

USING Z-WAVE LIGHTING DEVICES WITH HOMEVISION

1.0 INTRODUCTION

Several companies make products that support the Z-Wave communications protocol (see the website at <http://www.z-wave.com/> for details). This application note details how to use Z-Wave lighting devices with HomeVision and HomeVision-Pro (both referred to herein as HomeVision). HomeVision does not contain built-in support for Z-Wave devices. However, Z-Wave devices can be used with the “Custom lighting” feature available in HomeVision version 3.4 and higher. This requires the user to copy a prewritten macro into their HomeVision schedule and to set a few controller options. This Z-Wave feature uses only about 1% of HomeVision’s memory.

This application note should provide enough information to allow users to get their Z-Wave devices working with HomeVision. Those wanting more details on how the custom lighting feature works can refer to the “Custom lighting” file installed in the HomeVision directory.

2.0 REQUIREMENTS FOR USING Z-WAVE DEVICES WITH HOMEVISION

You must have the following to use Z-Wave devices:

- A vizia rf + “Plug-In Serial Interface Module”, model VRC0P-1LW (or equivalent). This device is referred to as the SIM, or Serial Interface Module, in this document.
- An unused HomeVision or HomeVision-Pro serial port to connect the PIM to. For HomeVision, the use of an add-on HomeVision-Serial or HomeVision-Phone/Serial device is strongly recommended. For HomeVision-Pro, ports 3 or 4 are recommended, although a HomeVision-Phone/Serial add-on device can also be used. Note that the current Z-Wave implementation transmits serial data to the SIM, but doesn’t receive data from the SIM. Receiving data requires that the serial port’s “DTR” line be tied to 5V, which the HomeVision and HomeVision serial ports do not do. If you wish to modify the macros to receive or be able to use the HomeVision Terminal Emulator to receive data from the SIM, Contact Custom Solutions, Inc. to obtain a serial port that can support the SIM or instructions for modifying an existing port.
- HomeVision or HomeVision-Pro version 3.4 or higher. This requires both a version 3.4 PROM installed in the unit, as well as the 3.4 PC software.
- The HomeVision schedule file “Z-Wave.haf”. The schedule file contains pre-written Z-Wave macros. One of the “Control Macros” will run whenever a Z-Wave command is performed. The macros perform the serial interface commands needed to communicate with the SIM. This file is provided by Custom Solutions, Inc. and is available free on our web site at: www.csi3.com/Z-Wave.

3.0 HOW TO USE Z-WAVE DEVICES WITH HOMEVISION

3.1 Step 1 – Install and Configure Z-Wave devices

You must set up your Z-Wave network and its devices before using them with HomeVision. You can plug the SIM into an AC power outlet at this time; the SIM’s green LED should blink. Network setup is done using a Z-Wave programmer, such as Leviton model VRCPG. Refer to the programmer manual for details. In general, you will first include your dimmers/switches in the network, then include the SIM and other “controllers”. Record the Node ID assigned to each

device, as it will be used when configuring the HomeVision software. If you're using the VRCPG programmer, the programmer will default to Node ID 1, and the other devices will start at 2. You should test your devices using your Z-Wave programmer/remote or other controller before configuring HomeVision to control them.

3.2 Step 2 – Install and Test the SIM

3.2.1 SIM Installation

Install the SIM as follows if using HomeVision serial port 3 or 4:

1. Connect the SIM to HomeVision serial port 3 or 4 using the phone-to-serial cable provided with the SIM.
2. Configure the HomeVision serial port as follows:
 - a. Open the Expansion Boards Configuration Screen under the Configure menu.
 - b. Click the "Other" tab.
 - c. Ensure the check box for the desired HomeVision serial port (3 or 4) is checked.
 - d. Set the baud rate to 9600.
 - e. Set the timeout value to 10ms.
 - f. Set the duplex mode to full.
 - g. Uncheck the receive binary zeros option.
 - h. Click "Done"

Alternatively, you can use a HomeVision-Phone/Serial device as serial port 2 to communicate with the SIM. Install the device in accordance with its manual. Select the same serial port settings as described above, except that there is no duplex mode or receive binary zeros option to set.

