



Scope Level Installation

Thank you for purchasing an Accuracy 1st DG anti-cant scope level. When installing the scope level there are two appropriate methods of insuring your, optics reticle and level are true to the horizon.

The first method requires an accurate long straight edge with a level, similar to a contractor's framing level, and a piece of construction paper. (A large target, cardboard or anything you can draw on.)

- Place the target at a range that you can accurately focus on. Level the target as best as possible.
- Now draw a horizontal or vertical line on the target with the level and a marker. (This establishes a line that is either true to the horizon or perpendicular to it, either works fine.) The precision and care of insuring your drawn line is aligned with the true horizontal level is very important. So use tools appropriate to the job.
- Loosen the scope and/or remove it, whichever is necessary to install your scope level.
- Re-tighten the scope so it can be rotated, but will stay where you leave it.
- Get in your most used shooting position, for a sniper or similar discipline the prone position is the most used. Get down behind your weapon and nestle the rifle butt into your shoulder pocket.
- Bag your rifle into position or get a friend to assist you. (If you removed your scope, re-check all eye relief and cheek weld positions.)
- With the rifle in the most ergonomical and comfortable position, eye relief and cheek weld set-up for your style of shooting, adjust your parallax knob to remove all parallax then rotate your scope so the appropriate cross stadia line perfectly lines up with the drawn line.
- Evenly tighten the scope rings down to their appropriate torque specification.
- Re-check the comfort of the position of the rifle butt and the alignment of the cross hairs to the line. If everything lines up, hold or bag your weapon and with the scope reticle perfectly aligned with the appropriate stadia line in the reticle to the horizontal or perpendicular line you just drew. Your scope level is designed so it is optimal when it has a 0.30" gap, between the base and cap on both sides. It is easiest to screw the side of the level cap ring that is opposite the actual level vial so it has a roughly 0.03" gap then rotate it so the screw head under the vial area is exposed and torque it to where it is snug but will still rotate.

- Now with the reticle aligned properly rotate the level housing until the ball reads perfectly center. Tighten the screws, 6-8 inch pounds of torque, and reconfirm everything once again. With the supplied hex key, insert the long end into the socket head cap screw and by using two fingers on the short end, approximately 6-8 inch pound of torque will be applied with a gentle tightening. The socket head cap screw is a 6-32 pitch and generates a significant amount of clamping force with minimal torque. The level housing is 6061-T651 aluminum and the thread can be stripped with over tightening. In addition with the fine pitched threads it is possible to tighten the scope level to the point it damages your scope tube. It is highly advisable to torque the screw with an inch pound torque wrench similar to what is used to torque actual scope rings. The level only needs to resist moving, as well as the recoil inertias of your weapon. It is highly advisable to tighten anything mounted directly to your optics tube with extreme care as not to damage it.

The second method for installing the anti-cant scope level is very similar to the first; however, in lieu of drawing a line on a target, a plumb bob or piece of string/twine, etc. with a relatively heavy object tied to the end is used instead. The weight or plumb bob needs to be suspended and not touch the floor or ground. The weighted object will pull the string parallel to the Earth's gravitational pull and accomplish exactly the same objective that a level would. The only pit fall in this method is the swinging motion generated from wind or other outside forces. The remainder of this method is identical to the first method.

Additional features of your new Accuracy 1st Development Group, Inc. scope level:

- **At first glance it is apparent there are differences in the Accuracy 1st DG, Inc. scope level:** The vial is curved and contains a precision ceramic ball. Likewise it has a small air bubble in the vial. The housing is offset slightly and is in the 11 O'clock position and it has a slot with a rubber stopper in the back.
- **Curved Level Vial and Ceramic Ball:** Most levels use a bubble to determine if you are level. A bubble has surface tension on the glass, it normally is not a huge amount if it is a precision vial; however, most levels are comprised of cheap plastic vials that are unlikely to start moving until they experience 2-3 degrees of movement. In precision long range shooting this amount of uncertainty can easily equate to a miss. The Accuracy 1st DG, Inc. scope level, having a grade 10 precision ceramic ball bearing, can sense angular alignment to well below 1 degree of cant. This insures that when the ball is aligned with the level marks it is precisely aligned with the horizon. In addition the vial is curved and marked every 2.5 degrees. For the average shooter, simply maintaining proper alignment to the horizon is more than sufficient. But in instances where you compromise other critical and more vital positions to be aligned with the horizon, the Accuracy 1st DG, Inc. scope level provides you a known amount of cant. Having a known amount of cant can be compensated for with calculation offsets to your dope. This can be done accurately if you have a precise measurement of cant. Even though the graduations are every 2.5 degrees it is relatively easy to interpolate much finer resolution. We could have

actually graduated the vial to a finer resolution but given size constraints and visual acuity, 2.5 degree graduations are as fine as what is necessary. What we have determined provides the best balance between the determining factors. To achieve a balance between the important factors the vial had to be made so it could sense minor amounts of cant. The only way to achieve this in a precision level is to curve the vial and have a very round object moving along the curvature.

