Rex's Wiring Essentials:
Fitting or replacing windings to RMK stators

Skill Level: Expert

Our RMK ignition kits are supplied fully assembled and must be fitted and used as supplied. For owners wishing to modify their kits it may be possible to retain the bike's original 6 volt electrics by fitting the 6 volt winding from the original generator to the new billet stator plate. Please be aware that fitting standard windings is not possible in all cases and this publication does not cover every OEM generator configuration. The advice given in sections 2 & 3 should also be followed when replacing a failed winding. If you have a points magneto where the lighting is connected at the condenser to the ignition source coil, also see section 4.

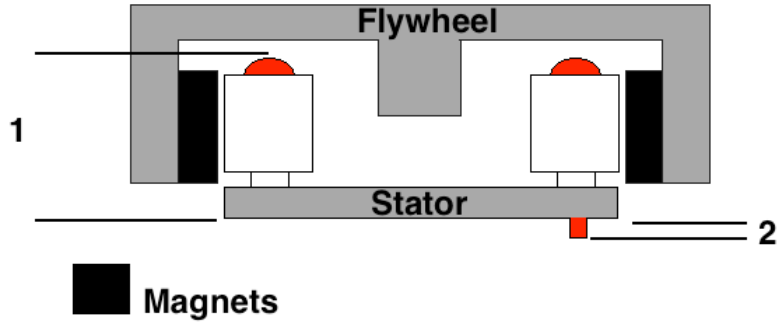
We stress that a great deal of skill and experience is needed to carry out this work successfully. The ignition kit or the engine can be damaged beyond use by in-expert assembly or set up.

Adding original 6 volt lighting coil works best where only a single lighting coil was used also the intended winding is in first class condition. If the insulation end pieces are missing, the copper is loose on the steel core, the magnet wire is discoloured or there is corrosion the winding may not be suitable for re-use. The next issue is that many DT models came with an additional ancillary winding to aid the main one. While these can be transplanted it is essential that the person carrying out the work makes detailed notes and diagrams of the wiring and assembly details as unless we have that generator mapped out we may not be able to tell you how it was connected! We reserve the right to make a charge for our technician's time in sorting out your technical issues.

We have designed a single 12 volt lighting coil (p/n: LC-3) for 1974-79 DT generators which produces enough power on its own and does not need any auxiliary windings, making it easy to mount and wire with only two wires to connect. With our 12 volt combined regulator rectifier this becomes a straight forward route and avoids complicated mounting and wiring issues. The 12 volt system gives other advantages such as a boost in lighting performance and makes the indicators reliable too. Bulbs are easier to obtain in 12 volt as many are used for cars as well as bikes.

Section 1: Removing and preparing an original lighting coil for re-use

Before removing anything from the stator place it on a flat surface and accurately measure the highest point (1). Usually this will be a fixing bolt or insulation piece, record this figure. Other dimensions that must be observed are any protrusions through the back of the stator plate (2). Generally the highest point must never be exceeded unless there is enough clearance under the flywheel to accept a taller winding. Note there may be rivets or other protrusions inside the flywheel. Many DT 250 and IT400 models have very limited space even with the standard lighting coil, therefore great care must be taken to avoid rotor contact with the windings. Even a slight contact will damage the winding beyond repair.



