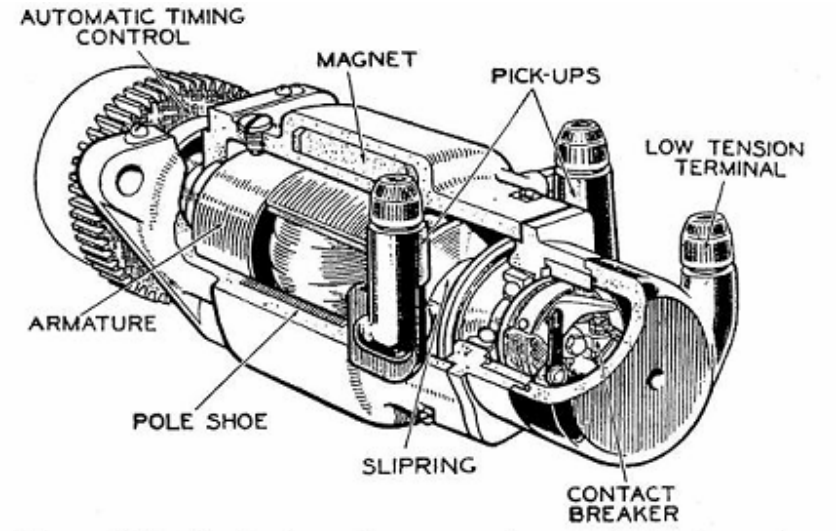
Magneto Tips

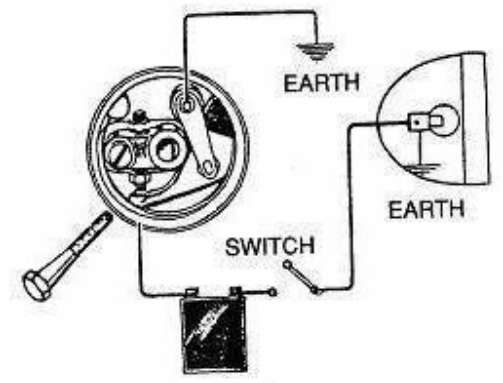
Forward: this document is intended as a simple guide containing tips for the servicing and maintenance of Lucas and BTH magnetos – both makes being basically of the same design. Contrary to popular belief, Lucas and BTH made quality instruments and most mags fail either through not having been serviced properly, or though age alone. This guide is not about re-building magnetos – that is best left to a specialist, as much specialized equipment, knowledge and experience is needed to do a competent job. Instead, it is about maintenance and diagnosis of common magneto faults, so that you have an idea of how to maintain your mag in good health and can diagnose what is wrong if your mag needs re-building. This will help you select a competent re-builder.

Most – if not all – of these tips come from various period publications, including original Lucas manuals, and have stood the test of time. Whether or not a tip works for your particular bike is up to you to decide. Use them at your own discretion.



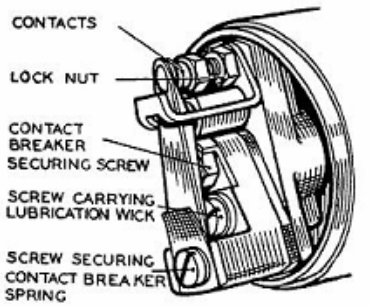
Type: K2F—For horizontally opposed or vertical twin engines.
Type: KVF—For vee twin engines.

Timing. One way of adjusting the timing on your bike is to use the lighting system as a test light. You can do this by taking out the center bolt holding the points plate (leave the plate in place), disconnecting the battery earth or ground (-) and connecting a lead between this ground wire and the insulated or stationary part of the points or contact breaker. Make sure no contact is made with any other part. Switch on the lights and check that they go on and off when the points open and close. If they do, the exact instant of opening is given by the lights dimming visibly just before they go out and with a little practice, you can get your timing exactly on the mark.



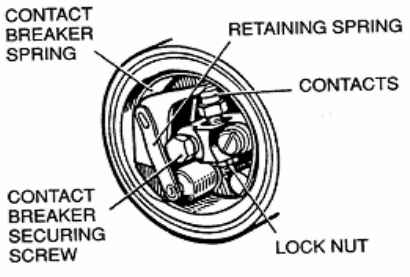
Using the Bike as a Timing Light

Lubrication. Pivoting arm type contacts or points should have the moveable contact arm lubricated at 3000 mile increments. Light machine oil (sewing machine oil), is used for this and for lubricating the wiper or wick found in most mags, to provide lubrication for the face plate or ring type points cams. One or two drops on the wick will do it. When assembling the cam ring or face cam, a thin smear of light grease on both sides is OK.

