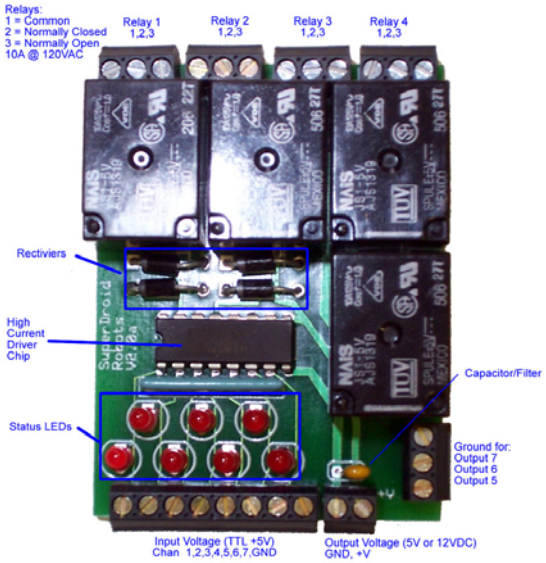

TTL High Current Drivers and RC Switches

Revision Date: February 20, 2007

TTL High Current Driver and RC Switches Assembly Instructions

TTL logic outputs from the OOPic or basic stamp, PIC, etc do not have the capacity to drive much more than an LED. These boards allow you to easily drive higher current devices. It will drive up to 50V and 2 watts of power (1 watt per channel, but the channels can be paralleled for over 1 watt). The circuit can handle about 500mA continuously. The circuit also has inductive load transient suppression, which occurs when driving such things as coils on relays.

SuperDroid Robots has four types of TTL High Current Drivers. They all have seven channels of input and output. Some versions have status LEDs, which will light with the TTL (+5VDC) logic input. The driver boards with relays are rated at 10A@120VAC per relay. An external power source must be plugged into the board that drives the loads. If you use the relays, then the supply needs to be either 5VDC or 12VDC otherwise the supply needs to be between 5-50VDC. The 5VDC coils will draw about 60mA each. The 12VDC coils will draw about 37mA each.

An extension of the TTL High Current Driver is the RC Switches, which use the same relays and drivers only they are driven by a standard hobby RC signal.

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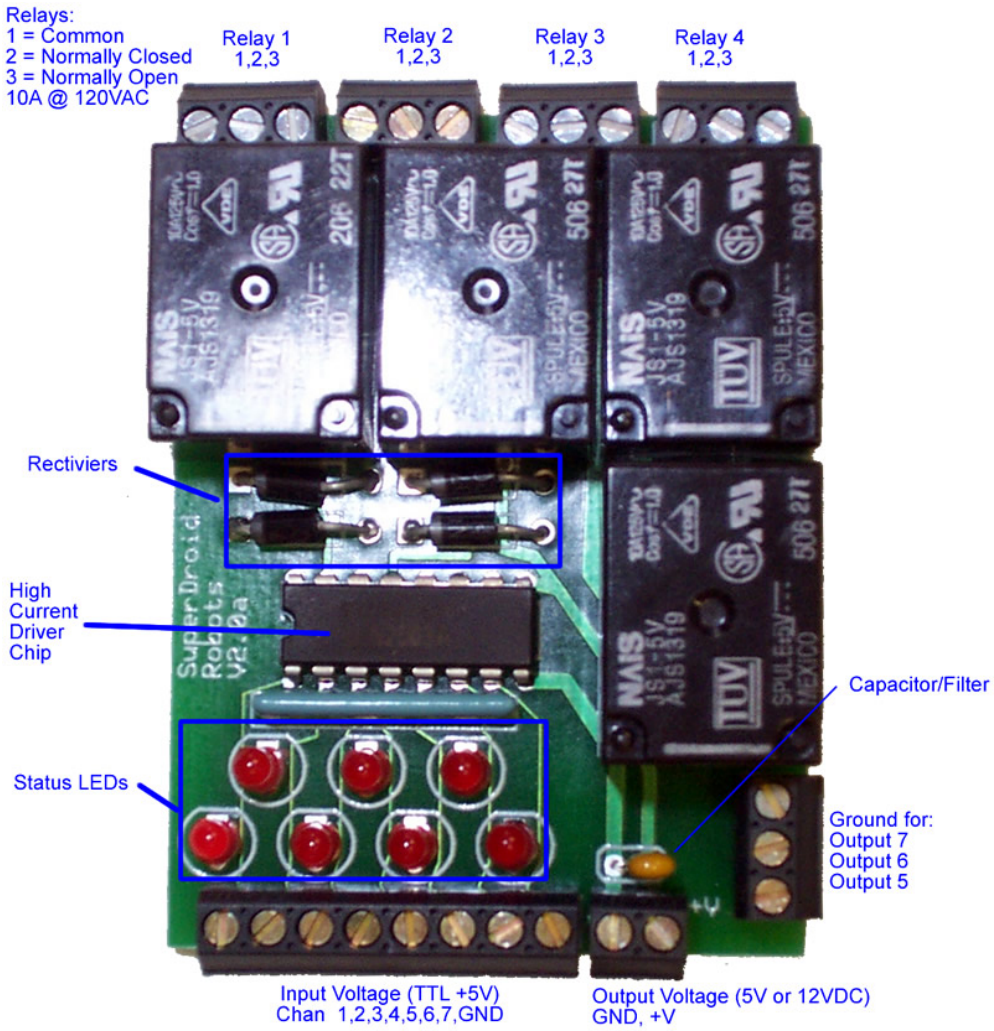

