

creative conners, inc.

Avista Software Manual

Version 1.0

Table of Contents

Avista™ Software Manual	4
1 - Getting Started	4
1.1 A word about safety	4
1.2 System requirements	4
1.3 Installing Avista™	5
1.4 Configuring the Avista™ & Stagehand™ network.....	5
2 - Basic Motion Control Concepts	9
2.1 Power	10
2.2 Position Feedback	10
2.3 Motor Tuning	11
2.4 Over-travel Limits.....	11
3 - Avista™ interface overview	12
3.1 Menus.....	12
3.2 Motor setup	13
3.3 Cue spreadsheet.....	20
3.4 - Cue Sheet.....	25
3.5 - Stage Schematic.....	27
3.6 - Manual motor control	32
4 - Setting up a show	32
4.1 – Network Setup.....	33
4.2 –Configuring motor parameters	34
4.2.1 – Setting the IP address.....	35
4.2.2 – Testing the motor	35
4.2.3 –Tuning a motor.....	36
4.2.4 – Setting general motor information	39
4.2.5 –Settings for Stage Schematic.....	40
4.2.6 – Tuning a Motor that is in Service.....	41
4.2.7 –Setting Max Position Error	44
4.3 –Writing Cues	45
4.3.1 – Writing Cues in the Cue Spreadsheet	45
4.3.2 –Writing Cues in the Stage Schematic.....	47
4.3.3 – Linking Cues	48
4.4 – Running a show.....	49
4.4.1 – Loading Cues	49
4.4.2 – Running Cues.....	49
5 – Troubleshooting	50
Motor won't run in cue.	50
Motor won't run with jog controls.....	50

Motor runs fine with jog controls, but won't run from Avista. .50
When running a cue, the motor speeds fast in the wrong
direction and then turns off.51
When running a cue, the motor speeds fast in the right direction
and then turns off.51
Technical Support51
 Phone Support.....51
 Web Support51
 Email51
 Bugs52
Index.....53

Avista™ Software Manual

1 - Getting Started

Welcome to Avista, the software designed for theatrical automation. Avista™ is built to make moving scenery easy and intuitive. As today's shows are increasingly complex, Avista™ offers a simple solution to bring the excitement of motorized scenery to every production. By using a Windows® PC and standard Ethernet hardware, you can have a complete motion control system that is easy to set-up and incredibly economical. Whether you need to move a deck winch, turntable, roll drop, or any other effect, Avista™ allows you to focus on the custom aspect of your production while providing a standard method of motion control.

1.1 A word about safety

The spectacle created by motorized scenery is fantastic. Motion control allows huge scene changes to operate smoothly in a matter of seconds. But this power deserves the utmost caution. Unlike operating a computerized lighting console, or sound system, an automation system can pose a serious danger to performers and technicians. Large pieces of scenery moving at high speed can easily injure, even fatally, any person that is unwittingly caught in its path. Therefore, a large responsibility is placed on the automation operator to be alert and aware of the people that may be in harm's way.

Avista™ assists the operator in maintaining safety by providing constant information of every motor's position and status. A hard-wired emergency stop system, ShowStopper, provides an immediate way for the operator to shut down all the motion on the stage. Ultimately, it is the operator's judgment and ability to see any potential hazards that will keep the show safe.

1.2 System requirements

To effectively use Avista™ you will need:

1. A Windows® compatible PC (300 mHZ or faster)
2. Windows® 2000 or better
3. 10mb of free storage space

4. A network interface card (or built-in networking)
5. An Ethernet hub
6. Ethernet cables (1 for every device on the network)
7. One or more Stagehand™ motor controllers with electric motors (winches, turntables, etc.)
8. A ShowStopper™ emergency stop base station

1.3 Installing Avista™

To install Avista™:

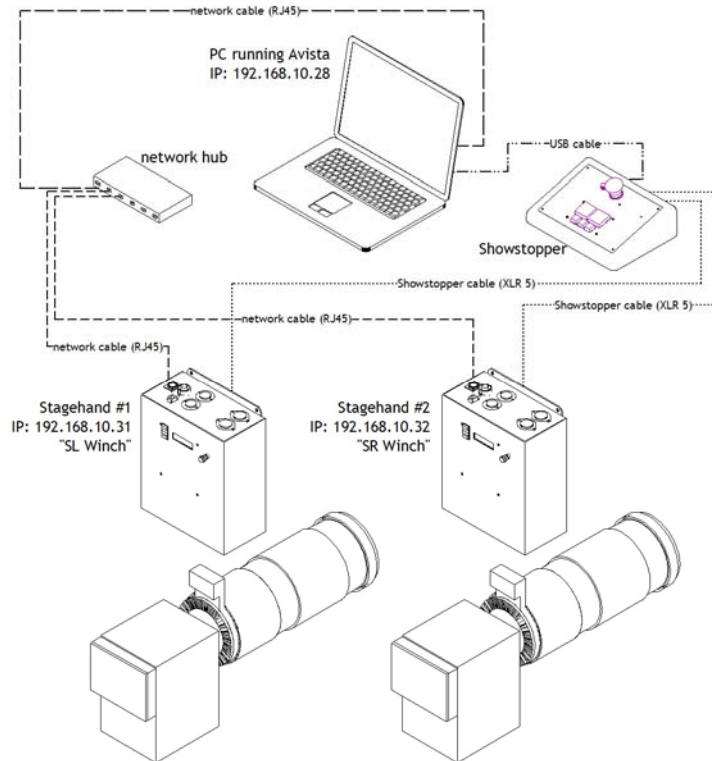
1. Insert the disc into your drive
2. Navigate to *My Computer* and open the Avista disc
3. Double-click *Setup.exe*
4. Follow the on-screen instructions

1.4 Configuring the Avista™ & Stagehand™ network

Avista™ can control any number of Stagehand™'s over a network. I recommend that you setup a local network that is isolated from any other network in your facility to eliminate the possibility of network traffic affecting a performance.

The following diagram shows a typical network system for using Avista™. Make sure that you have Ethernet cables connecting your PC and each Stagehand™ to an Ethernet hub (or series of hubs). Most Ethernet hubs will indicate if a proper hardware connection is made, which helps in finding damaged Ethernet cables.

Figure 1.1

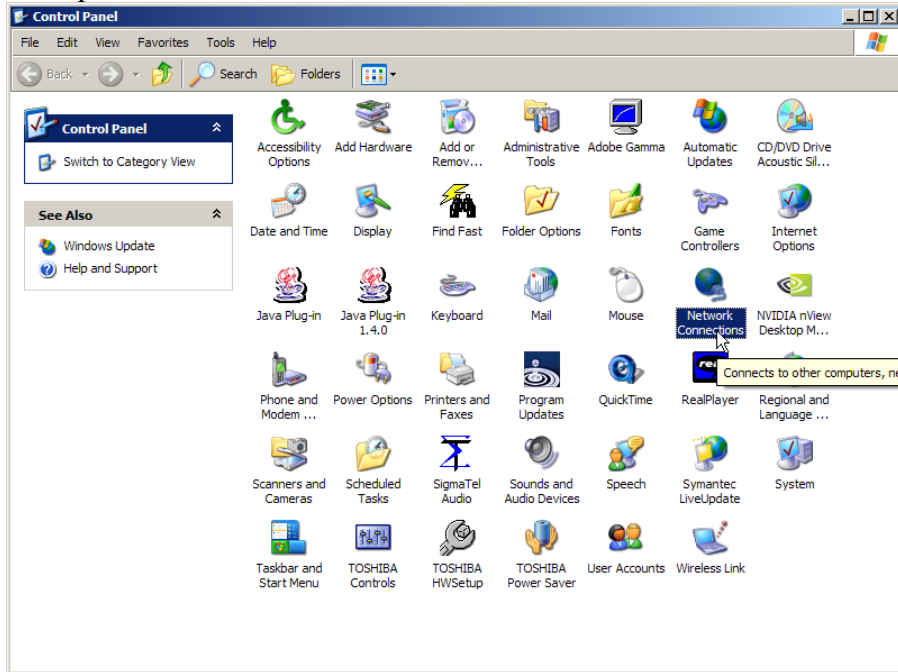


The network uses static IP addressing, which means that you manually assign an IP address to every device on the network. If you have already configured a Stagehand™, you know that setting its IP address is an easy process of pushing a button and turning a knob. Setting the IP address of your PC is only slightly more involved.

To set the IP address of your PC:

1. Click the **Start** button on your desktop

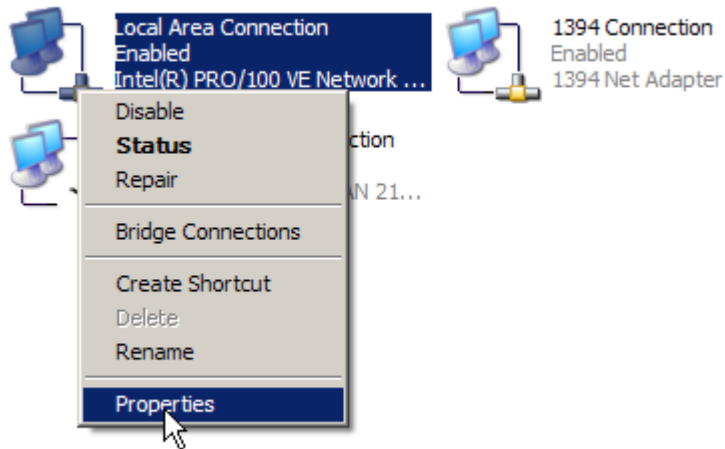
2. Open Control Panel



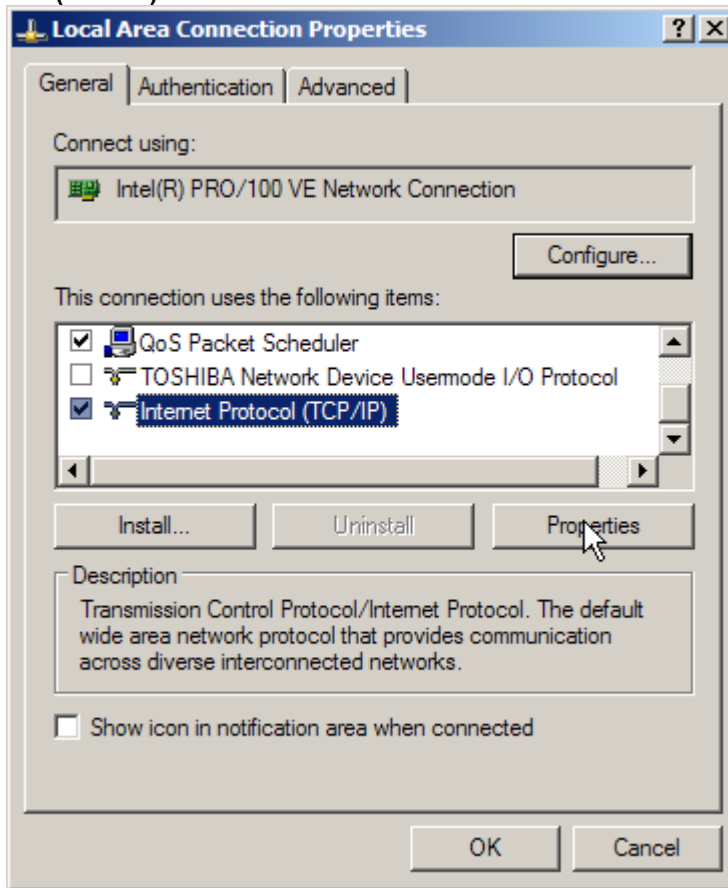
3. Open Network Connections

4. Right-click on the network adapter you wish to use and select **Properties** from the contextual menu

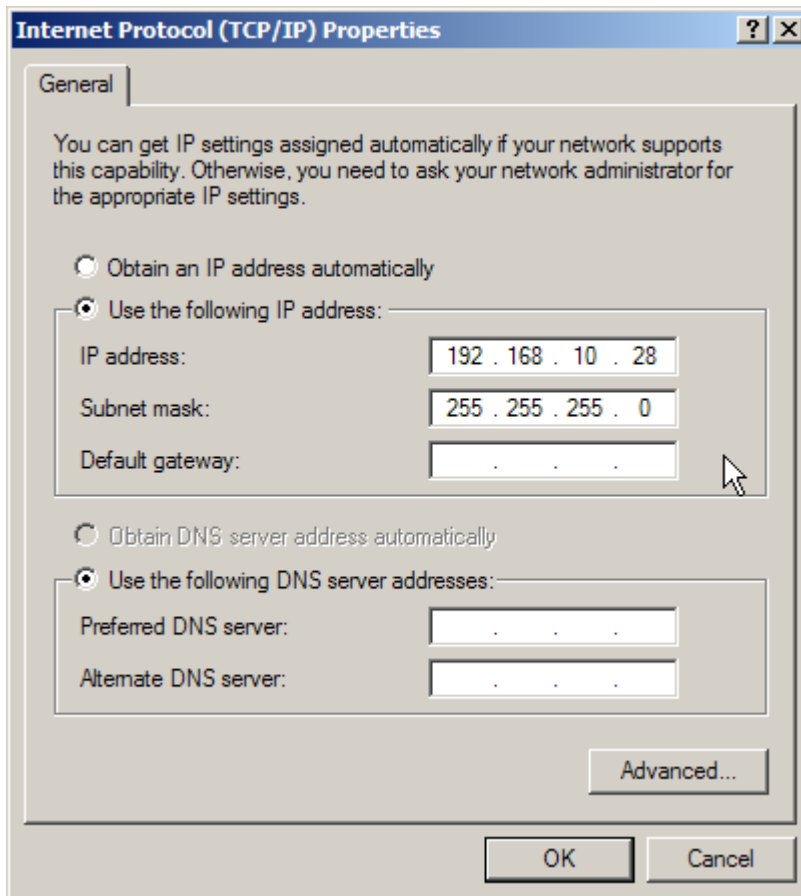
LAN or High-Speed Internet



5. Scroll through the list and double-click on **Internet Protocol (TCP/IP)**



6. Click **Use the following IP address:**



7. Enter an IP address such as **192.168.10.28**
8. Enter the subnet **255.255.255.0**
9. Click **OK** until you are back to the desktop

At this point you may need to restart your PC depending on which operating system you are running.

2 - Basic Motion Control Concepts

From the perspective of an audience member motion control is magic. From the technician's perspective it should not be magic. Though the combination of Stagehand™ motor controllers and Avista™ software create a motion control system that everyone can use, it is important to know some basic concepts to avoid mistakes and help troubleshoot your system.

2.1 Power

Depending on the model of Stagehand™ that you are using you need to supply either 120vac or 230vac single-phase power to each Stagehand™. The Stagehand™ will convert this power into something suitable for your motor (either 90vdc or 180vdc). The output voltage is varied to achieve variable motor speed.

The Stagehand™ tracks the motor's position and then relays that position to Avista™ to display on-screen. If a Stagehand™ loses power, the next time it powers up it will reset its position to zero (0). This is very important, because if a motor is sitting 10' from centerline and the power is interrupted, when the power comes back on the Stagehand™ will think that the motor is now at 0' from centerline. In this case, the motor needs to be driven back to the true 0' spike (usually a piece of spike tape or limit switch) and reset to 0', either through Avista™ (using the **Define Home** button on the **View > Motor Setup** window) or by cycling power to the Stagehand™.

The best operating procedure is to return all motors to zero (0) at the end of every performance. If power is lost overnight when no one is around, then it won't affect the Stagehand™'s position information. Otherwise, a pre-show check should be done to insure that every motor is truly at the correct position.

Since all position information is stored in the Stagehand™, the PC running Avista™ can be shut down at any time without affecting position information whatsoever.

2.2 Position Feedback

How does the Stagehand™ know how to change speeds? Good question. There are two factors that affect the speed of a motor. The first is the target speed that is programmed for each cue. In Avista™ you tell each motor how fast to move in each cue. This information is sent to the appropriate Stagehand™, which in turn supplies some voltage to the motor and watches to see what happens. If the motor moves faster than the Stagehand™ expected, it reduces the voltage. If the motor moves slower than expected, the voltage is raised. This

cycle continues at a rapid pace until the motor reaches the desired position.

In order for the Stagehand™ to know how far and how fast the motor is moving in relation to the voltage it is supplying it needs an encoder. An encoder is a simple device that creates electronic pulses as it spins. The encoder is physically connected to the motor so that as the motor spins the encoder spins. If the encoder were disconnected from the motor, the Stagehand™ would not see any movement regardless of whether the motor was actually rotating or not. This could cause the motor to race, because the Stagehand™ would keep supplying more and more voltage to the motor hoping to see an increase in speed. A similar situation would occur if the polarity of the motor was reversed from the encoder.

There are safety features that you can set up to prevent a motor from racing, such as **Max Position Error** which tells a Stagehand to shutdown if it doesn't get good response from the motor. This feature is discussed in the chapter *Setting Up A Show*. Later in this section *Over-travel Limits* are discussed as another safety precaution to guard against motor racing.

2.3 Motor Tuning

The cycle of watching encoder pulses and adjusting motor voltage is controlled by the tuning parameters of the Stagehand™. These tuning parameters are often referred to as the PID filter, which stands for Proportional, Integral, and Derivative gains. You enter numeric values for this filter into Avista™, which will then send the filter parameters to a Stagehand™. While the mathematics of this filter is somewhat complex, the practical application is not. We will walk through motor tuning in greater detail in the chapter *Setting Up A Show*. It is worth mentioning that if you are using a PushStick™ winch or motor package from Creative Conners, Inc. there are preset tuning parameters that you can use which should work fine for the majority of situations.

2.4 Over-travel Limits

If the encoder position is wrong because of loss of power, physical disconnect from the motor, or some equipment failure, a physical

limit switch can be used to protect the motor from running too far. These limit switches, when struck, will prevent the motor from moving any farther in the detected direction (either forward or reverse). The Staghand™ will only permit a movement in the opposite direction until the limit switch is cleared.

Those are the basic principles of motion control, as you get more familiar with the operation of Avista™ and Stagehand™ these concepts will become more concrete and intuitive. To get more familiar, let's take a look at some of the features of Avista™.

3 - Avista™ interface overview

Avista™ is comprised of five main windows that display information about the motors on your network and the cues that make those motors move. The following section provides an overview of the interface elements and their purposes before diving into writing cues for a show. If you just can't stand the anticipation, go ahead and jump to the next chapter *Setting up a Show*, but come back when you need the details of a particular button or feature.

To take a look at the interface, launch Avista™ from the **Start** menu. When Avista opens, you are presented with the main program window and the **Motor Setup** window. Let's look at the menu option in the main program window.

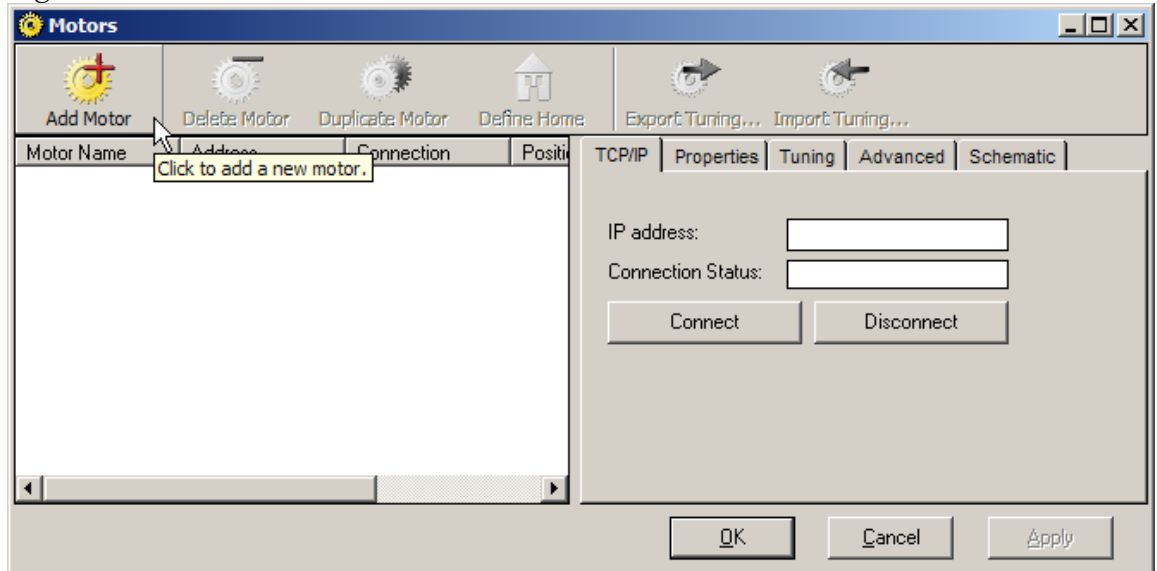
3.1 Menus

The **Menus** across the top of the main program window provide the following functions:

1. *File* – The file menu is used for creating, saving and printing shows.
 - a. *New* – Creates a new, blank show file.
 - b. *Open* - Displays a dialog box that allows you to open an existing show file.
 - c. *Save* – Saves the currently open show file.
 - d. *Save As* – Saves the currently open show file with a new name.

changed during cues, they can be edited at any time so you don't need to worry about locking in a specific value.

