

What, Why, and How of Frame Adjustments



Introduction

Every single eyeglass frame must be adjusted and custom fitted to the patient. If something is amiss, the patient will experience a visual error. This course will take the eye care professional (ECP) through the correct steps to measure and adjust a frame prior to ordering lenses for the frame. In addition, it will expand the knowledge of the dispensing ECP regarding adjustments and how to correct a frame problem. The course also covers how to re-adjust a frame after the initial fitting to keep a frame aligned and in good shape throughout the intended life of the eyeglasses.

First things first: Before taking measurements

Chances are good that a frame is not in standard adjustment when it is taken out of a shipment box or removed from a dispensary display. This is equally true for any frame that has been tried on or otherwise handled. Standardizing, or truing, a frame is part of the pre-fit process. Standardizing assures that the frame will sit neutrally on the patient's face before custom adjustments are made. Without this neutral shape, it would be difficult to determine if a misalignment is due to the frame or perhaps to the unequal parity of the patient's face.

Certain frame materials are better suited to adjustments. In plastics, zyl is adjustable, versatile and available in all price points. Ecology friendly frame materials are being crafted with plant based plastics. For metal frames, using recycled or up cycled metals suits the current eco-trend. While brand names have a huge impact on patient selection, savvy patients are asking for less well known, but eco-friendly frames.

Initial choices

The initial input of a knowledgeable ECP helps a patient to choose a frame wisely. In order to assist a patient in the choice of a frame, the optician must have knowledge of the frames in stock. Confirming the needed width for a frame is done with your PD ruler, yet many opticians can also look at a patient's face and use their experience to estimate the A and dbL. If the width of the frame has been chosen well, the patient's eyes should be as close to centered in each eye wire as possible. The overall width of a frame should be equal to $(A \times 2) + DBL$, with a bit added if the frame has special temple end attachments that extend outwards.

Frame measurements

Frames are usually stamped with the A size, the DBL and often the temple length. These numbers should closely correspond with hand measurements you take of the frame. The first number of a frame measurement (51-18-140) is the width of one lens measured in millimeters; in this instance, the A measurement is 51. In this example, the overall width of this frame should be around 120 millimeters in the front ($51 + 51 + 18$).



Generally, adult PDs fall into these ranges: A narrow adult PD might be measured from 40 mm to about 50 mm. A medium adult PD can range from about 48mm to 63mm. Considerably wider faces will require larger A sizes of about 52 mm or more. Some brands carry much larger A sizes, such as Fatheadz®. The ECP measures a patient's face with a PD ruler by measuring from the right temple of the face to the left temple of the face. Based on this measurement, an average frame is needed for a face about 140 mm wide. Use a moderately wide frame for a face that is about 145 mm. A wider frame is needed for a face approximately 150 mm; and then the widest frame is best for a face larger than 150 mm wide. With any frame, be sure that the eyes are well-centered and that the frame is not far narrower or wider than the widest part of the face.

It is common for a patient needing a wide A size to also need a substantial bridge, or DBL; although there are certainly exceptions to this rule. The DBL will be the second number stamped upon a frame, so in a frame marked 51-18, the DBL is 18. You can look at how close or wide set a patient's eyes are to help gauge bridge size. When a patient's eyes are set close together, a bridge in the range of 14 to 18 mm might be needed. DBL sizes of 18 to 22 mm are for wide set eyes. Again, there are variations for bridge sizes.

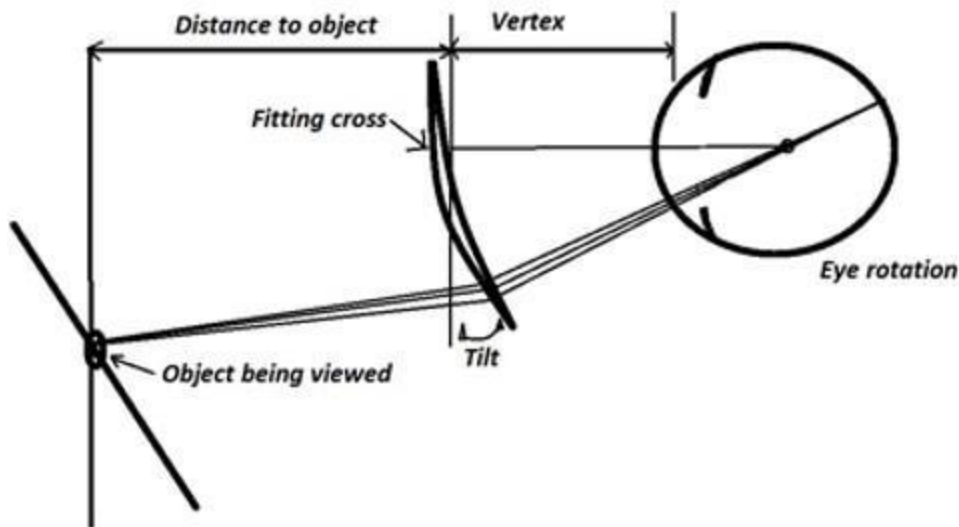
Remember that you can usually order a popular frame style in two or three combinations of A and DBL sizes. If a frame you have on your board is a 51-18 and it is too large for the patient, look for a smaller size of the same frame, such as a 48-16. A quick glance at your frames inventory program, or a subscription service such as Frames Data, will show all sizes as well as colors and additional features available for a style. It is highly likely that frame data is incorporated into any computerized office or inventory system already being used in your dispensary. Many companies have their own version of a data catalog online, and resources can even be found on social media, such as Facebook.

