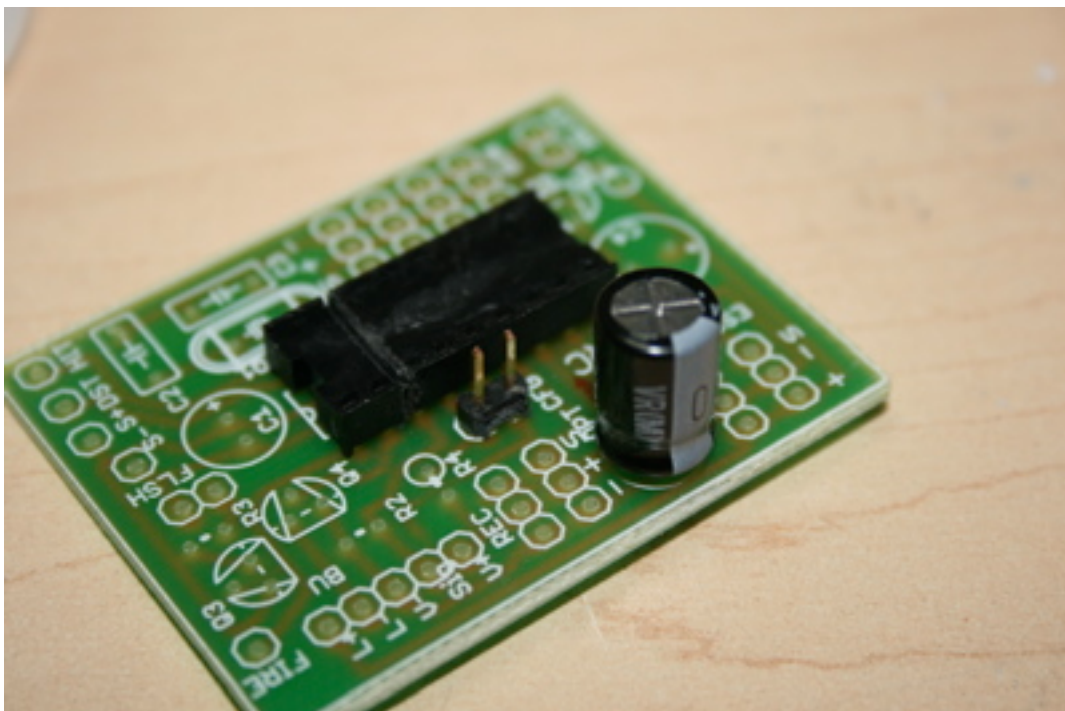
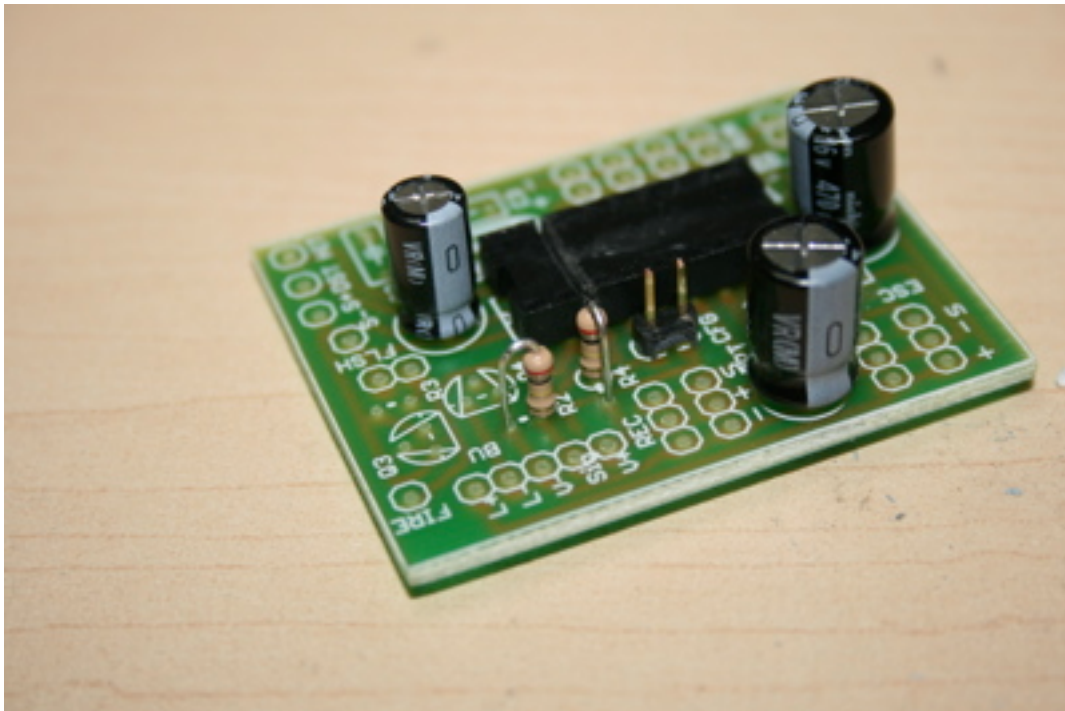


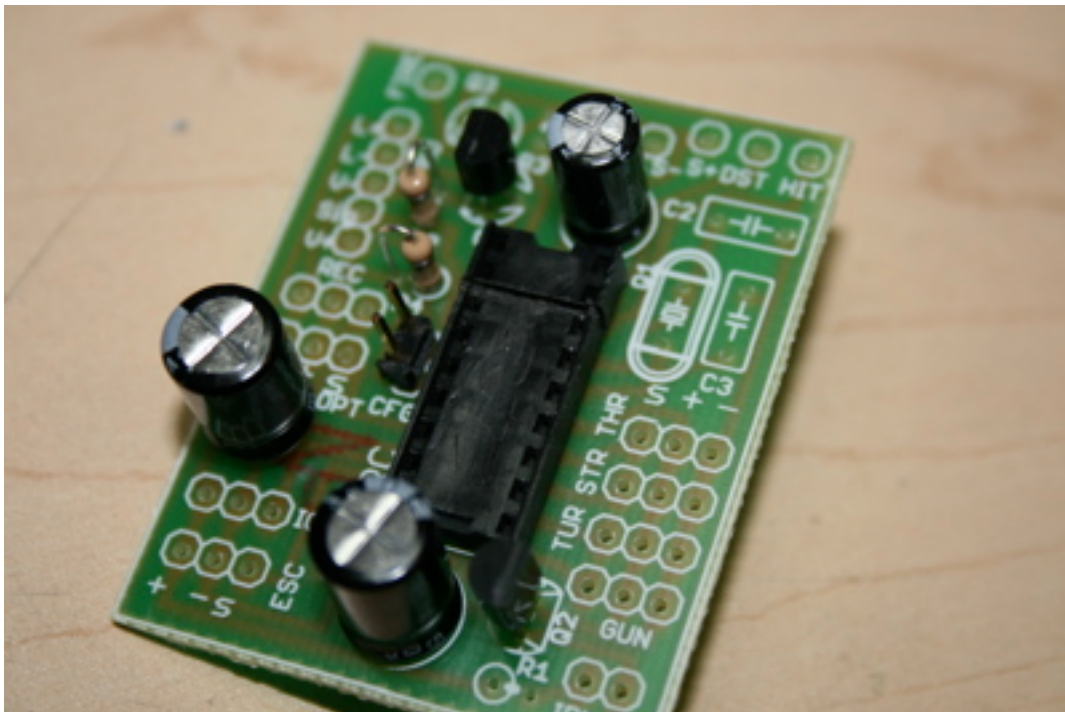
Solder the 18 pin socket onto the PCB. Make sure you line up the full notch with the small “D” shape marker on the silkscreen.



