Clocks4Classics

Car Clock Repair Kit Fitting Instructions




Contents

General Information

These instructions explain how to repair a Smith's or Jaeger electric car clock movement using the Clocks4Classics repair kit.
The instructions are based around the repair of a Jaguar Mk2 clock, however, the kit can be used to repair the vast majority of clocks which use the Smiths / Jaeger "pin clock" movement. In most cases the basic fitting method will be very similar although the removal of the case and dial mechanisms may differ. Please note that for some clocks (e.g. MG Magnette) it is necessary to remove the hands in order to gain access to the movement.
Some vehicles use an updated movement which has knobs on the front of the clock for adjusting the hands and regulating the timing of the clock. For these clocks please download the "Front Adjusting" instructions from our website.

Kit Contents

Printed Circuit board with Microcontroller and Infra-red sensor
Brass spacer
Balance wheel sticker
Heat shrink sleeving
Important
Do not remove the circuit board from its anti-static packaging until you have read the anti-static precautions below.

Things you will need

For fitting the Circuit Board:
Jeweller's screwdrivers
Small pair of long nosed pliers (electronics type)
Wire strippers
Small pair of wire cutters (electronics type)
Heat gun (for shrinking the heat-shrink sleeving)
For Cleaning & Oiling:
Clock oil
Cocktail sticks
Isopropyl alcohol or clock cleaning fluid.

Vehicle Polarity

The latest Clock4Classics Kits are suitable for both Positive and Negative Earth Vehicles
Single polarity kits have a "P" or "N" marked on the bag containing the circuit board to identify them as suitable for Positive or Negative Earth cars. If you have one of these earlier kits you should download the earlier version of these instructions (V13) from the Clocks4Classics website.

Anti-Static Precautions

As with any electronic parts, the circuit board can be damaged by static electricity. To avoid damage to the circuit board it is important to take the following precautions when handling the circuit board:

- Keep the circuit board in its anti-static packaging until you are ready to fit it.
- Before you open the anti-static packaging, discharge yourself by touching some grounded metalwork such as a water pipe or radiator pipe.
- Handle the circuit board by the edges and avoid touching the components on the board.
- Avoid contact with materials such as synthetic fibres or wool which generate static electricity.

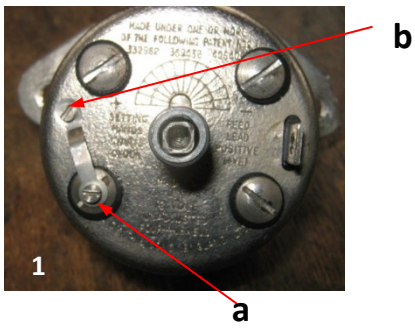
Main Parts of the Movement

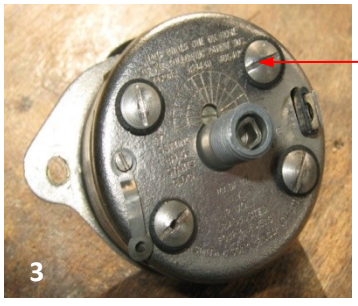
For reference the names of the main parts of the movement are shown below:

1. Insulating Plate 2. Baseplate 3. Dial Mechanism 4. Solenoid 5. Bottom Bearing Plate 6. Balance Wheel Assembly	7. Balance Support 8. Double Support Plate 9. Solenoid Retaining Pillars 10. Balance Support Nuts 11. Minute Wheel 12. Fuse Link	13. Escape Wheel Assembly 14. Transverse Wheel Assembly 15. Connecting Pillar 16. Insulating Tube 17. Connecting Bracket 18. Insulating Sleeve

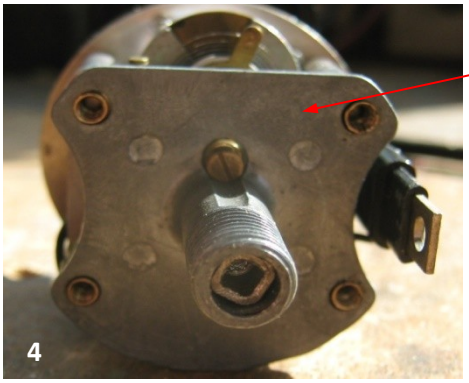
Clock Disassembly

It is recommended that you find a comfortable area to work with good lighting and that you place the disassembled parts small containers so that they are not lost. Be particularly careful with the dial face as this is easily marked.





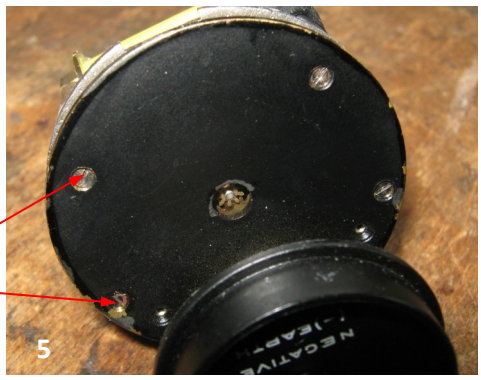
1. Remove small screw (a).
2. Loosen small screw (b) and swing fuse link to one side.
3. Remove 4 case securing screws and slide case backwards off mechanism.



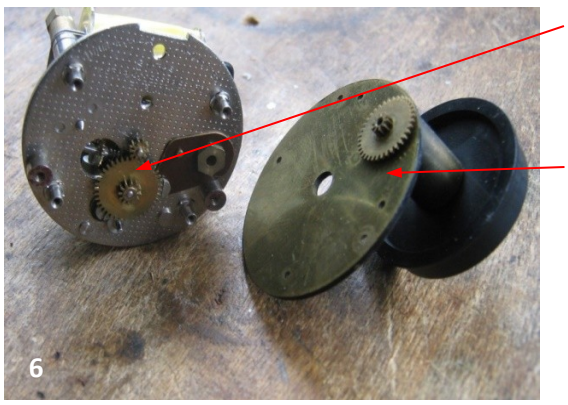
4. Remove back-plate to leave the movement as shown on right. If the back-plate is stiff to remove it may be necessary to gently lever it with a small screwdriver

5. Remove four (sometimes six) screws securing front dial mechanism.

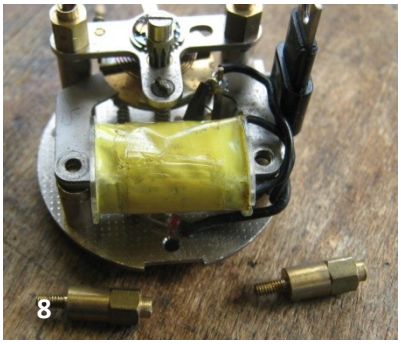
NB. If screws will not move do not use force. Apply cellulose thinners to the screw heads and leave for a few hours to loosen paint around screw heads. You can also apply thinners to the back of the screws. Be patient – this almost always works!

