



# ***FOIL***

## ***Very Basic Armoury: Tools, Rewiring, Common faults, Bodywires, Lamés, Broken Kit Conventions***

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## Very Basic Foil Armoury – FOIL MECHANICS

### Safety

When starting to work on weapons, you should be aware that the drilling, grinding, sanding and re-wiring processes can cause particles and pieces of metal to fly unexpectedly into the air or at you. It is therefore highly recommended that you give yourself enough room in which to work; that you wear safety glasses and that you are not working close to other people. From personal experience, I have had a blade break in mid-re-wire and fly straight across the room, landing 9 foot from where I was working and 1 foot away from the window. So please take care. If you are in any doubt as to what you are doing, stop and ask someone experienced.

### Pressure and Dimensions

The foil needs at least 500 grams of pressure to activate the scoring apparatus and has a maximum length of 110cm.

### Target area

The valid target area is the torso only excluding arms and head and is indicated by the metallic jacket called a lamé. When the valid target area is hit, a 'hit' light on the scoring apparatus appears. When the non-valid target area is hit, a white light appears indicating that an of-target hit has been made.

### Circuit

There are three possible circuit states in foil.

*Fencers on guard* The foil circuit is 'on' or 'open' in the inactive position.

*Point depressed off target* Circuit broken and white light appears

*Point depressed on target* Original circuit broken and new circuit made, hit light appears.

### Using a multimeter to check your equipment

The maximum allowed resistance for a foil is 2 ohms.

The maximum allowed resistance for a bodywire is 1 ohm per line.

When you are working on your weapons, you will be using a multimeter to check at the various stages of assembly that your weapon is working properly at the correct resistance.

Get used to your multimeter. You need to know what its normal reading is when it is first switched on. If it is a really good one, the reading will be 0.1 to zero. If it is pretty cheap and cheerful, it will probably give a reading of 0.5 to 0.8. This is not a problem; you just need to note down what this reading is, as you need to subtract it from subsequent readings.

Always check your bodywire first, because you will be using this to check the rest of the equipment. Do not assume that just because it is new, it will work perfectly. Visually inspect the wire. (If you have a clear sheath wire.) See if there are any obvious breaks. It is possible for a wire to work intermittently if the wire is broken as the sheath can hold the wire together.

#### *Bodywire- three pin plug*

Look at the three-pin plug of your bodywire. The centre pin corresponds to the centre of the bayonet (i.e. the pin on top). The far pin (the one with the biggest gap) corresponds to the outer part of the bayonet (the roundshoulders) and the near pin corresponds to the lamé clip.

Test each as you want to see 1ohm or less resistance in each line. DO NOT FORGET to subtract your original multimeter measurement as mentioned earlier.

Bodywires can register a consistent 10–20ohms before they start showing white lights but you obviously have a problem that you want to sort out if the reading is this high.

Pull on the cords as well to make sure that the integrity of the cord is sound and that the sheath isn't holding broken wires together.

Then plug in your bodywire to your weapon and put the crocodile clips onto the centre and far pin. Take a reading and subtract the previous figures. You now have your weapon reading. If it is too high or there is no reading at all, you need to take a look at what is causing this. The following pages will give you a start on diagnosing and resolving.

## Very Basic Foil Armoury – TOOLS

### Basic tool kit

- Safety glasses
- Digital multimeter with probe & crocodile clip leads
- Lightweight tabletop vice will do if you do not have a workbench and vice.
- Set of Jewellers screwdrivers
- Allen key
- Pair side cutter pliers
- Stanley knife
- Long nosed pliers
- Re-wiring chain (you can make this – see below)
- Adjustable Spanner/ or set of small spanners - you need 5mm, 6mm but you can get them really cheaply in packs of 10 which range from 2mm to 10mm.
- Molegrips for removing really stubborn pommel nuts
- Point insertion tool

### Consumables

- Half a very small hacksaw blade if you do not own a Dremel
- Glue
- Cleaning fluid
- Blade tape
- Tip tape
- Cotton buds (nice strong well constructed ones)
- Small soft sanding block/fine grain sandpaper
- Wire insulation sheathing
- Threadlock

### Basic Spares

- Springs
- Grub screws
- Wires
- Tips
- Barrels

## Making a Re-wiring chain

When you rewire a blade, you will be bending it to seat the wire and to make sure that it will not break during extended flexing. So you need to find a way to hold the blade in a bent position so you do not have to sit and hold it while the glue dries.

