Z-Wave® USNAP® Module User Guide

Radio((•))Thermostat

Radio Thermostat Company of America

The RTZW-02 USNAP module is a plug in module that adds Z-Wave® functionality to a CT-Series Thermostat [CT= Communicating Thermostat].

The CT-Series Thermostat with an RTZW-02 module is compatible with a broad range of Z-Wave® certified devices from other manufacturers and can be controlled wirelessly with Z-Wave® controllers supporting the Thermostat General V2 Device Class. Please consult the user manual and your controller supplier for more details.
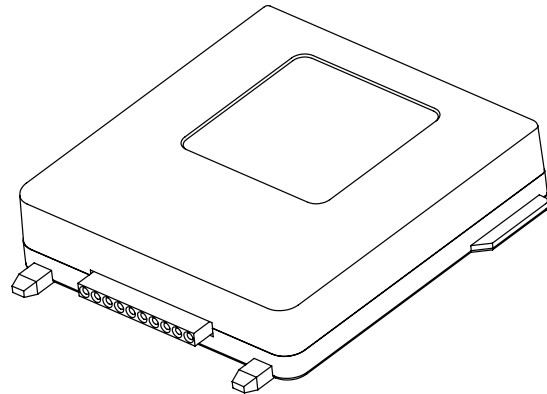
The RTZW-02 provides two-way communication as part of a Z-Wave® network. When it receives commands from Controller device, it sends back confirmation that the command was received and implemented. Each module in a Z-Wave® network communicates with every other module, acting as a "repeater" and routing your commands to their destination

514-001-000

by the most reliable pathway. When Z-Wave® devices (regardless of manufacturer) are installed throughout the house, signals are automatically routed around obstacles or dead spots, strengthening the network as more devices are added.

The Basics

The RTZW-02 USNAP module is designed to be inserted into an empty USNAP slot in any CT-Series Thermostat. (Follow the instructions that come with your CT-Series Thermostat and install it to your HVAC system before installing the RTZW-02 USNAP module.)
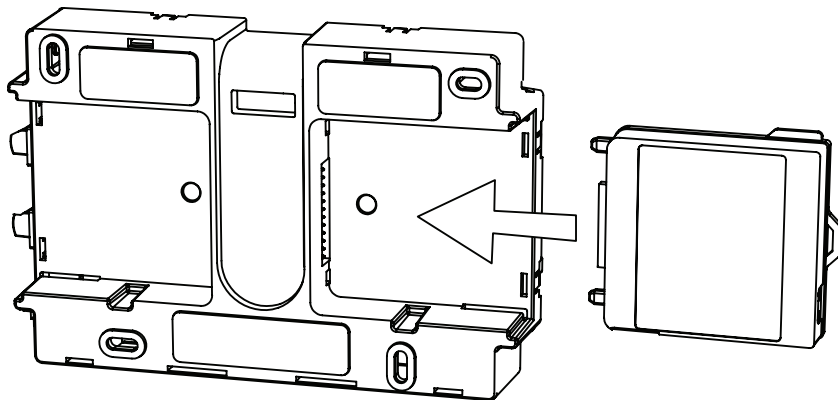
Note: Some models of the CT-Series are capable of operating in battery only mode (i.e. without C-wire from HVAC system), yet some other

models of the CT-Series (like the CT-80) are only capable of working in your HVAC system with the C-wire present.

The RTZW-02 USNAP module is designed to work with either constant present power in the thermostat (ie C-wire), or it can run only on batteries when no C-wire is present. Depending on which model CT-Thermostat you have, and how your CT-Thermostat is powered will determine which functionality the RTZW-02 module will have when added to a Z-Wave® network.

Getting Started

Examine your CT-Thermostat and identify an empty USNAP slot (refer to your CT-Thermostat instruction manual for details).

1) Power OFF the thermostat by removing batteries and disconnecting the C wire.
2) Insert the RTZW-02 module into the CT-Thermostat Radio Slot with the label on the RTZW-02 facing the wall behind the thermostat. The RTZW-02 module should slide in and engage with no visible protrusion from the thermostat.
3) Power up the thermostat by re-installing the batteries and re-connecting the C wire.
4) Press the reset button on your CT (see thermostat documentation) and reset the CT by pressing the reset button for 1 second.

During reset you should see the "radio tower" icon appear on your CT along with some beeps indicating that the CT Thermostat is initializing the RTZW-02 USNAP module. When the beeping finishes (about 10 seconds), your CT Thermostat will be ready to join and be controlled by a Z-Wave® network.

