Jaguar XK8/R Clock Repair

By Atlastajag1

Probable cause: clock stepper motor unit.
A loose connection is unlikely, as the clock could be manipulated by the +/- buttons, and the time loss is consistent. Hence it is more likely that the problem is related to the motor unit itself – specifically the gear drive - rather being electronic. If the clock wouldn't move at all, in either direction, either all teeth are stripped from the driver gear (possible but unlikely), or there is an electronic issue.

General Discussion:

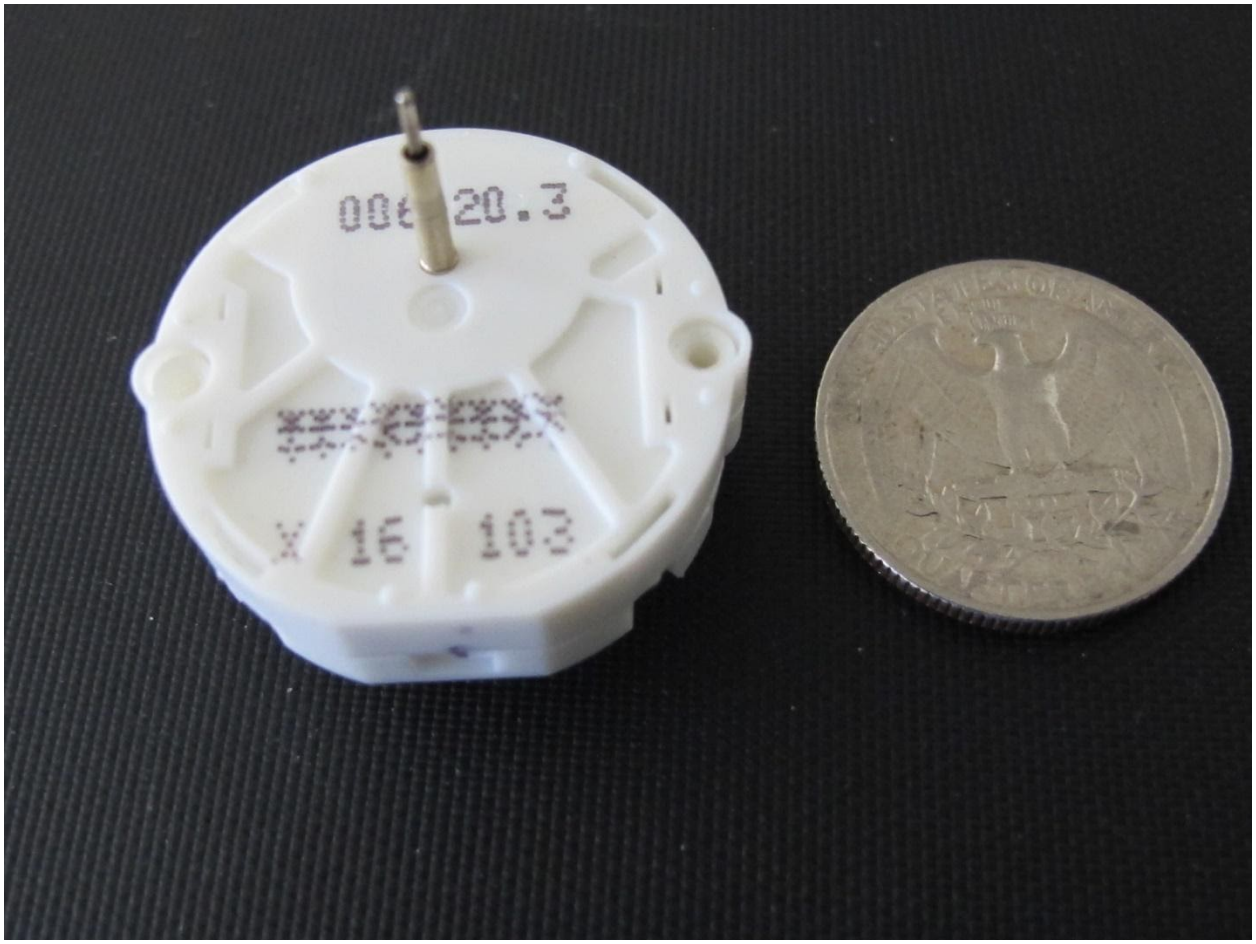
The most obvious ways to regain a working clock are: either to purchase an entire new minor instrument module (hereafter MIM) from Jaguar (upwards of $800, I hear), or buy a (hopefully) working and return-guaranteed unit (absolute must) from an auto breaker. Typically, a decent looking one will cost from $50 to $100, with some eBay offerings as high as $140.