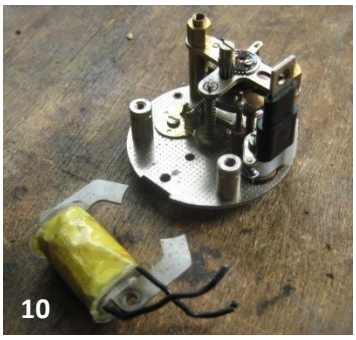


Occasionally you may find that the screws have been secured with thread-locking compound (Loctite). In this case they can usually be loosened by applying a hot soldering iron to the head of the screw to soften the thread-lock (use a very hot iron and hold against the screw for 2-3 minutes).

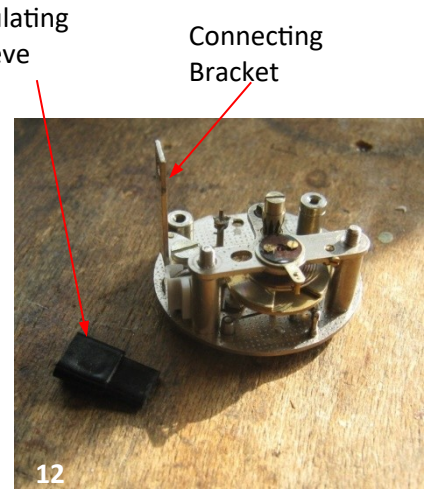


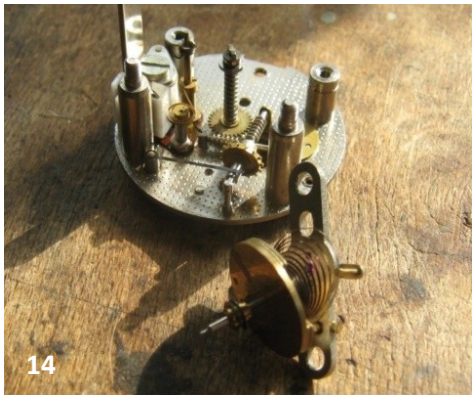
6. Lift off Front Dial mechanism. **NB.** On some clocks (those which have the hands in the centre of the dial plate) it will be necessary to remove the hands in order to remove the dial mechanism. Please see the instructions page of our website for a guide on how to do this.
7. Lift off Minute Wheel





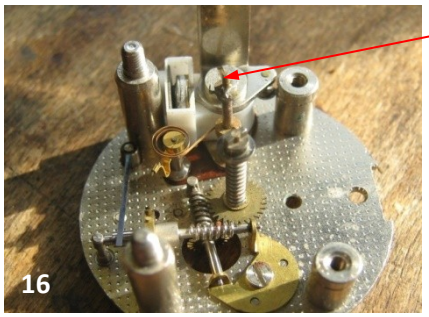
8. Remove 2 solenoid retaining pillars
9. Snip solenoid wires leaving as much wire as possible attached to solenoid.
10. Lift Solenoid from mechanism being careful not to stress the wires.
11. Once the solenoid has been removed, apply some super glue to the solenoid wires at the point where they enter the solenoid body and allow the glue to dry before handling the solenoid further. This protects the internal solenoid windings from stress if the wires are moved.





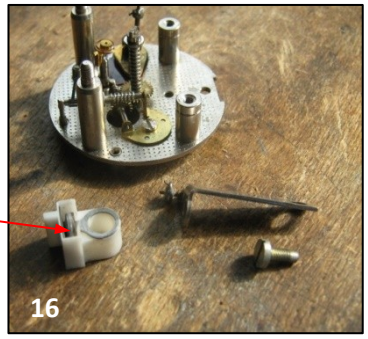
12. Remove Insulating sleeve from connecting bracket.
13. Remove two nuts securing balance support.
14. Carefully lift off the balance support and balance wheel assembly. Note that this assembly is quite delicate – take care to support the hair spring when removing the balance wheel assembly.

[**NB**. On some clocks (e.g. Jaguar Mk IV, XK140), there is an adjustment gear on the top of the balance support which prevents removal of the balance wheel assembly. In these cases please see Appendix C at the end of these instructions which explains how to remove the balance wheel on these types of clocks.]



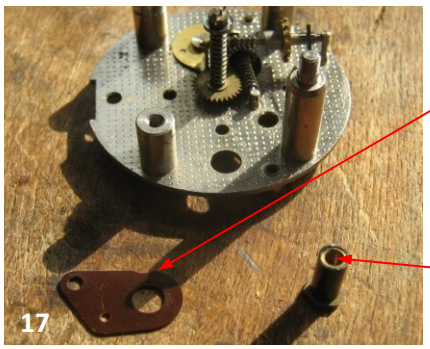
Connecting bracket retaining screw.

Connecting Bracket Support



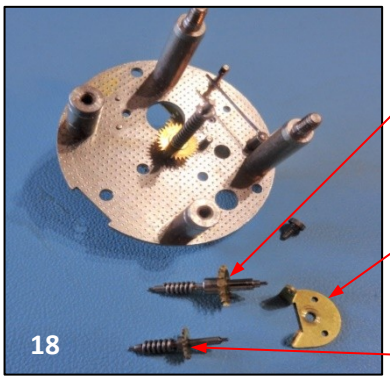
15. Undo connecting bracket retainer screw and remove connecting bracket and plastic support. Note that the plastic connecting bracket support is no-longer required and should not be refitted.

16. Undo contact pillar retaining screw and remove contact pillar upper insulating plate, contacts (not shown) and insulating `O' rings. **NB:** Contacts, contact pillar and insulating `O' rings are no longer required and should not be refitted.



Lower Insulating plate

Connector pillar + insulating tube



Escape Wheel Assembly

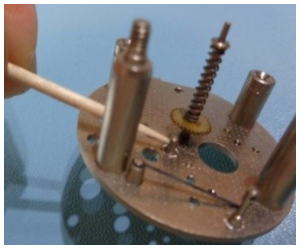
Double Support Plate

Transverse Wheel Assembly

17. Remove connecting pillar (with insulating tube) and lower insulating plate.
18. Remove Brass double support plate and Escape and Transverse Wheel assemblies.
19. Disassembly complete

Cleaning and Oiling

Once the clock has been disassembled you should carefully clean the parts in isopropyl alcohol or clock cleaning fluid. To clean out the pivot holes and jewelled bearings use a sharpened cocktail stick as shown in the photo.



Cleaning a pivot hole with a cocktail stick

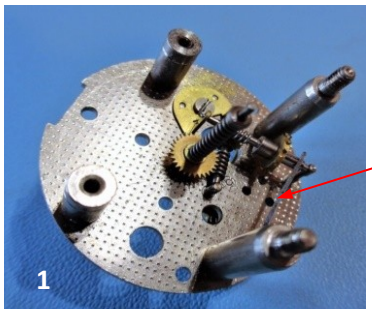
The clock should be oiled using clock oil (do not use general purpose oil such as "3-in-1" as this is too thick).

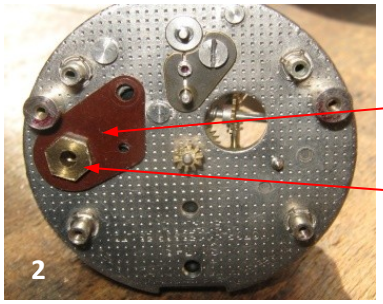
Oil all of the bearing holes, the underside of the damper spring and escape wheel but not the other gear wheels. Also place a drop of oil on the centre spindle where it passes through the base plate and on the thin dial washer which is under the hour wheel on the back of the dial plate.

