
ARP
automotive Racing products
2009 CATALOG
The World Leader In Fastener Technology


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FASTENERS AND STREET

ARP®
automotive Racing products

1863 Eastman Avenue
Ventura, CA 93003

e-mail: info@arpfasteners.com
web: www.arp-bolts.com
phone: 805-339-2200
fax: 805-650-0742

800-826-3045

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A Brief History

They say that to be successful you must identify a need and satisfy it. Back in 1968 racing enthusiast Gary Holzapfel saw that many of his friends' broken engines were caused by fastener failure. At the time, there were no commercially available studs and bolts up to the challenge. So Holzapfel called upon his many years of fastener making experience for a leading aerospace subcontractor and founded ARP® (Automotive Racing Products). In the ensuing years, the firm has grown from what was literally a backyard garage workshop into a highly diversified manufacturer with four operational entities in Southern California with a combined area in excess of 115,000 square feet. These include forging, machining, finishing and packaging/warehousing facilities in Santa Paula and Ventura, California. There is even a unique racing-themed restaurant at the main Santa Paula facility (called "Hozy's Grill" - which is open to the public).

Gary Holzapfel
Founder and CEO

On hand at the Grand Opening of ARP's new manufacturing facility in Santa Paula, CA were (l to r) 12-time NHRA World Champ John Force, ARP's VP Sales & Marketing Bob Florine, Founder and CEO Gary Holzapfel, Assistant Sales Manager Chris Raschke and ARP President Mike Holzapfel.

Today, ARP's product line contains thousands of part numbers, and has expanded to include virtually every fastener found in an engine and driveline. These range from quality high performance OEM replacement parts to exotic specialty hardware for Formula 1, IndyCar, NASCAR and NHRA drag racing and marine applications.

As a matter of fact, ARP's customer list reads like a "who's who" of motorsports around the world. In the past several years, virtually every major championship on the planet has been won with engines prepared by ARP customers. These include NASCAR Sprint Cup, CART, Formula 1, NHRA Top Fuel, Funny Car, & Pro Stock, NASCAR Nationwide Series and Camping World Truck Series. And so it goes. ARP works closely with many, many teams as a supplier of engine and driveline fasteners, and has clearly become recognized as "the" preeminent source for serious racers.

In addition to its core automotive business, ARP has an Aerospace Division, and is one of the very few companies in the world fully licensed by the United States Government to manufacture MS-21250 fatigue rated fasteners.

ARP also manufactures a variety of industrial fasteners on a contract basis, and is known for its ability to promptly provide efficient solutions to problems at hand.

ARP's state-of-the-art manufacturing facility in Santa Paula, California.

Packaging, warehousing and sales operations are handled out of Ventura, California.

All metal finishing operations are done in this Santa Paula plant.

This facility is home to ARP's forging and heat-treating operations.

The Manufacturing Process...

In order to ensure optimum quality control, ARP has grown to be exceptionally self-reliant and now controls all aspects of the manufacturing process. All operations are performed in-house and closely monitored. This is how ARP has been able to establish a reputation for "zero defects" quality throughout the industry.

The process begins right at the mill, where ARP orders only premium grade materials including several proprietary alloys. The ever-popular 8740 chrome moly steel, for example, comes from the mill in four distinct grades. The lowest is "commercial," which is followed by "aircraft quality." ARP uses only the top two grades (SDF and CHQ), which cost twice as much, but provide the foundation for defect-free fasteners. These materials come in bar stock (for studs) and huge coils (for bolts).

Transforming raw material into a fastener begins with "hot" and "cold" heading processes. Material is fed into powerful devices and cold forged, or induction-heated and formed under tons of pressure.

Material comes from the mill in large coils...which subsequently will be fed into cold-headers and formed into bolts.

Some bolts begin as induction-heated lengths of bar stock that are forged on huge presses with the desired head shape.

ARP's bank of cold-headers can handle material up to 5/8" diameter and form bolts in a multi-phase operation.

An overview of part of ARP's expansive machining operations. The shop is laid out for optimum efficiency.

Lengths of bar stock are automatically fed into special machines and cut to the appropriate length.

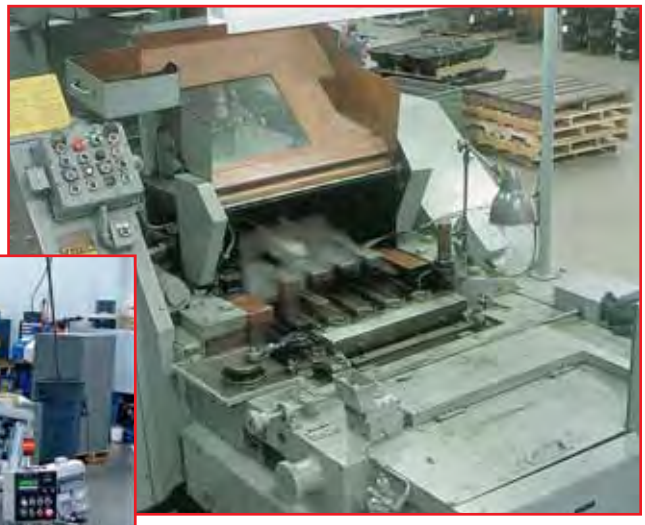
Following the basic shaping, material is heat-treated to desired levels. This crucial process is done entirely in-house to assure total quality control. ARP uses special vertical racks to hold each piece individually and assure complete 360° penetration. This is far superior to commonly-used methods of dumping items into a large bin and batch-treating.

Studs are centerless ground to guarantee concentricity. The thread rolling operation (to MIL-S-8879A specs) is done after heat-treat, which accounts for a fatigue strength up to *ten times higher* than fasteners which are threaded prior to heat-treat.

ARP manufactures nuts in a multi-step process that begins with raw material being fed into a giant forming device that "blanks" the hex and 12-point nuts and continues with highly sophisticated automated threading equipment tapping each nut with an accuracy of .001″ (which is five times higher than the aerospace standard). This ensures an exceptionally close-tolerance fit between the bolt/stud and nut.

Metal finishing is also performed in-house at ARP. Operations include black oxide coating of chrome moly or polishing stainless steel to a brilliant luster.

The Grinding Department is where all studs are centerless ground to ensure that they are perfectly concentric. As many as ten machining steps are required to achieve this level of accuracy.



Powerful cold-forging equipment is used to make ARP's hex and 12-point nuts. Multi-stage dies are employed to precision-form the finished "blanks."

A series of CNC-threading machines are employed by ARP to accurately tap the threads in nuts. Tolerances held are 5 times better than aerospace standards.

ARP performs the thread rolling operation after heat-treating, which results in a fatigue strength up to 10-times higher than fasteners with threads rolled prior to elevating the material's tensile strength.

Heat-treating is critically important in obtaining the correct tensile strength. Fasteners are placed in special vertical racks to ensure complete 360° penetration.

A bank of CNC machining centers are employed at ARP to perform specialty operations.

Contemporary EDM technology is used to perform special operations, such as hex-broaching the nose of a unique short-run fastener

Also on the premises is a fully-equipped lab for R&D and quality control. It has everything required to ensure that ARP products measure up to the company's ultra high standards. Some of the tests that ARP personnel perform on an ongoing basis include proof loading (using a 120,000 lb. capability tensile machine), fatigue cycle (Amsler) and hardness (Rockwell). Visual inspections include use of an Optical Comparator (to check thread root contour, etc.), fixtured micrometers and microscopic grain flow analysis. The computer-controlled fatigue cycle testers allow ARP to take fasteners to a failure point in millions of cycles – as opposed to the aerospace norm of 65,000 average to 130,000 cycles maximum. This allows ARP engineers to verify the design specifications of each fastener, and prove its ability to provide superior long-term service.

Finished products are packaged and warehoused in ARP's Ventura facility, which is also home to the firm's customer service, technical and sales office.

ARP's popular stainless steel engine & accessory fasteners are polished to a brilliant luster using this specialized equipment.

Fasteners are shot-peened after heat-treatment to remove any surface irregularities and improve overall external integrity.

The finishing touch for most chrome moly fasteners is the black oxiding operation. Fasteners go through a series of "baths."

Behind The Scenes

There are a number of important elements in the production of specialty fasteners, not the least of which are materials, design and manufacturing. As you read further into this catalog, you will get a better idea of the extraordinary steps taken by ARP to produce the very finest products of their kind on the market today. The key to success in all areas is personnel. And here's where ARP's cadre of highly qualified and dedicated specialists shines brightly.

Two valuable resources in the design of ARP products are Dr. Kenneth Foster and Russell Sherman, P.E. Both men have extensive backgrounds in mechanical engineering, metallurgy and stress analysis. Their academic credentials are substantial, and real world experience equally impressive. Dr. Foster has a Ph.D. in Engineering Mechanics from Cornell University and has taught at several colleges. He was formerly the head of Stress & Dynamics at Hughes Aircraft, Space Systems division. Mr. Sherman has been awarded a fellowship from A.S.M. International, a technical achievement award from Fastener Technology International, and holds a number of fastener patents.

Some of the most valuable work done by Foster and Sherman includes analyzing various aspects of engine, chassis and driveline structural loads, and coming up with solutions to the problems at hand. In this manner, the ARP Research Team is able to continually expand the company's product line.

Kenneth Foster, PhD
Consulting Engineer

Russell Sherman, P.E.
Consulting Engineer

Robert Logsdon
Quality Control Mgr.

ARP has added Robert Logsdon to its cadre of consultants. He comes to ARP with vast experience in the area of Metrology, Quality Control, Manufacturing, Acquisition and Configuration Management. Logsdon is a graduate of the U.S. Naval Academy of Metrology Engineering, the Defense Management College and U.S. Air Force Institute of

High powered electronic microscopes are used to carefully inspect critical components. ARP's quality control team is relentless!

A series of special checking devices are employed to monitor the quality of threads. For every thread size, there is a checking device.

A computer-controlled Instron tensile machine is used to determine the ultimate tensile strength of studs and bolts.

ARP has two of these highly sophisticated Amsler fatigue machines, which check fasteners through millions of cycles.

Technology. Additionally, ARP has one of the industry's most complete in-house R&D/QC facilities and a wide variety of testing equipment. Through the combined efforts of Logsdon and ARP's management team, the ISO 9001 Level 1 (Quality Manual), Level 2 (Quality System Procedures) and Level 3 (Work Instructions) documentation has been finalized and is being implemented. ARP is now ISO 9001 compliant.

ARP also enjoys a solid working relationship with many of the most respected professional engine builders and race teams from the world over – including those involved in Formula 1, NASCAR Winston Cup and Busch Series, NHRA, IHRA, World of Outlaws and a host of others. Constant interaction with these racing experts to provide fasteners for a wide variety of competition applications enables ARP to stay on the cutting edge of fastener technology development.

You will find ARP fasteners sold by leading performance retailers and professional engine builders from coast to coast. These firms know that ARP fasteners are the standard of the industry, and smart consumers will accept no substitutions. As you can see, all ARP fasteners are proudly made in the USA to the industry's highest standards. ARP also supports racers through generous contingency awards programs with many racing programs. ARP is a long-time NHRA Major Sponsor.

What ARP Can Do For You

In addition to manufacturing a comprehensive array of cataloged fasteners for automotive and aerospace applications, ARP thrives on the challenges of developing fasteners to solve unique problems. Racers, Pro Street enthusiasts and street rodders have, over the years, approached ARP about manufacturing special fasteners for unique applications, and the company has responded with innovative solutions.

ARP can provide complete R&D services, including metallurgical research, product design, prototype machining and extensive laboratory testing. Moreover, ARP has experience manufacturing fasteners from a wide variety of materials. All work can be performed under the strictest confidence. ARP is well versed in facilitating proprietary research and custom manufacturing for corporations the world over.

It is for good reason that ARP is recognized as "The World Leader In Fastener Technology!"

The finished goods are given a protective coating and stored in sealed containers, awaiting packaging. Millions are in stock!

ARP fasteners are prominently featured at leading performance retailers.

After final packaging the kits are placed in storage racks and are ready for order fulfillment. Thousands of SKU's are warehoused.

Components for each kit are placed on the appropriate display cards, sealed and labeled. Through-put has been significantly increased.

JOHN CARROLL SMITH: A TRIBUTE

There are many of us who can say we knew John Carroll Smith in life.

Carroll Smith was known around the engineering shops as a design and development engineer. He was known on race circuits as a team manager, driver coach and racing guru. And before that, he was known for his 30+ years of racing experience, driving in SCCA events, as well as on circuits in Europe including the Targa Florio and Le Mans.

Even more of us know Carroll Smith through his books. His "To Win" series of books brought technical acclaim as they became staples for amateur and professional racers, while his "Engineer in Your Pocket" are today highly regarded as engineering handbooks. We're never surprised to find his name on or featured in – books on race car design, preparation, engineering and tuning.

Among his peers at the Society of Automotive Engineers, he served as a judge for the Formula SAE competition. One of his proudest honors was the Society's Excellence in Engineering Education award.

Carroll Smith was a race engineer and special motorsports consultant with Automotive Racing Products for more than decade. The pages of our catalog alone bear the mark of his enormous contributions to our efforts.

Here at ARP, as elsewhere, Carroll Smith's mission was simple. He was determined to impart the encyclopedic knowledge of racing and the machinery of racing that he learned during those decades on the world's racetracks, around those shops and among his engineering peers.

He left us at ARP with a significant engineering inheritance. Much of what we now know from Carroll will ensure we remain the world leader in the field of racing fasteners. It is our way of reciprocating for what he gave us that we impart his expertise and experience in the form we know best, superior engineered products.

As an engineer, Carroll Smith had successes in Formula 5000, numerous GT and sports car races, and with the Ferrari Formula 1 team. He is best known, however, for his work with Carroll Shelby and the Ford GT40 program which he helped develop into a winner at Le Mans.

Ford has recently announced it is bringing back the GT40, its signature race car and a vehicle which, even forty years later, bears Carroll's fingerprints. To those of us who knew him in person and through his work, the return of the GT40 is just another indicator of the enormous contribution to race engineering that John Carroll Smith continues to make, even after his passing.

Carroll Smith passed away at his California home on May 16, 2003, from pancreatic cancer.

THE "AEROSPACE QUALITY" MYTH

In areas from hose ends to engine fasteners the terms "Aerospace material and Aerospace Quality" have become buzz words implying the very best in design, materials and quality control.

"It isn't necessarily so", says Gary Holzapfel, founder and CEO of Santa Paula, California based ARP, Inc. ARP (Automotive Racing Products) supplies extremely high strength and fatigue resistant threaded engine fasteners to NASCAR, CART, IRL, NHRA and Formula One engine builders and manufacturers. Holzapfel explained his reasons in an interview with Carroll Smith.