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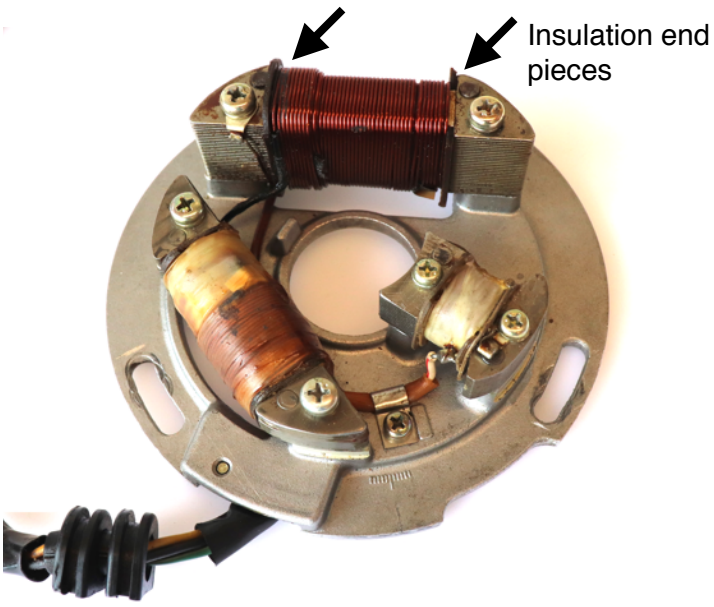
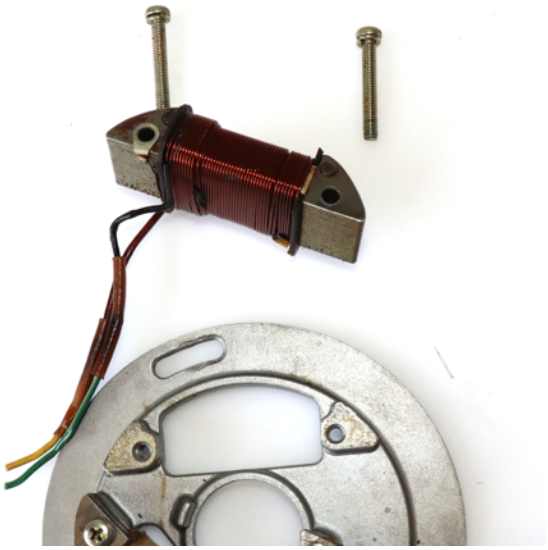
It is usually easy to identify the lighting coil as in most cases it will be noticeably larger than the others. One of the factors that determines how much power a generator can make is the weight of the iron around which the copper windings are formed. Only a few watts of power are needed for ignition, however at least 60 or 70 watts are needed for lighting and battery charging, hence lighting coils are generally larger than ignition source coils.

There are some exceptions, the Yamaha TT500 has a lighting coil that is the same size as the ignition source coil. Some bikes have an additional auxiliary lighting coil, these are mounted above and are roughly the same size as the ignition source coil. You will need to take great care in identifying each winding.



Remove the winding



Cut the loom away from the stator, unscrew all the windings and separate the wires. Leave the 'tails' long ('tails' is the name for the solid wires coming from the winding).

The next step is to offer the lighting coil up to the new back plate and determine where the wires will run and where best to join the coil to the new loom wire. The joints tend to make the wire bulky and inflexible at that point so careful consideration is required in positioning the joint. Do this before trimming the tails. You should use 1.0mm, 16 amp, thin wall wire to connect the winding to the bike's wiring loom.

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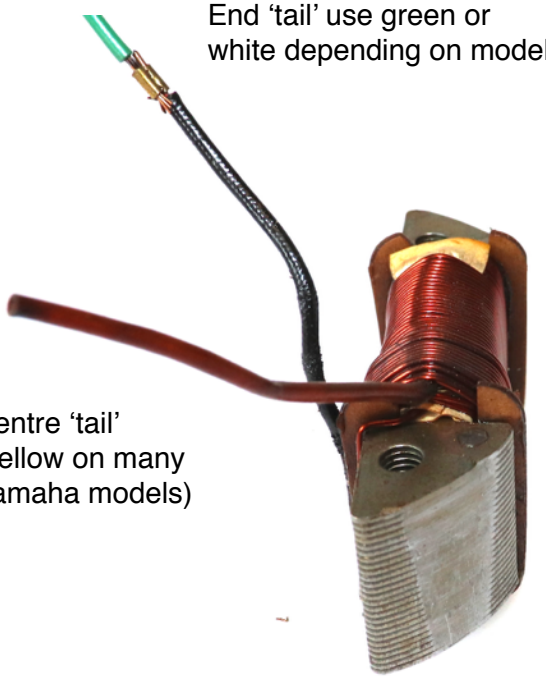
Identifying the lighting coil wires

These systems give a lot more power than the size of the generator suggests is possible. This requires a specific type of generator winding, earthed at one end and with tappings to supply the AC and a separate one for the DC.