If originality is important – you have a 2004-2006 car with chrome pointer hubs – a replacement MIM may be harder to find. Otherwise, using a good second hand MIM from any model year will probably work in any MY car.
Hours matter for the clock, which is always running: A MIM from an earlier MY than yours will have that many more hours on it, and will – unless refurbished - see below - come with even more hours than your failed unit.

That leaves the possibility of a repair:
The initial thought was to identify the stepper device used in the XK8 and source a replacement. Dismantling the MIM (see below), I determined that the XK8's clock motor case is stamped "X-16."

Many manufacturers employed stepper motor gauges in their dash consoles. Those by Delphi (GM) and Visteon (Ford) seem to have a similar, if not identical case design, while European cars such as Mercedes use a quite different shaped case.
The GM / Ford style motor units all seem to carry numbers such as CX-5, X-10, X-15, X-23, X27, X29, and so on up, but they all seem to operate single pointer, instrument cluster 'arc' gauges. The stepper unit used for the XK8 clock needs two concentric shafts, the ability to rotate continuously in either direction, and internal gearing \, and so would be quite different internally from a gauge application.

I could find no references anywhere to an X-16 stepper motor. For that matter, I could find no cars with an integral XK8-like clock, either. Possibly the XJ stand-alone clock works the same way. I was able to see, once the MIM was dismantled, that there is no ECM computer involvement with the XK8 clock. There is a quartz crystal and some electronics on a circuit board, and the clock works like a battery operated wall clock, other than the +/- setting buttons.



After dismantling the MIM and the clock stepper – see below – I discovered that the problem was indeed with the driver gear, where two teeth had broken off.

These gauge / clock stepper motors have a very small – think ½ size of a grain of rice - magnetized armature, with an integral (and equally minute) gear mounted on top of it. The armature / gear rotates on a hair-like spindle, fixed into the base at one end and engaged with a socket hole in the upper case.