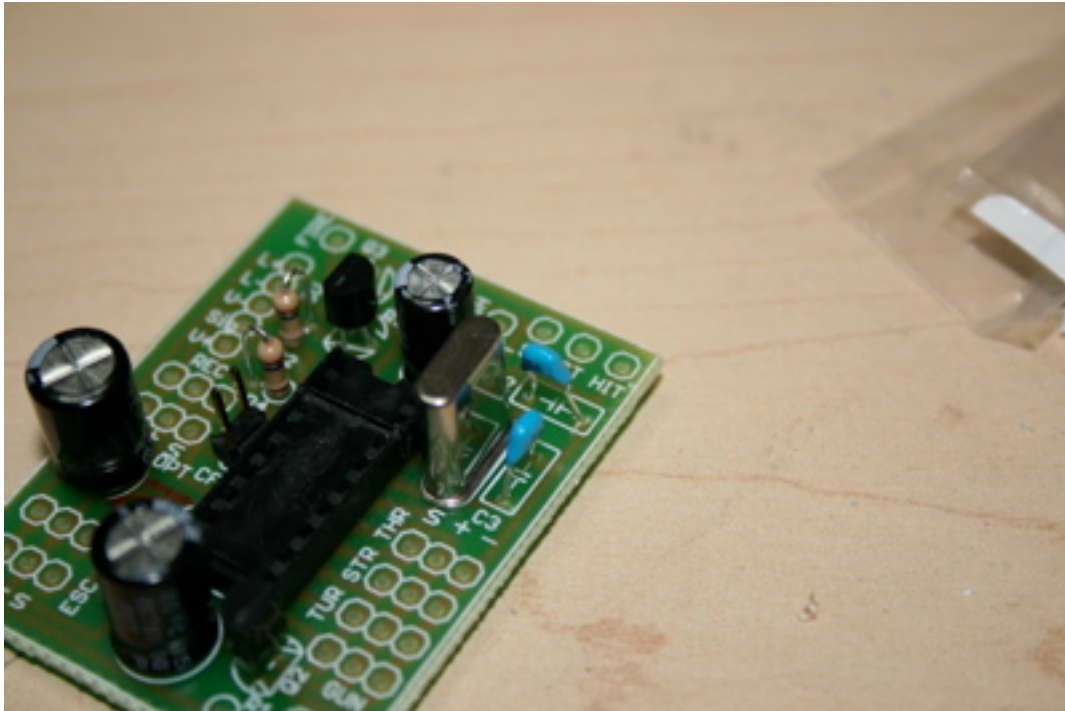
Solder in the 2 pin jumper header at “CFG” and a 470uF capacitor at C5. Make sure the capacitor matches the polarity on the silkscreen.



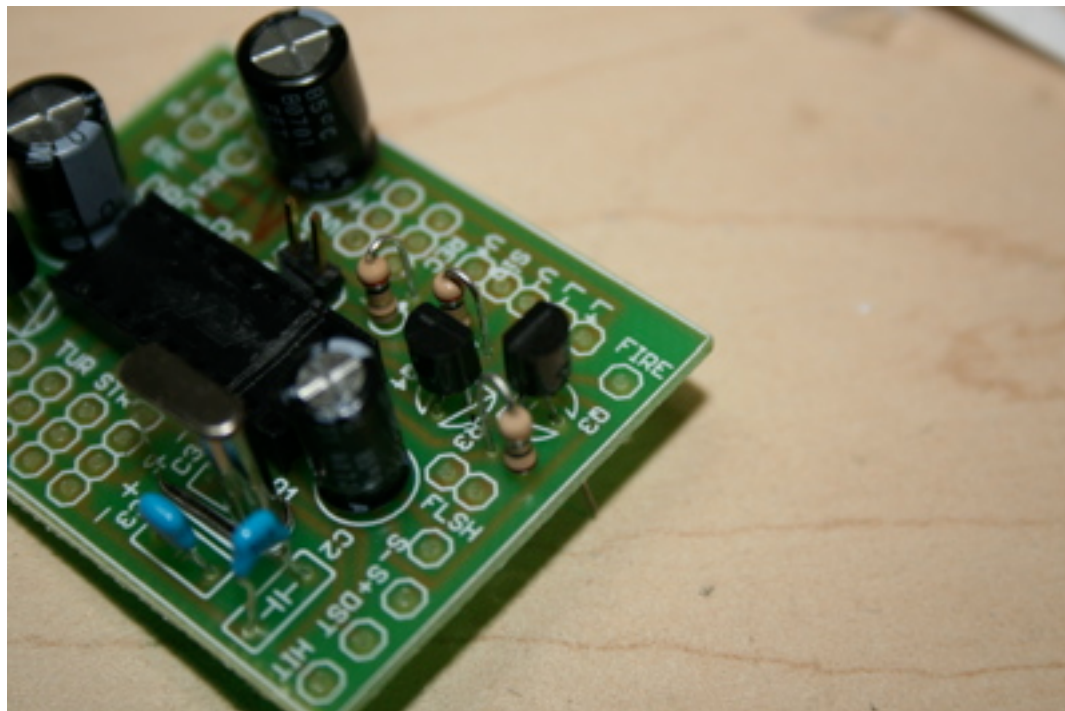
Solder in two 200k ohm resistors (red, black, yellow) at R2 and R4, a 470uF capacitor at C4, and a 1uF capacitor at C1. Make sure the capacitors match the polarity on the silkscreen.



Solder in two BS170 FETs, one at Q2 and the other at Q4, being careful to match orientation with the silkscreen.

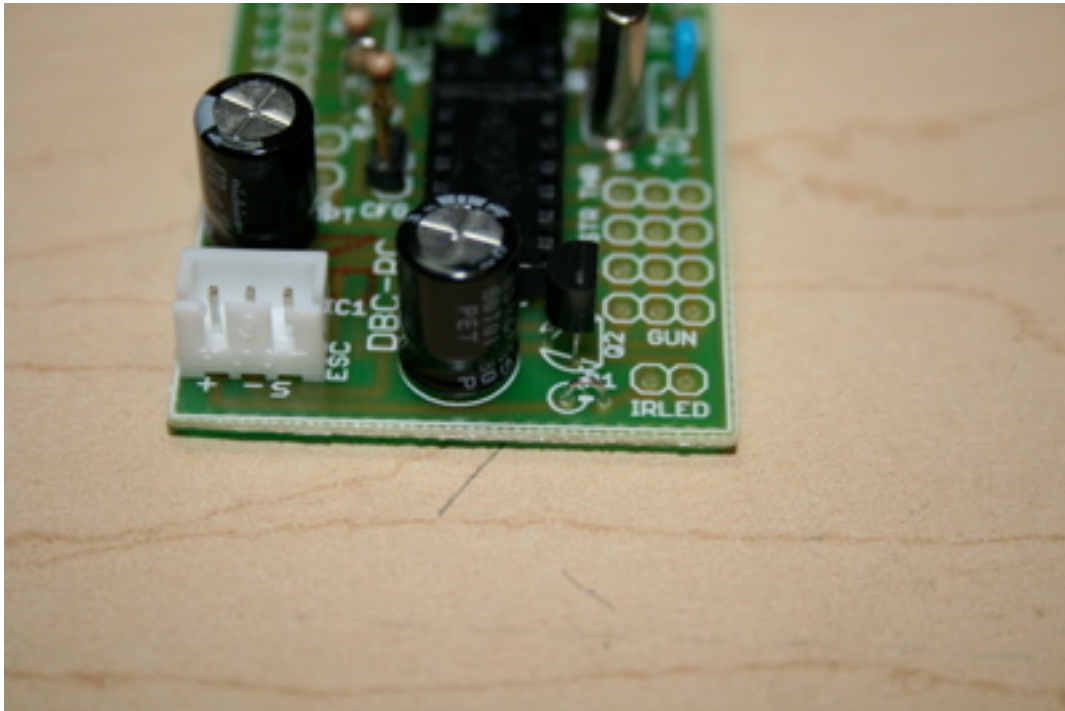


Solder in the 20mhz crystal at Q1, and the 20pf capacitors at C2 and C3 (no polarity to match).