Be careful not to apply too much oil – the oil should just fill the bearing hole. The best way to apply the oil is to use an oiling pen or a thin piece of wire with a flattened end.

Re-Assembly and Testing

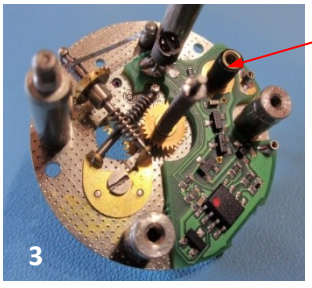
The following pages cover the re-assembly and testing of the clock.

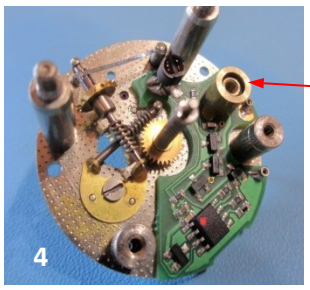




1. Refit Escape and Transverse Wheel assemblies ensuring that damper spring fits on top of escape wheel shaft.

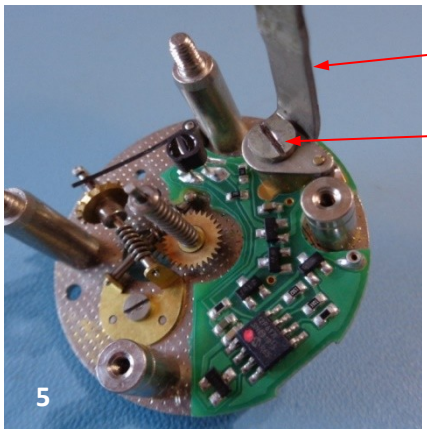
2. Fit one of the insulating plates to connecting pillar and insert into clock baseplate from front as shown. Ensure that insulating tube is in place around connecting pillar. **NB:** The insulating plate must be fitted on the underside of the baseplate as shown. Do not place an insulating plate between the baseplate and the circuit board.



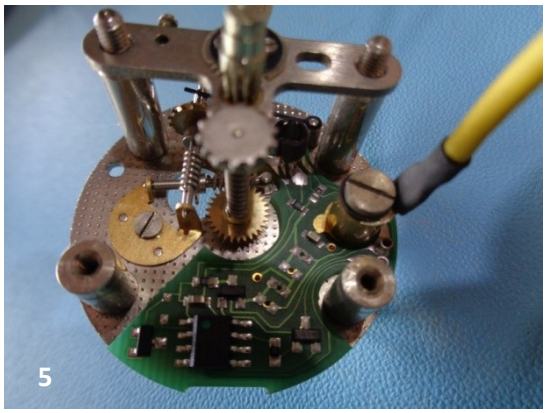


3. Position PCB on clock base plate as shown with hole over connecting pillar.
4. Fit brass spacer (supplied) over connecting pillar.

Note: On some clocks the insulating sleeve around the connecting pillar is made of thick material and may be difficult to pass through the brass bush. In this case replace the insulating sleeve with heat shrink tubing supplied in kit.



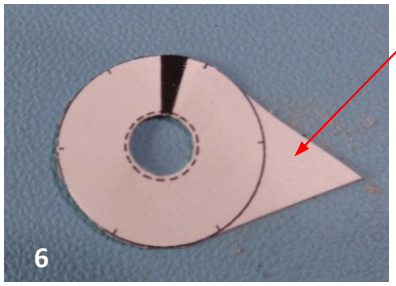
Connection for clocks with connecting bracket



Connection for clocks with no connecting bracket

5. Place the connecting bracket on top of the brass spacer and secure the bracket to the connecting pillar with the retaining screw as shown in the left hand photo. Make sure that the curved edge of the PCB lines up closely with the clock baseplate.

Note: On some clocks there is no connecting bracket and the power is connected via a wire which connects to the contacts inside the movement (sometimes via a small brass connection plate). In these cases you should connect the wire directly to the brass spacer as shown in the right hand photo. Be careful to check that the top of the retaining screw will not be able to touch against the underside of the solenoid pole piece when the solenoid is fitted as this would cause a short circuit. If necessary insulate the top of the screw or underside of the pole piece.



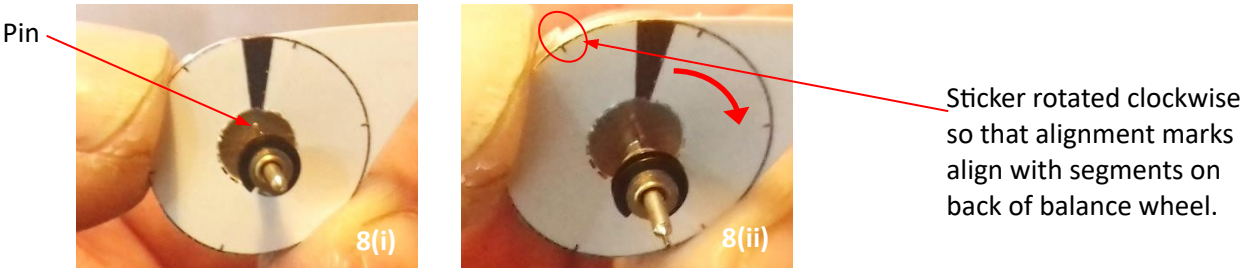
6. Use a scissors to cut out one of the balance wheel stickers from the sheet (the sheet includes a spare). Leave a 'tab' on the edge of the sticker to help with removing the backing when fitting. This tab can also be used to help hold the sticker when positioning it on the balance wheel. The tab can be trimmed off once the sticker is fitted.

7. Carefully clean underside of balance wheel with Isopropyl alcohol and a Q-tip.

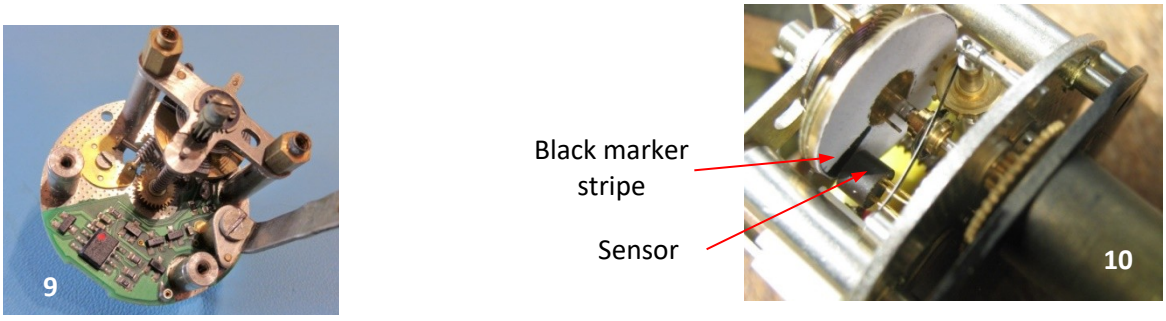
8. Before removing the backing from the sticker, practice positioning it as follows (see photos):

i) Hold the sticker above the underside of the balance wheel and position the sticker so that the thin end of the black stripe is directly in line with the pin.

ii) Rotate the sticker clockwise by a small amount so that the alignment marks on the outer edge of the sticker line up with the steel segments on the top of the balance wheel. This is the correct position for the sticker.