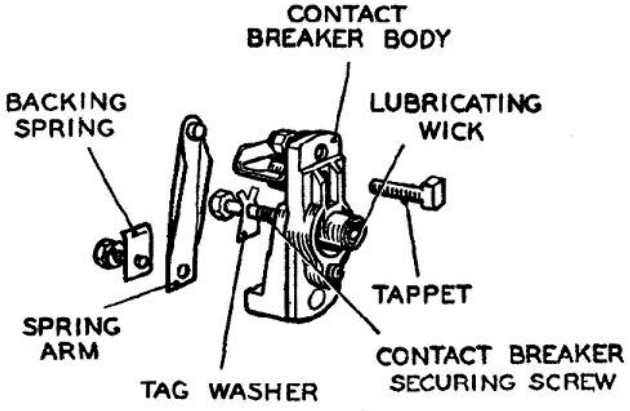


Face Cam type Contact Breaker.

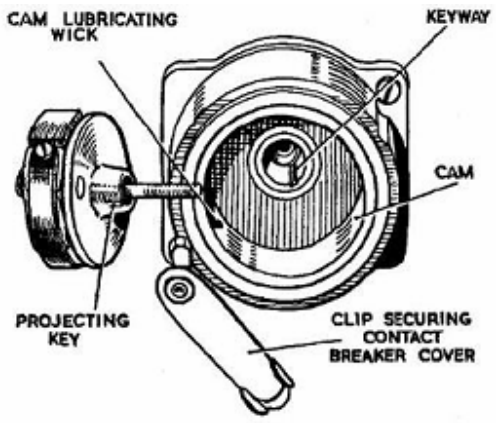
Inspecting the Points. Every 6000 miles, take off the contact cover and inspect the points. Points contact surfaces should look smooth and clean, with a metallic sheen. Pitting or material transfer from one contact to another is an indication of a failing capacitor/condenser, as is a whitish deposit around the contacts and possible hard engine starting when cold. A further indication of a failing capacitor/condenser is a flame like red/yellow spark at the points when the mag is operating. A bluish spark with the odd reddish spark thrown out occasionally, is normal. Points that are sticking at the pivot, will give poor running and mimic condenser problems. Check this first!



Contact points can be dressed, but usually the small files sold for this purpose are not effective as the point material is harder than the file. An exception to this is a flexible points file, called a Flex-file # 0002, 120 grit, .025" thick and non-conductive. They are made up of compressed carburundum grit in a flexible medium. These are made by the Rimac Company and are were originally for dressing voltage regulator contacts. Rimac is a part of Rinck-McIlwaine, Inc., Dumont, JF 07628 and are still in business. Clean dressed points to remove grit and dirt. A strip of white card stock or typing paper is good for this. Run it through the closed points until it comes out unmarked.



A Word about Condensers/Capacitors. These two terms are interchangeable. Original Lucas capacitors were made from layers of wax paper with one side coated with aluminum. Layered into a small metal box and sealed with solder, most if not all of these will have perished – even those offered on Ebay (at inflated prices), as "NOS, off the shelf." Solder is porous and the aluminum is very subject to corrosion. Save your money, unless you are looking for an expensive paper weight. All of the capacitors that I have seen used in Lucas or BTH are rated at .0015 MF. Any other rating will change the mag timing and reduce spark at the plug. If your bike is hard to start when hot, but starts well when cold or cooled off – you are probably experiencing condenser/capacitor problems and they will only get worse.

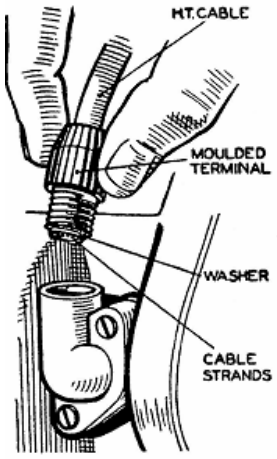


The capacitor performs two main functions: 1. It absorbs voltage and keeps the points from burning. 2. It "reflects" the electro-magnetic pulse back so that it arrives just when the points are opening and the magnetic field is collapsing – producing maximum voltage. If the capacitor is rated at a different value, the reflected wave will either arrive at the points too early or too late and spark intensity will suffer. That said, on a mag with a bolt-on condenser – like the Lucas SR1 – a common car capacitor/condenser will get you home and some of them – like the 6V V.W. condensers, are direct replacements - with a bit of modification to the lead and mounting point.

