

# ★ AMERICAN GUNSMITH®

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# Ultrasonic Firearm Cleaning, Part Two

*A remarkable, time-saving tool with the potential to wreck finishes if used improperly. Proper cleaning techniques and the experts reveal essential tips.*

by Richard MacLean

**W**hen it comes to devices that have on-off switches, “We don’t need no stinking directions!” seems to be the predominant thinking when setting these units up for the first time. “Turn ‘er on and let ‘er rip!” This start-up mode may work for home electronics that come supplied with one-page quick-start guides, however, this approach can lead to all manner of problems with ultrasonic units. In part one, we covered the background on ultrasonic cleaning, its evolution in firearm cleaning, and the current state of the technology. In this second part we will explore proper cleaning techniques, what the experts say about ultrasonic cleaning, and essential tips that have, to the best of our knowledge, never been published before.

## Proper Usage

Instructions for systems vary from manufacturer to manufacturer, but the basics are all the same. Firearms must be unloaded, of course, and for best results, field stripped. In the case of handguns, grip removal helps. Removal of forends and stocks on rifles and shotguns can be labor intensive for routine cleaning, but if these are synthetic, they can stay on. Wooden furniture should always come off. The same applies to telescopic, electronic, and laser sights. We will discuss other forms of sights later.

The cleaning solution concentrate should be diluted according to the manufacturer’s recommendations. Dilution ratios vary among products, thus one should consider the “true” cost when selecting a cleaner in addition to the product’s reputation for performance. Everything should be left unplugged until the solution is added. Running ultrasonic units empty or at below recommended levels can damage the transducers. Fresh cleaning solutions should be “degassed” of entrapped gasses by running the system for about five minutes.

The solution also should be heated to the recommended temperature prior to parts immersion. There is an optimum temperature range to promote cavitation and while room temperature works, 120-130°F is ideal for today’s solutions. Temperatures as high as 150°F are possible, but the parts become too hot to safely handle without protection. Evaporation losses also increase and manufacturers such as Crest Ultrasonics do recommend elevated temperatures when the parts are coated with heavy greases such as Cosmoline.

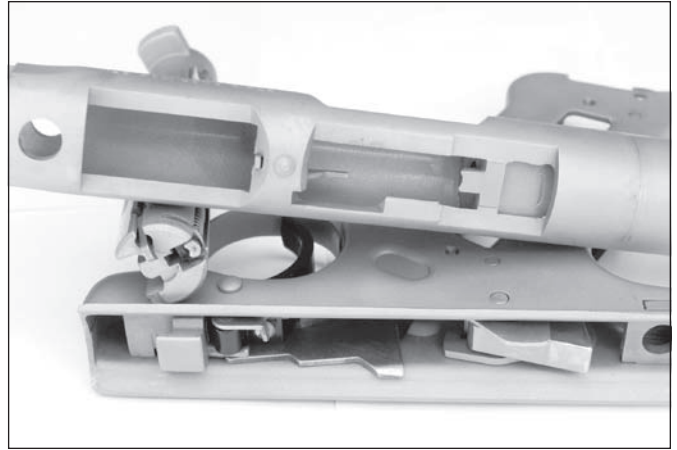
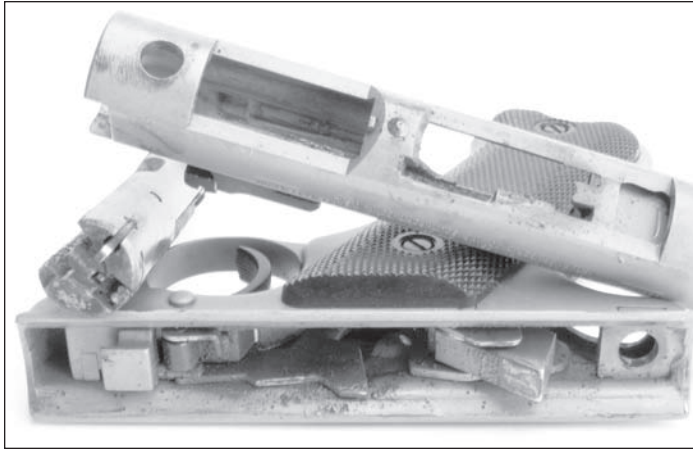
It is important that parts are kept off of the tank floor where the transducers are, in most cases, attached. That means that parts must be held in baskets or suspended. Most units today are supplied with stainless steel wire baskets made from square weave, 3 mesh, or lower stainless steel. There is a reason. Mesh above

50 acts as a solid to the ultrasonic waves. Very heavy baskets can also reduce the effectiveness of cleaning. Suspension hooks from rubber and nonrigid plastics absorb energy and should be used sparingly.