Smith: "Gary, do you believe that the term "aerospace quality" is over rated in the specialty fastener industry?"

"Yes I do. First of all, the term is meaningless. Any AMS (Aerospace Material Specification) material must be matched to the specific application. As an example, some airframe bolts (AN3-20) are legitimate "aerospace parts" and are very well suited for the low stress applications for which they were designed. But with a minimum ultimate tensile strength of 125,000 psi, and a relatively low temperature limit, they would be completely unsuitable for use in a racing engine.

We started out in the aerospace fastener business and we understand it. That's why we're not in it any longer. What is not generally understood about aerospace fasteners is that the fastener manufacturers do not design the product. The nuts, bolts and studs are spec'd by the airframe or engine designers and put out for bid. As long as the supplier certifies that the product meets the minimum requirement of the specification and it passes the customer's inspection procedures, low bid wins."

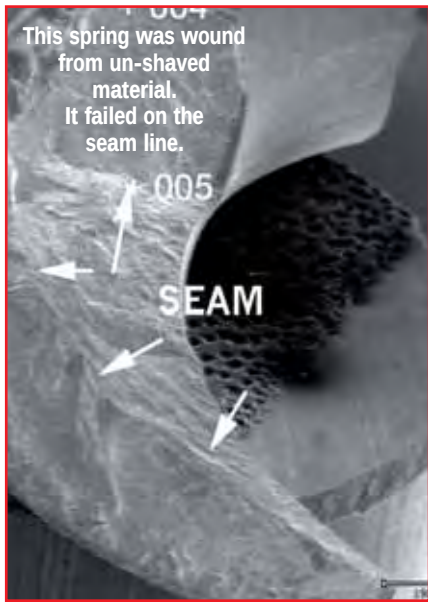
Smith: "Are you implying that the aerospace fastener manufacturers cut corners in order to win contracts?"

"No, it's a matter of manufacturing goals and simple economics. The aerospace market is price dominated. In order to get the contract, the fastener manufacturer's goal is to meet the specification at the least cost, not to produce the best possible part.

This means that they are going to use the least expensive steel and manufacturing processes that will meet the specification. There is nothing wrong with this approach.

It certainly does not mean that certified aerospace fasteners are unsafe in any aspect. They will do the job for which they were designed.

There is another factor. Airframe and aircraft engine manufacturers design their components to a very high margin of safety. Further, aerospace structures are designed to be "fail safe." There is a back up or second line of defense for virtually every structural component so that an isolated failure will not lead to disaster. They are also subjected to frequent and rigorous inspections."



Smith: "What's different about motor racing?"

"Quite a lot, really. While the demands for strength, fatigue resistance and quality control can be similar, and the assembly and inspection procedures in racing can

ARP's Mike Holzapfel and Russ Sherman discuss a fastener's alloy.

be as rigorous as aerospace, in professional racing very few parts are over designed and there are no fail safe features.

There are no back up provisions for component failure. A failed (or even loosened) nut or bolt in a racing engine means disaster - instant catastrophic failure. An expensive engine is destroyed and a race is lost.

That is why random failures are unacceptable in motor racing, and why aerospace standards should be only a starting point. This means that a specialist in the production of high performance engine fasteners must design and manufacture the very best fasteners that can be produced."

Smith: "So where does the production for a new racing fastener begin?"

"The design process begins with the customer's requirements the operating conditions and loads to be expected, the packaging constraints and the weight and cost targets. This allows us to select the optimum material for the part, and to do the initial mechanical design.

There is more to material selection than simply choosing the best alloy. It means using only the cleanest and purest steel available, which, in turn, means researching to identify the best and most modern steel mills. It means working closely with the mills both to insure consistent quality and to develop new and better alloys.

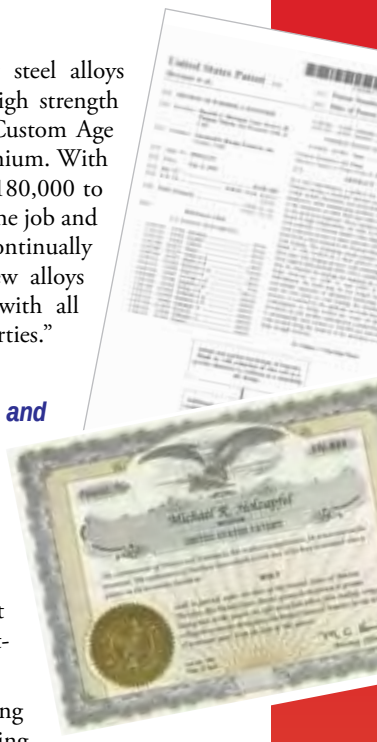
5 stage "Cold Header" used in the production of ARP bolts

There are not only a myriad of alloys to choose from; but for each alloy there are several grades of "aircraft specification" steel wire from which fasteners can be made. We believe that only the top (and most expensive) grade – shaved-seamless, guaranteed defect-free – is suitable for racing engine applications.

We also believe that samples from each batch should be subjected to complete metallurgical inspection."

Smith: "How many alloys do you work with?"

"We are currently producing fasteners from at least 6 different steel alloys from 8740 chrome moly to the very high strength chromium-cobalt-nickel alloys such as Custom Age 625+. We also use stainless steel and titanium. With UTSs (Ultimate Tensile Strength) from 180,000 to 270,000 psi, we can suit the material to the job and the customer's cost restraints. We are continually researching and experimenting with new alloys and manufacturing processes – some with all around better strength and fatigue properties."



Smith: "Once the design work is done and material has been selected, what's next?"

"Next comes the actual process of manufacturing. It goes without saying that all high strength bolts must have rolled rather than cut threads, and that the threads must be rolled after heat-treatment.

But there is more to it. The old saying to the effect of, "If you are doing something in a particular way because that's the way it has always been done, the chances are that you are doing it wrong," holds true in fastener technology.

Technology advances, and we have to advance with it. All of the manufacturing processes should be subject to continuous experimentation and development. As an example, with some alloys, cold heading produces a better product than hot heading, and vice versa. The number and force of the blows of the cold heading machine can make a significant difference in the quality of the end product. Excessive numbers of blows can lead to voids in the bolt head. ARP, in fact, holds significant patents on cold heading procedures for the higher nickel and cobalt based alloys. In a typical aerospace manufacturing process, these alloys are hot headed from bars, reduced in diameter from 48 to 50% by cold drawing, resulting in a hardness of about Rockwell C46 which is too hard for cold heading. So, the blanks are locally induction heated in a very narrow temperature envelope and hot headed.

If care is not taken the process can reduce the hardness of the bolt head and the area immediately under it as much as 3 to 5 points on the Rockwell C scale. Subsequent heat-treatment does not restore this partially annealed area to full hardness and strength. Therefore, the final result can be a relatively soft headed bolt. **This process is not preferred by ARP.**

Our patented process begins with a softer wire that can be cold forged. The process work hardens the head and the under head area to the desired hardness. We then power extrude the front end to achieve the reduction and hardness in the shank resulting in a bolt with even strength and hardness from end to end.

The same is true of thread rolling. Temperature and die speed must be controlled and changed for different alloys. Many bolt manufacturers who meet the Aerospace Specifications don't come close to meeting our standards. **We consistently go beyond standard aerospace specs.**

Our concern with the manufacturing processes extends to the details of heat-treating, shot-peening, fillet rolling and grinding – down to the frequency of dressing the grinding wheels. In the arena where aerospace standards are a starting point and random failures are unacceptable, I feel ARP stands alone as a primary

engineering and manufacturing source for specialty and custom fasteners for use in motorsports.

It is important to realize that simply quoting an AMS (Aerospace Material Specification) number without strength and percentage of elongation numbers is meaningless. Statements that the use of a particular material will, in itself, result in extreme strength and resistance to fatigue can be misleading. In the world of high strength alloys, whether they are used for bolts or for landing gears, the manufacturing processes are at least as important as the material specification.

Some in our industry claim to inspect materials at the "molecular" level. In metallurgical terms, molecules are not necessarily part of the vocabulary. Our engineers tell us that talking about molecules is misleading. When reference is made to metal, it is typically in terms of atom structures. We routinely check metallurgical features microscopically. By the way, the same is true for claims of manufacturing to "zero tolerance."

"Our engineers tell us that this is technically unrealistic."

Smith: "How does the actual process work at ARP?"

"For each new design, we produce a number of prototype parts using different design aspects and sometimes different methods.

We inspect and test after each process, choose the best design and method of manufacture, and then freeze the design and write the manufacturing specification."

Smith: "You have mentioned the importance of fatigue resistance. Is there a difference in the procedures for strength and fatigue testing between aerospace and the specialty racing industry?"

"Yes. While the ultimate tensile strength testing is the same, fatigue testing is different. Aerospace fasteners are fatigue tested to the relevant specification of fluctuating tension load and number of cycles typically 130,000 cycles with the high tension load at 50% of the UTS and the low load at 10% of the high load. If all of the test samples last 85,000 cycles (per AMS 5842-D), the lot is accepted.

Even though racing fasteners are not continuously subjected to their maximum design load, at 18,000 rpm, 100,000 cycles takes just 5 minutes, thirty-four seconds. Except for drag racing, measured in seconds, no race lasts just 5 minutes. Therefore we consider this Aerospace Standard to be inadequate. At ARP, we fatigue test to elevated loads (10% above aerospace requirements) and to a minimum cycle life that exceeds 350,000 cycles. The majority of samples are routinely tested to one million cycles. During material development...and in the case of extremely critical new designs, we test to destruction.

Thread rolling is the last mechanical operation in our manufacturing process. For each production run the thread rolling machine is shut down after a few parts. These parts are inspected for dimensional accuracy and thread quality, and are physically tested for both strength and fatigue before the run is continued. Random samples are inspected and tested throughout the run. Extremely critical components are individually inspected for dimensional integrity."

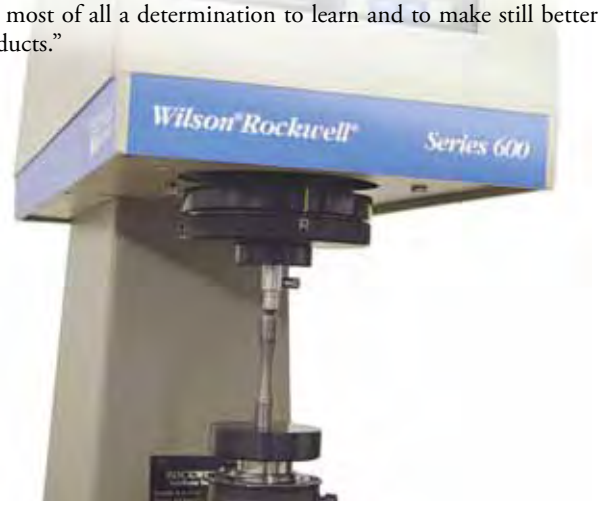
Smith: "What about out sourcing?"

"Economics often dictate that many processes in the manufacture of aerospace fasteners are out sourced or farmed out. In fact, 30 plus years ago, ARP began as an out source thread rolling shop.

Over the years, however, we have found, through experience, that the only way to maintain the quality we require is to keep everything in-house. From heading through machining, grinding, heat-treat, thread rolling, and shot-peening to black oxide treatment we perform every operation in house on our own equipment with our own employees."

Smith: "Gary, One of the things that I am hearing is that every aspect of the manufacture of racing engine fasteners is more expensive than that of similar aerospace items."

"True, but the bottom line is that we have to look at the cost aspect of the very best fastener versus the cost aspect of a blown engine and a lost race. In the end, the manufacturing of fasteners for racing comes down to a matter of attitude; a refusal to accept published standards and procedures as the best that can be done and most of all a determination to learn and to make still better products."



There are literally hundreds of standards and specifications. For all types of applications, from bridges to spaceships. None are, however, as critical as those required for real-world motorsports applications. In an environment where lighter is faster there is clearly no room for redundancy systems, like those found in military and aerospace applications. The mere nature of Motorsports requires designers to produce fasteners that are light; yet produce toughness, fatigue and reliability factors that extend far beyond other acknowledged application standards. The design and production of fasteners, exclusively for racing, clearly involves many complex factors. Some so special no standards or design criteria exist; and so everyone at ARP is totally dedicated to the development and analysis of appropriate bolt designs exclusively for special applications. Designs that take into account the special loads and endurance that must be carried, the material selection, processing, and the methods of installation that will continue to deliver ARP quality and reliability.

The focus of the following material, prepared by the ARP engineering staff, could be called:

"MOTORSPORTS FASTENER ENGINEERING for the NON-ENGINEER."

It is hoped that by providing an overview of the engineering, design and production forces ARP applies daily, you – as the end user – will be better equipped to evaluate your initial fastener requirements, effectiveness and performance.

DESIGN PROCEDURES for AUTOMOTIVE BOLTS

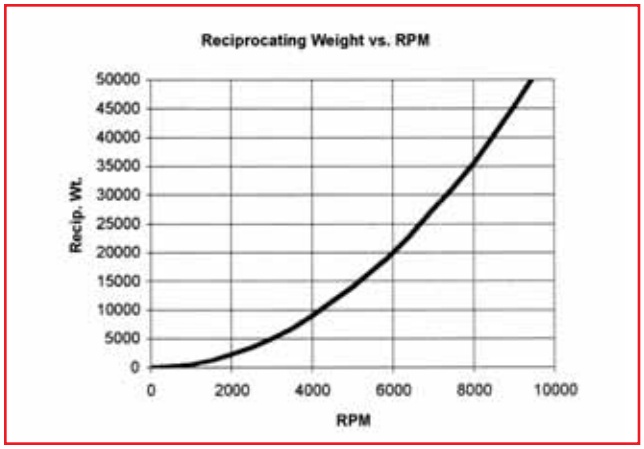
Presented by Dr. Kenneth Foster, PhD

The design of automotive bolts is a complex process, involving a multitude of factors. These include the determination of operating loads and the establishment of geometric configuration. The process for connecting rod bolts is described in the following paragraphs as an example.

The first step in the process of designing a connecting rod bolt is to determine the load that it must carry. This is accomplished by calculating the dynamic force caused by the oscillating piston and connecting rod. This force is determined from the classical concept that force equals mass times acceleration. The mass includes the mass of the piston plus a portion of the mass of the rod. This mass undergoes oscillating motion as the crankshaft rotates. The resulting acceleration, which is at its maximum value when the piston is at top dead center and bottom dead center, is proportional to the stroke and the square of the engine speed. The oscillating force is sometimes called the reciprocating weight. Its numerical value is proportional to:

$$\left(\text{Piston Weight} + \frac{\text{Rod Weight}}{3}\right) \times \text{Stroke} \times (\text{RPM})^2$$

It is seen that the design load, the reciprocating weight, depends on the square of the RPM speed. This means that if the speed is doubled, for example, the design load is increased by a factor of 4. This relationship is shown graphically below for one particular rod and piston.



