

creative conners, inc.

Stagehand Mini Reference Manual

Version 1.0

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Stagehand TM DC Reference Manual

1 – Getting Started

Congratulations on your purchase of the Stagehand Mini scenic motion controller from Creative Conners, Inc. **Stagehand Mini** brings the excitement of automation to theatres of all sizes. **Stagehand Mini** is a unique motion controller that eliminates the clutter and complexity of other automation systems.

This manual will direct you through:

1. Unpacking
2. Installing & testing
3. Operation procedures

If you need help along the way contact us either on our website (www.creativeconners.com), via email (support@creativeconners.com), or by phone (401.862.2980)

1.1 What's in the box?

Inside the box you should find:

1. Reference manual (this document)
2. Stagehand Mini motion controller
3. 7-pin encoder connector
4. 4-pin control output cable with connector on one end and flying leads on the other end.

If any of these items are missing, please contact us immediately for a replacement.

If you purchased any power cables, encoders, limit switches, or other accessories, those items are packaged separately.

1.2 Stagehand Mini Overview

The **Stagehand Mini** is designed to give you the powerful motion control capabilities of the **Stagehand AC** & **Stagehand DC** while allowing you to connect to your own motor drives. While the **Stagehand AC** & **Stagehand DC** can power a motor directly, the **Stagehand Mini** requires an external drive component to amplify its

control signals to a level that can move a mechanical device. Like its bigger siblings, the **Stagehand Mini** provides a complete motion control solution and integrates seamlessly with other **Stagehand** products and the **Avista** automation software.

After unpacking your **Stagehand Mini**, take a moment to familiarize yourself with its various connections and features.

Figure 1.1



Figure 1.1 shows the connections located on the top of the **Stagehand Mini**. From left to right, top to bottom, these connections are:

1. **Encoder** – The encoder receptacle is a Amphenol T3107 000 connector. This receptacle provides power (24VDC) to, and receives position information from, a quadrature encoder.
Note: The encoder allows Stagehand to track a motor's position.
2. **Control Output**– The control output receptacle is an Amphenol T3111 000 connector. Since the **Stagehand Mini** does not have an internal drive to directly power a motor, the **Control Output** connector provides the +/-10vdc speed signal and a Normally Open enable signal.
3. **FWD Limit** – The forward limit receptacle is a NEMA midget connector (ML1). This receptacle is used to connect a limit switch that will detect the end of forward travel for your

machine. The limit should be wired as normally closed switch (N.C.).

4. **REV Limit** – The reverse limit receptacle is a NEMA midget connector (ML1). This receptacle is used to connect a limit switch that will detect the end of reverse travel for your machine. The limit should be wired as normally closed switch (N.C.).
5. **Ethernet** – The Ethernet receptacle accepts a standard RJ45 network cable. **Stagehand Mini** uses Ethernet as the control protocol to communicate with a PC running **Avista** software.
6. **Brake Power** – The brake power receptacle is a NEMA midget connector (ML3). This receptacle supplies AC power for your spring-set brake at 208/230VAC.
7. **E-Stop** – The E-Stop (a.k.a. emergency stop) receptacle is a 5-pin XLR connector. This receptacle receives a dedicated emergency signal (24VDC) from a **Showstopper** base station. If this signal is present, the **Stagehand** is free to move, when the signal is interrupted it will immediately remove power from the motor

