

SOUND ENGINEERING FROM

LOCTITE



Speaker Assembly Adhesives Guide



Loctite® adhesives have been specified by the world's major speaker manufacturers for over two decades. With the most diversified line of adhesives and sealants in the industry, Loctite has products to meet your specific needs. Whether you're bonding, gasketing, sealing or coating, Loctite is the best resource for speaker application assistance. Adhesives can provide design advantages, improve overall product performance, speed assembly time, and increase production efficiency and quality. We can help you get your speakers to market — faster and at reduced costs.

At Loctite, our goal is to become your productivity consultant. Our engineers are extensions to your engineering staff. Put us on your design team and we will work closely with you by:

- providing and developing products that meet your performance requirements;*
- giving you the best technical service and support in the industry;*
- providing highly trained and skilled personnel who know how to troubleshoot and solve problems;*
- supplying in-house product and application training and support.*

Using state-of-the-art testing and evaluation facilities in our North American Engineering Center, Loctite can simulate curing and parts handling, as well as production line conditions for product applications, providing you with proven solutions.

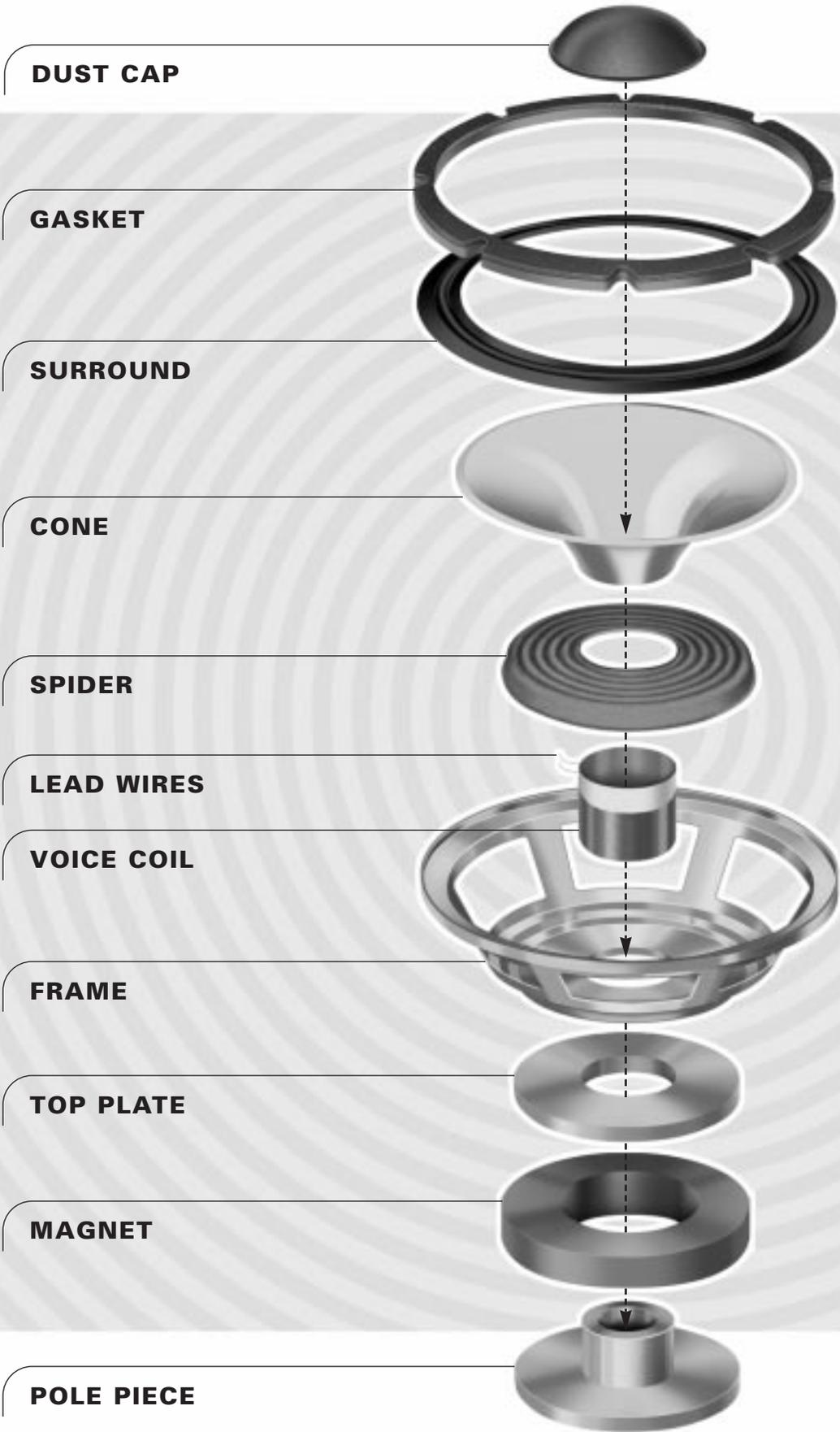
Every member of the Loctite team stands ready to assist you. Our Adhesives & Sealants Specialists make up the most knowledgeable sales force in the business. By analyzing individual customer applications, they are able to determine which Loctite product, process or solution will work best for your specific applications. They work together with Loctite engineers, chemists, and marketing managers to develop innovative processes to meet customer needs, whatever the demand.

Put us to the test and put us on your team. Call Loctite at 1-800-842-0041 for technical assistance, or 1-800-323-5106 for the name of your Loctite Sales Engineer.

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LOCTITE PRODUCT SELECTOR GUIDE

Speaker Applications	Recommended Products	Package Sizes	Order #	Key Product Features
Pole Piece to Magnet to Top Plate	324 SPEEDBONDER™ Adhesive ¹	50 ml Bottle	32430	Medium viscosity, high impact resistant structural acrylic.
		1 liter Bottle	32490	
	326 SPEEDBONDER™ Adhesive ²	50 ml Bottle	32629	Fast fixturing, medium viscosity structural acrylic.
		1 liter Bottle	32685	
	332 Structural Adhesive ³	25 ml Syringe	33201	High thermal, shock and impact resistance; structural acrylic paste.
300 ml Cartridge		33275		
1 liter Bottle		33290		
12 liter Pail		17601		
392 Structural Adhesive ³	25 ml Syringe	39205	Ultra fast fixturing, thermally resistant structural acrylic paste.	
	50 ml Bottle	39250		
	300 ml Cartridge	39275		
	1 liter Bottle	39280		
	15 liter Pail	17507		
3270 Structural Adhesive ²	1 liter Bottle	12035	Low viscosity, fast fixturing structural acrylic.	
	15 liter Pail	18614		
Top Plate to Frame	BLACK MAX® 380	3 gm Tube	38004	Low viscosity for small gaps; toughened black cyanoacrylate.
		1 oz Bottle	38050	
1 lb Bottle		38061		
2 kg Bottle		18494		
PRISM® 410	3 gm Tube	41004	Medium viscosity; toughened, black cyanoacrylate.	
	20 gm Bottle	41045		
	1 lb Bottle	41061		
	2 kg Bottle	41088		
Voice Coil to Spider to Cone	BLACK MAX® 380	3 gm Tube	38004	Low viscosity; toughened, black cyanoacrylate.
		1 oz Bottle	38050	
		1 lb Bottle	38061	
		2 kg Bottle	18494	
	PRISM® 410	3 gm Tube	41004	Medium viscosity; toughened, black cyanoacrylate.
		20 gm Bottle	41045	
		1 lb Bottle	41061	
		2 kg Bottle	41088	
	PRISM® 411	3 gm Tube	41104	Medium viscosity; clear, toughened cyanoacrylate.
		20 gm Bottle	41145	
1 lb Bottle		41161		
2 kg Bottle		41191		
SUPER BONDER® 422	1 oz Bottle	42250	Gap filling; general purpose cyanoacrylate.	
	2 kg Bottle	42261		
PRISM® 498	1 oz Bottle	49850	Thermally resistant, clear, medium viscosity cyanoacrylate.	
	1 lb Bottle	49861		

¹Use with Activator 7075

⁴Made to order

²Use with Activator 7090,7091, or 7649

⁵Not a distributor stock item.

³Use with Activator 7380 or 7387

Speaker Applications	Recommended Products	Package Sizes	Order #	Key Product Features
Voice Coil to Spider to Cone (continued)	PRISM® 4204	20 gm Tube 1 lb Bottle	26324 26325	Medium viscosity; thermally resistant cyanoacrylate.
	PRISM® 4210	3 gm Tube 20 gm Bottle 1 lb Bottle 2 kg Bottle	19757 19758 19759 19760 ⁴	Thermally resistant, black, low viscosity cyanoacrylate.
	PRISM® 4211	3 gm Tube 20 gm Bottle 1 lb Bottle 2 kg Bottle	19761 19762 19763 19764 ⁴	Thermally resistant, black, high viscosity cyanoacrylate.
	DURABOND E-20HP	50 ml Dual Cartridge 200 ml Dual Cartridge 400 ml Dual Cartridge 5 gallon Pail, Resin 5 gallon Pail, Hardener	29314 29315 29316 29317 ⁴ 29318 ⁴	High performance, off-white toughened epoxy with high peel and shear strength; 20 minute worklife.
	DURABOND E-60HP	50 ml Dual Cartridge 200 ml Dual Cartridge 400 ml Dual Cartridge 5 gallon Pail, Resin 5 gallon Pail, Hardener	29319 29320 29321 29322 ⁴ 29323 ⁴	High performance, off-white toughened epoxy with high peel and shear strength; 60 minute worklife.
	DURABOND E-120HP	50 ml Dual Cartridge 200 ml Dual Cartridge 400 ml Dual Cartridge 5 gallon Pail, Resin 5 gallon Pail, Hardener	29353 29354 29355 29356 ⁴ 29357 ⁴	High performance, non-sag, amber, high strength epoxy; 120 minute worklife.
	Spider Assembly to Frame	PRISM® 401	3 gm Tube 20 gm Bottle 1 lb Bottle 2 kg Bottle	40104 40140 40161 17738
PRISM® 410		3 gm Tube 20 gm Bottle 1 lb Bottle 2 kg Bottle	41004 41045 41061 41088	Medium viscosity, toughened black cyanoacrylate.
Surround to Frame or Cone	PRISM® 401	3 gm Tube 20 gm Bottle 1 lb Bottle 2 kg Bottle	40104 40140 40161 17738	Ultra fast fixturing, low viscosity cyanoacrylate.
	PRISM® 403	3 gm Tube 1 oz Bottle 1 lb Bottle 2 kg Bottle	40304 40340 40361 40390	Low odor/low blooming, medium viscosity cyanoacrylate.
	PRISM® 410	3 gm Tube 20 gm Bottle 1 lb Bottle 2 kg Bottle	41004 41045 41061 41088	Medium viscosity, black toughened cyanoacrylate.
	PRISM® 411	3 gm Tube 20 gm Bottle 1 lb Bottle 2 kg Bottle	41104 41145 41161 41191	Clear, toughened, high viscosity cyanoacrylate.