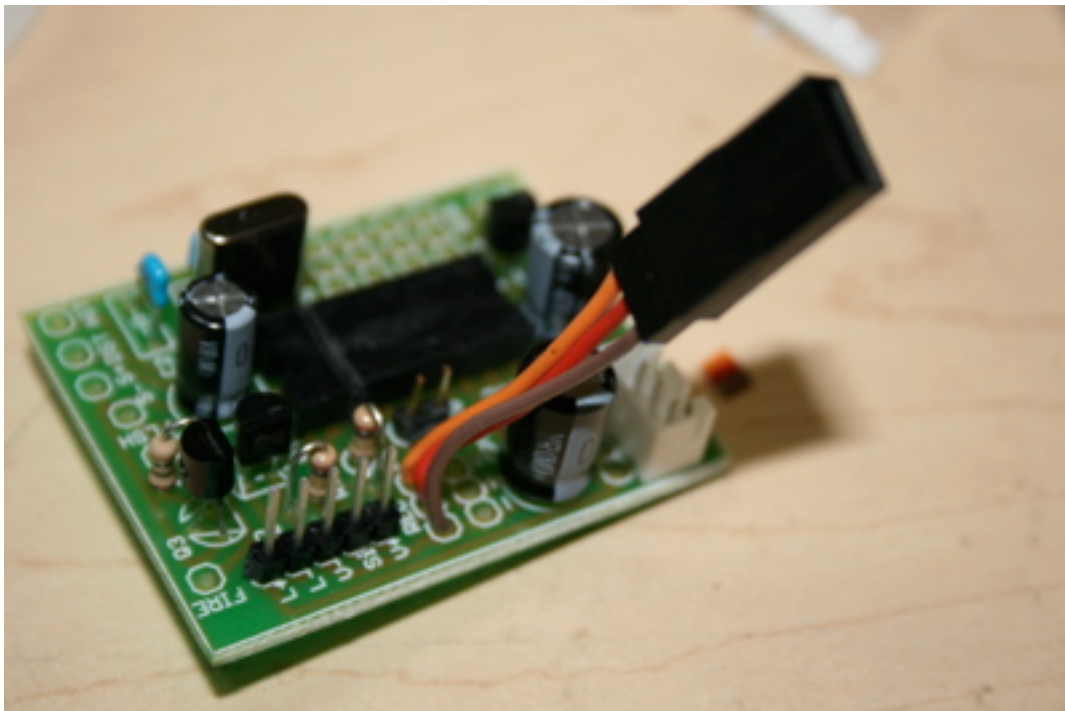


Solder in a 10 ohm (brown, black, black) resistor at R3.

CAUTION: Locate the P-fet. If the P-fet is labeled “BS 250 KL”, you have to install the fet turned 180 degrees (not shown). If the fet is labeled “TP 0610KL” install it normally (shown). If the fet is labeled “ZVP2106A”, install it normally (though the text may be on the back)

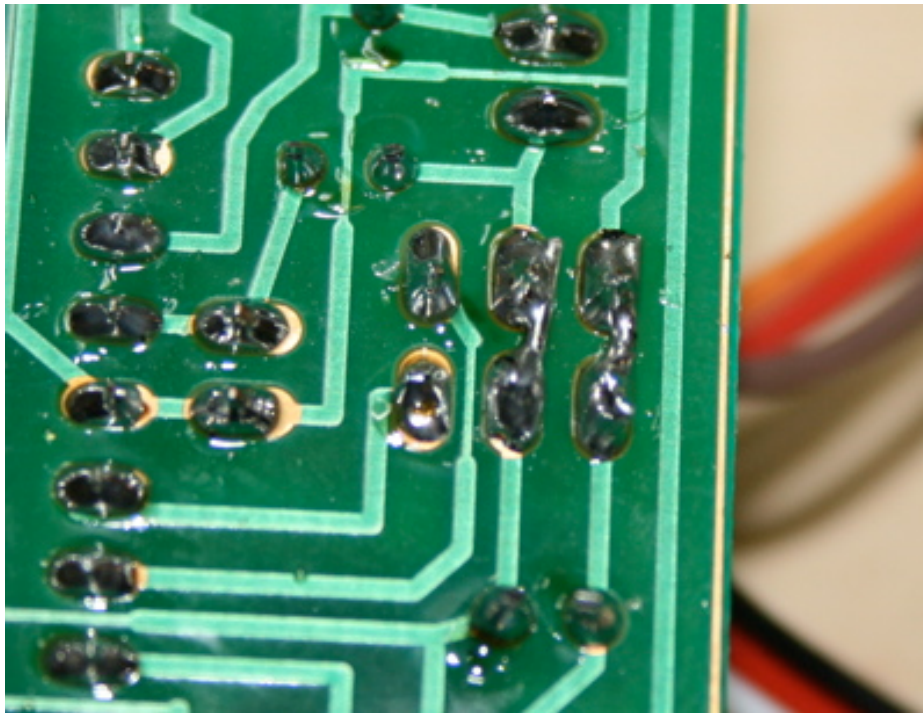


Install the socket at “ESC”. Note the orientation as shown.



Cut the five servo extensions, leaving enough wire on the “plug” side to reach from the DBC to your receiver location.

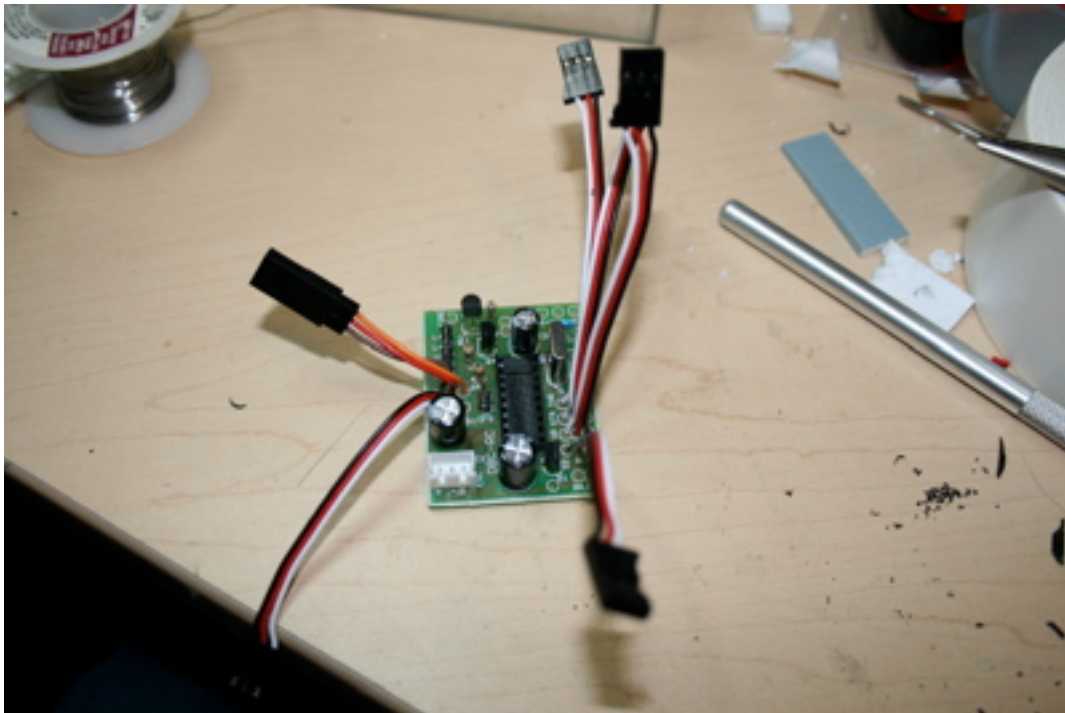
Optional: Then install one of the sockets at “REC” as shown for a recoil servo. Wire colors may differ, so note the polarity (Red=+, Black/Brown=-, Orange/White=s).



