Alarm.com
Smart Thermostat
Z-Wave Manual

V1.3

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Building 36 Technologies

1 Z-Wave Add and Remove Process

To navigate the menus, use up/down buttons to move selection and the selection (>) button to confirm the selection.

1.1 Adding the thermostat to a Z-Wave network

1. Put Z-Wave controller into Add mode. See Z-Wave controller documentation for further documentation.
2. Press the Menu (-) Button
3. Select SETTINGS
4. Select NETWORK
5. Select ADD
6. Thermostat will display 'Network Add In Progress' and the 5-digit DSK pin. The pin can be used for S2 inclusion.
7. The thermostat has been added successfully when the thermostat displays 'Network Add Complete'

1.2 Removing the thermostat from a Z-Wave network

8. Put Z-Wave controller into Remove mode. See Z-Wave controller documentation for further documentation.
9. Press the Menu (-) Button
10. Select SETTINGS
11. Select NETWORK
12. Select REMOVE
13. Thermostat will display 'Network Remove In Progress'.
14. The thermostat has been removed successfully when the thermostat displays 'Network Remove Complete'

1.3 Reset thermostat to default state

The thermostat can be reset with the following procedure. This will remove the thermostat from the Z-Wave network and reset all the device parameters.

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

1. Turn the display on with any button press
2. Press Menu (-) button to go to main menu
3. Select SETTINGS.
4. Select INSTALLER.
5. Select CONTINUE when prompted with the warning.
6. Select RESET
7. Select YES when prompted with the reset confirmation question.
8. Select CONTINUE when prompted with the network reset question.

2 Compatibility with Other Manufactures' Z-Wave Devices

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

3 Node Information

The thermostat supports non-secure, S2 Unauthenticated, and S2 Authenticated enrollment. The thermostat can be learned in as an Always On Slave (AOS) or Listening Sleeping Slave (LSS) depending on the available power source at learn in. If the thermostat has 24VAC power from the HVAC system (commonly called C-Wire) it will learn in as an AOS device. Otherwise it learns in as an LSS device.

A Security Enabled Z-Wave controller must be used in order to fully utilize the product.

The Z-Wave DSK code is embedded in the QR code on the back of the thermostat, beneath the Z-Wave Plus logo. The 5-digit DSK pin is located beneath the QR Code. The QR code and entire DSK is printed on the thermostat box. During add process, the thermostat shows the 5-digit DSK pin on the thermostat screen.

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 network vicinity.

The table below shows the command classes supported by the thermostat, the command class version, and the required security class for each command class.

Table 1 - Z-Wave Command Class and Security Information

Command Class	Version	Required Security Class
Z-Wave Plus	2	None
Association	2	Highest Granted Security Class
Battery	1	Highest Granted Security Class
Clock	1	Highest Granted Security Class
Configuration	1	Highest Granted Security Class
Firmware Update Meta Data	3	Highest Granted Security Class
Humidity Control Setpoint	1	Highest Granted Security Class
Humidity Control Mode	2	Highest Granted Security Class
Humidity Control Operating State	1	Highest Granted Security Class
Manufacturer Specific	2	Highest Granted Security Class
Notification	7	Highest Granted Security Class
Sensor Multilevel	11	Highest Granted Security Class
Thermostat Fan Mode	3	Highest Granted Security Class
Thermostat Fan State	1	Highest Granted Security Class
Thermostat Mode	2	Highest Granted Security Class
Thermostat Operating State	2	Highest Granted Security Class
Thermostat Setpoint	3	Highest Granted Security Class
Version	2	Highest Granted Security Class
Device Reset Locally	1	Highest Granted Security Class
Power Level	1	Highest Granted Security Class
Association Group Info	1	None
Supervision	1	None
Security 2	2	None
Transport Service	2	None
Basic	1	Highest Granted Security Class

4 Notifications

The thermostat supports the Power Management and System Event Types.

NOTE : Power Management (0x08) is off by default.

Table 2 - Notification Command Class Definitions

Notification Type	Notification State	Description
Power Management	Power Status	State of thermostat connection to the HVAC system. When 24VAC is connected and 24VAC is detected, the state is set. It is cleared when 24VAC is not detected.
	AC Mains Disconnected	Set when 24VAC C-Wire is not detected.
	AC Mains Connected	Set when 24VAC C-Wire is detected.
System Status	Hardware Failure with code	Set when hardware failure detected. • 0xE0 Temp Sensor Fail • 0xE1 Relay Processor Fail • 0xE2 Z-Wave Processor Fail • 0xE3 Wiring Error • 0xE4 Unexpected Z-Wave Reset • 0xE5 Overcurrent • 0xE6 Unexpected Switch Opened • 0xE7 Unexpected Switch Closed
	Software Failure with code	Set when software failure detected. No software errors are defined.