Join or Un-Join Network

1) Set your primary controller to INCLUSION mode to add the thermostat as a node on your network (see your specific controller's User Manual for detailed instructions).

2) Press/Touch the Mate Button. This will bring you to the network inclusion screen.

> Mate button: On touch screen units the MATE button is on the MENU screen. On other LCD thermostat's see thermostat instructions for mate button location.

3) If you only have 1 USNAP module inserted in the thermostat you will see a r1 or r2 to indicate that the radio is in slot 1 or slot 2. If you have multiple radios you can select which radio you want to join the network by selecting an r1 or r2 from the top left hand corner of the screen. When you have selected a radio, the large r1 or r2 will appear in the center of the screen.

4) When the radio is selected and the large r1 or r2 is on the center of the screen, press the mate button, this will initiate the inclusion process. When a device has has been successfully included into the network the icon **LINK** will appear under the radio tower. Similarly, when you are trying to exclude the device from the network, the icon **LINK** will disappear when the node has successfully left the network.

Your controller will indicate the thermostat was successfully added to its network (see your specific controller's User Manual for details.)

For other controller specific tasks such as adding the thermostat to Scenes or Groups, or excluding the thermostat as a node, use the mate button to activate the Z-Wave® signal needed for inclusion or exclusion.

Operation

See your specific controller's User Manual for detailed instructions on operating your thermostat. If your controller supports full thermostat device class functions then the following remote features are available:
a) Up and Down Temperature Control
b) Change between HEAT and COOL modes
c) Read the current temperature
d) Set/Read the indicator

d) Set/Read the Fan mode

e) Set/Read the clock (on certain CT models only)

f) Set/Read the user display area (on certain CT models only)

Battery Power
When your thermostat is running on battery power, the Z-Wave® radio will turn off to help conserve battery life. The RTZW-02 Z-Wave® radio module supports Z-Wave® beaming, which allows other devices in the network to wake up the RTZW-02 and accept commands, and then go back to sleep.

C-Wire Power
When your thermostat is running on C-Wire power, the Z-Wave® radio will stay on and actively help in routing messages within the Z-Wave® network.

Simple Mode/Normal Mode
The most RTCOA Touchscreen thermostats offer two modes of operation, Normal Mode and Simple mode. Normal mode is intended for use as a stand alone programmable thermostat. In Normal mode the user can program the thermostat to change temperatures at various points throughout the day. Simple mode is intended for use with a larger control system - like an alarm system or home automation system. Simple mode is meant to run a single temperature constantly. This temperature can be set locally on the thermostat,

or remotely using a Z-Wave® USNAP module. See the thermostat instruction book for how to enter simple mode

Factory Default Restore
Performing a Factory Default Restore will return your thermostat to the state it was in when it left the factory. This means that all of its configuration and parameters will be returned to their default values. This includes resetting its Z-Wave network information, removing it from its previous network. This action should only be used in the event that the network primary controller is missing or otherwise inoperable. To perform this action, the thermostat must be switch to OFF mode. Wait until the radio wave icons on the left side of the screen stop blinking then touch the screen once to turn on the back light and then hold the center of the screen for about 8 seconds until the thermostat beeps.

Behavior Note: When power is first applied to this device it will broadcast a Hail message followed by a Node Information frame. This behavior is to maintain backwards compatibility with older controllers
that work with this line of devices.

Advanced Z-Wave® Information
The RTZW-02 supports compliant mapping of the Z-Wave® BASIC_
COMMAND_CLASS to the CT thermostat "Energy Saving" and "Comfort
Mode" as follows:
Basic Set (Value = 0x00) = Set Energy Saving Mode
Basic Set (Value = 0x01-0x63 & 0xFF) = Set Comfort Mode

Energy Savings applies a 4° F setback to the existing set point temperature to
comply with EPA recommendations for energy savings.

Association group:
This device support one association group, and up to two nodes in that group. If at
least one node is added to association group one (1), the thermostat will send the
following association reports when the respective state has changed:

- Thermostat Mode Report
- Thermostat Operating State Report
- Fan Mode Report
- Fan State Report
- Setpoint Report (for all supported setpoints)
- Sensor Multilevel Report (if enabled by Configuration Command Class)

The association command class can be configured to send encapsulated reports

via the Multi Instance Command Class or the Multi Channel Command Class. If the association configuration commands are sent inside encapsulated commands, the thermostat will respond with encapsulated reports of the same type (Multi Instance v1 or Multi Channel v3). Encapsulation is the only way to configure the thermostat to send humidity sensor multilevel association reports.