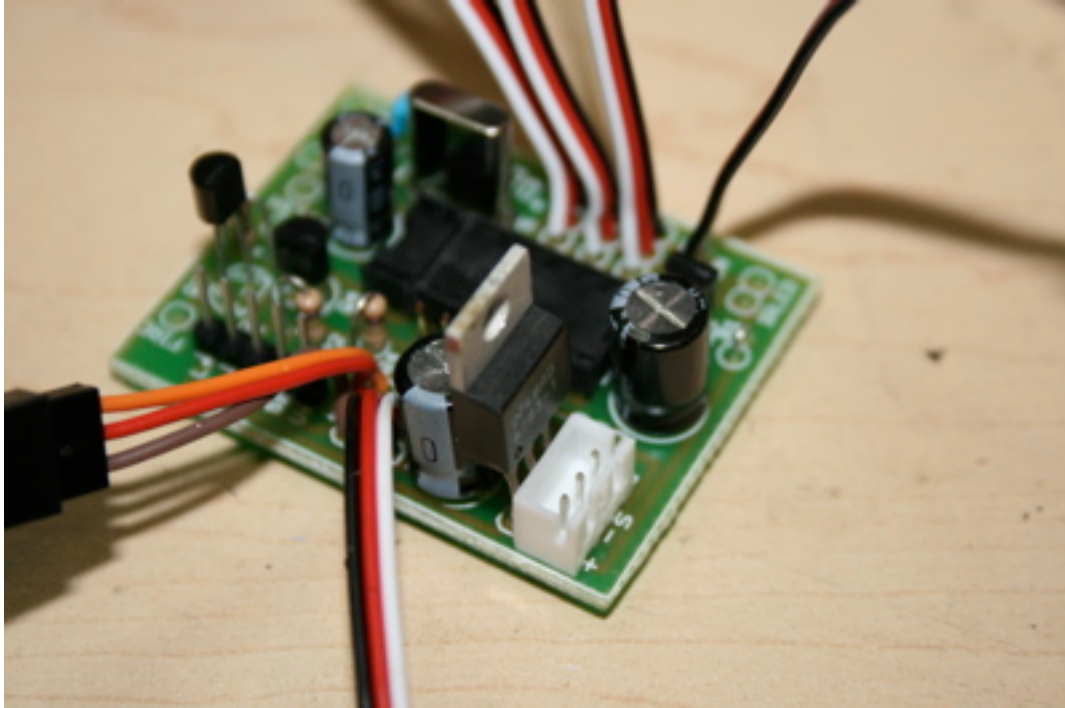
IMPORTANT: There is a minor PCB error on version1 boards. The “+” and “-” traces between the “OPT” and “REC” need to be joined. **Boards marked “v2” do not need this fix.**

1. You can use two small jumper wires or solder bridges (complete the next step first)
2. Or, you can strip the “+” and “-” wires for the “OPT” cable a bit longer in the next step and “fold” the extra from the “OPT” pad to the “REC” pad.

Be careful you don’t short the “+” and “-” traces together, or to the signal traces. If in doubt, check with a voltmeter.

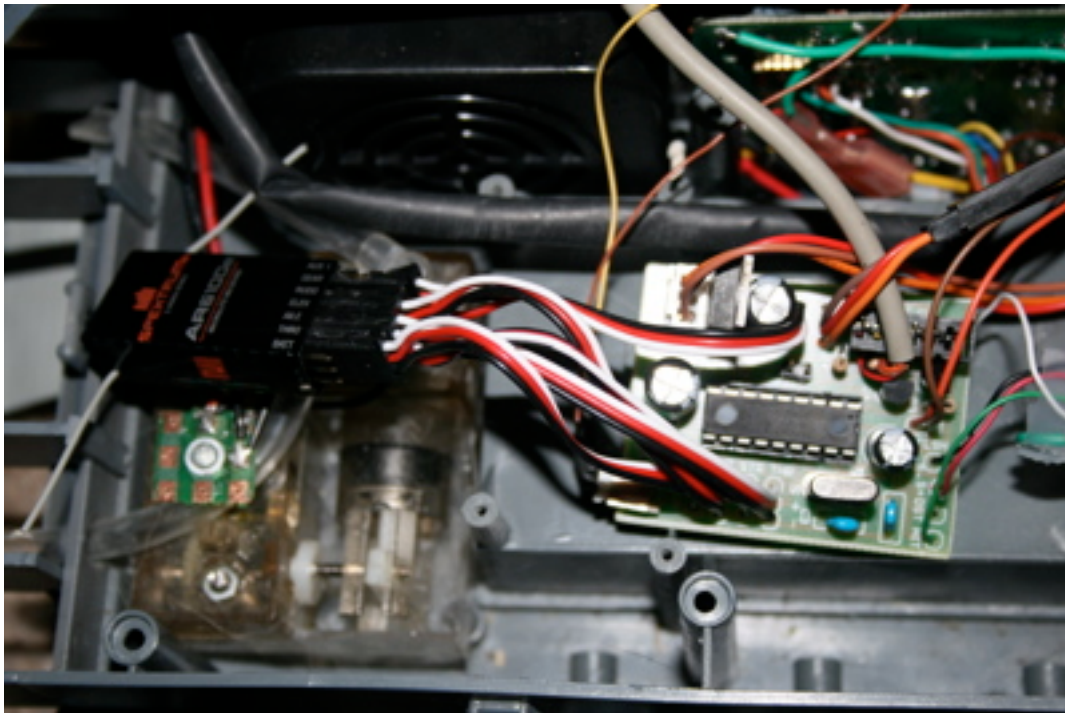


Install the five servo plugs into locations “THR, STR, TUR, GUN” and optionally “OPT” (for five channel radios). Wire colors may differ, so note the polarity (Red=+, Black/Brown=-, Orange/White=s).



Install the voltage regulator at location IC1. You may want to locate it closer to the board than shown to make the DBC easier to mount.

Note the orientation as shown. If you hookup any extra servos or electronics to the receiver, the regulator may need a heatsink.



Install the PIC chip in the socket, making sure you match the notch in the chip with the notch on the board/socket. Connect the Heng Long jumper cable to the “ESC” socket.

Connect the four (or five) servo signals to your receiver.

NOTE: All of these instructions assume you are using a Mode 2 TX (e.g. Airplane throttle and rudder channels on the left stick), even though the channels can be moved around to suit your own desires. For clarity, you may want to match my channel mappings until you are familiar with the system operation. My mappings attempt to emulate the Heng Long controls to some degree.

Recommended Initial Channel mappings:

Tank function	Airplane function	Futaba Channel	JR Channel	Spektrum Channel
Throttle (THR)	Elevator	2		ELE
Steering (STR)	Aileron	1		AIL
Turret (TUR)	Rudder	4		RUD
Gun (GUN)	Throttle	3		THR
Option (OPT)	N/A	?	?	?

In my testing with Futaba, none of the channels needed to be reversed. In my testing with Spektrum, all of the channels needed to be reversed. I suspect that JR may also need to be reversed.

At this point I recommend you test operation of the DBC-RC2HL **without** the fifth channel (OPT), sound card, or DBU connected before proceeding.

See the "Operation Manual" for more information. You should leave the fifth channel disconnected, or it may prevent the tank from starting if the channel is in the "shutdown engine" position (which can be quite confusing...don't ask me how I know).

Additionally, if the throttle channel is backwards, it may require full reverse to start the tank instead of full forward. Once you have the engine started, carefully explore the controls to verify the operation and see if some channels need reversing for "correct" operation. You may also want to disable the airsoft gun using the switch during this period.