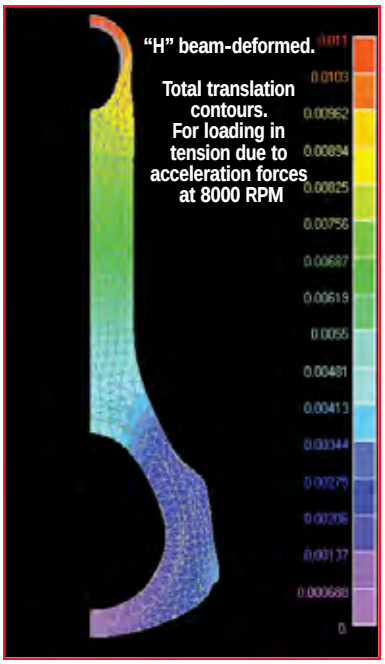
A typical value for this reciprocating weight is in the vicinity of 20,000 lbs. For purposes of bolt design, a "rule of thumb" is to size the bolts and select the material for this application such that each of the 2 rod bolts has a strength of approximately 20,000 lbs. (corresponding to the total reciprocating weight). This essentially builds in a nominal safety factor of 2. The stress is calculated according to the following formula:

$$\text{Stress} = \frac{\text{Force}}{\text{Area}} = \frac{\text{Recip.Wt.}}{\frac{\pi}{4}D^2}$$

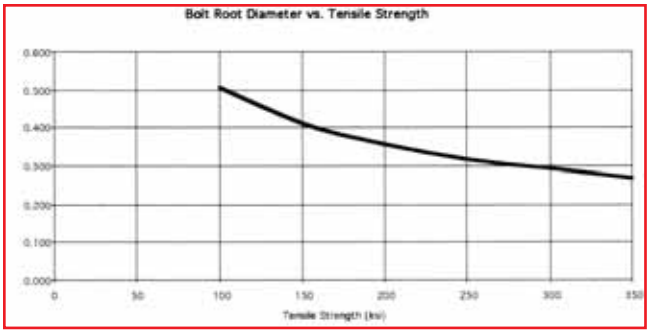
so that the root diameter of the thread can be calculated from the formula:

$$D = \sqrt{\frac{4 \times \text{Recip.Wt.}}{\pi \times \text{Allowable Stress}}}$$

This formula shows that the thread size can be smaller if a stronger material is used. Or, for a given thread size, a stronger material will permit a greater reciprocating weight. The graph *(see page 14)* shows the relationship between thread size and material strength.



It must be realized that the direct reciprocating load is not the only source of stresses in bolts. A secondary effect arises because of the flexibility of the journal end of the connecting rod. The reciprocating load causes bending deformation of the bolted joint (yes, even steel deforms under load). This deformation causes bending stresses in the bolt as well as in the rod itself. These bending stresses fluctuate



from zero to their maximum level during each revolution of the crankshaft.

The next step is to establish the details of the geometric configuration. Here the major consideration is fatigue, the fracture that could occur due to frequent repetition of high stresses, such as the bending stresses described above. Several factors must be considered in preventing fatigue; attention to design details is essential.

Fatigue failure is frequently caused by localized stress risers, such as sharp corners. In bolts, this would correspond to the notch effect associated with the thread form. It is well known that the maximum stress in an engaged bolt occurs in the last engaged thread. By removing the remaining, non-engaged threads, the local notch effect can be reduced. This leads to the standard configuration used in most ARP rod bolts: a reduced diameter shank and full engagement for the remaining threads. Providing a local fillet radius at the location of the maximum stress further reduces the local notch effect. Thus this configuration represents the optimum with respect to fatigue strength.

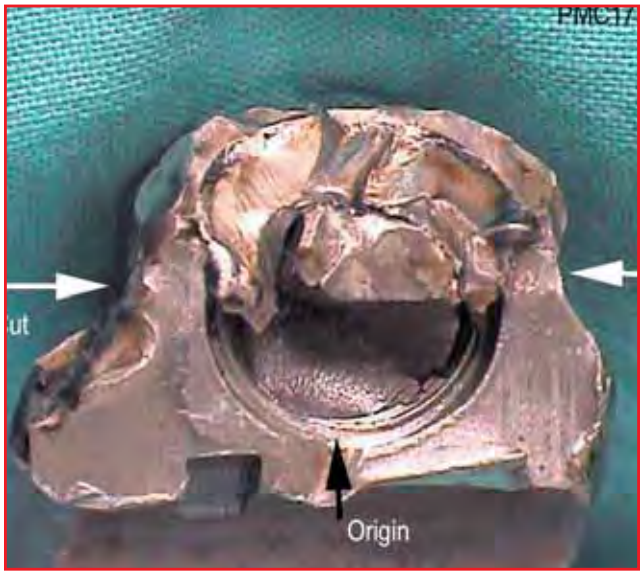
The reduced diameter shank is helpful in another sense. It reduces the bending stiffness of the bolt. Therefore, when the bolt bends due to deformation of the connecting rod, the bending stresses are reduced below what they would otherwise be. This further increases the fatigue resistance of the bolt. A typical bolt configuration is shown below.

Once the bolt configuration has been established, the manufacturing process comes into play. This involves many facets, which are discussed in detail elsewhere. Here, however, one process is of primary interest. With respect to bolt fatigue strength, thread rolling is a major consideration. Threads are rolled after heat treating. This process, which deforms the metal, produces a beneficial compressive stress in the root of the thread. It is beneficial because it counteracts the fluctuating tensile stresses that can cause fatigue cracking. If heat-treatment were to occur after rolling, the compressive stresses would be eliminated. This would therefore reduce the fatigue resistance of the bolt.

An additional factor must be taken into account in defining the bolt configuration: the length of engaged thread. If too few threads are engaged, the threads will shear at loads that are lower than the strength of the bolt. As a practical matter, the thread length is always selected so that the thread shear strength is significantly greater than the bolt tension strength.

This problem is especially important in bolts used in aluminum rods because of the fact that the shear strength of aluminum is much lower than the shear strength of steel.

Finally, although not a design parameter, the subject of bolt installation preload must be addressed. It is a fundamental engineering concept that the force in a bolt in an ideal preloaded joint will remain equal to the preload until the externally applied force exceeds the preload. Then the force in the bolt will be equal to the external force. This means that fluctuating external forces will not cause fluctuating forces in a preloaded bolt as long as the preload exceeds the external force. The result is that fatigue failure will not occur. In a non-ideal joint, such as in a connecting rod, the bolt will feel fluctuating stresses due to fluctuating rod distortions. These are additive to the preload, so that fatigue could result. In connecting rods, precise preloads are required because if they are too low, the external forces (the reciprocating weights) will exceed the preloads, thus causing fatigue. If they are too high,



they provide a high mean stress that combines with the fluctuating stresses due to rod distortion. Again, fatigue is promoted. The objective, then, is to preload a bolt so that it just exceeds the external load, and no higher. To sum up: both insufficient preloads and excessive preloads can lead to fatigue failures.

Appropriate preloads are specified for each ARP bolt. These preloads can be attained in a connecting rod by applying proper torque using a torque wrench or by measuring the amount of stretch in the bolt using a stretch gauge (it is known that a bolt stretches in proportion to the tension in it). The torque method is sometimes inaccurate because of the uncertainty in the coefficient of friction at the interface between the bolt and the rod. This inaccuracy can be minimized by using the lubricant supplied by ARP.

Other factors, equally as important as design, include material selection, verification testing, processing, and quality control. These aspects of bolt manufacturing are discussed elsewhere in this document.

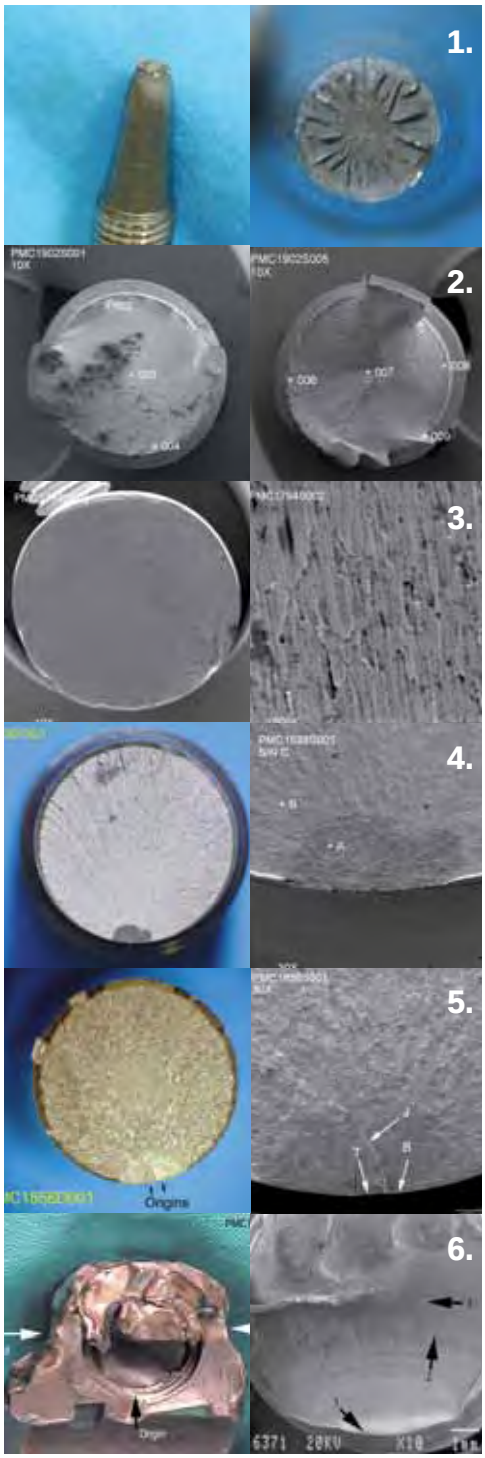
The foregoing discussion concentrated on the design of bolts. The same considerations apply in the design of studs.

Recognizing Common Failures

There are six types of metallurgical failures that affect fasteners. Each type has unique identifying physical characteristics. The following chart is designed to be used like a spark plug reading chart to help analyze fastener failures. While few of us have access to sophisticated analysis equipment, a standard Bausch and Lomb three lens magnifying glass will generally show 98% of what we want to see. Several of the photos below have been taken utilizing a Scanning Electron Microscope (SEM) and are presented to simply illustrate typical grain configurations after failure.

1. Typical Tensile Overload

In a tensile overload failure the bolt will stretch and "neck down" prior to rupture. One of the fracture faces will form a cup and the other a cone. This type of failure indicates that either the bolt was inadequate for the installation or it was preloaded beyond the material's yield point.



2. Torsional Shear (twisting)

Fasteners are not normally subjected to torsional stress. This sort of failure is usually seen in drive shafts, input shafts and output shafts. However we have seen torsional shear failure when galling takes place between the male and female threads (always due to using the wrong lubricant or no lubricant) or when the male fastener is misaligned with the female thread. The direction of failure is obvious and, in most cases, failure occurs on disassembly.

3. Impact Shear

Fracture from impact shear is similar in appearance to torsional shear failure with flat failure faces and obvious directional traces. Failures due to impact shear occur in bolts loaded in single shear, like flywheel and ring gear bolts. Usually the failed bolts were called upon to locate the device as well as to clamp it and, almost always, the bolts were insufficiently preloaded on installation. Fasteners are designed to clamp parts together, not to locate them. Location is the function of dowels. Another area where impact failures are common is in connecting rod bolts, when a catastrophic failure, elsewhere in the engine (debris from failing camshaft or crankshaft) impacts the connecting rod.

4. Cyclic fatigue failure originated by hydrogen embrittlement.

Some of the high strength "quench and temper" steel alloys used in fastener manufacture are subject to "hydrogen embrittlement." L-19, H-11, 300M, Aeromet 100 and other similar alloys popular in drag racing, are particularly susceptible and extreme care must be exercised in manufacture. The spot on the first photo is typical of the origin of this type of failure. The second is a SEM photo at 30X magnification.

5. Cyclic fatigue cracks propagated from a rust pit (stress corrosion)

Again, many of the high strength steel alloys are susceptible to stress corrosion. The photos illustrate such a failure. The first picture is a digital photo with an arrow pointing to the double origin of the fatigue cracks. The second photograph at 30X magnification shows a third arrow pointing to the juncture of the cracks propagating from the rust pits. L-19, H-11, 300M and Aeromet 100, are particularly susceptible to stress corrosion and must be kept well oiled and never exposed to moisture including sweat. Inconel 718, ARP 3.5 and Custom age 625+ are immune to both hydrogen embrittlement and stress corrosion.

6. Cyclic fatigue cracks initiated by improper installation preload

Many connecting rod bolt failures are caused by insufficient preload. When a fastener is insufficiently preloaded during installation the dynamic load may exceed the clamping load resulting in cyclic tensile stress and eventual failure. The first picture is a digital photo of such a failure with the bolt still in the rod. The arrows indicate the location of a cut made to free the bolt. The third arrow shows the origin of the fatigue crack in the second picture – an SEM photo at 30X magnification that clearly shows the origin of the failure (1), and the telltale "thumbprint" or "beach mark" (2). Finally (3) tracks of the outwardly propagating fatigue cracks, and the point where the bolt (unable to carry any further load) breaks-away.

The following material is intended to provide a brief overview of the metallurgical considerations that, daily, influence the design and production of the most reliable fasteners in motorsports. It is hoped that a simple understanding of the knowledge and commitment required to produce this reliability will make your future fastener decisions much, much easier.

Metallurgy for the Non-Engineer

By Russell Sherman, PE

1. What is grain size and how important is it?

Metals freeze from the liquid state during melting from many origins and each one of these origins grows until it bumps into another during freezing. Each of these is a grain and in castings, they are fairly large. Grains can be refined (made smaller); by first cold working and then by recrystallizing at high temperature. Alloy steels, like chrome moly, do not need any cold work; to do this – reheat treatment will refine the grain size. But austenitic steels and aluminum require cold work first. Grain size is very important for mechanical properties. High temperature creep properties are enhanced by large grains but good toughness and fatigue require fine grain size – the finer the better. All ARP bolts and studs are fine grain – usually ASTM 8 or finer. With 10 being the finest.

2. How do you get toughness vs. brittleness?

With steels, as the strength goes up, the toughness decreases. At too high a strength, the metal tends to be brittle. And threads accentuate the brittleness. A tool steel which can be heat-treated to 350,000 psi, would be a disaster as a bolt because of the threads.

ARP engineers use "Scanning Electron Microscopic" inspection capable of detecting all elements in the periodic table with atomic numbers greater than 5 – permitting the acquisition of high resolution imaging.