If you look closely you'll see that one wire emerges from the middle of the winding and one from the very end. On Yamaha DT/XT models the one that emerges from the middle is normally yellow. For DTs the end is green while for XTs it's white. Look closely and determine which emerges from the middle and which is the end.

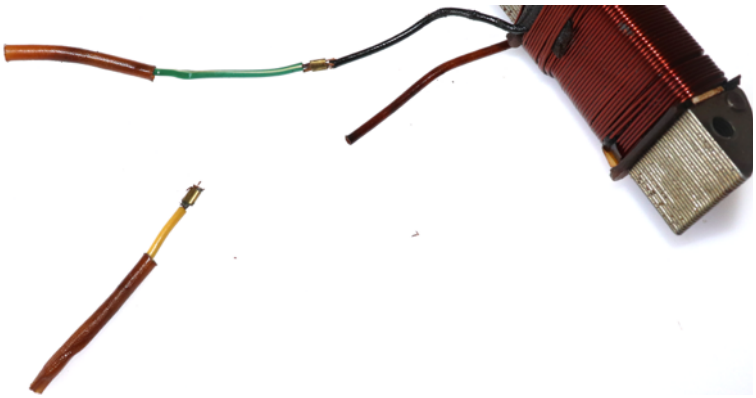


There is no need to contact us if yours has different wire colours. Simply determine the wire from the middle and then the top and make a note of this. Its only important to know which is which. Please note that our technicians <u>will</u> charge for their time in responding to your requests for advice regarding wire colours.

"Lifted Earth Modification"
The standard generator is able to give more power than its size suggests due to the fact that most of its power is not rectified. Rectifiers get hot and this is wasted power. Converting this type of winding to fully DC causes significant losses, to the point where most of the useful output is wasted as heat. Most people who try this modification are not aware that, with the lights on, the battery is not being charged until the engine is at 4,500 RPM. Its worth to note that our company does very few rewinds on the standard lighting coils of this type. However if they have had the lifted earth mod carried out we see burnt out examples very often.

Joining wires to the winding

The loom wire is joined to the solid magnet wire by an in-line splice, or by just soldering it. Its important to understand that magnet wire has a thin coating of insulation on it, although it appears to be copper in colour this must be scraped away to allow a good electrical connection. Its best to cut the old splice off, leaving the tail as long as possible and strip back a fresh portion of wire:



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A craft knife can be used to scrape off the tough layer of enamel insulation from the magnet wire.

If you do not remove the copper coloured insulation, the winding will not produce any power, no matter how tightly you form any crimp to the winding tail.

Enamel insulation on wire

Most alternator wire is not 'solderable' so soldering will not melt the enamel away. The only way to make an electrical connection is to physically scrape the enamel off the wire.

Enamel insulation scraped away

Shown (left) is a 'bootlace' splice, these are supplied in many of the universal hardware kits. Note kits for new 12 volt lighting coils will not have these if the wires come pre-attached to the winding. Universal kits contain the insulation, connectors, splices and a selection of useful hardware and electrical connectors.

Use a sufficiently powerful soldering iron to heat the joint. Generally 25 watt irons simply are not powerful enough as the winding will sink away the heat. A 40 watt is the minimum needed.

Make sure the solder has flowed fully around the winding tail and throughout the joint.

Note that on the tail from the middle you may need the larger splice to accommodate the double wire.

- Ensure the solder is smooth and has penetrated the joint fully.
- Sharp spikes will puncture the insulation and short the winding out!