You need:

- about 1m of 3.5mm galv chain from B & Q.  
My local will cut whatever length you specify but you get charged per metre. You need enough to make your blade bow as you will be attaching an end of the chain to each end of the blade. Get galv chain as it is easy to remove some links if the chain is too long.
- 6mm butterfly (wing) nut and a bolt to fit
- 2 x 22mm plumbing cap from either B & Q or your local plumbers merchant. Ask for a "22mm endfeed cap". Get brass as it is soft and easy to drill.

Drill a small hole in the side of the cap, about 3mm from the rim. Open the last link of the chain, pass it through the cap, and use a pair of pliers to close the link once it is connected to the cap. Use the bolt to secure the wingnut to the chain to make sure you don't lose the wingnut.

You now have a re-wiring chain.

## Very Basic Foil Armoury – REWIRING A BLADE

### Re-wiring a blade

Keep a bit of rag handy. In fact always keep a bit of rag handy!

If you are assembling a new weapon (i.e. you have bought a new bare blade), then wipe down blade with cleaning fluid as a lot of manufacturers coat blades with oil to keep them in good condition during storage and transit. Obviously, you are going to be fighting a losing battle if you are trying to glue your wire into an oily groove.

### Dismantling

Dismount the handle and guard.

Turn blade so that it is pointing tip uppermost. Clamp in vice. Much better to have both hands free for this next stage.

Depress tip and keep depressed. Undo grub screws enough to release tip. You will feel the pressure change under your fingertip. If you do not keep a finger on the tip, when you release the grub screws, the tip will fly out and hide itself in the carpet, under the table, in your sock, in your dog etc. Keep a magnet handy if you are down to your last two grub screws as it will help you find them.

Check tip for wear and if looks okay, clean it and put it somewhere safe. Remove the grub screws and check these for wear, clean them and put them with the tip. If they show any wear then throw them away and use fresh ones.

Use the cleaning fluid to clean barrel with a cotton bud. Repeat until cotton bud comes away clean.

Gently remove blade from vice and tap tip end on table to bring out spring. Replace if it looks tired or worn. If you want to reuse, place spring on jewellers screwdriver and pull gently to restore 'bounce'. This will work for short term use.

Use your small spanner or adjustable spanner to undo barrel from blade. Put it with the tip and grub screws. Remember that you can't mix and match different manufacturers' tips and barrels – they will not work together.

Also remember that you can't mix and match different manufacturers' wires and tips and barrels as they are constructed differently.

### Stripping out old wire

Strip out the old wire and glue. People use different methods such as acetone and scraping – simplest is a heatgun to remove the wire – use the long nosed pliers to hold the wire as it comes up out of the blade so you don't burn your fingers. Remember when you have finished that the blade will be hot.

Use a dremel if you have one to remove glue residue. If you do not have a dremel then half a small hacksaw blade works but is slower. Make sure you get all the old glue out. This is of critical importance. A little bit of residue will make the new wire stick up, and make it vulnerable to damage. Make sure there are no metal slivers as these may cause short circuits later on. Clean blade with cleaning fluid.

Cut 1 piece of tape about 1in long, and put it where you can get at it easily.

Wind the 6mm wingnut onto the tang, as far as it will go.

### Putting in new wire and replacing barrel

Wrap the piece of tape around the tang - just at the shoulder, where the blade starts. The point of this is if you overdo the glue a little, it will stick wire to PVC tape (which doesn't work very well) instead of sticking wire to tang (which works very well indeed).

Pass about 3in of wire through the barrel (no more) making sure that the cup/contact end is in

the right place - i.e., at the open end of the barrel. Make sure that the wire moves up and down easily.

