

APPENDIX A: HAL External Control Message Protocol

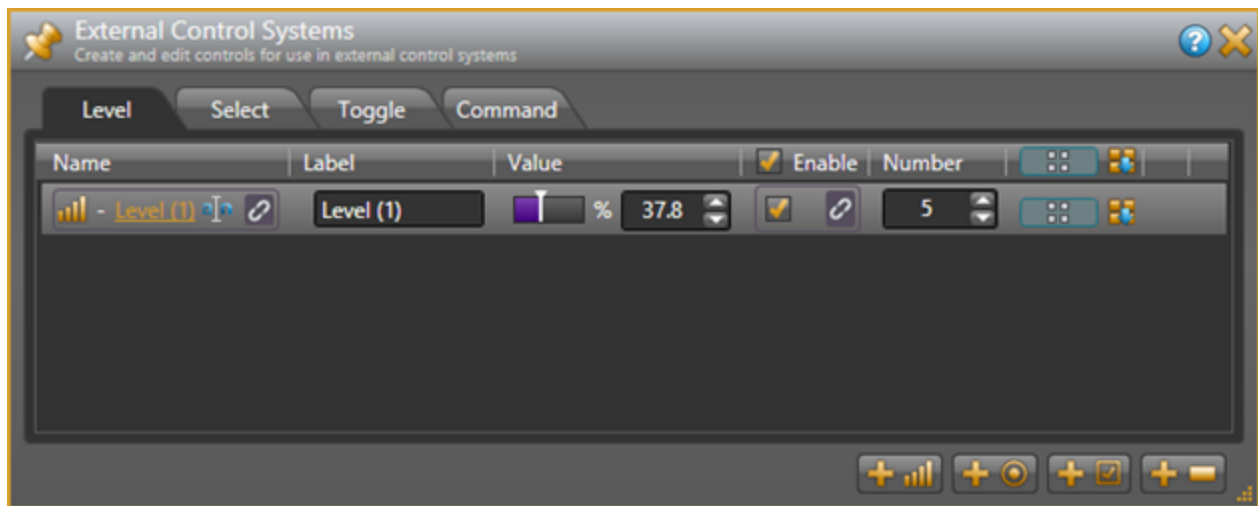
Once you have connected to either the Halogen or HAL external control server, you can communicate with it using simple, text-based messages. This section defines this message protocol.

All messages consist of ASCII text and a single message always starts with a '<' character and ends with a '>' character. Inside the start and end characters is the message body, which always includes at least a message type followed by a control number. Each part of the message body is separated from another part by an '&' character. Messages can also have additional parts depending on the type of message. The table below shows the format for each specific message type.

When sending messages to the Halogen/HAL Control Server, it:

- Allows white space anywhere in the message, which includes space, tab, carriage return, and line feed characters
- Ignores all characters outside of a message (that is, before the start character and after the end character)
- Ignores the case of alpha characters – you can use upper or lower case in any combination

Halogen's External Control Systems dialog defines the unique control number for each control, which is always 'n' in the message table below. For example, suppose you have defined a Level control in the Halogen External Control Systems dialog as follows:



In this instance, the control number is 5, and that is what you use in the 'set level' and 'get level' messages when developing external control systems. In this case the 'get level' message for this control is <L&5>.



Details of external control messages

In the following tables, normal characters are literal while bold characters are variable and defined in the description.

All Controls

Message Format	Description	How Used	Example
<?>	Get all values message.	Send this to HAL to request the current values of all controls.	<?> - request the current values of all controls in the configuration.

Level Controls

Message Format	Description	How Used	Example
<L&n>	Get level message, where: n is the control number.	Send this to HAL to request the current value of a Level external control.	<L&1> - request the current value of Level external control number 1.
<L&n&v>	Set level message, where: n is the control number. v is the control value. The range for v is 0 to 1000, corresponding to 0 to 100.0%.	Send this to HAL to set a Level external control to a new value. HAL sends this: <ol style="list-style-type: none">1. in response to a get level message2. whenever a Level external control changes value	<L&1&456> - set the value of Level external control number 1 to 45.6%.

