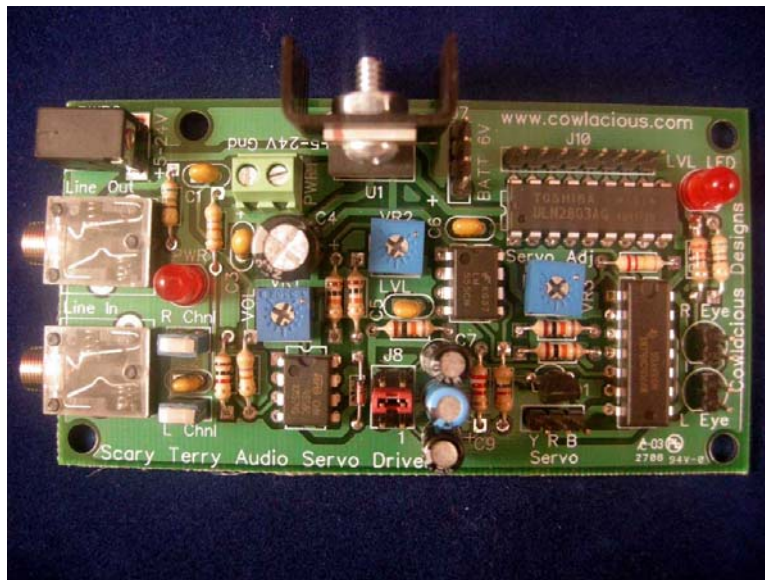


Scary Terry's Audio Servo Driver™ Kit

ST-200 Circuit Board



Cowlacious Designs™
By Computer & Electronic Services

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Introduction:

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!

Scary Terry describes the circuit as follows:

“My goal in creating this was for a simple, inexpensive and reliable circuit that doesn't require programming a microcontroller for each individual movement. I've used several of these circuits over the last couple of Halloween's to drive Bucky (skeleton skull) and other animatronic heads, and they worked all night long without fail.”

“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:

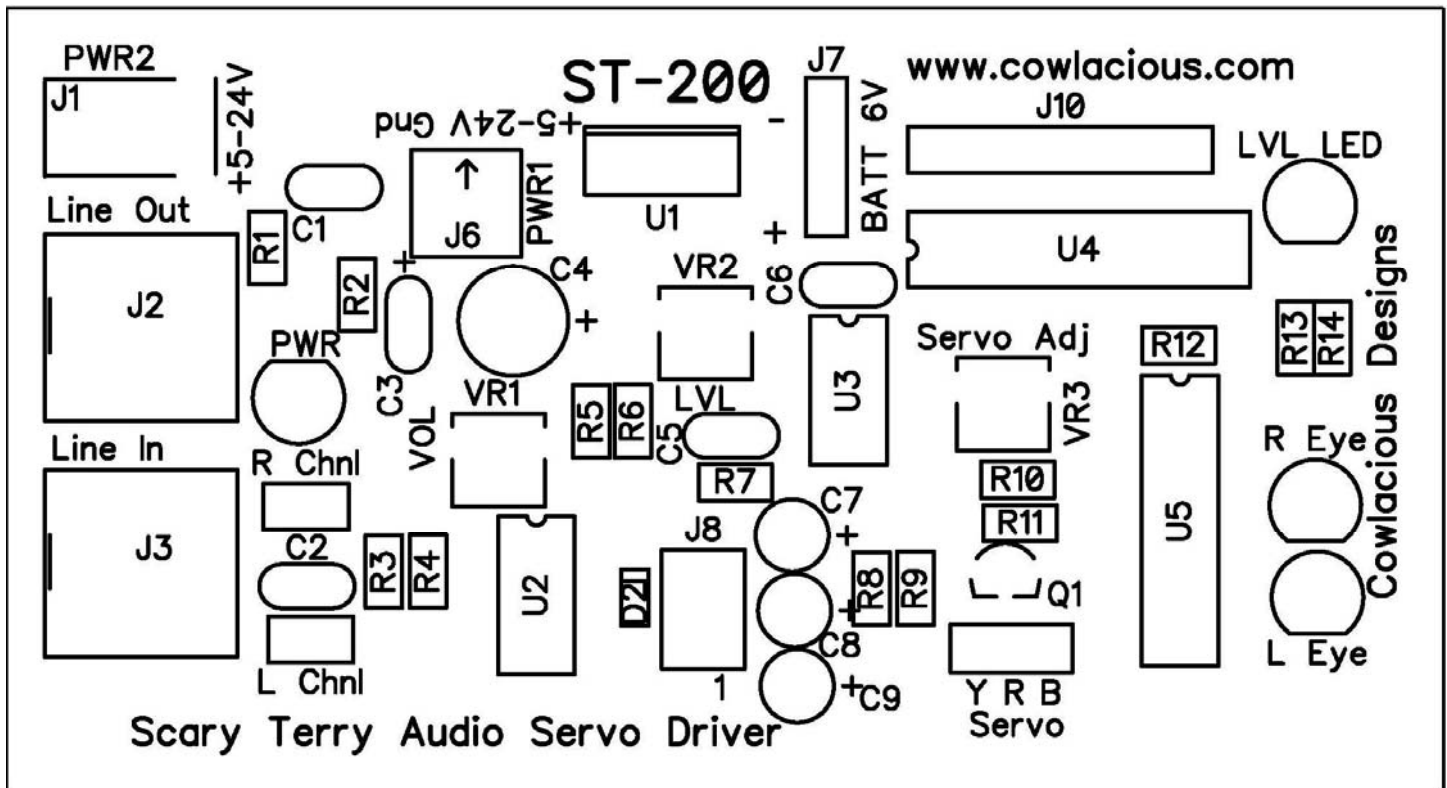
<http://www.scary-terry.com/>

Parts list for Scary Terry's Audio Servo Driver

Count	Label-Value	Designation(s)
1	Scary Terry Circuit Board	ST-200
1	680Ω Resistor (blue, grey, brown, gold)	R1, R14
2	47K Resistor (yellow, violet, orange, gold)	R2, R4
1	1KΩ Resistor (brown, black, red, yellow)	R3
5	10KΩ Resistor (brown, black, orange, gold)	R5, R6, R7, R10, R11
1	2.2KΩ Resistor (red, red, red, gold)	R8
1	4.7KΩ Resistor (yellow, violet, red, gold)	R9
1	220KΩ Resistor (red, red, yellow, gold)	R12
1	330Ω Resistor (orange, orange, brown, gold)	R13
1	1N914 or 1N4148 switching diode	D2
1	1458 or 4558 op amp I.C.	U2
1	555 timer I.C.	U3
1	ULN2803 I.C.	U4
1	74HC4066 I.C.	U5
1	5KΩ Variable Resistor (502)	VR1
1	1KΩ Variable Resistor (102)	VR2
1	50KΩ Variable Resistor (503)	VR3
2	1/8" (3.5mm) Stereo Jack	J2, J3
4	0.1uF disc capacitor	C1,C2,C5,C6
1	.47 tantalum capacitor	C3

1	2N4401 transistor	Q1
2	Red LED	PWR (D1), LVL LED (D3)
2	2 Pin Header	R Eye (D4), L Eye (D5)
1	3 Pin Header	Servo (J9)
1	4 Pin Header	J7 (Batt 6V)
1	8 Pin Header	J10
1	6 Pin Double Row Header	J8
2	Header switch (Blue w/ white push/pull switch)	J4, J5
1	Power Terminal Block (Green)	J6
1	470uF electrolytic capacitor	C4
1	2.2uF electrolytic capacitor	C7
1	4.7uF electrolytic capacitor	C8
1	10uF electrolytic capacitor	C9
1	Barrel power supply connector	J1
1	LM2940CT-5.0 Voltage Reg.	U1
1	Heatsink TO-220 case style	Heat Sink
1	#6 screw, 1/2"	Screw
1	#6 nut	Nut
1	Red Shorting Cap	J8
2	LED Cable (for eyes)	R Eye, L Eye
2	LED, Clear Ultrabright Red	R Eye, L Eye
1	Battery Holder 4x1.5VDC AA	Battery Holder

Construction



- Remove the components from the packaging and check to make sure that all of the parts are there.
- Look at the circuit board and identify the component side of the board. This is the side with the white silk screen for the components. The outlines for the components are marked D1, U1, U2, etc. This is the side of the board that parts will be placed on. **DO NOT SOLDER ON THIS SIDE OF THE BOARD.** Solder parts in place by soldering the leads on the opposite side of the board.
- Install resistors R1, R14, R2, and R4. Solder them in place and trim the leads.
- Install resistors R3, R5, R6, R7, and R10, R11. Solder them in place and trim the leads.
- Install resistors R8, R9, R12, and R13. Solder them in place and trim the leads.
- Install diode D2. Make sure the band on the diode matches the band on the circuit board. Solder it in place and trim the leads.
- Install the chip I.C.'s: U2 (RC4458 or LM1458), U3 (555), U4 (ULN2803), and U5 (74HC4066). **Make sure the notches on the chip**

are facing the same way as shown on the silkscreen of the circuit board. Solder in place. Note: If you find it easier, place and solder one chip at a time.