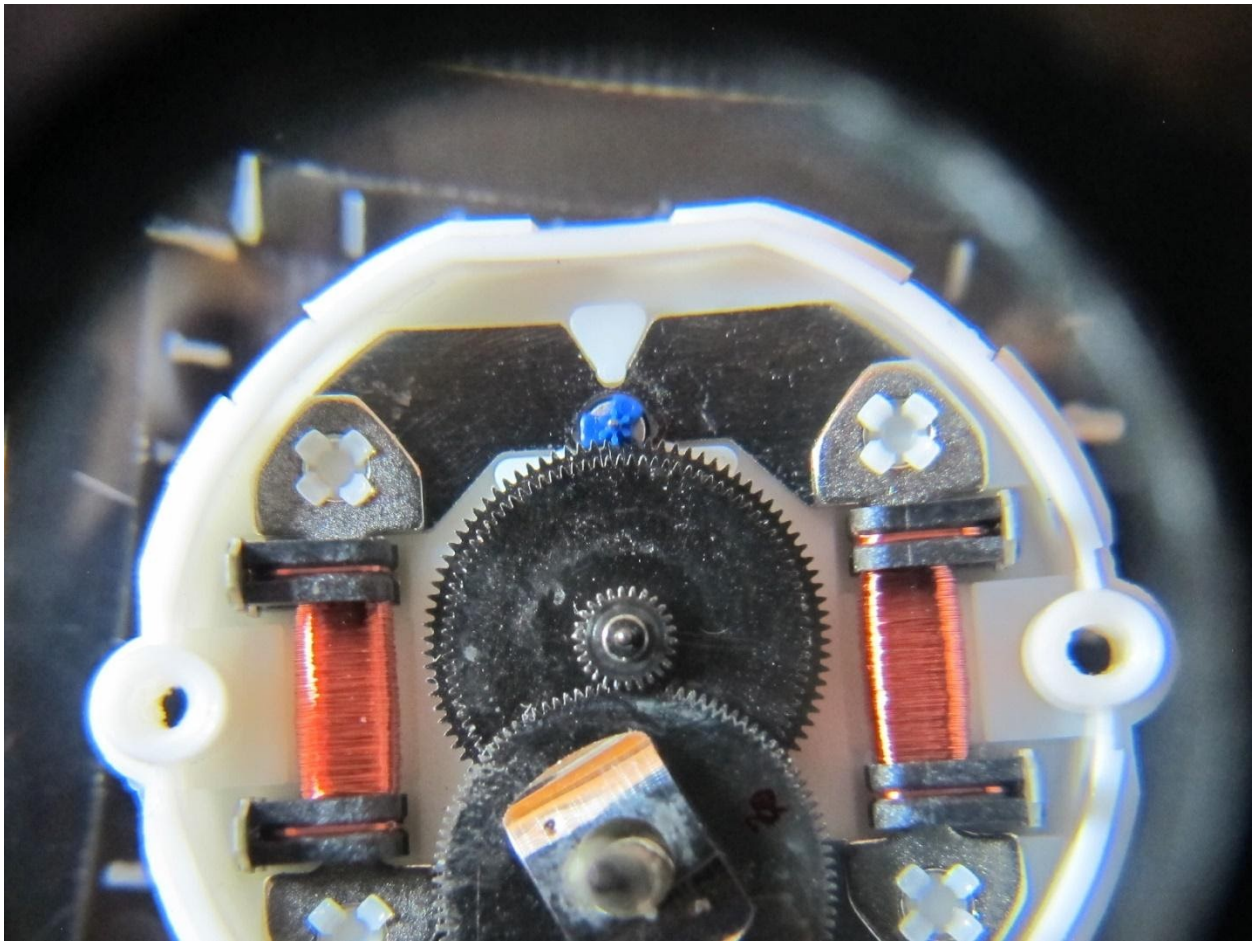
Although the application of any X-** series stepper motor gauge would be different to the clock - variations in solder pin configuration; different internal gearing, and with only a single output shaft etc. – it seemed possible that the armature / gear part might be identical for all versions. Also, given the small size of the armature / gear, it seemed likely that the pitch of the driving gear / number of teeth might also be identical to that in the X-16.

A single X-27 was located on eBay and ordered for $7 delivered. The motor armature / gear was determined to be identical to the X16.

The two gauge motors in the MIM are certain to be identical to each other, but as neither gets much ‘action’, they may ‘never’ fail. I wasn’t motivated enough to find out the X-** number for the gauges; getting that information entails unsoldering the gauge’s motor, as well as the clock, and removing all pointers and the gauge overlay.

Although the motor coils, and the armature / driver gear of the X-27 (and probably others in the X-series) may be the same, the gears inside the X-16 are unique: it has extra gear sets to drive the two concentric output shafts and maintain the 60:1 minute and hour hand movements. The X-16 also uses more robust steel ‘driven’ gears.
As mentioned, timing accuracy comes from a quartz crystal / divider circuit on the main PC board, and the motor is pulsed (stepped) once every minute. That is, the driver gear indexes 1/6th of a turn every minute / pulse.