3.2.2 Testing (optional)

It is possible for you to send commands to the SIM and view SIM responses using the HomeVision Terminal Emulator. This can be used for several purposes:

1. To verify the SIM is operating properly.
2. To directly control Z-Wave devices either to test them or to put them into "scenes" or "groups".

You can do this with HomeVision's "serial port forwarding" capability. This feature can take data that HomeVision receives from the SIM and transmit it out serial port 1 to a PC so you can monitor what the SIM is transmitting (note that HomeVision will often transmit other data to the PC, so you may see a mixture of data). It can also take data you enter in the terminal emulator and send it to the SIM. Enable this feature as follows:

1. Open the Controller Settings Screen under the Configure menu.
2. Click the Serial tab.
3. In the "Select direction of serial port data forwarding" area, check either "2 to 1", "3 to 1", or "4 to 1" depending on which HomeVision port the SIM is connected to.
4. If you want to also send commands to the SIM from the PC, also check either "1 to 2", "1 to 3" or "1 to 4".
5. Click OK.
6. Load the schedule file into HomeVision.

WARNING: You should only enable serial port forwarding for brief setup and testing purposes. During normal operation, you should not forward all the serial port 1 data to the SIM, as it could interfere with the SIM's operation.

Once enabled, you can open the Terminal Emulator in the HomeVision software to view messages from the SIM or send commands to it. When you plug the SIM into the AC powerline, it will transmit a message something like this:

```
$Leviton(C) 2008 V1.5/Z-Wave 2.09
```

You can test your Z-Wave devices by sending commands to them. Enter the command in the top box of the Terminal Emulator screen and press the enter key. The file "RZC0P ASCII Interface.pdf" details the ASCII serial protocol used by the SIM for those interested in the details.

Following are examples of commands you can send to the SIM and the expected responses:

Turn device at Node ID 2 on:

```
Transmit: >N2 ON or >N2ON
Response: <E000 {means there was no serial command error}
          <X000 {means the command was successfully transmitted via RF}
```

Turn device at Node ID 2 off:

```
Transmit: >N2 OF or >N2OF
Response: <E000
          <X000
```

Set device at Node ID 2 to level 50%:

```
Transmit: >N2L50
Response: <E000
          <X000
```

Request status of device at Node ID 2:

```
Transmit: >?N2
Response: <E000
          <X000
          <N002L030 {means node 2 is at level 30 (30%)}
```

Request network update after controlling Node ID 2:

```
Transmit: >UP
Response: <E000
          <N002S000,099,000 {means node 2 is at level 99, and scene 0 is
                             using a fade rate of 0}
```

3.3 Step 3 – Configure Z-Wave Groups

If you are using Z-Wave "groups" to group lights together, you will need to configure the lights into the desired groups. This may be possible using software that came with one of your Z-Wave controllers. If not, you can do it by using the HomeVision Terminal Emulator screen to transmit "Group store" commands to the Z-Wave SIM. The process is described below.

1. You must have first enabled HomeVision's "serial port forwarding" from port 1 (the PC) to the port the SIM is connected to. See Paragraph 3.2.2 for details
2. Open the HomeVision Terminal Emulator screen under the Other menu.
3. For each group you want to create, type a command in the top box using the following format:

```
>Nx,x,xGSy
```

where:

- The “x” characters are the Z-Wave Node ID numbers (note that these are *not* the same as the HomeVision light ID numbers, discussed later). This is a list of numbers separated by commas (there is no need for spaces, although spaces shouldn’t cause a problem).
- The “y” character is the group number.