- Install the variable resistors VR1, VR2 and VR3. VR1 has 502 written on its side. VR2 has 102 written on its side. VR3 has 503 written on its side. Solder them in place and trim excess leads.
- Install J2 and J3, the stereo 3.5mm audio “Line In” and “Line Out” jacks. Solder in place.
- Install the 0.1uF ceramic disc capacitors C1, C2, C5, and C6. Solder in place and trim the leads.
- Install the 0.47uF tantalum capacitor C3. Make sure to observe the polarity of this capacitor. When looking at the writing stamped on the capacitor, the positive lead is on the right. Solder in place and trim the leads.
- Install Transistor Q1, orienting it in the position shown by the silkscreen on the circuit board. Solder in place and trim the leads.
- Install the LED “PWR” orienting the LED as shown on the silkscreen of the circuit board. The short lead should be towards the letters “PWR” with the PWR LED.
- Install the LED “LVL LED” orienting the LED as shown on the silkscreen of the circuit board. The short lead of the LVL LED should be towards R13 and R14.
- Install a 2-pin header in the “R Eye” location. Solder in place.
- Install a 2-pin header in the “L Eye” location. Solder in place.
- Install a 3-pin header in the “Servo” location. Solder in place.
- Install a 4-pin header in the J7 (“Batt 6V”) location. Solder in place.
- Install a 8-pin header in the J10 location. Solder in place.
- Install a 6-pin dual row header in the J8 location. Solder in place.
- Install the blue header switch in the J4 location. Solder in place.
- Install the other blue header switch in the J5 location. Solder in place.
- Install the green “PWR1” terminal block in location J6. Solder in place.

- Install electrolytic capacitors C4 (470uF), C7 (2.2uF), C8 (4.7uF), and C9 (10uF). Solder in place and trim the leads. **Make sure to orient the capacitors positive and negative leads correctly. The negative side is marked with an arrow down the side of the capacitor. The positive side is marked on the circuit board.**
- Install the LM2940CT-5.0 voltage regulator into location U1. Solder in place and trim the leads. Note: The backside of the LM2940CT should be facing the “ST-200” text on the board.
- Install the heat sink onto the U1 voltage regulator using the #6 screw and nut. The fins of the heatsink should face away from the circuit board.
- Install a red shorting cap onto the middle pins of J8 to select the 4.7uF capacitor.
- Carefully check your soldering job to make sure all the connections are soldered and to make sure that no solder bridges have occurred that would connect items that shouldn't be connected.
- Congratulations, it is now time to test and adjust the circuit.

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 battery pack to the four pin “Batt 6V” header or a 5-24VDC power supply to “PWR1” or “PWR2” connector. **Only use one of the power supply connections.** There are three of them to provide you with the greatest versatility in powering the circuit. A 24VDC supply may require a larger heatsink to be put on the voltage regulator depending on the operating time of the servo.
- You should see the “PWR” LED light up as soon as power is applied.
- Adjust the threshold level, “LVL” (VR2), clockwise until the “LVL LED” just turns off and then stop the adjustment. If the “LVL LED is already off, the turn VR2 counter clockwise until the “LVL LED turns on and then rotate VR2 clockwise until the “LVL LED” turns off and then stop the adjustment. This control is used to adjust how loud the sound needs to be before the servo will start to move. If it is set too low the servo will remain at its maximum position too much of the time. If it is set too high the servo will not respond to the sound at all or not as much as desired.
- Adjust the “Servo Adj” (VR3) pot so that the servo moves just a little ways from its 0% starting position. This control is used to set the starting position of servo. If you are using it with one of our skulls, it sets the starting position of the jaw bone (i.e. whether the teeth are clenched tightly or slightly apart before sound is applied).
- Feed audio to the circuit through the 3.5mm stereo “Line In” jack. If you want both channels of sound to control the ST-200 then make sure that the white caps of the switches on “R Chnl” and “L Chnl” are both pushed down. If you want only the right channel to control the ST-200 then gently pull up on the white cap of the “L Chnl” switch. If you want

only the left channel to control the ST-200 then make sure the white cap of the “L Chnl” is pushed down and then gently pull up on the “R Chnl” white switch cap.