Figure 3.1



- The button bar at the top of the window allows you to:
 1. **Add Motor** – This adds a new motor to your show. Add as many motors to your show file as you have physical motors on stage.
 2. **Delete Motor** – Removes a motor from the show if it becomes unneeded for any reason.
 3. **Duplicate Motor** – Creates a new motor that is a copy of the motor selected in the list. This is useful if you have several motors on stage that have similar characteristics. You can set all the parameters on the first motor you create and then duplicate the motor as many times as you need, changing just the unique parameters.
 4. **Define Home** – This resets the motor's position counter to zero. You need to do this during the initial setup or any time you lose power to a Stagehand™. Conceptually this is very important, the motor always counts position relative to the zero position so you need to make sure that what you consider position “zero” or home is accurate. In practice this done by putting a piece of spike tape on the

- stage floor and manually moving the motor to match that spike and then pressing **Define Home**.
5. **Export Tuning** – Creates a motor configuration file (*.mtr) of the selected motor’s tuning parameters. This file can then be imported into other show files allowing you to keep a stock of tuning parameters for your various mechanical effects (winches, turntables, etc.). This is handy since the process of tuning a motor can be tedious.
 6. **Import Tuning** – Reads a motor configuration file (*.mtr) and applies the tuning in the file to the selected motor.
- The list of motors beneath the button bar displays information about the motors currently defined for the show.
 1. **Motor Name** – This is the name that you give the motor. The name can be any combination of letter and numbers, typically a descriptive phrase like “SL Prop Wagon”.
 2. **IP Address** – The IP address of the motor, or more precisely the Stagehand that you want to control.
 3. **Connection** – Status of the network connection to the motor. If everything is working this will read “Connected”. If there is a network problem (cable unplugged, wrong IP address, etc.) this will read “Closed”. *Note: If you find a network problem that has prevented Avista from connecting to the motor press the Connect button to restart communication.*
 4. **Position** – Shows the current position of the motor.
 5. **Limits** – Displays the status of both physical limit switches:
 - a. **All Clear** – All Clear means that neither limit switch is engaged.
 - b. **Forward Limit** – The forward limit is engaged.
 - c. **Reverse Limit** – The reverse limit is engaged.
 - d. **Both Limits** – If Both Limits are engaged either you placed the limit switches too close to one another, or more probable, one or both of the limits aren’t plugged into the Stagehand.

Note: You can resize the Motor List by clicking and dragging the grey bar that separates the Motor List and the tabbed pane.

- Next to the list of motors is a tabbed pane that contains all of the parameters that can be configured for each motor. To adjust a motor's parameters, first select the motor from the list and then edit the configuration parameters in the tabbed pane. While you usually set these parameters as the first step in beginning a new show, you can adjust these values at any time.
 1. **TCP/IP** tab
 - a. **IP Address** – Enter the IP address for the Stagehand you wish to control. The IP address is separated with periods, i.e. “192.168.10.32”. Those of you that are network savvy may be asking “Where can I set the subnet mask?” Well, you can't. The Stagehand's subnet mask is set to “255.255.255.0” and isn't configurable.
 - b. **Connection Status** – Displays the network status for the selected motor. “Connected” means everything is working, anything else means that you need to troubleshoot your network. See the appendix on troubleshooting for some pointers.
 2. **Properties** tab
 - a. **Motor Name** – In this box you can enter a descriptive name for the motor. The name can be any combination of letters and numbers.
 - b. **Position Units** – Natively, the Stagehand will send position information in encoder counts. Typically, it isn't convenient to program a show in encoder counts, instead you usually want to program movements in inches, or feet, or degrees, or millimeters, etc. You can choose what units you wish to use from this drop-down menu.
 - c. **Position Scale** – In order for Avista to display the motor's position in helpful units (like inches), you need to specify how many encoder counts there are per inch (or millimeter, or degree, etc.). We'll get into the process in greater detail later on, but suffice to say that the easy way to do this is move the motor manually (either using the jog controls on the Stagehand, or the

- jog control in Avista). See how many counts you moved, measure how far the motor traveled, and then divide the number of counts by the distance traveled.
- d. **Maximum speed** – This is the maximum speed you want to move the motor in Avista. Speed values are always given in position units per second. So if you are using inches as the position scale, speed will be in inches per second. Of course, there are physical limitations to how fast your motor can move. To discover the top speed of your motor, make sure it's physically disconnected from any scenery and then run it at full speed using the job controls on the Stagehand. While moving, click the **Maximum Speed** button and Avista will read the speed of the motor. This may be faster than you want to move the motor in the show, if so you can manually adjust the value to whatever you like.
 - e. **Forward Limit** – This sets the software limit for the motor. Entering a position here will prevent the operator from accidentally writing a cue beyond the desired travel on stage. Avista also uses this value to calculate the length of the track when using the **Stage Schematic**. To set the limit, either type in a value or press the **Forward Limit** button to use the motor's current position as the **Forward Limit**.
 - f. **Reverse Limit** – This sets the software limit for the motor. Entering a position here will prevent the operator from accidentally writing a cue beyond the desired travel on stage. Avista also uses this value to calculate the length of the track when using the **Stage Schematic**. To set the limit, either type in a value or press the **Reverse Limit** button to use the motor's current position as the **Reverse Limit**.
 - g. **Max. Position Error** – This value is used to shutdown a motor automatically if the motor's position isn't keeping up with Avista. This is a safety feature to try and detect problems with the motor (i.e. a mechanical jam, broken encoder, etc.) The text field is used to set the "slop" allowable for the motor, and the checkbox

should be checked if you want Avista to automatically shut the motor down if the motor can't keep up within the programmed "slop". The "slop" is necessary to accommodate things like cable stretch, play in the winch track, and less-than-perfect tuning. Typically, theatrical mechanisms are a lot sloppier than high end robotics so you want to set the value high enough to prevent Avista from shutting down a motor that is performing OK.

3. **Tuning** tab

Tuning is the most intricate part of motion control. Though the underlying mathematics is complex, the basic premise is simple. When a computer moves a motor it knows two things at any given time: where the motor should be, and where the motor actually is. The difference between these two values is known as the Position Error. To minimize the Position Error the computer is constantly adjusting the amount of power sent to the motor. The magnitude of these adjustments is determined by the tuning parameters. There is a tutorial on motor tuning later in this manual.

- a. **Proportional Gain** – This gain setting adjusts how hard the motor will try and correct for position errors. Too low of a value will cause the motor to appear sluggish, too high and the motor will over-compensate for the position error and jerk back and forth.
- b. **Derivative Gain** – This gain setting provides a damping to smooth jerky motion. The damping is applied against the rate of change in position error. While proportional gain keeps a steady amount of power to combat position error, derivative gain will increase the amount of power if the position error is accelerating.
- c. **Integral Gain** – This gain setting is similar to proportional gain, it provides a constant ratio of power against position error. Unlike proportional gain, the force will increase over time. In other words, the longer the position error is detected, the more corrective force will be asserted. *Integral Gain is touchy, and seldom has much use in theatrical*

applications. It is a very fine-tuned adjustment that is more typical used with precise mechanisms.

- d. **Integral Limit** – This setting provides a ceiling for the amount of corrective force that the Integral Gain can generate. This prevents integral wind-up, which is a backlash effect. *Like Integral Gain, Integral limit is seldom used in theatrical applications.*
 - e. **Sampling** – The sampling setting determines how frequently position error is checked and corrected. This value is a multiplier of the Stagehand’s internal timing cycles. Typically the sampling rate is between 1 and 10.
4. **Advanced Tab**
- a. The two-column list is a detailed view of the Stagehand status. This report can be useful in troubleshooting Stagehand problems if you are on the phone with technical support.
 - b. **Reset Drive** – This button will cycle power to the embedded motion controller inside the Stagehand. This can be used to in troubleshooting a Stagehand, it allows a drive to be reset without having to physically cycle power to a Stagehand.
5. **Schematic tab**
- The parameters in the Schematic tab are used to adjust the way the motor is viewed on the virtual stage in the Stage Schematic.*
- a. **Distance from Plasterline** – This is the distance from plasterline to the center of the track for a winch, or the center of a turntable. You can type in a numerical value in this text box, or adjust the position graphically in the Stage Schematic.
 - b. **Distance from Centerline** – This is the distance from centerline to the reverse limit of the track for a winch, or the center of a turntable. You can type in a numerical value in this text box, or adjust the position graphically in the Stage Schematic.
 - c. **Wagon Width** – The approximate width of the actual wagon that is connected to a winch. This value will be

- used to display a graphic of the wagon on the virtual stage in the Stage Schematic.
- d. **Wagon Length** – The approximate length of the actual wagon that is connected to a winch. This value will be used to display a graphic of the wagon on the virtual stage in the Stage Schematic.
 - e. **Turntable Diameter** – This box is only visible when the Turntable option is selected below. Enter the approximate diameter of the turntable, this value will be used to display a graphic of the wagon on the virtual stage in the Stage Schematic.
 - f. **Motor Type** – Select either winch or turntable to control the way the graphic representation of the motor is displayed in the Stage Schematic. Winches are shown as a rectangular wagon with a winch track. Turntables are shown as a circle with a rotating pie section.
- Underneath the tabbed view are three buttons: OK, Cancel, & Apply.
 1. **OK** – Records any changes made to the motor parameters and closes the window.
 2. **Cancel** – Throws out any changes made to the motor parameters and closes the window.
 3. **Apply** – Records any changes made to the motor parameters and leaves the window open for further editing. You must click apply to save any parameter changes before clicking on a new motor in the motor list. If you don't, a dialog box will ask if you want to save the current changes before editing a different motor.

3.3 Cue spreadsheet

The Cue Spreadsheet offers a numerical view of the cues in the show. The data is presented in a table where columns are cue numbers and rows are motor movements. This view gives an easy look at the entire show, which allows you to see quickly which motors are programmed to move in a specific cue and to edit the movement.