Fix the blade in a vice, tip upwards. Thread the barrel onto the blade, using just a touch of Threadlock if you have it. Ensure that you grip the base of the barrel as gripping the tip may cause deformation of the barrel. As you tighten in, keep moving the wire up and down to be sure it isn't getting pinched. Make sure that the barrel is tight on the blade or the barrel will eventually unscrew itself from the blade after repeated hits.

The reason for only passing a few inches of wire through the barrel at this point is that if the tightening process nicks the insulation, it will nick it at the point that you will cut off and abandon and you will still have a useable length of wire.

Once you are sure that the barrel is tight, gently pull the wire through, until the cup/contact is at the top of the barrel. Use an insertion tool to push it in, at the same time pulling the wire so it does not crimp up inside the barrel, under the cup. Make sure that the cup/contact is firmly seated. You can use a screwdriver for this but an insertion tool is easier.

Place the tip in the 22mm cap end of the chain, and pull the blade into a 45-degree bend. Link the other end of the chain to one of the wings of the wingnut on the tang. This should hold the bend in place. Locate the wire in the groove, using the fact that you can tension against the radius of the bend to keep it in. Wrap the other end around the taped end of the tang - first coil towards the end, and then back over itself to secure.

Check to ensure the wire still in the groove. Then loosening the chain for a second, retension the blade until the bend is about 90 degrees, or even a little more on a maraging blade. This will seat the wire more firmly in the groove. Then hook the chain back onto the wingnut to hold in place.

You should be holding something that looks a bit like a bow, without the arrow. Holding it tip uppermost, use a low-viscosity glue, running it into the groove from about 1 inch below the tip. Capillary action will make it run up the fabric insulation. Work your way down the groove, wiping off excess with the rag, until you are about 8 inches from the bottom. Hang up to dry for 5 mins (tip still uppermost).

Once it is dry, or at least tacky, reverse the weapon so the tang is uppermost, and glue again, starting from about 1 inch from the shoulder, and working towards the point where you finished earlier. Keep wiping off that excess glue.

Leave to dry again. Remove the tensioning chain and the tape.

Reverse the natural bend of the blade to see if any part of the wire pops up (bits you missed when glueing). If there are any, re-tension the blade, glue the dodgy bit, and allow to dry. Repeat until the wire is firmly bedded in.

### **Assembling your foil**

Place blade in vice with tang uppermost. Cut enough wire insulation sheathing to fit over wire and leave wire bare to fit around screw in bayonet pin without either having miles of flapping wire in your guard or pulling the wire taught from gap to socket.

Put wire through guard (you will see a hole cut for wire to pass through) and fit carefully onto blade making sure that you do not pinch the wire.

Fit the socket on, again being careful as you pass the wire through hole. For a right-handed person, you will be putting it on the left hand side. For a left-handed person, you will be putting it on the right hand side.

Strip off the insulation material on wire. On Leon Paul wires, you need to strip off the fluffy white cotton. On All-stars wires, you need to strip off the lacquer and cotton. Use the sanding block for this or a strip of sandpaper.

Undo screw on socket a little way. Wind wire snugly around and retighten. Cut off excess wire.

In foil, you may tape wire down to guard to secure it. (In epee you cannot.)

Fit the grip, making sure that the slot in the handle is fitted so as not to nip the wire. This is important so check carefully. Tighten the grip.

Reverse the blade in the vice and tape the blade and tip. It is best to tape in two sections, do the blade first by putting on a length of blade tape slightly overlapping the shoulders of the barrel.

Regulations state that the tape length must be 15cms from top of blade. I understand that no-one bothers to enforce this at competition apart from in the USA. Allegedly. Your call, then as to how seriously you take this. Then do the tip, being careful not to tape in to the gap where the tip travels downwards.

You are done.

## Very Basic Foil Armoury – FAULTS AND CHECKS

### Faults and checks

Hopefully your blade worked after all your hard work. If it did not, you may not need to despair and instantly start setting about a complete re-wire. See 'Foil Mechanics' for starter information on testing. There is more on the following pages on how to diagnose and resolve faults. Always start with the bodywire and check this is working properly first. You do not want to set about a complete rewire and then find out that it is your bodywire at fault.