Figure 1: TTL High Current Driver with 4 Power Relays

1. Start by laying the board out in front of you. The Label should be on the middle left topside. Refer to Figure 1.
2. Insert all the LEDs as shown in Figure 1 in a staggered location. The long leg of the LED should be towards the TTL Input edge of the board (they will not work if put in the other way).

   Please Note: If you use the LEDs, the supplied voltage to the output will be about 10% less than the Input voltage since it drops some voltage to ground to light the LEDs. (If you put 12V as the input voltage, you will only get about 11 volts on the output

pins.) Both the 12V and 5V relays will still pull in fine at this slightly reduced voltage. If the voltage drop is an issue either increase the output voltage supply or don't use the LEDs.

3. Insert the resistor network as shown in Figure 1. The orientation of the resistor is important. There is a black dot on the resistor net; it should go into the square pad hole.
4. Insert the Diodes. Orientation of the Diodes is important. It will short the circuit if put in the wrong way. The lead that comes out of the side of the diode with a line on it should go in the square pad hole (face towards the left edge of the board as shown in Figure 1).
5. Insert the capacitor as shown in Figure 1. Orientation is not important.
6. Install the Screw Terminals (if provided) as shown in Figure 1.
7. Insert the relays as shown in Figure 1. All the relays should be placed in their locations at the same time before soldering. Push the relays down so they are all flat and start soldering the terminals, checking to make sure the relays stay flat.
8. Insert the high current driver IC. The orientation is important. The chip will be shorted and will not work if put in wrong. Pin one goes in the square pad hole such that the notch on the chip is closest to the label on the board. Refer to Figure 1.
9. Attach either 12VDC or 5VDC to the Output Voltage using the polarity shown in Figure 1. Turn on the power, no sparks or smoke should appear at this time.
10. Attach your TTL lines from a PIC/+5VDC signal to the Input locations. If you want 1 TTL signal to dive multiple channels, just install jumpers between the inputs.
11. Attach the Ground for the PIC/+5VDC signal to the input voltage Ground location.
12. Send TTL signals (+5V). The LED should light and the Relays will pull in if you are hooked to channels 1-4. Channels 5-7 will measure ~90% of the output voltage between the grounded output channel to the +VDC for the output voltage supply.

Assembly of the 2 Relay board:

1. Start by laying the board out in front of you. The Label should be on the bottom right topside. Refer to Figure 2.

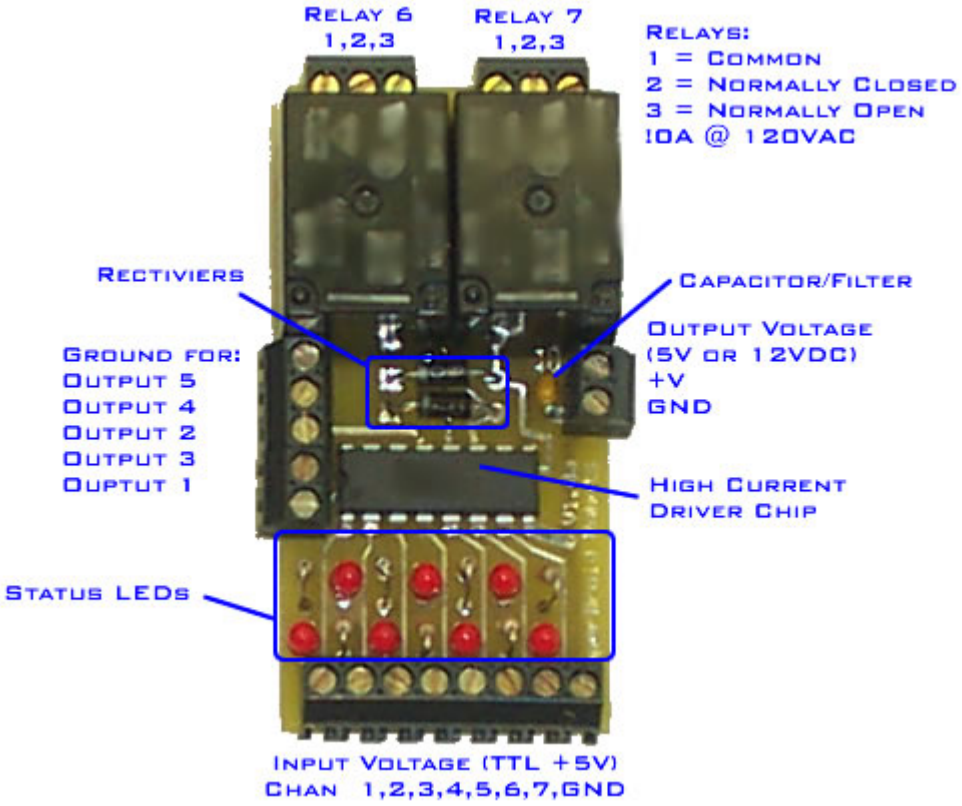

Figure 2: TTL High Current Driver with 2 Power Relays

2. Insert all the LEDs as shown in Figure 2 in a staggered location. The long leg of the LED should be towards the TTL Input edge of the board (they will not work if put in the other way).

   Please Note: If you use the LEDs, the supplied voltage to the output will be about 10% less than the Input voltage since it drops some voltage to ground to light the LEDs. (If you put 12V as the input voltage, you will only get about 11 volts on the output pins.) Both the 12V and 5V relays will still pull in fine at this slightly reduced voltage. If the voltage drop is an issue either increase the output voltage supply or don't use the LEDs.

3. Insert all the resistors as shown in Figure 2. The orientation of the resistor is not important.

4. Insert the Diodes. Orientation of the Diodes is important. It will short the circuit if put in the wrong way. The lead that comes out of the side of the diode with a line on it should go in the square pad hole (face towards the left edge of the board as shown in Figure 2).
5. Insert the capacitor as shown in Figure 2. Orientation is not important.
6. Install the Screw Terminals (if provided) as shown in Figure 2.
7. Insert the Relays as shown in Figure 2. All the relays should be placed in their locations at the same time before soldering. Push the relays down so they are all flat and start soldering the terminals, checking to make sure the relays stay flat.
8. Insert the high current driver IC. The orientation is important. The chip will be shorted and will not work if put in wrong. Pin one goes in the square pad hole such that the notch on the chip is closest to the label on the board. Refer to Figure 2.
9. Attach either 12VDC or 5VDC to the Output Voltage using the polarity shown in Figure 2. Turn on the power, no sparks or smoke should appear at this time.
10. Attach your TTL lines from a PIC/+5VDC signal to the Input locations. If you want 1 TTL signal to dive multiple channels, just install jumpers between the inputs.
11. Attach the Ground for the PIC/+5VDC signal to the input voltage Ground location.
12. Send TTL signals (+5V). The LED should light and the Relays will pull in if you are hooked to channels 6&7. Channels 1-5 will measure ~90% of the output voltage between the grounded output channel to the +V for the output voltage supply.

Assembly of the 1 Relay board:

1. Start by laying the board out in front of you. The Label should be on the bottom middle topside. Refer to Figure 3.

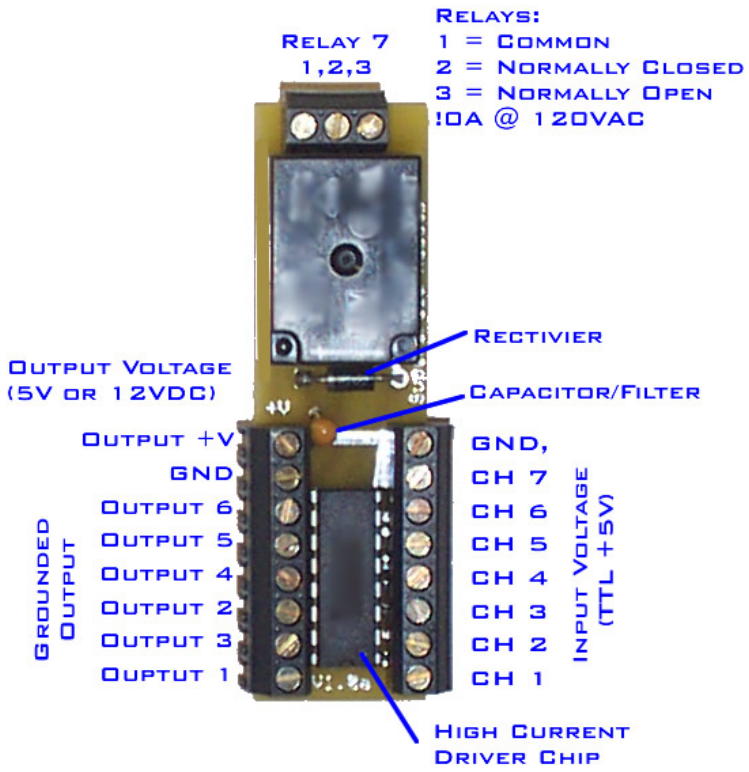

Figure 3: TTL High Current Driver with 1 Power Relay

2. Insert the Diode. Orientation of the Diode is important. It will short the circuit if put in the wrong way. The lead that comes out of the side of the diode with a line on it should go in the square pad hole (face towards the left edge of the board as shown in Figure 3).
3. Insert the capacitor as shown in Figure 3. Orientation is not important.
4. Install the Screw Terminals (if provided) as shown in Figure 3.
5. Insert the Relay as shown in Figure 3. Push the relay down so it's all flat and start soldering the terminals, checking to make sure the relay stay flat.