Hot running magneto. We are talking temperature here, not spark intensity. A mag that is running significantly hotter than the surrounding engine components is usually caused by the bearings being worn to the extent that the armature starts to rub internally, creating enough friction and heat to melt the varnish insulation on the windings. This will cause the mag to fail in short order.

High Tension Pickups. These are usually either held on with screws or a spring clip. Every 6000 miles, take them off and wipe the inside with a clean, dry cloth. Check that the carbons move freely and that they are longer than 1/8" from the shoulder. Clean the slip ring track by pressing a clean, dry cloth against it while the engine is slowly turned over. Replace missing packing or insulating washers, or the pickups will rub against the slip ring flanges, creating dust and marring engine performance.

Spark Plug wire or High Tension Cables. On magneto fired bikes, it is imperative to use only solid copper, stranded conductor wire – no carbon string or other types! Tinned wire is OK and some can be had in 7mm from Japan as well as Beldon (J.C. Whitney), etc. Secondly, use no more than one resistor component in the high tension circuit – such as a resistor plug or resistor spark plug terminal – none if you can get away with it. Do not solder the wires to the little copper washer at the mag end – just fold them over and splay the individual strands out. Use a rubber cover (not shown), at each acorn nut, to exclude water and one at the advance/retard cable - if fitted.



Renewing High Tension Cables.

When high tension leads show signs of cracking or perishing, they must be replaced. 7 mm. rubber covered ignition cable must be used for high tension leads.

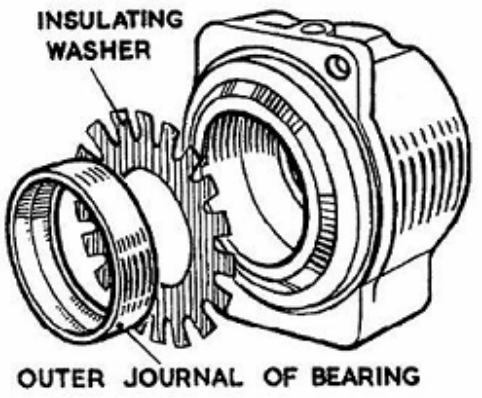
The method of fitting the cable is as follows:—

Thread the knurled moulded nut over the lead, bare the end of cable for about ¼ in., thread the wire through the metal washer provided and bend back the strands. Finally screw the nut into its terminal.

Mag Timing and Contact Gap. Lucas mags and distributors should be set as follows: rotating armature types - .012”-.015”. Rotating magnet types: .010”-.012”. Coil ignition: .014”-.016”. Varying much from these settings can disturb the magnetic timing of the spark and result in a weaker spark.

Service. Every 20,000 miles, our mags were to be taken off and sent to the Lucas factory for service. This service included testing, general cleanup, adjustment, lubrication and replacement of needed parts – most importantly any seal at the drive end. Since this is no longer possible, I would suggest replacement of the seal when oil shows up on the ground carbon or at 20,000 miles, as a simple preventative measure.

Seal Replacement: replacing a seal means almost completely disassembling the mag and removal of the drive end bearing outer race and its insulating “star” washer. Once disassembled and with the armature removed (don’t forget to take out the safety gap screws – hex shaped screws at the bottom of a K2F mag – or the slip ring will be damaged when you remove the armature), the mag body is heated until water will boil on its surface and the open end is tapped sharply against a suitable piece of wood. The bearing outer race and its insulating star washer should fall out. They are available through Mike Green in the UK and can be ordered through his website at www.magneto.co.uk . Save the insulating washer as you will need to measure it for thickness when replacing it. Measure a place that has not been compressed by the bearing race.



