer Z-Wave Transport-Encapsulation Command Class Specification

6.15 Security 2 Command Class V1

Refer Z-Wave Transport-Encapsulation Command Class Specification

6.16 Supervision Command Class V1

Refer Z-Wave Transport-Encapsulation Command Class Specification

Supervision Command Class is Mandatory Command Class for the Z-Wave Plus. It allows to send the next commands without waiting for the first command and update the status response when available. This reduces the network bandwidth and improves the system performance.

The lock supports the following encapsulated commands in S0/S2 via the Supervision Get:

a. Door Lock Operation Set
b. User Code Set
c. Indicator Set
d. Notification Set
e. Association Set
f. Configuration Set
g. Powerlevel Set
h. Powerlevel Test Node Set

For all other encapsulated commands, the Supervision Get will return a NO_SUPPORT value in the Supervision Report.

Also, if the Supervision Get command is issued for the supported CC's in S0/S2 in an unsecured manner, or, if the DUT is in the unsecured mode, it will respond with a NO_SUPPORT value in the Supervision Report.

6.17 Time Command Class V1

Refer Z-Wave Management Command Class Specification

- This is the only Command Class with Support and Control provision on the lock.

- The Time Command Class is required to provide the Network Time for the lock to support the User Code Access Scheduling.

- Note: At Power Up the Lock is assigned with Default Time (1st Jan 2000) and once the Lock is included in the secured Z-Wave Network, it will use the Time Command services to get the Network Controller Time.

6.18 Transport Service Command Class V2

Refer Z-Wave Transport-Encapsulation Command Class Specification

6.19 User Code Command Class V1

Refer Z-Wave Application Command Class Specification

- The lock supports user codes between 4 and 10 digits in length. Each code in the lock can be the different length.
- If a user code is received that contains an improper number of digits (less than 4 digits or more than 10 digits, for example) the lock returns a user ID status of 0xFE and does not modify the contents of that user code.
- The user id status is used to indicate the future desired state of the slot. To add a user code, the status is set to 1. To clear the user code, the status is set to 0. Setting the status to 0 and the user identified to 0 clears all the codes in the lock.
- Same user codes can be duplicate on different slots.
- The lock supports 10 users. [Combination of Door lock registered, and Z-Wave registered]

6.20 Version V2

Refer Z-Wave Management Command Class Specification

Parameter	Value
Z-Wave Library Type	0x03 (slave_enhanced_232)
Z-Wave Protocol Library Version	0x06
Z-Wave Protocol Library Sub Version	0x04
Firmware 0 Version (ZW ASIC)	0x01
Firmware 0 Sub Version (ZW ASIC)	0x05
Hardware Version	0x01
Number of firmware targets	0x01
Firmware 1 Version (Host)	0x02
Firmware 1 Sub Version (Host)	0x02

- The lock reports the version as per the table in Supported Command Classes in section 5. All versions that are not indicated otherwise are version 1. If the command class is not contained in the table, the lock returns 0x00 for the version.

6.21 Z-Wave Plus Info V2

Refer Z-Wave Management Command Class Specification

Parameter	Value
Z-Wave Plus Version	0x01
Role Type	0x07 (ROLE_TYPE_SLAVE_SLEEPING_LISTENING)
Node Type	0x00 (NODE_TYPE_ZWAVEPLUS_NODE)
Installer Icon Type	0x0300 (ICON_TYPE_GENERIC_DOOR_LOCK_KEYPAD)
User Icon Type	0x0300 (ICON_TYPE_GENERIC_DOOR_LOCK_KEYPAD)