

# DIY Lure Coursing

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This is going to be a journal about my process and adventures in building a lure coursing machine. I'm going to detail what parts I picked out, what drove me to make the selections, how they're put together, how much all of those costs and of course, pics of the dogs running on the system once I got it together. It'll be an on-going kind of thing, so be patient with the demand for pics.

What is Lure Coursing?

From Wikipedia:

quote: In lure coursing, dogs chase an artificial lure across a field, following a pattern that is meant to simulate live coursing. A typical lure course is between 600 and 1000 yards (548 to 914 meters) long. In Europe the course length can be over 1000 meters, and may incorporate some obstacles or jumps. The course must have a minimum number of turns in order to simulate prey (the jack-rabbit or hare) changing direction in a chase. The fields can be fenced or not. If a dog is lure focused they will typically follow the lure from start to finish and not run off course. Dogs with some considerable lure experience, termed "lure-wise", may try to anticipate or "cheat" by attempting to cut off the lure instead of trying to capture the lure using follow, speed and agility. Sighthounds generally have no need to be trained or enticed to chase the lure since the desire to chase is instinctual. However some breeds may require lure play at a very early age to encourage them to follow an artificial object with enthusiasm. Dogs must be at least one year old to compete; the hard fast turns are tough on a dog's developing joints and lure coursing before the age of one can cause joint problems later in life.

Who runs Bartertown?

American Kennel Club - Lure Coursing  
American Sighthound Field Association

Both associations hold official trials and maintain a points system ranking hounds that run. ASFA is completely separate from the AKC, but generally, the trials are pretty similar. You can get into oval track and straight racing as well, but I don't have much interest in those sports.

What makes the bunny run?

PHAST has a great article on they typical coursing setup.

Generally, you have your machine, a battery, a charger, the line and a mess of pulleys. 99% of the machines out there are one-direction only: clockwise. They do, however, make reversible machines. I'm interested in making my first one out of a reversible motor.

Why own a machine?

Simply put: my dogs are cheating and losing interest.

I read a very in-depth article the other day sent to me by masokissed (sucks to your assmar) about lure coursing failing to simulate bunnies. I learned much from this, but most importantly, I was fascinated by the ability to actually run a very interesting course using a mid-field reversal, and how that was fantastic for correcting cheating hounds as they never know when the bunny will about-face and take off where it came from.

Why not buy a pre-made machine?

You could, but they're expensive. Injoy makes the best pre-manufactured machines around. They contract out with a motor company, have the motors custom built, similar to the FLS, and their frames are very nice, but wood.

After you've been in the sport for a while, you will inevitably have equipment break down mid-trial far more than you'd wish on your worst enemy. This forces you to become a field mechanic, swapping motors, solenoids, wheels, frames, buttons; you name it. You realize that there really isn't much to a lure coursing machine and "hell, I could build that pretty cheap." Injoy's nice if you have a new club that is sparking interest, and the members don't have experience on equipment or aren't confident enough to do it themselves.

Pretty much, in the sport, there are two kinds of single-direction motors that I know of out there in general use:

Ford Long Shaft Starter (FLS)

## Trenton Starter Motor Custom (Trenton)

Both are very reliable motors, but the FLS's are getting terribly hard to find and what rebuilds you can get your hands on from are from India (poor quality) and don't last very long. The FLS originally was installed on tractors and cars in the 50's and 60's. The Trenton has to be custom ordered from the Trenton Starter and Generator Company, 626 Genessee St, Trenton NJ 08611 609-396-6396. I tried getting in touch with them, but didn't get anyone. Besides, I really wanted a bi-directional motor anyway.

Being resourceful, I researched the specs on the typical motor that we use:

12VDC

60 amps no load, 250 amps with load

2.5 hp - 5 hp. (2.5 is honestly great. In a reversible, I'd only want 2.5)

~3000 rpm.

Close to a 6" shaft for direct wheel mounting.

Looking on the Injoy site, they sell a 3 terminal, bi-directional motor and machine, but they charge \$400 for just the motor. You can find FLS motors for about 90 bucks if you look in the right places, so I figured I might be able to cut-out the markup if I talk to the manufacturer myself. Given the specs, I set off to find a motor company that either had a motor with a 6" 5/8 shaft or would be willing to custom build one. This led me to the Western Motor Service Company. They have a 2.5hp 12V bi-directional that they're putting on a different mounting plate and installing a 6" shaft for me.

Motor (W6562) cost: \$249.71

200 Amp, 5 post solenoids(WS341): 4@21.65 = \$86.60

What about the frame? Like you know how to weld.

