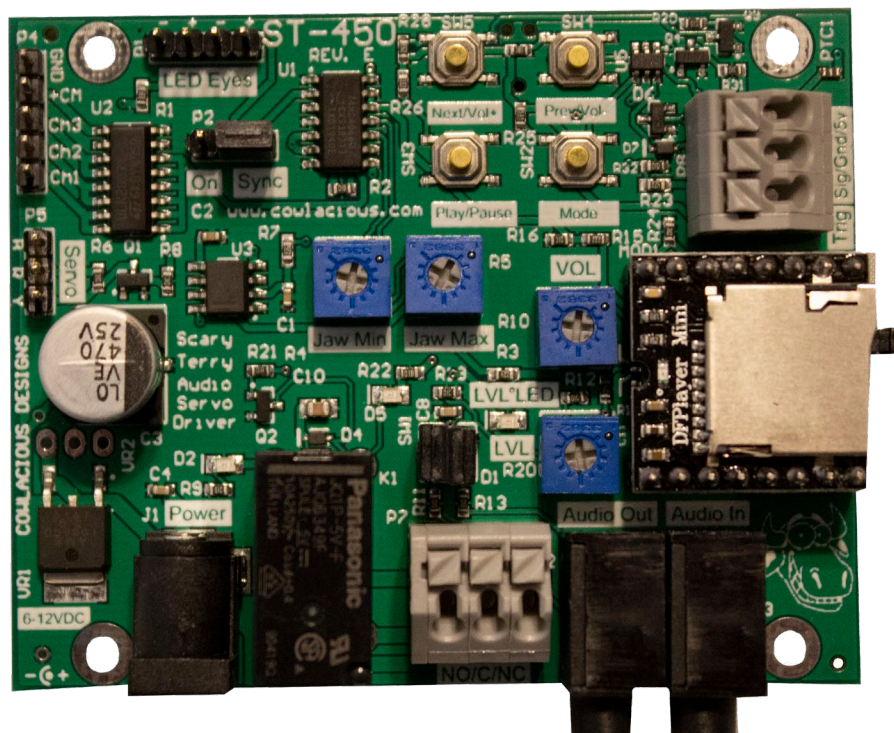


# Scary Terry's Audio Servo Driver™

ST-450 Circuit Board  
With MP3/Wave Audio Module and Relay



Cowlacious Designs™  
By Computer & Electronic Services

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## **Introduction:**

The ST-450 provides all the functions of the standard Scary Terry board, such as the ST-425, but adds a build in audio player that can be triggered via a switch, motion sensor, or voltage source. In addition, a relay has been added to the board that can be used turn on/off other devices, such as a light, whenever the audio is playing.