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” (VR1) 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 “VOL” (VR1) is adjusted to an appropriate audio level.

If you want the audio level up at a higher level for the output side of things, adjust the audio level to its desired position then adjust the “LVL” (VR2) until you get the response you want.

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 J6 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 up two pins it will use a 2.2uF capacitor, speeding the reaction time up a little. If you move the jumper to the down two pins it will be using a 10uF capacitor which will slow the reaction time down a little.

High Current Section (J10)

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 8 channels is capable of sinking 500mA 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.

Please see the connection diagram for using the high current section of the Scary Terry circuit board.

SUPPLIED OPTIONAL DEVICES

LED AUDIO EYES

The Scary Terry board is also provided with two two-pin headers for LED Audio Eyes. Our LED Audio Eyes can simply be plugged onto these connectors. These eyes will flash with the sound just like the “LVL LED” on the circuit board flashes to the sound. When attaching our LED Audio Eyes, make sure the black wires face toward the flat side of the LED symbol on the circuit board. 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 heatshrink tubing to hold the LED in its socket.

OPTIONS AVAILABLE FOR PURCHASE

Please see our web site at www.cowlacious.com

9VDC, 500MA, WALL TRANSFORMER THAT PLUGS INTO THE “PWR2” JACK.

HITECH 425BB SERVO

COMPUTER SPEAKERS

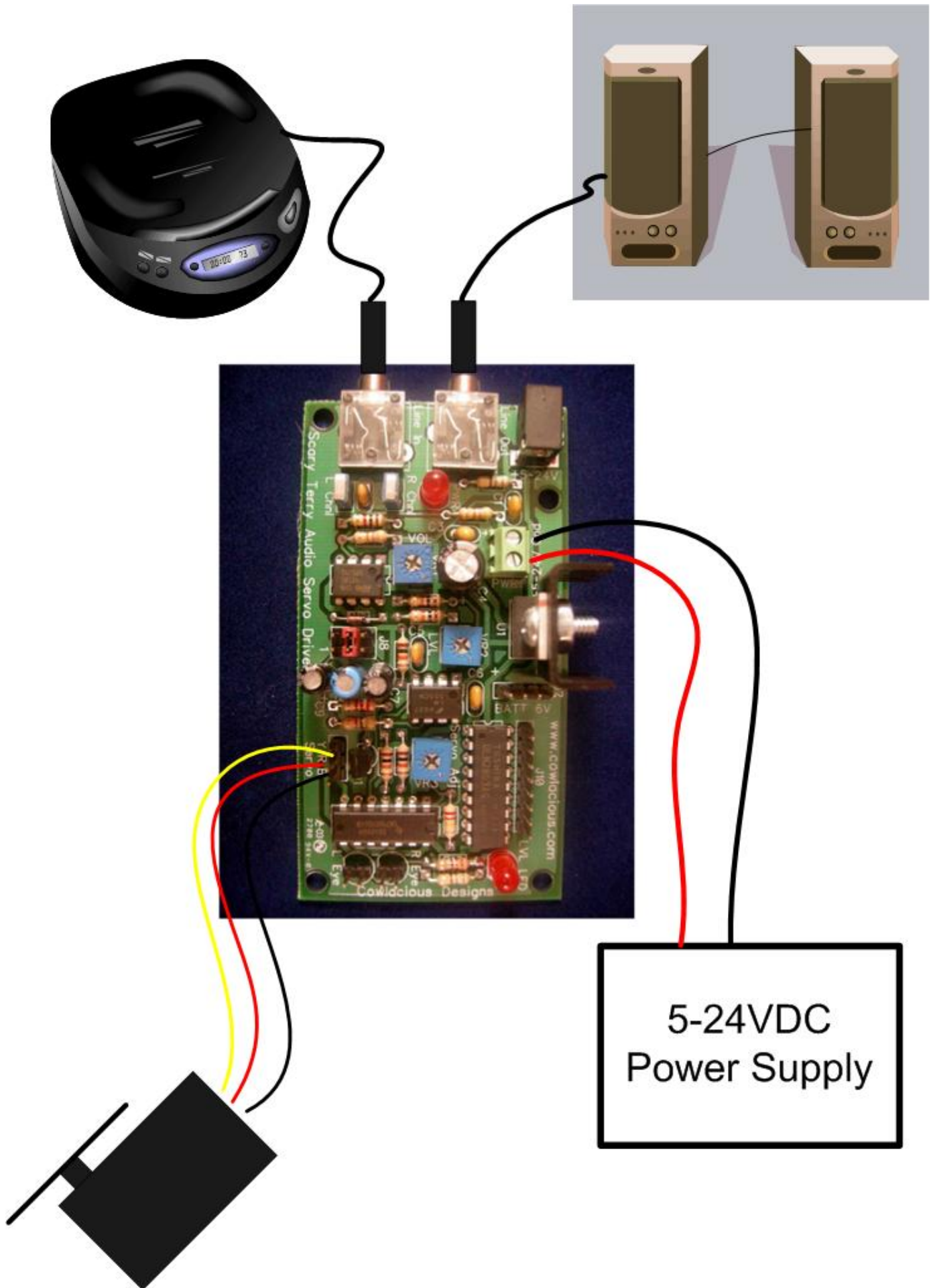
3.5MM TO 3.55 STEREO CABLE (ONE IS PROVIDED)