That's where friends come in. Les Pekarski owns a sign making shop. He's also one of the patriarchs of our fine sport. He's offered to help me mount a motor and build up a frame from scrap materials in his shop. Injoy's wooden frames are classy looking, but I really like the aluminum frames.

What about the rest of the crap?

This is where you pretty much can't do it yourself. You just have to breakdown and buy Injoy stuff, not that it's bad. Injoy stuff is really good as a matter of fact, and worth the price, but for a startup, it's pretty fucking bank-breaking. I went ahead and ordered:

8 STD Pulleys @ \$34 each

2 STD Hold-Down pulleys @ \$42 each

1 S/S Continuous Loop Wheel @ \$190

1 STD Take-Up Wheel @ \$100

I'd love to be your credit card company.

Yeah, those first two purchase are pushing me over \$1000 so far, and I still have to buy a battery, build up a generator and buy some string.

There is a light at the end of my rainbow when it comes to money: Practices.

You can organize an area group of people that are interested in "fun runs" for their dogs, be it sighthound or not. You explain that each run is \$5.00, and it's for equipment maintenance. People usually don't have a problem and watching a corgi make a 800 yard course is fun for everyone.

Is that it?

Like I said, this will come in installments. I'll update with pics of the equipment as it arrives and the assembly process as I get it together. Any purchases I make will be documented and lessons I learn explained. I know there are a few other sighthound people out there interested in equipment in their local area, masokissed and joelleypie namely, but I figured this was a good a place as any to explain it all.

I really look forward to the day that I can take pics of dogs running on my equipment and re-schooling Reza.

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Whelp, I ordered my string this morning. There are two places to get string:

Injoy  
500 yard roll @ \$29.00 + shipping

BOI Solutions  
1500 yard spool @ \$59.00 (shipping included)

Les recommended I go with BOI. I don't think it has as much to do with the quality of the line as much as it's cheaper and comes on a big ass spool instead of those little wads that Injoy sells. If you think about it, our courses are in the 800-900 yard range, typically, so 1 order of 1500 yards is not even two courses. String is totally reusable though, and there are tips you can use to preserve the life of your string. Here are some from the PHAST website on string maintenance:

quote:

We use nylon-braided string and replace it as often as necessary. There is no set rule as to how many trials are run before we replace the string. It depends on the length of the course, number of pulleys, terrain, weather, number of entries and many other variables; however, if the string breaks several times during the day, it is time to replace it. Always have enough new string on hand to restring the course. This will not take more than a few minutes and can save a lot of time over all. All you have to do is cut the string at the lures, tie new string on behind the lures and tie the other end of the old string to the take-up wheel mounted on a lure machine. One person holds a large screwdriver that is placed through the center tube of the roll of new string and another person carefully operates the lure machine. This will pull the old string onto the take-up wheel and the new string replaces the old through the pulleys on the field. Before starting a trial, we always replace the section of the string that was near the lures because that section is most likely to have been chewed on by the hounds during the previous trial. Always check your pulleys as you set up the course. Make sure that they turn freely and that there is nothing that could snag the string and lure as they pass through the pulley. Check to make sure the string is not digging into the ground.

Christ on a cracker, I spent way too much time trying to find the EXACT button I like. After all the lure op'ing, you tend to get attached to a certain button because of the button travel, the way it clicks, the resonance, the force required... It just clicks right for you, and anytime you're forced to use some other switch other than the one you love, you start 'sparging out about how much you hate this stupid button that was thrust upon you.

Anyway, I need a button, a toggle switch, an enclosure and a cord. Normally, setups don't require a switch, but because this will be a reversible, I need to be able to change directions on the remote.

I'm ordering all my switch crap from Mouser because their online catalog is pretty damn awesome and they have spec-sheets galore.

My plans for a switch:

#### THE BUTTON:

Mouser #: 540-GPTCNH01

Mfr. #: GPTCNH01 (Cherry Corp)

Desc.: Snap-Action Switches SPDT 15A SCREW MTRC PANEL MOUNT PLUNGER

\$9.28

#### Toggle switch:

Mouser #: 506-MTL106D04

Mfr. #: MTL106D04

Desc.: Toggle Switches SPDT ON-NONE-ON

\$10.32

#### Enclosure:

I couldn't find anything useful online. This will end up being a hacked apart DC wall brick that fits my hand.

#### Cord:

25' heavyduty extension. You cut the female end off, plop that on the machine for the receiver. The cut end is wired into the box to the switch and toggle. Three wire is just what we need for the 2 pole switch.