### Mending/cleaning

The contact screws need to be kept tight. The pressure of the wire insulation on the penetrating head of the screws can cause them to start to back out a bit. Additionally you can get grit and/or corrosion between the screw and the wire, which will interfere with conductivity.

Pull down the rubber boot and back the screws off a quarter turn and then retighten them. This will help break-up any layer of corrosion and ensure a good contact between the screw and the wire.

### *Leon Paul type*

If the break is near the end then you can pull through, cut off faulty bit and retighten. As the screws are penetrating ones, you do not need to strip – they make the connection when they are driven home. With this type, it is much easier to pull through first and cut afterwards, as you will not then have to feed the wire through the small hole.

### *Dual pin/bayonet type*

To mend, pull through, strip and feed wire into hole.

### Lamé end of clip

This has the most regulations attached to it, as it will mean that an opponent's hit will not score if it is faulty. You must resolder if you have mended the wire on this end.

### Storage

If you will persist in throwing your bodywires into your bag with your sweaty kit and your blades all in a glorious jumble, then you have only yourself to blame when they fail. Put the bodywires either in the outside compartment of your bag if you have one or get a small bag and put a silica sachet in as well. Obviously take the wires out to air when you get home.



## Very Basic Foil Armoury – COMMON FAULTS

### Common faults/failures

**Problem: Clean hit scored (e.g. you see point land in middle of chest) but no light appears.**

Reason: You have not taped your blade properly and both the tip and the blade are coming into contact with the lame.

Solution: Tape your blade properly - FIE regulations state 15 centimetres from tip of blade.

Reason: Your grub screws are in too tight.

Solution: Remove, examine for wear and replace if necessary. If they will not hold tip, check tip is right for barrel.

Reason: You are not hitting properly.

Solution: Miore practice!

Reason: Friction between the barrel and point is preventing the point from depressing.

Solution: Slap on the floor to loosen it; otherwise clean or replace the tip.

Reason: Spring is too heavy.

Solution: Compress it or heat one end with a match.

Reason: Opponent is grounding his weapon to his/her lamé

Solution: Tell her/ him to stop; it's illegal.

Reason: The wire has come away from the connector screw at socket in guard

Solution: Change weapons and mend at leisure.

Reason: The wire is broken along the blade.

Solution: Change weapons and mend at leisure.

Reason: You are grounding your own foil to your opponent's lamé.

Solution: Improve the insulation on your foible (15 cm is required).

Reason: The foil wire is shorting to the weapon.

Solution: Check the integrity of the insulation along the wire and beneath the cushion. Also make sure no wire ends at the clip are touching the rest of the weapon.

Reason: The scoring box is on the wrong weapon setting.

Solution: Hmm.

Reason: There is a short in your body wire.

Solution: If there are no lights when the weapon is unplugged, but there are lights when the body wire is unplugged from the reel, the body wire is at fault.

**Problem: Intermittent white light.**

Reason: Your guard is loose and is therefore breaking the circuit.

Solution: Tighten handle.

Reason: There is dirt in your tip.

Solution: Spin tip to clean or dismantle completely, clean and reassemble.

Reason: The spring loaded bayonet socket is broken.

Solution: Throw it away and replace.

Reason: Broken wire, especially near tip so that it is okay when you test but when flexed, circuit is broken.

Solution: In extremis (ie competition and you have no other weapons) apply clear nail varnish to break. This is not going to work for more than a couple of hits and is not even guaranteed for this. But if you have no other weapon, then you might as well try it. Proper solution is a rewire.

Reason: Loose barrel.  
Solution: Tighten carefully. Might break wire.

Reason: Soft or short spring.  
Solution: Use foil weight test. If fails, replace or stretch spring.

**Problem Permanent white light appears**

Reason: Fencer not plugged in.  
Solution: Hmm.

Reason: Ground lead has pulled out of spool.  
Solution: Hmm.

Reason: Connector pulled out of socket in guard.  
Solution: Replug.

Reason: Wire is rising up from blade.  
Solution: Change weapon.

Reason: Faulty bodwire.  
Solution: Change bodwire.