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”.

The Wiring Assembly provides a eight pin connector with 6” wires for making connections to the circuit board header (J10) easier.



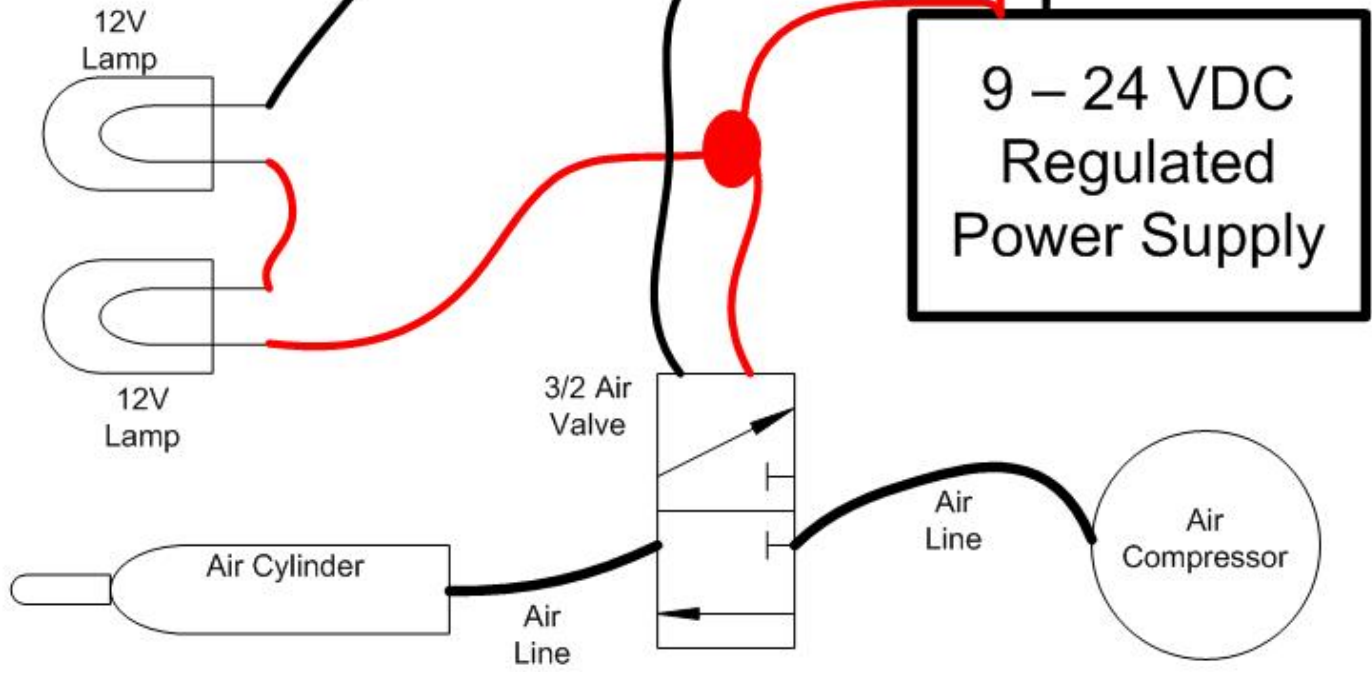
Connection Example for High Current Circuit