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notsoape posted: Are there any extra safety risks with a mid-field reversal during the run? Would the hound be more likely to cross the line/potentially tangle when they turn?

Hounds cross the line during a course anyway, but there are steps you can take to prevent takes/tangles.

1. Don't let the dogs catch the bag. Fairly obvious, but a take is probably where 90% of line wraps occur. Sometimes, it can't be prevented, like when a dog cheats so bad that there is no escaping him. Most cheaters can be slung off on turns to get them back off the course and prevent a take by simply letting them think they have a shot, and then zipping them onto a turn with no lead and they just go sailing off into the distance. Anytime the dogs get close to the bags or I see one coming in like a homing missile on a 90 degree path for interception, my hand flips open that little snap on my knife, ready for draw.

I had a ridgeback surprise the lureop last weekend while I was huntmastering. He fucked around for the first half of the course, and you knew his score was shit and wasn't really going to be in the running. Well the dog loped up the middle of the hill while the other two were pushing it up the far right, hard up the hill. The lure broke left and ran the crest of the hill and the fucking ridgeback saw his chance. He ran a perfect 90 and hit the lure running. My hand was on my knife and had the latch undone because I could see the worse unfolding. When the dog sprung up like a marlin, screaming, I had the line cut before anyone could say anything. The dog didn't have a scratch on him, thankfully.

2. Make sure the line is kept within 3-4 inches of the ground around the whole course. A higher line means you're far more likely to have a dog cross over and catch the line. Crossing over a line isn't bad though, and we do it all the time. In fact, you can force a dog to one side of the line or the other with lure operation. If you want them on the inside of the turn, show them the turn real early and you can keep them running on the inside. If you want them on the outside, hesitate the show and they'll cross over on the turn and keep pulling them on the outside of the curve. This is useful if you want to set them up for future turns, prevent the lure from going unsighted because of terrain, forcing them into areas they normally would be too smart to go (like running far up a hill into the corner of the property or closer to a boundary) or avoiding collisions/crossovers. Otherwise, a safe crossover isn't that bad, and sometimes, the dog will still run with the line between or on the outside of its legs. You want to stop the course, but as long as the line is running with the dog, it's not that bad and most of the time, they won't even get a lineburn.

3. Try to keep dogs from running through a cross-over. If you run a figure-8 pattern, that point where the line crosses over itself is a trap for puppy feet. Try to keep dogs from running directly through that cross-point either with the lay of the course or with lure operation.

Now, with regards to a reversal, no, not really. You just have to have a proper turn before the reversal to get the dogs moving away from the return path and have to be quick on the switch to prevent them from making a take at the reversal point. Check out course plans #13 and #14 and the comments on it. See how the turns are used to pull the dogs off the line before the reversal point. You don't want to reverse on a straight and zip the lure straight back into them; i don't think there is a hare alive that would be stupid enough to do that and if it did, wouldn't be alive very long.

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Look at the size of that shaft

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## PUSH THE BUTTON

Ok, here's how I made the button of my dreams.

### 1. Tools and shit:

Multimeter to test circuits

Wire stripper because I don't want carpenter's teeth

Soldering Iron because I'm very serious about good connections

Dremel because it can do everything but hammer a nail

{Not Pictured} phillips head for screw, pliers for the nuts, sledge for busting open some shit, safety goggles because a dremel is the #1 cause of blindness among modeling nerds and an xact-o to carve some shit up.

## 2. Items:

Toggle Switch  
Push Button Switch  
Old DC Adapter from something that I have no idea what but will probably lament it's destruction later  
Extension Cord

## 3. Wiring:

This is where I had to make a choice. See, most motors are 2 wires coming off the machine. If you cross those wires, the motor goes. Well, everyone I know uses an AC plug Type A or B, but only wires into the flat terminals on the plug; they never use the circular grounding terminal in the switch. I wanted to make my switch work on all setups, so I went ahead and wired the fat flat terminal as common and made the thin flat terminal as "forward." I then used the round grounding terminal as "reverse." This allows me to use the switch in anyone else's machine if the fancy struck me or shit went wrong and they needed my button as a backup.

## 4. Process:

BREAK SOME SHIT. I had to use a sledge hammer to crack the seam on the DC adapter. I guess screws are too expensive in communist China.

Then cut the female end of the extension cord off. Keep at least a foot on the end and save it for later because we're going to mount that to the machine as the socket for the switch.

I then used the Dremel to bore a hole and mounded the push button where the prongs used to be.