The amount of loading (i.e., weight of parts in the tank) also affects performance. The rule of thumb is load the tank to less than half the weight of the water volume. For example, if a unit’s capacity is two gallons or about 16 pounds, no more than eight pounds should be loaded. Another guideline is that the cross-sectional area of the parts should not exceed 70% of the tank’s cross-sectional area. Just like doing loads of household laundry, two small loads get the wash cleaner than one large maximum-capacity load.

The parts in the basket should be tipped to release trapped air. Slides and receivers should be placed dirty side facing down. Revolvers should have cylinders open and ejectors held open with some object such as a coin. For best results, hammers should be cocked during half of the cycle and down the remaining time. More about the nuisances of proper loading later.

Now comes the most critical step. Set the timer to no more than the maximum recommended time. This may be only five minutes for most firearms. For anodized, parkerized, baked-on paint finishes, and specialty finishes, the maximum time may be even less. If your unit



**Above:** The “after” results (right) from ultrasonic cleaning can be dramatic, as demonstrated by this suppressed Ruger Mark II Amphibian by AWC.

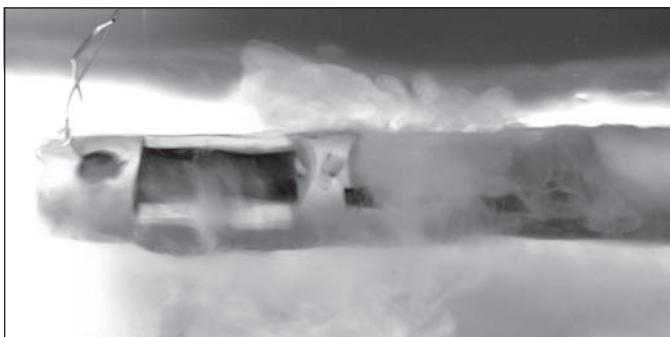
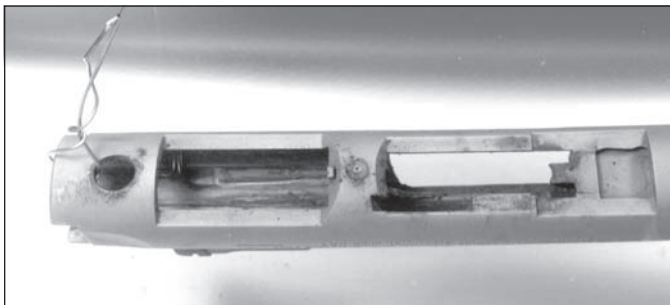
does not come supplied with an internal timer, get an external in-line one and use it. Do not count on your memory to shut the unit off at the right time. Non-baked-on painted finishes can be particularly sensitive to damage, including painted sights and cartouches. Indeed, manufacturers such as Crest Ultrasonics recommend that painted pictograms or cartouches be first coated over with a wax crayon. By the time the wax is ultrasonically removed, the overall firearm is done.

With ultrasonic cleaning, less is better. For extremely dirty areas and especially bores, some mechanical brushing and re-submersion for a few minutes will yield the best results.

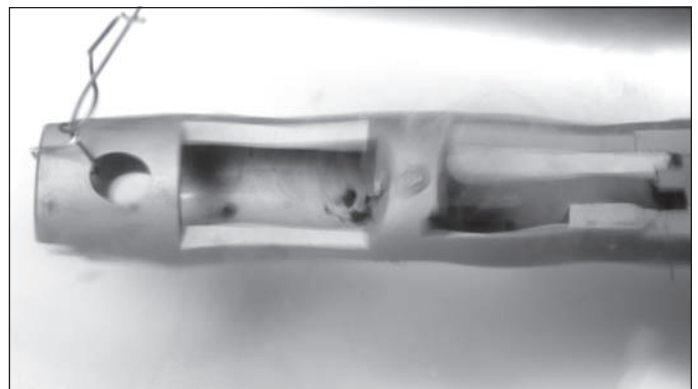
Problems occur when individuals assume more is better, and even the thickest of fouling will be removed without brushing.