Speaker Applications	Recommended Products	Package Sizes	Order #	Key Product Features
Dust Cap to Cone	PRISM® 401	3 gm Tube 20 gm Bottle 1 lb Bottle 2 kg Bottle	40104 40140 40161 17738	Low viscosity, ultrafast fixturing cyanoacrylate.
	PRISM® 410	3 gm Tube 20 gm Bottle 1 lb Bottle 2 kg Bottle	41004 41045 41061 41088	Black, toughened, medium viscosity cyanoacrylate.
	SUPER BONDER® 422	1 oz Bottle 1 lb Bottle	42250 42261	Gap filling; general purpose cyanoacrylate.
	3106	25 ml Syringe 1 liter Bottle 15 liter Pail	23697 23698 24674	Fast & flexible UV/V light cure acrylic.
	3175	25 ml Syringe 1 liter Bottle 15 liter Pail	29505 29506 29507	Ultra clear UV cure acrylic; fast tack-free surface cures.
	PRISM® 4204	20 gm Tube 1 lb Bottle	26324 26325	Handles 250°F continuous; high viscosity cyanoacrylate.
	FLASHCURE™ 4303	4 oz kit 1 lb kit	29577 ⁵ 29578 ⁵	Light cure cyanoacrylate; surface cure in <5 seconds
Gasket to Surround	PRISM® 410	3 gm Tube 20 gm Bottle 1 lb Bottle 2 kg Bottle	41004 41045 41061 41088	Toughened, black, medium viscosity cyanoacrylate.
	PRISM® 411	3 gm Tube 20 gm Tube 1 lb Bottle 2 kg Bottle	41104 41145 41161 41191	Clear, toughened, high viscosity cyanoacrylate.
	SUPER BONDER® 422	1 oz Bottle 1 lb Bottle 2 kg Bottle ⁴	42250 42261 42288	General purpose, high viscosity cyanoacrylate.
Dressing Lead Wires to Cone	PRISM® 410	3 gm Tube 20 gm Bottle 1 lb Bottle 2 kg Bottle	41004 41045 41061 41088	Toughened, black, medium viscosity cyanoacrylate.
	FLASHCURE™ 4303	4 oz kit 1 lb kit	29577 ⁵ 29578 ⁵	High viscosity version light cure cyanoacrylate.
	3175	25 ml Syringe 1 liter Bottle 15 liter Pail	29505 29506 ⁴ 29507 ⁴	Fast, low intensity tack-free surface cures; ultra clear UV cure acrylic

¹Use with Activator 7075

²Use with Activator 7090,7091, or 7649

³Use with Activator 7380 or 7387

⁴Made to order

⁵Not a distributor stock item.



Pole Piece to Magnet to Top Plate

The three essential components bonded in the magnet assembly are the magnet itself (most commonly ceramic ferrite rings) and either a T-yoke, which includes a pole piece, or a plate and pole combination, and a top plate, or washer, made of steel. The T-yoke (referred to as the back plate, end plate or pole and plate) is bonded onto one face of the magnet, and the top plate (referred to as the washer or front plate) is bonded to the other face.

To achieve consistent bonding performance, mating surfaces must be clean. Steel parts may be contaminated with plating residues, or lubricants, and the nature of the problem varies with the production process. A by-product of the Blanchard grinding process that makes magnet faces smooth and parallel, is a coating of fine dust which should be cleaned from the mating surface before bonding, using a damp cloth. If any other residues are suspected, the mating surfaces of the parts should be cleaned with isopropyl alcohol or acetone.

Bonding the magnet assembly together is often accomplished with two-part epoxy adhesives, especially in Asia, where the adhesive is widely known as "A/B glue". When mixed properly at a 1:1 ratio, the resulting adhesive is typically gray. A combination of poor or absent mixing technique (running two beads over each other), and assembly line workers failing to rotate the parts while pressing them together, is a recipe for disaster. This approach requires that the operator dispense the correct ratio by eye, which may be difficult with components of differing viscosities. An emerging trend is the use of static mix nozzles or equipment to obtain a more consistent, reliable method.

Cyanoacrylates have been used for magnet and steel assembly in small and specialized drivers, and although they can be very fast, their long term bond strength to ceramic materials remains questionable. The success of the method suggests that in low stress applications, a rubber toughened cyanoacrylate may provide the desired performance. Occasionally, cyanoacrylates are used to tack parts together quickly, in combination with structural acrylics to insure the needed long term durability.

Current thinking on magnet to steel bonding runs in favor of structural acrylic adhesives, with several variations formulated for different surfaces, gap fill capability and fixture times. These structural adhesives are economical, fast, strong, easily dispensed, and create thin bondlines to minimize magnetic energy losses. Loctite® structural acrylics develop good handling strength in 30 to 90 seconds, which allows the magnet assembly to be magnetized within 5 minutes of assembly. This speed of fixture also allows the magnet assembly to be placed briefly into a clamp, where it can be pressed to create a very thin and uniform bondline. This extra step can be beneficial in high performance drivers and compression drivers, where tolerances must be very tight. Structural acrylics are used with primers, and the latest solventless primers for dichromated surfaces can bond to steel that has been dichromated, or plated with clear, black or yellow zinc.

Ideally, the adhesive should not be applied over a painted surface, as the bond between the paint and the substrate can limit overall bond strength. Activators for acrylics or any other adhesives, should be applied only onto the steel parts (at room temperature), so that the carrier solvents in the activator can evaporate entirely before assembly. Since ceramic magnets are quite porous, the activator applied to them can wick deep below the surface. So while appearing to be dry on the surface and ready for bonding, the magnet may still be loaded with solvents. Trapped solvents may significantly slow the cure, and can weaken the ultimate bond strength.

A note about the use of Ferrofluids. Ferrofluids are colloidal suspensions of magnetic particles in an oil-like carrier liquid, and provide improved thermal transmission from the voice coil to the surrounding steel parts. Since the fluid is magnetic, it remains in the gap, completely enveloping the voice coil, and any fluid migration (by wicking or splashing) onto nearby bondlines must be avoided. Ferrofluidics Corporation (603-883-9800) has evaluated loudspeaker assembly adhesives for compatibility with their fluids, and has approved many Loctite® adhesives as fully compatible.

The Loctite adhesives typically used in speaker assembly do not effect, nor are effected by, incidental contact with Ferrofluids, once fully cured. However, uncured acrylic adhesives are known to have catastrophic effects upon Ferrofluids if they come into contact, causing the magnetic fluid viscosity to rise dramatically. Since Loctite® structural acrylics are anaerobic (curing in the absence of oxygen), any excess adhesive outside the bondline will not cure, and will remain hazardous to Ferrofluid.

Other Types of Magnets

Along with tremendous magnetic density, Neodymium-iron-boron (NdFeB) magnets have introduced another unwelcome feature, rapid corrosion. The quality of the protective coatings can be a significant problem with these magnets, depending on their source. Neodymium magnets are currently available with a variety of surface treatments such as: 1) vapor deposited aluminum, 2) electro-plated nickel, 3) electro-deposited epoxy paint, and 4) plasma deposited titanium-nitride. Each of these coatings requires special consideration. Neodymium magnets should be inspected closely before assembly operations begin, and those that show oxidation should be discarded. Bonding to already oxidized surfaces will neither create a strong bond, nor inhibit further corrosion.

Neodymium, samarium-cobalt and alnico magnets generally use a "pot and pole-tip" topology, rather than top plate and pole plate. The steel parts involve the same finishes and the adhesive recommendations are the same as for ceramics.

Recommended products for the Pole Piece to Magnet to Top Plate Assembly:

Loctite® SpeedBonder™ Adhesives 324, 326 or Loctite® Structural Adhesives 332, 392 or 3270.

See detailed Product Information on SpeedBonder and Structural Adhesives on pages 18 and 19.





Top Plate To Frame

Normal manufacturing process calls for the pole piece and magnet to be assembled in one operation, while the frame and top plate are assembled in a separate operation. Punched steel frames always include a ring of holes which mate with a ring of raised pins on the top plate, and the parts are swaged together in a press. Cast aluminum frames are generally fixed to steel parts by bolts threaded into the top plate. Thin paper gaskets are sometimes fitted between the frame and the top plate to prevent buzzing, and to seal the gap, thus avoiding whistling noises. A better solution is a thin bead of Loctite® structural adhesive, eliminating gasket inventory, while both sealing and reinforcing the joint.

In making frames more attractive, particularly for the automotive aftermarket, manufacturers have embraced powder coat finishes on their frames, which introduce some unwelcome bonding challenges. Most of the powders used in these processes contain epoxies combined with wax compounds, to create smoother and more attractive surfaces. However, this wax interferes with the bond and must be stripped off any bonding surfaces. Washing these surfaces with solvents such as toluene, xylene or methyl ethyl ketone can significantly improve bond strength, although these solvents have fallen out of use in the last few years. Isopropyl alcohol may be the best alternative.

Recommended products for the Top Plate to Frame Assembly:

Loctite® Cyanoacrylate Adhesives 380 or 410.

See detailed Product Information on Cyanoacrylates on pages 22 and 23.



Spider Assembly to Frame

Strength requirements for this bond vary dramatically. At the low end of the stress scale are drivers using a small voice coil, with modest cone movement together with a large diameter spider. Under these circumstances, the stress on the bondline is minimal, and the adhesive can be selected for economy or dispensing ease, or both. At the high stress end of the scale are large coil and large excursion drivers, particularly those with small diameter spiders. In this type of driver, the adhesives are subjected to simultaneous shear, cleaving, peel and thermal stresses. The bond must be slightly flexible yet aggressive and durable.

Priming the surface of the frame with a Loctite cyanoacrylate primer will ensure the quickest possible bond. A bead of low-viscosity cyanoacrylate, such as 401 applied to the edge of the spider, will wick into the bondline, developing good handling strength in about 20 seconds. If oversprayed with a Loctite® accelerator, it is even faster. Both adhesive and accelerator make for an almost invisible bondline.