In the unlikely event of a coil failure, it might even be possible to transfer the coils / iron field parts, but the X-16 housing and gearing themselves must be retained.
So, the X-27 gets to donate the essential armature part, and then gets discarded.
This is the image, as seen through a jeweler’s loupe. The blue item is the motor armature / gear, as replaced. Note that the 6-tooth driving gear is nylon.



Repair process:

Open the driver's door to clear the convertible roof, and then power down the car by removing the battery ground cable connector.

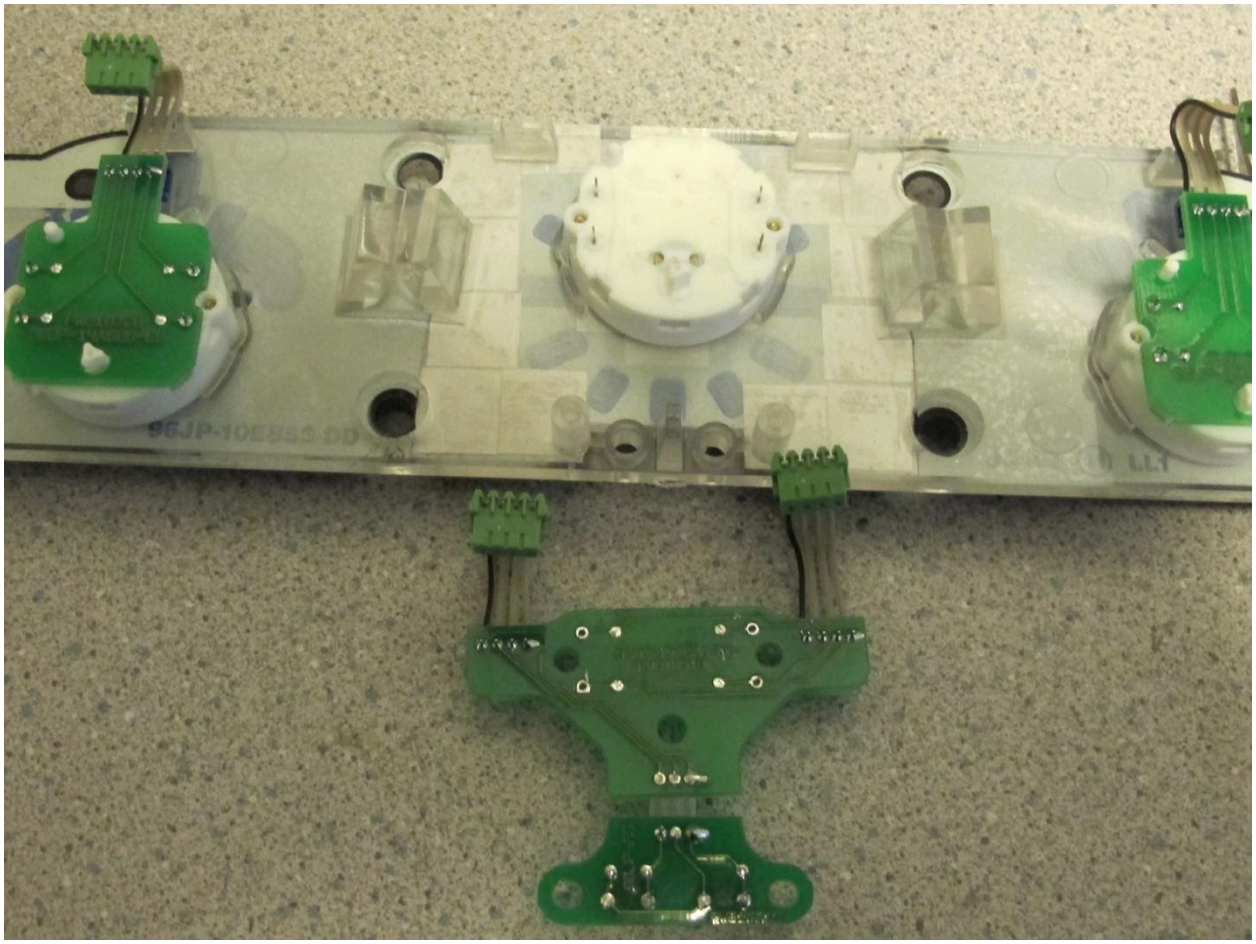
The instrument module veneer bezel is first removed: Using a plastic sparger, crank the bottom edge of the veneer bezel out from the bottom two fasteners. Pivot / raise this edge considerably to work on the top two angled fasteners. I found it useful to go in through the air vent opening. The (very aggressive) panel gripper sockets will likely come out attached to the steel tabs from the bezel, and have to be reset later in their rectangular holes.