5 Configuration Command Class

Temperature parameters take the form of 4-byte Z-Wave temperature commands where byte 1 is the (precision|scale|size) and bytes 2 and 3 are the 16-bit signed temperature value. Byte 4 is unused. The thermostat will format temperature reports with the same scale as the thermostat display temperature units. If the temperature value is 0xFFFF (e.g. 0x2AFFFF00) the parameter is disabled.

5.1 Parameters

5.1.1 0x01 : HVAC Type (normal | heat pump)

- 0x00 - Normal (DEFAULT)
- 0x01 - Heat Pump
- Size 1 byte

5.1.2 0x02 : Number of Heat Stages / Auxiliary Heat Stages (0 | 1 | 2 | 3)

- Default 2
- Size 1 byte

5.1.3 0x03 : Number of Cool Stages / Heat Pump Stages (0 | 1 | 2)

- Default 2
- Size 1 byte

5.1.4 0x04 : Heat Fuel Type (Fossil | Electric)

- 0x00 - Fossil
- 0x01 – Electric (DEFAULT)
- Size 1 byte

5.1.5 0x05 : Calibration Temperature (-10°F to 10°F), 1°F increments

- Default 0°F
- Size 4 bytes

5.1.6 0x06 : Swing (0.0°F to 3°F), 0.5°F increments

- Default 0.5°F
- Size 4 bytes

5.1.7 0x07 : Overshoot (0.0°F to 3°F), 0.5°F increments

- Default is 0.0°F
- Size 4 bytes

5.1.8 0x08 : Heat Staging Delay (1 to 60 minutes)

- Default 30 minutes
- Size 1 byte

5.1.9 0x09 : Cool Staging Delay (1 to 60 minutes)

- Default 30 minutes
- Size 1 byte

5.1.10 0x0A : Balance Setpoint (0°F - 95°F), 1°F increments

- Default 30°F
- Size 4 bytes

5.1.11 0x0B : RESERVED

5.1.12 0x0C : Fan Circulation Period (10 to 1440 minutes)

- Default 60 minutes
- Size 2 byte

5.1.13 0x0D : Fan Circulation Duty Cycle (0 to 100%)

- Default 25%
- Size 1 byte

5.1.14 0x0E : Fan Purge Time (1 to 3600 seconds)

- Default 60 seconds
- Size 2 bytes

5.1.15 0x0F : Maximum Heat Setpoint (35°F - 95°F), 1°F increments

- Default 95°F
- Size 4 bytes

5.1.16 0x10 : Minimum Heat Setpoint (35°F - 95°F), 1°F increments

- Default 35°F
- Size 4 bytes

5.1.17 0x11 : Maximum Cool Setpoint (50°F - 95°F), 1°F increments

- Default 95°F
- Size 4 bytes

5.1.18 0x12 : Minimum Cool Setpoint (50°F - 95°F), 1°F increments

- Default 50°F
- Size 4 bytes

5.1.19 0x13 : Thermostat Lock

- 0x00 - Disabled (Default)
- 0x01 – Full Lock
- 0x02 – Partial Lock
- Size 1 byte

5.1.20 0x14 : Compressor Delay (0 to 60 minutes)

- Default 5 minutes
- Size 1 byte

5.1.21 0x15 : RESERVED

5.1.22 0x16 : RESERVED

5.1.23 0x17 : Temperature Display Units (Fahrenheit | Celsius)

- 0x00 - Celsius
- 0x01 - Fahrenheit (Default)
- Size 1 byte

5.1.24 0x18 : HVAC Modes Enabled (Off | Heat | Cool | Auto | Emergency Heat)

- Bitmask
  - Bit 0 - Off
  - Bit 1 - Heat
  - Bit 2 - Cool
  - Bit 3 - Auto
  - Bit 4 - Emergency Heat
- Allowed Values
  - 0x03 - Off, Heat
  - 0x05 - Off, Cool
  - 0x07 - Off, Heat, Cool
  - 0x0F - Off, Heat, Cool, Auto (DEFAULT)
  - 0x1F - Off, Heat, Cool, Auto, Emergency Heat
  - 0x17 - Off, Heat, Cool, Emergency Heat
  - 0x13 - Off, Heat, Emergency Heat
- Size 1 byte