DO NOT leave spikes of solder at the splice

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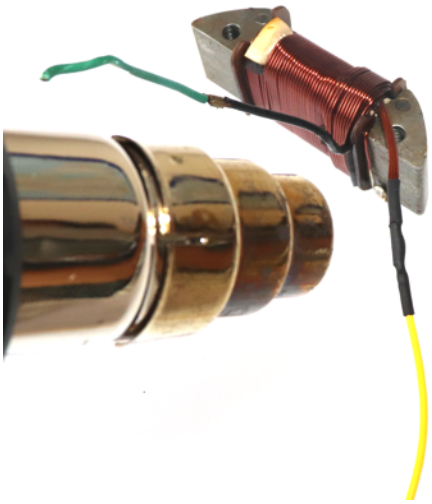


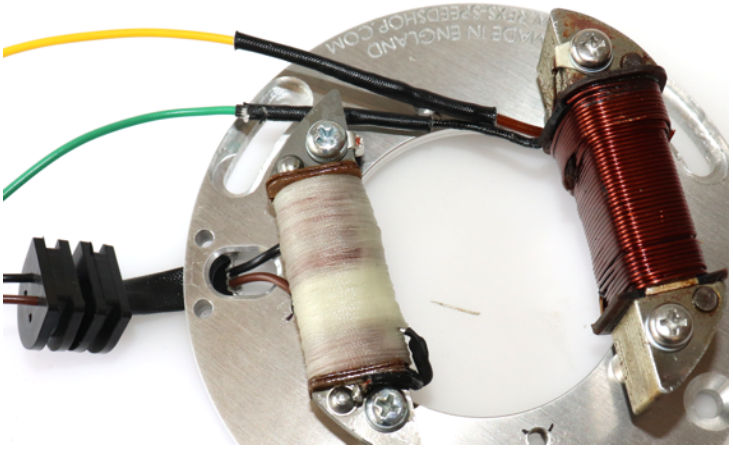
Heat shrink is applied over the splice ensuring the joint is completely covered.

Slide a piece of high temperature sleeve over the heat shrink to protect the joint from heat and abrasion.

Section 2: Fitting a winding to the stator.

Follow these sections when replacing a failed winding or re-using a 6 volt lighting coil. When replacing a failed winding, simply reuse the hardware already there. If fitting a winding where there was none there is a selection of hardware kits available on our website that contain essential parts; -bootlace splices, high temperature insulation, spacers, screws, grommets and connectors. They are listed according to the diameter of the retaining screws used on the stator. Some kits are specific to a lighting coil.

It is important to ensure that the wires are run so that they do not contact the rotating flywheel when the generator is assembled. If you imagine a circle at the same diameter as the radiused ends of the windings, all wiring must be inside of it. This can be achieved by careful positioning of the wires and using the opposite winding as a guide to run wires under.



Caution: Where wires pass through a hole it is important they are protected with an over sleeve.

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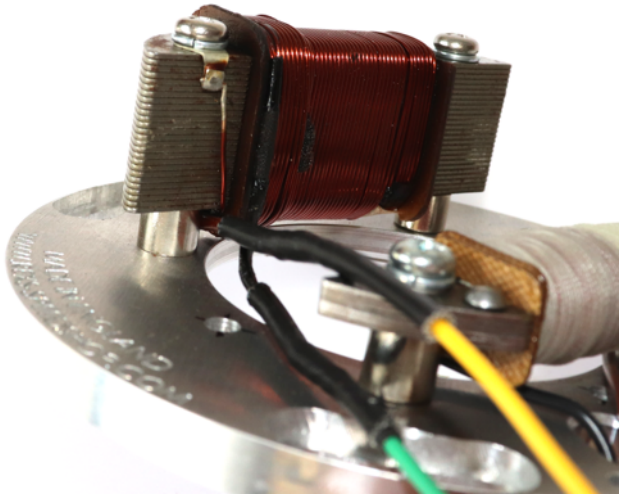