3. Define Rockwell as we use it. Why do we use the C scale?

A man named Rockwell developed a means of measuring hardness of metals which was superior to other methods. A Rockwell hardness tester measures the depth of penetration into the metal when a load is applied. For hard materials, a diamond penetrator is used. For soft material, small balls are used – 1/16″ or 1/8″ diameter-and the machine measures the depth. We use the C scale for the 120,000 psi strength level and above. The C scale uses the greatest load – 150 Kg. The A scale uses only a 60 Kg. load but can be correlated with C. It is necessary to use the A scale for thin sheets because using the 150 Kg load would cause the diamond to penetrate almost all the way through.

Metallurgist, Russell Sherman, PE, and stress/dynamics engineer Dr. Kenneth Foster, PhD, are the heart of ARP's technical power team.

4. What is "micro hardness?"

Some parts are too small to be Rockwell hardness tested. They are placed in hard plastic and a microscope is used to place a small indenter into the metal. Using the microscope the length of the impression is measured.

5. How does modulus of elasticity refer to our products?

The modulus of elasticity of all alloy steels is exactly the same – 30,000,000 psi. This is true whether it is heat-treated or not – whether it is 100,000 psi strength level or 300,000 psi. Metals are like a spring – put a load on them and they will stretch – double the load and they will stretch double. This is important in connecting rod bolts because by measuring the stretch we really are measuring the load. Load is what is important and measuring stretch of a given size and configuration bolt will indicate how much load is stretching the bolt.

6. What are metal carbides and what is their significance?

The strength of all alloy and carbon steels is derived from the metal carbides formed during heat treat. The carbon in steels combines with iron, vanadium and with chromium, as well as many other metal alloy additions to form compounds, which are a very hard phase within the iron matrix. Tool steels generally have high carbon content (above .8%) and can be made very hard – but brittle.

7. What exactly is chrome?

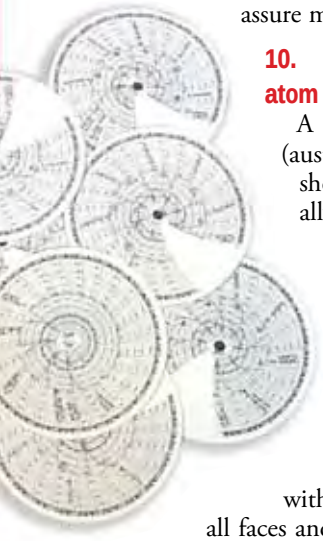
Chrome is the metal chromium and is typically used for plating because it is shiny. It is also used as an alloy addition to iron to form a stainless steel. A stainless steel must contain at least 12% chromium, but these lean chromium steels can still show some rust on the surface. Using 18% chromium will make a more rust resisting stainless. Exposing any stainless to oxygen at temperatures above 1200˚F will cause the chromium to join the oxygen and therefore leave the surface depleted in chromium. If it falls below 12% the surface will show rust.

8. What does it mean when a broken part looks crystallized?

When the fracture face has a rocky appearance it is because the material had a very large grain structure. Basically the grain grew during manufacturing due to poor technique and handling. A properly processed part will have a silky smooth appearance which is an indication of fine grain size. So crystallization does not occur as a result of load or fatigue – it was present in the material at the time of manufacture.

9. Define "precipitation hardening" and "phase change."

The precipitation hardening comes from microscopic precipitation of hard phases which serve to keep rows of atoms from moving under stress. Some metals undergo a change in atomic structure at high temperature. Alloy steels, which are bcc at room temperature, become fcc at temperatures above 1400°F. This switch over is called a phase change. When cooled down they revert back to the bcc structure. Management of this phase is extremely critical and ARP maintains a complete in-house heat-treatment facility. It's the only way we can assure material integrity.



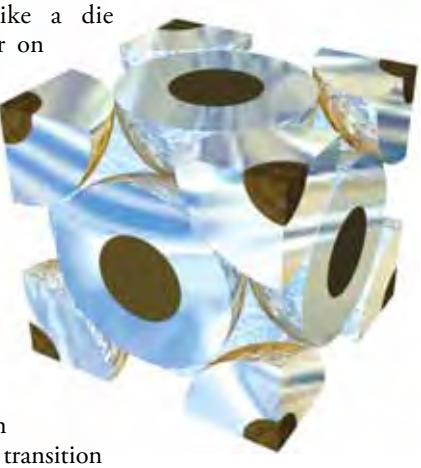
10. What does a "face centered cubic" (fcc) atom arrangement look like? How many atoms?

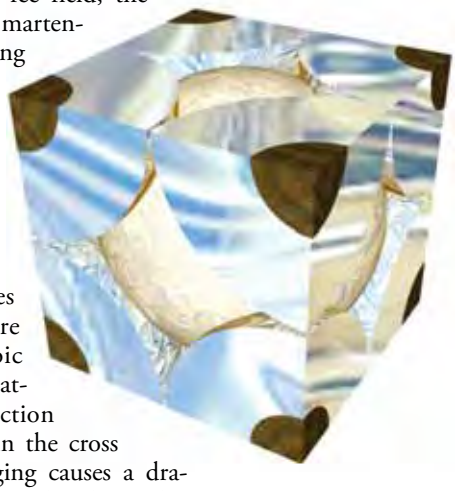
A face centered cubic arrangement of atoms (austenitic) looks like a Las Vegas die with a five showing on all six faces. This can't be seen visually by any type of microscope.

The number of atoms in any one cubic cell would be 14 – these do not stand alone but are attached to other cells which share some of the atoms.

11. How does a "body center cubic" (bcc) atom look? How many atoms?

The body center cubic structure would look like a die with a four on all faces and one atom in the center of the cube. The atomic arrangment of pure iron is bcc at room temperature and does not change until the temperature reaches 1674˚F. At this temperature it changes to austenite which is face center cubic (fcc). The addition of carbon to the iron lowers this transition temperature. This is the basis for heat treatment of steel. If the iron carbon alloy (steel) is quenched from the fcc field, the structure becomes martensite, a very hard strong condition.

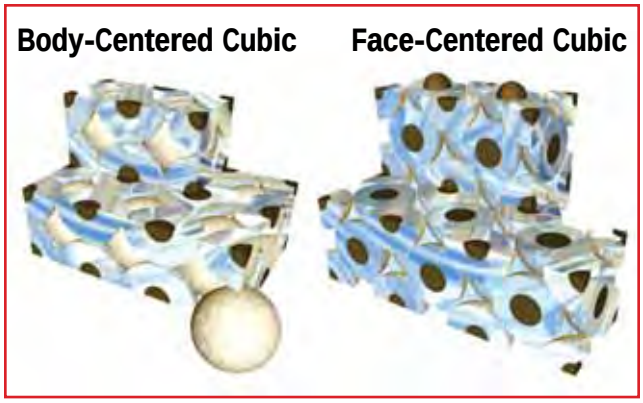




12. What does a "stainless steel" atom arrangement look like?

The 300 Series stainless steels are face-centered cubic and are not heat-treatable. Heavy reduction (power dumping), in the cross section, during forging causes a dramatic increase in strength. This is the process ARP uses to make 304 Stainless Steel reach 170,000 psi UTS.

13. How do the space lattice or crystal structures appear?



All grains or crystals are composed of atoms bound together in a definite pattern. These structures are called space lattice or crystal structures. At a fixed temperature, the atoms in an array are spaced a definite distance from one another, although they vibrate about their mean position. Even though atoms are actually not held together in this manner, it is helpful to picture the crystals as a 3-dimensional latticework connected by imaginary lines. Metallurgists who primarily study ferrous metal are interested in only two basic crystal structures: bcc (body-centered cubic) and fcc (face-centered cubic).

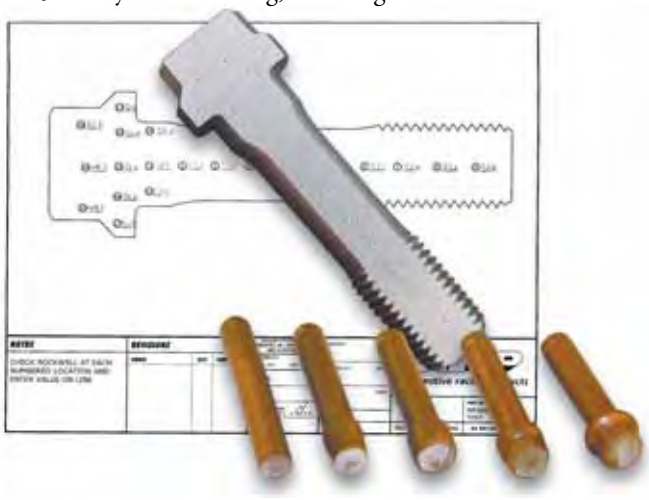
14. What are the metallurgical ramifications of "cold heading" vs. "hot heading?"

Cold heading is a more efficient process and allows the part to be cold worked. The temperatures used for hot forging will reduce the effect of work hardening. This is important for metals which derive much of their strength from the cold work. Cold heading produces a better product than hot heading. The number and force of the blows of the cold heading machine can make a significant difference in the quality of the

end product. Excessive numbers of blows can lead to voids in the bolt head. ARP, in fact, holds significant patents on cold heading procedures for the higher nickel and cobalt based alloys.

Our patented process begins with a cold drawn wire that can be cold forged. The process work hardens the head and the under head area to the desired hardness. We then power extrude the front end to achieve the reduction and hardness in the shank resulting in a bolt with even strength and hardness from end to end.

In a typical aerospace manufacturing process, these alloys are hot headed from bars, reduced in diameter from 48 to 50% by cold drawing, resulting in a hardness of about



Rockwell C46 which is too hard for cold heading. So, the blanks are locally induction heated in a very narrow temperature envelope and hot headed. The process reduces the hardness immediately in the area under the head approximately 3 to 5 points on the Rockwell C scale. Subsequent heat treatment does not restore this partially annealed area to full hardness and strength. The final result is a relatively soft-headed bolt. Therefore, this process is not used by ARP.

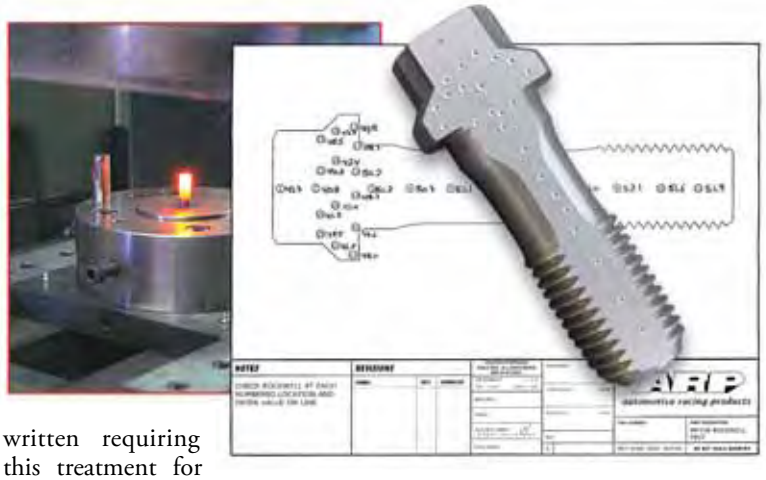
15. What is the difference between the usage of "bar" material vs. "wire?"

Bars produced by the mill in straight sections are normally shipped in 12 foot lengths. Wire is supplied in continuous coil form and is hundreds of feet in length. Bars are cut to length and the bolts are hot forged from these lengths. Wire on the other hand is fed into a cold header in a continuous manner.

16. What exactly is A286? And to what is it compared?

A286 is a 25% nickel and 18% chromium alloy with smaller amounts of titanium and aluminum, which precipitate during aging – after solution treatment. It is a true stainless steel due to the high chromium and it is austenitic due to the high nickel. A286 was developed as a high temperature alloy for use in pre-jet aircraft engines. The strength level was only 140,000 psi, but it had good high temperature strength and exceptional toughness, making it an excellent fastener alloy.

Rocketdyne became interested in it for rocket engines being developed in the early 60's. But they required higher strength. We were part of the team that developed a thermo-mechanical method to produce a strength level of 200,000 psi. This involved severe cold reduction after solution treatment and before aging. An aerospace material spec (AMS) was then



written requiring this treatment for 200,000 psi strength level. There is no other steel alloy, at this level, which can match A286 for corrosion resistance, toughness or bolt fatigue strength.

17. Define "Power Dump."

This is a term used to define the heavy extrusion of the fastener body during forging. The part is forced into a die much smaller than the blank thereby causing a severe reduction in cross section area. This reduction of the cross sectional area is

5-stage "Cold Header" used by ARP

accompanied by an increase in length because metals can't be compressed. However, power dumping or reduction, delivers a significant increase in strength properties and is part of the patented process we use to produce fasteners from 304 stainless steel with 170,000 psi UTS and AMS 5844 (ARP 3.5) with ultimate tensile strengths in the 270,000 psi UTS range with outstanding fatigue.

18. What is the difference between 4130 and 8740 chrome moly?

Both are alloy steels with similar chemistry. The 4130 has only .3% carbon and can't be hardened as high as 8740, which has .4% carbon. Also, 8740 has about .45% nickel and 4130 has none. Both have moly (most alloy steels have moly). The chromium content of 4130 is slightly higher, .95% instead of .55%. However, 8740 is generally considered to have slightly better toughness due to the nickel.

19. What exactly is ARP2000 and how does it compare to 8740 and 4340?

ARP2000 is a heavily alloyed martensitic quench and temper steel, initially developed for use in steam power plants. As such it has excellent stability at high temperatures. But most important, ARP research discovered that in addition to temperature stability it has excellent notch toughness in the higher strength ranges and is alloyed to be tempered to Rockwell C44/47. 8740 and 4340 can be tempered to the same hardness. But, the tempering temperature would yield material in the "temper brittle zone" (between 500° and 700°F), producing significant notch sensitivity. ARP2000 is tempered above that temperature range and has a strength between 200,000 and 220,000 psi.

20. How does L19 compare to ARP2000?

L19 differs from ARP2000 in that it is a vacuum melted alloyed steel with sufficient chromium and carbon to achieve high hardness (but below the level of a stainless steel). L19 is air-cooled from the hardening temperature in a way that does not require an oil quench to achieve full hardness and is tempered to assure full conversion to martensite between 1025°F and 1075°F. L19 is a proprietary material capable of achieving strengths of 220,000/230,000 or 260,000/270,000 psi as may be required. Both L19 and ARP2000 steels are modified bcc (martensite) at room temperature. L19 has the same advantage as ARP2000 in that a high strength is obtained at a high tempering temperature. This alloy is easily contaminated and requires special handling.