Figure 3.2

		1	2	3	4	5	6	6.5	7	8	9
Turntable		Loaded	Idle	Idle		Idle	Idle		Idle	Idle	
	Position: N/A	277.60		153.40	203.60		153.40	94.40		0.00	29.40
	Speed	4.99		4.99	4.99		7.00	4.99		4.99	4.99
	Acceleration	4.99		4.99	4.99		4.99	4.99		4.99	4.99
Winch		Loaded	Idle	Idle	Idle	Idle		Idle	Idle	Idle	Idle
	Position: N/A	25.24	140.24	25.24	140.24	0.00		0.00	140.24	61.72	4.21
	Speed	50.00	75.00	50.00	75.00	100.00		100.00	75.00	75.00	75.00
	Acceleration	50.00	69.00	50.00	69.00	50.00		50.00	69.00	69.00	69.00

- At the top of the window is a button bar with two buttons:
 1. **Add Cue** – Creates a new cue. After you press the button a dialog box will ask you for a cue number to be assigned to the new cue. Cue numbers can be any numeric value (i.e. 10, 510, 3.1, 4.24254). Cues can be added at any time, in any order. For instance if you write a cue 4 & a cue 5 only to discover that you need a cue 4.5, just add it in and it will be inserted between cue 4 & 5 automatically.
 2. **Delete Cue** – Deletes the selected cue from the show. This will delete all of the motor movements for the cue and remove the cue from the show
- Beneath the button bar is the table that contains all of movements in the show. The table is organized to provide cue information in an easy-to-read format.
 1. *Grey Columns* – The first two columns have a grey background and cannot be edited directly.
 - a. The first column displays each motor by name. *The name of the motor can be edited in the Motor Setup, see the previous section for details.*
 - b. The second column provides four pieces of information for each motor:
 - i. **Status** – This box shows the status of the motor (Fwd Limit, Rev Limit, Loaded, Running, Idle, Complete, Fault, Stopped, E-Stop, Connected, Not Connected)
 - ii. **Position** – Displays the current position of the motor, scaled to the value set in the **Motor Setup**. This is also a row label for the cells on the right. The white cells on the right display where the motor will move

- to in each cue. These values can be edited directly.
- iii. **Speed** – A row label for the white cells. The white cells on the right display the speed of the motor in each cue. These values can be edited directly. The values are in scaled units per second (i.e. inch per second, degree per second, etc.)
 - iv. **Acceleration** – A row label for the white cells. The white cells on the right display the acceleration of the motor in each cue. These values can be edited directly. The values are in scaled units per second per second (i.e. inch per second per second, degree per second per second, etc.)
2. *Grey row* – The top row of grey cells contain the cue numbers for each cue in the show. These numbers are set as you create each cue.

You can copy/paste entire cues from cue to another. Click on the cue number to select the entire cue. Select **Edit>Copy** from the menu, or press **Ctrl+C**. Click on the cue you wish to paste into and select **Edit>Paste** from the menu or press **Ctrl+V**.

If you find that you need to change a cue's number, you can easily create a new cue, copy the old cue into the new cue, and then delete the old cue. Alternatively, you can change the cue number in **View>Cue Sheet>Cue Properties**.

To load a cue, double-click on the cue number. This will send the cue information to each motor in the cue and place the motors on standby.

3. *White Cells* – There are five types of white cells in the main area of the spreadsheet:
 - a. **Cue Name** – The top row of white cells contains a descriptive name for the cue. This cell is blank by

default. To change the cue name, click on the top cell and type in a name. When finished, hit Enter, Tab, or click on another cell.

- b. **Motor Movement Status** – The row of cells that align with the motor names in the grey cells report the status of the motor’s movements in each cue.

The status will be either:

- i. **Loaded** – The motor has received a cue from Avista and is ready to start.
- ii. **Running** – The motor is currently moving towards the position programmed for this cue.
- iii. **Complete** – The motor has finished moving to its position.
- iv. **Idle** – The motor is awaiting instruction for movement.
- v. **Stopped** – The motor has been stopped before reaching its target position. The motor could have been stopped by Showstopper, a limit switch, or the on-screen stop button.

*To remove just one motor from a cue, click on the Motor Movement Status and press **Backspace**.*

- c. **Position** – These cells contain the target position for the motor in each cue. To edit the target position just click on the cell and type in a new value. Then hit **Enter**.
 - d. **Speed** – These cells contain the speed for the motor in each cue. To edit speed values, simply click on the cell and type in a new value. Then hit **Enter**.
 - e. **Acceleration** - These cells contain the acceleration for the motor in each cue. To edit acceleration values, simply click on the cell and type in a new value. Then hit **Enter**.
4. **Colors** – The spreadsheet cells are color coded to give quick visual feedback regarding the status of each motor in each cue. The background color of a cell will change depending on the current status of a motor in a cue.

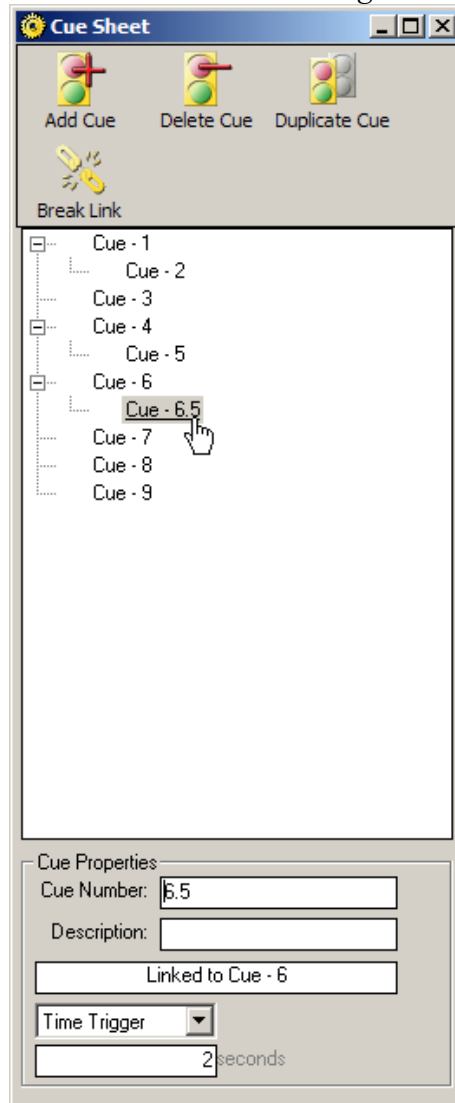
- a. **White** – A white cell indicates that the motor is idle.
- b. **Red** – A red cell indicates that the motor is loaded with a cue.
- c. **Green** – A green cell indicates that the motor is running a cue.
- d. **Blue** – A blue cell indicates that the motor has finished running a cue to completion.
- e. **Yellow** – A yellow cell indicates that the motor has been prematurely stopped while trying to complete a cue. The reason for the motor stopping is either: E-Stop, a stop command from either the on-screen **Cue Control** or Showstopper, a limit switch is engaged, or **Max Position Error** was reached.

You can copy/paste between any editable cells in the spread sheet view. To copy a range of cells, select all the cells you wish to copy and choose **Edit>Copy** from the menu or press **Ctrl+C**. Select the top left cell of the range you'd like to paste the copied cells into and choose **Edit>Paste** from the menu or press **Ctrl+V**.

3.4 - Cue Sheet

The Cue Sheet presents the cues in the show in a tree view. This offers an overall picture of the cues and the flow of the show. From this view cues can be linked to each other to create complex, automated cue movements.

Figure 3.3



- At the top of the Cue Sheet is a button bar for common cue manipulation tasks.

1. **Add Cue** – Creates a new cue and prompts you for a cue number. This has the same effect as the *Add Cue* button on the Cue Spreadsheet.
 2. **Delete Cue** – Deletes the selected cue from the show. This has the same effect as the *Delete Cue* button on the Cue Spreadsheet.
 3. **Duplicate Cue** – Creates a copy of the selected cue. A dialog box will then prompt you for a new cue number to store the copied cue.
 4. **Break Link** – Breaks the link between two cues. Select the *child cue*, the cue furthest indented, and then click the break link button. The link is broken and the child cue is returned to an independent cue
- Beneath the button bar is the tree view that lists all the cues in a hierarchy that depicts both the order and links of the cues.
 1. **Click on a cue** – Click on a cue to select the cue. This allows you to edit values in the Cue Properties pane below. If the cue is linked, you can now break the link with the Break Link button above.
 2. **Double-click on a cue** – Double-clicking on a cue will load the cue, sending cue information to all relevant Stangehands and put the motors on standby.
 3. **Drag-and-drop** – Click and drag a cue onto another to link the two cues together. The cue that you drag will become the *child cue*, meaning that it will be driven by the cue that you dropped it on. You can adjust how the link works with the settings in the *Cue Properties* pane below.
 4. **Colors** – Next to the cue name, a color-coded icon will appear when running cues to give a quick status report.
 - a. **Red** – A red light bulb indicates that the cue is loaded and will be started whenever the Go button is pressed on the Cue Control or on Showstopper.
 - b. **Green** – A green light bulb indicates that the cue is currently running.
 - c. **Blue** – A blue light bulb indicates that the cue has completed all of its movements.
 - d. **Yellow** – A yellow light bulb indicates that the cue has been stopped prematurely. This could indicate an emergency stop, motor fault, or limit switch.

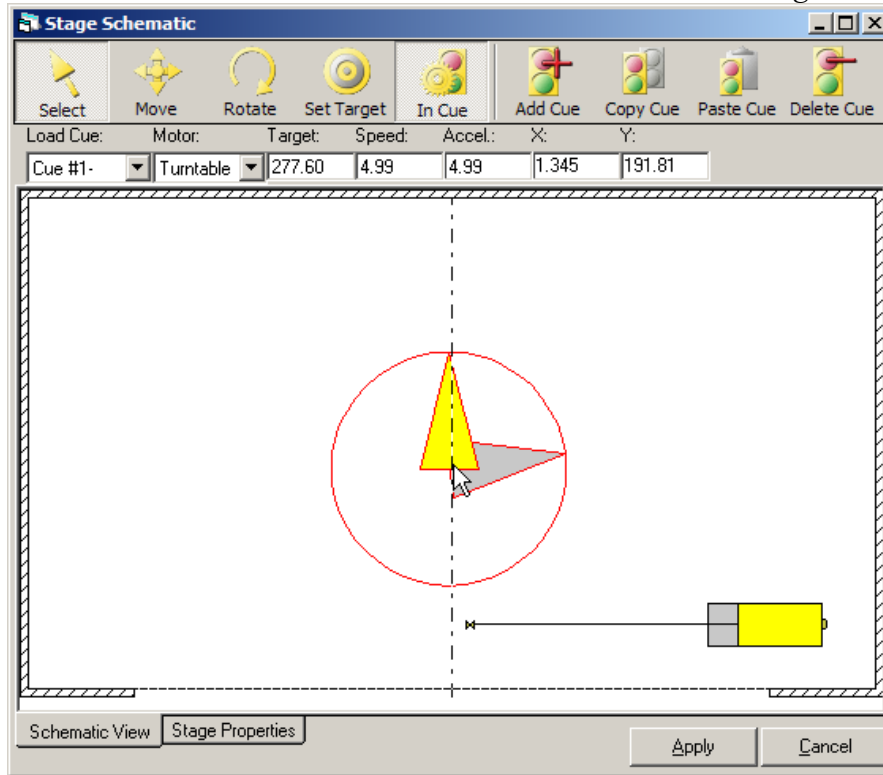
- Beneath the tree view is the **Cue Properties** pane. To access the properties of the cue select it in the tree view above.
 1. **Cue Number** – Here you can change the number of the selected cue. After entering a new value press Enter to record the change.
 2. **Cue Description** – Enter a descriptive name for the cue, this can help you identify cues more easily than just the cue numbers. After entering a new value press Enter to record the change.
 3. **Link Status** – If a cue is linked to another cue, the parent cue's number will be displayed here.
 4. **Link type drop down list** – For a linked cue, choose which type of link you want:
 - a. **Independent** – Setting a link to independent will break the link.
 - b. **Completion** – The child cue will start directly after the parent cue completes all of its movement.
 - c. **Time Trigger** – The child cue will start at a programmed number of seconds after the start of the parent cue.
 - d. **Position Trigger** – The child cue will start when a specific motor in the parent cue reaches a certain position. When this link type is selected another drop down list appears to allow you to select which motor in the parent cue will drive the child cue.
 - e. **Link parameter** – For time trigger cues this box contains the number of seconds between the start of the parent cue and the start of the child cue. For position trigger cues this box contains the position of the motor in the parent cue that will trigger the start of the child cue. After entering a new value press Enter to record the change.