Patient measurements

Of course estimates are only a good place to start in frame choice, especially when directing the patient to the correct frame board. However, formal patient measurements must be acquired: patient's PD, OcHt or seg height, possibly vertex distance, and perhaps position-of-wear. We will look at errors in measuring in a moment, but let's check a few pointers for position of wear (POW) measurements:

- POW measurements will sometimes result in a compensated RX
- POW measurements are needed for optimized progressives & atoric/aspheric single vision lenses

- POW may include: monocular PDs, monocular OcHts, vertex distance, frame tilt & wrap
- The center of rotation and the line of sight might be required
- These measurements are combined with traditional frame measurements
- PD's and OcHts will be monocular
- Both prescribed and fitted vertex distance may be needed
- Default distances are 40 cm for near-sighted lenses; 20 feet for distance-sighted lenses



Observe the patient standing and walking, since some patients “pose” when sitting. For instance a patient who walks with their head tilted slightly back may require a lower seg height than what is measured when the patient is seated. Mark the frame and have the patient stand or walk with the new marking to verify any postural adjustment needed.

Pupillary Distance and errors

The most common error in taking a pupillary distance (PD) measurement is to mistakenly take a near measurement when a distance is needed and vice versa. One way to avoid this error is to routinely record both measurements in the patient file. Then only transfer the required PD to an order form or screen. This will also avoid an error at the lab; if only the correct PD is provided, only the correct PD can be used.

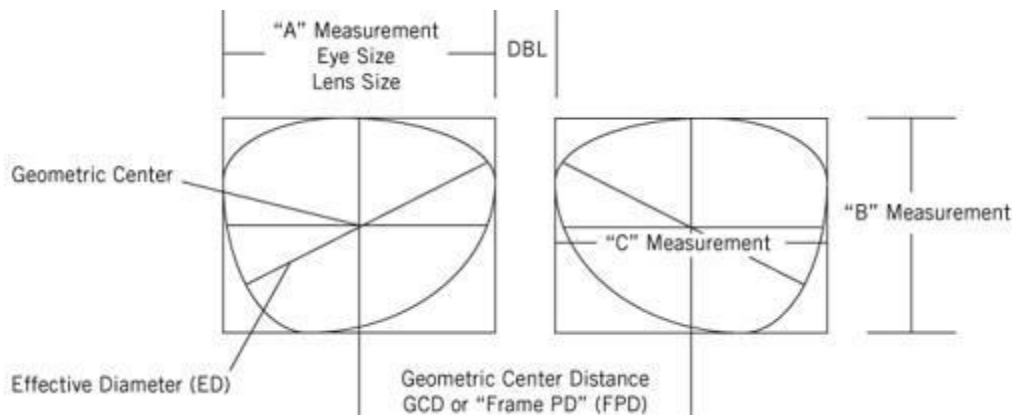
Some patients have trouble keeping a steady focus, most especially the elderly and the young. In this circumstance, some ECPs take the measurement a few times and average the results.

It is important that the eye level of the ECP is even with the patient. Adjust the stool(s) or stand to get the correct level. Mono OcHt, especially for progressives, should be verified with the use of gel clings, vis-à-vis lines or having a coworker double check markings.

Universal fit frames have a flatter design. Because the lenses sit closer to the eyes in this genre of eye wear, adjustments are critical for good vision. POW fitting will help to avoid many potential errors and problems.

Frame measurement errors

Always use the boxing system to confirm measurements printed on the frame or in the database with actual measurements. Here is a quick recap of standard boxing measurements that need to be verified:



The A or EYE SIZE is the widest horizontal space of the lens within the imaginary box enclosing the lens. The widest part of the frame might NOT be in the center, so verify. Add the depth of the bevel when measuring.

The B or vertical size is the height between the two horizontal box lines enclosing the lens. Again, include the depth of the bevel when measuring the frame.

GCD (FPD) is the distance between the geometric centers of the right and left lens. As this is difficult to physically measure without lab markings, it can be calculated as (A plus DBL).

DBL means distance between lenses and relates to the printed bridge size. This is the minimum nasal distance between the two lenses and may not be located in the vertical center of the bridge.

ED, or effective diameter, is technically twice the longest radius from the geometric center of lens to the farthest edge. However, since this is almost impossible to measure by hand, traditionally this is the largest measurement in any direction on one eye wire. It might even be located reverse or upside down relatively.

Traditionally, when measuring a frame inside from edge to edge, 1 mm is added to account for the lens bevel. Failure to account for the bevel will lead to an error. However, accidentally adding the 1mm to a rimless frame would also result in an error. Do not add millimeters to a rimless frame.

ANSI standards only allow for 2.5 mm of error horizontally, or 1 mm vertically; so an initial error in measurement could lead to a finished job being rejected if it induces significant prism. Some PD rulers are made to fit within the bevel for the most accurate measurement, but this is not possible if demo or existing lenses are already in place.

Getting bent out of shape



Every frame must be put into standard alignment and then customized to the patient's face and skull. A patient may inadvertently sit on or fall asleep in their glasses. Frame misalignments can be caused by accidents, repeated removal of a frame incorrectly, wearing the glasses on top of the head like a headband, and many other mistreatments of a frame. A misalignment of the frame and lens may make the patient think something is wrong with their vision since objects appear taller, smaller or skewed.

Your patient may complain about frames that slide, that leave red marks on the side of the nose or behind the ears, and frames that seem crooked. It will be up to the ECP to assess the cause and re-adjust the frame to alleviate the problem.

Here's a quick review:

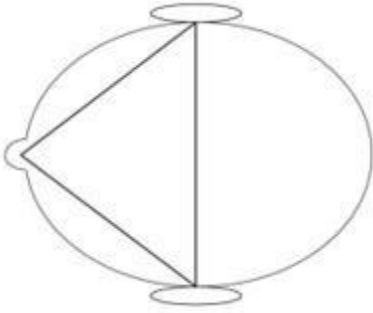
Standard Alignment (Bench Alignment)

Bench Alignment gives a level starting point and assures that frame adjustments on the patient's face will be minimal.