Figure 1.2

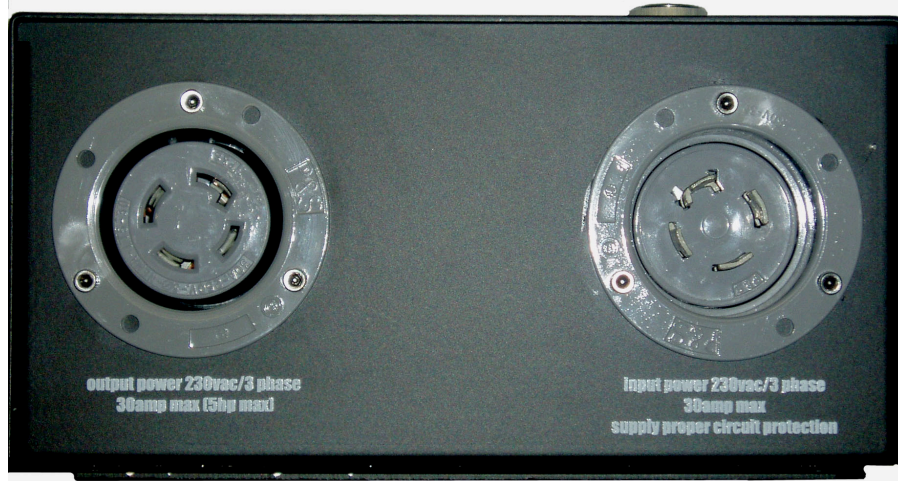


Figure 1.2 shows the controls located on the front of the **Stagehand Mini**. From left to right, top to bottom, the controls are:

1. **Forward jog button** – When pressed the **Stagehand** will switch to manual operation, and begin to jog in the forward direction.
2. **Reverse jog button** – When pressed the **Stagehand** will switch to manual operation, and begin to jog in the reverse direction.
3. **LCD Display** – The display shows information about the **Stagehand**'s status. When idle, it shows the current IP address and the status of the network connection between the **Stagehand** and a PC running **Avista**. If a limit switch or **E-Stop** has been activated, the condition will be displayed. In jog mode, it will display the jog direction and speed. In address mode, it will let you alter the current IP address.
4. **Knob** – The **knob** performs different functions depending on the function being performed:

- a. If either **jog button** is pressed, the **knob** will function as a speed dial.
- b. To set the IP address, press the **knob** (it's also a button) and then turn the **knob** to adjust the address.

Figure 1.3

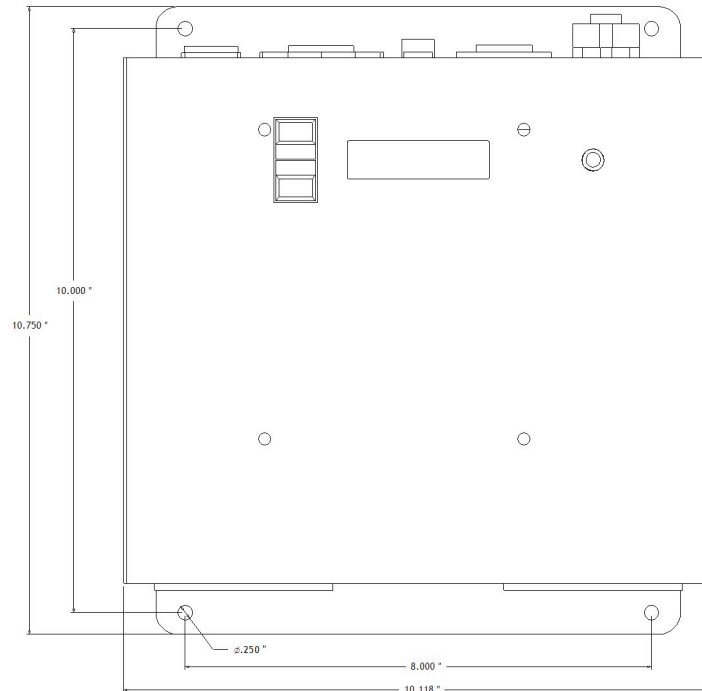


The **Stagehand Mini** has a power inlet and a power output socket on the bottom of the panel, as shown in Figure 1.3. Both are NEMA L15-30 twist-lock connectors (3-phase, 4-wire, 30amp). The **Input Power** receptacle should be connected to line voltage, the **Output Power** should be used to power the device being controlled by the **Stagehand Mini**. The **Output Power** is a switched power outlet that is controlled by the **Showstopper** Emergency Stop circuit. In the event of an **E-Stop**, power will be removed from the **Output Power** receptacle, thus insuring that any device connected to the **Stagehand Mini** will be stopped.

