

# **Servicing Modern Automatic Watches**

*An annual seminar conducted by*

Manuel Yazijian, CMW21, Watchmaking Instructor/Certification Coordinator,  
at the A.W.C.I. Headquarters in Harrison, Ohio on Thursday, August 2nd, 2007.

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When a watchmaker is asked, “Do you always replace the battery when servicing a quartz watch?” most of us will respond, “Absolutely.”

However, when asked, “Do you always replace the mainspring when performing complete service on an automatic watch?” The answer may intrigue you, just as it did the watchmakers in attendance this past month at the Chronometer Club’s annual seminar.

In an instructional style unique to Manuel Yazijian, AWCI’s watchmaking instructor and certification coordinator, the answer to this baiting question is, “It depends.”

The primary focus of this one-day seminar, a training normally conducted over five days, was on the power source for the automatic watch, its barrel and related componentry, and the “unspeakable things” that a watchmaker may inadvertently do to one of the most fundamental and easily underestimated components of a watch’s ability to perform precision timekeeping – the proper “setup” of the automatic barrel. The importance of this knowledge is even more relevant with the existence of modern timing machines which enables one to verify not only the rate of the watch, but its overall “health”, i.e. amplitude or motion.

This article will focus only on the highlights of the seminar. Inquiring readers seeking a more in-depth explanation of modern automatic service are encouraged to take the full, five-day course offered regularly through A.W.C.I.’s Academy of Watchmaking Classes.

With an attendance at the seminar that included twelve bench participants, and more than a dozen highly-qualified spectators, the seminar proved to be an eclectic mixture of opinions on the various automatic watch service scenarios posed by Mr. Yazijian. This variety of responses only served to underscore the answer to the primary question of mainspring replacement, “It depends.” Most seasoned watchmakers know from experience that for every service problem there are usually multiple ways to render a solution, and efficiency and effectiveness are one’s chief consultants.

It is towards these ends that Mr. Yazijian has developed a flexible approach, predicated on reality-based experience, in choosing the depth and degree of service required by the power storage device within an automatic watch. This three-tiered solution process is aptly labeled:

**A. The “Ideal”**

**B. The “Safe”**

**C. The “Risky.”**

These courses of action are guided by several key factors, taken into consideration by the watchmaker at and prior to the point of service, and not necessarily in any order of importance:

- The factory guidelines for service (some specify new barrel complete).
- The age of the watch (modern vs. vintage)

- Wear and tear (mainplate and barrel bridge bushings/jewels, arbor, barrel bushings, mainspring bridge, barrel wall, barrel floor, barrel cap, etc.)
- The availability of parts (genuine, correct type, date of production, etc.)
- The ability to acquire and utilize the proper tool(s)

Other factors as guided by the watchmaker's judgment and experience

As we examine these approaches to servicing the barrel in the modern automatic watch, the guiding outcome principles must be kept in mind – that the automatic barrel and its components be “setup” properly with respect to:

1. Inspection for wear and repair/replacement as required.
2. Correct end and sideshakes, with adjustment as required.
3. Proper lubrication (of the spring, barrel wall, and arbor pivots).
4. Adequate torque (tested at the factory)
5. Confirmation of adequate power reserve with the Bergeon Cyclotest or other suitable equipment, utilizing factory tables and guidelines.

A. “**The Ideal**” approach represents, for the watch manufacturer, the best quality assurance, as this involves the replacement of the barrel complete with a factory fresh unit, one that has already been properly internally lubricated and torque tested. The watchmaker utilizing this approach acquires the part, inspects it for correct application, date of production and any damage or defect, properly lubricates the arbor pivots, installs and verifies function and power reserve in the assembled movement. Because this approach eliminates many of the errors that can be introduced by the watchmaker, i.e. improper lubrication, damage to the mainspring during installation, etc., it is considered “**ideal**.”

It may surprise watchmakers to know that some manufacturers, such as Tissot, have specified replacement of the barrel complete as the only option for service in some automatic models since the early 1960s. Currently, at least one manufacturer of modern automatics also recommends the ideal approach.