Sound

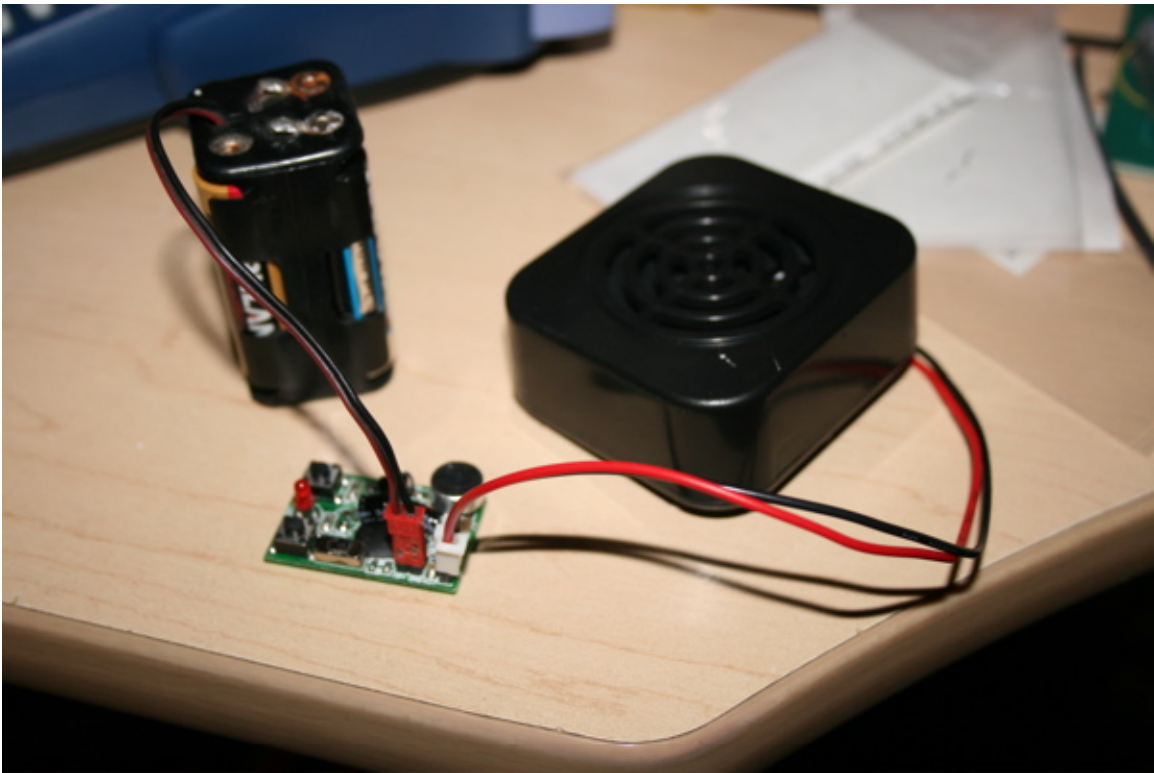
The DBC-RC2HL has three sound outputs, “fire”, “hit”, and “death” which can be optionally used to trigger an external sound card, or sound cards. If using two sound cards, I recommend you use one card for “hit” and “death” sounds, and the other card for “fire” sounds. If using only one card, you should be aware that if configured for “fire” and “hit” sounds, the sounds must be kept as short as possible, as if the second sound is played before the first finished (e.g. tank fires after being hit), the sound card issues a beep before playing the second sound).

Sample sounds are available at: http://darkith.dyndns.org/~darkith/html/dbc_snd.shtml

(note that the instructions on that page are for a **different** DBC)

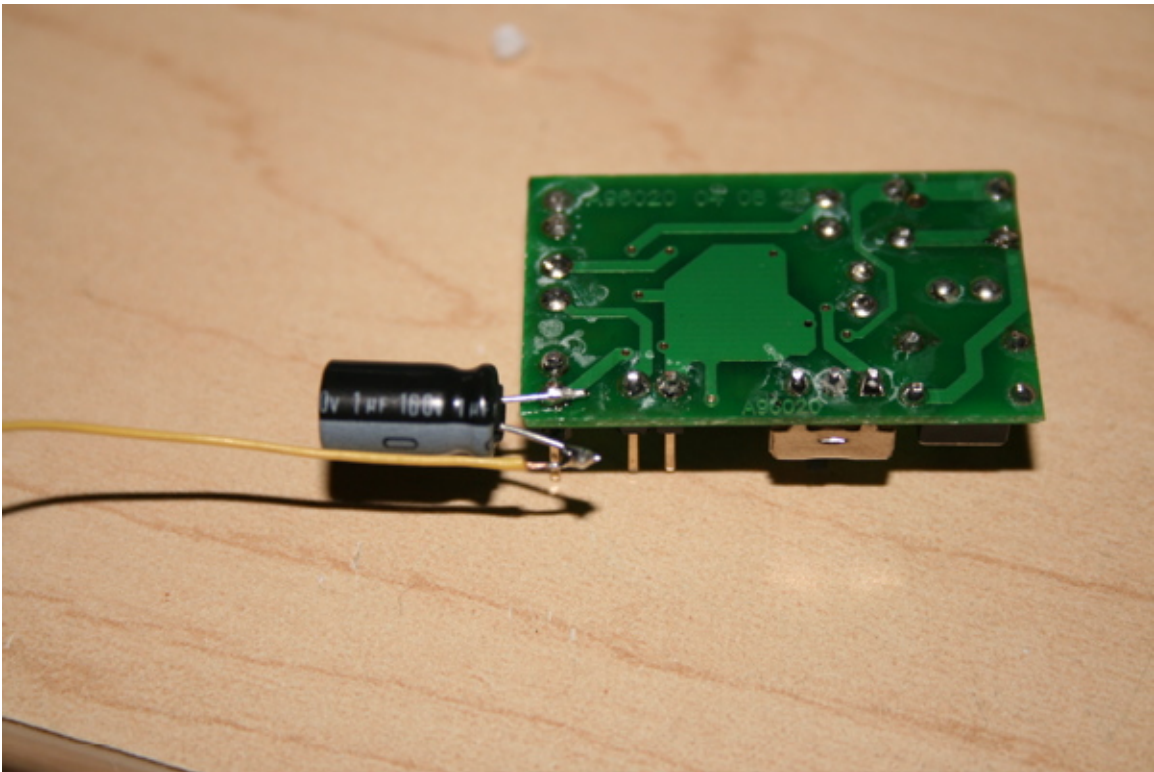
Recoding tips:

1. The sound should be recorded at a pretty high volume, with little background noise.
2. Don't expect punchy bass or crisp treble through the HL sound system, instead use sound effects with a high dynamic range
3. The hit sound shouldn't be any longer than 2.5–3 seconds, or a second hit will not trigger a 2nd hit sound but will instead shut off the 1st sound (the hit will still count though).
4. The death sound shouldn't be any longer than 15 seconds.
5. On version DBC–RC2HLs, the “hit” sound can be optionally played for “deaths” when configured (see the “hardware config” section of the Operation Manual). This allows the use of a single sound card with a “fire” sound and a “hit” sound played for both types of hits (normal and final hit).
6. The automatic gain of the chip will ramp up the gain if the sound goes quiet on the end. Then, when you let go of the record button, the noise the button makes will come across as a "donk" sound. Either stop recording before the sound effect completely fades (the cutoff will be masked by the engine noise), or press the effect buttons gently from the "edge" and release gently (this will produce a reduced sound).
7. Use a multi-track sound editor (like the free/open-source Audacity) to mix together various sound effects.