1.3 Installing Stagehand

1.3.1 Mounting Stagehand

Figure 1.4



The **Stagehand Mini** has four mounting holes, as shown in Figure 1.4, that can be used to mount the panel to a wall or portable stand. The **Stagehand** should be mounted in a location that is moderate in temperature (40°F-90°F) as well as free from excessive dust and moisture.

Typically, it is best to mount the **Stagehand Mini** within 6' of the motor it controls. This reduces cable clutter and minimizes the risk of electrical interference (both RFI & EMI). Longer distances are possible with motor, encoder, and limit cable extensions.

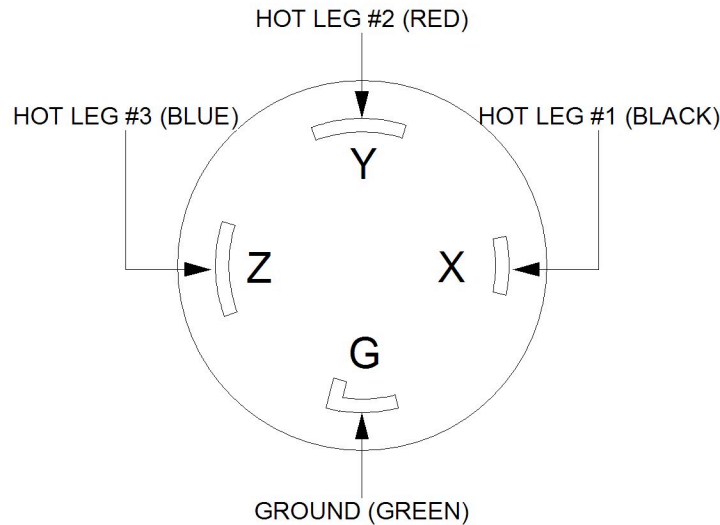
1.3.2 Hooking up power

Stagehand needs power to store a motor's position information & to power an external drive. **Care should be taken to power the Stagehand from a source that is not likely to be interrupted. If**

power is lost to a Stagehand, the motor's position information will be reset to zero (0), regardless of the motor's actual position.

Stagehand Mini should be connected with a NEMA L15-30 cord-style receptacle that is wired as shown:

Figure 1.5



Note: The internal electronics of the Stagehand Mini only utilize X, Y, and G for operation. The third leg, Z, is provided for external drives that require 3-phase power. Therefore, when using 208VAC drives, it is possible to wire the Stagehand Mini for 208VAC by only using pins XYG.

To reduce the risk of fire and equipment damage, **Stagehand Mini's** should be installed with proper branch circuit protection. Install a properly sized circuit breaker on the dedicated circuit supplying power to the **Stagehand**. Consult the documentation from the manufacturer of the external drive for proper breaker sizing.

Once you have applied power, the LCD display should light up and display the following (note: IP address may be different).

Figure 1.9



The “E-Stop!!” message is displayed because you have not yet hooked up the **Stagehand** with **Showstopper**. If the **Stagehand** does not detect a signal from **Showstopper**, it will assume an Emergency Stop condition.

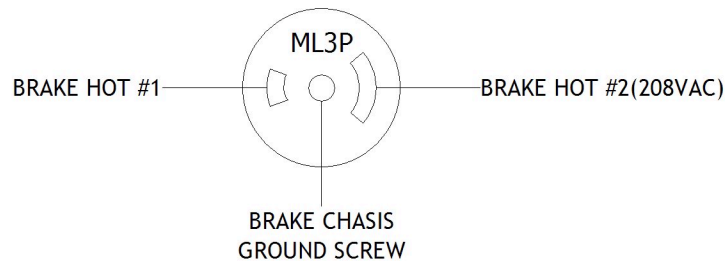
The number on the bottom line of the display is the **Stagehand's** IP address. We'll look at changing the IP address in section 1.4.