6. Insert the high current driver IC. The orientation is important. The chip will be shorted and will not work if put in wrong. Pin one goes in the square pad hole such that the notch on the chip is closest to the label on the board. Refer to Figure 3.
7. Attach either 12VDC or 5VDC to the Output Voltage using the polarity shown in Figure 3. Turn on the power, no sparks or smoke should appear at this time.
8. Attach your TTL lines from a PIC/+5VDC signal to the Input locations. If you want 1 TTL signal to dive multiple channels, just install jumpers between the inputs.
9. Attach the Ground for the PIC/+5VDC signal to the input voltage Ground location.
10. Send TTL signals (+5V). The Relay will pull in if you are hooked to channel 7. Channels 1-6 will measure ~90% of the output voltage between the grounded output channel to the +V for the output voltage supply.

Assembly of TTL Driver with Status LEDs:

1. Start by laying the board out in front of you. The Label should be on the bottom right topside. Refer to Figure 4.

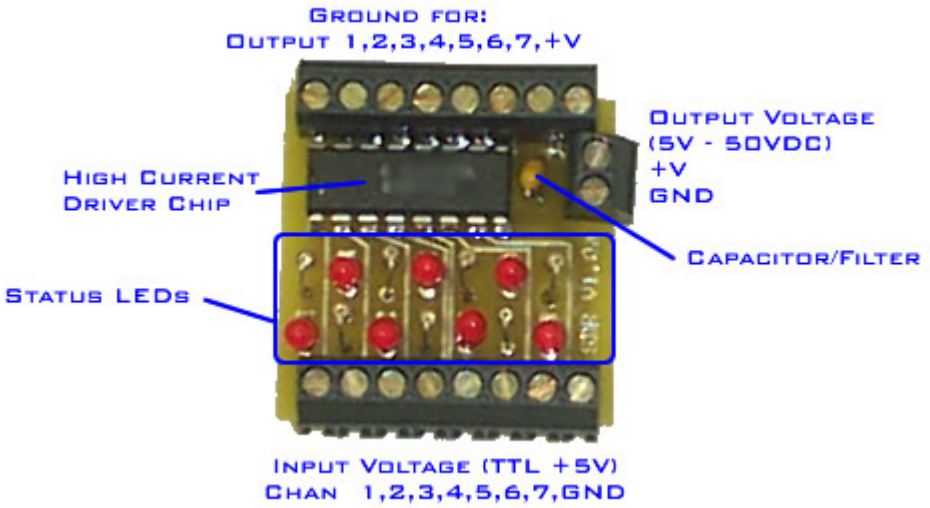

Figure 4: TTL High Current Driver with Status LEDs

2. Insert all the LEDs as shown in Figure 4 in a staggered location. The long leg of the LED should be towards the TTL Input edge of the board (they will not work if put in the other way).

   Please Note: If you use the LEDs, the supplied voltage to the output will be about 10% less than the Input voltage since it drops some voltage to ground to light the LEDs. (If you put 12V as the input voltage, you will only get about 11 volts on the output pins.) If the voltage drop is an issue either increase the output voltage supply or don't use the LEDs.

3. Insert all the resistors as shown in Figure 4. The orientation of the resistor is not important.
4. Insert the capacitor as shown in Figure 4. Orientation is not important.
5. Install the Screw Terminals (if provided) as shown in Figure 4.
6. Insert the high current driver IC. The orientation is important. The chip will be shorted and will not work if put in wrong. Pin one goes in the square pad hole such that the notch on the chip is closest to the label on the board. Refer to Figure 4.
7. Attach 5-50VDC to the Output Voltage using the polarity shown in Figure 4. Turn on the power, no sparks or smoke should appear at this time.

8. Attach your TTL lines from a PIC/+5VDC signal to the Input locations. If you want 1 TTL signal to dive multiple channels, just install jumpers between the inputs.
9. Attach the Ground for the PIC/+5VDC signal to the input voltage Ground location.
10. Send TTL signals (+5V). The LED should light and channels 1-7 will measure ~90% of the output voltage between the grounded output channel to the +V for the output voltage supply.