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Message Format	Description	How Used	Example
<p><L&n&+v></p> <p><L&n&-v></p>	<p>Increment/Decrement level message, where:</p> <p>n is the control number.</p> <p>+ indicates increment.</p> <p>- indicates decrement.</p> <p>v is the amount to increment or decrement the current control value.</p> <p>The range for v is 0 to 1000, corresponding to 0 to 100.0%.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>NOTE: When an increment or decrement message would result in setting the level control to a value outside of the allowed range of 0 to 100%, the HAL sets the level to the limit value.</p> </div>	<p>Send this to HAL to increment or decrement a Level external control.</p>	<p><L&1&+105> - increment the value of Level external control number 1 by 10.5%.</p> <p><L&2&-234> - decrement the value of Level external control number 2 by 23.4%.</p>
<p><LA&n></p>	<p>Get label message, where:</p> <p>n is the control number.</p>	<p>Send this to HAL to request the current label value of a Level external control.</p>	<p><LA&1> - request the current label value of Level external control number 1.</p>
<p><LA&n&string></p>	<p>Set label message, where:</p> <p>n is the control number.</p> <p>string is the label for the control.</p>	<p>Send this to HAL to set the label for a Level external control to a new value.</p> <p>HAL sends this:</p> <ol style="list-style-type: none"> 1. in response to a get label message 2. whenever a label for a Level external control changes value 	<p><LA&1&-Volume> - set the label value for Level control number 1 to "Volume".</p>

Message Format	Description	How Used	Example
<LE&n>	Get enable message, where: n is the control number.	Send this to HAL to request the current enable value of a Level external control.	<LE&4> - request the current enable value of Level external control number 4.
<LE&n&v>	Set enable message, where: n is the control number. v is the enable value. The values for v are 0 (disabled) or 1 (enabled).	Send this to HAL to set the enable for a Level external control to a new value. HAL sends this: <ol style="list-style-type: none"> 1. in response to a get enable message 2. whenever an enable for a Level external control changes value 	<LA&4&0> - set the enable value for Level control number 4 to 0 (disabled).

Toggle Controls

Message Format	Description	How Used	Example
<T&n>	Get toggle message, where: n is the control number.	Send this to HAL to request the current value of a Toggle external control.	<T&23> - request the current value of Toggle external control number 23.
<T&n&v>	Set toggle message, where: n is the control number. v is the control value. The values for v are 0 (unchecked) or 1 (checked).	Send this to HAL to set a Toggle external control to a new value. HAL sends this: <ol style="list-style-type: none"> 1. in response to a get toggle message 2. whenever a Toggle external control changes value 	<T&23&1> - set the value of Toggle external control number 23 to 1 (checked).

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Message Format	Description	How Used	Example
<TA&n>	Get label message, where: n is the control number.	Send this to HAL to request the current label value of a Toggle external control.	<TA&1> - request the current label value of Toggle external control number 1.
<TA&n&string>	Set label message, where: n is the control number. string is the label for the control.	Send this to HAL to set the label for a Toggle external control to a new value. HAL sends this: <ol style="list-style-type: none"> 1. in response to a get label message 2. whenever a label for a Toggle external control changes value 	<TA&1&Mute> - set the label value for Toggle control number 1 to "Mute".
<TE&n>	Get enable message, where: n is the control number.	Send this to HAL to request the current enable value of a Toggle external control.	<TE&4> - request the current enable value of Toggle external control number 4.
<TE&n&v>	Set enable message, where: n is the control number. v is the enable value. The values for v are 0 (disabled) or 1 (enabled).	Send this to HAL to set the enable for a Toggle external control to a new value. HAL sends this: <ol style="list-style-type: none"> 1. in response to a get enable message 2. whenever an enable for a Toggle external control changes value 	<TA&4&0> - set the enable value for Toggle control number 4 to 0 (disabled).