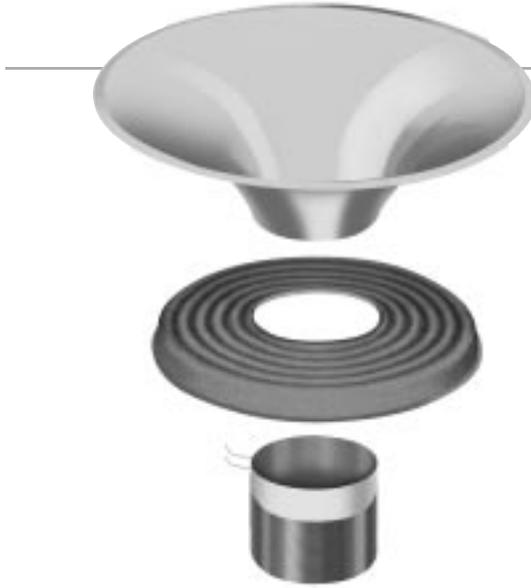
Some spiders have a surface coating, such as mold release, that can delay or even entirely inhibit the cure of cyanoacrylates. A simple remedy is to wipe the bore of the spider with a Loctite® accelerator, such as 7452. If primers (such as PRISM® Primer 770 Adhesion Promoter) are being used, they should be applied to surfaces other than the spider, as they may wick into the fibers and not evaporate fast enough for convenient assembly. The phenolic resins used in manufacturing spiders varies from slightly base to slightly acidic, and the pH factor can dramatically influence the cure speed of cyanoacrylates.

On drivers using plastic frames, the spider to frame bond can be accomplished by direct heating of the bondline, causing the plastic to reflow into the spider. This is very quick and economical, but makes rework of any QC rejects impractical.

Recommended products for the Spider Assembly to Frame:

Loctite® Cyanoacrylate Adhesives 401 or 410.

See detailed Product Information on Cyanoacrylates on pages 22 and 23.



Voice Coil to Spider to Cone

In most cases, this is considered a single bond, although it is sometimes accomplished in two separate steps, as two bondlines, and in some cases, uses two different adhesives. This text assumes the most common situation: one step, one bondline, and one adhesive. Cyanoacrylates, or instant adhesives, are the products of choice, particularly the newer thermal resistant products which work well where added temperature resistance is needed. Cyanoacrylates are fast, simple and the perfect compliment to high speed manufacturing lines.

Paper cones tend to be very porous, and as their moisture content changes, the speed of cure of cyanoacrylates will change. Very low moisture conditions tend to slow the cure, while very high moisture conditions accelerate it. Variations in paper chemistry can create pH shifts in the cone, and can affect the speed of cure with cyanoacrylates. Loctite® PRISM® surface insensitive cyanoacrylates work extremely well, over a range of humidity and pH conditions.

No matter how experienced the user is, polypropylene cones always present a bonding challenge. Preparation is the key to success. Polypropylene is a difficult surface to wet since it has very low surface energy, but this characteristic can be overcome with suitable treatment. Several techniques are in use within the loudspeaker industry, including corona discharge, blown plasma arc, flame treating, and the use of chemical primers to enhance surface energy. While chemical primers are the most common technique used, plasma etching can produce extremely high bond

strengths. The plasma technique uses an inert gas RF plasma generator to blow an arc of blue plasma onto the bond area of the cone. Bonding with cyanoacrylate adhesives must take place within a minute for optimum results. Some localized cosmetic pitting (dulling) of the surface is normally evident, so the plasma must be confined to the bond area only. The final bond strength obtained with the plasma technique is high, as is the hardware investment.

The chemical alternative can be as simple as spraying a Loctite® Polyolefin Primer onto the substrate to be bonded and allowing it to evaporate. Or the process might call for pre-cleaning the area with acetone and then mechanically abrading it. The most effective high speed on-line compatible approach may be mechanical abrasion of the bond area, followed promptly by an application of Loctite Polyolefin Primer. This routine lends itself to simple automation and offers exceptionally high bond strength. The effect of the primer should not be underestimated, as bond strengths are often 25 to 40 times higher than those achieved when using the same adhesives without primer.

The cone-coil-spider bond is probably the most highly stressed in any given driver, often subjected to simultaneous shear and cleaving forces, and also elevated temperatures. Attention should be paid to the thermal limit of the adhesive, not only the maximum "peak" temperature rating, but also the time-versus-temperature information, which yields much more useful data. Loctite® thermally resistant cyanoacrylates work well on most known bobbin and collar materials, and tolerate sustained high temperature operation (particularly product 4204) much better than any previous types of cyanoacrylates. These products offer minimal mass and easy dispensing, creating a very strong cone-coil-spider bond. Some have high temperature resistance plus rubber-toughened properties, allowing them to take peel and cleaving stresses in stride.

One production technique that has proven beneficial is spider to coil pre-fixing. It involves adhesive-fastening these parts together off-line, using a simple jig. Because the coil and spider subassembly is not built in the driver, it can be inspected to ensure that the spider is perfectly level and is seated at the right height on the bobbin. If required, additional reinforcing bonds can be placed.



Since any gap between the spider and the bobbin has been sealed, there is less risk of cone adhesive migrating down into the gap during final assembly.

Although some recently developed epoxies offer good bonds, they are often too slow for most high speed production environments. In production environments where speed is not such a critical factor, such as in batch building, some Loctite® DURABOND epoxies work extremely well. DURABOND epoxies E-20HP, E-60HP or E-120HP are recommended for the most demanding and highly stressed voice coil bonding applications. Some take an hour or so at room temperature to achieve enough handling strength to allow meaningful end-of-line testing. This is usually unacceptable. Epoxy cure times can generally be reduced by using hot-plug inserts or heat tunnels, making DURABOND E-120HP useful for slow assembly lines and batch production methods. Unfortunately, the chemistry that produces a fast cure typically also seriously compromises other useful qualities of the epoxy. Often the fastest epoxies display low peel and shear strengths, brittleness, and a catastrophic tendency to crystallize under repeated thermal cycling.

Some single component, frozen epoxies have been used for the cone-coil-spider bond, but they are more costly and require special storage in freezers. On the assembly line, the problems of thawing these adhesives from -40°C just before use, contending with their short pot lives, and dispensing them from small disposable syringes, make them impractical.

For small drivers, and those where the stresses are more modest, cyanoacrylates have been used with great success. In high-frequency and midrange drivers, and moderate power low-frequency drivers, (typically with coils under 50mm), cyanoacrylates are ideal. They add minimal mass, create a strong bond quickly, and have excellent environmental tolerance. Cyanoacrylate

"instant" adhesives work best when the joint involves two close-fitting, reasonably parallel surfaces. On low frequency drivers, this can be obtained by forming cones with short neck sections that closely parallel the voice coil, ideally with less than 0.25mm of radial clearance. Gel type cyanoacrylates are available for bonding those speaker parts which have larger gaps or poorer tolerances. Redesign of the part may be more cost efficient however, because when large gaps must be filled, adhesive consumption can be quite high.

Cyanoacrylates can be made to form uniform fillets or wedges, if laid as a heavy bead, and then oversprayed with accelerator, creating a tidy, quick bond. The low viscosity versions produce a uniform, cosmetically attractive bondline. The rapid cure of these adhesives in the last few steps on the production line allows drivers to be tested within minutes of assembly. Also, when drivers are assembled with cyanoacrylates, the frequency response and impedance curves taken at the end of the line are essentially the same as those taken after the adhesive is fully cured. The elimination of off-line stacking reduces space requirements and labor costs, and the improved QA feedback from the test station allows almost immediate correction of problems.

If low viscosity cyanoacrylates are applied and then oversprayed with an accelerator, the resultant cure reaction may be too rapid, which can seriously compromise the bond strength and create a "popcorn" like appearance to the adhesive. Typically, low viscosity cyanoacrylates are already fast curing and do not require acceleration. An over-application of accelerator can have the same effect, also creating the "popcorn" like appearance.

Recommended products for the Voice Coil to Spider to Cone Assembly:

Loctite® Cyanoacrylate Adhesives 380, 410, 411, 422, 498, 4204, 4210, or 4211, or
Loctite® Epoxy Adhesives E-20HP, E-60HP, or E-120HP.

See detailed Product Information on Cyanoacrylates on pages 22 and 23; and
Epoxies on pages 28 and 29.



Surround to Frame or Cone

The long bondline and large bond areas in this application may result in moderately high adhesive consumption. Thus, most attractive adhesives may be those that exhibit good bond strength very quickly when applied in minimal volume, especially in the production of low priced or commodity grade loudspeakers.

Polyester foam and untreated cloth edges are hygroscopic, and the adhesive cure speed will be influenced by the amount of moisture retained within the part. Loctite® 410 has proven most acceptable for polyester foam bonding. It fixtures in approximately five seconds when the bond is oversprayed with a Loctite® accelerator such as 7113, 712, or 7109. Note that Accelerator 7452 should not be used on foam edges, as it is too aggressive.

Polyester foam and treated cloth may also be bonded in the same way, but since they may be impervious to the spray, the accelerator overspray may not be very effective. Care should be exercised to avoid creating cosmetic blemishes on the part.

Approach attaching rubber edges with some caution, as each of the elastomer families have different characteristics. Adhesive migration may be a cosmetic issue, so consider black or clear adhesives. The stresses on the bondline during use are not especially high, as the rubber forms an effective strain relief. There may be high torque (shear forces) applied by the mounting screws during installation of the driver into an enclosure.

The recommended surface pre-conditioning for all rubber edges is to wipe the part with 70% isopropyl alcohol before bonding. This improves the bond strength by removing lubricants, plasticizers and mold release from the rubber surface.

The specific recommendations for bonding surrounds of IIR (butyl rubber) and NBR (nitrile, or Buna-N rubber) are the same adhesives, but the resultant bond strength is much better with NBR. Since IIR is attacked by some solvents, it may curl up if Loctite® Accelerator 7452 is used, since the carrier solvent is acetone. In this case, Loctite® Accelerator 7113 (heptane based) should be substituted. Either type of accelerator works well with NBR. The need for accelerator pre-treatment of the surround should be evaluated. Some assembly routines rely on the bond remaining pliable for a short period, to allow precise part alignment by hand. Other automated routines require the bond to achieve handling strength in a few seconds.

For bonding SBR (styrene-butadiene rubber) edges, Loctite® 401, (used without a primer on the frame bondline), is superior. Thermoplastic surrounds such as those made from Santoprene, Stek TPE-PU (thermoplastic elastomer-polyurethane) and other TPUs all benefit from pre-treatment with PRISM® Primer 770 Adhesion Promoter. The adhesive recommendations are the same as for conventional rubbers. While EPDM rubber edges are not common, they are occasionally used, and can be bonded very successfully with Loctite® cyanoacrylate adhesives. The nature of the rubber suggests that no primer is required.