3.5 - Stage Schematic

The Stage Schematic is unique feature in Avista. It provides a virtual stage to let you write cues visually, positioning motors graphically instead of keying in numbers. The Stage Schematic shows a plan view of typical proscenium theatre, which can be adjusted to resemble your own theatre. Motors are then positioned on the plan

view to approximate their actual positions on your stage. Motors are shown as either winches or turntables, depending on the setting in **Motor Setup > Schematic** tab.

Figure 3.4



- At the top of the Stage Schematic is a button bar that provides tools for adjusting individual motors and cues.
 1. **Select** – When depressed, this button allows you click on any winch or turntable to select it. If you want to select more than one winch or turntable hold the **Shift** key down while clicking. Objects that are selected will have a red outline. To deselect all objects, **click** on a blank part of the virtual stage.
 2. **Move** – When depressed you can move the graphics on the stage. **Click** anywhere on the stage and the selected winches and turntables will move to the cursor. For winches the reverse limit of the track (marked with a small circle) will snap to the cursor. For turntables, the center of the turntable will snap to the new cursor. *This does not move the position of the motor in a cue, it is used to place the graphics on the*

virtual stage. To change the position of a motor in a cue, use the Set Target tool.

3. **Rotate** – This tool lets you rotate the winch tracks of winches to orient them to some other angle than parallel to plasterline. Select the motors you want to rotate, then click **Rotate**. To define a new rotation angle takes three clicks:
 - a. Click on the stage to define an base point for the new rotation.
 - b. Move away from the base point and click to define a baseline for the rotation. As you move the mouse you'll see a dotted guide line.
 - c. Rotate to the new position and click.
4. **Set Target** – This tool lets you set the target position for a motor in a cue. With a cue loaded, select the motor you wish to set a target for. Click on **Set Target**, then click and drag anywhere on the virtual stage. Dragging to the right will increase the target position, dragging to the left will decrease the target position. As you drag the mouse you will see a grey shadow of the wagon or turntable moving. This grey shadow represents the target position. After you have set all of the targets, press the **Apply** button at the bottom of the window to record the changes, or press **Cancel** to throw away the changes.
5. **In Cue** – For a motor to move in a cue, it must be included in the cue. The **In Cue** button includes the selected motors in the currently loaded cue. With a cue loaded, select the winches or turntables you want to have in the cue and then depress the **In Cue** button. To remove a winch or turntable from a cue, click on the **In Cue** button to release it. *Once a motor is in a cue, you still need to program target, speed, and acceleration in order for the motor to actually move when the cue is run.*
6. **Add Cue** – Clicking on this button will add a new cue to the show. A dialog box will prompt you for a new cue number.
7. **Copy Cue** – Clicking on this button will copy the movements of the currently loaded cue to the clipboard.
8. **Paste Cue** – Clicking on this button will paste the any movements from the clipboard to the currently loaded cue.
9. **Delete Cue** – To remove a cue from the show, load the cue and press this button.

- Beneath the toolbar is a series of drop-down lists and text boxes, called the Display Bar, where you can load and edit cues.
 1. **Load Cue** – Select a cue from the drop-down list to load it and display the cue on the virtual stage.
 2. **Motor** – Select a motor from the drop-down list to select it on the virtual stage. This is an alternative to selecting the motor using the Select tool in the button bar.
 3. **Target** – This box will display the current target for the last selected motor in the loaded cue. You can edit the target by typing in a new value, to record the changes press the Apply button at the bottom of the window, or press Cancel to throw away the changes and revert to the previous version of the cue.
 4. **Speed** – This box will display the current speed for the last selected motor in the loaded cue. You can edit the speed by typing in a new value, to record the changes press the Apply button at the bottom of the window, or press Cancel to throw away the changes and revert to the previous version of the cue.
 5. **Accel** – This box will display the current acceleration for the last selected motor in the loaded cue. You can edit the acceleration by typing in a new value, to record the changes press the Apply button at the bottom of the window, or press Cancel to throw away the changes and revert to the previous version of the cue.
 6. **X** – The current horizontal cursor position is displayed here.
 7. **Y** – The current vertical cursor position is displayed here.
- Beneath the Display Bar is a tabbed pane that shows the virtual stage on the Schematic View tab, and basic stage parameters on the Stage Properties tab.
 1. **Schematic View tab**
 - a. **Hatched perimeter** – The hatched perimeter represents the walls of your theatre, just as in plan view drawing. There is a centerline and plasterline placed on the drawing to provide some reference lines between your real theatre and the schematic on screen.
 - b. **Winches** – Winches are displayed on the virtual stage as a wagon that slides along a winch track. The graphic has four basic elements:

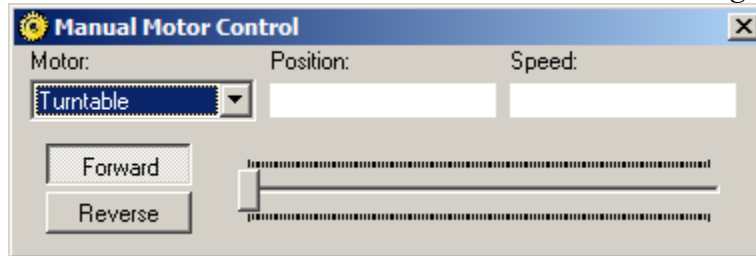
- i. **Wagon** – The wagon is drawn as a rectangle. The size of the rectangle can be adjusted in the View>Motor Setup>Schematic tab.
 - ii. **Reverse Limit** – The reverse limit is shown as a small circle.
 - iii. **Forward Limit** – The forward limit is shown as a small X.
 - iv. **Winch Track** – The winch track is drawn as a line that connects the reverse limit and forward limit. To change the length of the track, edit the forward and reverse limit values found in **View>Motor Setup>Properties**.
- c. **Turntables** – Turntables are displayed on the virtual stage as a circle with a wedge that points towards the turntable's current position. The graphic has two basic elements:
 - i. **Turntable** – The diameter of the turntable is shown as a circle. To change the diameter of the turntable adjust the Turntable Diameter found in **View>Motor Setup>Schematic**.
 - ii. **Pointer** – The pointer is shown as a triangular wedge. As the turntable rotates the pointer will rotate to display the current position of the turntable.
- 2. **Stage Properties tab** – The values entered on the Stage Properties tab control how big the stage looks on the Schematic View.
 - a. **Units of measure** – Select a unit of measure that you want to use when entering the dimensions of your theatre.
 - b. **Stage Width** – Enter the approximate width of your theatre from SL Wing to SR Wing.
 - c. **Stage Depth** – Enter the depth of your stage from the plasterline to the US wall.
 - d. **Proscenium Opening** – Enter the width of your proscenium opening.

Note: Obviously not everyone works in a traditional proscenium space, just enter values that give you a close approximation of the available playing area.

3.6 - Manual motor control

The manual motor control makes jogging motors to an arbitrary position easy without having to be in front of a Stagehand.

Figure 3.5



1. **Motor** – From the drop-down list select which motor you'd like to move.
2. **Position** – This box will display the position of the motor as it is being moved in its scaled units. This allows you to either place the motor at an exact position, or move the motor to a spot on stage where it is visually correct and note the position number. The unit scale can be adjusted in **View>Motor>Setup>Properties**.
3. **Speed** – This box will display the current speed of the motor in units/second. The unit scale can be adjusted in **View>Motor Setup>Properties**.
4. **Forward/Reverse** – Select which direction you want to move the motor.
5. **Speed Slider** – The slider bar controls how fast to move the motor. Click and drag on the slider to move the motor, whenever you release the mouse button the motor will instantly stop. This is a safety feature to insure that the operator is always at the controls when a motor is moving.

4 - Setting up a show

With the description of the interface finished, let's get our hands dirty and set up a show to see how to put all of these aspects of the software to use.

4.1 – Network Setup

Before launching Avista, make sure you have connected all of your Stagehands and your PC to a network hub. *Also make sure that all Stagehands are connected to Showstopper, and Showstopper shows a System Ready light.* For sake of this example, I'll use two Stagehands and a PC with the IP addresses:

1. PC – 192.168.10.28
2. Stagehand #1 – 192.168.10.31
3. Stagehand #2 – 192.168.10.32

If you skipped over Configuring Avista and Stagehand Networks earlier in this manual, here's the process for configuring the IP address on your PC.

To set the IP address:

1. Click the Start button on your desktop
2. Open **Control Panel**
3. Open **Network Connections**
4. Right-click on the network connection you wish to use and select **Properties** from the contextual menu
5. Scroll through the list and double-click on **Internet Protocol (TCP/IP)**
6. Click **Use the following IP address:**
7. Enter an IP address such as 192.168.10.28
8. Enter the subnet 255.255.255.0
9. Click **OK** until you are back to the desktop

At this point you may need to restart your PC depending on which operating system you are running.

To set the IP address of the Stagehand:

1. Push the knob on the face of the Stagehand, this will bring up the IP configuration menu.
2. Rotate the knob until the cursor is in the last segment of the IP address.
3. Push the knob to edit the address.
4. Rotate the knob up or down until you have the correct address.
5. Push the knob to record the address.
6. Rotate the knob until the cursor is flashing on OK.