5.1.25 0x19 : Configurable Terminals Setting (W3 | H | DH | Vent)

- 0x00 - None (DEFAULT)
- 0x01 - W3, 3rd Stage Auxiliary Heat
- 0x02 – H, Humidifier
- 0x03 – DH, Dehumidifier
- 0x04 – External Air Baffle or Vent
- Size 2 byte

5.1.26 0x1A : Power Source (mains | battery) READ ONLY

- 0x00 - Battery
- 0x01 - C-Wire
- Size 1 byte

5.1.27 0x1B : Battery Alert Threshold Low (0-100%)

- Default 30%
- Size 1 byte

5.1.28 0x1C : Battery Alert Threshold Very Low (0-100%)

- Default 15%
- Size 1 byte

5.1.29 0x1D : Current Relay State (READ ONLY)

- Loads – 1 = load, 0 = no load
- State – 1 = closed, 0 = all other state
- Size 4 byte

Bits	7	6	5	4	3	2	1	0
Loads	Z1	Y2	Y	W2	W	G	O	-
	Override	-	-	C	RC	RH	Z2	B
State	Z1	Y2	Y	W2	W	G	O	-
					RC	RH	Z2	B

5.1.30 0x1E : Remote Temperature Enable

- When reading, the second byte is the remote temperature status
  - 0x00 : Remote temperature disabled
  - 0x01 : Active and functioning properly
  - 0x02 : Inactive, timeout reached (see parameter 0x27)
  - 0x03 : Inactive, temperature differential reached (See parameter 0x28)
  - 0x04 : Inactive, 3 successive communication attempts failed
- 0x00 - Disabled (DEFAULT)
- 0x01 - Enabled
- Size 1 byte

5.1.31 0x1F : Heat Differential (1.0°F to 10.0°F), 0.5°F increments

- Default 3.0°F
- Size 4 bytes

5.1.32 0x20 : Cool Differential (1.0°F to 10.0°F), 0.5°F increments

- Default 3.0°F
- Size 4 bytes

5.1.33 0x21 : Temperature Reporting Threshold (0.5°F to 2.0°F), 0.5°F increments

- Default 1.0°F
- Size 4 bytes

5.1.34 0x22 : RESERVED

5.1.35 0x23 : Z-Wave Echo Association Reports

- 0x00 - Disabled (DEFAULT)
- 0x01 - Enabled
- Size 1 byte

5.1.36 0x24 : C-Wire Power Thermistor Offset

- Default -2.0°F
- Size 4 byte

5.1.37 0x25 : Run Fan With Auxiliary Heat

- 0x00 - Disabled (DEFAULT)
- 0x01 - Enabled
- Size 1 byte

5.1.38 0x26 : Z-Wave Association Report Bit Mask

- Bitmask to selectively enable non-required Z-Wave association reports. The report is enabled if the bit is set to one (1).
    - Bit 0 – Thermostat Mode
    - Bit 1 , 2– Reserved
    - Bit 3 – Thermostat Operating State
    - Bit 4 – Thermostat Fan Mode
    - Bit 5 – Thermostat Fan State
    - Bit 6 – Ambient Temperature
    - Bit 7 – Relative Humidity
    - Bit 8 – Reserved
    - Bit 9 – Battery Low Notification
    - Bit 10 – Battery Very Low Notification
    - Bit 11- Thermostat Supported Modes
    - Bit 12 – Remote Enable Report
    - Bit 13 – Humidity Control Operating State Report
    - Bit 14 – HVAC Type
    - Bit 15 – Number of Cool/Pump Stages
    - Bit 16 – Number of Heat/Aux Stages
    - Bit 17 – Relay Status
    - Bit 18 – Power Source (C-Wire or Battery)
    - Bit 19 – Notification Report Power Applied
    - Bit 20 – Notification Report Mains Disconnected
    - Bit 21 – Notification Report Mains Reconnected
    - Bit 22 – Notification Report Replace Battery Soon
    - Bit 23 – Notification Report Replace Battery Now
    - Bit 24 – Notification Report System Hardware Failure
    - Bit 25 – Notification Report System Software Failure
    - Bit 26 – Notification Report System Hardware Failure with Code
    - Bit 27 – Notification Report System Software Failure with Code
    - Bit 28 – Display units (C/F)
    - Bit 29 – Heat Fuel Type
    - Bit 30 – Humidity Control Mode
    - Bit 31 – Humidity Control Setpoints
- Default is 0xFFFFFFFF
- Size 4 byte

5.1.39 0x27 : Remote Temperature Timeout (0 to 32,767 minutes)