A frame in good bench alignment will exhibit all of the following:

- Positive face form
- Horizontal alignment
- Vertical alignment
- Temple alignment
- Nose pad alignment

When looking at the adjustment of the frame on the patient's face, use the fitting triangle. This reminds the ECP that the frame should only touch the bridge of the patient's nose and just above the crotch of or slightly behind each ear.



Patients encounter frame alignment problems if they fall asleep in their glasses, have an accident or mishap involving the glasses. A variety of misalignments can also be caused by well-meaning patients who have attempted to tighten their own frames in amateur ways. Now it is up to the ECP to realign the glasses properly and then adjust the eyewear to the face again.

Bridge and pad arms



Most metal frames have two adjustable nose pads attached to the frame front with pad arms, and can be straight, bayonet or curved (hook) style. Nose pads can attach to the pad arms with screws, snap in, or crimped on methods. If the nose pads can rock ever so slightly when resting on the bridge of the nose then they are called rocking pads.

Bridges that are made of one piece construction fit onto the crest of the nose and are known as adjustable strap bridges. These bridge styles are great for kids and active wearers, since they are both durable and comfortable.

For measurements or adjustments, always start with the bridge. This is the portion of the eyeglass frame that balances the entire weight of the frame on the face. A bridge that is not correctly fit may cause the entire frame to be off balance. A bridge that is too small or too large for the patient will adversely affect the vertical location of the frame.

Frame with adjustable pad arms

If the bridge slides down the nose, adjustable nose pads or pad arms can be moved inward for a better fit to the sides of the nose. For a plastic frame choosing a frame with a smaller DBL is preferable during the choice process. Very little, if anything, can be done to adjust a fixed plastic bridge after lenses are inserted. The only recourse is to either send the frame to your lab to have adjustable pad arms, or silicone inserts, installed. If the gap is minor, application of adhesive silicone pads may do the trick. Self-adhesive silicone pads can also reduce slipping due to oily skin and perspiration. Butterfly style or stick on pads come in many varieties and sizes to better fit the frame in mind, such as these from Western Optical (permission to quote by Western) sets of 10, all 1.8 mm thick: 15mm, 17mm, and 19mm.

An adjustable pad bridge on a metal frame that sits high on the nose, or causes red marks, must be adjusted to widen the space between the pads. A plastic bridge that is too tight cannot really be adjusted. Some sources cite heating a plastic bridge and stretching it on a wooden dowel, but the results are usually unsatisfactory.

Temples

The temples should not touch the sides of face in front of the ears, but should go over the ear crotch and gently touch the mastoid area behind the ears to hold the frame in place. It is best to choose a frame with the correct temple size. Sometimes the patient just falls in love with the last frame in stock, but the temples are not optimal. Every ECP has had the instance of stretching out a temple almost straight to get it to accommodate the patient, or creating a curve behind the ear that is more radical than would normally be acceptable. This is usually done in an attempt to help the patient out, but is never a good solution. If possible, the patient must be gently but firmly directed to a frame with temples that fit correctly.

A small adjustment to the bend or curl can be done without too much fuss. However, if a new bend is located more than about 3 mm away from the existing one, it is best to completely straighten the temple and then apply a new bend; otherwise the frame may end up with an angular bend. Curling the plastic temple gently at the web of the hand and thumb creates a natural curve. Plastic temples can be heated and adjusted by hand; metal temples require the proper tools.

If temples are too long or too short, the frame front may be at an incorrect vertex distance for the chosen lenses, or in comparison to the refracted distance. Temple lengths for adults range from 130 to 150 on the average, and most companies offer a couple of different lengths for each frame.

Tighten or replace screws

Nothing is more embarrassing than having a patient return with a loose or missing screw immediately after a minor adjustment was made. This tiny eyeglass part can pose a big problem in the long run. To prevent this, tighten all screws, even if you don't think this is necessary. It is far easier to tighten a screw than to later find a replacement of the proper size. After some experience, the proper size of a replacement screw will be simple to recognize. Some frame manufacturers will provide a replacement kit and your office will likely have a size chart in the lab.



Eyeglass screws are tinier versions of the hardware variety, and come in all shapes and sizes, measured in millimeters. They are classified by thread size, shaft diameter, and length; with the thread size listed first. For example, a screw with a thread size of 2.4 mm, a shaft diameter of 1.0 mm, and a length of 6.6 mm would be listed as such: 2.4 x 1.0 x 6.6. Available in both Phillips and flathead varieties, the thread size and diameter are more important than shaft length when replacing screws.

Be sure to use the correct screwdriver for the job. For better torque and overall stability when applying pressure to tighten screws, rest the frame on an optician's anvil, rubber bench block, or the edge of a solid surface. This simple bracing action may also help to prevent a nasty puncture wound to the ECP or a scratch to the frame.

For tightening hex nuts on drill mounted frames, use a hex nut wrench while tightening the screw on the front side with a driver. This is sometimes a tricky maneuver and may require the help of a co-worker.

A screw size checker will help to identify screw size when the original screw is damaged or stripped. This plastic or cardboard guide is drilled with a variety of labeled holes to determine the proper replacement needed. If the hinge has been stripped, the only solution may be a bolt and nut. In either event, a screw checker will determine the right size for the job. By inserting the screw into the graduated holes, it is possible to determine the proper diameter for the replacement screw or bolt.

In the event that the screw is completely missing, you can determine the right gauge using a screw and hole gauge. This small wheel consists of spokes that are inserted into the empty barrels of a pair of glasses until the spoke fits snugly, revealing the proper screw diameter.



When all else fails, a self-aligning screw like the “Snap-it” screw has a long, thin, easily broken sliver of metal at the base of the screw. This will guide the screw through the barrels, which is especially helpful in a spring hinge. After the screw is tightened, the excess is cut or broken off, and the end of the screw smoothed with a file. “Snap-it” screws can save valuable time and frustration in searching for screw and properly aligning replacement screw. Also, thread-lock or clear nail polish applied to the threads will help to prevent a repeat loss of a screw.