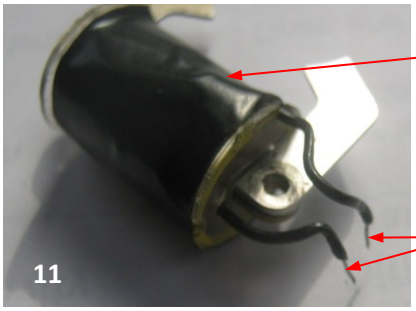
Once you are confident that you have found the correct position for the sticker, peel off the backing and apply the sticker to the underside of the balance wheel. Smooth it down and trim off any parts which overhang the edge of the balance wheel with a sharp craft knife.

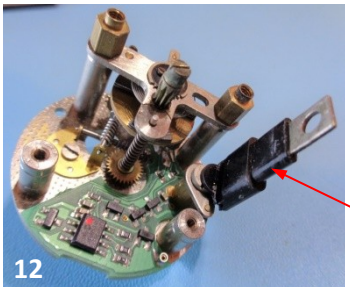


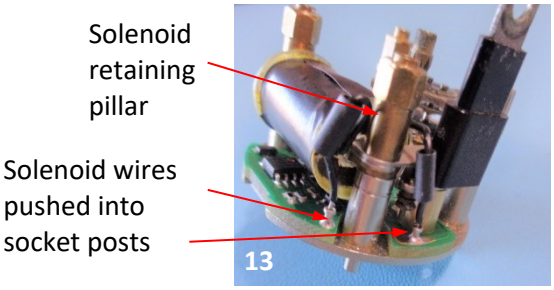
9. Place the balance wheel assembly loosely in place and use tweezers to position the spindles into their bearing holes. Once the spindles are in their holes push the assembly gently into place and check that the balance wheel rotates freely.

10. Secure the balance support with the two retaining nuts and check again that the balance wheel turns freely. When the balance wheel is at rest, the black marker stripe should sit just a little clockwise of the centre line of the sensor (when viewed from the underneath of the balance wheel). If the marker stripe does not appear to be in the correct place, check that the label is correctly applied and then check the at-rest position of the balance wheel (see Appendix A).

11. Strip approx. 3mm from the ends of each solenoid wire. If the tape around the solenoid body looks worn, wrap this with a couple of turns of new insulation tape. Be careful not to flex or pull on the wires as this can break the connection inside the solenoid. To avoid straining the wires, use a small pair of pliers to hold the wire end near to the solenoid body whilst using the wire strippers.





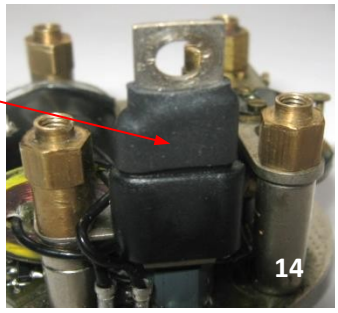


12. Fit insulating sleeve over connecting bracket.

13. Re-fit the solenoid and screw solenoid retaining pillars into place making sure that there is an even gap between the pole pieces and the balance wheel on each side. Place two pieces of heat-shrink over solenoid wires and carefully push the two solenoid wires into the socket posts as shown. **Caution:** Make sure that the connector bracket cannot twist and touch against the baseplate pillars or solenoid pole piece as this would cause a short circuit. The insulating sleeve should prevent this but if the gap between the connector bracket and these parts is very small then it is advisable to add some insulation or trim the connector bracket.

NB: The socket posts are designed to have low insertion force – although the wires slide in easily they will still make a good connection. Do not solder the wires into the socket posts as this will melt the solder on the PCB and may cause damage.

Do not shrink the heat-shrink tubing until mechanism has been tested.



14. If the top of the plastic insulating sleeve is damaged, cover the damaged part with the heat-shrink sleeving supplied and use a hair dryer or heat gun to shrink the sleeving over the plastic insulating sleeve

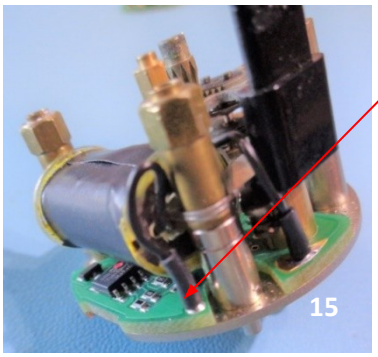
Testing the movement

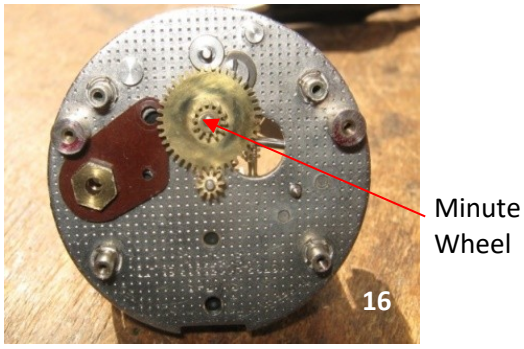
At this point it is a good idea to test the operation of the movement.

Power Supply Requirements

For testing the clock you must use a **fused** *12V battery or a* ***regulated*** *12V power supply. Car battery chargers are not designed for use without a battery in the circuit and are unsuitable for powering the clock as they produce a very "noisy" output under these circumstances. Similarly, wall mounted power supplies (such as those used for used for powering consumer electronic equipment etc.) are often unregulated and will not produce a suitable output. Using a battery charger when the clock is installed in the car does not generally cause a problem as the battery smooths out the voltage fluctuations.* ***Caution:*** *When testing the clock be very careful not to short the PCB terminals against the body of the clock or to each other as this will damage the PCB.*

- *Connect the clock to the 12V supply – one terminal to the clock supply connector and the other terminal to the body of the clock.*
- *The balance wheel should first move to a starting position and remain there for approximately 3 seconds.*
- *Following this it should start to oscillate back and forth. The amplitude of oscillation will build up over a minute or so until the wheel is oscillating steadily.*
- *If the balance wheel does not oscillate please see the fault finding section at the end of these instructions.*

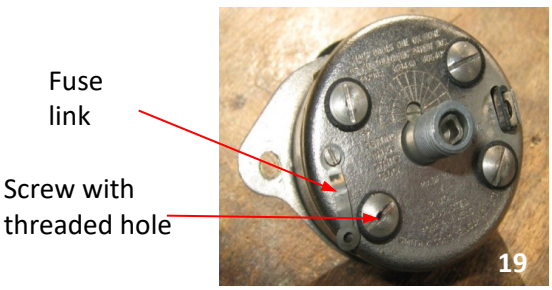




15. Push the heat-shrink tubing down over socket posts and then use a heat gun to shrink the tubing over the posts. Be careful not to use too much heat as this may melt the insulation on the wires.
A pair of tweezers can be useful to tease the heat-shrink tubing over the socket posts.