7. Push the knob.
8. The display should now read:
 - a. "Not Connected"
 - b. "192.168.10.31" (or whatever address you selected)

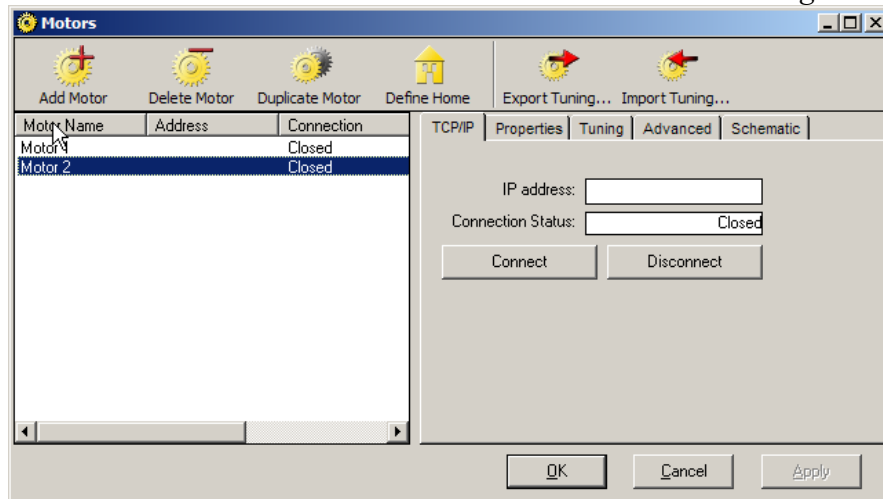
If the display reads "Emergency Stop!" check that all connections to Showstopper are made and that you have a System Ready light on Showstopper. If the display reads "Forward Limit!", "Reverse Limit!", or "Both Limits!" check your limit switch connections. Make sure the limits are all wired Normally Closed.

With the basic hardware setup finished, launch Avista from the Start Menu. When Avista starts up you will see the Motor Setup window with a blank list of motors. So the first step is to configure your motors.

4.2 –Configuring motor parameters

In order to configure motors, you first need to add them to the show. In our example we are using two Stagehands with motors attached. To add two motors, click the Add Motor button twice.

Figure 4.1



4.2.1 – Setting the IP address

To set the IP address of both Stagehands:

1. Click on “Motor 1” in the **Motor List**.
2. In the **TCP/IP** pane of the tabbed view, enter 192.168.10.31.
3. Press the **Connect** button. The Connection status should change to “Connecting” and then “Connected” almost instantly. *If the status does not change to Connected, check your network cabling and your PC’s network settings.*
4. Click on “Motor 2” in the **Motor List**.
5. Repeat steps 2 & 3, except use 192.168.10.32 as the IP address.

You now have both motors connected to Avista, before we set up any further parameters let’s do a quick check to make sure your motor is working properly.

4.2.2 – Testing the motor

To test the motor, first make sure the motor is not connected to any scenery. If the polarity of the motor isn’t correct, or the encoder is hooked up right, you could see a violent reaction from the motor. This is harmless, so long as nothing heavy is attached to the motor. **Make sure you disconnect any load from the motor before continuing.**

Let’s make sure that the polarity of the motor is correct, so that when the computer tries to drive the motor forward, the motor moves forward not reverse.

1. Open **View>Manual Motor Control**.
2. Select Motor 1 from the **Motor drop-down list**.
3. Select **Forward**.
4. Slowly raise the **speed slider** until you see the position numbers changing.
5. If the numbers in the **Position box** are getting bigger, then the motor is moving forward. If not, the motor is moving in reverse. To correct the direction of the motor let go of the speed slider and go swap the black and white wires in the motor plug. *For more information see the Stagehand manual.*

6. Assuming that you have the motor spinning correctly, lower the speed on the speed slider until the motor stops. Release the **speed slider** and now select **Reverse**.
7. Slowly raise the **speed slider** until you see the position numbers changing.
8. If the numbers in the **Position box** are getting smaller, then the motor is moving in reverse. If not, fix the polarity of the motor as described in step 5.
9. Repeat steps 2-8 except select Motor 2 from the drop down list.

With both motors tested, we're ready to begin setting the rest of the parameters in the motor setup panel. Close the **Manual Motor Control** and open **View>Motor Setup**, if it's closed.

4.2.3 –Tuning a motor

The best opportunity to tune a motor and get a feel for the tuning process is before the motor is attached to a speed reducer or any other equipment. Ideally you set the motor on a bench with the encoder attached and have the motor shaft within reach as you adjust tuning parameters from Avista. This is the first method of tuning that I'll outline. The second method of tuning is with the motor already in service, which we'll discuss after setting up some of the other motor parameters.

I like to think of tuning a motor as an analogy to building a cruise control for a car. You want the car to stay at a 65mph on its trip, but to maintain that speed you need to constantly adjust the amount of fuel supplied to the engine. If you are going up a hill, you need more fuel. If you are coasting down a hill, you need less fuel. If the cruise control adjusts too much and goes above 65mph it has to let off the gas and coast back down. Following that analogy, Proportional Gain is the amount of gas supplied to correct the speed. Too high a value and the car will be jerky as it bounces between 60mph up to 70mph and then back down to 60mph. Too low a value and the car won't maintain 65mph going up a hill. Derivative Gain can be thought of as a shock absorber attached the gas pedal, it smoothes out the jerkiness

of the Proportional Gain corrections. Sampling is how often the cruise control checks the speed on the wheels.

Before we begin tuning, the three main settings that will be adjusted are:

1. **Derivative Gain** – Derivative Gain applies a damping force to the shaft of the motor. It applies more force as the rate of position error increases. So the faster you turn the motor shaft by hand, to more resistance you'll feel. You want Derivative Gain to be as high as possible without motor vibration. Typically you start increase Derivative gain by 50 until you observe motor vibrations and then you back off a little.
2. **Sampling** – Sampling controls how often the Stagehand updates the position error and applies the corrective action. Like Derivative Gain, this value should be as high as possible (though it is rare to have a Sampling value above 5). Typically you start with a Sampling of 1 and increase by 1 until you observe motor vibrations and then back off a little.
3. **Proportional Gain** – Proportional Gain applies a corrective force proportional to the position error. Where Derivative Gain will only affect the rate of change in position error, Proportional Gain will actively try to push to motor back to the target position. If Proportional Gain is too low the motor will not have enough power to fully correct its position. If Proportional Gain is too high, the motor will over-compensate for the position error and oscillate as it continually overshoots its target.

Tuning settings can vary widely depending on the motor and encoder used. For reference, when I tuned a 2hp motor with a 60ppr encoder I had the values: Proportional Gain = 36, Derivative Gain = 4000, Sampling = 1.

Alright, if you are sitting beside your motor with an encoder attached, let's get started.

1. With Avista open, make sure the Motor Setup panel is visible (**View>Motor Setup**)
2. Select Motor 1 from the **Motor List**
3. Click on the **Tuning** tab

4. Enter a **Derivative Gain** of 50 and a **Sampling** of 1.
5. Click the **Load Filter** button. This sends the new tuning parameters to the Stagehand
6. Click **Start Zero-Speed Move**, this sends a cue to the Stagehand to disengage the brake and try and hold the motor's current position. *If the motor starts to jerk violently during tuning, click **Kill Move**, readjust the parameters and click **Load Filter** and **Start Zero-Speed Move** again.*
7. Turn the motor shaft by hand in both directions. You should feel more resistance the faster you turn.
8. If the motor is jerking as you turn the shaft go to step 9, otherwise increase **Derivative Gain** by 50 and go to step 5.
9. Increase **Sampling** by 1 and try turning the shaft by hand, if the jerking is minimal, increase **Derivative Gain** by 50 and go to step 5. Otherwise continue.
10. Reduce **Derivative Gain** by 10 and press **Load Filter**.
11. Turn the motor shaft by hand, if the jerkiness is minimal proceed to step 12. Otherwise repeat steps 10 & 11.
12. Raise **Proportional Gain** by 5.
13. Click **Load Filter**.
14. Try turning the motor shaft by hand.
15. If the shaft doesn't spring back to its original position when you release it, then go back to step 12.
16. If the shaft springs back and then starts jerking back and forth, reduce **Proportional Gain** by 1 and click **Load Filter**. Test by turning by hand, and repeat until the shaft stops jerking.
17. If the shaft springs back to its original position when you release it and doesn't jerk back and forth, then you are done.
18. Press **Kill Move** to engage the brake and shut the motor off.
19. Press **Apply** to save these settings.

If you have a stock of the same motor and encoders, you should click the **Export Tuning** button on the button bar and save the tuning parameters to a separate file. This will allow you to use **Import Tuning** to select the same tuning parameters for every show.

Depending on the loading of the motors, these values may have to be adjusted as you start writing cues. Generally, lowering **Proportional**

Gain will reduce the jerkiness of a motor, while raising it will increase its ability to maintain proper speed.

4.2.4 – Setting general motor information

1. With the **Motor Setup** window open, click on Motor 1 in the **motor list**.
2. Click on the **Properties** tab.
3. In the **Motor Name** box enter SL winch (or whatever you like).
4. Select “inches” from the **Position Units** drop-down list.
5. To set the position scale, you may want to get a helper just to keep from having to run back and forth between your PC and the piece of scenery your moving.
 - a. Connect the scenery to the motor.
 - b. Open **View>Manual Motor Control**, leave **Motor Setup** on screen as well.
 - c. Move the scenic piece slowly in reverse until you get to the furthest reverse position you’ll use in the show. This should be at least 6” away from your physical limit switch.
 - d. On **Motor Setup** press **Define Home**. This will reset the motor’s position to zero.
 - e. Place a piece of spike tape on the floor to mark the scenery. *You will want to keep this spike tape for the run of the show to check position periodically.*
 - f. On **Manual Motor Control**, move the scenic piece slowly in forward until it reaches the furthest forward position you’ll use in the show. This should be at least 6” away from the physical limit switch.
 - g. Note the position of the motor, in either the **Manual Motor Control Position** box or in the **Motor List** on the **Motor Setup** window. This number represents the encoder counts that the motor just moved. For this example I’ll use 150000 encoder counts, though your number may be different.
 - h. Now measure how far the scenery moved from your spike tape in inches. For this example I’ll use 363 ½”, your number may be different.

- i. Position Scale = encoder counts / inches. So in our example position scale is 150000 / 363.5 which is 412.65. Calculate your own position scale using the numbers you have collected.
 - j. Enter the position scale in the **Position Scale** box and press **Apply**. Avista automatically rounds the number to get rid of any fraction.
6. To enter the **Maximum Speed**, have your helper run the motor using the **jog controls** on the Stagehand. Press and hold the **FWD** button and turn the knob up (*for more info consult your Stagehand manual*). Run the motor at the maximum speed you want to use in the show. While the Motor is moving press **Maximum Speed**. Slow the motor to a stop. For this example I'll use a maximum speed of 29 inches/second.
 7. To enter the **Forward Limit**, move the scenery to its most forward position and press the **Forward Limit** button. Avista will read the current position as the **Forward Limit**. If you need to tweak this number, edit the number in the box. The forward limit is shown in the same units as the position scale (inches, feet, etc.)
 8. Enter 0 in the reverse limit box.
 9. Leave the **Max. Position Error** unchecked for the moment. We'll adjust this value after the motor has been tuned.
 10. Press **Apply**.