Select the shortest spacer that allows the winding to sit with its lower surface clear of the stator plate and the upper clear of the rotating flywheel, compare the figures obtained from the original stator to check the height of the new assembly. You must fit the generator to the engine at this point, fit the flywheel and rotate it carefully by hand ensuring that the flywheel does not contact the top of the windings. Even a slight touch or rub can easily destroy the winding. It can be timing consuming to find a spacer that allows both the copper windings to be clear of the stator and the flywheel. You may have to machine a longer spacer down. Sometimes you cannot avoid the insulation pieces touching the stator, these can be dressed down with extreme caution. Do not touch the copper! Even a slight contact with a tool or abrasive will remove the enamel from the magnet wire and damage it, if this happens the winding will overheat and burn out. The spacers included have been selected so they fit without machining for the majority of cases, but checking the running clearance is essential.

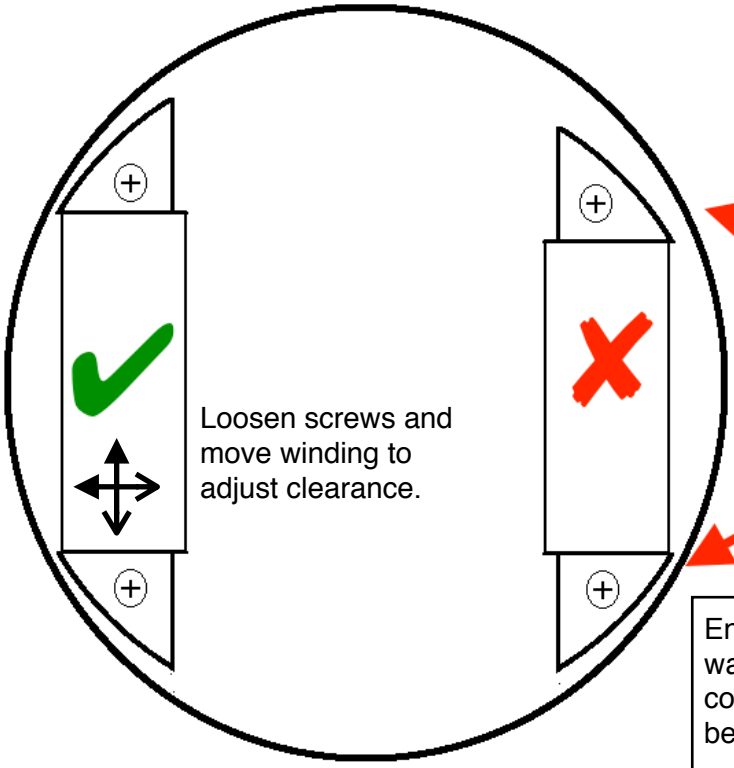
Section 3: Adjusting the winding - magnet end gap clearance

While the stator is fitted to the engine the clearance of the winding to the rotating magnets must be checked. Our RMK ignition kits & standard stators come with the windings mounted to the stator concentrically. A specially made assembly tool is used to ensure this. You can achieve the same results by slightly loosening the retaining screws so its possible to manipulate the winding to achieve equal clearance at each of its ends. This is tricky as the magnets will pull the winding towards them. To over-come this, pieces of cardboard can be placed between the magnets and the winding as shims while the screws are re-tightened. Remove the cardboard before starting the engine as it can jam and cause the winding to be torn away from the stator as the flywheel rotates. Alternately you can remove the flywheel, adjust the position of the winding, then re-fit the magnets and re-check your adjustment.

If there is no other specification given adjust clearances to between 0.3-1.0mm and equal at each end. Use 0.5 - 1.0mm for DT and XT windings, a large winding will expand more as it heats up, therefore this range is safer than 0.3 to 0.5mm. It is important to get the clearance as equal as possible. Generator performance is dramatically affected by an incorrect air gap. If the gap is too small the windings will expand to touch the magnets causing friction between the two parts. Even a slight contact will cause enough heat to burn out a winding within in a very short time. If the gap is larger than 1.0mm or the end gaps are different sizes the electrical output reduces dramatically.