1.3.3 Hooking up a motorized effect

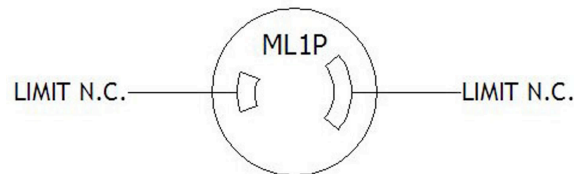
Prior to using your **Stagehand Mini**, you will need to install connectors on your devices. The following diagrams show how to install connectors on each piece of equipment.

Figure 1.10

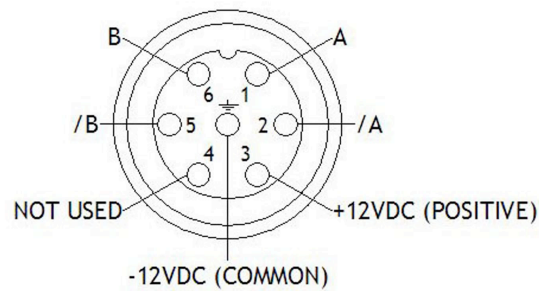
Brake Plug



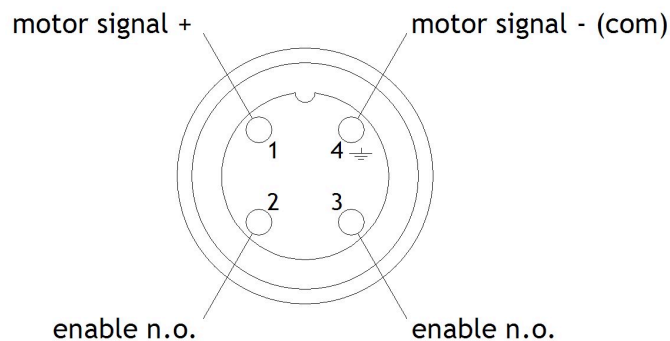
Limit Plugs



Encoder Plug



Control Output



Once you have the necessary connectors installed, hook up the components as follows:

1. Plug the brake into the brake socket.
2. Plug forward and reverse limits into the respective sockets.
3. Plug the encoder into the encoder socket.
4. Plug the supplied control output cord into the control output socket.
5. Attach the flying leads of the control output socket to your external drive as follows:
 - a. Pin #1 should connect to the positive terminal for speed control. Make sure you connect this to the proper terminal for analog signal following (+/-10vdc).
 - b. Pin #4 should connect to the common terminal for speed control. Again, make sure you

connect this to the proper terminal for the analog ground or common.

- c. Pin #2 & Pin#3 are terminals to a N.O. (normally open) enable switch. When the **Stagehand Mini** needs to enable the external drive for movement, it will close switch allowing current to pass between these pins. Drives typically have an enable (or inhibit) circuit, connect these leads to the terminals for the enable circuit on your drive. Make sure to consult your drives documentation for proper operation, as some drives allow you to select whether the enable is N.O. or N.C.

After all control connections are made to the **Stagehand Mini**, connect your external drive to the power output socket and get ready to test!

1.3.4 Testing a motor

To confirm that your motor is properly connected to the Stagehand Mini you should test these conditions:

1. *E-Stop* – Release the E-Stop button on **Showstopper**. You should hear a “click” from inside the **Stagehand Mini**, this is the **E-Stop** contactor closing. The LCD display should show that the **E-Stop** is released by switching the status display to:

Figure 1.11



“Not Connected” indicates that the **Stagehand Mini** is not communicating with a computer running Avista.

2. *Brake release* – Press the **fwd** jog button. You should hear a distinct “click” from your brake. This is the sound of the brake releasing. Release the **fwd** jog button. You should hear a click of the brake engaging.
3. *Motor Motion* – Press the **fwd** jog button and slowly turn the **knob** clockwise. The motor should begin moving. Turn the

knob counterclockwise to slow the motor to a stop, then release the jog button. Repeat with the **rev** jog button.