Connect a 5–6V battery (a JST plug fits nicely) using the marked polarity and record the appropriate sounds. The instructions are available at <http://www.electronics123.net/amazon/datasheet/A96020.pdf>. (basically flip the switch to rec and hold down the appropriate button, release to finish, move switch to play and hit button to demo)

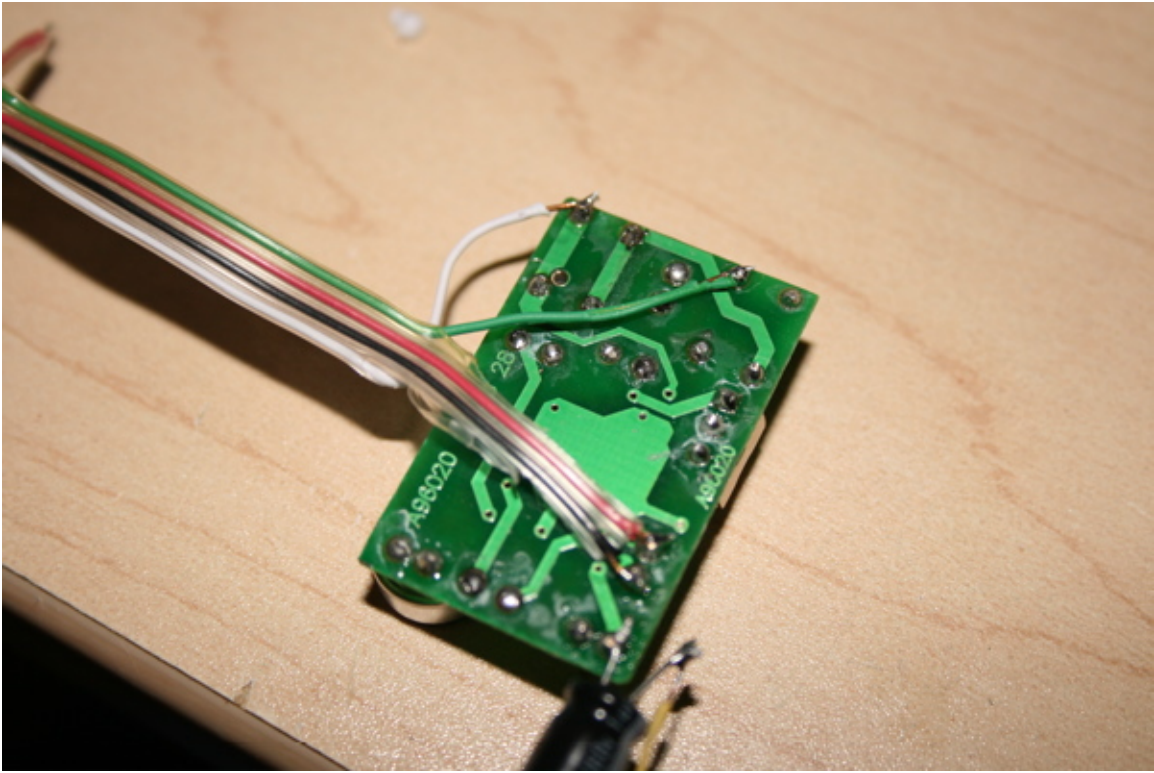
A stock Heng Long speaker fits on the speaker pins, allowing you to judge the quality of your recording. Note that the volume is much lower than the volume available when the sound is amplified by the tank electronics.



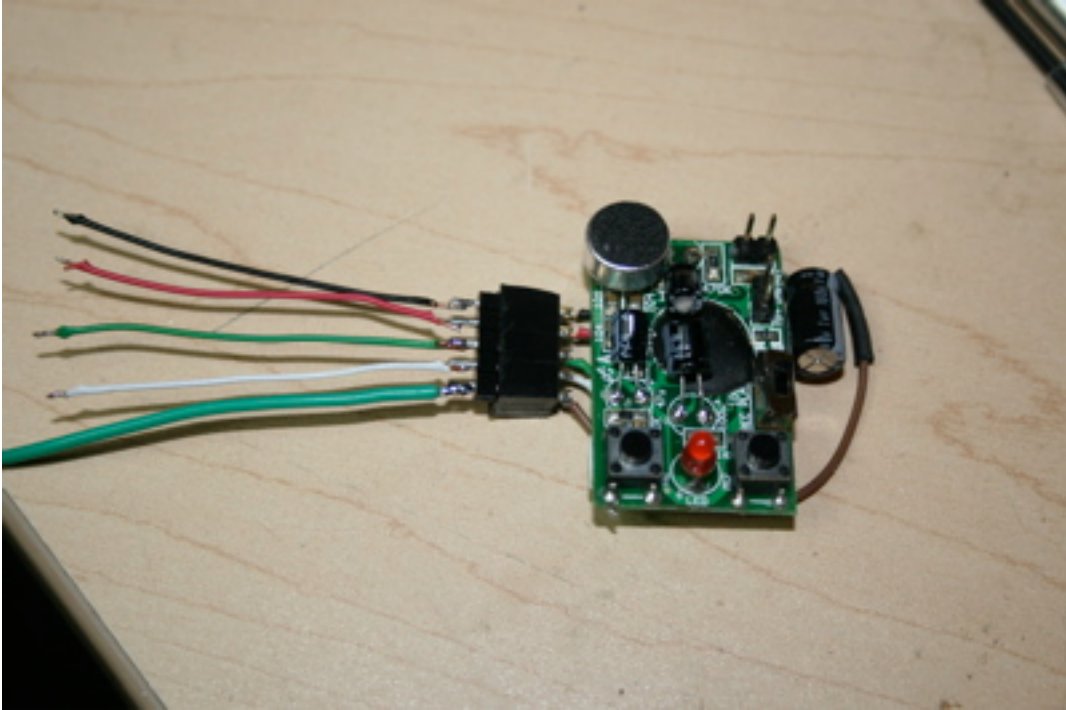
If you're connecting the output to the Heng Long sound system, solder the positive pole of a 1uf or 2.2uf capacitor to either of the two speaker outputs on the underside. Using the underside makes it easier to remove the unit and connect a speaker when recording new sounds. Connect a long wire to the negative side of the capacitor, this wire will need to be long enough to reach the Heng Long ESC board.

If you're using a standalone speaker, connect it directly to the speaker outputs.

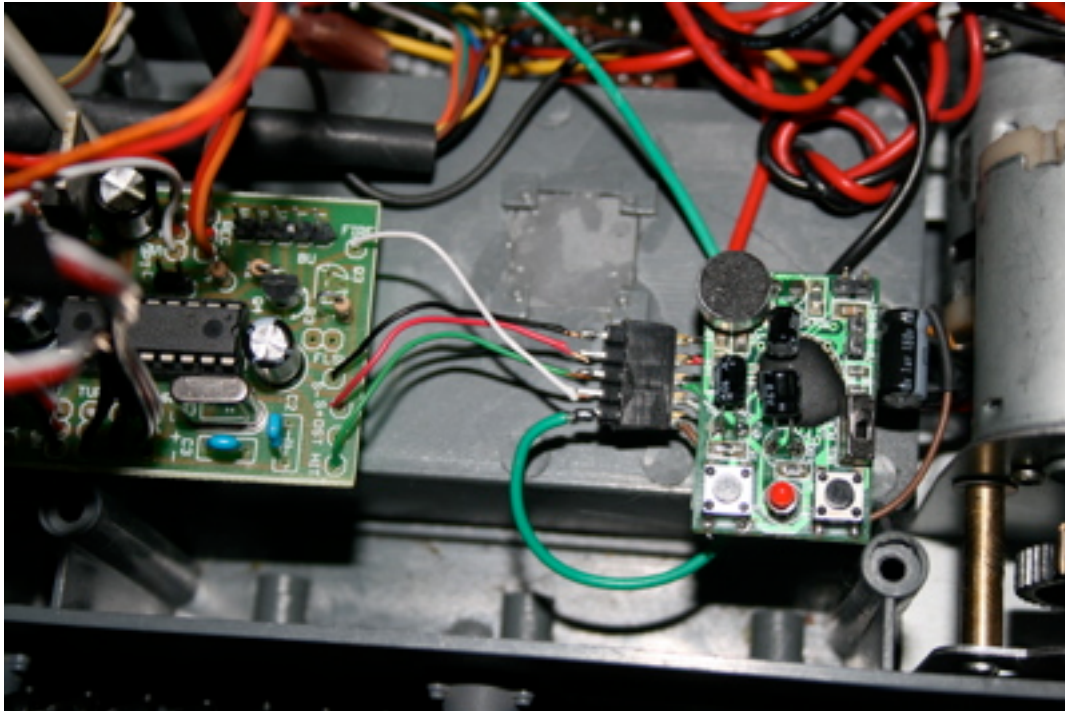
Make sure you only connect one type of output