4.2.5 –Settings for Stage Schematic

One of the exciting features of Avista is the **Stage Schematic**, a virtual stage where you can graphically write cues by the positioning motors with the mouse rather than keying in numbers. In order for a motor to be properly represented in the **Stage Schematic**, you need to set up a few basic parameters.

1. Select **View>Motor Setup>Schematic** tab
2. Select the **Motor Type**, either **Winch** or **Turntable**. *Note: You can use the Winch type for any linear mechanism and the Turntable for any rotary mechanism.*

For **Winch Motor Type**:

3. Enter the approximate **Wagon Width** of the scenery you are moving.

4. Enter the approximate **Wagon Length** of the scenery you are moving.
 5. Click **OK**.
- For **Turntable Motor Type**:
6. Enter the **Turntable Diameter**.
 7. Press **OK**.
 8. Select **View>Stage Schematic>Stage Properties** tab
 9. Select your units from the **Units of Measure**.
 10. Enter in the approximate **Stage Width, Stage Depth, & Proscenium Opening**.
 11. Press **Apply**.
 12. Select the **Schematic View** tab.
 13. You should now see a plan view of a stage with your motors downstage center.
 14. Use the **Select & Move** tools to move the motors to match their positions on your real stage. For accurate positioning of winches and turntables use the **View>Motor Setup>Schematic** tab.

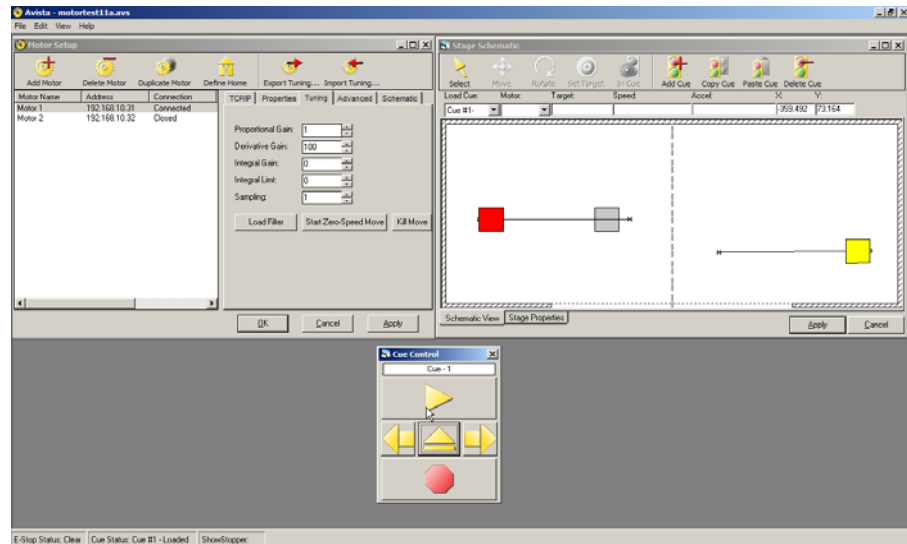
We know have a show file set up and configured. Before you go on to writing cues, take a moment to save the file using **File>Save As...**

4.2.6 – Tuning a Motor that is in Service

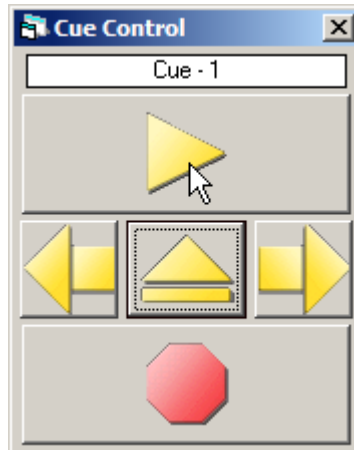
If weren't able to tune your motor on a bench, disconnected from any mechanics, follow these steps to tune the motor while attached to scenery. **If you were able to complete the tuning process in section 4.2.3, then skip ahead to the next section.**

1. First we will write two cues to move the motor back and forth as we test our tuning progress. The goal is to get the motor to move back and forth smoothly and have it hit the targets accurately.
 - a. Open **View>Stage Schematic**
 - b. Click on the **Stage Properties** tab
 - c. Enter the approximate dimensions of your theatre.
 - d. Click on the **Schematic View** tab
 - e. Select SL winch, or whatever you named Motor #1, from the drop down-list. You should see the winch highlighted with a red outline.
 - f. Click on the **Move** tool in the button bar

- g. Click a spot on the stage that is close to the real position of the winch track. The winch graphic should snap to your mouse click.
 - h. Click the **Add Cue** button, and enter a 1 for the cue number.
 - i. Select Cue #1 from the **Load Cue** drop-down list. This loads the cue into the Stagehands and onto the virtual stage.
 - j. To place Motor #1 in the cue, select the motor using either the **Motor** drop-down list or the select tool. The motor will show a red outline when it is selected.
 - k. Press the **In Cue** button.
 - l. With Motor #1 still selected, click on the **Set Target** tool.
 - m. Click anywhere on the virtual stage and drag to the right. Notice how the motor's target shadow moves along the winch track.
 - n. Select a spot on the track around half way and release the mouse.
 - o. In the **Speed** box enter a speed half of the maximum speed of the winch (in our example that would be 14.5 inches/second)
 - p. In the **Acceleration** box enter a modest acceleration value, for this example let's use 3 inches/second/second.
 - q. Click the **Apply** button to record the changes to Cue #1.
 - r. Click the **Copy Cue** button
 - s. Click **Add Cue** and enter a cue number of 2.
 - t. Click the **Paste Cue** button.
 - u. Select Cue #2 from the **Load Cue** drop-down list to load the newly pasted cue.
 - v. Change the **Target** value to 0 and press **Apply**. Now we have two cues set up to move the motor, so let's continue with the tuning process.
2. Now select **View>Motor Setup>Tuning**.



3. Enter the following values:
 - a. Proportional Gain = 1
 - b. Derivative Gain = 100
 - c. Sampling = 1
4. Click **Load Filter**
5. In the Stage Schematic window select Cue #1 from the **Load Cue** drop-down list.
6. In **View>Cue Controller** press the **Go** button (looks like a “play” button) and observe the motor moving.



7. If the motor doesn't complete the move all the way to the target, increase **Proportional Gain** by 10.
8. Click **Load Filter**.

9. Select Cue #2 from the **Load Cue** drop-down list and press **Go** on the cue controller.
10. If the motor doesn't complete the move all the way to the target repeat steps 7 & 8 until it does. There will often be a slight error in the final position of the motor, but it should be able to reach its target within .125". If the motor starts jerking back and forth during its move, start reducing the **Proportional Gain** by 1 until the cue runs smoothly.
11. Run a cue again and listen to the motor during the acceleration.
12. If the motor is "chugging" during the acceleration, increase the **Sampling** by 1 and run a cue to test the progress. Repeat until the "chugging" is minimal.
13. Double the **Derivative Gain** and run a cue. Keep doubling until the "chugging" comes back.
14. Reduce the **Derivative Gain** by 50 until the "chugging" is minimal.

That's it! As you get a feel for the tuning parameters you can experiment more to find optimal settings for your setup. Under normal circumstances, tuning should take no more than half an hour. The general rules of thumb are:

1. The higher the **Proportional Gain** the more accurate the motor will be. If the **Proportional Gain** is too high the motor will jerk back and forth.
2. The higher the **Derivative Gain** the more precise the motor will be during changes in speed (acceleration) and changes in loading. If the **Derivative Gain** is too high you will notice chugging in the acceleration of the motor.
3. **Sampling** works with **Derivative Gain** to increase accuracy during changes in speed and loading.

4.2.7 –Setting Max Position Error

Once you have your motor tuned as best as you can, it is a good idea to set the **Max Position Error**. This setting lets Avista shut down a motor if it is getting too far off its target at any time during a movement. This will prevent a run-away motor if the encoder becomes disconnected from the shaft of the motor, or if the encoder

breaks. It also can help minimize the damage if a piece of scenery hits an obstruction.

Max Position Error should be low enough to help prevent accidents, yet high enough that it doesn't shut down a motor just because it is poorly tuned or has some slop in the mechanics. So the better the tuning of the motor, the lower the value can be in the **Max Position Error**. Let's try it out:

1. Select **View>Motor Setup>Properties**
2. Click on the check box next to **Max Position Error**, this is the allowable margin of error in motor movement. This enables Avista to shutdown a motor when the programmed position error is reached.
3. Enter a value for the **Position Error**. This value will be in the same scale that you are using for the motor (i.e. inches, degrees, etc.) Start low (1 inch or .25 degrees)
4. Click **Apply**
5. Run a cue and see if Avista shuts the motor down mid- cue. If it does, either tighten up the tuning (without **Max Position Error** box checked) or raise the **Max Position Error** limit until you can complete the cue. *Note: If Avista stops the motor on a Position Error fault, you must press the **Stop** button on the **Cue Control** before re-loading a cue and trying again.*

4.3 –Writing Cues

There are two ways to write cues in Avista, using the **Cue Spreadsheet** or using the **Stage Schematic**. We will run through an example using both methods utilizing the same two motors that we configured in the previous section.

4.3.1 – Writing Cues in the Cue Spreadsheet

Writing cues in the **Cue Spreadsheet** may be a more familiar interface to anyone who has worked with other automation systems. Cues and motors are laid out in a grid, similar to what you would find in a program like Microsoft Excel. The columns are cues, and the rows are motors. To enter or edit any cue just click on the spreadsheet cell and type in a new value. Let's try it out.

1. Select **View>Cue Spreadsheet**

2. If you wrote cues to help in the tuning process you'll see them in the spreadsheet, if not you should see the motors in the show listed on the left and no cues for them.
3. Click on the **Add Cue** button and enter a cue number of 10 and click OK. *Tip: It's often good practice to start writing cues at 10 or 100 to leave room for preset cues or spike cues.*
4. A new column with a heading of 10 should have appeared. Currently no motors are included in the cue, so there aren't any values under cue 10.
5. Under the cue 10 column, enter some values for Motor 1:
 - a. Enter a **Position** that is half of the **Forward Limit**. In this example I used 150. Motor #1 is scaled in inches, so this target position is a 150 inches.
 - b. Enter a **Speed** that is half of the **Maximum Speed**. In this example I used 14.5. Motor #1 is scaled in inches, so this Speed is 14.5 inches/second.
 - c. Enter an **Acceleration** that is a quarter of the **Maximum Speed**. In this example I used 7.25. Motor #1 is scaled in inches, so this **Acceleration** is 7.25 inches/second/second. *Note: Depending on the resolution of your encoder, not all speed and acceleration values are possible. Avista will automatically compute the nearest value and write that into the cue. This can be disconcerting when you first see the number you entered not "stick", but it lets you know what is actually achievable. To increase your control on acceleration and speed, you need to increase the resolution on your encoder.*
6. To add Motor #2 to the cue, enter in some cue values under cue 10. *Make sure these motors don't run the risk of bumping into each other.*

That's all there is to it. Now let's try out some of the editing features of the spreadsheet as we make another cue.