Four Phillips screws release the MIM from the dash.
Depress the lock bar at the front of the connector, and work the connector off to the left side. The MIM is now detached and can be removed.

Remove the two panel light bulb holders: I found them worryingly hard to turn by fingers, but with the use of a small Crescent wrench, end-ways on, made the ¼ turn lamp holders released without any damage. Suggestion: have a fresh pair of T10 5W replacement bulbs for the re-assembly process, unless you have previously replaced them.

Working on the rear of the MIM, cut the Visteon warranty seal in a zig-zag fashion along the housing / cover fit lines, using an Exacto knife; remove the four rear cover screws (T20) and separate the white rear plastic cover from the main body.

Each gauge is connected to the main PC board by a ribbon cable connector. The clock requires two, via a two-piece extension board. The upper cable board is soldered onto 4 pins from the motor housing, while the lower board – used by the +/- buttons - is held to the main board by two (T7) screws. Gently pry all ribbon connectors free and ease the ribbons out of their grooves.



Using a solder wick or vacuum solder puller, remove the solder holding the four motor pins to the upper clock-motor board. Remove the two screws (T7) holding the extension board to the main PC board. The main PC board can now be put on one side.

All three stepper units are held in place from the front, each by a pair of screws (T7). All motor stepper motor screw-heads are covered by a single overlay for gauge / clock-face laminate overlay, which is glued down to a Plexiglas plate (needed for illumination). At first sight, all pointers would have to be pulled off and the entire overlay removed. Very daunting: removing all pointers and separating the whole overlay would add to the risk of damage, take considerably more time and, later on, this long overlay would be difficult to glue / re-position accurately.