Selector Controls

Message Format	Description	How Used	Example
<S&n>	Get selection message, where: n is the control number.	Send this to HAL to request the current value of a Select external control.	<S&6> - request the current value of Select external control number 6.
<S&n&v>	Set selection message, where: n is the control number. v is the control value. The range for v is 0 to one less than the number of selections.	Send this to HAL to set a Select external control to a new value. HAL sends this: <ol style="list-style-type: none">1. in response to a get selection message2. whenever a Select external control changes value	<S&6&3> - set the value of Select external control number 6 to 3 (the fourth item in the set of selections).
<SL&n>	Get selection link message, where: n is the control number.	Send this to HAL to request the current number of selections for Select external control.	<SL&7> - get the number of selections for Select external control number 7.
<SL&n&x>	Set selection link message, where: n is the control number. x is the number of selections. 0 indicates that no selections are available – i.e. the selector link is inactive.	It is not meaningful to send this message to HAL because an external control system cannot change a selection link. HAL sends this: <ol style="list-style-type: none">1. in response to a get selection link message2. whenever the link activation changes for the Select external control	<SL&7&4> - set the number of selections for Select external control number 7 to 4.

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Message Format	Description	How Used	Example
<SN&n&i>	<p>Get selection name message, where:</p> <ol style="list-style-type: none"> 1. n is the control number. 2. i is the selection item. The range for i is 0 to one less than the number of selections. 	<p>Send this to HAL to request the current value of a selection name for a particular selection item of a Select external control.</p>	<p><SN&12&2> - get the current selection name for selection item 2 of Select control number 12.</p> <p>Selection item 2 is the third item in the set of selections.</p>
<SN&n&v&string>	<p>Set selection name message, where:</p> <p>n is the control number.</p> <p>v is the control value. The range for v is 0 to one less than the number of selections.</p> <p>string is the current display name for selection v.</p>	<p>It is not meaningful to send this message to HAL because an external control system cannot change a selection name.</p> <p>HAL sends this:</p> <ol style="list-style-type: none"> 1. in response to a get selection name message 2. whenever the link activation changes for the Select external control 3. whenever one of the selection names change 	<p><SN&12&2&Jazz> - set the current selection name for selection item 2 of Select control number 12 to "Jazz".</p> <p>Selection item 2 is the third item in the set of selections.</p>
<SA&n>	<p>Get label message, where:</p> <p>n is the control number.</p>	<p>Send this to HAL to request the current label value of a Selector external control.</p>	<p><SA&1> - request the current label value of Selector external control number 1.</p>

Message Format	Description	How Used	Example
<SA&n&string>	Set label message, where: n is the control number. string is the label for the control.	Send this to HAL to set the label for a Selector external control to a new value. HAL sends this: <ol style="list-style-type: none"> 1. in response to a get label message 2. whenever a label for a Selector external control changes value 	<SA&1&-Program> - set the label value for Selector control number 1 to "Program".
<SE&n>	Get enable message, where: n is the control number.	Send this to HAL to request the current enable value of a Level external control.	<SE&4> - request the current enable value of Selector external control number 4.
<SE&n&v>	Set enable message, where: n is the control number. v is the enable value. The values for v are 0 (disabled) or 1 (enabled).	Send this to HAL to set the enable for a Selector external control to a new value. HAL sends this: <ol style="list-style-type: none"> 1. in response to a get enable message 2. whenever an enable for a Selector external control changes value 	<SA&4&0> - set the enable value for Selector control number 4 to 0 (disabled).

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Command Controls

Message Format	Description	How Used	Example
<C&n>	Command message, where: n is the control number.	Send this to HAL to fire a Command external control. HAL sends this whenever a Command external control fires.	<C&4> - Fire Command control number 4.
<CA&n>	Get label message, where: n is the control number.	Send this to HAL to request the current label value of a Command external control.	<CA&1> - request the current label value of Command external control number 1.
<CA&n&string>	Set label message, where: n is the control number. string is the label for the control.	Send this to HAL to set the label for a Command external control to a new value. HAL sends this: <ol style="list-style-type: none"> 1. in response to a get label message 2. whenever a label for a Command external control changes value 	<CA&1&Flatten> - set the label value for Command control number 1 to "Flatten".
<CE&n>	Get enable message, where: n is the control number.	Send this to HAL to request the current enable value of a Command external control.	<CE&4> - request the current enable value of Command external control number 4.
<CE&n&v>	Set enable message, where: n is the control number. v is the enable value. The values for v are 0 (disabled) or 1 (enabled).	Send this to HAL to set the enable for a Command external control to a new value. HAL sends this: <ol style="list-style-type: none"> 1. in response to a get enable message 2. whenever an enable for a Command external control changes value 	<CA&4&0> - set the enable value for Command control number 4 to 0 (disabled).