For example, if an Association Set is encapsulated in a Multi Channel Command Encapsulation command is sent to the humidity instance (2), then the thermostat will encapsulate all un-solicited humidity sensor multilevel reports in the Multi Channel Command Encapsulation Command. The default instance is the temperature instance (1). If the Association Set is sent un-encapsulated then the thermostat will send all un-solicited temperature sensor multilevel reports unencapsulated.

All association reports other than the humidity multilevel are in the default instance (1). The thermostat will encapsulate the association reports based on the last Association Set encapsulation type received (i.e. un-encapsulated, Multi Instance v1, or Multi Channel V3).

Anti-theft:

The Anti-theft Command Class is used to disable a subset of supported/controlled command classes in the thermostat if the thermostat is being excluded and re-included into a Z-Wave network again. The thermostat supports version 2 of the Anti-theft Command Class. This command class is typically used when installing a thermostat in a public location such as a hotel room or conference center. The command class allows the user to lock the thermostat to the actual Z-Wave network

and to render it useless if it is removed from the local network without being unlocked.
Another application would be to protect service provider owned products from leaving
the service providers network before they are paid for.
The following command classes are disabled when Anti-theft protection is engaged:

> Basic Command Class
> Clock Command Class
> Indicator Command Class
> Manufacturer Specific Command Class
> Muiltilevel Sensor Command Class
> Thermostat Mode Command Class
> Thermostat Operating State Command Class
> Thermostat Fan Mode Command Class
> Thermostat Fan State Command Class
> Thermostat Setpoint Command Class
> Version Command Class
> Configuration Command Class
> Battery Command Class
> Association Command Class
> Anti-theft Command Class
> Multi Channel Command Class*
> * Only supported if a humidity sensor is present.

Configuration Parameters:

This device supports the following configuration parameters:

Parameter	Name	Set/Get	Default	Values
1	Temp Reporting Threshold	Set/Get	2	0 to 4
2	HVAC Settings	Get Only	N/A	see details
3	Utility Lock Enable/Disable	Set Only	0	0 to 127
4	C-Wire/Battery Status	Get Only	N/A	0 or 1
5	Humidity Reporting Threshold	Set/Get	2	0 to 3
6	Auxiliary/Emergency	Set/Get	0	0 or 1
7	Thermostat Swing Temp	Set/Get	2	1 to 8
8	Thermostat Diff Temp	Set/Get	4	4 to 12
9	Thermostat Recovery Mode	Set/Get	2	1 or 2
10	Temp Reporting Filter	Set/Get		see details
11	Simple UI Mode Enable/Disable	Set/Get	1	0 or 1
12	Multicast Enable/Disable	Set/Get	0	0 or 1

1. Temperature Reporting Threshold (8-bit)
This value determines the reporting threshold when association reporting is enabled. Unsupported values will be ignored.

Value	Threshold
0	Disabled
1	0.5 ºF
2	1.0 º F
3	1.5 ºF
4	2.0 ºF

2. HVAC Settings (32-bit)
Byte 1 = HVAC Setup: Normal (0x01) or Heat Pump (0x02)
Byte 2 = Aux Setup(Gas (0x01) or Electric (0x02)) & Number of Auxiliary Stages (Heat Pump)/Number of Heat Stages (Normal)
Byte 3 = Number of Heat Pump Stages
Byte 4 = Number of Cool Stages

3. Utility Lock (8-bit)
If set to 0, the utility lock is disabled, all other values, 1-255, will enable the utility lock.

4. C-Wire/Battery Status (8-bit)
If 0x01, the thermostat is being powered form a C-wire, if 0x02, the thermostat is being powered off of batteries.

5. Humidity Reporting Threshold (8-bit)
This value determines the reporting threshold when association reporting is enabled. Unsupported values will be ignored.

6. Auxiliary/Emergency Enable/Disable (8-bit)
If set to 0, auxiliary / emergency heat is disabled, all other values, 1-255, will enable the auxiliary / emergency heat. This can only be enabled when the thermostat is set to Heat Pump mode.

7. Thermostat Swing Temperature (8-bit)
The thermostat swing temperature is in units of 0.5 degrees Fahrenheit. A value of 0x01 is 0.05F and 0x02 is 1.0F. The supported values may vary from thermostat to thermostat but typically the allowed values are 0.5F (0x01) to 4.0F (0x08).