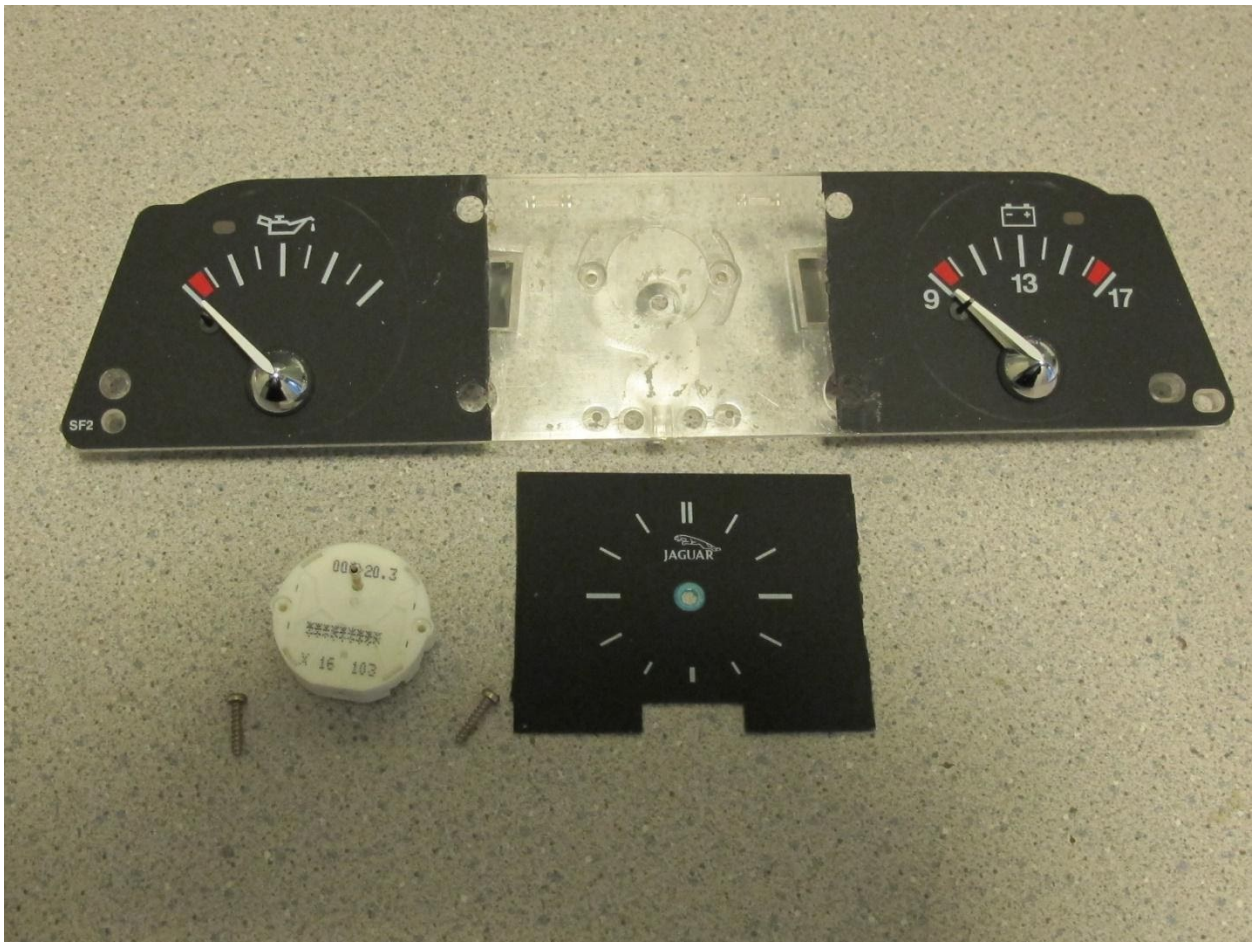
To simplify matters by removing only the clock dial and gain access to the clock stepper screws only, I cut out a rectangular section of the overlay in the center, consisting only of the clock face. That way, only the clock hands would have to be removed, and the re-attachment of the overlay would be much easier. Cut lines are made vertically between each pair (upper and lower) of (front lens) screw holes. The resulting splices are hidden by the front lens of the MIM, and are invisible after re-assembly.

Procedure: Remove the front transparent MIM cover by releasing the four fastening screws (T20). Be very careful not to abuse the two remaining instrument pointers or scuff up the overlay. Remove the clock - / + button actuator assembly.

Protect the clock face with clean paper card. I removed the clock hands as follows: Using a stack of old (but clean) credit cards on either side of the clock hands, almost touching the hub of the minute-hand pointer, and using a slotted card to straddle the pointer shaft, I inserted an additional card into the stack on either side. Damage is less likely if the pointers are warmed VERY gently with a hair dryer. The minute-hand is worked free, using additional credit cards if needed. Repeat the procedure to remove the hour hand.