Some attention should be given to weathering effects, and both the frame to surround and the surround to cone bonds should be environmentally tested to ensure a long and trouble-free life for the speaker.

Recommended products for the Surround to Frame or Cone Assembly:

Loctite® Cyanoacrylate Adhesives 401, 403, 410 or 411.

See detailed Product Information on Cyanoacrylates on pages 22 and 23.



Dust Cap to Cone

These are high volume, low-stress bondlines, and some consideration must be given to the cosmetic consequences of adhesive migration. Black or clear adhesives are preferred to bond these paper, felt, plastic, or hot-pressed foam materials to the cone. There are several chemistries for this application. Light cure acrylics offer tack-free surfaces and cure-on-command performance. New light cure cyanoacrylate 4303 offers the ability to cure in shadowed areas, with surface cures in <5 seconds after exposure to a suitable UV light source. It also bonds the more difficult to bond substrates without the need for accelerators. As with other bondlines, if drivers are subjected to testing immediately after assembly, cyanoacrylates can offer excellent cure speed, ensuring highly stable and repeatable end-of-line measurements.

Recently, PVA resins have become popular as cosmetic coatings on paper cones. This glazed skin face on the cone contributes little or nothing to the performance, and can pose new adhesive problems. For example, dust-cap adhesives no longer penetrate into the cone body, bonding instead to the relatively weak glazed skin. A low frequency driver in a small sealed enclosure can exert a catastrophic stress level on such a bond. The dust-cap adhesive should penetrate well into the cone paper, to ensure the strongest mechanical bond. If possible, cosmetic coatings should be avoided.



Recommended products for the Dust Cap to Cone Assembly:

Loctite® Cyanoacrylate Adhesives 401, 410, 422 or 4204; or
Loctite® Light Cure Adhesives 3106, 3175, or 4303.

See detailed Product Information on Cyanoacrylates on pages 22 and 23; and on Light Cure Adhesives on pages 26 and 27.

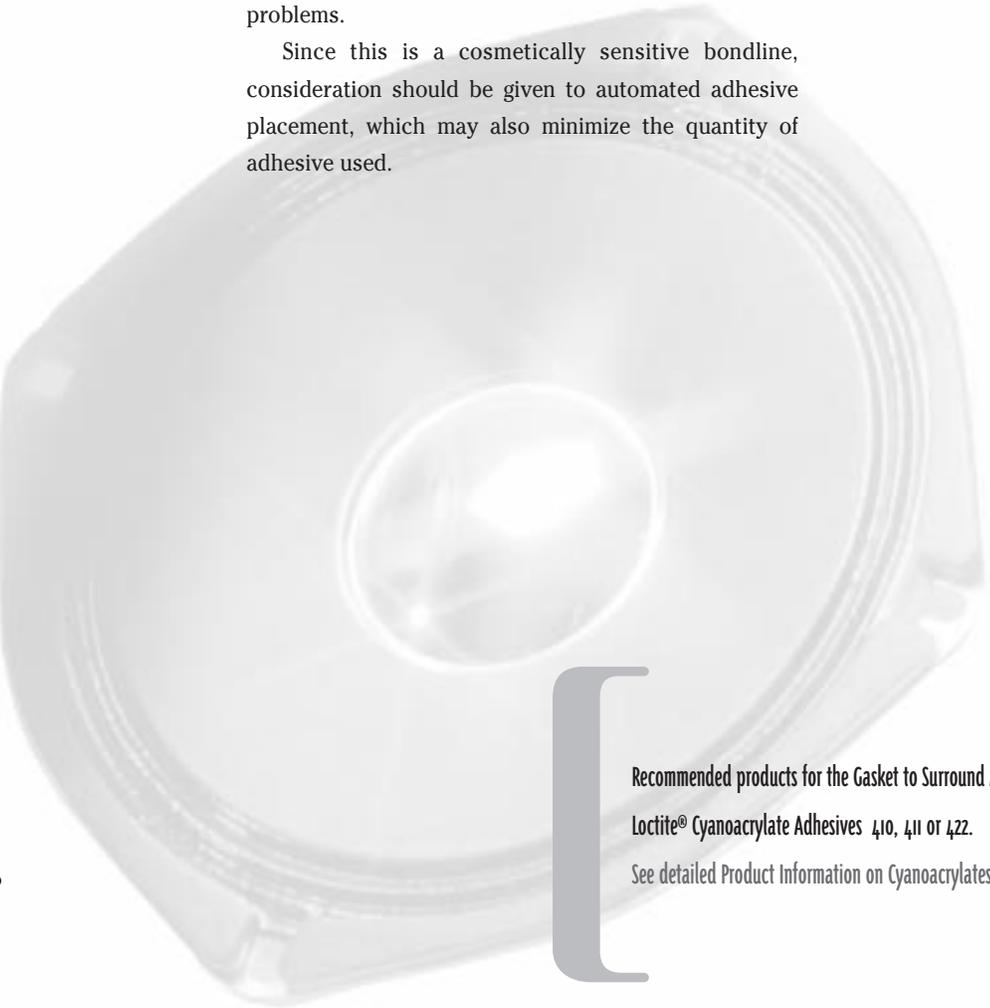




Gasket to Surround

As with other bondlines, if drivers are subjected to testing immediately after assembly, cyanoacrylates offer excellent cure speed, ensuring highly stable and repeatable end-of-line measurements. The use of accelerators on gasket bonds can allow the drivers to be packaged immediately after QA testing, without gasket "squirming" problems.

Since this is a cosmetically sensitive bondline, consideration should be given to automated adhesive placement, which may also minimize the quantity of adhesive used.



Recommended products for the Gasket to Surround Assembly:

Loctite® Cyanoacrylate Adhesives 410, 411 or 422.

See detailed Product Information on Cyanoacrylates on pages 22 and 23.



Dressing Lead Wires To Cone

To stress-relieve tinsels on the back of the cone and at the terminals on Low Frequency Drivers, several products work well. For an extremely fast fixture, Loctite® Light Cure Cyanoacrylate 4303 is the product of choice. This two-part formulation cures in 3-5 seconds, using low intensity UV light sources, filling gaps up to 0.75mm. Loctite® 4303 is medium viscosity and flows well into both the tinsel lead and the cone surface. The major advantage of these adhesives is speed, making lead dressing possible for the first time on a high speed assembly line.

An alternative Light Cure Adhesive is an acrylic formulation, Loctite® 3175. Designed to achieve rapid tack-free surface cures when exposed to a low intensity UV light source, this product is also excellent when rapid cure speeds are required.

Recommended products for Dressing Lead Wires to Cone Assembly:

Loctite® Light Cure Adhesives 4303 or 3175, or
Loctite® Cyanoacrylate Adhesive 410.

See detailed Product Information on Light Cure Adhesives on pages 26 and 27.
See detailed Product Information on Cyanoacrylates on pages 22 and 23.

SPEEDBONDER™ and Structural Adhesives

Loctite® SPEEDBONDER™ and Structural Adhesives were developed for bonding applications requiring tensile, shear, and peel strength combined with maximum impact, stress and shock resistance. These two-part, no-mix acrylic adhesives consist of a resin and an activator. The resin component is a solvent-free, medium to high viscosity liquid. Activators are discussed following this section. SPEEDBONDER™ 324, 326 and 3270 and Structural Adhesives 332 and 392 are specially formulated to provide an optimum balance of speed and strength with ease of application.

Speaker Applications:



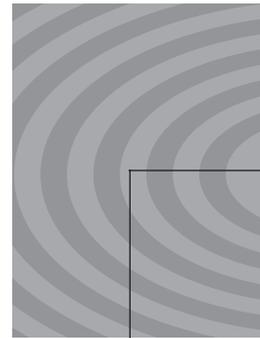
Bonding Pole Piece to Magnet to Top Plate

Product Features & Benefits:

- 100% resin, solvent-free adhesives.
- Forms high strength bonds to ceramic, ferrite and steel, including dichromated and plated metals.
- Two component, no-mix technology. Eliminates pot-life related waste and thickening related process variations.
- Dispensable from original containers with manual, semi-automatic or fully automatic dispensing systems.
- Rapid fixture at room temperature. Minimizes work-in-process and line length.
- Cure speeds may be tailored with choices of activators and primers on some products.

Processing Steps:

1. Apply recommended activator/primer (see Activators Chart pg. 21-22) to one or both surface(s) if required. Remove any surface contamination by degreasing prior to activation for optimum results.
Note: Solvent based activator/primers must be allowed to dry.
2. Apply selected adhesive to the other surface.
3. Join surfaces using sufficient force to spread adhesives. Secure the assembly, and allow the adhesive to fixture before further handling.



TECHNICAL PRODUCT INFORMATION

Product Number	324	326	3270	332	392
Key Product Features	High Impact Resistance & Large Gap Filling	Fast Fixturing & High Strength, Gap Filling	Low Viscosity, Fast Fixturing, Versatile	Highest Thermal, Impact & Shock Resistance	Ultra Fast, High Thermal Resistance, Good Gap Filling
Chemical Type	Urethane Methacrylate Ester	Urethane Methacrylate Ester	Urethane Methacrylate Ester	Modified Acrylic	Modified Acrylic
Color	Clear Amber	Clear Amber	Amber	Yellow Paste	Tan Paste
Gap Fill	.040"	.020"	.010"	.020"	.020"
Viscosity cP	17,000	18,000	7,000	200,000	60,000
Shear Strength (PSI)*	3,000	2,700	3,500	3,000	2,600
Temperature Range	-65°F to 275°F	-65°F to 225°F	-65°F to 225°F	-65°F to 400°F	-65°F to 300°F
Cure Speed** Fixture Full	1 1/2 minutes 24 hours	45 seconds 24 hours	1 minute 24 hours	1 minute 24 hours	30 seconds 24 hours
Recommended Primers/Activators	7075	7649/7090/ 7091	7649/7090/ 7091	7380/ 7387	7380/ 7387
Specific Gravity	1.11	1.1	1.11	0.97	1.16
Technical Data Sheet+	324	326	3270	332	392

* Varies with substrates.

** Grit Blasted Steel; varies by primer or activator selected.

+ For additional technical information, request Technical Data Sheet and Material Safety Data Sheets by calling 1-800-562-8483.

Bolded Primer/Activator indicates which was used for this data.