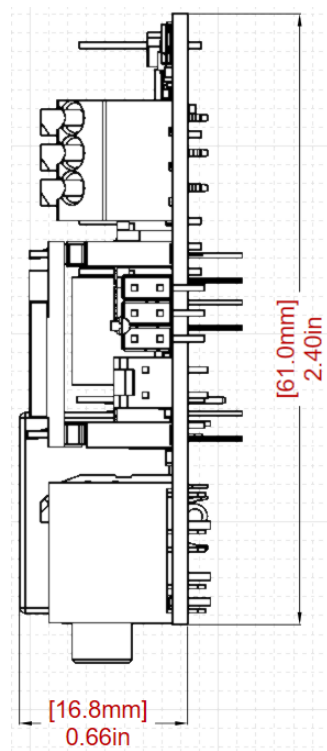
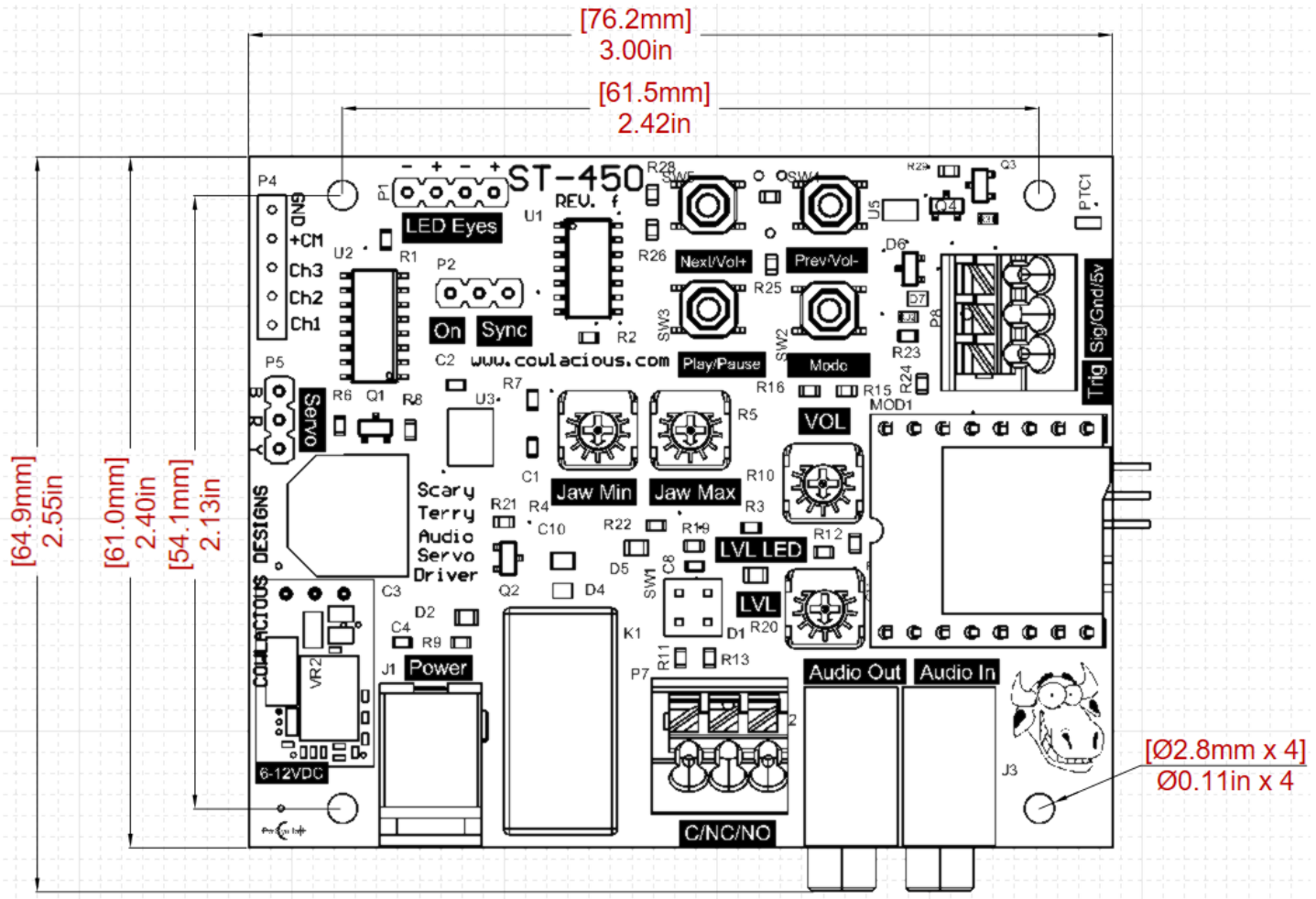
Scary Terry has allowed us at Computer & Electronic Services to produce a Cowlacious Designs circuit board from his original design. Over the years we have changed it a little bit, but the main circuitry is still Terry's! We thank him for the great circuit he designed for everyone to enjoy!