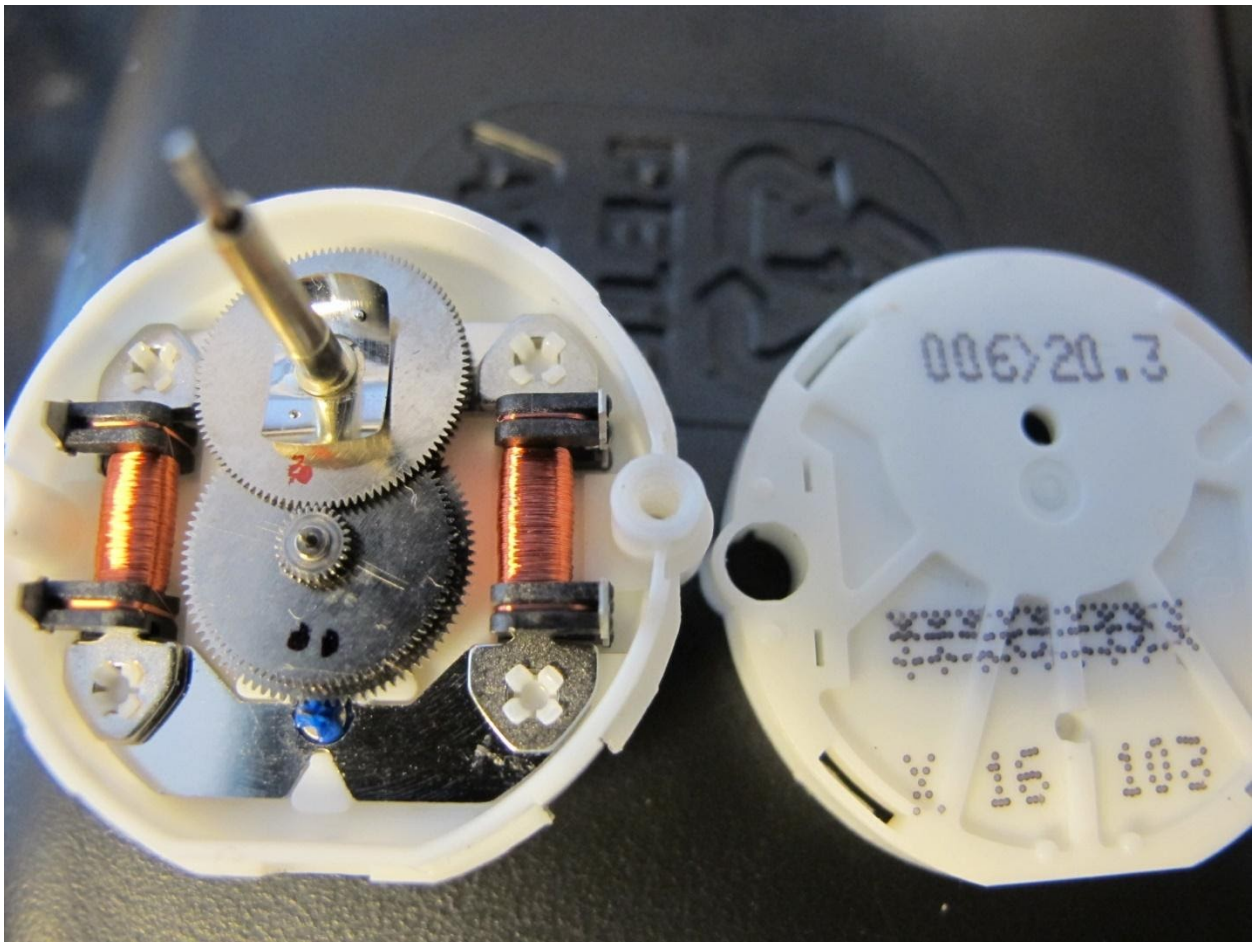
Between the upper and lower bezel fastener holes on both side of the dial, on center, I used two parallel strips of blue painter’s tape on the overlay placed to create a slender cutting guide gap, to provide both a visual guide and some protection for the overlay / clock face whilst cutting. Using a 6” SS ruler as a cutting guide, carefully cut down through the overlay to the Plexiglas. Insert an Exacto blade from the edge at the top and bottom of the clock face, in several directions, so as to separate the overlay laminate from the Plexiglas base. Test lift the clock overlay near to the cut line periodically, until certain that the clock-face rectangle can be removed from the Plexiglas without creasing it. I found the overlay plastic fairly tough, and several cutting strokes were required. Avoid contact with the clock shafts as you lift the overlay clear.