For the watchmaker; however, this course of action may be **less than ideal**, as he or she may be unable to obtain the barrel complete from the manufacturer, and/or has not built the cost of the barrel complete into the estimate for repairs. This solution is also untenable if the barrel complete, or the barrel proper and/or its cap, is unavailable, such as may be the case when the watch in question is a vintage automatic. In these and other similar situations, if watchmaker is able to obtain a new mainspring, and intends to reuse the barrel components (rendered suitable through inspection, proper cleaning and/or repair), then “**The Safe**” approach is considered.

B. “**The Safe**” approach requires that the watchmaker fit a brand new, factory-fresh mainspring from a sealed package, preferably with a recent production date. This issue is vital when fitting “old-stock” mainsprings on older automatic movements, as these mainsprings may have settled on a supplier's shelves for decades, and the internal lubricant may have congealed and/or solidified, rendering it unusable unless properly cleaned and relubricated (as in the “risky” approach below).

*Important sequential considerations:*

1. **Properly prepare the barrel** (thorough inspection, proper disassembly, ultrasonic cleaning, further inspection, and/or repairs). Always handle a clean barrel with finger cots, so as not to contaminate the surfaces or the barrel teeth.

- 2. Correctly lubricate the barrel wall. Always follow the manufacturer's recommended lubrication requirements. Caution should be exercised to avoid the unnecessary addition of additional lubricant on a pre-lubricated automatic mainspring that is factory**

**fresh, as this can cause the more liquid grease to mix with the much thicker and stickier braking grease.**

**For all modern ETA automatics, Chronogrease P-125 (braking grease) may be applied in judicious amounts utilizing one of three approaches:**

a. **Braking Notch Technique** – An adequate, \*non-intrusive amount is applied to ½ of the total number of braking alternating notches of the barrel wall utilizing a dedicated oiler, such as a Bergeon, red-handled (fine) oiler.

b. **Braking Notches Technique (alternate)** - A smaller, \*non-intrusive amount is applied to each of the respective barrel notches on the barrel wall, the thought being that “more is less.” By “less” the concern is that grease not be carried onto the barrel floor during the installation of the new mainspring; hence, there is “less” chance of this, as “less” is applied in “more” notches.

c. **Acting Surfaces Technique** – Because it is thought that even adequately applied grease to the braking notch may not allow for adequate distribution of the grease upon the acting surfaces of the barrel wall, a third technique has been developed. Small dabs of grease are deposited with the red-handled oiler, not in the notches, but on the acting surfaces of the barrel wall between the notches. These pre-deposits are then carefully spread with the tip of clean (and unused) peg wood, whose tip has been shaped into a spatula wedge capable of adequately smearing the pre-deposits of grease around the complete surface area of the braking wall. Again, this final amount should be checked for \*non-intrusiveness.

**\*Non-intrusiveness** implies that the watchmaker check the grease deposits on the barrel notches (or acting surface of the wall, as in approach “c”) to insure that the grease is as flat as possible within or against the notch or wall, and is not intruding (as in a stringy piece extending outward) into the barrel space, where the new mainspring’s outer coil/bridle might catch it, and deposit the grease on the barrel floor – causing stiction of the coils and adversely effecting the power transfer and time keeping.

**NOTE:** Correct barrel-wall lubrication can only be verified after the lubricated barrel is assembled, replaced in the movement, fully wound, let down, uninstalled from the watch, and the barrel cap removed. One then inspects the underside of the barrel cap for the telltale signs of lubrication remnants, which should preferably be non-existent. The grease should NOT intrude onto the surface of the barrel cap. Further verification can also be made by safely removing the mainspring from the barrel and noting the absence of grease on the barrel floor. Obviously, this is a verification technique employed when one is learning the skill of proper lubrication.

**3. Properly install the new mainspring and assemble the barrel components** utilizing the proper size barrel arbor-holding tool (such as Bergeon #30610 series), a barrel closing tool (available from Cas-ker # 590.856), and specially prepared acrylic block (to hold the arbor and provide a clean surface for barrel assembly). Check and adjust the endshake.