Once cleaned, the firearms are drained, rinsed with water, and dried. Again, there are variations on how best to accomplish this, including the use of compressed air. Common sense should be used. For example, the hardened gunk in the firing pin channel will be loosened, but unless it is mechanically scrubbed or blown free with compressed air, it will remain entrapped. More about this key point later from the experts.

The next step is to coat the parts to displace any residual trapped water and provide a protective coating. Parts can be sprayed or submerged with a water-displacement solution that also protects and lubricates. But the best method is to place the cleaned parts into a basket suspended in a pan containing an ultrasonic displacement lubricant. This pan rests on top of the cleaning solution and the unit is run for several additional minutes. The ultrasonic waves are transmitted through the bottom of the pan into the lubricant. Finally, the parts are



**Counter Clockwise:** Cleaning progress can be seen in this series for the Ruger Mark II barrel suspended horizontally (distortion is from surface waves). From top, before the unit was turned on; one minute into the cleaning; after 5 minutes. Note the carbon accumulation, illustrating why areas where crud can accumulate need to be blown out or mechanically cleaned.





drained and the excess lubricant is removed with a rag and, if available, with compressed air. The gun is then assembled and lubricated and/or greased according to the firearm manufacturer's recommendation.

### Damage To Finish Controversy

The first part of this article explored the power released through cavitation induced from ultrasonic waves and the ad hoc history of its early application for firearms cleaning. Not surprisingly, there have been numerous cases over the years of very unhappy individuals left with wrecked finishes on valuable firearms. Google "ultrasonic cleaning damage to firearm finishes" and you will get nearly half-a-million hits, the vast majority irrelevant but still there are numerous posts that raise the issue of surface damage.

**Above left:** Optics and wood furniture need to come off, such as on this S&W Model 41 (right.) Field stripping is essential. Plastic grips can stay on, but it is best to remove these to improve cleaning. Glock states that ultrasonics will not affect its guns. **Above right:** H&K reports that even Hoppe's 9 can remove the paint from lettering and cartouches if a part, such as this barrel, is soaked long enough. Source, H&K USA.

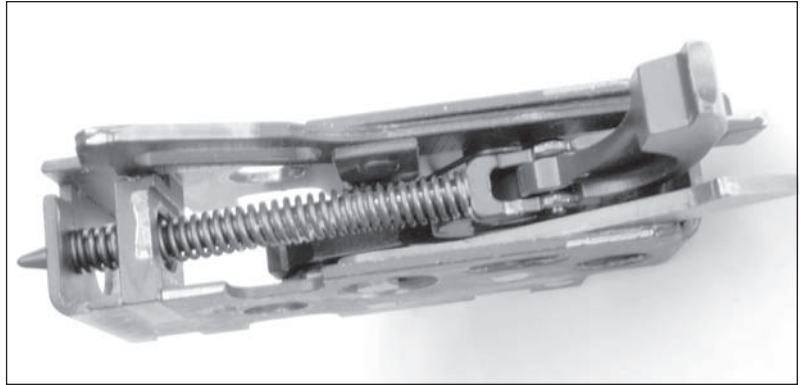
What are the facts? Yes, ultrasonic cleaning can cause surface erosion to some finishes. The extent varies from zero for stainless steel to significant for non-baked-on paints if the wrong cleaning solvents are used for long periods of time. Softer, shiny metals such as aluminum foil show the effect most dramatically. Even glass can be etched given the "right" set of conditions. Weapons made from 7075 alloy aluminum

with a hard anodized finish can also be impacted if all the wrong parameters are employed and the finish is not the best quality.

Monty Crain, head of Brownells technology group, states, "After cleaning our M16s and M4s about 10 times [typically made from 7075 alloy], you could see some of the anodizing becoming lighter, most likely due to a poor finish at the manufacturer. Those were probably

**Below:** Painted sights and lettering are more vulnerable to cavitation damage than baked-on gun finishes. Damage can be minimized by a coating of wax or crayon. By the time the crayon is removed, the firearm is clean.





because of extended cleaning times due to distractions while busy on other tasks.