For that annoying screw that is broken within the hinge, the use of a screw extractor is needed. Both drill and pressure extractors exist. Drill-type screw extractors will grip the shaft of the broken screw and allow it to be removed through a standard rotating motion. Pressure extractors line up the frame barrels with a pin, which is then driven down onto the screw, forcing it out. With an especially stubborn broken screw, the frame may need to be sent to the lab for professional extraction.

Adjustments

Avoid making drastic adjustments to the glasses, since reversing an adjustment may lead to metal fatigue. It is far easier to increase the adjustment than to reverse what was just done. Make a small adjustment, check for fit, and increase the adjustment if needed.

Here is a review of the most basic adjustments:

Frame Adjustments - An Overview	
Left lens is higher	Bend left temple up or right temple down
Right lens is higher	Bend right temple up or left temple down
Left lens is lower	Bend left temple down or right temple up
Right lens is lower	Bend right temple down or left temple up
Left lens is farther in	Bend left endpiece in
Left lens is farther out	Bend left endpiece out
Right lens is farther in	Bend right endpiece in
Right lens is farther out	Bend right endpiece out
Increase pantoscopic angle	Bend both temples or endpieces down
Decrease pantoscopic angle	Bend both temples or endpieces up

Working with Frame Materials and Construction

From the first moment of design to the actual frame arriving at the dispensary, every detail matters to the ECP, including what a frame is made of and any special construction or design features. Some of those details can and should be explained to the patient, while some background information the ECP keeps mentally filed away. Your patient will not need, nor want to know, every step in the complex manufacturing process, but basic explanations can be helpful. Eyeglasses are medical devices and therefore must meet all legal standards and this information may be valuable to the patient. Your patient might understand the cost of a brand name license, but not the cost of research and science that needs to be performed to create a viable eyeglass frame. Every ECP enjoys pointing out details that make the patient's choice individual to them, such as a frame embellishment or a custom color. Ecofriendly materials and construction are of importance to a segment of the population. Letting the patient touch and experience the frame prior to trying it on is fun for both patient and ECP.

When adjusting frames, keep in mind that different materials may need different handling.

Material	Category	Adjustment requirement	Other notes
Cellulose acetate	Plastic	Use moderate heat	Easy to adjust
Cellulose propionate	Plastic	Use moderate heat	Easy to adjust
Nylon	Plastic	Use high heat or hot water	Limited adjustments
Optyl	Plastic	High heat	Hold in place to cool
Polyamide/Co-polyamide	Plastic	Little or no heat	Will shrink under high heat
Titanium (Pure)	Metal	Use pliers to adjust	Care to prevent scratching
Memory Metal	Metal	Heat only adjustable areas	Use pliers cautiously
Stainless Steel	Metal	Pliers and strong pressure	Difficult to adjust
Aluminum	Metal	Hand adjust carefully	Thin pieces can kink up
Nickel silver	Metal	Use pliers	Easy to adjust
Monel	Metal	Use pliers	Easy to adjust
Precious metals, some naturals	Varies	Wrap all tools	Avoid any ornaments

Measurements and fitting tips for a universal fit frame

Many facial features are not suited to the standard frame, such as flat bridges, pronounced brow ridges, and flat cheeks with reduced vertex distance. The universal frame is designed to better fit features often associated with, but not limited to, the Asian and African-American communities. These frames offer bridges that are built up towards the back of the frame and a wider range of splay angles. Considerations are also needed as to frame depth, B measurements and tilt so that the frame does not hit the patient's cheeks when talking or smiling. Children benefit from universal fit frames using the same adjustments. Universal fit frames with smaller A sizes are available with several temple lengths will work well for children. However, as the child grows the facial features may change and frame choice will need to change in response.

The bridge must fit well before measurements are taken since the frame balance greatly depends upon a correctly fit bridge. Universal fit measurements are similar to Position of Wear (POW): PD, seg height, frame wrap, vertex distance, frame tilt, and potential mandated bevel position.

Variation on the theme: semi-rimless and drilled rimless adjustments

Rimless mountings typically become loose where the lens is mounted to the frame. It could be that what is needed is to tighten the fasteners in a screw and nut mounting or to tighten the retaining nut with an optical wrench. Check all washers and bushings and add a cap nut if needed.

To adjust the end piece, inward or outward: first place a bracing plier over the mounting screws or compression posts. Then place the flat/round plier with the round post inside the end piece. Squeeze tight; the end pieces should be angled about 90 degrees from the front. Use flat/ round pliers since the round post will not kink the metal. Use a double padded plier to adjust pantoscopic angle. Use the bracing plier from the top of the frame to reduce the possibility of chipping a larger lens.

Most pad arms are soldered to the back of the bridge. A bracing plier firmly holds the frame while manipulating the nose pad or pad arm. First, protect the surface of the lens with a lens shield, static peel off stickers or scotch tape, making sure that tape or other protection does not cover holes in the lens.

Use the least amount of tension to avoid exerting excess pressure on the back of the lens. This is accomplished by bracing the mounted lens so that torque applied to the screw or hex nut does not transfer to the lens itself. If needed, brace with a covered pliers while adjusting with another. Then cut the butt end of the screw with cutting pliers and file carefully with a file to smooth any roughness.

If the mount has a bushing, it should be inserted through the back of the lens with the flat portion on that side. The tubular portion stays on the front side of the lens. Press or cut the bushing so that it is flat on the back side. Firmly hold the back side of the lens while pushing the mount prongs into the bushings from the front side. Seat the prongs as tightly as you can by hand. Finally, with one firm squeeze, compress the mount using an open mouth mount plier, or a plier specifically provided by the manufacturer. The rocking end of the plier should be on the back side to accommodate base curve.



The tools used for a drilled mount are important and this is one area that using substitute tools may damage or break the lenses. When in doubt about lens surfaces, selectively use cleaning cloths to protect the lens. Drilled rimless tools will need maintenance, such as possible replacement of the nylon pads that cover the jaws.