Once correctly adjusted ensure the winding retaining screws are torque tightened. See the shop manual for your bike for this information. Where no specific figures are quoted use the standard torques for the diameter of fastener. Thread lock and shake proof washers must be used.

Warning: Your warranty is void where winding clearance checks are not carried out and the generator fails or is damaged due to contact with the flywheel - this includes re-worked or repaired stators that we have supplied. Final assembly is YOUR responsibility!



-Ensure gaps at each end are the same.

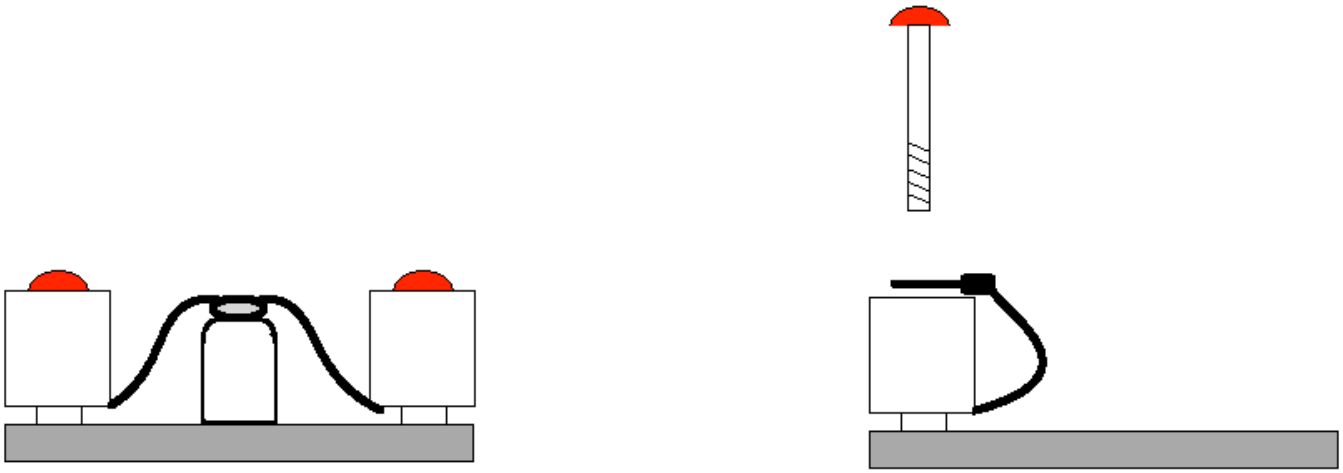
-Avoid excessive clearance.

Ensure that the retaining screws are tight, use spring washers under the screw head and thread locking compound on the threads to avoid the screws becoming loose.

Injury or damage to parts may occur if these screws come loose when the engine is running.

Section 4: Interconnections Between Lighting and Ignition Source Coils

Where the lighting and ignition coils have been joined at the condenser (points ignition models) the lighting coil can be used if the connection is removed from the condenser, leaving the tail as long as possible. The tail should be fitted with a ring terminal and then earthed via the retaining screw, refer to the splicing section as the magnet wire is insulated.