“If you violate the canons of good gun cleaning and leave any surface in any solution too long, you will suffer the wrath. All ultrasonic cleaners will damage any painted surface within 15 minutes of submersion if it is not a baked-on finish. Fifteen minutes should be the rule of thumb on submersion for most surfaces because you are only loosening the grime, and some physical scrubbing is required to remove the particulates from the surfaces, both internal and external.

“All vagaries aside, it will also depend on the type and quality of the coating. I have left parkerized parts in for well over 15 minutes and all but a mere vestige of parkerizing was gone. Teflon/Moly, Aluma Hyde II, Dura Coat, Aluma Hyde, Spray Texture, Camo colors, and so on can be adversely impacted at times exceeding 30 minutes in certain ultra-

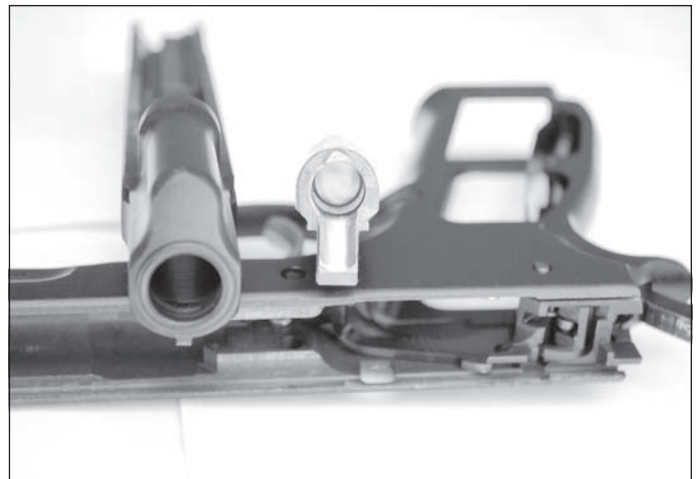
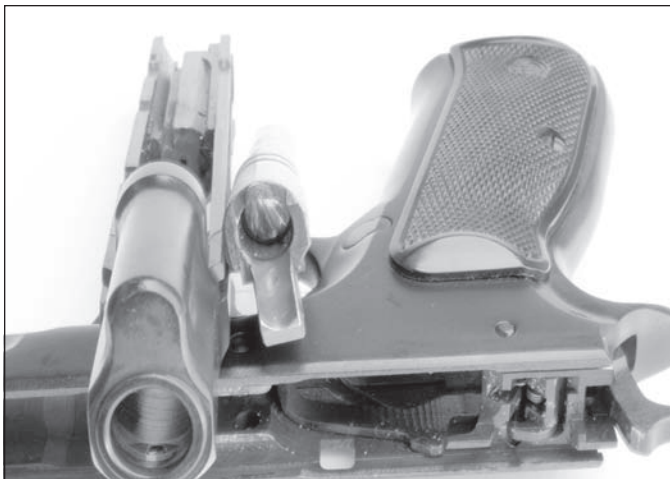
**Above:** Gunk can accumulate in the firing pin channel after ultrasonic cleaning. For many firearms, disassembly and cleaning of this channel takes seconds, but for firearms such as this H&K USP (left), removal is more difficult. Blowing with compressed air is recommended. Other assemblies, such as this MP5 trigger pack (right) are wide open and easily cleaned without disassembly, as long as they are properly positioned in the tank so that gunk can flow out.

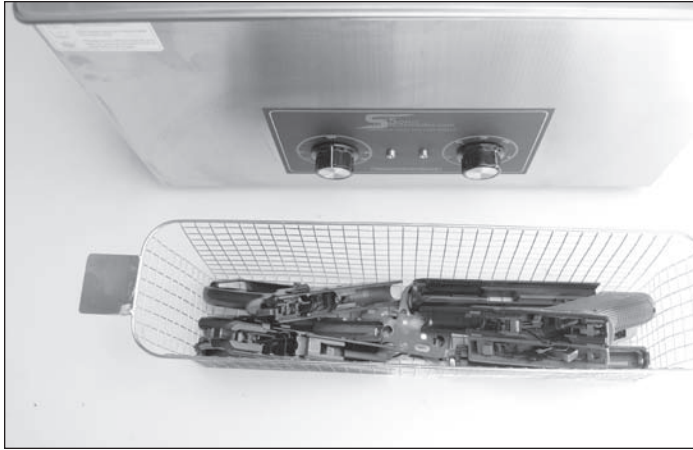
sonic cleaners and solvents. There are no standards for damage/time estimates as no destructive tests have been performed.”