Communications Monitoring

Message Format	Description	How Used	Example
<PING>	Ping message	Send this to HAL to request a pong message.	<PING>
<PONG>	Pong message	<p>It is not meaningful to send this message to HAL.</p> <p>HAL sends this whenever it receives a ping message from an external control system.</p>	<PONG>

APPENDIX B: Using PuTTY to Test External Control Systems

The Halogen/HAL external control message protocol is ASCII text based, which means that you can use a standard telnet client to connect to the control server and exchange messages. This is often useful when developing and testing a HAL configuration that contains external controls, either to monitor the operation of your external control system or to serve as a simple form of external control system before the production system is ready or available.

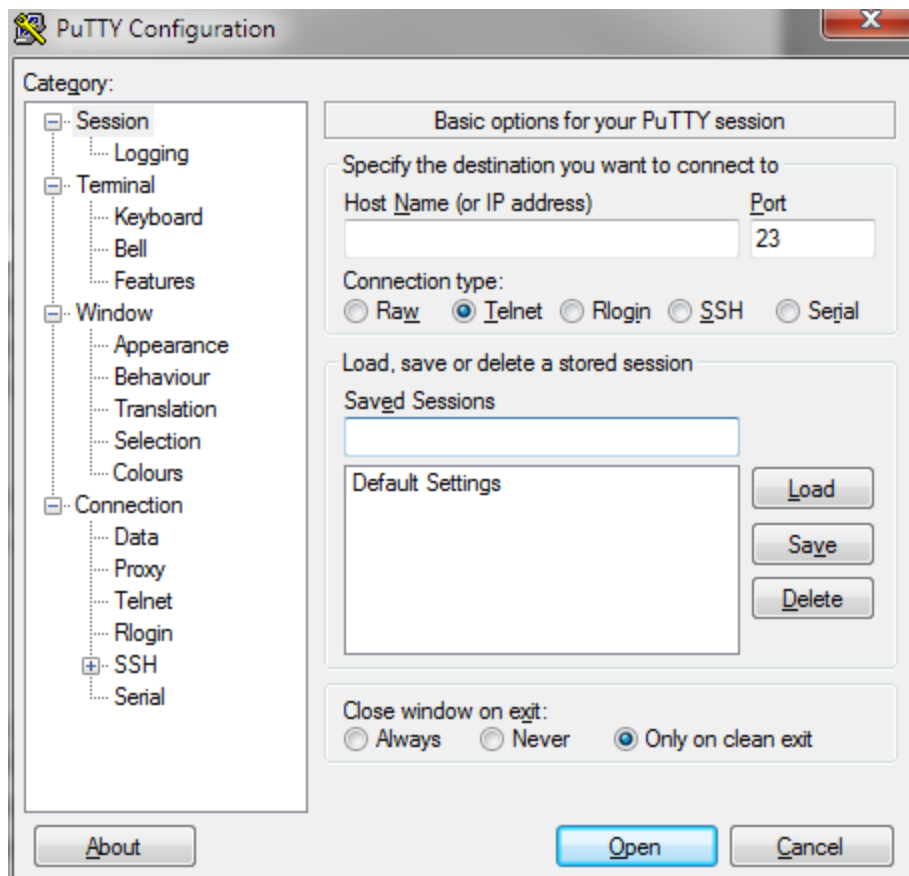
Any telnet client will work, but this section shows how to do this with PuTTY, an open source telnet client application that is free, easy to install and use, and runs on all versions of Windows.

How to obtain and install PuTTY

The top level web page for PuTTY is <http://www.putty.org>. That page contains a link to a page that has links for downloading the PuTTY application. All you need is the latest release version of putty.exe for Windows on Intel x86. Download this file and put it in an accessible folder on your PC. Since the complete installation is a single file, putting it on the desktop works great.