16. Place a small drop of clock oil in the mounting hole of the minute wheel and refit as shown.

17. Fit front dial mechanism being careful that hands align correctly (check alignment at 12 o-clock position). **NB:** When fitting the dial plate tighten diagonally opposite screws so that the plate is pulled down evenly.



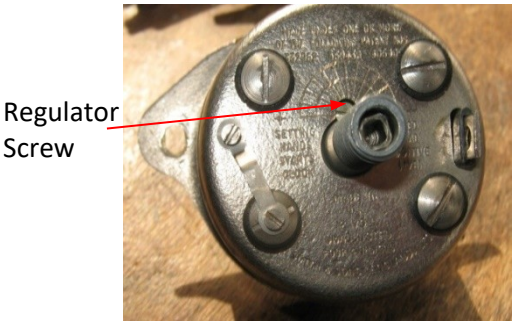
18. Re fit back plate to rear of clock.

19. Refit case and 4 retaining screws. Ensure screw with threaded hole is in position shown.

20. Refit fuse link and tighten both screws

Regulating the Clock

Before fitting the clock to the car you should adjust the timekeeping using the regulator screw on the back of the case.



- First set up the clock on the bench in its normal orientation and connect it to a **fused** 12V supply (e.g. an old car or motorcycle battery).
- Allow the clock to run for an hour or so before attempting any adjustments.
- Turning the screw anticlockwise makes the clock run faster; turning it clockwise makes it run slower.
- Be aware that the adjustment is quite sensitive – small movements of the screw can make a big difference.
- Bear in mind that this is still a mechanical movement and will be affected by temperature etc.

NB: There is often quite a lot of backlash in the dial mechanism so it can take some time for the mechanism to `catch up' before the hands begin to move. The best way to overcome this is simply to set the hands a couple of minutes fast when first setting the clock.

Installing the Clock in The Vehicle

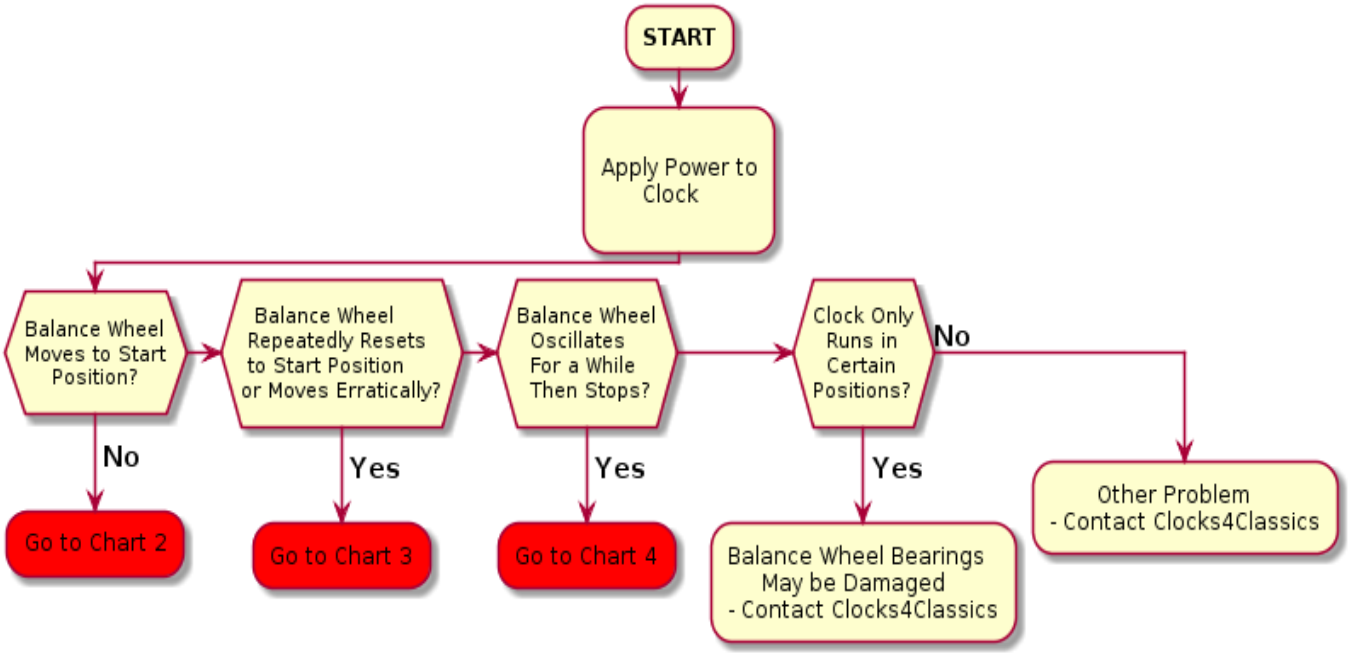
The clock should be fitted to the vehicle using the original mounting points. To protect the wiring it is recommended that the supply to the clock is fitted with a 1 Amp in line fuse. When fitting the clock be careful not to bend the hands – if the hands are touching each other or touching the dial this will stop the clock.

Fault Finding

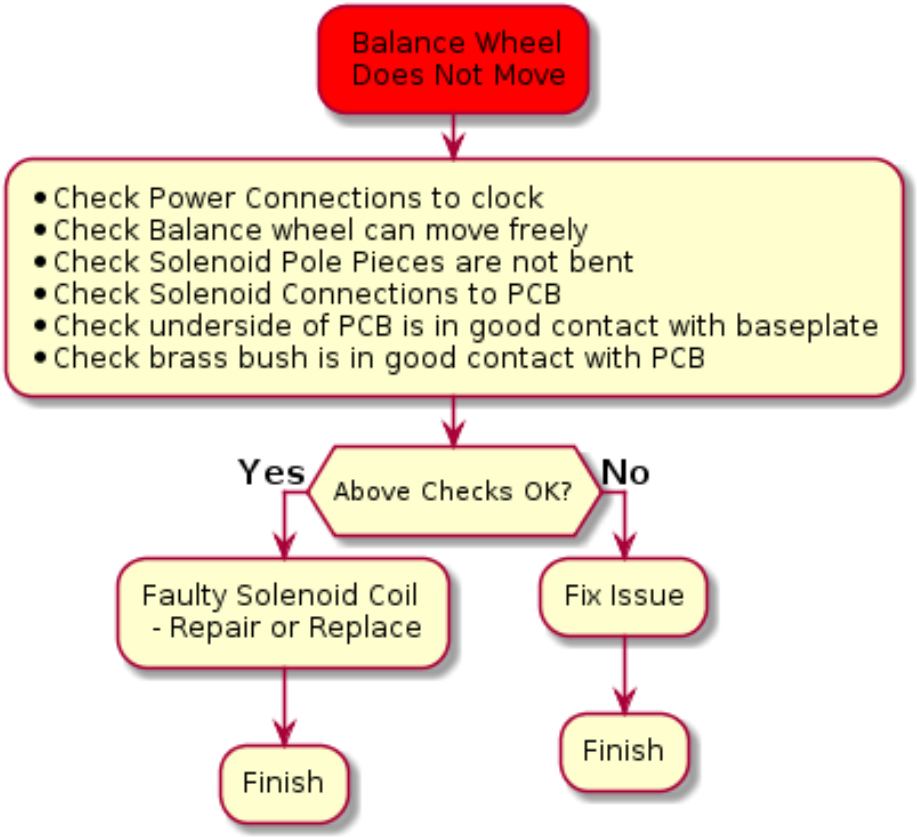
If you have problems getting your clock to run please refer to the fault finding charts below this should enable you to quickly find the cause of the problem.