ORDERING INFORMATION

Product Number	324	326	3270	332	392
25 ml Syringe				33201	39205
50 ml Bottle	32430	32629			39250
300 ml Cartridge				33275	39275
1 liter Bottle	32490	32685	12035	33290	39280
15 liter Pail			18614	17601 (12 Liter*)	17507

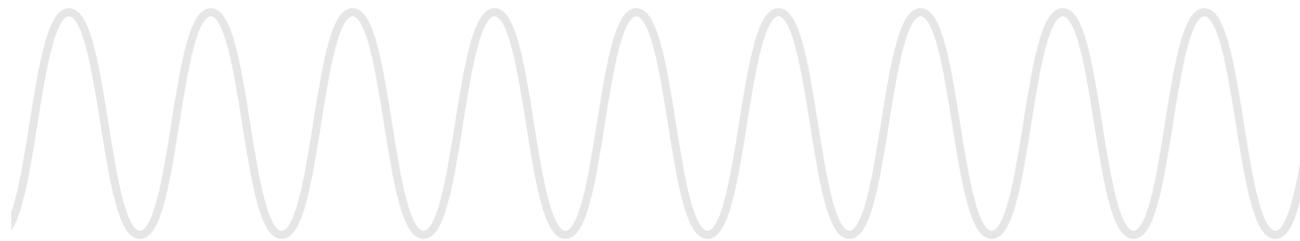
* MTO – Made to Order

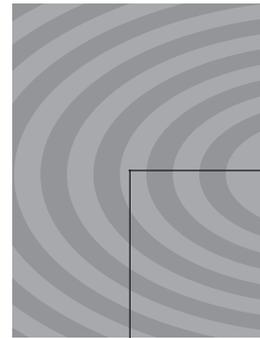
Activators for SPEEDBONDER™ and Structural Adhesives

Activators are the necessary second component of Loctite® SPEEDBONDER™ and Structural adhesives. Available in both solvent-based and solventless versions, activators effect the cure of SPEEDBONDER™ 324, 326 and 3270, and Structural Adhesives 332 and 392. If the carrier solvent present in the activator solvent dispersion is undesirable, the pure catalyst is available as a solvent-free activator. However, it should be noted that when using a solvent-free activator, a minimum amount of activator should be applied, as excessive activator will detrimentally affect the performance of the adhesive. Activator is applied to one or both surfaces and the adhesive is applied to the other. Cure begins when the parts are mated.

Processing Steps:

1. Apply SPEEDBONDER™ or Structural Adhesive to one (or both, if required) of the substrate surfaces.
2. Apply activator to the other surface. Allow activator's carrier solvent to flash off; if using a solventless version parts will remain wet to the touch.
3. Mate the two surfaces.
4. Catalyst from the activator initiates the polymerization of the resin. Allow fixture strength to develop before handling.





TECHNICAL PRODUCT INFORMATION

Product Number	7649	7075	7090	7091	7380	7387
Description	Primer N	Acrylic Activator	Solventless Activator N	Solventless Activator for Dichromated Surfaces	Solventless Activator	Acrylic Activator
Use with Product #	326, 3270	324	326, 3270	326, 3270	332, 392	332, 392
Solvent Carrier	Acetone	Acetone	Solventless	Solventless	Solventless	Heptane/Isopropanol
Specific Gravity	0.79	0.79	1.03	>93	0.97	0.8
Flash Point (TCC), °F	-4	None	>200	>200	>200	25
TLV, ppm (ACGIH, TWA)	500	500	None	None	Cu 0.2mg/m ³ fume Cu 1 mg/m ³ dust	400
On-Part Life	30 days	2 hours	1 hour	1 hour	2 hours	2 hours
Technical Data Sheet+	7649	7075	7090	7091	7380	7387

+ For additional technical information, request Technical Data Sheet and Material Safety Data Sheets, by calling 1-800-562-8483.

ORDERING INFORMATION

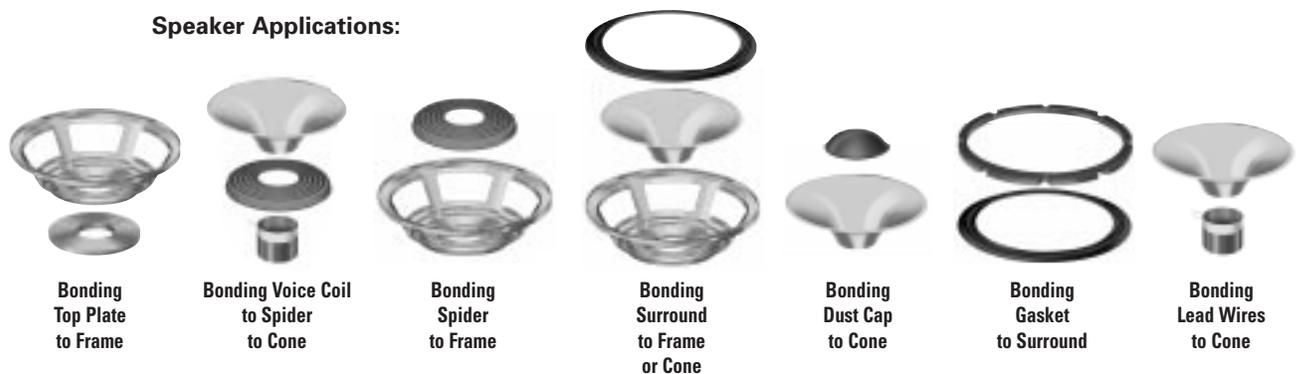
Product Number	7649	7075	7090	7091	7380	7387
1 oz Bottle			19368			
1.75 oz Bottle	19269				19824	18861
25 gm Aerosol Can	21347					
4.5 oz Aerosol Can	21348	22671				21088
1 qt Can		21349				18862
1 liter Bottle			12695	18109 (can)	19822	
1 gallon Can	19266	11476			19907	

Cyanoacrylate Adhesives

Loctite® cyanoacrylates, or instant adhesives, are one-part, room-temperature curing adhesives and are available in a range of viscosities, cure speeds, gap-filling capabilities, and substrate compatibilities. A wide variety of specialty formulations with properties tailored to meet challenging speaker assemblies are available. Accelerators, primers and adhesion promoters allow custom tailoring of the gap fill and fixturing times to meet your production requirements.

When pressed into thin films between two surfaces, cyanoacrylates cure rapidly to form rigid to slightly flexible thermoplastics with excellent adhesion to most substrates. PRISM® cyanoacrylates are the highest performance instant adhesives from Loctite. They are engineered to surpass the most stringent demands, working where other instant adhesives fail. The PRISM family includes toughened, low odor/low blooming, surface insensitive, and thermally resistant products.

Speaker Applications:



Product Features & Benefits:

- 100% resin, solvent-free adhesives.
- Excellent adhesion to thermoplastics, thermoset plastics, dichromated and plated metals, porous and acidic and other difficult-to-bond substrates.
- Single component; easy to dispense with manually, semi or fully automatic systems.
- Rapid fixturing at room temperature. Cure speeds may be tailored with a choice of accelerators.
- Primers available for polyolefins and difficult-to-bond plastics.

PRISM® Toughened Instant Adhesives are a family of rubber-toughened (for added flexibility) cyanoacrylates, offering high peel, impact and dynamic load strength. With better temperature resistance than standard cyanoacrylates, they are ideal in high stress, humidity, vibration and impact applications.

PRISM® Surface Insensitive Instant Adhesives provide strong, rapid fixture times and cure speeds on difficult-to-bond surfaces, including acidic painted and dichromate plated parts, as well as porous materials. They cure even under low humidity conditions.

PRISM® Thermally Resistant Instant Adhesives offer improved resistance to high humidity and heat, maintaining their bond strength longer than all other instant adhesives when exposed to higher temperatures. These adhesives are more flexible and can handle vibration better than standard cyanoacrylates.

PRISM® Low Odor/Low Bloom Instant Adhesives have lower vapor pressures, minimizing odor and "frosting", for use on appearance sensitive assemblies. These products have the lowest temperature ratings and are thus limited to applications where there will be low temperature exposure.

SUPER BONDER® Instant Adhesives form high strength bonds to most substrates. Available in a wide range of viscosities to match specific gap and material requirements.

Loctite has a wide range of cyanoacrylates to select from. Only the most commonly used for speaker assemblies are represented in this guide. Should you need different properties, contact your Loctite Sales Engineer at 800-323-5106, for more choices.

Processing Steps:

Cyanoacrylates work best on clean parts (remove all traces of contamination, such as mold release, oil, grease, etc.). When the cyanoacrylate contacts a surface, the water present on the surface neutralizes the acidic stabilizer in the adhesive, resulting in rapid polymerization.

1. Apply a bead of cyanoacrylate to one of the surfaces to be bonded or wick a low viscosity formula between pre-assembled parts.
2. If an accelerator or adhesion promoter is desired, refer to the processing steps outlined in the following section on page 24.
3. Mate the parts and wait for fixturing strength to develop before further handling.

TECHNICAL PRODUCT INFORMATION

	Surface Insensitive Products	Toughened Products			Low Odor/ Low Bloom Products	Thermally Resistant Products			SUPER BONDER® Products	
Product #	401	380	410	411	403	4204	4210	4211	422	498
Key Product Features	General Purpose, Low Viscosity	Low Viscosity, Small Gaps	Medium Viscosity, Gap Filling	Clear, Gap Filling, Med. Viscosity	Clear, Gap Filling	Gap Filling, Best Thermal Resistance	Black, Small Gaps	Black, Gap Filling	Gap Filling, General Purpose	Thermal Cycling Resistance
Chemical Type	Ethyl	Ethyl	Ethyl	Ethyl	Alkoxy	Ethyl	Ethyl	Ethyl	Ethyl	Ethyl Alkoxy
Color	Clear	Black	Black	Clear	Clear	Clear	Black	Black	Clear	Clear
Gap Fill	.005"	.006"	.008"	.008"	.008"	.008"	.005"	.007"	.008"	.007"
Viscosity cP	110	200	3,500	5,000	1,000	4,000	160	2,500	2,500	500
Shear Strength (PSI)*	3,200	3,750	3,200	3,200	2,600	2,100	3,600	3,600	3,200	3,000
Temperature Range	-65°F to 180°F	-65°F to 225°F	-65°F to 225°F	-65°F to 210°F	-65°F to 160°F	-65°F to 250°F	-65°F to 250°F	-65°F to 250°F	-65°F to 180°F	-65°F to 250°F
Cure Speed**										
Fixture	15 seconds	90 seconds	90 seconds	30 seconds	50 seconds	30 seconds	120 seconds	210 seconds	50 seconds	50 seconds
Full	24 hours	24 hours	24 hours	24 hours	24 hours	24 hours	24 hours	24 hours	24 hours	24 hours
Specific Gravity	1.05	1.1	1.07	1.07	1.1	1.1	1.1	1.07	1.09	1.1
Technical Data Sheet+	401	380	410	411	403	4204	4210	4211	422	498

* Varies with substrates.