Solder everything together like you know what you're doing. It's actually pretty simple. The white is my "return wire" and is used in both circuit connections, forward and reverse. Attach that to the "On" screw of the push button. Then run a wire from the "COM" screw of the push button to the middle terminal of the toggle switch. The middle terminal of the toggle is the "COM" for that switch. Then, on either side of the toggle, solder up the forward (black) wire and then the reverse (green) wire.

\*Check all your circuits with the multimeter before you close up the box. Turn it to the Omega (resistance, Ohm meter) setting. If a connection isn't made, it should read "OL." If you toggle to the proper side and push the button, you should get a reading of "0" resistance meaning you completed a circuit.

Button: done.

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Powerhouse of energy  
Whipping up a fury, Dominating flurry  
We create the Battery

One of my final "big purchases" was the battery:

Why you need a battery. Think of the battery in the circuit as the reservoir of current. When you push that button for a 40 second course, you're pulling at speed about 100-200 amps, but at the start, there's a spike of 800-900 amps. If you

just tried to run that off an alternator or generator, there's no way you'd get the current spike requirements. You have to have that pool of current in the circuit to supply that immediate spike. You still need an alternator/generator/charger in the circuit to supply constant "refilling" of the battery.

#### Requirements:

12V - Most car, marine and RV batteries meet this requirement.

High starting current - This is the Amp dump from a cold start, or when the motor isn't moving. I've see motors pull about 800-900 Amps from a dead stop. Your battery needs to be able to pull at least above 700.

As many Amp Hours (AH)'s as possible - This is a measure of how long, basically, the battery will last at typically 25 amps. The more AH's you have, the longer before your battery is drained.

Deep Cycle - thicker lead plates in the battery allow "deep cycling." This means it's more resilient to being drained, recharged and still being able to hold a charge. You beat the shit out of a battery when you drain it fully, and most automotive batteries are not deep-cycle. They're accustomed to high current draw, but low-drain before recharge, and will perma-die in most lure coursing situations.

There's three types of automotive batteries: Wet cell (Flooded), Gel and Absorbed Glass Mat (AGM). For more information on the different types that will do more justice than me trying to explain the differences, go here.

As you can see, there are some awesome benefits to using an AGM. Unfortunately, you're going to pay three times the prices. The other huge problem you have is "what if it drops dead?" Well, you have a dead battery that you have to ship back at your own expense if it's under warranty and wait on a replacement. This leads me to the greatest factor when choosing a battery:

Buy your battery at Wal-Mart.

1. Wal-marts are everywhere.
2. Most are open 24-7, so when your battery comes up dead, you can run at 5 AM and replace it before the trial.
3. They don't ask questions. As long as you present with a dead battery, a receipt and are within the warranty period, you get a brand new, charged battery.
4. 3 year warranty on the MAXX batteries.
5. They carry a good battery for our requirements.
6. You'll only pay about \$80 instead of the \$240 for an AGM

So for 80 bucks, you basically have a heavy-duty, deep-cycle, perpetual battery that you can return anywhere in the USA at any hour of the night to a staff that couldn't care less how you beat the shit out of it in a non-typical application.

I bought the biggest Everstart MAXX battery they had. Here's something else you'll want to keep in mind: Try to get one that has the round battery cable terminals AND the wingnut, screw terminals. This gives you alot more flexibility when it comes to interconnection motors, batteries and chargers. The one I got has both.

The MAXX series is also a deep-cycle. Seriously, don't go and try to use any old car battery to lure course.

Other than that, there are a few tips you want to keep in mind for storage. Keep it off the ground, and in a temperate, dry location. Charge it before you put it up. Charge it before you put it back into use. Check the water level in the flooded battery periodically and keep it full.

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#### \*UPDATE!!!\*

Shit tons have happened since I made the last post in this thread. I completed the motor, tested it and ran a practice today. I've been a really shitty blogger, but isn't that what all bloggers eventually decay into? I was so busy throughout this week with the build up: working every night after work to get the motor completed and tested in order to run a practice today. Well, I guess I'll just make an abridged write-up on the process.

First, the schematic:

This is the basic wiring, straight off the motor manufacturers website. I couldn't tell you how goddamn convenient it was to have them post this. I have never seen a reversible motor in my life, but decided to make one anyway and would "figure it out on my own" if I didn't have this little gem. It would have been a mess, even with a EE degree because I had no idea how the 2 field coils in the reversible motor worked. Normally, you'd just have a motor with a + and a -, you ground out the - on the motor, run the + from the battery into one side of the solenoid and run a cable from out the other side and into the + on the motor. Simple.