1. Click on the **Add Cue** button and enter a cue number of 11.
2. We want to create a cue that returns both motors to Position 0 at the same speed and acceleration of cue 10. To do this will use copy/paste. Select from Motor #1 Position through Motor #2 Acceleration. Select **Edit>Copy**
3. Click on Motor #1 Position under Cue 11.

4. Select **Edit>Paste**
5. You should now have a copy of Cue #10 in Cue #11.
6. Change both position values to 0.

Let's say you decide that you actually want Cue #11 split into two cues so that you can stagger the motion of Motor #1 & Motor #2.

1. Click **Add Cue** and enter 11.5.
2. Select from Motor #2 **Position** to Motor #2 **Acceleration** under Cue 11.
3. Press **Ctrl + C** to copy the movement.
4. Select the Position cell for Motor #2 under cue 11.5
5. Press **Ctrl + V** to paste the movement into cue 11.5
6. To delete Motor #2 from cue #11, click on the status cell for Motor #2 under Cue 11 and press **Backspace**. When the dialog asks you to confirm the deletion, click **OK**.

Now you should have to separate cues that bring the motors home. Later on we'll look at how you can link these cues together to have Cue #11.5 automatically follow Cue #11.

4.3.2 –Writing Cues in the Stage Schematic

Avista's **Stage Schematic** makes writing cues very intuitive. The **Stage Schematic** presents a virtual stage in plan view where you can position targets for every motor and get a visual representation of the cue you are writing. If you haven't already configured your motors and stage for the schematic view, go back to the section *Settings for Stage Schematic*.

1. Select **View>Stage Schematic**
2. Click the **Add Cue** button; enter 12 for the cue number.
3. Select Cue #12 from the **Load Cue** drop-down list.
4. Select Motor #1 using either the **Select** tool, or the **Motor** drop-down list.
5. Click the **In Cue** button so that it is depressed.
6. Using the **Set Target** tool click and drag on the stage. As you drag right the target shadow for Motor #1 increases its position. Dragging to the left will decrease the target position. Pick a spot for the target and release the mouse.
7. Enter speed and acceleration values into the **Speed** and **Accel** boxes. Use similar values to those you used in the spreadsheet.
8. Use the **Select** tool to select Motor #2.

9. Repeat step 5-7 for Motor #2.
10. Click **Apply**.

Suppose you want to remove Motor #1 from Cue #12.

1. Select Cue #12 from the **Load Cue** drop down list
2. Select Motor #1 using either the **Select** tool or the **Motor** drop-down list.
3. Click on the **In Cue** button, so that it is released.
4. Click **Apply**.

4.3.3 – Linking Cues

Avista makes it easy to link multiple cues together that create complex motions. In this example we'll link a couple of cues together and explore the different link options. We'll link together cues 11 & 11.5 so that cue 11.5 begins when Motor #1 reaches position 75”.

1. Select **View>Cue Sheet**
2. Click on Cue #11.5 and drag it onto Cue #11. As you drag you'll see the cursor change to a chain link, this lets you know that you will link two cues together.
3. Drop Cue #11.5 on Cue #11. Cue 11.5 is now indented underneath Cue #11.
4. Click on Cue #11.5
5. In the **Cue Properties** pane select **Position Trigger** from the drop-down list.
6. Make sure Motor 1 is selected in the **Motor** drop-down list.
7. Enter 75 in the trigger parameter box and press **Enter**.
8. Run Cue #11 and witness how Cue #11.5 automatically executes.

To change the type of link, just select either **Time Trigger** or **Completion** from the link type drop-down list.

If you want to break the link between the two cues you can either:

1. Select Cue #11.5 and press the **Break Link** button
- Or
2. Select Cue #11.5 and select **Independent** from the link type drop-down list.

4.4 – Running a show

Now that we have written some cues, let's discuss how you run a show. Though there are different ways to accomplish each task, running a show consists of loading cues and executing cues.

4.4.1 – Loading Cues

Loading a cue sends all of the movement information for each motor and sends it to each Stagehand that will be moving in the cue.

To load a cue you can:

1. Double-click on a cue in the **Cue Sheet**.
2. Double-click on a cue column in the **Cue Spreadsheet**.
3. Select a cue from the **Load Cue** drop-down list on the **Stage Schematic**.
4. Linked cues will automatically load themselves when appropriate.
5. Using either the on-screen **Cue Control** or the USB ShowStopper:
 - a. Press the **Load Cue** button and enter a cue number.
 - b. Use the **Next Cue** or **Previous Cue** button to step through the show sequentially.

You can load a cue at any time even while another cue is running. This allows for “pile on” cueing, which means that you can manually run multiple cues with staggered starts. This is helpful if you have two cues that overlap, but the timing of the cues isn't consistent enough for a linked cue. Examples are if a series of cues are timed with an actor's dialogue or position on stage. *Note: If you load a cue that has movement information for a motor that is currently moving, that motor will be stopped in preparation for its next move.*

4.4.2 – Running Cues

To run a cue, the cue must be loaded first. Then press the **Go** button on either the on-screen cue control or the **Go** button of the USB ShowStopper. Linked cues will run automatically.

5 – Troubleshooting

Though the combination of Avista, Stagehand, and Showstopper strives to make automation easy, there are certainly times when things don't work. This part of the guide will give you some earned advice about what to culprits to look for when motors refuse to move.

Motor won't run in cue.

Try moving the motor with the jog controls on the Stagehand.

Motor won't run with jog controls.

Check the power being supplied to the Stagehand.

Check the LCD status display on the Stagehand.

- E-Stop! – Either the Showstopper is activated, or the Stagehand isn't connected to the Showstopper so check your cables.
- Forward Limit – The motor is sitting on the limit switch, so you won't be able to move forward. Or the limit switch is unplugged or wired incorrectly. Limit switches need to be wired normally closed (n.c.)
- Reverse Limit – Same as Forward Limit.
- Both Limits – Either you've engaged both limits and need to move one, or the limits aren't plugged in (or they're wired incorrectly).

Meter the voltage coming out of the Motor Power socket on the Stagehand as you use the jog controls. If you have a 120vac input you should see 90vdc output, 230vac input you should see 180vdc output.

Meter the voltage coming out of the brake socket, you should see either 120vac or 230vac as soon as you press either jog direction button.

If you aren't getting motor voltage, check the internal fuses in the Stagehand (see Stagehand owner's manual for details)

Motor runs fine with jog controls, but won't run from Avista.

Check the Stagehand LCD's network status. Connected means it is communicating with your PC, Not Connected means there is either a break in the network cabling or Avista hasn't

connected to the Stagehand. Use the Motor Setup to connect to the Stagehand.

Make sure you have a tuning filter loaded. From the Motor Setup>Tuning click Load Filter.

If the motor stopped in the middle of a cue and now won't restart, chances are that Avista shut down the motor because it exceeded the Max. Position error. Press the Stop button on Cue Control or Showstopper and then try to reload the cue.

When running a cue, the motor speeds fast in the wrong direction and then turns off.

1. The polarity of the motor is reversed. Open up the motor plug and switch the white and black wire.

When running a cue, the motor speeds fast in the right direction and then turns off.

1. Check to make sure that the encoder is still attached to the motor securely.
2. Check the encoder connector.

Technical Support

Though we try our best to produce reliable software and clear instructions, there may come a time when you need personal support.

Phone Support

You can call our technical support at 401-862-2980 Monday-Saturday from 8am – 6pm EST. Phone support is free for 90 days, after that a rate of \$30/hr. applies to support calls.

Web Support

There is an active user support forum on our website.
<http://www.creativeconners.com/phpBB2/index.php>

Email

If you have a technical question you can email technical support support@creativeconners.com.

Bugs

If you think you have found an “undocumented feature”, we want to know! Though we wish Avista was flawless, the next best thing is to fix problems as soon as they arise. Please send any bug reports to support@creativeconners.com and check our website for any patches or updates www.creativeconners.com.

Index

- Add Cue, 21, 26, 29
- Break Link, 26
- Colors, 26
- Copy Cue*, 29
- Cue
 - Add new, 21, 26, 29
 - break link, 26
 - copy, 29
 - delete, 21, 26, *See*
 - duplicate, 26
 - linking, 26, 27
 - load, 26, 30
 - paste, 29
 - properties, 27
 - set target, 29
- Cue Control***, 13
- Cue Properties, 27
- Cue Sheet***, 13, 25
 - color code, 26
- Cue spreadsheet, 20
- Cue Spreadsheet***, 13
 - color coding, 23
- Cues
 - linking, 48
 - loading, 49
 - Running, 49
 - writing in spreadsheet, 45
 - writing in Stage Schematic, 47
- Delete Cue, 21, 26, *See*
- Duplicate Cue, 26
- encoder, 11
- IP address
 - setting, 16
- limit switches, 12
- Linking Cues, 48
- Loading Cues, 49
- Manual motor control***, 13, 32
- Max Position Error, 11, 44
- Motion Control, 9
- Motor
 - Add, 14
 - Define Home, 14
 - Delete, 14
 - Duplicate, 14
 - Export Tuning, 15
 - Forward limit, 17
 - Import Tuning, 15
 - manual control, 32
 - max position error, 44
 - Max Position Error, 17
 - Maximum speed, 17
 - Name, 16
 - Reset Drive, 19
 - Reverse limit, 17
 - Scaling, 16
 - Schematic, 19
 - setup, 34, 39
 - testing, 35
 - Tuning, 18
 - tuning in service, 41
 - tuning on a bench, 36
 - Type (winch/turntable), 20
 - Units, 16
- Motor setup, 13
- Motor Setup***, 13
- Motor Tuning, 11
- network, 5
- Network Setup, 33
- Paste Cue, 29
- Power, 10
- Reset Drive, 19
- Running a show, 49
- Running Cues, 49

Stage schematic
 stage properties, 31
Stage Schematic, 13, 27, 40,
 47
System requirements, 4
Troubleshooting, 50
Tuning, 18
 Derivative Gain, 18

Export, 15
Import, 15
Integral Gain, 18
Integral Limit, 19
 on a bench, 36
Proportional gain, 18
Sampling, 19
Writing Cues, 45