Reason: Rusty grub screws.  
Solution: Discard and replace.

**Problem Weapon Fails Weight Test**

Solution: The spring is too soft. Stretch the spring or get a new one.  
Solution: Friction between the barrel and point is overwhelming the spring. Clean the inside of the barrel, or replace the entire tip if it is bent or warped.  
Solution: Too much tape on the end of your blade is jamming against the sides of the weight.

**Problem: Valid touch produces a white light**

Solution: Opponents lame is not connected – ask the referee to check.  
Solution: Opponents bodwire is broken. Ask the referee to check. (Diagnose by testing at the lame clip and at the reel wire connection.)  
Solution: Opponents lame has a dead spot. Ask the referee to check.  
Solution: Your foil bodwire polarity is reversed. Disassemble and reverse the connections.  
Solution: The exterior of your foil point is dirty/corroded. Change your weapon.

**Problem: Foil produces white lights when tip is not depressed.**

Solution: The tip is jammed shut. Spin the point or slam on the floor to free it.  
Solution: Grit in the tip is breaking the circuit. Spin the point or slam on the floor to dislodge the grit.  
Solution: The barrel is loose, tighten carefully with pliers.  
Solution: The foil wire is broken. If the light is intermittent, try flexing the blade to induce the white lights; success means that the wire is probably broken. If the lights are triggered by shaking the blade, the point or clip may be to blame.  
Solution: The circuit is breaking at the clip. Check that the bodywire is held securely at the clip.  
Solution: The bodywire is broken. Diagnose by shorting the two connections on the weapon end of the bodywire; if the lights continue then the bodywire or reel is at fault. Short the two close prongs at the other end of the bodywire; if the lights stop, the bodywire is to blame. If not, see next.  
Solution: The scoring apparatus is broken. The connections, reel wire, reel contacts, floor wire, or scoring box may be at fault.  
Solution: The guard is loose, tighten the pommel or pommel nut.

## Very Basic Foil Armoury – LAMES

### Checking lamés

Clip one lead of the multimeter in to the lamé bodwire clip and use the other to work across the lamé. Check readings on multimeter.

### Mending

Theoretically it is possible to patch lamés but most people do not bother, as it is difficult to get it even and flat. If you are going to do it, you need to fold the edges down around the piece of patch before attaching it to the lamé. Expect some objections from your opponents and definitely expect to have it looked at closely at competitions.

### Care of

If you leave your lamé in your bag, you can expect it to go rusty. Pack it inside out and roll loosely rather than fold as folding tightly will eventually cause wear along the creases. Hang it up to air and dry as soon as you get home. Don't leave it bundled up with wet kit and blades.

### Washing

Don't. There's no need to wash it just because it smells bad. The only time you should wash it is if you inadvertently leave a mars bar rolled up in it and the only way you will ever remove it is by washing. Use warm water and a mild detergent like woolite and a gentle hand. Hang up to dry (it takes ages). But really, do not wash unless you absolutely have to.

### Rust

This gives high resistance. You can remove it with lemon juice and vinegar. But it won't go rusty if you look after it as above.

### Very Basic Foil Armoury – BROKEN KIT CONVENTIONS

**It helps everyone if broken kit is immediately identified and not put back into store to be confused with working kit.**

No leads, boxes or spools should be used if the connections look damaged or faulty.

Spools:	Wind a couple of turns of the lead round the body and secure. Tell the armourer/coach
Faulty leads:	Should never be used. Plug should be removed and the armourer/coach informed.
Broken box:	Wind a couple of turns of the lead round the body and secure. Tell the armourer/coach.
Broken weapons:	Should be dismantled immediately and the broken blade stored in a safe place for disposal. Tell the armourer/coach.
Faulty mask:	Should be identified to the armourer/coach immediately and destroyed.
Faulty weapons:	Find the armourer/coach and explain problem. Tape and place in designated area with tape
Faulty bodywires:	Find the armourer/coach and explain problem. Tape and place in designated area.
Faulty lamé:	Find the armourer/coach and explain problem. Tape and place in designated area.
Damaged jacket:	Find armourer/coach and explain problem. Tape and and place in designated area.