If done with care, the assembled 3-piece mounted lens should not have gone through undue stress. However, if in doubt, a polariscope can be used to check for stress marks around the drilled holes.

Another type of semi-rimless is the nylon cord or Corlon. Adjustments, lens re-insertion and cord replacement are the three most common patient requests. The holes in the ends of the eye wire in which the nylon is looped and the order in which the nylon loops through the holes, provide for the tension around the lens to keep it in place.

To replace or change lenses in nylon cord frames, locate the tape that came with the frame, or a piece of ribbon can substitute. If the ribbon might fray or leave threads behind, packing type plastic tape cut to a sharp diagonal at the end works well. Some ECP's will use a bit of excess nylon cord. For easier lens removal, rotate the lens slightly in the frame until a space opens between the lens and the frame or cord. Push the tape or ribbon through this small opening and slide the tape or ribbon to the least sharp corner. Then pull it out and down so the existing nylon line exits the groove. Gently work the line out of the groove until the lens can be easily removed.

To replace lenses, place the tape or ribbon into the top and side grooves while supporting the frame top and lens with your fingers. Place the nylon line into the groove of the sharpest lens corner first, while pulling outward pull the tape or ribbon toward the rounder corner until all the line fills the groove. Slide the tape to the bottom center of the lens and gently remove the tape or ribbon.

The right tool for the job

With all adjustments it is equally important to understand the various tools available to make these changes efficiently.

Ideally your dispensary will have every optical tool, but the reality is that you might have to improvise a bit when a less common tool is not available. Let's look at the variety of tools available as well as which other tool might be a reasonable substitute in a pinch.

Snipe nose pliers are an all-around tool for gripping, reaching into tight places, and bracing portions of the frame when making an adjustment. A long handled, half-padded plier might work when this tool is not at hand.

Nylon gripping pliers, (padded or half padded pliers) is a better gripping and bracing tool to minimize the possibility of scratching and damaging the frame. A snipe nose pliers with one or both sides covered in tape or with a cleaning cloth is a work-around.

Chappel cutting pliers will trim the excess part of a replacement screw as well as shorten the ends of temples. **Side cutter pliers** will more efficiently cut screws or rivets in difficult to reach places. Either can work if the ECP cleverly changes his or her hand positioning.



Snipe Nose Pliers



Chappel Cutting Pliers



Nylon Gripping Pliers

Nose pad pliers adjusts the angle of a pad guard arm, or changes the amount of curl to move the frame up or down, or to change the vertex distance. These pliers have a cut out area to cushion the actual nose pad. Snipe nose pliers can make the same changes with hand positioning, using caution not to damage the nose pads.



Nose Pad Pliers

Eye wire closure pliers will check the ability of the eye wire to close around a recently edged lens, and will help to avoid stripping the screw. Double padded pliers or needle nose pliers wrapped in tape or cloth will work.

Axis aligning pliers have large rubber pads on each jaw and are used to turn a lens that is slightly off axis; verification of the axis with the lensometer is needed after this tool is used. There is no elegant tool to substitute and the cautious use of fingers is less effective.

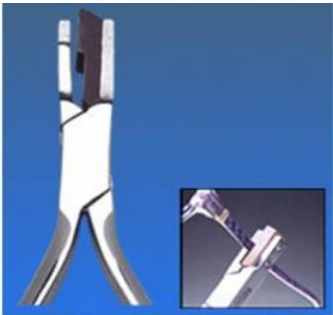


Eye wire Closure Pliers



Lens Aligner Plier

End-piece aligning pliers adjust the tilt of a frame or to even out temple heights. This tool allows the movement of the temples in almost any direction. Some angling pliers have small indentations to avoid damaging the screw. Careful use of needle nose or padded pliers can be a substitute.



Angling Pliers



End-piece Angling Pliers

Files include the two-sided half round file, the rattail file, and the flat #2 cut which is considered an all-purpose file. In a pinch, an emery board has worked on plastic frames.





Optical screwdrivers, both Philips and slotted, typically have a small and a larger head for different sized screws. Unfortunately, there is no substitute for a good screwdriver, although I have heard of an optician using a nail file edge when at dinner with a friend.

Wrenches attach, hold and tighten lock nuts. Wrenches can be found as a separate tool, or as an interchangeable blade for a screwdriver. Some rimless mount assemblies may require a special kit.

Other specialty hand tools

Some specific-use tools are: a spring hinge reattachment kit; hook mounting tool for use with a nylon cord frame; push on nose pad removers; slotted tweezers for easier screw replacement and hinge screw ejectors which will extract stripped and broken screws. There are work-arounds for all of these tools but each specialized tool does make an adjustment easier.



Spring hinge kit



Screw ejector kit

Tools for a 3-piece mount You may already have tools on hand for working with a 3-piece mount. These are: Pliers that have an indentation to cradle the top of the screw or the bottom of the hex nut, such as a screw mount bracing plier. On this tool, one side of the jaw is covered by a cut-out nylon

pad while the other jaw is slotted. A rocking mount bracing plier has one fixed jaw and the other jaw has a floating assembly that creates backside support. The rimless compressing/bracing plier is commonly used, which braces the eyewear while pressing the prongs of the mount and bushings together. A nylon covered jaw with indentations cradles the mount while the other has a floating assembly for the flat portion of the bushing.

Frame Warmers are the salt pan warmer and the hot air blower. Some less than elegant in-a-pinch methods are hair dryers and hot tap water.



Salt pan frame warmer



Hot blower frame

Tool maintenance

No matter what tool is required, always discard any tool that is not repairable. A broken tool could cause injury to the ECP, or mar and break eyeglasses. Protect your investment in quality tools by observing their tolerance limits. A tool that is properly maintained should last you through many years of use. However, any damaged tool should be replaced to avoid damaging a lens. This recommendation is true even if your dispensary has a limited tool selection.