** Grit Blasted Steel; will vary if a primer, activator, or accelerator is used.

+ For Additional Technical Information, request Technical Data Sheet and Material Safety Data Sheets by calling 1-880-562-8483.

ORDERING INFORMATION

Product #	401	380	410	411	403	4204	4210	4211	422	498
3 gm Tube	40104	38004	41004	41104	40304		19757	19761		
20 gm Tube						26324				
1 oz Bottle	40140	38050	41045	41145	40340		19758	19762	42250	49850
1 lb Bottle	40161	38061	41061	41161	40361	26325	19759	19763	42261	49861
2 kg Bottle (4.4 lbs)	17738	18494	41088	41191	40390		19760*	19764*		

* MTO – Made to Order

Accelerators and Primers for Cyanoacrylates

Loctite offers a complete line of accelerators, primers and adhesion promoters to enhance the performance of Loctite® cyanoacrylates.

Accelerators speed the cure of cyanoacrylates and are primarily used to reduce fixture times or to cure fillets on bondlines. They also greatly expand the gap fill capability of the adhesive. Accelerators consist of an active ingredient dispersed in a solvent, and are typically applied to a substrate surface prior to the application of adhesive. Once the carrier solvent has evaporated, the cyanoacrylate can immediately be applied and its cure initiated by the active species that the accelerator has left behind. Depending on the product, the solvent can require 10 to 60 seconds to evaporate, and the active species can have an on-part life ranging from 1 minute to 72 hours. Accelerators can also be sprayed over a drop of cyanoacrylate to rapidly immobilize or cure it.

Primers (also called Adhesion Promoters) enable the cyanoacrylates to form strong bonds with polyolefins and other hard to bond plastics such as fluoropolymers and acetal resins. Like the accelerators, polyolefin primers consist of an active ingredient dispersed in a solvent. Once the carrier solvent has evaporated, the surface is immediately ready for bonding. Primers have on-part lives ranging from 4 minutes to one hour. Often up to 20 times the unprimed bond strength can be achieved.

Products Features & Benefits:

- Accelerators expand the gap fill capability and reduce fixturing times.
- Accelerators provide curing on inactive surfaces, speed the cure on active surfaces, and increase the curing speed between bonding surfaces.
- Accelerators are often used to prevent fabric or porous parts from soaking up low viscosity adhesives.
- Primers significantly increase adhesion to polyolefins and other difficult-to-bond plastics, such as low energy surfaces.
- Primers also activate and accelerate the cure speed of cyanoacrylates.

Processing Steps for Primers:

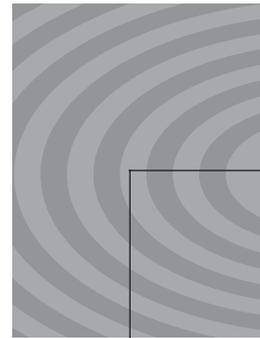
1. Apply an even film of primer by spraying, brushing, or dipping the substrate, followed by drying at ambient temperatures as required. (If joining two polyolefin-type materials, the primer is applied to both surfaces.)
2. Apply adhesive and assemble.

Processing Steps for Accelerators:

1. Apply cyanoacrylate to the parts to be bonded or fixed.
2. Assemble parts.
3. Apply accelerator over exposed adhesive by spray or by drop. Use one drop of activator per one drop of adhesive.

or:

1. Apply accelerator to one substrate. (Allow solvent time to evaporate if required.)
2. Apply cyanoacrylate to the other surface and assemble parts.



TECHNICAL PRODUCT INFORMATION

Product Number	712	7452	7113	7109	793	770
Description	Tak Pak® Accelerator— for plastics	Tak Pak® Accelerator— not for all plastics	Activator/Accelerator	Non-Flammable Accelerator	Polyolefin Primer	Polyolefin Primer
Use with Product #	Any Loctite cyanoacrylate	Any Loctite cyanoacrylate	Any Loctite cyanoacrylate	Any Loctite cyanoacrylate	Any Loctite cyanoacrylate	Any Loctite cyanoacrylate
Solvent Carrier	Isopropanol	Acetone	Heptane	Perfluorocarbon & proprietary co-solvent	Water/Alcohol	Heptane
Specific Gravity	0.8	0.79	0.68	1.56	0.9	0.68
Flash Point (TCC), °F	53	1.4	30	>200	149	30
TLV, ppm (ACGIH, TWA)	400	500	400	None	100	400
On-Part Life	45 seconds	45 seconds	24 hours	1 minute	1 hour	8 hours
Technical Data Sheet +	712	7452	7113	7109	793	770

+ For additional technical information, request Technical Data Sheet or Material Safety Data Sheet by calling 1-800-562-8483.

ORDERING INFORMATION

Product Number	712	7452	7113	7109	793	770
.7 oz Aerosol Can	18636	18637				
1.75 oz Bottle	20352	18490	19605	22440	18650	18396
1.75 oz Spray		18580				
16 oz Can					20246	18397
1 qt Can		18575		23034		
1 gallon Can	18390	18576	19606			

Light Cure Adhesives

The offerings of Loctite® Light Cure adhesives include acrylics, cyanoacrylates, epoxies and silicones. The chemistries most widely used for speaker assemblies include both acrylic and cyanoacrylate products. Upon exposure to the proper light source, rapid polymerization takes place. Available in a range of viscosities, cure speeds, gap-filling capabilities, and substrate compatibilities, these products are typically selected for their speed of cure.

Speaker Applications:



Bonding Dust Cap to Cone



Bonding Lead Wires to Cone

Light Cure Acrylic Product Features & Benefits:

- 100% resin, single component, solvent-free adhesives.
- Excellent adhesion to thermoplastics, thermoset plastics, dichromated and plated metals.
- Single component; easy to dispense with manually, semi or fully automatic systems.
- Instant cure on command at room temperature.

Light Cure Cyanoacrylate Features & Benefits:

- UV initiated with secondary moisture completing the cure; shadow and fillet cures.
- Excellent adhesion to a variety of substrates, including elastomers, acidic and porous substrates and polyolefins.
- Two part, pre-measured activator and adhesive.
- Extremely rapid cures; <5 second tack-free times. Eliminates need for accelerators.

Loctite has a wide range of Light Cure products to select from. Only the most commonly used for speaker assemblies is represented in this guide. Should you need different properties, contact your Loctite Sales Engineer at 800-323-5106, for more choices.

Processing Steps:

For Light Cure cyanoacrylates: The activator and adhesive are packaged as two-part. Mix by pouring the pre-measured activator into the adhesive bottle and shake lightly for 60 seconds. The mixed product has a pot life of 5 days at room temperature. Shield from exposure to UV and visible light, including ambient light. For Light Cure acrylics, shield from UV, visible or ambient light.

1. Apply a bead or dots of the Light Cure product of choice to one of the surfaces to be bonded, or wick a low viscosity formula between pre-assembled parts.
2. Mate the parts and expose to a suitable light source for the recommended length of time (refer to Technical Data Sheet.) Parts may be handled immediately.

TECHNICAL PRODUCT INFORMATION

Product Number	4303	3106	3175
Key Product Features	Higher Viscosity, Shadow Cures	Flexible, High Impact Resistance, Tough.	Ultra Fast Surface Cures, for Tacking Components.
Chemical Type	Ethyl Cyanoacrylate	Acrylic	Acrylic
Color	Light Amber	Pale Straw	Straw
Viscosity cP	900	5,000	4,000
Shear Strength (PSI)*	2,300	4,980	1,040
Temperature Range	-65°F to 180°F	-65°F to 300°F	-65°F to 275°F
Surface Cure** Fixture Full	<5 seconds 24 hours	>30 seconds 24 hours	11 seconds 24 hours
Specific Gravity	1.05	1.07	1.04
Technical Data Sheet+	4303	3106	3175

* Varies with substrates.

** Exposed to 30 mw/cm², Metal Halide UV light, @365 nm.

+ For Additional Technical Information, request Technical Data Sheet and Material Safety Data Sheets by calling 1-880-562-8483.

ORDERING INFORMATION

Product Number	4303	3106	3175
4 oz Kit	29577*		
1 lb Kit	29578*		
25 ml Syringe		23697	29505
1 liter Bottle		23698	29506**
15 liter Pail		24674	29507**

* MTO - Made to order.

** Not a distributor stock item.

Loctite® Product, Ordering and Technical Information

Epoxy Adhesives

Loctite® epoxies are recommended for the most demanding and highly stressed voice coil bonding applications. Three DURABOND epoxies excel in this area, as they are particularly suited for production environments where speed of cure is not as critical as performance. These are two-part, room-temperature curing adhesives, that are toughened to provide high peel and shear strength on a wide variety of plastics and metals.

DURABOND two-part epoxies offer superior adhesion to metals, and high thermal and chemical resistance, as well as extra high cohesive strength with low shrinkage. The DURABOND products are packaged in side-by-side cartridges, which are easily dispensed through hand held meter-mix dispensing systems. Available in 50 ml, 200 ml and 400 ml dual cartridges, as well as 5 gallon bulk sizes for high volume and automated assembly operations. For dispensing equipment and accessories, see page 31.

Speaker Application:



Bonding Voice Coil to Spider to Cone

Product Features & Benefits:

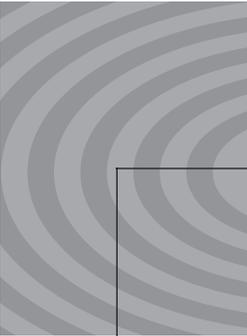
- 100% resin solvent-free adhesives.
- Superior adhesion to metals, including dichromated and plated metals.
- Room temperature cures; friendly two-part, easy to dispense formulations.
- Low shrinkage and CTE.
- High cohesive strength.
- High thermal and chemical resistance.

Loctite has a wide range of DURABOND epoxies and urethanes to select from. Should you need different properties, contact your Loctite Sales Engineer at 800-323-5106 for more choices and information.

Processing Steps:

DURABOND epoxies work best on clean, dry and lightly roughened surfaces. Avoid using the first 2 ml of adhesive upon initial dispensing. Use Loctite® DURABOND dispensers for cost-effective and accurate dispensing.

1. Apply a bead of epoxy (through a mix nozzle) to one of the surfaces to be bonded.
2. Mate the parts and clamp, allowing required set time for best performance.