Assembly of TTL Driver without Status LEDs:

1. Start by laying the board out in front of you. The Label should be on the bottom right topside. Refer to Figure 5.

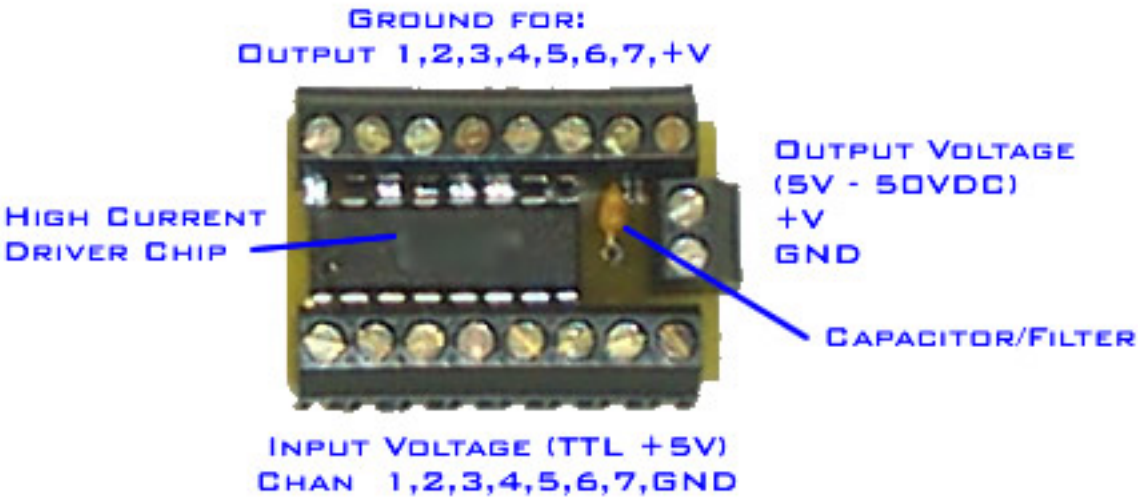

Figure 5: TTL High Current Driver without LEDs

2. Insert the capacitor as shown in Figure 5. Orientation is not important.
3. Install the Screw Terminals (if provided) as shown in Figure 5.
4. Insert the high current driver IC. The orientation is important. The chip will be shorted and will not work if put in wrong. Pin one goes in the square pad hole such that the notch on the chip is closest to the label on the board. Refer to Figure 5.
5. Attach 5-50VDC to the Output Voltage using the polarity shown in Figure 5. Turn on the power, no sparks or smoke should appear at this time.
6. Attach your TTL lines from a PIC/+5VDC signal to the Input locations. If you want 5 TTL signal to dive multiple channels, just install jumpers between the inputs.
7. Attach the Ground for the PIC/+5VDC signal to the input voltage Ground location.
8. Send TTL signals (+5V). The LED should light and channels 1-7 will measure ~90% of the output voltage between the grounded output channel to the +V for the output voltage supply.

Assembly of the DPDT and SPDT Reversing Relay board:

1. Start by laying the board out in front of you. The Label should be on the left topside. Refer to Figure 8.

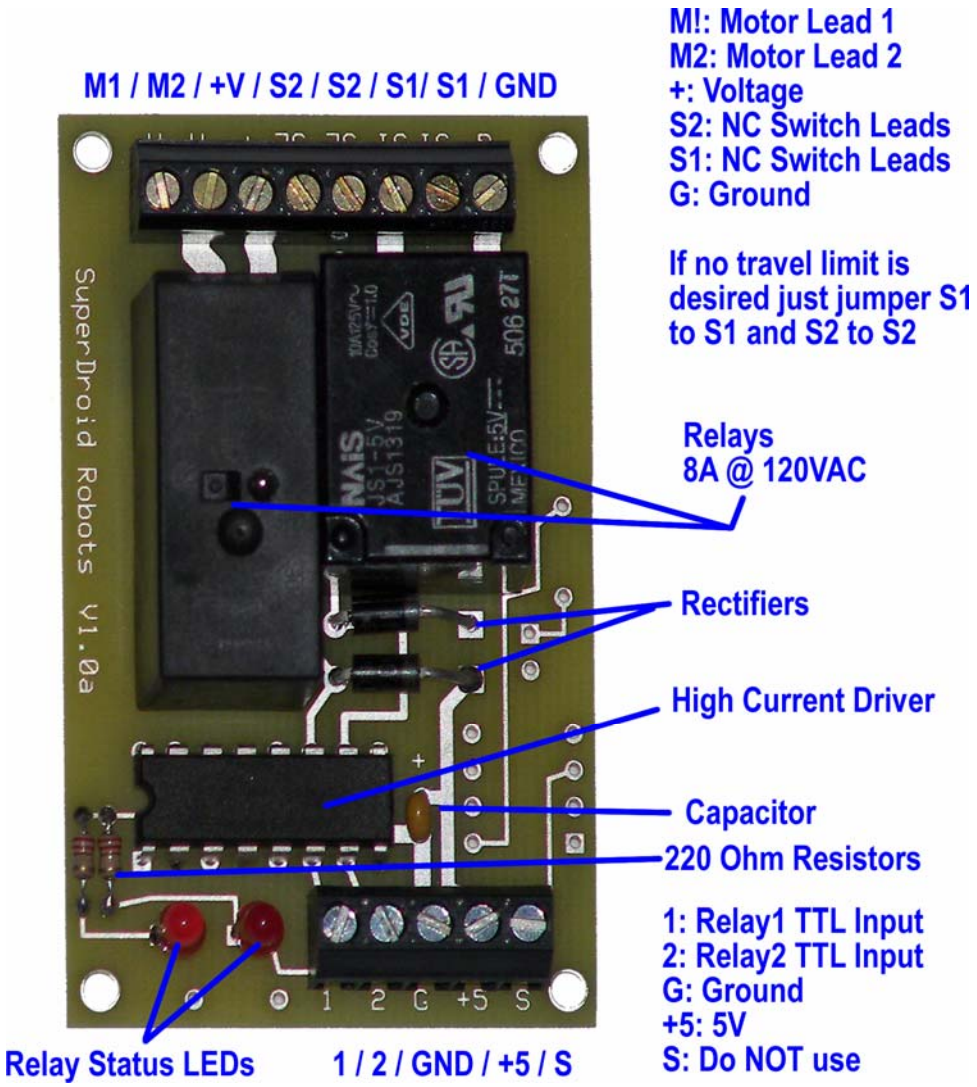

Figure 6: TTL High Current Driver with DPDT and SPDT Relay

1. Insert all the LEDs as shown in Figure 6. The short leg of the LED should go into the square pad. (they will not work if put in the other way).

2. Insert all the resistors as shown in Figure 6. Use an ohm meter or refer to the color banding to determine the values of the resistors. The orientation of the resistor is not important.
3. Insert the Rectifiers. Orientation of the rectifier is important. It will short the circuit if put in the wrong way. The lead that comes out of the side of the rectifier with a line on it should go in the square pad hole.
4. Insert the capacitor as shown in Figure 6. Orientation is not important.
5. Install the Screw Terminals (if provided) as shown in Figure 6.
6. Insert the Relays as shown in Figure 6.
7. Insert the high current driver IC. The orientation is important. The chip will be shorted and will not work if put in wrong. Pin one goes in the square pad hole such that the notch on the chip is closest to the label on the board. Refer to Figure 6.
8. Attach 5VDC to the board using the polarity shown in Figure 6. Turn on the power, no sparks or smoke should appear at this time.
9. Attach your TTL lines from a PIC/+5VDC signal to the Input locations. If you want 1 TTL signal to dive multiple channels, just install jumpers between the inputs.
10. Attach the Ground for the PIC/+5VDC signal to the input voltage Ground location.
11. Send TTL signals (+5V). The LED should light and the Relays will pull in. The SPDT relay (Input 2) pulls in the power, the DPDT relay (Input 1) reverses the load. Pulling in only the DPDT relay will have no effect. The limits must be made up to complete the circuit. Start by jumpering the limit S1 to S1 and S2 to S2, then as the load is driving remove the jumpers to determine which one switches which direction. Each switch will only disconnect power in one direction; the other direction will work until that switch is opened.

Assembly of the SPDT RC Switch Relay Board:

1. Start by laying the board out in front of you. The Label should be on the left topside. Refer to Figure 7.

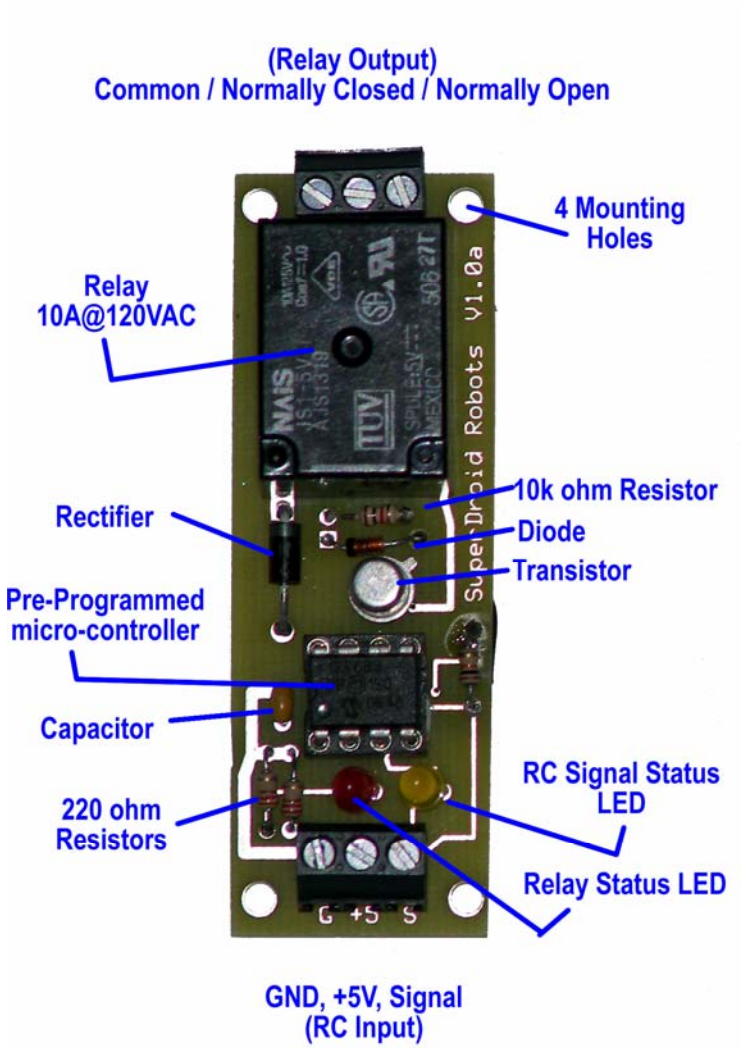

Figure 7: SPDT RC Switch Relay Board

2. Insert all the LEDs as shown in Figure 7. The short leg of the LED should go into the square pad. (they will not work if put in the other way).

3. Insert all the resistors as shown in Figure 7. Use an ohm meter or refer to the color banding to determine the values of the resistors. The orientation of the resistor is not important.
4. Insert the Rectifier. Orientation of the rectifier is important. It will short the circuit if put in the wrong way. The lead that comes out of the side of the rectifier with a line on it should go in the square pad hole.
5. Insert the capacitor as shown in Figure 7. Orientation is not important.
6. Insert the diode as shown in Figure 7. Orientation of the diode is important. It will short the circuit if put in the wrong way. The lead that comes out of the side of the diode with a line on it should go in the square pad hole.
7. Insert the transistor Figure 7. Orientation is important. There is a small tab on the transistor, it should be oriented as shown in Figure 7 (pointing toward the upper right).
8. Insert the 8 pin IC socket. The orientation is important. The notch should be towards the capacitor so pin one is in the square hole.
9. Install the Screw Terminals (if provided) as shown in Figure 7.
10. Insert the Relay as shown in Figure 7.
11. Insert the 8 pin preprogrammed. The orientation is important. The notch should be lined up with the notch on the previously installed IC socket. There is a dot on the IC, its pin one.
12. Attach the RC signal, ground and 5V to the board. You can power this board from the RC receiver if desired, although a regulated 5V source is best. If the RC receiver is being power from a non regulated source, such as a battery pack care must be taken. Most NiCad or NiMH will only output 4.8V, which will work fine. If using 4 alkaline batteries, your voltage will likely be above 5V, and the board will not work. This can be solved by using the supplied resistors. The resistor should be put between the supply voltage line (the red/orange line) and the 5V terminal input on the board. The list below shows the acceptable voltage ranges with and without resistors.
    - 3.2V to 5.1 V, no resistor
    - 4.5 to 4.9V, 47 ohm resistor
    - 5.9 to 6.7V, 100 ohm resistor
13. When the board is 1st powered the red and yellow LEDs will blink back and forth for about a second. If a RC signal is not present the yellow light will blink fast. If the RC signal is in neutral position the yellow light will be solid. When the RC signal is ~1/3 up or down, the red LED will light and the relay will pull in.

Assembly of the DPDT and SPDT Reversing RC Switch Relay board:

1. Start by laying the board out in front of you. The Label should be on the left topside. Refer to Figure 8.

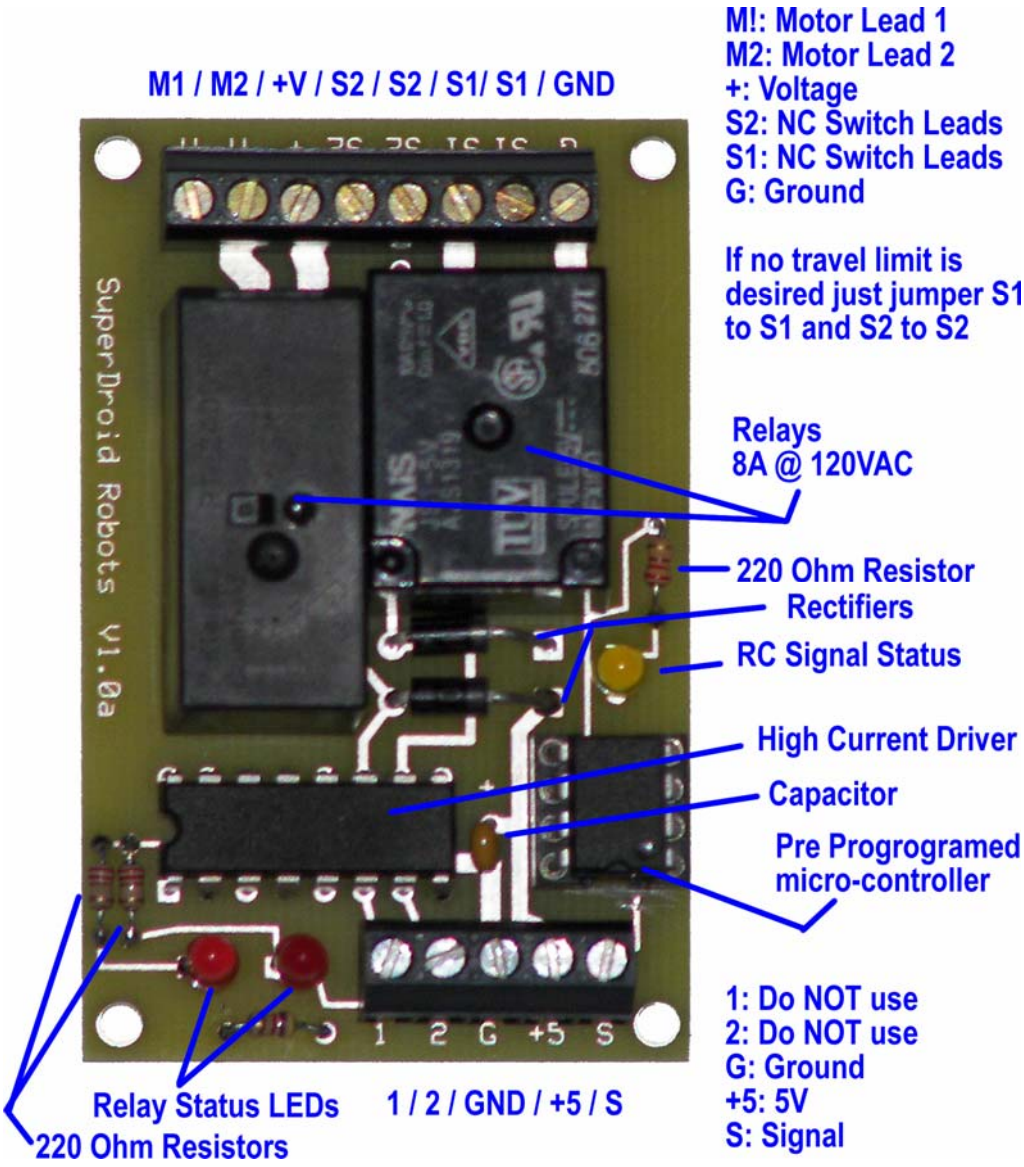

Figure 8: DPDT and SPDT RC Switch Relay Board

2. Insert all the LEDs as shown in Figure 8. The short leg of the LED should go into the square pad. (they will not work if put in the other way).

3. Insert all the resistors as shown in Figure 8. Use an ohm meter or refer to the color banding to determine the values of the resistors. The orientation of the resistor is not important.
4. Insert the Rectifiers. Orientation of the rectifier is important. It will short the circuit if put in the wrong way. The lead that comes out of the side of the rectifier with a line on it should go in the square pad hole.
5. Insert the capacitor as shown in Figure 8. Orientation is not important.
6. Insert the 8 pin IC socket. The orientation is important. The notch should be towards the bottom of the board so pin one is in the square hole. Refer to figure 8.
7. Install the Screw Terminals (if provided) as shown in Figure 8.
8. Insert the Relays as shown in Figure 8.
9. Insert the high current driver IC. The orientation is important. The chip will be shorted and will not work if put in wrong. Pin one goes in the square pad hole such that the notch on the chip is closest to the label on the board. Refer to Figure 8.
10. Insert the 8 pin preprogrammed. The orientation is important. The notch should be lined up with the notch on the previously installed IC socket. There is a dot on the IC, its pin one.
11. Attach the RC signal, ground and 5V to the board. You can power this board from the RC receiver if desired, although a regulated 5V source is best. If the RC receiver is being power from a non regulated source, such as a battery pack care must be taken. Most NiCad or NiMH will only output 4.8V, which will work fine. If using 4 alkaline batteries, your voltage will likely be above 5V, and the board will not work. This can be solved by using the supplied resistors. The resistor should be put between the supply voltage line (the red/orange line) and the 5V terminal input on the board. The list below shows the acceptable voltage ranges with and without resistors.
    - 3.2V to 5.1 V, no resistor
    - 4.5 to 4.9V, 47 ohm resistor
    - 5.9 to 6.7V, 100 ohm resistor
12. When the board is 1st powered the yellow LED will blink for about a second. If a RC signal is not present the yellow light will blink fast. If the RC signal is in neutral position the yellow light will be solid. When the RC signal is ~1/3 up or down, the either the SPDT relay will turn on (turning the load on), the opposite direction will result in both relays pulling in (reversing the load and turning it on)
13. The LED should light and the Relays will pull in as stated above. The SPDT relay (Input 2) pulls in the power, the DPDT relay (Input 1) reverses the load. Pulling in only the DPDT relay will have no effect. The limits must be made up to complete the circuit. Start by jumpering the limit S1 to S1 and S2 to S2, then as the load is driving remove the jumpers to determine which

one switches which direction. Each switch will only disconnect power in one direction; the other direction will work until that switch is opened.