On any cutting tool, check the cutting edge. Using a cutting tool to cut something harder than it is supposed to cut can result in nicks, chips or scratches to the tool, the lens, or the frame.

Look at the handles and if the distance between the handles has decreased with use, too much force was used, or the material being cut was perhaps harder or of a larger gauge than the cutting plier can handle. In general, beveled blades are more durable and produce more cuts over the life of the tool than a flush cutter. However, a bevel cut is not as close as a flush cut and could leave a more pronounced edge on the screws that were cut.

Flush cutter blades provide a minimized edge, or spike, on the cut end of the screw and require less pressure to make a cut than a bevel cutter.

Less common frame parts or features

While **bridges** on metal frames are primarily pad arm style there are a couple of deviations. Those with either snap-on or screw-on form fitted bridges are generally made of rigid plastics or silicon material.

Some metal frames have windsor, or w, bridges. They sit directly on the crest of the nose and may have a coat that cushions the patient's skin a bit. Coating the bridge works well for all-day wear and can alleviate some skin allergies, such as to nickel silver. Windsor bridges, made of titanium or surgical stainless steel, may not need coating.



In addition to plastic frame bridges that are either the saddle or keyhole, there are some plastic frames with adjustable nose pads built in, commonly attached to the backside of the bridge and embedded into the plastic material.

Classic saddle bridge

Silicone flat pads that fit flush on the undersides of the bridge or carved into the bridge create a recessed point of contact. Adhesive silicone flat pads are also available to attach to any frame. The silicone helps reduce slipping.

Found on both metal and plastic frames, **top bars** are pieces attached above the bridge between the eye wires and are usually ornamental, but can reinforce the frame on certain designs. Eyewear with two top bars are known as double bar frames.

Combination frames commonly have metal eye wires surrounding the lenses and a plastic top. The right and left top rims are often attached to the chassis with tiny screws located on the backside or nasal side of the frame front.

Temples, along with the bridge, help to distribute the weight of the eyeglasses and are hinged at the endpieces. Fashioned from either metal or plastic, some temples may feature a metal insert for overall strengthening.

Floating temples are the result of lenses directly attached with the use of bushings to give the appearance that the lenses are free floating.



Temple tips will provide comfort and less slippage as well as covering a base metal that is not hypoallergenic. The most common temple tips are easily removable or replaceable, and should be heated slightly to prevent cracking when adjusting.

Endpieces attach the frame front to the temples at the temporal sides. They may butt together directly, or have a 90 degree bend to move the hinges to the side of the head. Hingeless endpiece designs hold lenses in place without screws, nuts or bolts. A specific endpiece made of a continuous piece of metal exerts just enough tension to keep everything in place.



Barrels and **hinges** attach the temple to the endpiece and are held together with a screw. Barrels are arranged in unequal numbers for a stronger hinge arrangement. Hinges can also be spring style so that the temple can swing out or flex without breaking; a hinge temple might swing up, down, or even rotate 360°. Spring hinges require fewer adjustments and some patients enjoy the subtle tension created by the spring. But spring hinges are not a cure all: they do stand up to normal wear and tear but when they do break, they will require replacement or complex soldering. Replacing a screw in a spring hinge can require special tools or two persons.

Common and uncommon adjustments

Many frame problems can be solved with the correct adjustment. Angles, bends and distances can either lend to or detract from a great pair of eyeglasses. It is not that uncommon for a patient to have bothersome vision even when lenses have been created perfectly if the frame is not in the same alignment as the initial measurements.

Even minor misalignments can cause poor visual acuity and/or physical discomfort. Pantoscopic tilt is best when aligned properly with the eye's optical axis of about 8-9 degrees of lens tilt. Increasing the pantoscopic angle will help to reduce reading distortion and can bring the material closer to the eye creating a visibly wider intermediate and near zone. Increased pantoscopic will appear to lower the segment and is adjusted according to mm and degrees, where 2° creates 1 mm of movement. Retroscopic can be used for opposite movement. Adjusting for pantoscopic tilt is harder as the number of barrels increases. 3 barrel hinges seem quite adjustable but the 7 barrel variety may not be adjustable at all. Angling the barrels individually could be required using a file to change the butt angle.

SegHt or OcHt can affect the patient's vision and a frame with adjustable nose pads is the easiest to raise and lower the OcHt. Heating a fixed bridge might give a millimeter or two of movement.

Vertex distance is crucial in higher powered eyeglasses, or if the patient is especially sensitive to a vertex change. If not recorded, a quick call to the refractionist will determine the refracted vertex distance (RVD.) Matching the RVD is best, but with some frames, that is impossible. Thus, it is important to remember that any lens moved closer to the face becomes effectively more minus (less plus.) A difference of more than 5 mm between the RVD and fitted vertex distance (FVD) is indicative that either a different frame should be chosen, or lens compensation must be performed. Mathematical compensation works best if ordering a new frame and lens.

Extreme frame wrap can cause prism or distortion; reducing the wrap even slightly can reduce prismatic effects. For a multifocal, increasing wrap slightly can move the “soft focus” area out of the field of view. Caution is needed since adjustments to frame wrap can alter the mechanical PD.

As lens designs have become more advanced and customizable, the potential problems have become more numerous and complex. The optician should keep up with current technology as the fit and wear position of a frame is usually needed. The comparison of an old frame to a new one can be helpful only if the patient was satisfied with the original eyewear. Be prepared to take all measurements anew, even for an established patient.