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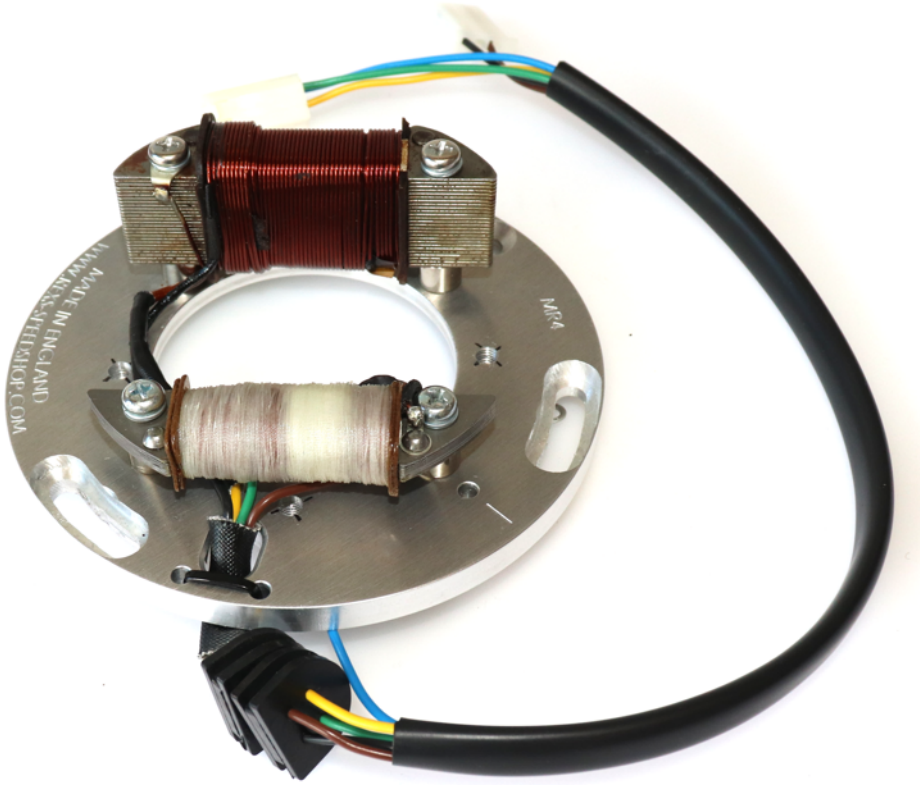
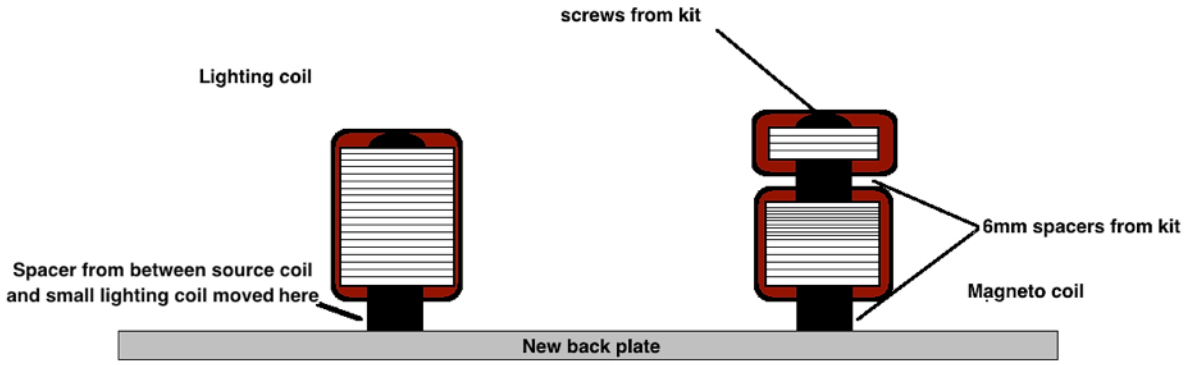


Above is an 'ignition only' RMK stator kit converted to supply 6 volt lighting using the lighting coil from the original generator. The lighting and charging is separate from the ignition, therefore using 6 volt lights does not reduce the up-graded ignition in anyway. Note the wires are tucked well away from the rotating magnets, sleeving has been used to protect the wires as they pass through the stator and the leads fitted with the right connectors to suit the bike's wiring loom. Note on XT500 kits there are holes drilled at the 6 and 12 O'clock positions to allow the wires to be fixed to the stator with cable ties.

Addendum: DT360/400 1974-76
Some of these models had an auxiliary winding over the CDi source winding. You can transpose this on to the new stator using spacers and screws from a hardware kit. Where the winding is present but with no copper magnet wire, there is no need to fit a blank winding to our ignition kits.



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