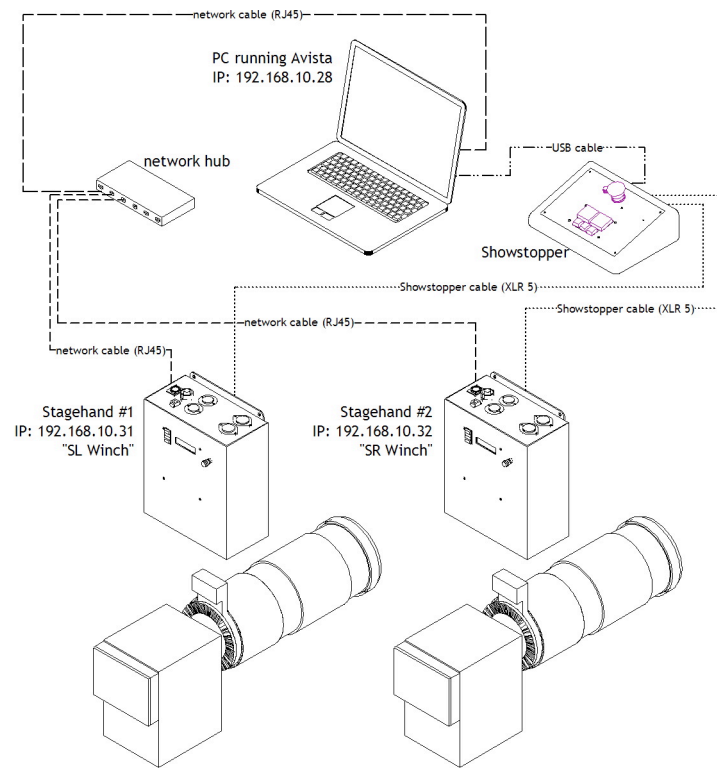
4. *Limit Switches* – Manually activate (or unplug) first the forward limit, then the reverse limit. The LCD display should indicate when a limit is detected.

Figure 1.12



1.4 Configuring a Stagehand Network

Many **Stagehands** can be controlled by a single PC running **Avista** software. **Avista** controls **Stagehands** through standard network cables and hubs. The following diagram shows a typical network of **Stagehands**.

Figure 1.13

Every component on the network must have a unique IP address. Though you can alter any of the four segments of the Stagehand's IP address, it is often easiest to alter the last number (valid ranges for each segment are 0 to 255). To change the address of a Stagehand, follow these steps:

1. If the **E-Stop** is engaged, release the **E-Stop** on **Showstopper**.
2. Push the knob on the front panel of the **Stagehand**. The LCD display will change to show that you can edit the IP address.

Figure 1.14



3. By turning the knob, move the cursor over the segment you wish to change. In this example, move the cursor until it is flashing over the number “32”.
4. Press the **knob** to edit the number “32”.
5. Turn the **knob** to dial in a new number, for example rotate clockwise until you reach the number “36”.
6. Press the **knob** to stop editing the number.
7. Rotate the **knob** until the cursor is flashing on “OK”.
8. Press the **knob** to accept the changes.

Note: To discard a changed IP address, you can click on Cancel in step 7.

2 – Using a Stagehand Mini

The Stagehand can be used to drive a motor either manually or through a computer running Avista.

2.1 Manual Operation

Using the jog buttons on the face of the Stagehand you can control when the motor stops & starts, and how fast it moves. When moving the motor with the jog controls, **Stagehand** is constantly tracking the position of the motor’s encoder. Regardless of whether you move the motor with the jog controls, or with a computer running **Avista**, the motor’s position will always be known.

Stagehand will detect limit switches when a motor is moved manually. If a limit switch is hit, **Stagehand** will stop the motor and prevent it from traveling any further in the direction that the limit switch was detected, until the limit switch is released.

Before moving a motor, make sure that everyone on stage is clear of the motor’s path & aware of what is about to move.

To move a motor manually:

1. Press either the **FWD** or **REV** jog button on the face panel.
2. Turn the **knob** clockwise to increase speed.
3. Turn the **knob** counter-clockwise to reduce speed.
4. Release the jog button to stop the motor and engage the brake.