Some cautionary notes:

- The barrel endshake should be adjusted to zero on the barrel cap, as the opening process has likely introduced excessive endshake. The barrel closing tool can be set up to properly perform this procedure utilizing the concave section/base of the tool and the conical tip of an acrylic pick. This “negative” or zero endshake will be corrected after the new mainspring is installed.

The new mainspring should be centered on the barrel, and pushed into place utilizing a suitable technique and/or tool that will not cause deformation of the mainspring, damage to the inner shoulder of the barrel floor bushing (from pressure by the inner coil of the mainspring), or disturb the factory-applied “dry” lubricant. This “Teflon-like” substance is visible on some new mainsprings as a blue-ish residue. A technique to avoid causing this damage would utilize the conical end of the acrylic pick to effectively center the inner coil, while holding the new mainspring and its inserter (properly oriented and centered) on the barrel, and carefully and evenly depressing the outer coil/bridle of the mainspring using the chisel tip of a brass or hard-acrylic pick.

The barrel cap is reinstalled utilizing the barrel closing tool, and in some cases, the inserter ring is also utilized to prevent distortion due to the presence of a protruding inner ledge on the back-side of some barrels.

Endshake is then checked utilizing either brass tweezers to hold the barrel arbor ends, and/or by attaching the barrel-arbor holding tool. To increase endshake to meet manufacturer requirements, the barrel closing tool can be used, in combination with the mainspring inserter ring. As always, re-verify endshake after making any adjustment.

C. “**The Risky**” approach is named for the dangers associated with having to re-use and re-install a mainspring. (usually reserved for situations where a replacement is not available, thus the same mainspring will have to be reutilized, e.g. vintage watches) Specifically, the following problems are possible.

***Cleaning of old and unknown lubricant from the mainspring:***

◇ must be performed without causing deformation to the spring, and by utilizing a non-corrosive solvent,

◇ must not be dried with any heat as this may alter the temper of the spring.

***Oiling of the mainspring:***

- pass the body of the spring through a small piece of pre-cut, lint-free watch paper that has been freshly impregnated with the appropriate mainspring lubricant,
- pass the lubricated spring through a second piece of clean watch paper so as to leave only a film of the lubricant.

***Potential deformation of the mainspring in the following situations:***

**1. During Removal from the Barrel** (if forced by circumstance to re-use the spring).

- a. The **active removal method** involves the rapid removal of the spring from the barrel – with risk to both the barrel and/or the spring, not to mention the watchmaker – as components may be launched at high speed if the technique is done improperly.
- b. The much-preferred **passive removal method** involves a thumb controlled unwinding, beginning with the inner coil (after barrel arbor removal, of course). This technique may cause a coning of the inner coil, as well as a scoring of the tip of the barrel’s outer, open edge, as the lower edge of the exiting spring scrapes across this surface during its passive, controlled rotational removal.

**NOTE:** With either of these methods, the spring must be carefully inspected for scoring, warping and flatness. The bridle spot welds (look like rivets) must have no sign of stress, and the spring must have its proper pre-tension coil configuration (only possible to determine by comparison with

an unused, undamaged factory-fresh spring). In most cases, the old mainspring will NOT pass inspection, and must be replaced as repair is generally impractical.

**2. During Winding with a suitable tool** (if forced to re-use and/or re-install a spring that is no longer in its original inserter).

- a. The inside of the mainspring winder must be clean and free of any old contaminants.
- b. The side-slot of the mainspring winder drum must be properly angled and follow the natural winding direction of the mainspring.
- c. The hook in the winding arbor should be of the recessed variety so as to minimize potential distortion of the mainspring's inner coil.

***As is customary, upon reassembly of the mainspring into the barrel, and proper lubrication of the arbor during reassembly and installation into the clean watch, the slipping action of the bridle and the power reserve must be confirmed.***

As a final remark when considering the best course of action when dealing with automatic mainsprings, the adage, "When in doubt, throw it out," is worthy of mention.