Specifics for children



Parents may want a frame that the child can “grow into” but this is probably not a good solution. The frame must not be too big or too wide; such a frame will misplace the optical centers of the lenses creating prismatic errors. A child’s PD will change as he or she grows, and frames must change too. Bridge fit is important. New frames will be needed when the child’s facial features change, which could be in less than a year. It is surprising that a parent may be willing to buy new shoes as a child grows, but fails to understand the need for new glasses. Nose pads can help to keep a frame in adjustment for a time, but eventually any frame will be outgrown. The apparent temple length changes as the child grows and adjustment or straightening will only help to a certain extent. Welcome children and parents to return frequently for professional adjustments to be made as the child grows. This will prevent the child or parent from attempting to effect adjustments that could result in breaking the frame or invalidating the manufacturer’s warranty.

Special patients and required adjustments

The ECP may be called upon to adjust a frame on a patient with extreme facial asymmetry, or even prosthetics following illness or injury. Most patients will warn you of special needs and might even guide you in working with a specific problem, such as a prosthetic nose or ear. Often a prosthetic is needed following cancer treatment and the face can be extremely tender. It is at times like this that listening skills can be far more important than simple frame manipulation.

Some other special needs can be as varied as: patients with Down's Syndrome may need specialized bridges and a different placement of temples for a better fit. A patient with a crooked nose, or a nose with a pronounced bump, will get better results from a bridge with customizable nose pads. A patient with a more prominent, or a sensitive mastoid process may require longer or shorter than average temples. The best tool in your dispensary is your knowledge of what else will work when the ideal fit is not at hand.



A brand new hinge: are you up on Zero G™?

One of the newest frame designs on the market is Zero G™. Obviously if you will be selling these high end titanium frames in the dispensary, a complete training by the representative is the best learning tool available.

Certain information can be found online and, according to the website: "Zero G™ Titanium refers to "zero gravity" or "weightlessness". This exclusive collection focuses on classic, modern, and timeless shapes in rich colors and unique patterns. Designed in California and handcrafted in Japan, Zero G is created with style, balance, comfort, and weightlessness in mind. All Zero G™ frames are hypoallergenic, 40% lighter than stainless-steel, and cut from a single sheet of surgical-grade titanium. Zero G's unique hinge system is designed without screws or solder-points and the spindle is guaranteed not to loosen or fall out - a guarantee unique to Zero G™. All frames feature a distinctive embossed "four squares" logo on the temples - representing quality, balance, strength, and simplicity."

However, if the ECP does not routinely work with this new frame design, refer the patient back to the original dispenser. These frames are unique and a slight error could leave the ECP responsible for an expensive repair or replacement.

Errors due to the lens misalignment



Aberration causes the image formed by a lens to be blurred or distorted, depending on the type of aberration. Aberration can severely affect the performance of lens independent of excellent frame adjustments. Generally these aberrations can be monochromatic or chromatic.

Monochromatic aberrations are caused by the lens geometry when light is reflected or refracted. Defocus is a monochromatic aberration that is easily corrected with the correct vertex distance. Other monochromatic aberrations are generally reduced by pupillary constriction: spherical, coma, oblique astigmatism, curvature of field and distortion.

Chromatic aberrations are caused by dispersion related to wavelength when the different wavelengths are not focused to the same point. Chromatic aberration can be axial (or "longitudinal") or lateral (or "transverse"). The resulting rainbows seen at the edge of lenses can be reduced with index variation, removing and polish of the lens edge or even applying black paint.

One frame that inherently has mild lens aberration is the ready reader. As the ECP knows, the MPD for these handy reading glasses is based upon the population average, but will cause distortion for a patient with a face much smaller or larger than that average. Your dispensary may stock ready readers to prevent the patient from purchasing an incorrectly powered reader from the drugstore. With this in mind, ready readers are available in almost all styles and brands.

Single vision full readers to magnify text uniformly are only worn for reading. Single vision half eyes will keep the magnification consistent, but allow the patient to peer over the top for distance viewing. Ready readers crafted like Traditional bifocals will be plano at the top and have reading power in the segment and can be worn longer and during different activities than single vision designs. Progressives where the upper portion, again, is plano, with a gradual increase in magnification. Just like prescriptive progressives, intermediate distances are easily viewed through a lens corridor. Computer bifocals or progressives where the field of view at the top of the lens is intermediate and the bottom of the lens provides near. Computer readers might be referred to as office ready readers and often include AR coating. Bifocal or progressive sun lenses designed for reading outdoors provide UV protection while reducing light and contrast, so they are used as sun lenses with a ready reader component.

To adjust or not to adjust?



Every ECP has asked this question more than once as it relates to possible breakage of the patient's frame. If the frame was purchased from your dispensary and is still in warranty, then the adjustment should be performed. However; if the frame is out of warranty, is in poor condition already showing wear and tear, and if the adjustment is to the patient's own frame (POF), then the ECP must proceed cautiously. Inspect the frame in front of the patient, point out any problems or possible weak areas,

and have the patient assume responsibility. A written and signed waiver is appropriate in many instances. Unfortunately, sometimes “no” is the only reasonable response to a risky repair request.

Summary

Frame styles, brands and lines seem to come and go so quickly it is difficult to keep up with all of the changes and variations. However, if the ECP does not routinely work with this new type of frame design, refer the patient back to the original dispenser. These frames are unique and a slight error could leave the ECP responsible for an expensive repair or replacement. Similar weightless designs and innovative designs needing specialty adjustments will come to the market. It is wise for the ECP to keep current through publications, manufacturer internet sites and contact with representatives.