For example, the following command puts the lights with Z-Wave Node ID numbers 2 and 5 into group 1:

```
>N2,5GS1
```

4. Test each group by sending a “Group recall” command to control the group. Type a command in the top box using the following formats:

```
>GRyON      {to turn group y on}
>GRyOF      {to turn group y off}
```

For example, this command turns group 1 off:

```
>GR1OF
```

You don’t have to create your groups now. You can come back anytime and add or change the groups.

3.4 **Step 4 - Configure the HomeVision Software**

Next, you must configure the “Custom Lighting” feature so it can control Z-Wave devices. This requires setting up the macro that will perform the Z-Wave functions. Proceed as follows:

1. In your schedule file, open the “Variable Summary Screen” under the “Objects/Events” menu:
 - a. Click the “Add Variable” button repeatedly, or click once and then hold down the ENTER key, to add variables. Continue until variable 250 or higher is reached
 - b. Enter the following names for variables 245 through 250:
 - Variable #245 name = “Z-Wave light number”
 - Variable #246 name = “Z-Wave light node ID”
 - Variable #247 name = “Z-Wave type”
 - Variable #248 name = “Z-Wave light command”
 - Variable #249 name = “Z-Wave light data 1”
 - Variable #250 name = “Z-Wave - temporary”
 - c. Click “Done”
2. Open the “Timer Summary Screen” under the “Objects/Events” menu:
 - a. If you don’t have an unused timer in the schedule, click the “Add Timer” button to add one.
 - b. Name an unused timer “” and make a note of the timer ID number - you will use it in Step 5
 - c. Click “Done”
3. Open the “Macro Summary Screen” under the “Objects/Events” menu:
 - a. Click the “Add Macro” button repeatedly, or click once and then hold down the ENTER key, to add macros. Continue until macro 250 or higher is reached
 - b. Name macro #250 “Z-Wave Control Macro”
 - c. Click “Done”
4. Select “Custom Lighting” from the “Configure” menu:

- a. Select the "User-created macro and variables method"
 - b. If you're not using X-10 (or possibly even if you are), you may want to check the "Swap X-10 and lighting buttons on Toolbar" option. When you do this, the X-10 button will be replaced by a "Lighting" button (shown as a light bulb). This provides an easy way to access the custom lighting commands. If you don't select this option, you can access the lighting commands from the pop-up menu under the toolbar's "Other" button.
 - c. Set the "Maximum light level" value to 100 (this is the default value)
 - d. For "Macro", select macro #250 (Z-Wave Control Macro)
 - e. For "ID number variable", select variable #245 (Z-Wave light number)
 - f. For "Address variable", select variable #246 (Z-Wave light node ID)
 - g. For "Extra byte variable", select variable #247 (Z-Wave type)
 - h. For "Command variable", select variable #248 (Z-Wave light command)
 - i. For "Data value 1 variable", select variable #249 (Z-Wave light data 1)
 - j. For "Data value 2 variable", select variable #250 (Z-Wave - Temporary)
 - k. Click "OK"
 - l. Save your schedule file
5. Copy the Z-Wave Control Macro into your schedule file:

NOTE: The instructions below close your schedule file and open another one to copy the macro. Alternatively, you can start a second copy of the software and open both schedule files simultaneously.

- a. Open the HomeVision schedule file named "Z-Wave.haf". Note that if you're using the HomeVision-Pro software to open this file, it will ask if you want to convert the file to the HomeVision-Pro format. Click "OK".
- b. Open the "Macro Summary Screen" under the "Objects/Events" menu
- c. Scroll down to the end of the macro listing. There will be three Z-Wave Control Macros (macros 250, 251, and 252). Each macro uses a different HomeVision serial port for communicating with the Z-Wave SIM. Select the "Actions defined" field for the Control Macro corresponding to the serial port your SIM is connected to
- d. Select the "Actions defined" field, then right-click and select "Copy" from the pop-up menu
- e. Open your schedule file
- f. Open the "Macro Summary Screen" under the "Objects/Events" menu
- g. Scroll down to the end of the macro listing and select the "Actions defined" field for macro #250 (Z-Wave Control Macro)
- h. Select the "Actions defined" field, then right-click and select "Paste" from the pop-up menu
- i. Double-click the "Actions defined" button to open the Actions Entry Screen for macro #250
- j. Scroll to the bottom of the macro and look for the line "Wait 0:00:03.00 with timer #0 (Z-Wave timer), Then:". Double-click the line to edit the command. Select the Z-wave timer # that you created in Step 2, then click "OK" to close the edit box
- k. Click "OK" to close the Actions Entry Screen
- l. Click "Done" to close the Macro Summary Screen
- m. Save your schedule file