The great majority of problems are caused by lack of cleaning which results in excess friction in the movement - please note that although the balance wheel may appear to move freely it only takes a very small amount of extra friction to cause a problem and re-cleaning and oiling will often enable the clock to run correctly.

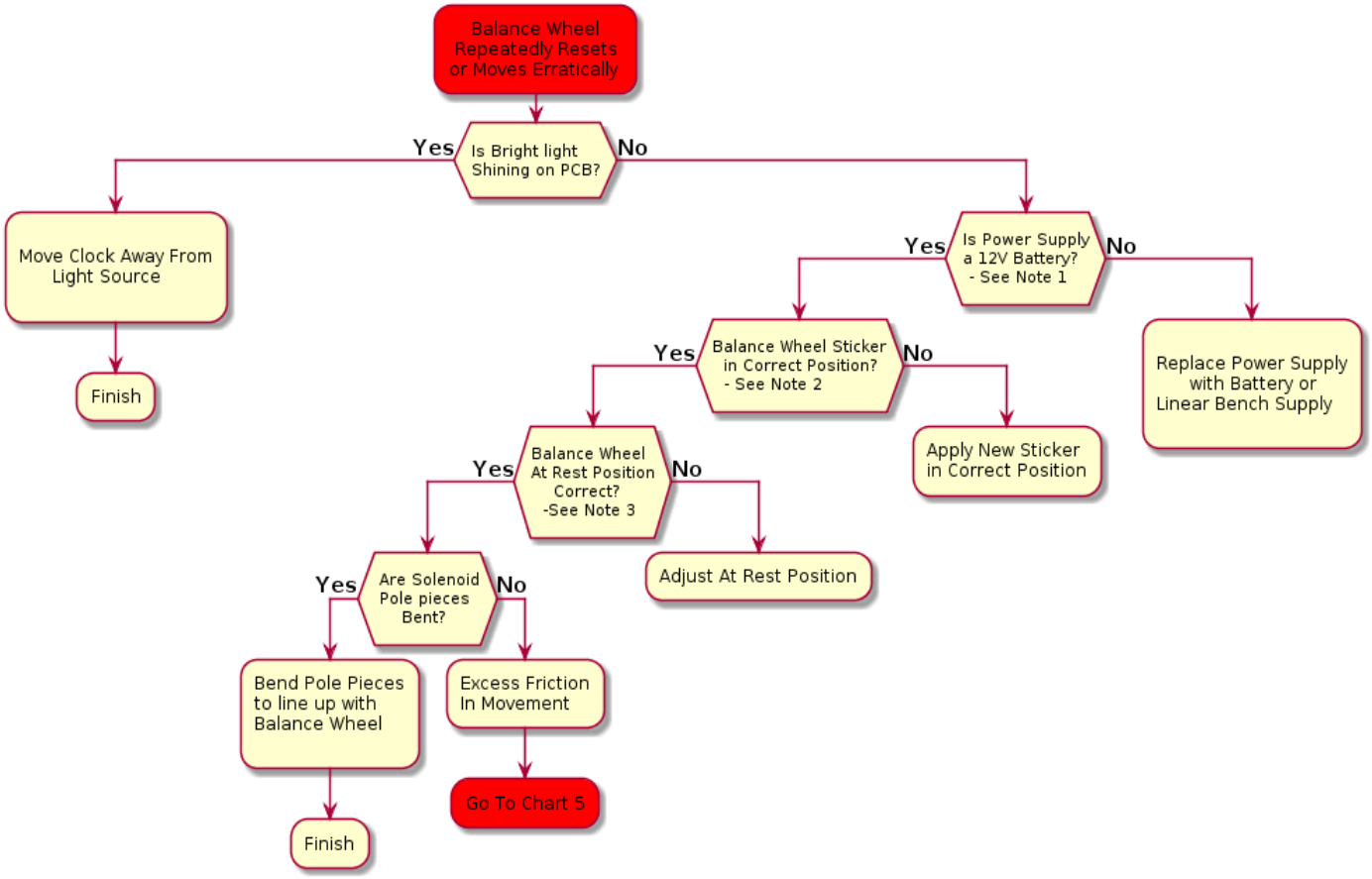
Fault Finding Chart 1



Fault Finding Chart 2



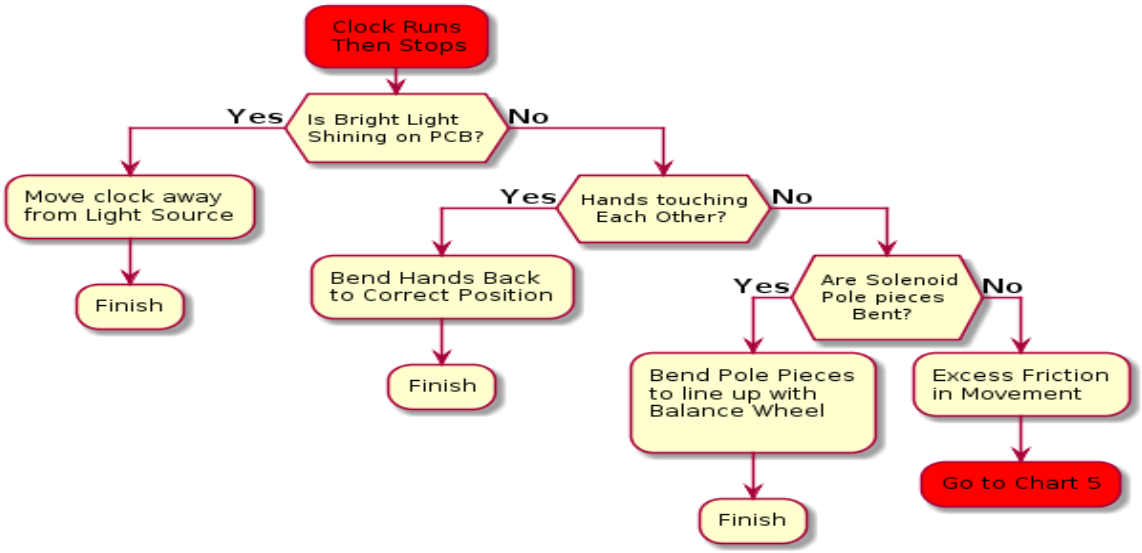
Fault Finding Chart 3



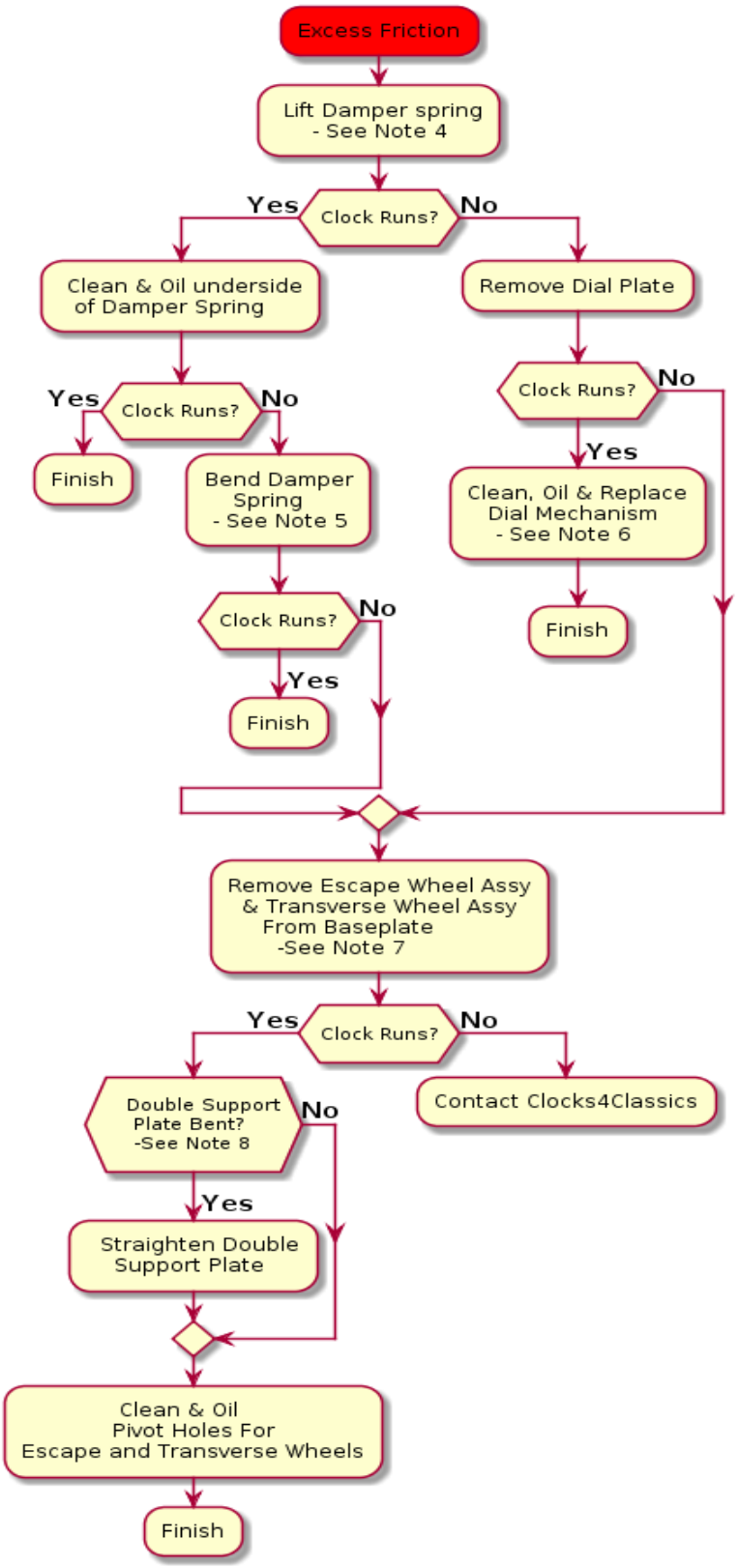
Notes:

1. To test the clock you must use a 12V battery or a good linear bench power – see Power Supply Requirements on Page 11.
2. The sticker must be aligned correctly – see sticker positioning instructions on Page 9
3. At Rest position is factory set – only change this if you are sure it is incorrect – See Appendix A on Page 16

Fault Finding Chart 4



Fault Finding Chart 5



Notes:

4. Gently lift the spring away from its shaft with a small screwdriver and see if clock will run. A picture of the damper spring is shown on Page 7.

5. If the Damper spring is too stiff gently bend it upwards but be careful not to break it.

6. To clean the dial mechanism, remove the hands and clean & polish the two shafts which drive the hands. Also clean& polish the back of the dial plate where it rubs against the thin dial washer. Apply a drop of clock to all parts.

7. A picture of Escape and Transverse Wheel Assemblies and Double Support Plate is shown on Page 6.

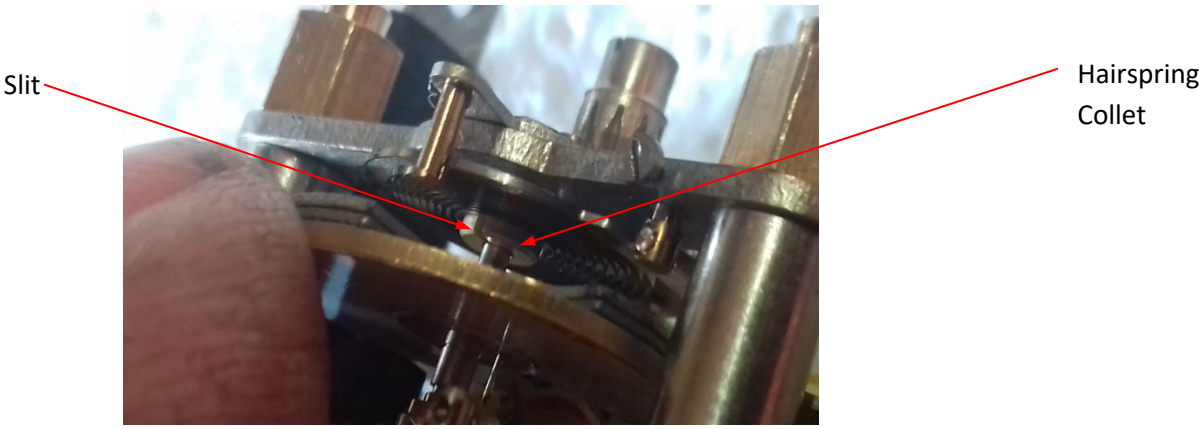
8. If the vertical parts of the plate are bent they will rub on their respective shafts and cause friction. A picture of the double support plate is shown on Page 6.

APPENDIX A:

Balance Wheel at Rest Position

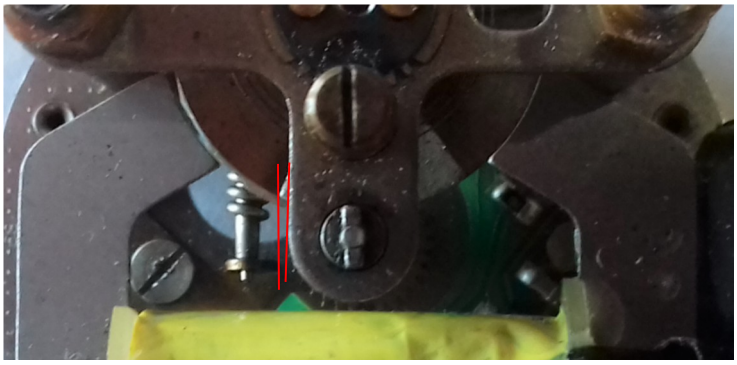
The “at rest” position of the balance wheel is factory set and should NOT need to be adjusted, however, if it is clearly wrong it can be adjusted as follows.