21. What is AMS5844? And how does it compare to AMS5842E?

Both of these alloys are considered multiphase, non-steel, austenitic materials. Both derive their strength (260,000 psi) from severe cold work (48/50%) which raises the hardness from Rockwell C 46 up to 49/50. The AMS5842 (for MP159) was developed much later than AMS5844 (for MP35) in order to increase the usable service temperature by about 100° so it could be used in hotter sections of jet engines.

22. Provide a brief overview of the metallurgy required to produce AN, AMS & other Aerospace type fasteners.

All alloy steel fasteners are essentially manufactured by the same process. Incoming steel from the mill is forged to specification, then heat treated and thread rolled. Regular AN bolts are forged to size and are normally not precision ground. They may even have threads on them when heat treated.

Expensive aerospace fasteners are more likely suited for some motorsport applications. These fasteners require precision forging, careful heat treatment and then precision grinding, fillet rolling under the head and a great deal of skill in thread rolling.

23. What is moisture tolerance and how or where is it important?

Non-stainless steels have low moisture tolerances because the water attacks the steel by forming iron oxide (rust). Therefore none of these have a high tolerance for moisture and the surface must be protected by oil or plating. ARP maintains an in-house plating facility to assure all non-stainless product is delivered 100% corrosion free.

24. How do the various standards compare to each other with regard to fasteners? Where are the standards?

A standard fastener is one that can be referenced from a nationally or internationally recognized standards document and may be produced by any interested manufacturer.

In all fastener categories the custodian of each group (MS-AN-NAS) have tried to standardize the processing of specifications such as AS (American Standard) heat-treating, MIL-H-6875 cadmium plating, AMS QQ-P-416 passivation and AMS QQ-P-35 testing, MIL.-Std 1312 and NDT in aerospace applications are generally by sample.

ASTM stands for the American Society for Testing Materials, a large industry funded group used to write standards for many materials and testing procedures. It compares directly to **AMS (Aerospace Material Standard)**.

In the case of ARP, 100% raw material is purchased to AMS specification – with the exception of special alloys used in proprietary products. All materials are carefully examined for proper chemistry – and finally, periodic examination by an independent laboratory. ARP consistently strives to exceed industry specifications for quality and product management.

MS (Military Standards): MS bolt specifications cover a wide range of fastener hardware, high strength bolts, nuts and washers with spec's for materials and processing. MS fasteners have various tensile strengths.

AN (Army-Navy) Specifications: Generally lower strength bolts and studs primarily in the 125,000 psi UTS range. AN also covers a wide range of nuts, washers and other hardware.

NAS (National Aerospace Standard): These specifications cover fasteners in the strength ranges 160,000/180,000/200,000 psi UTS.

ISO (International Standards Organization):

ISO 9001-94: is a quality control system designed for manufacturers with design control.

ISO 9002-94: is a quality control system designed for manufacturers who build parts to customer specifications, and do not have design control.

ISO 9001-2000: is current ISO system well suited for manufacturers with engineering design functions, drawing control and statistical techniques to achieve demanding quality requirements.

This system is the main focus of ARP's World Quality Concept.

25. What metallurgical issues cause common failures?

The most common cause of failure of connecting rod bolts (and wheel bolts) is too little induced load (stretch) during installation. This allows the alternating load to impose cyclic loading on the bolt. Over tightening is also another cause, because the induced stress is too close to the yield point.

MATERIAL SPECIFICATIONS

ARP manufactures fasteners from a wide assortment of materials ranging from popular stainless steel and 8740 chrome moly to exotic alloys that have been developed to handle space travel. You should also know that there are grades within specific alloys. For example, 8740 is available in four grades: 1. SDF (guaranteed seamless and defect free). 2 CHQ (cold head quality). 3. Aircraft. 4. Commercial. ARP uses only the first two (SDF and CHQ), even though they cost more than double "Aircraft" quality.

STAINLESS STEEL: Ideally suited for many automotive and marine applications because stainless is tolerant of heat and virtually impervious to rust and corrosion. ARP "Stainless 300" is specially alloyed for extra durability. It's polished using a proprietary process to produce a beautiful finish. Tensile strength is typically rated at 170,000 psi.

8740 CHROME MOLY: Until the development of today's modern alloys, chrome moly was popularly considered a high strength material. Now viewed as only moderate strength, 8740 chrome moly is seen as a good tough steel, with adequate fatigue properties for most racing applications, but only if the threads are rolled after heat-treatment, as is the standard ARP production practice. Typically, chrome moly is classified as a quench and temper steel, that can be heat-treated to deliver tensile strengths between 180,000 and 210,000 psi.

ARP2000®: An exclusive, hybrid-alloy developed to deliver superior strength and better fatigue properties. While 8740 and ARP2000 share similar characteristics – ARP2000 is capable of achieving a clamp load at 220,000 psi. ARP2000 is used widely in short track and drag racing as an up-grade from 8740 chrome moly in both steel and aluminum rods. Stress corrosion and hydrogen embrittlement are typically not a problem, providing care is taken during installation.

L19: This is a premium steel that is processed to deliver superior strength and fatigue properties. L19 is a very high strength material compared to 8740 and ARP2000 and is capable of delivering a clamp load at 260,000 psi. It is primarily used in short track and drag racing applications where inertia loads exceed the clamping capability of ARP2000. Like most high strength, quench and temper steels – L19 requires special care during manufacturing to avoid hydrogen embrittlement. This material is easily contaminated and subject to stress corrosion. It must be kept well-oiled and not exposed to moisture.

AERMET® 100: With a typical tensile strength of 280,000 psi, Aermet 100 is a new martensitic super-alloy that is stronger and less expensive than the super-alloy austenitic materials that follow. Because it is capable of achieving incredibly high clamping loads, it is ideal for short but extreme environments like top fuel, funny car and some short track applications. Although Aermet 100 is a maraging steel that is far superior to other high strength steels in its resistance to stress corrosion, it must be kept well-oiled and not exposed to moisture.

INCONEL 718: A nickel based material that is in the high temperature, super-alloy class, it is found to be equally suitable in lower temperature applications. This material delivers tensile strengths into the 220,000 psi range and exhibits improved fatigue properties. Best of all, Inconel 718 is completely immune to hydrogen embrittlement and corrosion.

ARP3.5® (AMS5844): While similar to Inconel 718, these super-alloys are found in many jet engine and aerospace applications where heat and stress attack the life of critical components. The high cobalt content of this alloy, while expensive, delivers a material with superior fatigue characteristics and typically tensile strength in the 260,000 psi range. The immunity to hydrogen embrittlement and corrosion of these materials is a significant design consideration. These materials are primarily used in connecting rods where extremely high loads, high RPM and endurance are important factors – Formula 1, NASCAR and CART applications.

CUSTOM AGE 625 PLUS®: This newly formulated super-alloy demonstrates superior fatigue cycle life, tensile strength and toughness – with complete resistance to atmospheric corrosion and oxidation. ARP is the first to develop manufacturing and testing processes for fasteners with Custom Age 625+. Best of all it is less expensive and expected to soon replace MP-35 as the material of choice in the high strength, super-alloy field. Typical tensile strength is 260,000 psi.

TITANIUM: ARP now offers special order fasteners made of an alloy (Ti6Al-4V) that is specially heat-treated (a process developed by ARP's own Russ Sherman) and provides superior strength to other titanium alloys employed in racing and aerospace. The material has a nominal tensile strength of 180,000 psi, and is very corrosion resistant. The main advantage of titanium, of course, is its weight – which is about 40% lighter than a comparable fastener made of steel. Head studs and accessory bolts are ideal applications for this lightweight material.

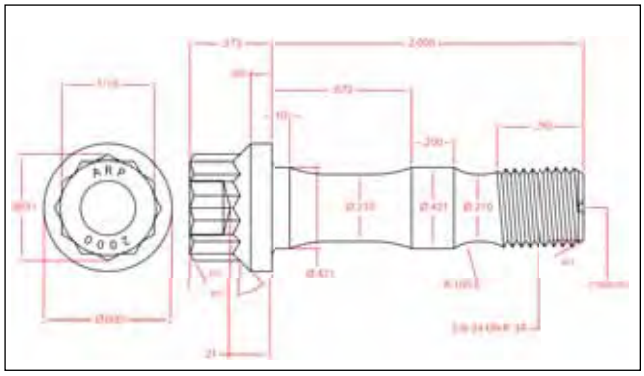
QUICK REFERENCE GUIDE TO MATERIALS USED IN FASTENERS

MATERIAL	USE?	YIELD STRENGTH	TENSILE STRENGTH	USED FOR
Grade 5	No	90,000 psi	120,000 psi	Accessory bolts and studs
Grade 8	No	120,000 psi	150,000 psi	Accessory bolts and studs
"Stainless 300"	Yes	140,000 psi	170,000 psi	Accessory bolts & studs, head studs
Custom 450®	Yes	150,000 psi	180,000 psi	Head bolts, accessory bolts
8740 chrome moly	Yes	180,000 psi	200,000 psi	Rod bolts, head & main studs & bolts
A286	Yes	170,000 psi	200,000 psi	Head bolts, accessory bolts
ARP2000	Yes	180,000 psi	220,000 psi	Rod bolts, head & main studs
L19	Yes	200-230,000 psi	260,000 psi	Connecting rod bolts
Inconel 718	Yes	190-210,000 psi	220,000 psi	Connecting rod bolts
Custom Age 625+®	Yes	235-255,000 psi	260,000 psi	Head studs, connecting rod bolts
ARP 3.5	Yes	220-250,000 psi	260,000 psi	Connecting rod bolts
AerMet® 100	Yes	260,000 psi	280,000 psi	Connecting rod bolts
Titanium	Yes	160,000 psi	180,000 psi	Head studs, accessory bolts

YOU CAN GET ARP FASTENERS MADE TO YOUR REQUIREMENTS!

The following pages in this catalog detail the vast number of "off the shelf" fasteners available from ARP. However, it's important for you to know that a significant amount of ARP's business comes from the development and manufacture of custom fasteners. For example, many top Formula 1, CART and IRL race teams and constructors have come to rely on ARP for a myriad of special purpose fasteners. Many of these have been developed on a proprietary basis, and we cannot go into details about "what" is being manufactured for "whom" by ARP. But suffice to say that that ARP has established a reputation within the racing industry for doing cutting edge R&D and following it up with fasteners made to the most stringent quality control standards on the planet. ARP also "private labels" a number of special fasteners for various manufacturers in the performance industry.

8740 ARP2000 L19



ARP can custom manufacture fasteners from nearly a dozen different materials, with tensile strengths ranging from 170,000 PSI to over 300,000 psi. By way of example, we have made cylinder head studs for the same application from 8740 chrome moly, our own ARP2000 and L19.

The bottom line is that because of ARP's extensive in-house R&D and manufacturing capabilities, the firm is in a position to design and build fasteners on a custom basis. Serious inquiries from members of the high performance industry are always welcome. Look to ARP to provide effective solutions to all your fastener needs!

Custom-Made ARP Titanium Studs & Bolts

One of ARP's best-kept "secrets" is the company's deep involvement in the manufacture of titanium fasteners. As a matter of fact, ARP's resident metallurgist, Russ Sherman, literally "wrote the book" when he developed the original procedures for the heat treatment of the most popular titanium alloy in use today (Ti6Al-4V), and presented the research data to the American Society for Metals. Sherman's procedure of solution-treating, warm processing and aging brings the titanium to strength levels never before achieved, and has also been instrumental in setting new standards for the aerospace industry.

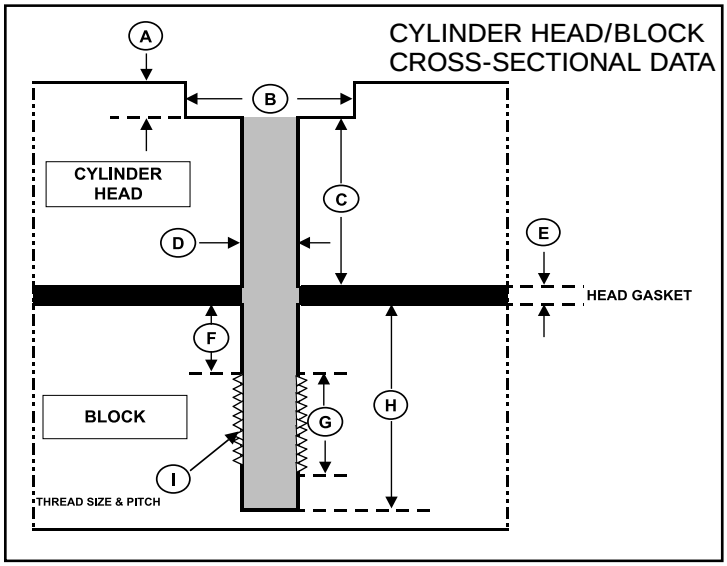
This particular titanium alloy and process lends itself well to a number of racing applications, including head studs and accessory fasteners. Of course, the primary advantage of using titanium instead of steel is weight; titanium is about 40% lighter. The material ARP uses has a tensile strength of 180,000 psi, comparable to heat-treated chrome moly – but about half the weight.

ARP stands ready to manufacture Ti6Al-4V titanium fasteners custom-made to your specifications. Contact our Special Projects Dept. at **805-525-1497**.

GETTING THE CORRECT ARP HEAD STUD/BOLT FOR THE APPLICATION

Today, there are literally dozens of different cylinder head and engine block combinations for the more popular applications, and new offerings coming out all the time. It is virtually impossible for ARP's engineering staff to obtain detailed information from all of these various sources, so it may be necessary for customers to calculate exactly what they have so the correct cylinder head studs or bolts are used. Whether it's a small block Chevy engine or a Honda VTEC, the procedure remains the same.

The illustration on the right shows the nine different variables that come into play when determining the proper fastener for a particular position. Many cylinder heads have different column heights, etc. at various positions, and additional variables come into play when using aftermarket engine blocks (some of which have "blind" tapped holes for attaching the heads that are shallower than OEM). It is therefore critically important that you determine exactly how many different bolt/hole combinations exist for the cylinder head installation.