TECHNICAL PRODUCT INFORMATION

Product Number	E-20HP	E-60HP	E-120HP
Key Product Features	High Strength, Toughened, High Peel, High Shear	Toughened, High Strength, High Shear and High Peel	Ultra Strength, Non-sag, High Shear
Chemical Type	Epoxy	Epoxy	Epoxy
Color	Off-White	Off-White	Amber
Cure Depth	>.500"	>.500"	>.500"
Viscosity cP	37,000	37,000	11,000
Shear Strength (PSI)*	3,000-5,000	3,000-5,000	3,000-6,000
Peel Strength (PIW)*	20-70	20-70	20-50
Worklife	20 minutes	60 minutes	120 minutes
Temperature Range	-65°F to 250°F	-65°F to 250°F	-65°F to 265°F
Mix Ratio by Volume (Resin: Hardener)	2:1	2:1	2:1
Technical Data Sheet+	E-20HP	E-60HP	E-120HP

* Varies with substrates.

+ For Additional Technical Information, request Technical Data Sheet and Material Safety Data Sheets by calling 1-800-562-8483.

ORDERING INFORMATION

Product Number	E-20HP	E-60HP	E-120HP
50 ml Dual Cartridge	29314	29319	29353
200 ml Dual Cartridge	29315	29320	29354
400 ml Dual Cartridge*	29316	29321	29355
5 gal Pail, Resin*	29317	29322	29356
5 gal Pail, Hardener*	29318	29323	29357

* MTO – Made to Order

Other Loctite® Adhesives

There are thousands of formulations and products available from Loctite, many more than can be included in this guide. Only the most widely used or preferred products for speaker assembly are detailed and included. Should you need a different viscosity or color, or even a different chemistry or slight variation of a formulation, chances are, Loctite has the best solution.

It is the intent of Loctite to continue to bring you the latest products and innovations straight from our laboratories. Our mission is to provide the most comprehensive and state-of-the-art adhesives, sealants, dispensing and curing systems in the industry.

Loctite Application Areas Include:

- ❖ Bonding
- ❖ Coating
- ❖ Gasketing
- ❖ Impregnating
- ❖ Retaining
- ❖ Potting
- ❖ Threadlocking
- ❖ Sealing

Loctite Product Areas Include:

- ❖ Acrylic/Structural Adhesives
- ❖ Light Cure Adhesives
 - Acrylics
 - Silicones
 - Epoxies
 - Cyanoacrylates
- ❖ Anaerobics
- ❖ Cyanoacrylates
- ❖ Epoxies
- ❖ Polyurethanes
- ❖ Silicones
- ❖ Primers/Activators/Accelerators
- ❖ Hot Melts

www.loctite.com

We are constantly expanding our product lines as we acquire new technology and develop new, innovative products. To keep current on Loctite products, we suggest you visit our website at www.loctite.com frequently. Or, if you desire personal assistance, you may also contact your local Loctite Sales Engineer by calling **1-800-323-5106**.

Loctite offers a complete line of dispensing and curing equipment designed specifically for use with its high performance adhesives, sealants and coatings. Dispensing and curing equipment options range from hand-held, manual and semi-automatic systems to fully automatic and custom engineered systems for turnkey integration in high speed assembly processes. Loctite also offers comprehensive engineering resources to assist its customers in developing manufacturing and assembly processes which effectively integrate on-line dispensing and curing.

DURABOND Epoxy Dispensing Equipment & Accessories

All two-part Loctite® DURABOND Adhesives are easily dispensed through hand-held meter mix dispensing systems. These systems provide a convenient, cost effective method to accurately apply DURABOND Epoxy Adhesives with minimal waste.



50 ml Dispenser

Manual dispensing gun for use with DURABOND 50 ml double barrel cartridges. Comes with two different plungers, allowing it to be used with either 1:1 or 2:1 ratio cartridges.

Order number 983435 50 ml Manual Dispenser



Manual Dispenser

Available in either 200 ml or 400 ml versions. Accepts both DURABOND 1:1 and 2:1 double barrel cartridges.

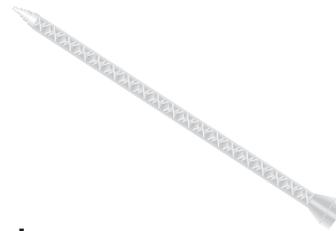
Order number 983436 200 ml Dispenser-Manual
Order number 983438 400 ml Dispenser-Manual



Pneumatic Dispenser

Available in either 200 ml or 400 ml versions. Accepts both DURABOND 1:1 and 2:1 double barrel cartridges. Equipped with adjustable pressure regulator.

Order number 983437 200 ml Dispenser-Pneumatic
Order number 983439 400 ml Dispenser-Pneumatic



Mix Nozzles

Disposable, plastic nozzles conveniently attach to DURABOND double barrel cartridges. Adhesive is automatically mixed as it travels through the nozzle. Sold in bags of 10.

Order number 983440 50 ml Mix Nozzle - 6.3mm ID, Luer Slip End
Order number 983441 50 ml Mix Nozzle - 6.3mm ID, Stepped End
Order number 983442 200/400 ml Mix Nozzle - 6mm ID, Stepped End
Order number 983443 200/400 ml Mix Nozzle - 8mm ID, Stepped End



Luer Lock Collar

Easily self-threads onto Stepped End Mix Nozzles. Allows for easy attachment of standard dispensing needles to precise application of DURABOND Adhesives. Sold in bags of 10.

Order number 983444 Luer Lock Collar for Mix Nozzles

For dispensing equipment for automated operations, or for larger package sizes, contact Loctite at 1-800-562-8483 for further information.

Manual Dispensing Systems



BOND-A-MATIC® 3000

This pneumatically-operated system provides precision control for dispensing Loctite® adhesives. Designed for use with 200 gram tubes, one-pound, one-liter, and two-kilogram bottles. By controlling the amount of adhesive dispensed with the unit's hand-held Vari-drop™ applicator valve, operators minimize waste and fatigue.

Order number 982719 BOND-A-MATIC® 3000 Dispenser, 0-15psi

Order number 982722 BOND-A-MATIC® 3000 Dispenser, 0-100psi

Order number 998130 Vari-Drop™ Applicator

How to Select a Dispensing Process:

1.

Select and approve adhesives to be used.

2.

Select equipment based on process requirements:

- Manually Controlled: operator controls location and amount of adhesive dispensed.
- Semi-Automatic: operator controls location and initiates the adhesive dispense cycle. The applicator controls the amount of adhesive dispensed.
- Automatic: the location and amount of adhesive dispensed are controlled by the applicator. The applicator is activated by a part presents switch or the operator.

Semi-Automatic Dispensing Systems



Syringe Dispensing System

This precision dispensing system is designed for use with 10 ml and 30 ml syringe packaged products. Ideal for "small dot" dispensing. Includes electronic control unit, syringe holder, syringes, footswitch and manual. Requires minimum 30 psi to maximum 100 psi, 100-240 VAC @ 47-63 Hz. 40 W.

Order number 97006 Complete System



System shown includes 0.5 liter reservoir and hand-held dispense valve with footswitch.

Semi-Automatic Dispensing System

This semi-automatic dispensing system is ideal for precision dispensing application where the amount of product to be applied can be preset. Includes electronic control unit, choice of reservoir and choice of dispense valve and manual. Requires a minimum 60 psi to maximum 100 psi, 100-240 VAC @ 47 -63 Hz. 40 W.

Order number 97102 Controller

Order number 97105 0.5 liter Reservoir

Order number 97112 Dispense Valve

Order number 97201 Footswitch

Order number 98009 Light Cure Dispense Valve

Also available:

- 2 Liter reservoir with or without low level indicator.
- 300 ml cartridge reservoir with or without low level indicator.

Fully Automatic Dispensing Systems



System shown includes 0.5 liter reservoir and stationary valve.

Fully Automatic Dispensing System

This fully automatic dispense system is designed for stand-alone automated applications or complete integration into an automated assembly process. Includes two-channel electronic controller, choice of dispense valves, choice of reservoirs, plus options for solenoid valve, footswitch, advancing slides and rotospray dispenser. Requires minimum 60 psi to maximum 100 psi, 100-240 VAC @ 47-63 Hz. 110 W.

Order number 97103 Controller

Order number 97106 0.5 liter Reservoir, low level indicator

Order number 97114 Dispense Valve

Light Cure Systems



Medium Intensity Light Cure System

The ZETA® 7410 is a modular light cure system designed to accept various sized of parts. The UV/Visible metal halide lamp system can be pedestal mounted to the control unit or detached for mounting over existing material handling systems.

Order number 98000 ZETA® System 7410



High Intensity UV Chamber

This chamber is available with either a medium pressure mercury arc of electrodeless Fusion lamp system. Designed for timed, batch cure operations. Accepts parts up to 8"h x 10.5"w x 11"d. Has 25 adjustable distance to lamp settings and incorporates external ventilation hookup.

Order number 98007 ZETA® Chamber 7215 Mercury Arc Lamp System

Order number 98008 ZETA® Chamber 7216 Electrodeless Lamp System



High Intensity UV Conveyor

The ZETA® 7600 system contains a 6" long medium pressure mercury arc lamp mounted parallel over a variable speed conveyor belt. Accepts parts up to 3"h x 6"w. Operates at low, medium or high power.

Order number 980550 ZETA® Conveyor 7600



Electrodeless UV Lamp Conveyor

This benchtop conveyor accepts parts up to 3"h x 7-1/2"w, with an effective cure width of up to 6". Variable conveyor speed adjustment. The ZETA® Conveyor 7415 was developed for use with FUSION UV Systems Model F300S lamp and P300M power supply.

Order number 98003 ZETA® Conveyor 7415

Order number 98004 Fusion F300S (208V) Lamp Assembly & P300M Power Supply

Order number 98005 Fusion F300S (240V) Lamp Assembly & P300M Power Supply



Spot Curing System

This solid-state system utilizes a high pressure mercury arc lamp which transmits light through a 1,000 mm flexible wand to produce a 5 mm diameter curing area. Digital control permits timed or continuous operation.

Order number 983675 Single Wand System

Order number 983683 Dual Wand System



Radiometers

Verify lamp performance with these self-contained, electro-optic instruments designed to measure and display the intensity emitted by UV-A (320-390 nm) curing systems. ZETA® Meter 7010 can be placed in most curing environments. ZETA® Meter 7020 is suitable for spot curing systems.