8. Thermostat Differential Temperature:
Thermostat Differential Temperature Set Command Definition

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_CONFIGURATION							
Command = CONFIGURATION_SET							
Parameter = 0x08							
Default	RESERVED				Size = 0x02		
Thermostat Differential Mode							
Thermostat Differential Temperature							

The configuration report returns both heat and cool differential temperatures.

Thermostat Differential Temperature Report Command Definition

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_CONFIGURATION							
Command = CONFIGURATION_SET							
Parameter = 0x0A							
Default	RESERVED				Size = 0x04		
Precision (0x00)			Scale		Bound Size (0x01)		
Temperature Filter Lower Bound							
Precision (0x00)			Scale		Bound Size (0x01)		
Temperature Filter Upper Bound							

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_CONFIGURATION							
Command = CONFIGURATION_REPORT							
Parameter = 0x08							
Thermostat Heat Differential Temperature							
Thermostat Cool Differential Temperature							

Parameter (8-bit)
The parameter is set to 8 for the thermostat differential temperature.
Default (1-bit)
If the default bit is set, the thermostat heat differential temperature will be set to 2.0 degree Fahrenheit.
Size (3-bit)
The Size field must be set to 2 (010b).
Thermostat Differential Mode (8-bit)

The Thermostat Differential Mode determines which differential temperature to set. Valid values are 0x00 (Heat) or Cool (0x01)

Thermostat Differential Temperature (8-bit)

The thermostat differential temperature is in units of 0.5 degrees Fahrenheit. A value of 0x04 is 2.0F and 0x06 is 3.0F. The differential temperature must be an integer value. Non-integer values, such as 1.5F (0x03), should not be used. The supported values may vary from thermostat to thermostat but typically, the allowed values are 2.0F (0x04) to 6.0F (0x0C).

9. Thermostat Recovery Mode (8-bit)

The Thermostat Recovery Mode can be either fast (0x01) or economy (0x02).

10. Thermostat Reporting Filter(16-bit):

Set Command Definition

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_CONFIGURATION							
Command = CONFIGURATION_SET							
Parameter = 0x0A							
Default	RESERVED S				ize = 0x04		
Precision (0x00) S		cale B			ound Size (0x01)		
Temperature Filter Lower Bound							
Precision (0x00) S		cale B			ound Size (0x01)		
Temperature Filter Upper Bound							

Thermostat Reporting Filter Report Command Definition

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_CONFIGURATION							
Command = CONFIGURATION_SET							
Parameter = 0x0A							
Temperature Filter Lower Bound							
Temperature Filter Upper Bound							

Parameter (8-bit)
The parameter is set to 10 (0x0A) for the temperature reporting filter.

Default (1-bit)
If the default bit is set, the upper bound is zero (0) and the lower bound is 124. This disables the filter.

Size (3-bit)
The Size field must be set to 4 (100b).

Precision (3-bits)
The precision field describes what the precision of the temperature filter value. The filter must be zero (0x00).

Scale (2-bits)
The scale field indicates the temperature scale used, 0 indicate the use of the Celsius temperature scale and 1 indicates use of the Fahrenheit scale.

Bound Size (3-bits)
The size field indicates the number of bytes used for the temperature filter value. This field must be one (0x01).

Temperature Filter Lower Bound (8-bit)
The thermostat will report ambient temperature changes for temperature values less than the lower bound. This field must be between 0F and 124F. By default, this value is 124F (report all temperature changes).

Temperature Filter Upper Bound (8-bit)
The thermostat will report ambient temperature changes for temperature values greater than the upper bound. This field must be between 0F and 124F. By default, this value is 0F (report all temperature changes).

11. Simple Mode Enable/Disable (8-bit)
If the value is set to 0x00 then Normal Mode is enabled. If the value is set to 0x01 then Simple Mode is enabled.

12. Multicast Enable/Disable (8-bit)
If set to 0, multicast is disabled, if set to 1, will enable the multicast.

FCC and IC Statement

FCC Regulatory Information:
NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

   a) reorient or relocate the receiving antenna,
   b) increase the separation between the equipment and receiver,
   c) connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
   Consult the dealer or an experienced radio/TV technician for help.

IC Regulatory Information:
This Class B digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation of the device. Cet appareillage numérique de la classe B répond a toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

WARNING: Changes or modifications to this receiver not expressly approved by RTCOA. could void the user's authority to operate this equipment.