You must have the following data:

A. Depth of cylinder head counter bore_____

B. Diameter (o.d.) of head counter bore _____

C. Column height (net thickness of head) _____

D. Diameter (o.d.) of bolt hole in head _____

E. Head gasket thickness (uncompressed) _____

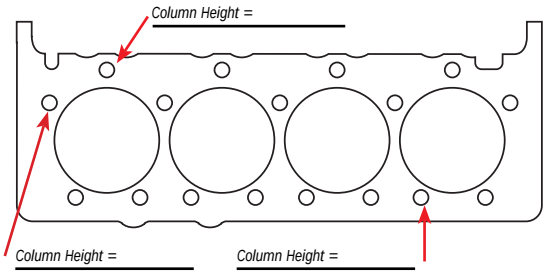
F. Depth of counter bore in block _____

G. Length of thread in block _____

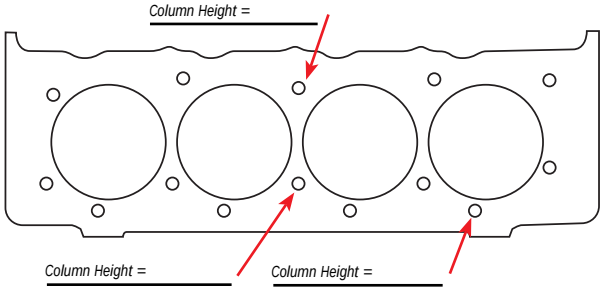
H. Depth of hole from surface to bottom _____

I. Thread size and pitch _____

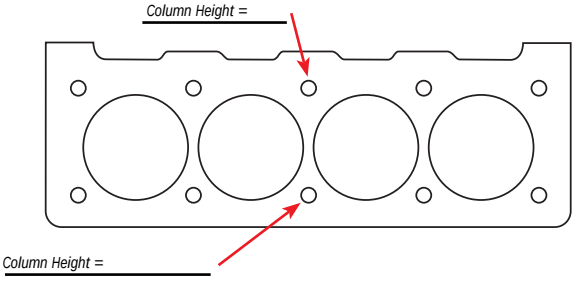
STANDARD SMALL BLOCK CHEVROLET



STANDARD BIG BLOCK CHEVROLET



CHRYSLER, FORD & MOST 4-CYLINDER



ICY/Phoenix Racing - Subaru Factory Team

Bryan Fuller uses ARP hardware on all his custom rides

GLOSSARY OF TECH TERMS

Austenitic: Refers to the atomic arrangement of some metals, such as nickel based alloys, and some steels with about 18% chromium. This atomic arrangement is called "face centered cubic." Austenitic steels can not be heat treated, but can be strengthened by cold working.

CHQ: A term used to grade heading wire and stands for "cold heading quality." This grade is superior to both Commercial and Aircraft quality.

Clamp Load: This is the force exerted by a tightened bolt and is the same as preload.

Fatigue: The process by which failure is caused after many repetitions of loads smaller than the ultimate strength of the material.

Ferritic: Refers to steels with an atomic arrangement different from austenite and martensite. These steels are not strong and the widest use is in steam power plants and accessory fasteners made by some companies, because they are able to withstand wet environments. Newer steels such as ARP300 and A286 are far superior.

Hydrogen Embrittlement: This condition results from the accumulation of hydrogen gas in the atomic structure of the metal. This gas flows to the point of high stress (stress risers) and causes microscopic cracks. The hydrogen then flows to the "new" crack tip and causes it to crack further. In this way the crack moves across the part, because the crack-tip IS the stress riser. Finally the crack gets so large that the section is not large enough to support the load. No hydrogen embrittlement can take place without tensile stress. ARP employs a baking process that purges hydrogen gas from the steel.

Knurling: A process of creating serrations in a part by rolling a die, under pressure, against the part. Normally these serrations are very sharp and can create cracks and ARE stress risers. The process is used on knobs so the user can get a firm grip. But in the case of fasteners, the body can be knurled so the part can be forced into and retained in an irregular hole – stress risers and all.

Maraging: Refers to steels that are a low carbon version of martensitic steels, specially alloyed so that the martensite is not hard. These steels can be worked in the quenched condition and then be hardened by low temperature aging. The strength comes from the formation of complex metal carbides.

Martensitic: Refers to atomic arrangement and in the case of steels, is a modified body centered cubic structure. These steels can be heat-treated because martensite is iron carbide, which is very hard. However, these steels can be hydrogen embrittled and will rust. Generally, martensite normally refers to metal structures which are formed by quenching from high temperature.

MS21250: A military specification for a 12-point, 180,000 psi bolt which specifies the fatigue load required for testing every size.

Notch Sensitivity: Refers to the ability of a metal to withstand the increased stress at a notch. Some materials, such as glass, crack very easily if notched. While others, such as soft gold or tin stretch out under stress – even with a notch. Normally, the stronger the steel, the more likely it is to break quickly at the notch. "Toughness" is wanted because this is associated with opposite of notch sensitivity. Austenitic metals are usually less notch sensitive than martensitic steels of the same strength levels.

OAL: Means "Over All Length."

Preload: The force IN a bolt when it is installed with a torque greater than simply hand tight. Preload can be established by measuring torque or bolt stretch or by the less than accurate "turn-of-the-nut" method.

Qualified Products List: A government requirement that simply mandates that bolts be manufactured only by companies which have qualified by making bolts that have been submitted for testing and approval to a government agency. ARP has qualified for this list.

Quench & Temper: A method of heat-treating martensitic steels. The parts are heated into the austenitic range (usually above 1450˚F) then quenched into water or oil. This leaves the part in a very hard martensitic condition which then must be tempered by heating at lower temperatures (between 350˚F and 1200˚F), depending upon the steel and strength desired.

Reciprocating Load: The acceleration force exerted on a connecting rod due to the up and down motion of the piston and its associated mass ie; wrist pin, rings, small end of the rod.

Stretch: The increase in length of a bolt when installed with a preload.

Stress: The load applied to a part divided by the cross-sectional area of the part, usually expressed in pounds per square inch (psi).

Stress Corrosion: This is a special form of hydrogen embrittlement in which the metal is attacked while under stress. Without the stress the crack will not move. But under stress the crack moves and corrosion takes place at the freshly opened crack face.

Stress Ratio: The ratio of the minimum stress to the maximum stress in a structure which is subject to fluctuating loads.

Stress Riser: You have a notch, ding or some change in section size, so now the stress at these points is increased above nominal stress. Compare this kind of stress to the flow of water in a river. When the river hits a narrow point it flows faster. Perhaps there is a rock in the middle – the river flows faster around the rock. The stress at these points can be so high that the part will fail – even though the average stress on the part never exceeded the tensile strength of the part.

S.D.F.: Seam and defect free. A designation for premium steel. This is typically the highest grade available, and is the only steel used by ARP.

Thread Engagement: This refers to the number of threads engaged in a nut or threaded hole. Full engagement, meaning all the female threads are engaged, is a desirable configuration to maximize fatigue strength.

Ultimate Tensile Strength: The maximum stress that a particular material can support without breaking. It is expressed in terms of lbs. per square inch, and is measured by means of a tensile test. The maximum force (lbs.) that a test specimen can support is divided by the cross-sectional area (square inches) of the specimen, the result is ultimate tensile strength in psi.

Torque Angle: A method of tightening a fastener relative to the amount of degrees turned once the underside of the bolt head or nut face contacts the work surface. This procedure is suitable for engine assembly only when the installation has been calibrated in terms of bolt stretch relative to the exact application (the amount of compression of the clamped components is critical).

UHL: Means "Under Head Length." The distance as measured from tip of the fastener to a place directly at the base of the head.

Yield Strength: The stress at which a given material or component exhibits a permanent deformation (i.e. "takes a set"). When the load that caused the stress is removed, the part will not return to its original dimensions. If you exceed the yield strength of a fastener (tighten it until it feels funny and then back it off a bit) the fastener is ruined and must be replaced.

FASTENER TORQUE RECOMMENDATIONS

Listed are the recommended torque values for most ARP fasteners. Recommended torque is equal to 75% of the fastener's yield strength. THE TORQUE VALUES REPRESENTED HERE ARE INTENDED TO BE FOR GENERAL INFORMATION, NOT FOR SPECIFIC INSTALLATIONS. In special instances, where supplied instructions deviate from the torque values recommended here, always follow the instructions. Simply read down to the correct fastener size, then across to find the torque value for your application. Stud torque values are based on the coarse thread yield strength and torque being applied to the fine thread i.e. (7/16-14 into the block and torque applied to 7/16-20 threaded nut). **NOTE: ALWAYS LUBRICATE FASTENERS PRIOR TO APPLYING TORQUE TO ENSURE ACCURATE READINGS.**

Recommended Torque to Achieve Optimum Preload (Clamping Force)
Using ARP Moly Assembly Lubricant or 30-wt. oil - Torque (ft./lbs.) - Preload (lbs.)

Note: For those using Newton/meters as a torquing reference, you must multiply the appropriate ft./lbs. factor by 1.356.

Thread Size and Type	Fastener Tensile Strength (PSI)								
	170,000/180,000 (1,171 N/mm²)			190,000/200,000 (1,309 N/mm²)			220,000 (1,515 N/mm²)		
	Torque w/30 wt. oil *not recommended*	Torque w/ARP Moly	Preload	Torque w/30 wt. oil *not recommended*	Torque w/ARP Moly	Preload	Torque w/30 wt. oil *not recommended*	Torque w/ARP Moly	Preload
1/4″ stud	12	10	3,804	14	11	4,280	15	12	4,755
1/4-20	13	10	3,804	14	11	4,280	16	13	4,755
1/4-28	14	11	4,344	16	13	4,887	18	14	5,430
5/16″ stud	25	20	6,264	28	22	7,047	32	25	7,830
5/16-18	26	21	6,264	29	23	7,047	32	26	7,830
5/16-24	28	22	6,948	32	25	7,817	35	28	8,685
3/8″ stud	45	35	9,276	50	39	10,436	56	44	11,595
3/8-16	46	36	9,276	51	41	10,436	57	45	11,595
3/8-24	50	39	10,512	57	44	11,826	63	49	13,140
7/16″ stud	71	56	12,720	80	63	14,310	89	70	15,900
7/16-14	73	58	12,720	82	65	14,310	91	72	15,900
7/16-20	80	62	14,220	90	70	15,998	100	78	17,775
1/2″ stud	108	84	16,992	122	95	19,116	135	105	21,240
1/2-13	111	88	16,992	125	99	19,116	138	110	21,240
1/2-20	122	95	19,164	137	107	21,560	152	119	23,955
9/16″ stud	156	122	21,792	175	137	24,516	195	152	27,240
9/16-12	159	126	21,792	179	142	24,516	199	158	27,240
9/16-18	174	136	24,312	196	153	27,351	217	170	30,390
5/8″ stud	214	167	27,072	241	187	30,456	268	208	33,840
5/8-11	220	174	27,072	247	196	30,456	275	217	33,840
5/8-18	243	189	30,660	273	212	34,493	303	236	38,325
6mm stud	10	9	2,900	–	–	–	–	–	–
6mm x 1.0	11	9	2,900	–	–	–	–	–	–
8mm stud	25	20	6,250	28	22	7,050	32	25	7,830
8mm x 1.25	25	20	6,250	28	22	7,050	–	–	–
10mm stud	54	42	10,600	68	53	12,015	70	60	13,350
10mm x 1.25	54	42	10,600	–	–	–	–	–	–
10mm x 1.50	50	38	9,500	–	–	–	–	–	–
11mm stud	80	63	14,220	90	71	15,998	100	79	17,775
12mm stud	97	77	15,540	109	86	17,483	122	96	19,425

ROD BOLT STRETCH & TORQUE SPECS

Make	Rod Bolt Part No.	Stretch (inches)	ARP Lube (ft./lbs.)
ALFA ROMEO	126-6101	.0075 - .0080	45
AMC	112-6001	.0065 - .0070	40
	114-6001	.0065 - .0070	40
	114-6002	.0070 - .0075	50
	114-6004	.0060 - .0065	50
BMC/TRIUMPH	206-6001	.0065 - .0070	50
	206-6002	.0065 - .0070	35
	206-6003	.0065 - .0070	44
	206-6004	.0065 - .0070	44
	206-6005	.0065 - .0070	44
	206-6006	.0065 - .0070	50
	206-6007	.0045 - .0050	30
	206-6009	.0065 - .0070	32
BMW	201-6102	.0065 - .0070	50
	201-6103	.0075 - .0080	60
	201-6104	.0065 - .0070	60
	201-6301	.0080 - .0085	36
	201-6302	.0080 - .0085	36
	206-6008	.0055 - .0060	30
BUICK	123-6001	.0060 - .0065	45
	123-6002	.0065 - .0070	45
	124-6001	.0055 - .0060	40
	124-6002	.0040 - .0045	40
	124-6003	.0040 - .0045	40
	125-6001	.0055 - .0060	50
CADILLAC	135-6003	.0060 - .0065	50
CHEVY	131-6001	.0060 - .0065	40
	132-6001	.0060 - .0065	40
	132-6002	.0050 - .0055	32
	133-6001	.0060 - .0065	50
	133-6002	.0065 - .0070	40
	134-6001	.0055 - .0060	40
	134-6002	.0045 - .0050	50
	134-6003	.0055 - .0060	50
	134-6004	.0075 - .0080	75
	134-6005	.0060 - .0065	50
	134-6006	.0055 - .0060	45
	134-6027	.0060 - .0065	50
	134-6401	.0055 - .0060	40
	134-6402	.0045 - .0050	50
	134-6403	.0055 - .0060	50
	135-6001	.0060 - .0065	75
	135-6002	.0055 - .0060	50
	135-6401	.0060 - .0065	75
	135-6402	.0055 - .0060	50
	234-6301	.0065 - .0070	40
	234-6401	.0065 - .0070	40
	234-6402	.0055 - .0060	50
	234-6403	.0065 - .0070	50
	235-6401	.0070 - .0075	75
	235-6402	.0065 - .0070	50
	235-6403	.0070 - .0075	75
CHRYSLER	141-6001	.0060 - .0065	50

Make	Rod Bolt Part No.	Stretch (inches)	ARP Lube (ft./lbs.)
CHRYSLER (cont.)	141-6401	.0060 - .0065	50
	142-6001	.0065 - .0070	50
	142-6002	.0060 - .0065	50
	144-6001	.0060 - .0065	50
	144-6401	.0060 - .0065	50
	145-6001	.0070 - .0075	75
	145-6002	.0060 - .0065	50
	145-6402	.0060 - .0065	50
	244-6401	.0070 - .0075	50
	245-6402	.0070 - .0075	50
FORD	150-6004	.0060 - .0065	50
	150-6005	.0060 - .0065	50
	150-6404	.0060 - .0065	50
	151-6001	.0060 - .0065	40
	151-6002	.0060 - .0065	40
	151-6003	.0050 - .0055	35
	151-6004	.0050 - .0055	35
	151-6005	.0045 - .0050	36
	152-6001	.0060 - .0065	50
	152-6002	.0060 - .0065	50
	153-6001	.0060 - .0065	30
	153-6002	.0060 - .0065	36
	154-6001	.0060 - .0065	50
	154-6002	.0060 - .0065	30
	154-6003	.0060 - .0065	50
	154-6004	.0050 - .0055	50
	154-6005	.0060 - .0065	50
	154-6006	.0060 - .0065	50
	154-6401	.0060 - .0065	50
	154-6402	.0060 - .0065	30
	154-6403	.0060 - .0065	50
	155-6001	.0060 - .0065	50
	155-6002	.0060 - .0065	50
	155-6003	.0060 - .0065	50
	200-6001	.0045 - .0050	60
	250-6404	.0070 - .0075	50
	251-6201	.0045 - .0050	30
	251-6202	.0060 - .0065	40
	251-6301	.0060 - .0065	44
	251-6402	.0070 - .0075	40
	254-6402	.0070 - .0075	25
	254-6403	.0075 - .0080	50
	255-6402	.0070 - .0075	45
	256-6301	.0065 - .0070	40
HOLDEN	205-6001	.0060 - .0065	50
	205-6002	.0060 - .0065	40
HONDA/ACURA	208-6001	.0050 - .0055	26
	208-6002	.0055 - .0060	40
	208-6003	.0080 - .0085	40
	208-6004	.0080 - .0085	37
	208-6005	.0085 - .0090	26
	208-6401	.0075 - .0080	40
LANCIA	275-6001	.0075 - .0080	62