Note that the "Z-Wave.haf" schedule file contains 19 macros and three custom lights starting at number zero. Also, the X-10 ON or OFF actions for some P house codes contain custom lighting commands. These were all used in testing the control macros and were left in the file in case they might help you. You do not need to copy these into your schedule file.

3.5 Step 5 – Add Z-Wave Devices to HomeVision Software

Next, add your Z-Wave devices to the custom light list:

1. Open the “Custom Lighting Summary Screen” under the “Objects/Events” menu
2. Click “Add light” to add as many Z-Wave devices as you have
3. Give a name to each light
4. In the “Address” field, enter the “Node ID” number assigned to it during the Z-Wave network setup
5. Leave the “Extra Data” field at the default value of 0 (zero)
6. Select the “Load Name” option if you want the light’s name to be loaded into the HomeVision controller for display on a TV
7. Check the “Light enabled” option (this is the default setting)
8. If desired, set the “Power Fail State”. Most Z-Wave users would leave this at the default setting of “No change”
9. Click “Done”
10. Save your schedule file
11. Load the schedule file into HomeVision (unless you’re going to add Z-Wave groups, described next, in which case you can wait to download after that)

3.6 Step 6 – Add Z-Wave Groups to HomeVision Software

If you’re using Z-Wave groups, add each group to the custom light list:

1. Open the “Custom Lighting Summary Screen” under the “Objects/Events” menu
2. Click “Add light” to add as many Z-Wave groups as you have
3. Give a name to each group
4. In the “Address” field, enter the Z-Wave group number
5. In the “Extra Data” field, enter a value of 1 (one). This indicates to the Control Macro that this is a group, not a single light
6. Select the “Load Name” option if you want the group’s name to be loaded into the HomeVision controller for display on a TV
7. Check the “Light enabled” option (this is the default setting)
8. Leave the “Power Fail State” at the default setting of “No change”. Most Z-Wave users would leave this at the default setting of “No change”
9. Click “Done”
10. Save your schedule file
11. Load the schedule file into HomeVision

4.0 COMMAND USAGE

You’re now ready to put commands in your schedule to control your Z-Wave devices. The available commands are described below. Note that the “Z-Wave.haf” schedule file contains examples of the main commands in the first 20 macros.

4.1 Entering Z-Wave Commands in your Schedule

To enter Z-Wave commands, use the “Lighting” button on the Actions Entry Screen Toolbar. If you selected the “Swap X-10 and lighting buttons on Toolbar” option during the configuration, the lighting button will be found at the top of the Toolbar (with a light bulb icon). Otherwise, it will be in the pop-up menu under the “Other” button.

The following commands are available to control a single light:

- Light ## off

- Light ## on
- Light ## toggle
- Light ## brighten XX times (note 1)
- Light ## dim XX times (note 1)
- Light ## to level XX at rate YY (note 2)
- Light ## to level in variable XX at rate YY (note 2)
- Light ## refresh (command light to whatever level HomeVision currently thinks light is at)

Note 1: For the brighten and dim commands, HomeVision will add or subtract the XX value from the level HomeVision *thinks* the light is currently at to determine the new level, and will then command the light to that level. If HomeVision does not properly track the light level, these commands will not work properly. The “level” commands should be used instead where possible, as they command the light directly to the level you specify.