1. Turn Balance wheel until the slit in the hairspring collet is visible as shown below:



2. Place a thin Jeweller’s screw driver in the collet slit and use this to hold the collet in its current position (i.e. prevent it from rotating)

3. With the collet held by the screwdriver, use your thumb to rotate the balance wheel on its shaft to achieve the correct “at rest” position. The correct position is achieved when the balance wheel segments are as shown in the photo below (viewed from the top side of the movement).



Approx. 0.75 mm

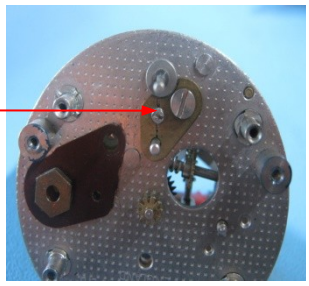
4. Note that the collet is sometimes quite stiff and it can be difficult to get the balance wheel to rotate in the first instance. In this case is may be easier to hold the balance wheel still and use the screw driver to rotate the collet. Once the collet has begun to move it is generally easier to hold the collet still and rotate the balance wheel as this gives finer control. It is easy to accidentally “overshoot” the adjustment and it may take several attempts to achieve the correct position.

APPENDIX B:

Adjusting the Balance Wheel Bearing

To adjust the balance wheel bearing use the screw on the underside of the baseplate as shown. The bearing should be adjusted so that there is a small amount of vertical play (so that you can just hearsome movement when the balance wheel is moved vertically).

Bearing Adjustment Screw

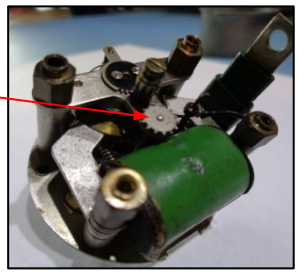


APPENDIX C:

Removal of balance wheel on clocks with adjustment gear

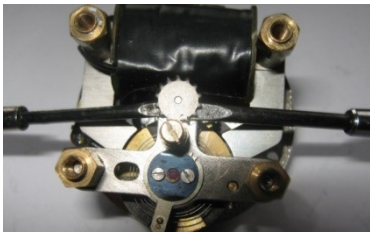
Some clocks (e.g. Jaguar Mk IV, XK140) have an adjustment gear on top of the balance support which prevents removal of the balance wheel mechanism. There are two possible methods of dealing with this as shown in the following pages – please choose one of these two methods depending on the tools available to you

Adjustment Gear



Method 1 – removal of adjustment gear

The adjustment gear can be removed by using two Jeweller's screwdrivers to gently lever between the gear and the balance support. Lever very gently using both screwdrivers simultaneously with the screwdrivers positioned opposite each other. Periodically rotate the gear wheel so that the force evens out around the gear. Sometimes the top of the shaft is peened over in which case it will be necessary to use a needle file to remove the peening prior to removing the gear.

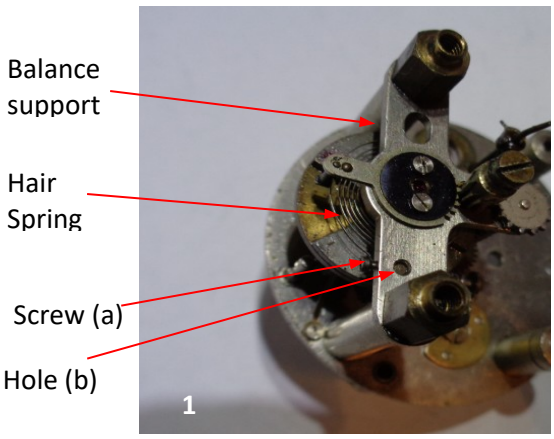


To replace the gear tap it back on making sure that the bottom of the shaft is well supported so that there is no shock transmitted to the balance support. It is recommended that you do not replace the gear until after the mechanism has been tested.

Method 2 – removing balance wheel with gear in place

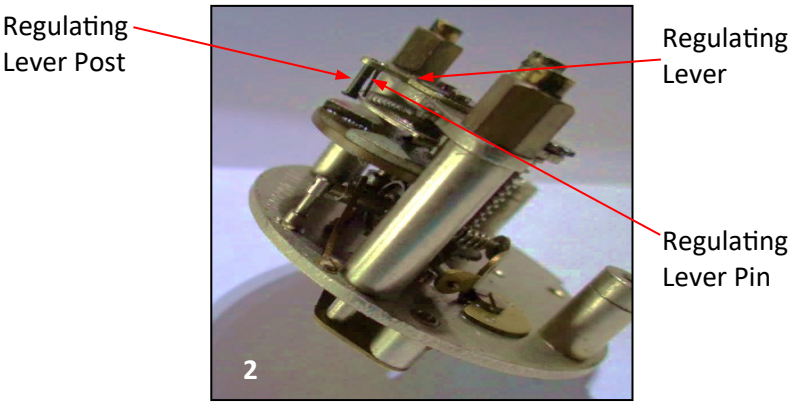
By disconnecting the hair spring from the balance support it is possible to remove the balance wheel assembly whilst leaving the bridge piece and adjustment gear in place.

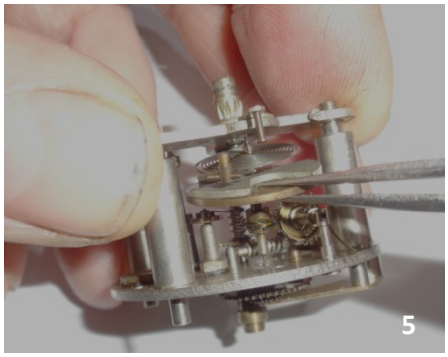
1. Loosen (but do not remove) screw (a) and remove hair spring retaining pin from balance support by using a small jeweller's screwdriver to push down through hole (b).



2. Use a small Jeweller's screwdriver to slightly bend the pin on the regulating lever so that the gap between the post and the pin is big enough to remove the hair spring. Do not bend the pin more than necessary as there is a risk that it may break.

3. Use tweezers to gently remove the hair spring from the gap between the post and pin on the regulating lever.





4. Remove the two nuts securing the balance support and lift the balance support so that it is free of the upper balance wheel bearing.

5. Whilst holding the balance support up use tweezers to gently remove the balance wheel assembly taking care not to damage the hair spring.

6. To replace the balance wheel assembly first use tweezers to place the balance wheel into the top and bottom bearings and then secure the balance support in place using the two securing nuts.

7. Use tweezers to place the outer coil of the hair spring in the gap between the post and pin on the regulating lever and then fit the hair spring retaining pin into the hole in the balance support and tighten the securing screw

8. Check that the balance wheel moves freely and that the outer coil of the hair spring is in place between the post and pin on the regulating lever. Finally use tweezers to squeeze the pin on the regulating lever back into place.