Starting PuTTY and configuring it for communications with the Halogen control server

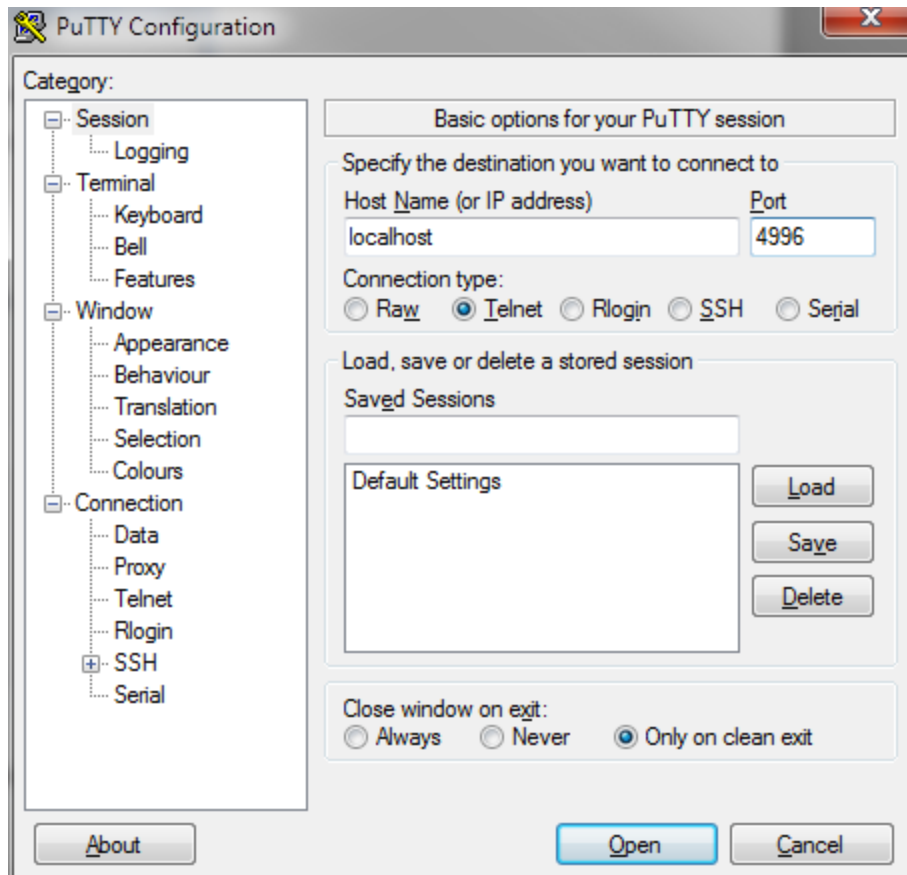
Start PuTTY by double clicking on the putty.exe file. This brings up the PuTTY Configuration window:



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To connect to the Halogen external control server, do the following:

1. Start Halogen and load your configuration that contains the external controls you'd like to test.
2. In the PuTTY configuration window:
 - a. Enter localhost in the Host Name text box
 - b. Change the Connection type to Telnet
 - c. Change the port number to 4996
 - d. Click the Open button



To connect to the HAL external control server, do the following:

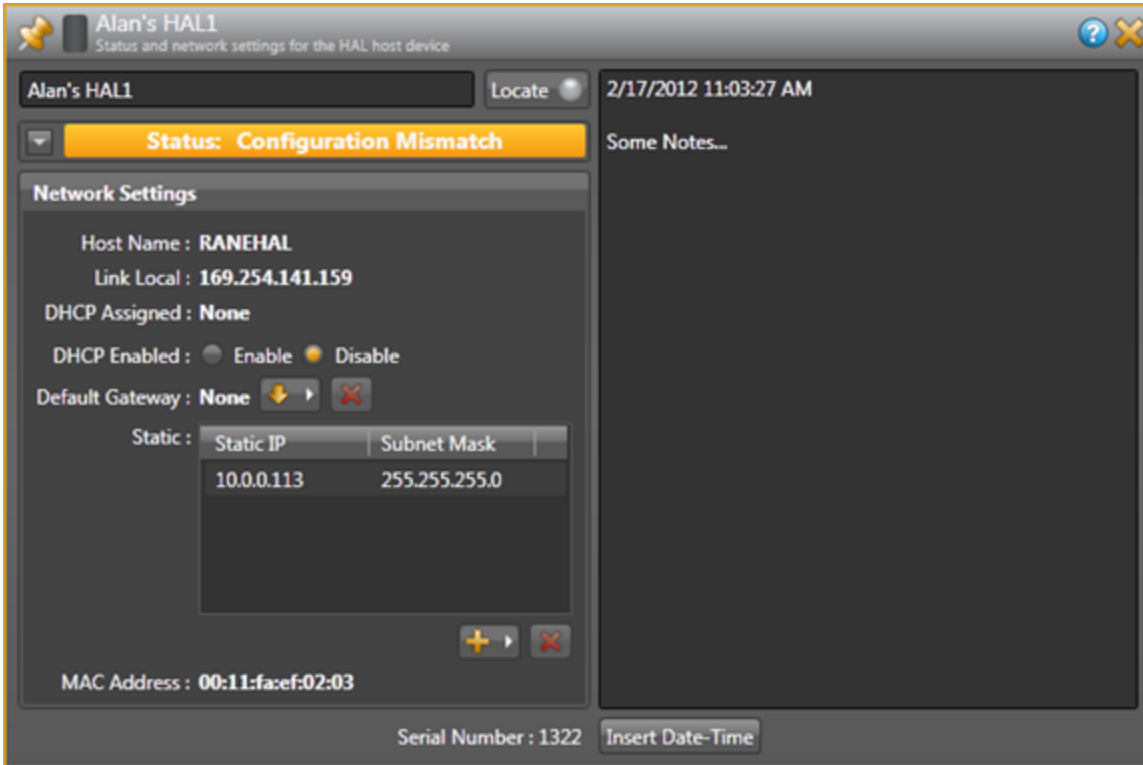
1. Start Halogen and Apply your configuration that contains the external controls you'd like to test to the HAL.
2. Open the HAL property dialog by double clicking on the HAL title bar in the Halogen Hardware Work-space.



3. Observe the HAL's configured IP addresses and pick one that you want to use with PuTTY. The address you choose needs to be on the same network as your PC that is running PuTTY.
4. In the PuTTY configuration window:
 - a. Enter HAL's IP address in the Host Name text box
 - b. Change the Connection type to Telnet
 - c. Change the port number to 4996
 - d. Click the Open button