- Default is 130 minutes
- Size 2 bytes

5.1.40 0x28 : Remote Temperature Differential (0°F to 99°F) 1.0°F increments

- Default is 25°F
- Size 4 bytes

5.1.41 0x29 : Remote Temperature ACK Failure Limit (0-127)

- Default is 3
- Size is 1 byte

5.1.42 0x2A : Remote Temperature Display Enable

- 0x00 - Disabled
- 0x01 – Enabled (DEFAULT)
- Size 1 byte

5.1.43 0x2B : Outdoor Temperature Timeout (0 to 32,767 minutes)

- Default is 1440 minutes
- Size 2 bytes

5.1.44 0x2C : RESERVED

5.1.45 0x2D : Heat Pump Expire (0 to 2880 minutes)

- Default is 0 minutes
- Size 2 byte

5.1.46 0x2E : Dehumidify by AC Offset (0°F to 10°F) 1.0°F increments

- Default is 3°F
- Size 4 bytes

5.1.47 0x2F : RESERVED

5.1.48 0x30 : PIR Enable

- Default is enabled.
- Size 1 byte

5.1.49 0x31 : Display Options

- Bitmask to set display options.
  - Bit 0 – if '1', show humidity on the main screen in all modes.
- Default is 0x00
- Size 1 byte

5.1.50 0x32 : System Configuration (READ ONLY)

- Summarized report of system configuration

Bits	7	6	5	4	3	2	1	0
Loads State	Aux Fan	Cool Stages		Heat Stages		Fuel	HVAC Type	
	Z2 Configuration				Z1 Configuration			
	Reserved							Override
	Reserved							

- HVAC Type : 00b – Normal, 01b – Heat Pump
- Fuel : 0b – Fuel, 1b -Electric
- Aux Fan : 0b- Disabled, 1b – Enabled
- Override : 1b – Relays manually configured, 0b – Relays automatically detected
- Size 4 bytes

5.1.51 0x33 : Thermostat Reset (Write Only)

- Must write the magic value 0x0B36 to take effect.
- Size 2 byte

5.1.52 0x34 : Vent Options

- 0x00 – Disabled
- 0x01 – Always activate regardless of thermostat operating state
- 0x02 – Only activate vent when the thermostat operating state is heating.
- 0x03 – Only activate vent when the thermostat operating state is cooling.
- 0x04 – Only activate the vent when the thermostat operating state is heating or cooling.
- Default is 0x04
- Size 1 byte

5.1.53 0x35 : Vent Circulation Period (10 to 1440 minutes)

- Default 60 minutes
- Size 2 byte

5.1.54 0x36 : Vent Circulation Duty Cycle (0 to 100%)

- Default 25%
- Size 1 byte

5.1.55 0x37 : Vent Maximum Outdoor Temperature (0°F - 99°F), 1°F increments

- Default Disabled (0xFFFF)
- Size 4 bytes

5.1.56 0x38 : Vent Minimum Outdoor Temperature (0°F - 99°F), 1°F increments

- Default Disabled (0xFFFF)
- Size 4 bytes

5.1.57 0x39 : Relay Harvest Level

- Set PTO Harvest Level for Relay MCU energy harvesting.
- 0x00 – Off
- 0x09 – 8 pulses
- 0x0A – 16 pulses
- 0x0B – 32 pulses
- 0x0C – 64 pulses
- Default is 64 pulses (0x0C)
- Size 1 bytes

5.1.58 0x3A : Relay Harvest Interval

- Set PTO Harvest Interval for Relay MCU energy harvesting.
- 0x00 – Off
- 0x02 – 4 Milliseconds
- 0x03 – 8 Milliseconds
- 0x04 – 16 Milliseconds
- 0x05 – 32 Milliseconds
- Default is 16 Milliseconds
- Size 1 bytes

5.1.59 0x3B : Minimum Battery Reporting Interval

- Minimum number of hours between battery reports. The thermostat will always report a battery report following a power cycle. The thermostat also sends a battery report every 24 hours regardless of the value of this parameter.
- 0 to 127 hours
- Default is 6 Hours
- Size 1 byte

5.1.60 0x3C : Humidity Control Swing

- Percent value the thermostat will add (for de-humidify) to or remove (for humidify) from the relevant humidity control setpoint
- 1-100%
- Default is 5%
- Size 1 byte

5.1.61 0x3D : Humidity Reporting Threshold

- The minimum percent the relative humidity must change between reported humidity values.
- 0-100%
- Default is 5%
- Size 1 byte