Terry's description of the basic operation of the circuit: "As long as there is sound present, the servo will drive to its "max" position. If the sound is short in duration, the servo will not have time to drive to "max" but will drive part way and return to "min" position. While this method of moving a mouth is not perfect, it's pretty good and I'm very happy with the effect. It's important to remember that any sound will drive the servo, voice, music or noise, so if you're trying to make a Bucky mouth move to a voice track, you shouldn't have music in the background of that particular track."

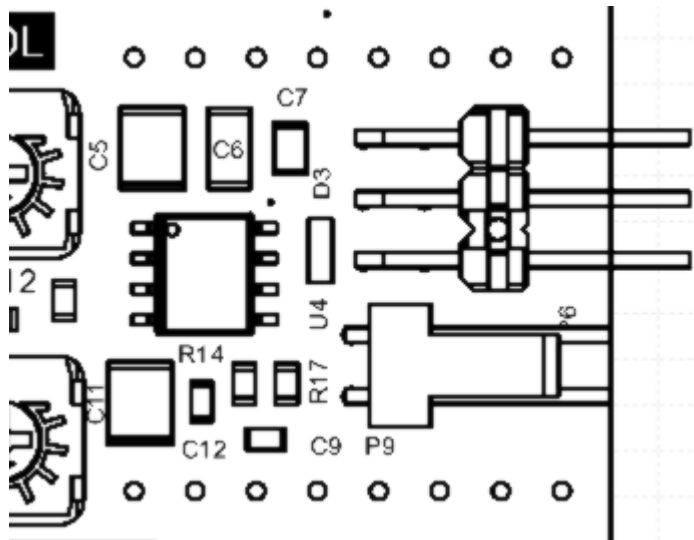
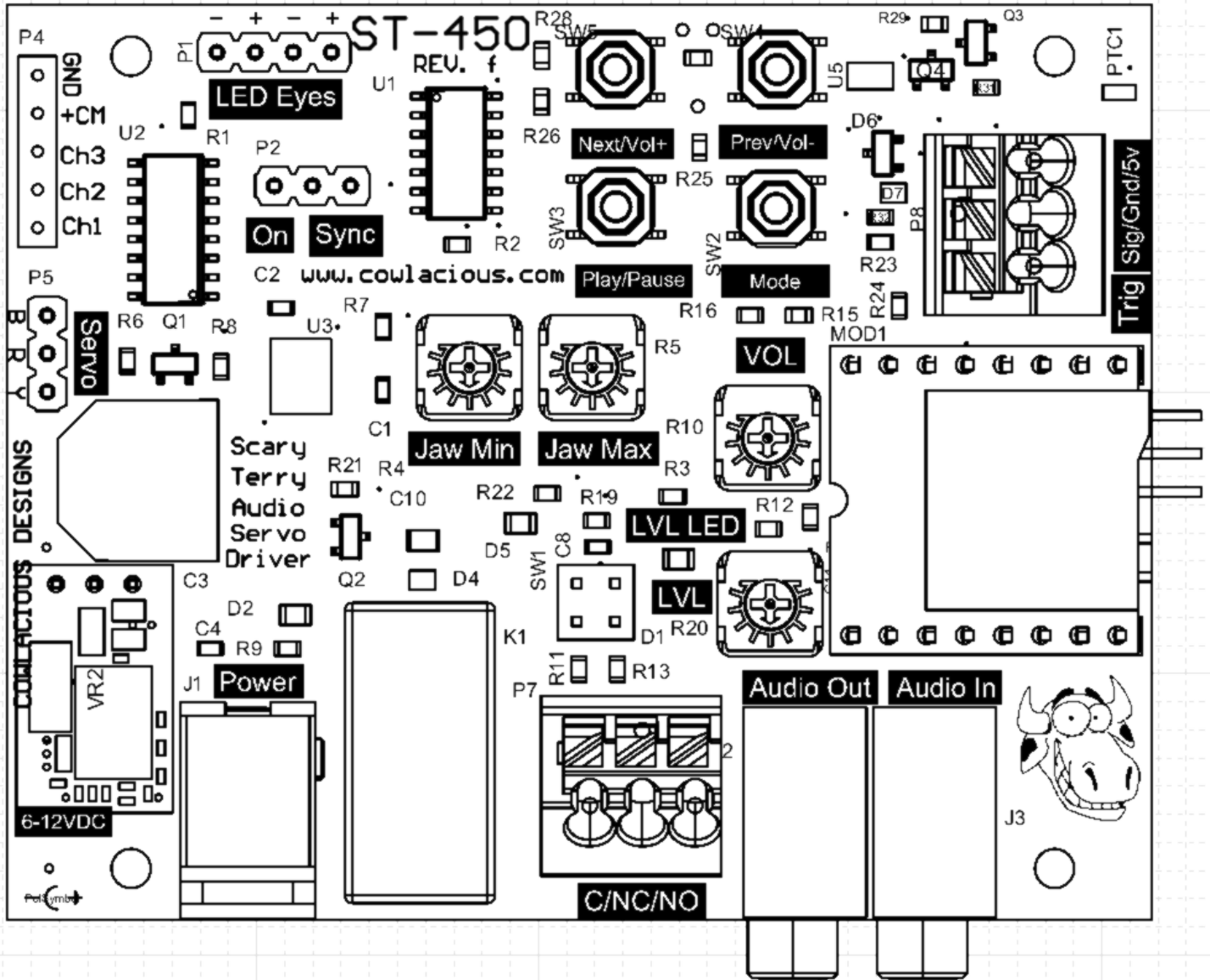
Terry's web site is:

<http://www.scary-terry.com/>

# Board Dimensions



# ST-450 Board Overview



Close up the area under the sound playback module (MOD1).

J1 Power Jack 9VDC  
J2 Audio Line Out  
J3 Audio Line In  
P1 LED Eyes connection  
P2 LED Eyes “Sync or On” switch  
P4 High current device connection  
P5 Servo connection  
P7 Servo response speed  
adjustment  
SW1 Audio channel(s) for the  
servo to follow  
R20 Trigger level pot  
R10 Volume pot  
R5 Jaw maximum adjustment pot

R4 Jaw minimum adjustment pot  
D1 LVL LED  
D4 Power LED  
D5 Relay “On” LED  
P7 Relay connections  
P8 Audio trigger connections  
P9 Speaker connection for 3W  
speaker  
SW3 Play/Pause button  
SW4 Previous/Vol – button  
SW5 Next/Vol + button  
SW2 Mode button

# Testing and Adjustment

(Note: Please see connection diagrams on the following pages.)

- Connect your servo to the servo header. Make sure you properly orient your servo connector with the header. The header is marked with “Y R B”, where Y is for Yellow, R is for Red or positive, and B is for Black or Negative. (Colors for the yellow wire will vary by servo manufacturer, but the Red and Black are usually there.)
- Supply power to the board by connecting a 9 VDC (500mA or greater) power supply to the barrel connector. **Center pin is positive, sleeve is negative.** You should see the power LED light up as soon as power is applied.
- Adjust the threshold level, “LVL” (R20), clockwise or counter-clockwise until the “LVL LED” turns on.
- Adjust “MAX” (R5) until the servo is in the maximum position you would like it to move to. This is maximum open mouth position.
- Adjust the threshold level, “LVL” (R20), clockwise just far enough that the “LVL LED” turns off. Note: This control is used to set the sound trigger level needed to make servo head toward the MAX setting. If it is set too far from the point that the LVL LED turns on the servo will not respond to the sound at all or not as much as desired.
- Adjust “MIN” (R4) until the servo is in the position you would like it to move to. This will be the closed mouth position. Don't close it so much that the jaw clenches or it could cause the servo to overheat.
- Feed audio to the circuit through the 3.5mm stereo “Line In” jack or put a  $\mu$ SD card, with at least one MP3 or wave file on it, into the socket of the  $\mu$ SD socket of the sound player module. Press “Play” to hear the audio from the sound player module.