2.2 Computer Control with Avista

The real benefit of **Stagehand** is achieved when using it in conjunction with a PC running **Avista** software. **Avista** allows you to program multiple motors to move at specified speeds to exact locations on stage. These moves are written as *cues* and can be edited and run in a similar fashion to a lighting console.

Stagehand receives cue information from **Avista** over standard network cables and hubs. **Avista** will inform **Stagehand** where to move, at what speed, and how fast to accelerate. When **Avista** sends a “GO” command, **Stagehand** will begin to move and will guide the motor to the exact position on stage.

In order for Stagehand to know where the motor is at any given time it must receive position information from the motor’s encoder. ***If the Stagehand loses power, when it regains power it will reset the encoder position to zero (“0”), regardless of the motor’s actual position.*** Should this happen, drive the motor manually to the true zero position (usually the reverse limit switch) and reset the position. There are two ways to reset position:

1. Cycle power to the **Stagehand**.

-OR-

2. Press the **Define Home** button in the **Avista** software.

To learn more about controlling motors with **Avista**, refer to your Avista software manual.

2.3 Adjust the Stagehand Mini Control Output

The **Stagehand Mini** is shipped calibrated to produce a motor control signal of 0VDC at 0% output speed. The signal can be adjusted if

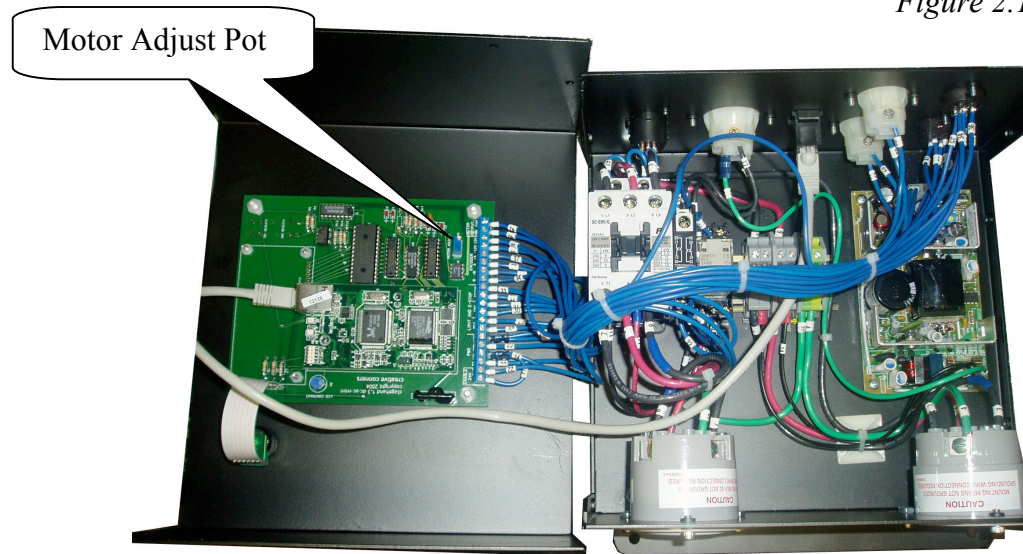
calibration is lost, or if a voltage bias is required for a particular application.

To calibrate the bias of the control signal, adjustments must be made with the enclosure open and power applied. As with any power electronics, there is a very real risk of electric shock. Be sure to use insulated tools, and extreme caution. If you are not confident in your ability to make such adjustments, please contact Creative Conners, Inc. and we will arrange to have the calibration done by one of our technicians.

To adjust the voltage of the motor control signal:

1. Disconnect power from the Stagehand Mini.
2. Remove all screws from the cover.
3. Gently lift-the cover off of the enclosure, rotate it clockwise 90 degrees, and lay it down next to the base of the enclosure. There is a wiring harness that connects the cover to the base, be careful not to damage the harness.
4. With the cover open locate the **Motor Adjust** pot on the back of the cover.
5. Connect a voltmeter to pins 1 & 4 of the control output cable.
6. Reconnect power to the Stagehand Mini. **Be very careful, there is now line voltage present inside the enclosure.**
7. Turn the screw on the **Motor Adjust** pot until you achieve the desired voltage across pins 1 & 4 of the control output cable.
8. Disconnect power from the **Stagehand Mini** and fasten the cover to the enclosure.