5.1.62 0x3E : Z-Wave Send Fail Limit

- If thermostat experiences successive Z-Wave Transmit ACK failures exceeding the limit, the thermostat will not attempt any more unsolicited association reports until it receives a successful acknowledge for an association report. If this value is zero, the ACK failure limit is disabled.
- Default is 10
- Size is 1 byte

5.1.63 0x3F : Z-Wave Listen Before Talk Threshold

- Set the listen before talk threshold on the thermostat. The threshold controls at what RSSI level the Z-Wave radio will refuse to transmit because of noise. Each step corresponds to a 1.5dB power step. Byte 0 is the LBT threshold for channel 0 and Byte 1 is the LBT threshold for channel 1.
- Valid Range in decimal: 64 (-65dB) to 78 (-44dB)
- Default is decimal 78 (-44dB) for both channels
- Size is 2 byte

5.1.64 0x40 : Vent Override Lockout (0-127 hours)

- The vent override lockout will activate the vent if the vent has not been active in the period specified by this parameter. This only applies if the vent configuration is not disabled and at least one configurable terminal is configured as vent.
- Default is 12 hours
- Size is 1 byte

5.1.65 0x41 : Humidify Options

- Humidify options.
- 0x00 – Always humidify regardless of thermostat operating state
- 0x01 – Only humidify when the thermostat operating state is heating, when in heat mode or when heating in auto mode. When in any other thermostat mode, the thermostat will humidify whenever it is necessary.
- Default is 0x01
- Size 1 byte

6 Association Reports

The thermostat will report the following on the lifeline association group (Group 1). The maximum number of devices on the lifeline association group is four (4)

- Sensor Multilevel Report (temperature) : When temperature changes by at least the temperature reporting threshold (See Configuration Parameter 0x21)
- Sensor Multilevel Report (humidity) : When relative humidity changes by at least the relative humidity reporting threshold (See Configuration Parameter 0x3D)
- Thermostat Mode Report : When thermostat mode changes locally
- Thermostat Mode Supported Report : When the thermostat detects a new HVAC configuration based on automatic wire detection.
- Thermostat Operating State Report : When thermostat operating state changes
- Thermostat Setpoint Report : When either the heat or cool target is changed locally
- Thermostat Fan Mode Report : When fan mode changes
- Thermostat Fan Mode Supported Report: When the thermostat detects a new HVAC configuration based on automatic wire detection.
- Thermostat Fan State Report : When fan state changes
- Humidity Control Operating State : When humidity control state changes, a humidity control operating state report is sent.
- Battery Report : Battery level is reported once per day and when the battery changed by 5% (minimum interval set by configuration parameter 0x3B). If the battery level falls below the low level (set by configuration parameter 0x1B), the thermostat reports both the battery level and 0xFF. The thermostat will wait a minimum interval between battery reports that are based on changes in the detected battery level (set by configuration parameter 0x3B). The 24 hour battery report is sent regardless of the setting of parameter 0x3B.
- Configuration Report (Remote Temperature Status Report): When report temperature status changes, a configuration report for parameter 0x1E is sent.
- Humidity Control Mode: When the humidity control mode is changed locally.
- Humidity Control Setpoint : When the humidity control humidifier setpoint or the dehumidifier control setpoint is changed.
- Notification Report : See Notifications section for more information.
- Device Reset Locally Report : When thermostat is set to default it will notify all nodes on in the lifeline association group.

7 Basic Command Class Handling (Energy Saving Mode)

The basic command class can be used to change the thermostat recovery settings. The value of zero (0x00) indicates the recovery setting is efficient. The value of 1 through 99 (or 255) will set the recovery setting to comfort. The default value is comfort.

If the thermostat is set into efficient from comfort, it will increase the cool setpoint by 3 degrees Fahrenheit and decrease the heat setpoint by 3 degrees Fahrenheit. If the setpoint change causes the setpoints to be within 3 degrees Fahrenheit of eachother, the setting is ignored. For example, if the heat setpoint was 72F and the cool setpoint was 68F in comfort mode and the thermostat was set to efficient, the resulting heat setpoint would be 69F and the cool setpoint would be 71F. This violates the minimum setpoint differential of 3F.

If the thermostat is set to comfort from efficient, it will decrease the cool setpoint by 3 degrees Fahrenheit and increase the heat setpoint by 3 degrees Fahrenheit. If the setpoint change causes the setpoints to exceed the minimum or maximum setpoint values, the setting is ignored. The minimum setpoint is 35F and the maximum is 95F.