With this, you have a 5 terminal solenoid, but a 6 would work too. There's an imaginary 6th terminal in the 5 terminal, but it's just the negative switch terminal that is ground out into the body of the solenoid. Anyway, the two heavy top posts on the solenoid are "normally closed," meaning when the switch isn't fired, they're making a continuous circuit. The two side posts are a separate circuit on the solenoid, but these two are "normally open," meaning they are a broken circuit. When you fire the solenoid, the top circuit breaks and the side posts connect, making a circuit.

Look, I made an animated gif for you:

You can see the circuits switching back and forth as the directions are reversed. Maybe it'll make sense the more you stare at it, maybe not. A BSEE in my case definitely helps.

So I had a friend in Georgia, Les Pekarski, make the frame for me. He's one of the fathers of lure coursing and has been in it from the start. He even had afghans back in the day. I got the frame and mounted the solenoids and motor to it and it ended up looking like this:

I started it in my living room, but when it came time to pull out the soldering iron, I decide maybe it would be safer to move to the floor of my kitchen.

\* token rollerblades in the corner of the picture.

Here's a picture of the final wiring on the solenoids/motor:

Wiring was a bitch. Period. I probably spent more time out looking for parts and driving around and shit than sitting down, working on the motor. I had a hard time trying to find thick enough cable. I went to a car audio place that had 0 gauge aluminum at \$7.50/foot. Terminals were fucking expensive there too. I went to a welding supplier store and they had a much better selection. I ended up getting 10 feet of 2 gauge and 10 feet of 0 gauge from them for \$3/foot. I spent probably about \$100 for the cable, ends and a tool to crimp the ends. It was the cheap tool that you pound with a hammer, but fuck it gets the job done. All of the cable has to be cut to length, stripped and capped, but don't bother soldering the ends as that's just overkill. Instead of running longer than necessary cable between the two right posts on each solenoid, I opted for the "bus bar" method of taking a 1/8"x5/8" copper bar, bending and drilling it to fit between the two posts. I also made a bus bar for the Left most posts on the solenoids that tie the two of them together because I had extra bar. I got the bar from a fabrication shop that the welding supply store pointed me to, and they were cool and get me a 12" bar for free. Drilling the copper was pretty easy as long as you have the drill bits with the special titanium or whatever the fuck it is coating that makes them super durable.

There are two modifications that I made. According to this document found on a golf cart parts distributor's website, they recommend to save the life of your solenoids, that you put a resistor across the high current solenoid terminals to prevent arcing across the internal contacts and to put a diode across the switch terminals. I ended up doing both, but noticed that when I put the diodes in, I wired them to the negative terminals on the high current side of the solenoid. Not thinking before I did that, I created a feedback loop that kept the switch closed and the motor went spinning off. Well I moved the negative side of the diode off to the frame and hoped that would work. I had "stick" early on in the trial today while running iggies and after that course, I cut out the diodes. No more sticking after that. I'm hoping that the resistors help prolong the life of these \$20 puppies.

Another piece of advice: don't go cheap on your battery charger. I bought a \$30 manual charger that you have to watch and shit. If you let it go over at best, you ruin your battery; at worst it explodes. Paranoid, I returned it and got the \$90 model that has a built in charger function, automatic shutoff, alternator testers and a "top off" mode good for the night before that will keep the battery charged until your ready to use it. Worth it.

So, yeah, I ran a practice with all the equipment today. No, I didn't take any pictures, but thankfully, Jennifer that owns the property had a really nice camera out there and was popping off tons of shots. When I get the pictures from her, I'll post them.

We had \$115 in dog runs. That's about 38 runs of dogs at \$3/dog. Many of the sighthounds ran multiple times. We had 2 afghans, 1 borzoi, 4 salukis, 1 silken windhound, 3 greyhounds, 4 whippets, 6-7 italian greyhounds, a corgi, a an Australian shepherd, a border collie, a couple chinese crested, 5 pharaoh hounds, 2 scotties and some other dogs that are slipping my mind probably.

We started setup at 11 and by 1 PM, had already run a couple test dogs and were ready for the scheduled start time. We got through running dogs at 5PM. No major equipment troubles to speak of, thank god, as that was my main worry besides a dog getting hurt of course. The motor got pretty damn hot with 3 fans on it, and I had to take a cloth bag and fill it with ice and put it on the motor to help cool it down. I'm betting it was because with the reversals and only one battery, the motor was trying to pull more current than the battery could put out. When that happens, the motor overheats really badly. Next time, I'm going to run a couple of those marine batteries in parallel to ensure that I have the current and voltage available.

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Here's a video of the practice put together by Don Redman: <http://www.youtube.com/watch?v=LYIGJkrKgQk>