The two T7 motor screws can now be removed and the motor unit released.



Separating the stepper-motor housing: Using a couple of jeweler's screwdrivers, partially release each of the nylon snaps that hold the upper (shaft side) side of the nylon case to the back. Holding the clock module with the shaft upright, ease the upper case off upwards, over the shafts, to expose the motor and gear set.
Particles of stripped driver gear will be found underneath the metal gear disks, and must be removed. Before lifting out the gear disks, it is important to mark them for ease of re-assembly.

I used fine Sharpies to dot mark the gears: black for the output shaft cluster and red for the other stack. I marked them with dots in the order in which they were removed; the colors make sure you know which stack the gear came from. Note / mark the orientation of the output shaft drag spring. Now you will be able to easily re-assemble the set.



The armature / driver gear part sits on a very thin hair-like pin, fixed at the base but engaging with a tiny hole in the top cover. Using tweezers, carefully remove and discard the faulty armature / gear, similarly dismantle the purchased X-27, remove its armature / driver gear, and place it in the X-16. The two coils of the X-16 motor checked out at approximately 280 ohms each. The remainder of the X-27 can now be discarded.

With all gears seated in the lower half of the motor case, and holding the lower housing horizontally, lower the top section vertically down over the output shaft. Double-check the alignment, then snap the two halves together.

The rebuild and re-assembly.

Place the clock-face rectangle face-down onto a clean surface and roll the dried glue into small beads, using your fingertip, so as to remove as much of it as possible from the surfaces of the plastic dial and the Plexiglas base. I chose not to risk any solvent cleaning on the glue side of the laminate, for fear of damaging the clock-face. Alcohol can be used with care on the Plexiglas base which, in my case at least, had less adhesive on it than the overlay.

Note: the two MIM panel lamps backlight the gauge and clock dial markers, along with Jaguar logo of the overlay, by way of the Plexiglas. No glue is used where any markings on the clock-face have to be back-lit for night viewing.

Then simply reverse the operations:

Re-install the X-16 stepper motor using the two (T7) screws.

The removed clock section of overlay is now re-attached. There is great potential for mishaps when using liquid adhesives, so I opted to use double sided adhesive tape. I happened to have small double-sided 3/8” mounting squares, with a peel tab on each one. A number of these will fit comfortably around the perimeter on glue side of the clock overlay, without encroaching on the illuminated markers. A few more squares had to be trimmed to size to fit in other areas. Almost all available area was thereby made adhesive.

Wipe the Plexiglas base with alcohol to ensure a good grip. Peel off all paper backers. Place the overlay clock-face over the clock shaft(s) and carefully align to one side edge and top / bottom, and tilt down into position. Press down all over the clock-face with a clean cloth.

Position the hour hand exactly to 12 o/c and ‘rock’ the pointer fully down. Place the minute hand also exactly at 12 noon and press down into position. Note: as with any clock, the mechanism has no zero location, but the two hands have to be registered together, most easily at noon.

Clean the outer surface of the lens. I used Maguiers Plastix to remove a few light scratches. I also cleaned the inside of the lens; first with a little Windex on a brown paper napkin, and finishing up with distilled water, also using a brown paper napkin. Use Scotch tape to pick off any particles on the overlay or lens.

Gently reposition the gauge pointers at their zero pins.

Re-install the -/+ push-button assembly.

Place the lens back in position over the clock and gauges, and fasten with the front four T20 screws.

Position the PC board in place, taking note of the main connector socket orientation.

Working from the rear, place the clock ribbon extension board on the four motor pins and solder them. Re-attach the clock extension board assy. to the main PC board with the two (T7) screws. Ease the gauge ribbon cables into position and plug them back in to their sockets.

The rear case parts can now be attached with the four rear (T20) screws.