Test Questions

1. What is a reason to re-adjust a frame?
 - a) To enhance the color reflections
 - b) To keep it in good shape
 - c) To polish the frame
 - d) To prepare it for storage in a box
2. What is another term for truing a frame?
 - a) Standardizing
 - b) Axis aligning
 - c) Key aligning
 - d) Patient customizing
3. How does the ECP confirm the needed width of a frame?
 - a) Adding A + DBL
 - b) With a PD ruler
 - c) With a string
 - d) Estimation
4. What is the A size of a frame that is stamped 46-17-135?
 - a) 63
 - b) 17
 - c) 135
 - d) 46
5. What is common for a patient who needs a wide A size?
 - a) The choice of frames will be extremely limited
 - b) The patient's eyes are close set
 - c) The patient will commonly need a substantial bridge size
 - d) A smaller A size can be stretched

6. What must be acquired?

- a) Formal patient measurements
- b) Estimated A size
- c) Estimated temple length
- d) Eye color of patient

7. Which is generally needed for a POW measurement?

- a) Binocular PD
- b) Poor center of rotation
- c) Seg height by subtracting 5mm from the PD
- d) Monocular PD

8. Which statement is true?

- a) Elderly patients can always keep a steady focus
- b) It is important that the eye level of the ECP is even with the patient
- c) Gel clings are never used as they can damage a frame
- d) The A size is a vertical measurement

9. How is GCD calculated?

- a) With a distometer
- b) With a pupillometer
- c) By measuring lab markings
- d) $A + DBL$

10. What measurement is Radius x 2?

- a) ED
- b) DBL
- c) FPD
- d) Decentration

11. What gives a level starting point for adjusting a frame?

- a) Positive face form alone
- b) Bench alignment
- c) Adjusting the nose pads
- d) The fitting triangle

12. What bridge style is great for active wearers?

- a) Bayonet
- b) Adjustable strap
- c) Windsor
- d) Keyhole

13. What is true about temples?

- a) They should press the sides of the face
- b) They should bend well in front of the ear crotch
- c) Plastic temples should be heated prior to adjustment
- d) They should press heavily on the mastoid process

14. Why would the ECP use a rubber bench block?

- a) To align the frame efficiently
- b) To measure a hex nut
- c) To seat a spring hinge
- d) For better stability when tightening a screw

15. What can be done for a stripped hinge?

- a) Nothing
- b) Use of a bolt and nut
- c) Send the frame to the lab for extraction
- d) Just sell the patient a new frame

16. What type of screw has a metal base that can be broken off?

- a) A Phillips head screw
- b) A slotted head screw
- c) A Snap-it screw
- d) A right gauge screw

17. What is a recommended adjustment for a left lens that is higher?

- a) Use lens liner
- b) Bend the left endpiece out
- c) Bend the left temple down
- d) Bend the left temple up

18. How is pantoscopic angle increased?

- a) Bend both endpieces down
- b) Bend both temples up
- c) Apply more curve at the temple tip
- d) Straighten the temples

19. What is true about nylon material?

- a) It is also known as Optyl
- b) It can be adjusted using pliers
- c) It breaks easily
- d) It is in the plastic category

20. A bridge affects _____

- a) Frame balance
- b) Vertex distance
- c) Frame wrap
- d) PD

21. Which tool holds the frame while the ECP manipulates the nose pads?

- a) An axis plier
- b) A bracing plier
- c) A screwdriver shaft
- d) An endpiece plier

22. What instrument will check for stress marks?

- a) The lensometer
- b) A hole gauge
- c) The polariscope
- d) A bushing mount

23. Which of these is a name for a semi-rimless frame?

- a) 3-piece
- b) Corlon
- c) Spring hinge mount
- d) Tape mount

24. Snipe nose pliers are best for _____.

- a) Reaching into tight places
- b) Readjusting lens axis
- c) Replacing temple covers
- d) Cutting the end of a screw

25. What is another name for a half padded pliers?

- a) Axis alignment pliers
- b) Nylon gripping pliers
- c) Chappel pliers
- d) Snipe nose pliers

26. What type of tool is a rattail?

- a) A snipe nose type pliers
- b) A swarf removal tool
- c) A file
- d) A cutter

27. What will tighten a lock nut?

- a) A wrench
- b) A Phillips screwdriver

- c) A spring hinge kit
- d) A mounting tool

28. What is a recommended method to warm a frame?

- a) A light bulb
- b) Friction
- c) A microwave
- d) A salt pan

29. What is another name for a "W" bridge?

- a) A what over bridge
- b) A Windsor bridge
- c) A wide bridge
- d) A width alignment bridge

30. What frame part assists the bridge in weight distribution?

- a) The brow bar
- b) The endpiece
- c) The temples
- d) The barrels

31. What creates a stronger hinge arrangement?

- a) An unequal number of barrels
- b) An equal number of barrels
- c) A rubber hinge piece
- d) A larger than needed screw

32. What is true about spring hinges?

- a) They have excessive tension
- b) They break easily with normal wear
- c) They flex well
- d) They will require too many adjustments

33. 2° of tilt will _____.

- a) Bother every patient greatly
- b) Be difficult to create on the frame
- c) Be measured with the lensometer
- d) Create 1 mm of movement

34. What frame is the easiest to raise and lower?

- a) A frame with adjustable nose pads
- b) A fixed bridge frame
- c) One with longer than needed temples
- d) One with a minimal RVD

35. What is true about frame wrap?

- a) Extreme frame wrap is needed on all dress frames
- b) Increasing frame wrap will loosen the fit
- c) Adjustments to frame wrap keeps the mechanical PD consistent
- d) Frame wrap can cause prismatic effects

36. What is needed as a child's facial features change?

- a) New frames
- b) New lenses
- c) A change from plastic to metal frames
- d) A fixed bridge

37. What might benefit a patient with Down's syndrome?

- a) Specialized temple tips
- b) A specialized bridge and different placement of temples
- c) Large vertex distance
- d) Longer than necessary temples

38. Which aberration results in rainbows seen at the lens edge?

- a) Monochromatic
- b) Spherical
- c) Chromatic
- d) Oblique astigmatism

39. What is a good reason to deny making an adjustment to a frame?

- a) The frame is still in warranty
- b) The frame shows no wear or tear
- c) The frame was purchased from your dispensary
- d) The frame is in poor condition

40. What does POF stand for?

- a) Patient's own frame
- b) Personally owned franchise
- c) Position of frame
- d) PALS on fix-order