ROD BOLT STRETCH & TORQUE SPECS

Make	Rod Bolt Part No.	Stretch *(inches)*	ARP Lube *(ft./lbs.)*
MAZDA	118-6401	.0060 - .0065	38
MITSUBISHI	107-6001	.0055 - .0060	40
	107-6002	.0065 - .0070	37
	107-6003	.0065 - .0070	35
	107-6004	.0065 - .0070	35
	207-6002	.0065 - .0070	28
NISSAN/DATSUN	102-6001	.0060 - .0065	32
	102-6002	.0050 - .0055	28
	202-6001	.0060 - .0065	40
	202-6002	.0060 - .0065	32
	202-6003	.0060 - .0065	40
	202-6004	.0065 - .0070	40
	202-6005	.0060 - .0065	40
	202-6006	.0065 - .0070	28
OLDSMOBILE	181-6001	.0055 - .0060	50
	184-6001	.0060 - .0065	50
	185-6001	.0055 - .0060	50
OPEL/VAUXHALL	109-6001	.0050 - .0055	32
	109-6002	.0050 - .0055	24
	109-6003	.0050 - .0055	32
	209-6003	.0055 - .0060	38
PEUGEOT	117-6101	.0070 - .0075	45
PONTIAC	190-6001	.0080 - .0085	50
	190-6002	.0060 - .0065	50
	190-6003	.0075 - .0080	75
	190-6004	.0055 - .0060	61
	191-6001	.0060 - .0065	40
	194-6001	.0060 - .0065	40
PORSCHE	104-6006	.0050 - .0055	40
	204-6001	.0115 - .0120	45
	204-6002	.0105 - .0110	50
	204-6003	.0090 - .0095	45
	204-6004	.0115 - .0120	45
	204-6005	.0115 - .0120	35
RENAULT	116-6001	.0045 - .0050	36
	216-6301	.0065 - .0070	40
	216-6302	.0065 - .0070	40
SUBARU	260-6301	.0070 - .0075	36
	260-6302	.0070 - .0075	34

Make	Rod Bolt Part No.	Stretch *(inches)*	ARP Lube *(ft./lbs.)*
TOYOTA	203-6001	.0050 - .0055	40
	203-6002	.0060 - .0065	50
	203-6003	.0050 - .0055	36
	203-6004	.0060 - .0065	45
	203-6005	.0070 - .0075	50
VOLKSWAGEN/	104-6001	.0045 - .0050	40
AUDI	104-6002	.0065 - .0070	40
	104-6003	.0075 - .0080	40
	104-6004	.0085 - .0090	30
	104-6005	.0050 - .0055	32
	104-6007	.0085 - .0090	30
	204-6006	.0075 - .0080	38
	204-6201	.0075 - .0080	33
GENERAL REPL.	200-6002	.0045 - .0050	60
	200-6003	.0060 - .0065	60
	200-6004	.0040 - .0045	60
	200-6006	.0050 - .0055	60
	200-6201	.0070 - .0075	75
	200-6202	.0070 - .0075	75
	200-6203	.0065 - .0070	75
	200-6204	.0070 - .0075	75
	200-6205	.0065 - .0070	75
	200-6206	.0060 - .0065	75
	200-6207	.0055 - .0060	45
	200-6208	.0065 - .0070	45
	200-6209	.0055 - .0060	47
	200-6210	.0055 - .0060	26
	200-6506	.0065 - .0070	70
	300-6601	.0065 - .0070	85
	300-6602	.0055 - .0060	50
	300-6603	.0055 - .0060	50
	300-6608	.0055 - .0060	32
	300-6701	.0065 - .0070	85
	300-6702	.0065 - .0070	50
	300-6703	.0065 - .0070	50
	300-6704	.0060 - .0065	50
	300-6706	.0060 - .0065	75
	300-6708	.0055 - .0060	30

Drag racing's winningest driver, John Force, relies on ARP.

Tony Schumacher - 2008 NHRA Top Fuel Champion

PROPER FASTENER RETENTION

There are three methods that can be employed to determine how much tension is exerted on a fastener; using a torque wrench, measuring the amount of stretch, and turning the fastener a pre-determined amount (torque angle). Of these methods, use of a stretch gauge is the most accurate.

To obtain the correct amount of clamping force a fastener should actually be stretched a measured amount. A properly used fastener works like a spring!

It is important to note that in order for a fastener to function properly it must be "stretched" a specific amount. The material's ability to "rebound" like a spring is what provides the clamping force. You should know that different materials react differently to these conditions, and ARP engineers have designed each fastener to operate within specific ranges.

On the other hand, if a fastener is over torqued and becomes stretched too much – you have exceeded the yield strength and it's ruined. If the fastener is longer than manufactured – even if it is only .001," it is in a partially failed condition. Therefore, ARP has engineered its fasteners with the ductility to stretch a given amount and rebound for proper clamping.

Heat, primarily in aluminum, is another problem area. Because the thermal expansion rate of aluminum is far greater than that of steel it is possible to stretch a fastener beyond yield as the aluminum expands under heat. An effective way of counteracting material expansion is through producing a more flexible bolt.

The Torque Angle Method

Since the amount that a bolt or nut advances per degree of rotation is determined by the thread pitch, it would appear that the amount of stretch in a given bolt or stud can be accurately predicted by measuring the degrees of turn from the point where the underside of the bolt head or nut face contacts the work surface. Termed the "torque angle" method, this procedure has long been the standard of civil engineering. It has been suggested that torque angle is a relatively simple and valid procedure to use in our "blind" installations – where it is not possible to physically measure the actual bolt stretch.

ARP has conducted extensive evaluations of the torque angle method. We have concluded that, for our purposes, it is suitable only when individually calibrated for each installation.

Simple calculation of bolt stretch based on thread pitch is not accurate. No material is incompressible. When a bolt or a stud is preloaded or stretched, the components being clamped compress to some small extent. When we are looking for bolt stretch of only a few thousandths of an inch, the amount of clamped material compression becomes a very real factor. Our investigation has proven that installed stretch is dependent, not only on the pitch of the thread and the degree of rotation, but also on the amount of compression of the clamped components, the length of the male fastener, the amount of engaged thread, the type of lubrication and the number of times that the fastener has been cycled. For example, for the same degree of rotation, the actual amount of bolt stretch will be critically different between an aluminum cylinder head and a cast iron cylinder head – or a steel main cap on an aluminum block and a steel main cap on a cast iron block. Further, there is a significant difference between the long and short cylinder head bolts or studs on the same head. The torque angle method can be accurate – but only if each individual installation has been previously calibrated by direct measurement of bolt stretch. When using the torque angle method, it is best to begin rotation from some small measured torque – no more than ten lb./ft. – rather than the first point of contact with the work face. To achieve accuracy it is also best to cycle the fasteners five times before either calibrating or installing.

Using A Torque Wrench

If the stretch method cannot be used in a particular installation, and the fasteners must be installed by torque alone, there are certain factors that should be taken into account. ARP research has verified the following "rules" pertaining to use of a torque wrench:

1. The friction factor changes from one application to the next. That is, the friction is at its highest value when the fastener is first tightened. Each additional time the fastener is torqued and loosened, this value gets smaller. Eventually the friction levels out and becomes constant for all following repetitions. Therefore, new fasteners should be tightened and loosened through several cycles before applying final torque. The number of times depends on the lubricant. For all situations where ARP lubricants are used, five cycles are required before final torquing.

2. The lubricant used is the main factor in determining friction, and therefore, the torque for a particular installation. Motor oil is a commonly used lubricant because of it's ready availability. If less friction is desired in order to install the fasteners with less torque, special low friction lubricants are available. With special lubes, the required torque can be reduced as much as 20 to 30 percent. It is important to keep in mind that the reverse is also true. If the torque value has been specified for a particular fastener on the basis of low friction lube, installing the fastener with motor oil will result in insufficient preload; the torque has to be increased to compensate for the extra friction caused by the motor oil.

3. Surface finish is also important. For example, black oxide behaves differently than a polished fastener. It is therefore important to observe the torque recommendations supplied with each fastener.

NOTE: It is possible for even the most expensive of torque wrenches to lose accuracy. We have seen fluctuations of as much as ten (10) foot pounds of torque from wrench to wrench. Please have your torque wrench checked periodically for accuracy.

The Stretch Gauge

We highly recommend using a stretch gauge when installing rod bolts and other fasteners where it is possible to measure the length of the fastener. It is the most accurate way to determine the correct pre-load in the rod bolt. Simply follow manufacturer's instructions, or use the *chart on page 25 of this catalog* for ARP fasteners. Measure the fastener prior to starting, and monitor overall length during installation. When the bolt has stretched the specified amount, the correct preload, or clamping load, has been applied. We recommend you maintain a chart of all rod bolts, and copy down the length of the fastener prior to and after installation. If there is a permanent increase of .001" in length, or if there is deformation, the bolt should be replaced. *A sample stretch monitoring chart is on page 28.*

see page 88 for complete information on stretch gauges

THE IMPORTANCE OF PROPER ROD BOLT STRETCH/TORQUE...

Whether measured by stretch or by torque, properly preloading a rod bolt is essential for trouble-free performance. If a bolt is installed without sufficient preload (or pre-stretch), every revolution of the crankshaft will cause a separation between the connecting rod and rod cap. This imposes additional stretch in the bolt. The stretch disappears when the load is removed on each revolution, or cycle. Over time, this cycle stretching and relaxing can cause the bolt to fail due to fatigue, just like a paper clip that is bent back and forth by hand. To prevent this condition, the bolt's pre-load must be greater than the load caused by engine operation.

A properly installed bolt remains stretched by its preload and isn't exercised by the cyclic loads imposed on the connecting rod. A quality bolt will stay stretched this way for years without failing. The important thing is to prevent the bolt from failing due to fatigue by tightening it to a load greater than the demand of the engine. Protect your bolts – tighten them as recommended.

You can easily monitor the condition of the rod bolts through use of a stretch gauge, or a micrometer for that matter. Prior to installing the rod, measure the length of the bolt in a "relaxed" (untorqued) state. Write this down. You can make up a chart similar to the one shown on this page to properly keep track of the data. When you tear the engine down for maintenance, again measure the length of each rod bolt – being careful to keep everything in the proper order. If any of the rod bolts have taken a permanent set and have stretched by .001″ or longer you should replace the fastener **IMMEDIATELY!** The stretching is a sure indicator that the bolt has been compromised and taken past its yield point.

In other types of bolted joints, this careful attention to tightening is not as important. For example, flywheel bolts need only be tightened enough to prevent them from working loose. Flywheel loads are carried either by shear pins or by side loads in the bolts; they don't cause cyclic tension loads in the bolts. Connecting rod bolts, on the other hand, support the primary tension loads caused by engine operation and must be protected from cyclic stretching. That's why proper tightening of connecting rod bolts is so important. *See page 25 for recommended stretch and torque.*

Friction is an extremely challenging problem because it is so variable and difficult to control. The best way to avoid the pitfalls of friction is by using the stretch method. This way preload is controlled and independent of friction. Each time the bolt is torqued and loosened, the friction factor gets smaller. Eventually the friction levels out and becomes constant for all following repetitions. Therefore, when installing a new bolt where the stretch method can not be used, the bolt should be tightened and loosened several times before final torque. The number of cycles depends on the lubricant. For ARP recommended lubes, five loosening and tightening cycles is sufficient.

A rod bolt stretch gauge is one of the most important tools a serious engine builder can own. It's valuable in properly setting up a rod for resizing, obtaining the proper torque load when installed in the engine, and monitoring the condition of the bolt while in use.

ROD BOLT STRETCH MONITORING CHART

ROD #1	ROD #2	ROD #3	ROD #4
INSIDE BOLT	*INSIDE BOLT*	*INSIDE BOLT*	*INSIDE BOLT*
IN_____OUT_____	IN_____OUT_____	IN_____OUT_____	IN_____OUT_____
OUTSIDE BOLT	*OUTSIDE BOLT*	*OUTSIDE BOLT*	*OUTSIDE BOLT*
IN_____OUT_____	IN_____OUT_____	IN_____OUT_____	IN_____OUT_____
ROD #5	**ROD #6**	**ROD #7**	**ROD #8**
INSIDE BOLT	*INSIDE BOLT*	*INSIDE BOLT*	*INSIDE BOLT*
IN_____OUT_____	IN_____OUT_____	IN_____OUT_____	IN_____OUT_____
OUTSIDE BOLT	*OUTSIDE BOLT*	*OUTSIDE BOLT*	*OUTSIDE BOLT*
IN_____OUT_____	IN_____OUT_____	IN_____OUT_____	IN_____OUT_____

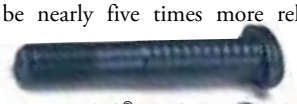
REPLACEMENT CONNECTING ROD BOLTS

Choose From Three ARP Replacement Rod Bolts:

Because factory connecting rods (or aftermarket versions of OEM rods) are used in a variety of applications from rebuilt stock motors to modified powerplants used in circle track, marine and drag racing engines – including those with superchargers and/or nitrous oxide injection systems – ARP offers replacement rod bolts in three different models. All of them are substantially better than the stock OEM and most aftermarket bolts.

GOOD: STANDARD HIGH PERFORMANCE BOLTS

A premium grade 8740 alloy chrome moly steel is used to manufacture ARP High Performance connecting rod bolts. This material is heat-treated to provide a tensile strength in the 200,000 psi range, which is substantially stronger than the OEM bolts. Cycle testing shows ARP High Performance rod bolts to be nearly five times more reliable than stock bolts.