Ultrasonic cleaner manufacturers recommend much less time-in-tank. Fifteen minutes, as stated by Monty Crain above, should be considered an upper limit never to be exceeded. Three-to-five minute durations followed by a little brushing and another minute or two in the tank will get the job done faster with little or no finish damage, according to Greg Infante of GunCleaners.

What about the major firearm manufacturers? Glock USA states ultrasonic cleaning is not an issue for their line of products, as long as “non-ammoniated cleaners are used.” Apparently, both the polymer and the metal finish can be impacted. Ultrasonic cleaning solvents for firearms are typically advertised as “non-ammoniated.” Glock USA also states that their tritium sights are not affected. Ultrasonic unit manufacturers recommend that these sights be positioned face up or away from the bottom of the tank for additional protection.

**Below:** This CZ 75 has a hard baked-on finish. Only three minutes max is recommended to achieve the cleaning results illustrated on the right.





Sam Bass, Heckler & Koch's Repair Manager for the U.S., states that their product lines are ultrasonic safe. "The most important issue concerning ultrasonic cleaning is to use the right solution at the right temperature and for the correct time. We have not seen damage from cavitation; if there is damage it is because of excessively harsh or caustic solutions. Yes, the paint inside the engraved cartouches can be gradually removed." As stated earlier, some ultrasonic manufacturers recommend that these engravings be filled with a coating of wax or covered with crayon.

Sam discloses another key factor, "It is important to correctly position the parts in the tank. You should take a look at each part and determine the best path for the loosened gunk to flow out and away from the part. For example, when cleaning an MP5 trigger group, the unit should be placed vertically so the sediment flows down, especially if the trigger assembly is not removed from the trigger housing. This same concept applies to pistols and, in particular, the firing pin channels. These may need to be stripped and cleaned of the loosened gunk. What we have also seen is that the cleaning solvent and the oil trapped inside after cleaning may eventually react together and turn into something resembling pine tar. Obviously this can create a dangerous situation with regard to reliable firing pin function."

**Above left:** An improper stack. Firearms and parts stacked such that gunk cannot flow out and the surfaces can vibrate next to one another.

**Above right:** Proper loading of the tank is essential, as shown here.

To gain an appreciation of Sam's concern over gunk accumulating, it is recommended that you watch a fascinating YouTube video (*Ultrasonic Gun Cleaning*) showing the crud flowing off a submerged revolver being ultrasonically cleaned ([youtu.be/nOVUpenSvdw](http://youtu.be/nOVUpenSvdw)).

What about the specialty finishers? Robbie Barrkman at Robar (623/581-2648, [robarguns.com](http://robarguns.com)) states that NP3 coatings are completely ultrasonic safe. Similarly, Chris Peters of Metaloy Industries ([originalmetaloy.com](http://originalmetaloy.com)) states, "Ultrasonic cleaners, when used properly, will have no effect on firearms finishes, be it hard chrome, parkerizing, bluing, and the spray and baked-on finishes. I highly doubt these units damage gun finishes since they would not make their way into many police departments, military units, or small gun shops."

"What I believe is the problem is the improper use of the units. For example, not racking the parts properly, letting parts, frames, and slides touch while in the operating unit and scratching the finishes that way rather than because of the unit cleaning and doing its job. If not racked or put in a wire basket, the ultrasonic waves in the cleaning solution could possibly move or vibrate the parts together causing

damage. I also doubt the manufacturer-supplied cleaning solutions are at fault since most water-based solutions are nontoxic and environmentally friendly. We recently purchased a small ultrasonic unit for other projects and for R&D purposes. It works very well. We have experienced no damage to our finishes or any others."

Others within this community of finishers have strong reservations. Bob Ford of Bear Coat Gun Finishes (303/678-8522, [bearcoat.com](http://bearcoat.com)) states, "They can do significant damage to 'coated' firearms and aluminum. It's called read the directions! With clean solvent they are okay. Most users do not filter or clean the material being used, trying to get as much mileage as possible out of it. With any buildup of trash in the solvent, a firearm sitting in the ultrasonic device will use the combination of ultrasonic vibration and contaminants as a grinding compound and will damage the firearm. We have had police departments all over the country send in firearms for rescue from such damage. Mostly SIGs, Colt ARs, and some coated firearms."