If you want both channels of sound to control the servo then make sure that the red shorting jumpers are on P8. If you want only the right channel of audio to control the servo, then remove the red jumper from the switch for left channel. If you want only the left channel audio to

control the servo then remove the red jumper from the switch for the right channel.

**PLEASE NOTE:** Both channels of the audio are always passed on to the “Line Out” jack. The “Line Out” jack can connect to an external set of powered computer speakers, powered MP3 speakers, or it can feed the Aux or Line In jack of an amplifier that has speakers connected to it.

- Adjust the “VOL” until you get the kind of response you want. Remember, this circuit is designed to move the servo to its maximum position whenever audio is present. If the audio is too loud it will remain in its maximum position until the “Gain” is adjusted to an appropriate audio level. If the audio source has an adjustable output, such as an MP3 players headphone jack, you will probably need to turn the players volume up to maximum.

The “VOL” adjustment and the “LVL” adjustment work in conjunction with each other, so you may need to experiment a little bit with these controls to get the effect you want from the sound source you are using.

#### **OTHER AJUSTMENTS AND CONNECTIONS**

There are three header pins on P7 with a red removable jumper across the two middle pins. This header allows you to fine tune how quickly the circuit responds to sounds. In the middle position it is using a 4.7uF capacitor. If you move the jumper over two pins to the right, facing the audio jacks, it will use a 2.2uF capacitor, speeding the reaction time up a little. If you move the jumper to over the other direction it will be using a 10uF capacitor which will slow the reaction time down a little.

#### **High Current Section (P4)**

The high current driver of the Scary Terry board allows the board to control devices such as small DC lamps, relays, and solenoids for air and water. This section can be used to control props that require larger eyes than LED's appear to be and/or to control a jaw that is just too big for a servo to be able to control.

Each of the 3 channels is capable of sinking 1000mA (1A) of current. We don't recommend pushing it that hard without attaching a heatsink to the chip, but that is what the specs for the device say.

The chip can sink up to 24VDC devices, even though the Scary Terry board is only a 5VDC board.

## Sound module control

**Play/Pause Button:** When pressed, plays the current audio file. If the button is pressed during playback then the audio will be paused until the button is pressed again, causing it to resume playback from that point.

**Next/Vol +:** When pressed, advances to the next audio track and begins playback. If the button is held down during playback the volume will continually increase (up to the maximum) until the button is released.

**Prev/Vol -:** When pressed, goes back to the previous audio track and begins playback. If the button is held down during playback the volume will continually decrease (down to the minimum) until the button is released.

**Mode:** When pressed, switches between single track play and continuous play. The player's default is single track play, so when pressed, after power up, the unit will begin to play the audio tracks in a continuous loop. If it is pressed again it would go back to single track play.

**Trigger connection:** When triggered the device will play the "next" audio file. It will play the same audio file each time if there is only one audio file on the  $\mu$ SD card. If there are multiple audio files it will play them in the order they were added to the  $\mu$ SD card.

The trigger can be controlled by a switch, motion sensor, or voltage level (up to 24VDC).



**For a switch** – Connect the “5V” pin on the trigger jack to one terminal of a switch, then connect the other terminal trigger connections “Trig” terminal. Pressing the switch will then play the next audio file on the  $\mu$ SD card in the sound player module.

**For a motion sensor** – Connect the “5v”, “Gnd”, and “Trig” to the equivalent pins on the motion sensor, such as our ACCY-MS-WDANG motion sensor. This will trigger the sound player module whenever motion is detected.

**About the 5V terminal** - The “5V” terminal can supply a maximum of 29mA. Anything above 29mA of current draw will cause a self-resetting fuse to open and cut off the power to the pin. You should use an external power supply to power your triggering device if it requires more current.