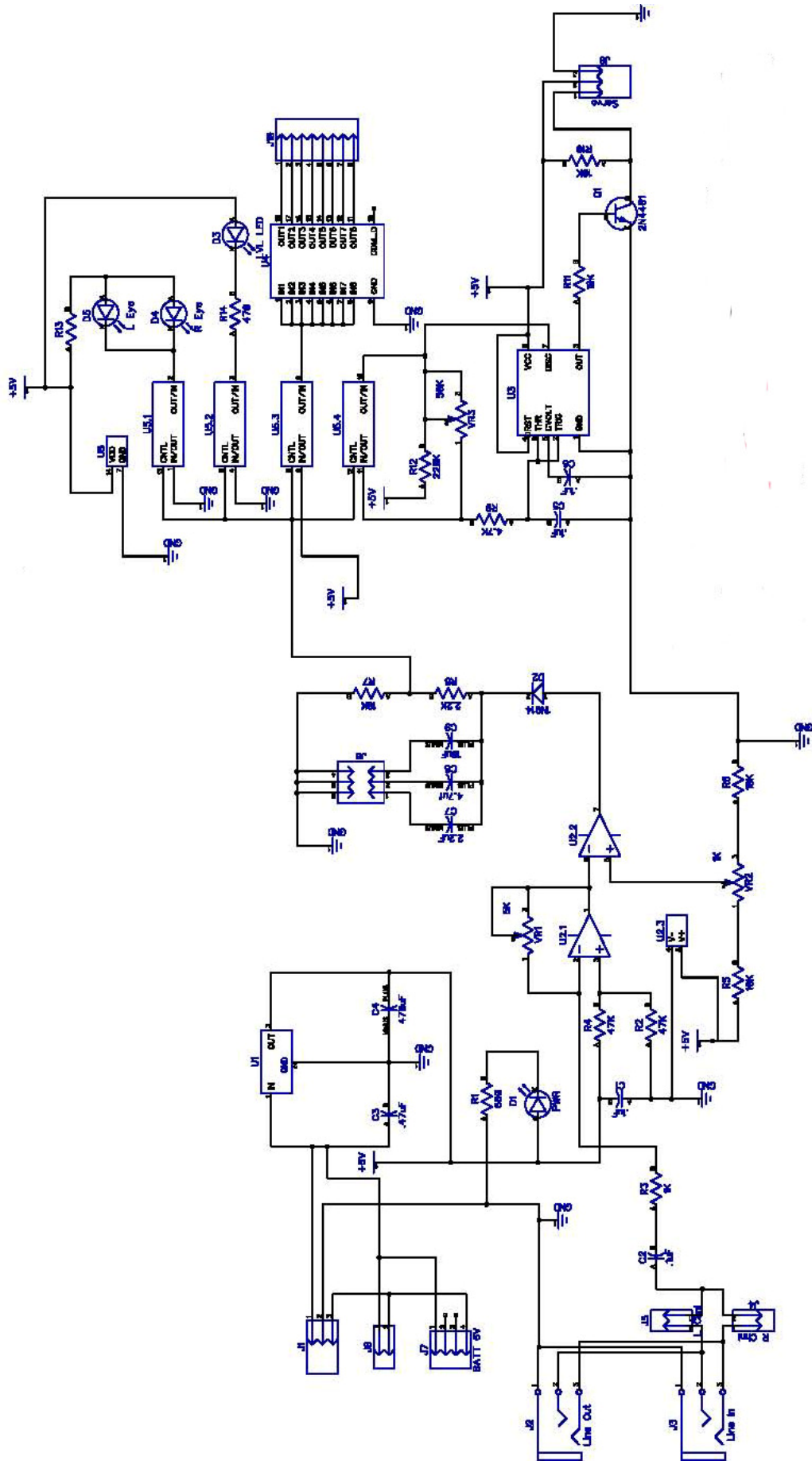
This circuit uses the Scary Terry Audio Servo Driver to drive two 12 VDC lamps and an air solenoid in sync with sound (the sound connections are not shown).



The high current circuit uses a ULN2803 driver chip that allows the user to sink as much as 500mA per channel. There are eight channels available with built in protection diodes for loads such as relays, solenoids, etc.

This could be used with a large prop that needs eyes bigger than LED's and needs an air ram to move a jaw that is too large for a servo to handle.





NOTES

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

We hope you enjoy it!



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