What about the suppliers of sights? As previously stated, painted sights can be problematic unless pre-coated with wax. Tritium sights are less prone to damage. Glock USA

has not had problems, and Trijicon states that its sights are “impervious to oils and solvents, with the exception of any solvents such as acetone or ethanol that could have a negative impact” on the paints and cements used in their sights. Ultrasonic cleaners used “to clean a weapon with Trijicon sights will have no effect on the sights” unless the wrong solvents are used.

What about suppressor manufacturers? Modern suppressors are typically sealed units and, one would think, an ideal candidate for ultrasonic cleaning. But “cleaner is better” does not apply to suppressors. Tom Bowers of Bowers Group LLC (503/992-8697, bowersgroup.com) explains, “The shiny internals of new suppressors are reflective. Some fouling will slightly improve performance. Of course, if the unit is literally plugged with material, the performance will be dramatically reduced, but we have rarely seen this under normal use.

“If a suppressor is significantly impacted with fouling and lead deposits, it is unlikely that ultrasonic cleaning would even work. Some suppressors are of ‘open architecture’ and more easily cleaned, even by ultrasonics, but some, such as those based on a K-baffle design, utilize voids with small access holes. Even if the fouling is loosened, much of it will typically remain entrapped and the suppressor cannot be completely drained. If the unit is entirely stainless steel, solutions can be used that will dissolve everything, including aluminum. You have to know the construction since some units have stainless on the outside but aluminum on the inside. It is best to let the original manufacturer handle service, and we don’t recommend cleaning of any type to our clients. People who have competing products should consult with the manufacturer for instructions related to those products.”

Another claim is that these devices may propagate preexisting

surface cracks. Indeed, these devices are not recommended for cleaning jewelry with natural emeralds since these gemstones have natural veins that are subject to vibration separation. Yes, if there are cracks, ultrasonics will “clean them,” but we have found no documentation of properly used ultrasonic cleaning propagating these further.

### Features To Consider

If you are in the market for an ultrasonic unit, the first step is to map out exactly what you want to accomplish. For example, there is a major jump in cost if you want to clean rifles versus just pistols and small parts. There are also differences in the recommended process, such as how long each step should take, drying, use of compressed air, and so on.

Costs vary widely starting with tabletop imports for brass less than \$200; to single pistol, one-gallon imported units at about \$400; to \$700 for two-gun units; to \$1,700 for units large enough to handle seven guns, submachine guns, or rifle barrels. Domestic units are generally 30% or more higher with large rifle-size tanks costing over \$5,000.

Used industrial units can offer a distinct cost advantage, but they could prove to be a fool’s investment if they are not at the proper frequencies and power levels as discussed in this article. Industrial units may have been designed for cleaning operations where surface erosion is not a significant concern, such as in carburetor cleaning. If these are not equipped with a shut-off timer, then, as stated earlier, one must be added.

Another fool’s investment is to use homemade cleaning solutions. The factors that go into commercial cleaning solutions include buffering agents, deformers, dispersants, emulsifiers, inhibitors, pH, saponifiers, sequestrants, surfactants, and wetting agents. Making these would be fine if you happen to be a chem-

ist, but beyond the reach of most gunsmiths.

If you are using your unit to clean auto parts, by all means, make your own solution with a mixture of a cup of Simple Green® and a tablespoon of dish detergent to about five gallons of water. It may work just fine. We provide this formula because if you should run across this or another cheap homemade ultrasonic cleaner in the context of firearms, watch out. The firearm you save may be your customer’s.

### Closing

The reoccurring theme from very knowledgeable individuals within the firearms industry is very consistent. Be they the manufacturers of the units or firearms, the distributors, or the coating companies, they all state that these units can damage finishes if improperly used. If used properly, they can dramatically cut cleaning times and clean hard-to-reach nooks and crannies like no other method. One should understand what their strengths and limitations are. For gunsmiths, time is money and specialized services can expand your list of offerings and increase profits.

### Acknowledgements

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