- **Why our level also has a bubble?** It is the very reason a bubble level has another level of uncertainty in its precision. As temperature increase or decreases the pressure inside of a vial increases. Since liquids are non-compressible as the fluid expands and contracts from cold or heat the internal pressure in the vial responds accordingly. Since air is compressible we intentionally have a small air pocket or bubble that increases or decreases in size as the temperature fluctuates. Without this air bubble, in extreme heat the fluid could expand to the point of bursting the vial. This exact same effect happens to a bubble level. The air bubble inside increases and decreases with temperature fluctuation. In a very well made precision glass bubble level the graduation lines are only calibrated at a very specific temperature and pressure. Which means it is only accurate at that specific temperature and pressure target. This physical property of expansion of the fluid, results in the fluctuation of the bubble size, is one more level of uncertainty that you will have when using a bubble level in hot environments.
- **The Accuracy 1st DG, Inc. scope level was specifically designed for the covert operations.** It has rounded edges everywhere to reduce snagging. It does not stick out any further than most windage or parallax adjustment knobs. It is strategically positioned so you can still observe your vertical turret adjustments, but also be visible through your non-dominant eye when still behind your ocular lens and viewing thru your optic. It is designed to negate temperature bubble size fluctuation via the use of a precision ceramic ball indicator. (Ceramic is an extremely inert material so it experiences extremely minimal expansion and contraction due to temperature.)
- **Rubber stopper inserted into the back side of the vial holder area.** The rubber stopper is precision fitted, not glued. It can be removed with an ordinary stick pin to allow additional light to come thru the vial. In the cavity an ancillary light source can be inserted, glow sticks; light gathering fiber optics, illumination paint or strips. Virtually anything that will fit in the slot and provide additional lighting to illuminate the level vial in low light or darkness. The physics behind using a level do not change just because the lighting environment changes.
- **Vial material:** The vial contains a precisely metered viscosity glycol solution, with a ceramic ball and lab grade, precision ground, Pyrex tubing. The glass has been annealed to increase its shock resistance, but even though it is a lab grade glass, it is much stronger and more shock resistant than most all other glass materials. The Pyrex glass has been engineered to resist the shock produced from weapons as large as a 50 BMG round, as well as the aluminum housing that encompasses the majority of the vial. But it is still glass and can break if it receives a sharp and direct blow to the vial. The choice of using precision glass is exactly that, precision. To achieve the level of accuracy we demanded the vial be produced from a precision

made highly uniform tubing. The vial comes at a great expense to the overall cost of the anti-cant level but it is the only suitable means of producing the precision we required.

Note: A serious miss conception in the shooting industry is that your weapon needs to be perpendicular to the horizon. This simply isn't true when weighed against other factors of greater importance. The stadia lines of your optics reticle absolutely need to be perpendicular and parallel to the horizon and then the anti-cant level to your optics reticle stadia lines unless you know exactly how far off axis the reticles are to the horizon. The weapon not being perfectly level with the optics and the horizon does induce a very minor bias. But not having your weapon in a secure and very rigid stance is much more detrimental to your shooting success. Using this method of having your weapon properly seated into your shoulder pocket which normally will be slightly askew of perpendicular to the horizon, provides a much more intuitive and proper alignment of the weapon to the shooter. If you were to align your rifle with a level, then the optic, and finally the anti-cant level, you are pulling the butt stock of your weapon out of your natural shoulder pocket or altering your stance to conform to the weapon. The more appropriate technique is to perfect your form in each shooting position to provide the most stable and ergonomic form and then conform the weapon to the position. Once again your optics reticle stadia lines need to be horizontal and perpendicular to the horizon. It is possible to allow for cant if it is precisely known how far off of horizontal you are, but this requires correction factors to be applied to all of your dope. It is much simpler to have your reticle stadia lines aligned with the horizon. Any compromise to your shooting stability platform or stance has measurable influence on the your ability to hold steady and break a clean shot as well as , rigidity of your stance resulting in less than optimal recoil management. Technique, a stabile shooting form and recoil management have much greater influences than the tiny amount of induced bias that is relative to the optic and weapon not being both perfectly perpendicular to the horizon. Proper form promotes good recoil management, which is crucial to precision shooting at long ranges, and imperative to the timeliness of a follow up shot as well as staying in your optic after discharge to view trace, splash, impacts, target movement or other important down range occurrences. First round impacts at range require a holistic approach to shooting fundamentals. But due to the nature of wind and its influences on external ballistics, or more appropriately stated our lack of ability to access the wind with high confidence levels, second shot corrections are a reality and necessity at extended ranges. At least until weapons mountable wind profilers are commercially available. Maximize the things you can control, minimize the things you cannot and educate yourself to know the difference.

Thank you again for your purchase of an Accuracy 1st DG, Inc. scope level. If you require additional assistance, please don't hesitate to contact us.

Sales@accuracy1stdg.com or visit us on the web at www.accuracy1stdg.com