*NOTE: The audio module and all the trigger functions are bypassed if you plug an external audio source into the line-in jack. The rest of the Scary Terry board will operate just as if the audio module was being used, but the audio driving it will be from your external source just like an ST-425 board operates.*

A free audio editor can be found at [www.audacity.sourceforge.net](http://www.audacity.sourceforge.net) that allows you to edit and mix your audio files.

## SUPPLIED DEVICES

### LED AUDIO EYES

The L Eye & R Eye connections can be set so that the LED Eyes are always on or so that they flash with the audio. Setting the red shorting jumper of P2 across the middle pin and the “Sync” pin will make the eyes flash with the audio. Setting the red shorting jumper of P2 across the middle pin and “On” will make the eyes stay on continuously.

The LED eyes attach to the R Eye and L Eye (P1) header with the black wire connecting to the (-) pin and the yellow wire connecting to the (+) pin. Our LED Audio Eyes can simply be plugged onto these connectors.

*NOTE: Just about any color LED will work fine with these connections (clear ultrabright red LED's are supplied). Insert one LED into the end of each LED Audio Eyes wire. The short lead or flat side of the LED should be place in the side of the socket with the black wire. They can then be taped or glued in place. You could also use a little heat shrink tubing to hold the LED in its socket.*

## OPTIONS AVAILABLE FOR PURCHASE

**Please see our web site at [www.cowlacious.com](http://www.cowlacious.com)**

9VDC, 500MA, WALL TRANSFORMER THAT PLUGS INTO THE BARREL JACK.

HITECH 425BB SERVO

3.5MM TO 3.55 STEREO CABLE (ONE IS PROVIDED)

3.5MM TO RCA CABLE

HIGH CURRENT WIRING ASSEMBLY

The high current section on the board allows for higher current devices to be controlled by the Scary Terry Audio Servo Driver board. This connection allows devices such as small lamps, relays, and solenoids for air and water to be controlled in sync with the audio, just like the LED Audio Eyes. These devices will turn on and off in sync with the “LVL LED”.

# Specifications

## Relay (K1)

Contact form: SPDT (1 Form C)

Switching voltage: 277VAC, 30VDC – Max

Contact current rating: 5A

## Relay connection terminals (P7)

Contact voltage: 300V Max

Contact current: 2A Max

Wire gauge: 20-26 AWG

## Trigger connection terminals (P8)

Contact voltage: 300V Max

Contact current: 2A Max

Wire gauge: 20-26 AWG

For reference: a 100W flood light draws .83A at 120VAC.

## Power Jack (J1)

Power Barrel Connector Jack 2.10mm ID (0.083"), 5.50mm OD (0.217")

## Speaker Out Jack (P9)

Maximum output from the module is 3W. Use the line out jack and an external amplifier if more amplification is needed.

## Audio Module

MP3 Audio Format

- Supports 11172-3 and ISO13813-3 layer3 audio decoding.
- Supports sampling rate (KHZ):8/11.025/12/16/22.05/24/32/44.1/48.
- Supports MP3 and WAV decoding.
- Supports FAT16 and FAT32 file system.
- 24-bit DAC output and supports dynamic range 90dB and SNR 85dB.
- Supports maximum 32GB micro SD.
- Supports maximum 3000 audio files under the root directory of the storage device.
- Supports maximum 99 folders, and each folder can stores 255 audio files.
- Built-in a 3 watts amplifier that can direct drive a 3 watts speaker.
- 30 levels adjustable volume.

Special Thanks to Scary Terry (Terry Simmons) for letting us use his original design for the development this product!

We hope you enjoy it!



Computer & Electronic Services  
Cowlacious Designs  
420 Rawl Rd  
Lexington, SC 29072  
775-741-1086  
[www.cowlacious.com](http://www.cowlacious.com)