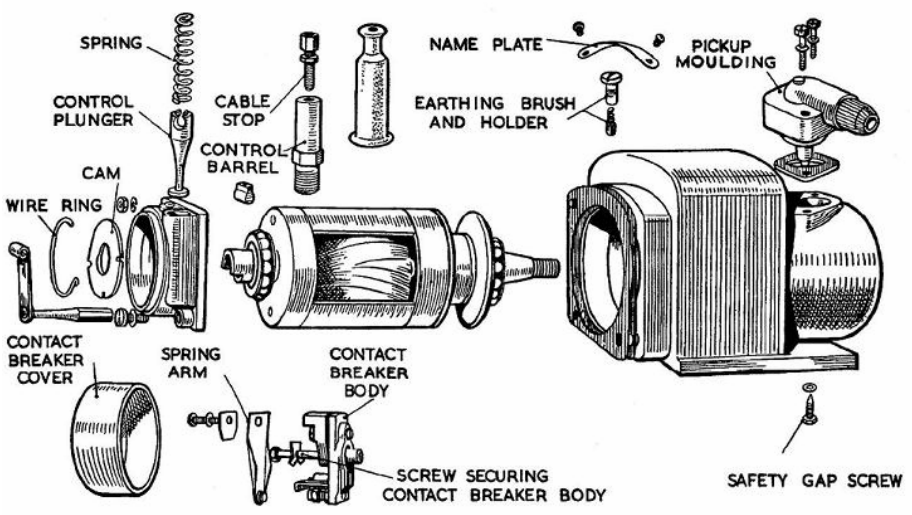
The seal should come out easily when pushed with a finger as the bearing race holds it in place – if it hasn’t been glued. Seals are also available through Mike Green. I like to use Hylomar to hold them in place as if this gasket dressing happens to extrude into the engine, it is still a liquid and will not clog up oil holes or damage pumps. Use what you like the best, but try to keep it thin enough to hold the seal without bits breaking off and getting into the engine – especially with RTV silicone rubber. Clean all traces of oil and old sealer off, before gluing the new seal into place. The spring on the seal goes toward the engine – we are keeping oil out of the mag. ;0)-

To replace bearing race and star washer: take the outer race and using solvent based contact cement in a very thin layer, coat the bottom and outside of the bearing race with it. Coat the star washer on one side as well. If using Mike Green's star washer, one side will be coated with plastic and the other is just plain paper. Coat the paper side with contact cement. Use the same thickness star washer, or the bearing spacing will be upset. Carefully position the outer race over the dried contact cement – you only get one try! – and press it home with the bearing race centered over the hole. You can use a piece of wax paper between the two, to position them properly, if you are the nervous type. Bend up the ears of the star washer until they are evenly spaced around the race and put a strong rubber band or piece of bicycle inner tube over the fingers to keep them in place. The rubber band will come off automatically when you push the race home.

Heat the case again to the point that water will boil on it. You will need some type of tool to hold the race while you tap it home. The perfect tool is a piece of aluminum round stock that is 2" in diameter and long enough to go into the mag body. This ensures that the race is inserted into the hole in the correct orientation. I've made ends for mine that interchange with the different inside diameters of the various bearings used in Lucas and BTH mags, but a wooden substitute would work as well. You can use two sided tape to temporarily hold the race to the tool while you insert it into the hole. Give it a few light taps to properly seat it in the bottom of the hole, or press it in with a hand press if you have one. You should feel the bearing hit bottom as you tap or push it in. If your case was heated properly, it should go in easily. Be sure the mag is sitting on a hard surface as you do this, as we don't want to break out the bearing hole retaining lip. The race will appear proud of the bottom of the hole or not pushed all the way into the bottom. This is normal and not a concern. Retrieve your rubber band. Use a Volt Meter set on Ohms to check that the bearing outer race is electrically insulated from the mag case. You should get zero reading with one probe on the case and another on the bearing race.

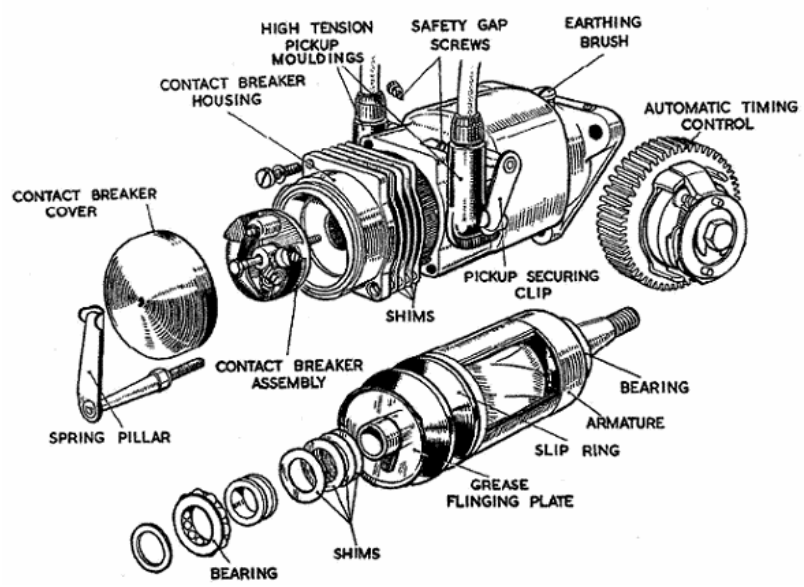
Having cleaned the bearings of old grease, re-fill them with grease about 2/3 of the way up the balls from each recess between the balls. Smear a light coat of grease inside each bearing race and smear a very light coating on the tapered drive end of the armature shaft – the part that will be going through the new seal. Make sure there are no burrs on the shaft that will damage the new seal. I use Marine Wheel Bearing grease – blue in color and made by Sta-Lube. It is waterproof and anti-fling off.