Note 2: The level commands will always change the light immediately to the specified level - the ramp (or “fade”) rates cannot be used. When entering commands, select the default ramp rate of “instantly”.

The following commands don’t send any commands to the Z-Wave devices. Instead, they set the internal variables that HomeVision uses to track the devices’ states (on, off, level, etc.). Most users won’t need these commands.

- Light ## set tracking state to OFF
- Light ## set tracking state to ON at level XX
- Light ## set tracking state to ON at level in variable XX
- Light ## set tracking state to ON at unknown level
- Light ## set tracking state to UNKNOWN
- Set state of current light to OFF
- Set state of current light to ON at level in variable XX
- Light ## put current level into variable XX

The following sections provide more details on some of these commands.

4.2 Level Command (recommended!)

We recommend you use the level command whenever possible. The level command sets the light directly to the specified level, thus ensuring that HomeVision knows the exact device level. When you enter the level command, the software also allows the user to specify the ramp rate. However, the ramp rate is ignored for Z-Wave devices. Instead, the level commands will always change the light immediately to the specified level. When entering commands, select the default ramp rate of “instantly”.

4.3 On, Off, and Toggle Commands

The On command turns the light on at its preset level. The Off command turns the light off. The Toggle command sets the light off if it’s currently on, and turns it on at its preset level if currently off. When HomeVision performs the On command, it will assume the light turns on at full brightness. However, the light may actually come on at a different level. This will cause HomeVision to improperly track the light level. A similar problem occurs when the Toggle command turns a light on. To avoid this problem, you can use a Level command to turn the light on to a specific level, and HomeVision will then know the level the light turned on at.

4.4 Brighten and Dim Commands

Although you can enter these in your schedule, the macro does not directly send “Brighten” or “Dim” commands. Instead, HomeVision tries to keep track of the device levels. When you perform a command such as “Brighten 10 times”, HomeVision will add 10 to what it thinks the current level is, and will then command the Z-Wave device to go to that level. There are 100 steps over the full range of level 0 to 100. A “Brighten 10 times” command will increase the brightness 10%. Similarly, a “Dim 20 times” command will decrease the brightness 20%. There is one limitation of this approach: if the device is at a different level than HomeVision thinks it’s at, the device will end up at the wrong level. The level commands should be used instead where possible, as they command the light directly to the specified level.

4.5 Group Commands

Z-Wave devices support “groups” that contain multiple lights. Each group must be entered into the “Custom Lighting Summary Screen” as described in Paragraph 3.6. When commands like On, Level ##, etc., are performed on a group instead of a single light, all devices in that group will respond the same way to the command. For example, a “Group 1 to Level 50%” command will cause all lights in group 1 to go on at 50%.

There is one drawback to these group commands: Because HomeVision doesn’t know which lights are in a group, it will not properly track the light levels. However, you can work around this problem if you only use a limited number of group commands. For example, assume you have a group of lights that you only change as a group to either off, 50%, or 100%. You could create three macros, one for each level. In the macro, put the appropriate group command to set the group to the desired level. Then, include one of the “Light ## set tracking state to ...” commands for each light in the group. Remember that these commands don’t actually control the light, but instead set HomeVision’s tracking level to the specified level. By doing this for each light in the group, HomeVision will know the correct levels. For example, assume lights 1, 2, and 5 are part of group 6. Create a macro named “Group 6 to 50%” and put these commands in it:

```
Group 6: Ramp to 50% (level 50) instantly  
Light #1: Set tracking state to ON at level 50% (level 50)  
Light #2: Set tracking state to ON at level 50% (level 50)  
Light #5: Set tracking state to ON at level 50% (level 50)
```

If you have four groups of lights, and you wanted three levels for each group, you’d need a total of 12 macros. If you ever add lights to or remove lights from a group, you would have to modify the macros accordingly.