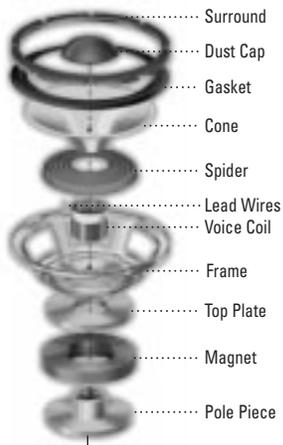
Order number 98001 ZETA® Meter 7010

Order number 98002 ZETA® Meter 7020

Special Equipment Systems

Have your custom Light Curing System needs satisfied by Loctite. Authorized integrators of:





Cone, also known as a **Diaphragm**.

Historically, paper has been the cone material of choice, originally folded and seamed, but now commonly formed by felting paper pulp onto a vacuum mesh die, and steam heated to set it. The density of the paper is controlled during forming to produce desired characteristics, and varies from very soft and pulpy, to very hard and dense. The specific components in a particular cone paper-slurry are closely guarded secrets, and this lack of information has created occasional problems in identification.

Since 1980, polypropylene has emerged from numerous potential new cone materials, and its success is due in great measure to its low cost and ease of vacuum forming. More recently, injection molded polypropylene has offered improved performance by virtue of variable thickness sections, and is finding widespread acceptance in hi-fi and autosound. The low melting point of polypropylene makes it unsuitable for high power use however. Other rising stars in the cone materials arena include glass fiber, carbon "graphite" fiber, Kevlar, and Nomex composites. Phenolic and epoxy treated cloth have both enjoyed brief popularity, but have largely been superseded by polypropylene. Some recent designs have applied aerospace style honeycomb disks in place of cones, with some success.

Conventional cones for tweeters are now rather obsolete, having been replaced by dome shaped cones, which are formed from cotton, rayon, nylon, silk and a variety of other materials such as PET (Mylar), PEI (polyether-imide), PEN (Kalidex), aluminum, titanium, and such unusual materials as copper and beryllium. Compression drivers, used on horn type loudspeakers, share much of the dome tweeter topology, although they tend to be somewhat larger in scale.

Driver, also known as **Loudspeaker** or **Element**.

The term driver is used to help differentiate between units which are raw sound producing elements, and loudspeaker systems, which by definition include one or more drivers in an acoustic enclosure. Several types of drivers are outlined below.

Woofer, also known as **Low Frequency Unit**, **Bass Driver**, or **Subwoofer**.

This is the largest of the family of drivers, and produces the lower tones. Subjected to the lion's share of the input power, it is usually the most stressed driver.

Midrange, also known as **Medium Frequency Unit**, **Squawker**, or **Middler**.

Generally a smaller version of the woofer, the midrange is responsible for much of the vocal range. It is omitted in 2-way loudspeaker systems.

Tweeter, also known as **High Frequency Unit**, **Treble Driver**, or **Super-Tweeter**.

The smallest of the drivers, the tweeter produces the highest overtones. The voice coil and diaphragm are always delicate, and mass is a major concern.

Frame, also known as **Basket**, **Chassis**, or **Cone Housing**.

This is the backbone of a loudspeaker driver, carrying both the magnet on the rear, and the cone and moving structure in its front cavity. Traditionally loudspeaker frames have been punched on multi-stage dies, from cold rolled steel strip of 0.7 to 1.3mm gauge. They are then plated or painted, and this continues to be the dominant form. Frames are also cast from aluminum, magnesium, and various engineering plastics (PBT, ABS, and others), which are gaining wide market acceptance. Frames are typically finished by electroplating with clear zinc, yellow zinc or in some instances chromium, or by painting or powder-coating.

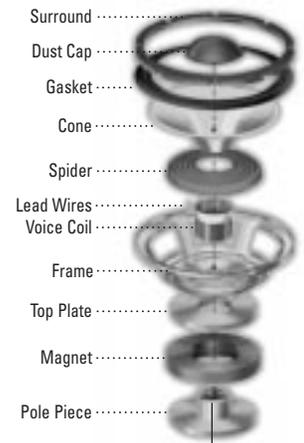
Dust Cap, also known as **Dome**, **Dust Dome**, or **Whizzer**.

The dust cap serves several functions other than the obvious one of keeping the gap free of contaminants. It may be a part of the acoustic design of the driver, serving to radiate high frequencies, or may be used to damp or suppress them, and may contribute structural integrity to the cone and voice coil assembly. Commonly seen as a gently curved dome, the dust cap may be mounted in either concave or convex orientations. Or it may have a short, light cone body attached, which is termed a "whizzer" cone, and imparts additional high frequency output to low cost drivers, where they are often formed from Mylar.

More typically, dust caps are made from the same materials as cones; hence paper cones tend to get paper dust caps while plastic cones are mated to plastic dust caps, although non-woven felts (hot pressed with polyester resins) are also occasionally used. In the past few years, the dust cap has been the object of considerable research. The result of this research has been the introduction of hot-pressed foam, a variety of plastics in both rigid and flexible forms, and molded rubber dust caps, all now widely used as acoustic design elements.

Gasket, also known as **Dress Ring**, **Trim Ring**, or **Pad Ring**.

This seemingly innocuous part serves two distinct functions. Naturally, its primary role is as a gasket, where it allows the driver to mount to a housing without air leakage or buzzes. The second function is as a covering over the surround to frame bondline, where it serves both to reinforce the bond and dress it cosmetically. Typically loudspeaker gaskets are punched from thick, laminated paper and may be formed in segments, or as a single piece. Both expanded polyether foam and polychloroprene rubber have joined the gasket materials of choice over the past few years, and include self adhesive backings. Some drivers, particularly those used in the hi-fi industry, are fitted with injection molded plastic trim rings for product identification and improved cosmetic value.



Lead Wires, also known as **Lead-Outs**, **Tinsels**, or **Flex Leads**.

The electrical signal passes from the terminals which are attached to the frame, to the voice coil which is attached to the cone, by means of special flexible wires known as tinsels, or lead wires. Lead wires are commonly made from very fine strands of silver-plated cadmium-copper twisted around strands of cotton, polyester-cotton or more recently Conex fiber. The specific alloy is chosen to provide low resistance and high flexibility, although recent research into cadmium-free lead wires has met with some success. Wax may be added to the lead wires to provide reduced solder wicking during the soldering operation, and to dampen the sometimes violent whipping behavior of the wires on high power drivers.

Magnet. (possibly the only truly universal term in the industry.)

The magnet provides the field which the coil needs to produce motion from electrical input. Ceramic ferrite rings are by far the most common type of magnets used in today's drivers, and their popularity is largely based on providing the maximum magnetic energy per dollar expended. It is often the most expensive single part used in a driver, and forms a large portion of the weight of the finished unit. Ferrite magnets are composed of ceramic "clay" binders and ferric oxides, which are doped with small amounts of lead, strontium or barium to enhance their performance. They are cast as donut shaped rings, and can shrink up to 16% during kiln firing. This shrinkage is not perfectly uniform, so after firing, the top and bottom surfaces are Blanchard ground to be flat and parallel. These heavy, dark gray rings are sintered and become very brittle and may be easily chipped in handling.

Spectacularly powerful neodymium-iron-boron magnets, once considered esoteric and extremely expensive, have steadily decreased in cost, allowing them to be cost-competitive with ceramic rings in some designs. Neodymium was first applied to tweeters, where it allowed them to be made extraordinarily small, but it is gradually being applied in other drivers.

Pole Plate, also known as **T-Yoke**, **Back Plate** or **Piece**, **Yoke**, or **End Plate**.

The center pole and the plate that covers the back of the magnet are the yoke, and this is most commonly cold-forged (a form of punching) from thick, low carbon steel rod, into net-shape finished parts. In more specialized and expensive drivers, it may be assembled from a flat machined plate and a separate machined pole, as this produces narrower tolerances.

Spider, also known as **Damper**, or **Rear Suspension**.

The spider is the (usually yellow) corrugated cloth device that provides some spring-return force to the cone and voice coil, while keeping the coil moving in the center of the magnetic gap. Although today, the vast majority of spiders are thermoformed from cotton impregnated with a polyester derived resin, the spider was named for the spider-like appearance of the earliest examples, which were cut from thin sheets of Bakelite. Polyester-cotton blends, nylons, and recently aramid fiber types have been used in higher performance drivers.

Surround, also known as **Front Suspension**, **Annulus**, **Edge Roll**, or **Compliance**.

One of the more visible elements of a loudspeaker, the surround serves to allow the cone to move in and out with minimal restriction, while holding it axially centered. Typically the surround is a half-roll section, thermo-formed from one or more layers of expanded polyester or polyether foam, and it bridges the gap between the (moving) cone and the (static) basket. Drivers for some TV's and specialized applications, together with most professional drivers use thermo-formed (hot-pressed) polyester-cotton cloth, which offers superior centering, and is lighter in weight. These cloth edges are invariably doped to seal the pores, and to improve the mechanical damping of the annulus. In woofers and some hi-fi drivers, the surround may be a half-roll of rubber, usually from the IIR (butyl) NBR (nitrile) or SBR (styrene-butadiene) families. In the most elementary drivers, it may be formed from a thinned section of the cone material itself, corrugated to provide added compliance.

Two other materials are finding increased acceptance, and they are thermoplastic elastomers (TPE) and thermoplastic urethanes (TPU). Surrounds formed from either of these materials may offer benefits such as reduced mass and cost, while offering excellent resistance to environmental conditions.

Top Plate, also known as **Front Plate**, **Washer**, or **Pole Plate**.

One of the three essential components in a conventional magnetic assembly, together with the magnet itself and either a T-yoke, or a plate and pole combination. Normally punched or machined from hypoeutectic (very low carbon) steel, and electroplated to resist oxidation. It provides a low reluctance path for the flux. While cadmium plating was once the standard finish on steel parts for loudspeakers, environmental pressure on the manufacturing plants have necessitated a switch to dichromate, zinc, and yellow zinc, although nickel is also occasionally seen.

Voice Coil, also known as **Bobbin**, **Collar** and **Winding**.

At its simplest, a voice coil would be wound from two layers of insulated round copper wire, onto a bobbin of thin (0.08mm) aluminum, and this would be wrapped at the neck with a layer of paper.

An example of a more advanced coil would be a single layer of insulated aluminum flat-milled aluminum ribbon wire, wound on its thin edge, onto a (0.13mm) polyimide bobbin, and secured at the neck with a structural (0.25mm) wrap of Nomex aramid paper. The voice coil is considered to be the heart of the driver, and yet is also the part that is subjected to the most mechanical and thermal stress. The voice coil travels in the magnetic gap and develops the force that moves the cone. It may reach temperatures of 120°C during operation and tolerate peaks of almost 250°C before failure.

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