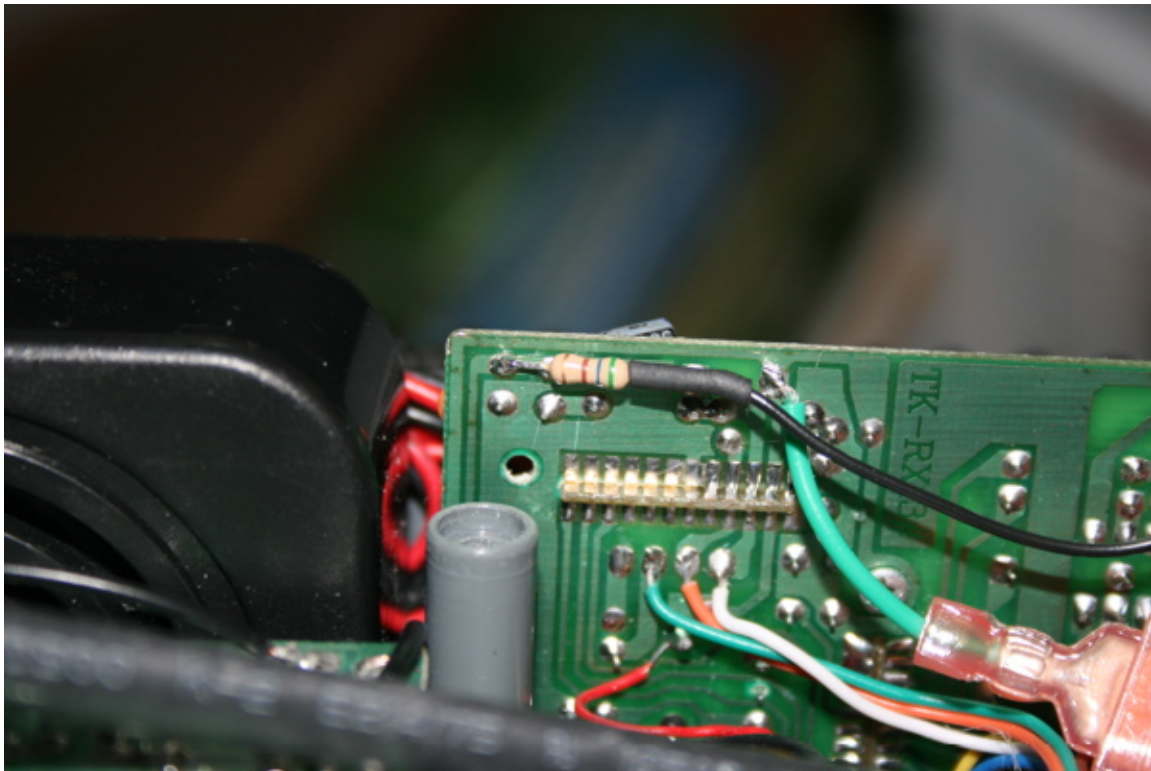
Solder a red wire to the underside of the 6v pin, and a black wire to the underside of the ground pin. Solder two wires to these locations under the buttons. Keep track of which wire is connected to which button.



Connect the wires to the optional header and pin connectors. This makes it easier to pull the sound chip off for future recordings.

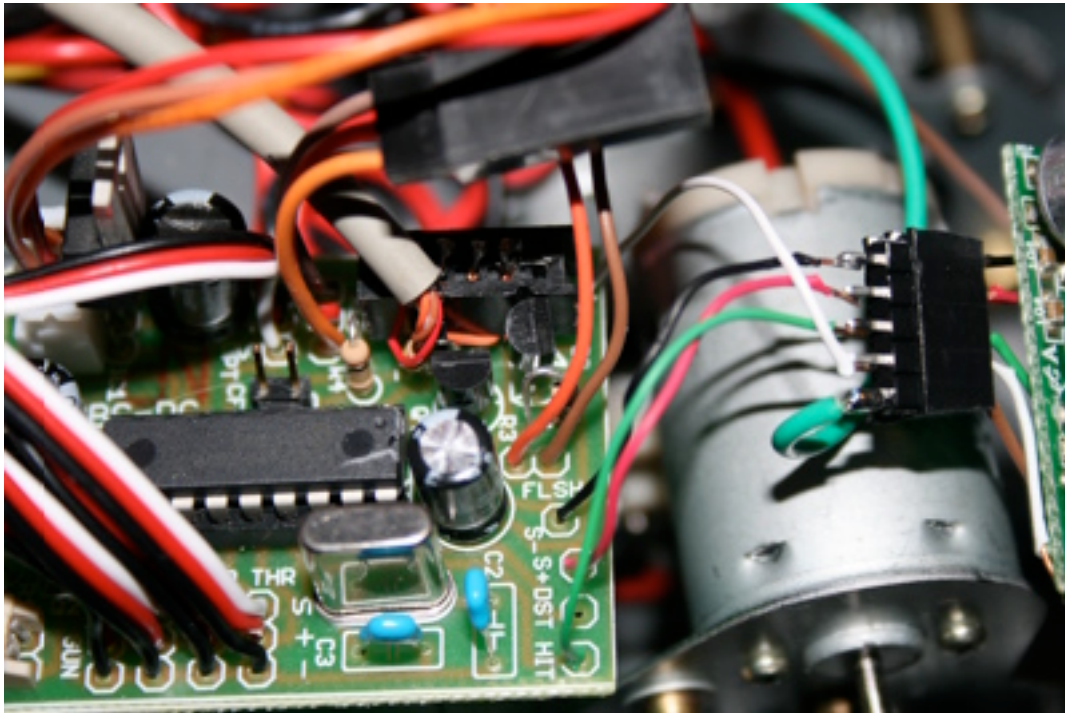


Connect the Red (+) wire to "S+" and the Black (-) wire to "S-". Connect the sound trigger wires to the desired outputs "Hit", "Dst" (destroyed), or "Fire". In this picture, "Hit" and "Fire" are used.



If you wish to connect the sound chip to the Heng Long sound system, connect the long wire from the capacitor to this point on the Heng Long board. You may optionally use a 560 ohm resistor (green, blue, brown) as shown to provide a more matched sound, but with less "impact". Insulate the sound card and connections with electrical tape to prevent shorting (but leave the buttons un-pressed).

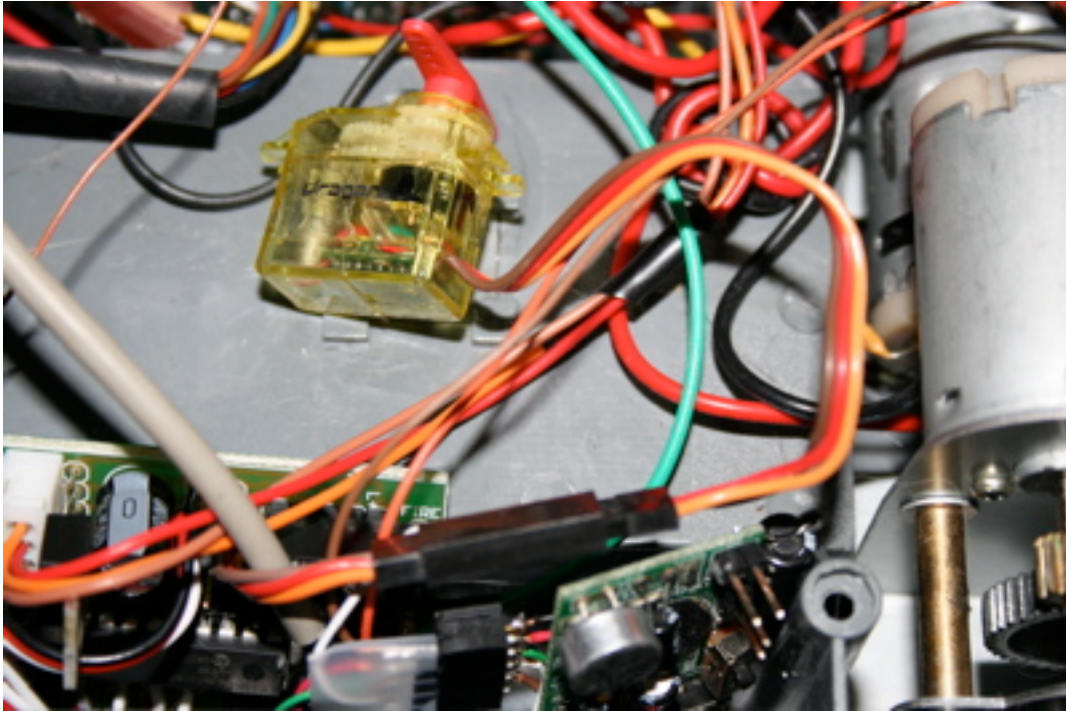
Cannon Flash



Connect a red wire to the **long** leg of the white LED and connect this wire to the *innermost* pin of the socket labeled “FLSH”. Connect a black or brown wire to the **short** leg of the white LED and connect it to the *outermost* pin of the socket.