Your mag is now ready for reassembly and hopefully, you have checked all carbons, springs, the slip ring, that the cam ring is free to rotate (if it is a manual advance/retard model), cleaned and lubricated the points, etc? If you got the proper star washer installed and the bearing race was driven home properly, there should be zero – or very close to zero – end play when you attempt to move the armature sideways after re-assembly and it should rotate without much drag until it comes up against the magnet and past that. Too much or too little end play can be adjusted by either adding/subtracting shims from the points bearing housing or from between the inner race and the brass end. This requires a special tool to remove the inner race, but a bearing separator will work well.



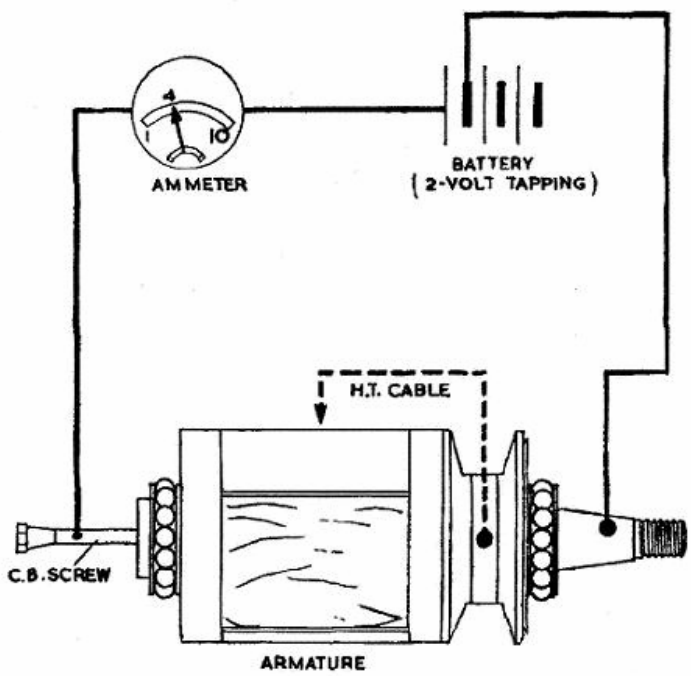
Typical N Model Magneto

Checking the Primary Windings. Primary windings can be tested by taking the armature out of the mag (don't forget to remove any safety gap screws first!), removing the bolt holding the points plate in place on its taper and removing the points plate and points assembly as one unit. Replace the points screw in its hole and run a lead from it to the positive terminal of a two volt battery (you can use two D cells in series – 3 volts – and the reading should be the same), with an ammeter in series with this wire. Now run a second lead from the negative side of the battery to the brass grounding segment (at the drive end) and you should get a reading of 4 amps. Much less than this – say 3.5 amps or less – indicates a failing primary winding – somewhat rare, but not unheard of.



Typical K Type Magneto

Testing the secondary or high voltage coil. Leave the positive battery lead as it is and twist a segment of solid copper wire around the slip ring (dotted H.T. cable in drawing), so that it contacts the brass slip ring segment. Run the other end to within ¼" of the armature body or laminated spool. Keeping your hands away from the armature, flick the lead from the negative side of the battery against the opposite or drive end of the armature. Doing this should produce a loud and fat spark from the end of the bare wire wound around the slip ring. If not, you either have a bad secondary winding – not rare at all – or a completely shot capacitor/condenser – not rare either and the two main causes of mag failure.



Testing Primary & Secondary Windings

Ground Circuit. Another thing often over looked is the ground carbon. Some mags use two, some only one and a few get by with nothing. Most times, you will find the ground at or near the drive end of the mag – sometimes under the I.D. tag. Some mags use one under the point's plate. If this ground carbon isn't doing it's job of being the last link of the high tension (high voltage), side of the mag, the mag will either not work at all, a weak spark will be present at the plug or a ground will be found through the bearing races (pitting them), if the star washer was not properly installed or has deteriorated. This is why we don't re-use star washers – even if they appear perfect! ;0)-

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