Figure 2.1



3 – 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.

Stagehand lost power and now the position information is incorrect.

Move the motor to the true zero ("0") position manually and reset the position be either cycling power to the **Stagehand**, or using the **Define Home** button in **Avista**.

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 external drive as you use the jog controls.

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.

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.

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.

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

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.

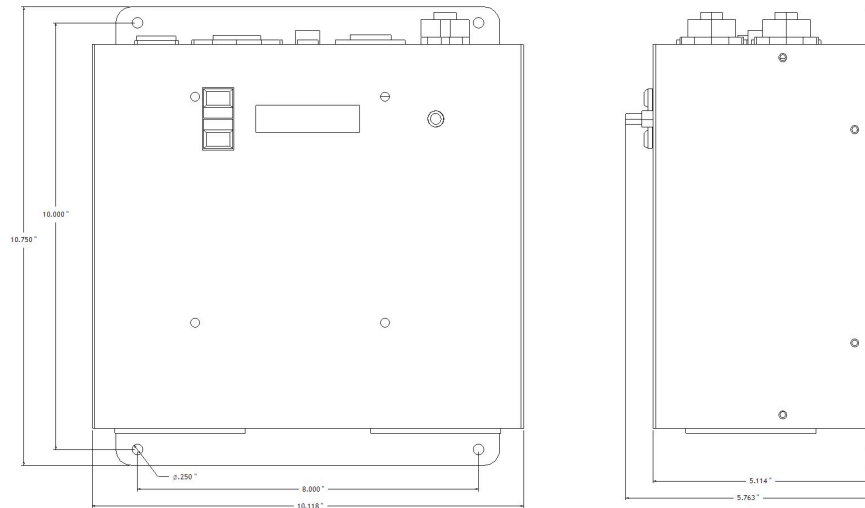
<http://www.creativeconners.com/phpBB2/index.php>

Email

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

4 – Specifications

4.1 Physical Specifications



4.2 Electrical Specifications

Input voltage	230V 3-phase 60Hz
Max input current	30 amps
Output voltage	230V 3-phase 60Hz
Brake output voltage	208V/230V 60Hz
E-Stop input	24VDC
Fwd limit input	N.C. switch
Rev limit input	N.C. switch
Control input	Ethernet RJ45
Control output	0 to +/-10vdc speed signal
	N.O. enable contact (5amp max contact rating)
Encoder input	Quadrature encoder with differential line drivers compatible with 24vdc power supply

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Stagehand V2 Addendum

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Recent upgrades to the Stagehand product line

This document is provided to inform you of the recent changes to the Stagehand product line that are not yet documented in our manuals. Starting in June 2006, the Stagehand motor controllers have been updated with the following features:

1. All Stagehand products now provide a battery backup to maintain encoder position during a power failure. The battery backup compartments on Stagehand DC, Stagehand AC, & Stagehand DC Max are located just beneath the Ethernet jack. On the Stagehand Mini, the battery compartments are located on the bottom of the panel between the input & output power connectors. The battery backup compartments will accept two 9-volt batteries and can provide power to the encoder and internal motion controller for approximately 45 minutes should main power be lost. Additional backup time can be attained by using two 9-volt lithium batteries.
2. All Stagehand products now have a green indicator light that illuminates when main power is present. If the green light is not illuminated, the Stagehand is running on battery backup and main power should be restored as quickly as possible.
3. The original Stagehand product has been renamed Stagehand DC to better describe its purpose as the product line continues to grow. The new Stagehand DC now shares the same case design as the Stagehand AC and the new 5hp Stagehand DC Max. The consistent case design between these products should simplify mounting techniques for shows that require various Stagehand controllers for various machines.

If you have any questions regarding these improvements, please contact technical support at 401-862-2980.