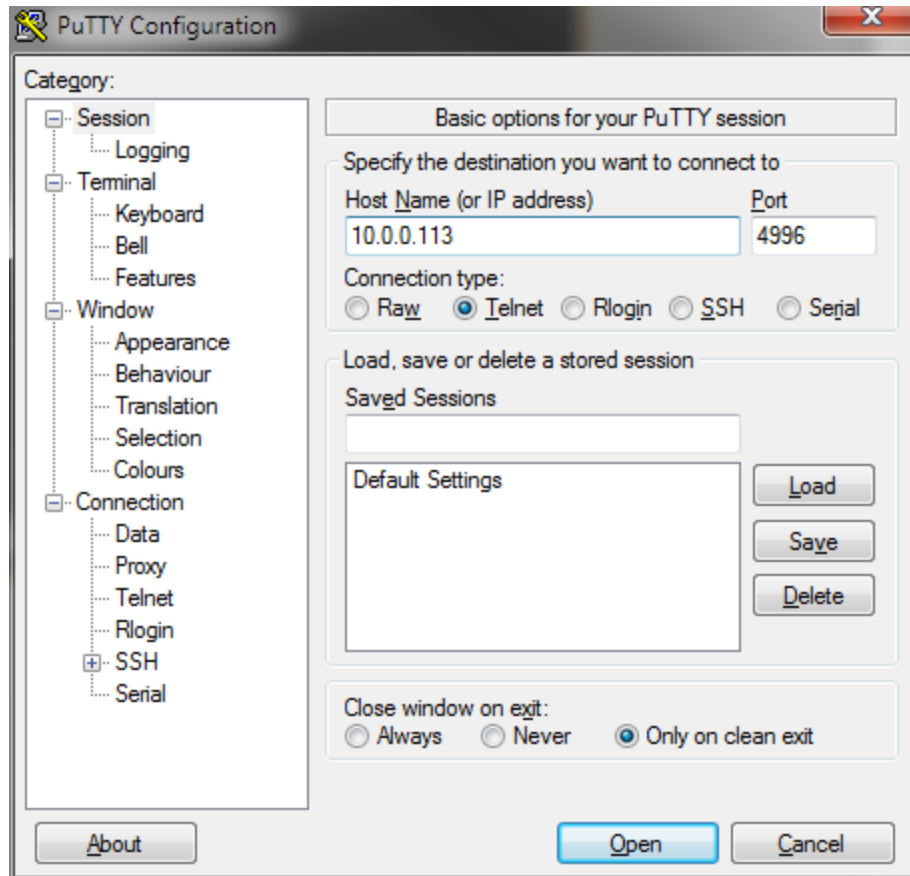


For example, the HAL1 host properties dialog will look something like this:



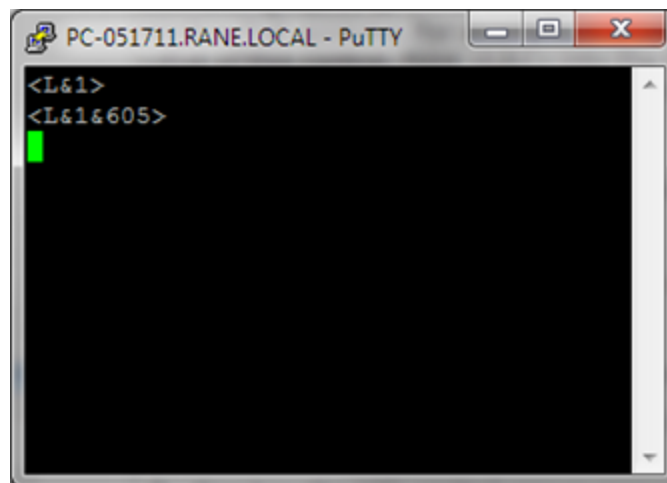
Here, We've added a static IP of 10.0.0.113. We'll use this in the PuTTY Configuration window:

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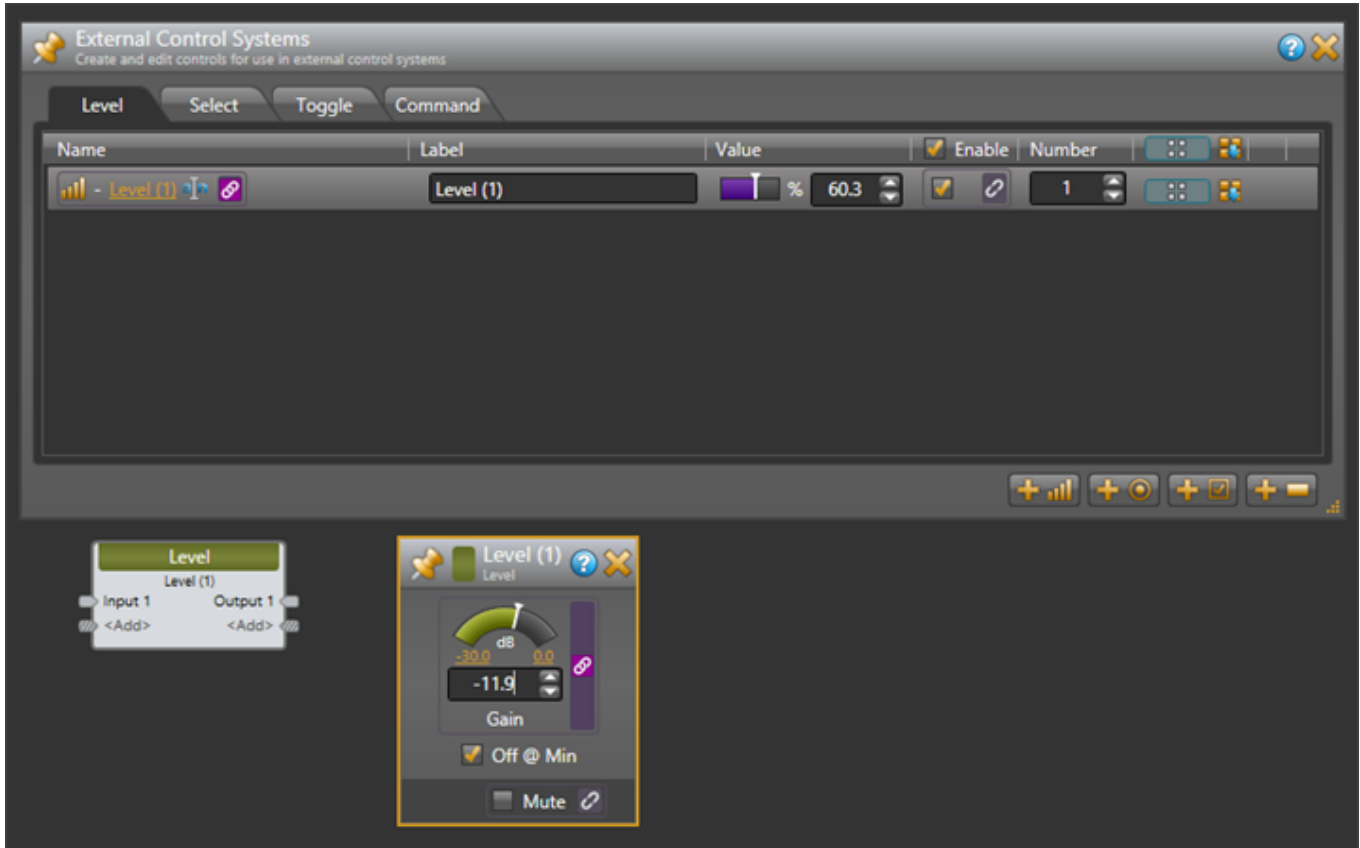
Communicating with the Halogen/HAL control server

Connecting PuTTY to either Halogen or HAL establishes communication between the telnet client and the control server. Now you can send and receive messages using the PuTTY window that appears. For example, suppose you have a Level control configured in Halogen that is control number 1 and currently has a value of 60.5%. To request the current value of this control, type `<L&1>` into the PuTTY window and then press Enter. This will send the message to Halogen, which will respond with `<L&1&605>`. If all is right with your test system, you'll see something like this:





Your Halogen configuration will be something like this: (the Level external control is linked to the Level block's level control)



How to use PuTTY when testing external control systems

Here are a few ideas for what you can do:

1. Test your HAL external controls by sending and receiving external control messages

To do this, connect PuTTY to your HAL or Halogen external control server and type external control messages into the PuTTY window and observe what HAL sends in response.

2. See how the HAL control server responds when you change external controls either from Halogen or from actual remotes in the HAL system.

Connect PuTTY to your HAL or Halogen external control server and change external controls from within the HAL system. Observe what the control server sends to PuTTY.

3. See how the HAL control server responds when configured presets activate or deactivate that affect external control values or link activations.

Connect PuTTY to your HAL or Halogen external control server and activate or deactivate presets that contain blocks or links related to external controls. Observe what the control server sends to PuTTY.

4. Use PuTTY to monitor the operation of your external control system

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You can connect any number of external control clients to a Halogen or HAL Control Server. This means that when you are developing and testing your control system with a commercial product, such as an AMX system, you can also connect to the control server using PuTTY.



NOTE: This lets you monitor most of the interaction between your external control system and your Halogen/HAL Control Server. This works because when external controls change, the Halogen/HAL Control Server sends these changes to all connected external control clients. So, when your external controller changes a control on the HAL, the HAL control server sends the change to your PuTTY client.

To use PuTTY in this way, first connect PuTTY to the Halogen/HAL Control Server that you want to monitor. Next connect your control system to the same Halogen/HAL Control Server. As your external control system interacts with the HAL system, external control messages will appear in the PuTTY window, giving you information about the operation of your external control system.