When the tank fires it's cannon, the LED will now flash.

Cannon Recoil



You may optionally connect a micro servo the connector soldered to “REC” earlier. This servo **must** be a micro servo, or the power requirements may cause the DBC to reset or reboot sporadically. With some micro servos, a heatsink may still be required on the voltage regulator for reliable operation.

Additionally, the servo will exhibit a minor amount of jitter when idle. This is not a reception problem, but a minor amount of inaccuracy in outputting the servo signal (other signals take priority). I recommend that you leave a little slop in your recoil mechanism to allow for this movement.

DBU/TBU

If using a DBU, see this page for construction:

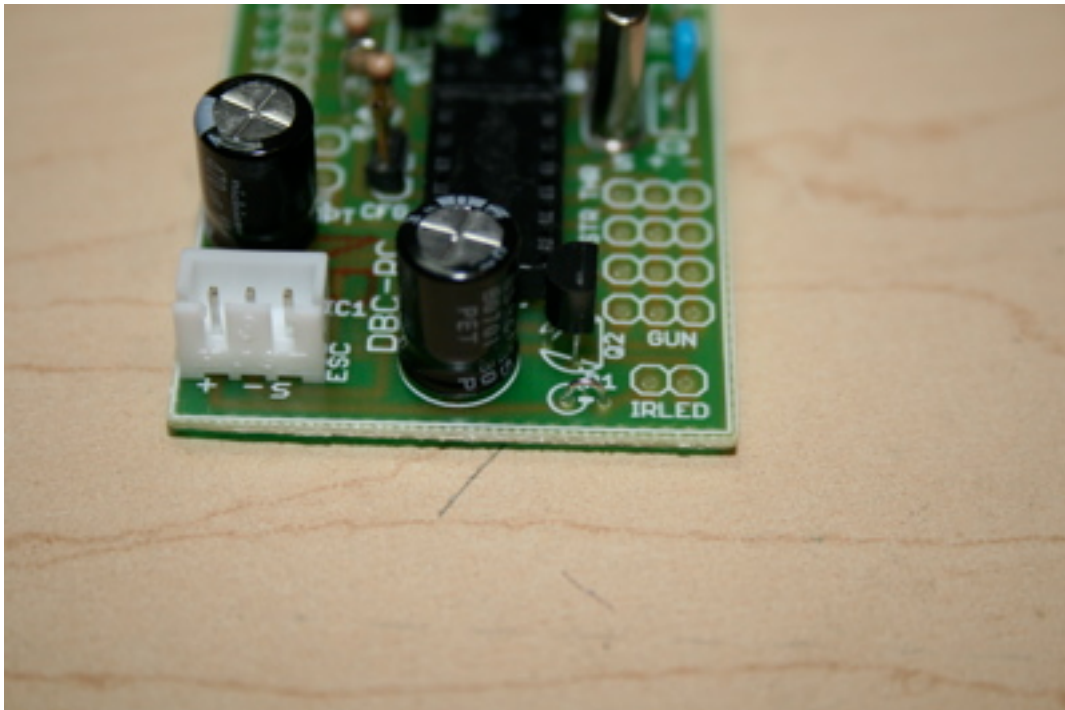
http://darkith.dyndns.org/~darkith/html/dbu_inst.shtml

Using the pinout in Step 10, connect the DBU to the DBC at the connection point “BU”.

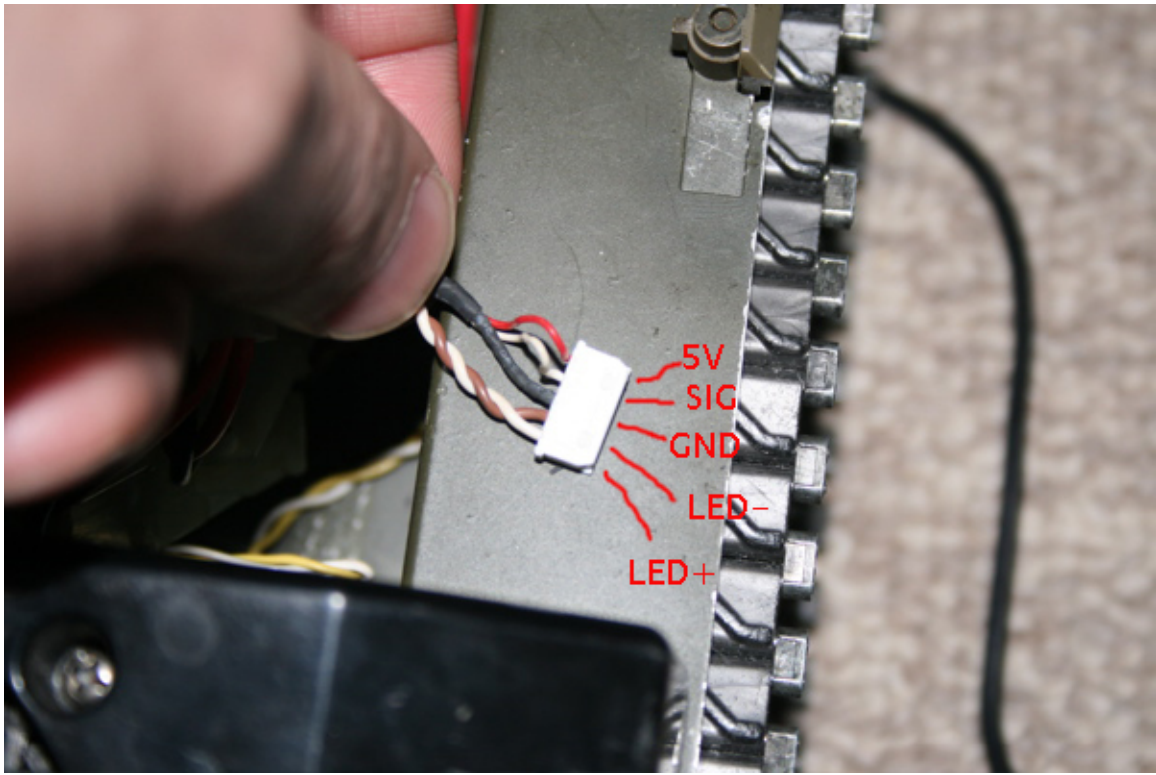


If using a DBU, connect a wire from the **long** leg of the supplied IR led to the *innermost* pin of the connection point labeled IRLED. This wire should be immediately next to the location R1

Connect a wire from the **short** leg of the led to the *outermost* pin of the connection point. The connection point is shown below.



If using the supplied DBU IR led, connect a jumper through the holes at R1. If using another IR LED, you may need to use a resistor between 10 and 68 ohms to equalize the range and prevent led burnout.



If fitting a TBU, use this pinout to connect to the DBC-RC2HL board. You will need to cut the connector off though.