BETTER: WAVE-LOC® HIGH PERFORMANCE BOLTS

The same heat-treated 8740 chrome moly steel is used to make these rod bolts as ARP's standard High Performance rod bolts. The big difference is in the shank design, with ARP's exclusive (and patented) Wave-Loc technology providing substantial benefits. Because there are fairly wide tolerances in factory bolt holes, the bolt must be able to fit snugly and a knurl is applied. Unfortunately, these knurls cut deep into the bolt material, leaving sharp edges and enormous "stress risers" that promote failure. That's why ARP developed the Wave-Loc design that features symmetrical waves and provides an effective interference fit without creating stress risers in the bolt or the rod.

BEST: "PRO" SERIES WAVE-LOC BOLTS

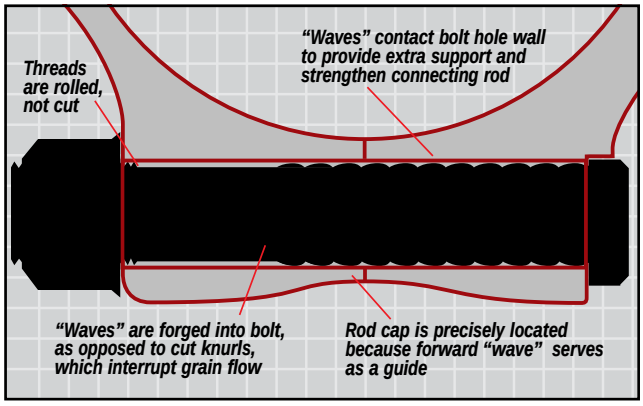
For the most severe applications, in conjunction with aftermarket I-beam rods, ARP has developed the "Pro" Series Wave-Loc bolts. These ultra heavy-duty rod bolts are made from a special material designated ARP2000. It has approximately 200% the fatigue life of 8740 chrome moly steel and has a tensile strength of about 220,000 psi, and is capable of more than 12,000 lbs. clamping force.

TECH NOTE: ROD BOLTS

Unquestionably the most important fasteners in any engine are the connecting rod bolts, as they hold the key to the entire rotating assembly. A broken bolt will lead to catastrophic engine failure. As you can imagine, the most critical joint is where the connecting rod halves mate. The rod bolts must support the primary tension loads caused by each rotation (or cycle) of the crankshaft. When the crank rotates, the big end of the connecting rod essentially becomes oval-shaped and the rod bolts bend. As the crankshaft continues to rotate, the rod becomes round again. With alternating tension loads and cyclic bending of the bolts, it is very important to install fasteners that are able to exert a clamping force greater than the load imposed upon the joint (tension).

In addition to utilizing a rod bolt with sufficient strength to withstand the tremendous cyclical strains placed upon it, it is absolutely imperative that the bolts be properly tightened. The preferred method of monitoring the correct amount of tension is through use of a stretch gauge. This is far more accurate than using a torque wrench. Moreover, through subsequently checking the rod bolts length at tear-downs, it is possible to determine if it has been stressed beyond safe limits and must be replaced.

ADVANTAGES OF WAVE-LOC ROD BOLTS:



- Wave-Loc surface contacts the rod and cap for optimum alignment and reduction of fluctuating stress – which strengthens the rod itself!
- Provides snug fit for all OEM connecting rods despite wide range of factory rod bolt hole tolerances.
- Available for most applications.
- Superior material grain flow because of patented Wave-Loc surface design as compared to knurled bolts that have sharp edges and "built-in" stress risers.
- Galling and scoring of the rod is virtually eliminated because there is only smooth contact and absolutely no "digging."


A

B

C

D

E

F

G

H

I

J

K

L

M

Application **Note:** Please verify rod bolt head style against the photos labeled A-M when replacing rod bolts	Head Style	Hi-Perf 8740 (complete)	Hi-Perf 8740 (2-PC)	HP Wave 8740 (complete)	HP Wave 8740 (2-PC)	Pro Wave ARP2000 (complete)	Pro Wave ARP2000 (2-PC)	Pro Series ARP2000 (complete)	Pro Series ARP2000 (2-PC)
ALFA ROMEO									
2.0L GTV	A	126-6101							
AMC									
258 cid inline 6	D	112-6001							
290-304-343-360 cid 11/32″	D	114-6001							
390 cid (1968-69)	D	114-6004							
390-401 cid (1970 & later) 3/8″	D	114-6002							
BMC/TRIUMPH/ROVER									
A Series 3/8″	J	206-6001	206-6021						
A & B Series 11/32″	C	206-6002							
B Series (1964-68) 18GB & 18GF 3/8″	E	206-6003							
Bonneville 650cc motorcycle (1956-72)		206-6009							
K Series	E	206-6007							
1.3L & 1.5L Spitfire	E							206-6004	
2.0L GT6 & 2.5L TR6	E							206-6005	
2.0L SOHC TR7	K	206-6006							
BMW									
1.6L Mini Cooper M8 x 43MM UHL	E	206-6008							
2.3L (S14) M11 x 41MM UHL	E							201-6104	
2.5L (M50/M50TU) inline 6 M9 x 53MM UHL	E							201-6301	
3.0L (S50 EURO) inline 6 M10 x 45MM UHL	E							201-6102	
3.2L (S54) inline 6 M11 x 47MM UHL	E							201-6103	
4.4L (M62/M62TU) V8 M9 x 53MM UHL	E							201-6302	
BUICK									
90° V6 (cap screw type) 1.500″ UHL	E							123-6001	123-6021
90° V6 (cap screw type) 1.700″ UHL	E							123-6002	123-6022
215 cid aluminum V8	D	124-6001							
350 cid (1968-73) standard 11/32″		124-6002							
350 cid (1968-73) .015 in. oversize 11/32″		124-6003							
400-401-425-430-455 cid	B	125-6001							
CADILLAC									
472-500 cid with 12 pt nuts	D	135-6003							
CHEVROLET, SMALL BLOCK									
7/16″ “K” rod with 12 pt nuts	A	134-6004							
265-283-327 cid (small journal) 11/32″	D	134-6001	134-6021	134-6401	134-6411	234-6401	234-6421		
305-307-327-350 cid (large journal) 3/8″	B	134-6003	134-6023	134-6403	134-6423	234-6403	234-6423		
350 cid PM Rod (1992-97) LT1/LT4	B	134-6005							
383 Stroker w/ 350 rod (extra head clearance)	A	134-6027							
400 cid	A	134-6002	134-6022	134-6402	134-6422	234-6402	234-6422		
Gen III/LS Series small block (except LS7) “Cracked Cap Design”	E	134-6006	134-6026					234-6301	234-6321
CHEVROLET, BIG BLOCK									
396-402-427-454 cid 3/8″	A	135-6002	135-6022	135-6402	135-6422	235-6402	235-6422		
409 cid	B	134-6003	134-6023	134-6403	134-6423	234-6403	234-6423		
454-502 cid 7/16″	A	135-6001	135-6021	135-6401	135-6421	235-6401	235-6421		
454-502 cid 7/16″ with 12 pt nuts	A					235-6403	235-6423		
CHEVROLET, 4 AND 6-CYLINDER									
140-145-164 cid Corvair 5/16″	D			132-6002	132-6022				
194-230-250 cid inline 6	D	132-6001	132-6021						
120-140 cid 4-cylinder Vega	D	131-6001	131-6021						
2.8L 60° V6	D	133-6002	133-6022						
4.3L 90° V6	A	133-6001	133-6021						
CHRYSLER									
2.2L & 2.5L 4-cylinder	D	141-6001	141-6021	141-6401					
170-225 cid Slant Six (1976 & earlier)	F	142-6001							
225 cid Slant Six (1977 & later)	D	142-6002							
318-340-360 Wedge & 318-360 Magnun	D	144-6001	144-6021	144-6401	144-6421	244-6401	244-6421		
383-400-413-440 Wedge & 354-392 Hemi	D	145-6002	145-6022	145-6402		245-6402	245-6422		
426 factory Hemi 7/16″	M	145-6001	145-6021						
FORD, SMALL BLOCK									
239-256-272-292 Y block (rod marked EBU)	M	154-6005							
239-256-272-292 Y block (rod marked ECZ)	F	154-6004	154-6024						
289-302 cid standard 5/16″	B	154-6002	154-6022	154-6402	154-6422	254-6402	254-6422		

Red part numbers indicate new items

Application **Note:** Please verify rod bolt head style against the photos labeled A-M when replacing rod bolts	Head Style	Hi-Perf 8740 (complete)	Hi-Perf 8740 (2-PC)	HP Wave 8740 (complete)	HP Wave 8740 (2-PC)	Pro Wave ARP2000 (complete)	Pro Wave ARP2000 (2-PC)	Pro Series ARP2000 (complete)	Pro Series ARP2000 (2-PC)
FORD, SMALL BLOCK (CONTINUED)									
302 cid Sportsman SVO 3/8″	M	150-6005	150-6025						
312 cid	F	154-6004	154-6024						
351 Cleveland	C	154-6003	154-6023	154-6403	154-6423	254-6403	254-6423		
351-400M	C	154-6001	154-6021	154-6401	154-6421				
Boss 302 & 351W	C	150-6004	150-6024	150-6404	150-6424	250-6404	250-6424		
351W with square head rod bolt	M	154-6006							
FORD, BIG BLOCK									
390-406-410-427-428 cid FE Series	G	155-6002	155-6022			255-6402	255-6422		
427 LeMans	E	200-6001	200-6021						
428 Cobra Jet (replacement for 13/32″ bolt)	A	155-6001	155-6021						
429-460 cid	M	155-6003	155-6023						
Boss 429-460	C	150-6004	150-6024	150-6404	150-6424	250-6404	250-6424		
FORD, 4 AND 6-CYLINDER									
1.6L CVH M8	E	151-6004							
1.6L Zetec (E) M8	E	151-6003	151-6023						
1.8L Duratec	E							251-6202	
2.0L DOHC Cosworth Sierra/Escort	E							251-6301	
2.0L RS 2000 M8	E							251-6201	251-6222
2.0L Zetec M9	E	151-6005							
2000cc Pinto	D	151-6001	151-6021						
2300cc Pinto	F	151-6002	151-6022			251-6402	251-6422		
2.8L & 2.9L V6	B	153-6001							
3.8L V6 Super Coupe T-bird	C	153-6002	153-6022						
240-300 cid inline 6	G	152-6001							
4.9L inline 6	C	152-6002							
FORD, MODULAR									
4.6L & 5.4L	E							256-6301	
HOLDEN									
11/32″	B	205-6002							
3/8″	B	205-6001							
HONDA/ACURA									
1.2L, 1.6L & 1.8L M8	A	208-6001							
1.6L & 1.8L M9	A							208-6401	
2.0L (F20C) & 2.2L (F22C) S2000	E							208-6002	
2.0L (K20A)	E							208-6003	
3.0L (C30A) V6 Acura NSX M9								208-6004	
3.2L (C32B) V6 Acura NSX M8								208-6005	
LANCIA									
2.0L SOHC 8V & DOHC 16V Turbo	E							275-6001	
MAZDA									
1.6L (B6) & 1.8L (BP) DOHC Miata M9	K	118-6401							
MITSUBISHI									
2.0L (4B11) (2008 & later)	E							207-6002	
2.0L (4G63) (1993 & earlier) M9	C	107-6001	107-6021						
2.0L (4G63) (1994-07) M8	A	107-6002	107-6022						
2.6L (G54B)	C	107-6003	107-6023						
3.0L (6G72) & 3.5L (6G74) V6	C	107-6004	107-6024						
NISSAN/DATSUN									
A Series (A12-A12A-A13-A14-A15)	A	102-6002							
L16 Series M8	C	102-6001							
L20 Series 4-cylinder & 2.2L (Z22) M9	C	202-6001							
L24 Series (early) inline 6 M8	C	202-6002							
L24 (late), L26 & L28 Series inline 6 M9	C	202-6003							
2.0L (SR20DE/DET) 11/32″	C	202-6005							
3.0L (VG30E/ET) SOHC V6 M9	C	202-6003							
3.0L (VG30D/DET/DETT) DOHC V6 11/32″	C	202-6004							
3.5L (VQ35) DOHC V6 M8	E							202-6006	
OLDSMOBILE									
2.3L & 2.4L Quad 4	I	181-6001							
307-350-403-425 cid	A	184-6001	184-6021						
455 cid	F	185-6001	185-6021						

Red part numbers indicate new items

Application **Note:** Please verify rod bolt head style against the photos labeled A-M when replacing rod bolts	Head Style	Hi-Perf 8740 (complete)	Hi-Perf 8740 (2-PC)	HP Wave 8740 (complete)	HP Wave 8740 (2-PC)	Pro Wave ARP2000 (complete)	Pro Wave ARP2000 (2-PC)	Pro Series ARP2000 (complete)	Pro Series ARP2000 (2-PC)
OPEL/VAUXHALL									
1.4L & 1.6L 8V M8	E	109-6002							
1.4L 16V M9	E	109-6003							
2.0L 16V M9	E	109-6001						209-6003	
PEUGEOT									
205 & 306	M	117-6101							
PONTIAC									
151 cid (Iron Duke) 4-cylinder 11/32″	D	191-6001							
3800 V6 (cap screw type) 1.700″ UHL	E							123-6002	123-6022
301 cid	D	194-6001							
287-317-347-370-389 cid (1955-62)	D	190-6002	190-6022						
326-389-400-455 cid (1963 & later) 3/8″	I	190-6001	190-6021						
455 Super Duty 7/16″	M	190-6003	190-6023						
455 Super Duty (cap screw type) 7/16-24	E	190-6004							
PORSCHE									
RSR Ti rod	H					204-6004			
1.7L & 2.0L Type IV	K	104-6006							
2.0L 911S (1969)	H					204-6003			
911, 930 Turbo & 933 M9	H					204-6005			
911 M10	H					204-6001			
944	K					204-6002			
RENAULT									
Clio (F4R) 16V M9	E							216-6301	
R5 Turbo (Mid-Engine)	E							216-6302	
R12 Gordini/Alpine (807g)	E	116-6001							
SUBARU									
1.8L (EJ18) & 2.2L (EJ22) SOHC, 2.5L (EJ25) SOHC/DOHC non turbo & 2.0L (EJ20) DOHC Turbo	I					260-6301			
2.5L (EJ25) DOHC Turbo	E							260-6302	
TOYOTA									
1.6L (4AGE) DOHC & 1.6L (4ALC) SOHC M9	A	203-6001							
1.6L (2TC/2TG) & 1.8L (3TC)	A	203-6003							
2.0L (3SGTE) & 2.4L (22R)	A	203-6002							
3.0L (7MGTE) inline 6 (1986-92) Supra	A	203-6004							
3.0L (2JZGE/GTE) inline 6 (1993-98) Supra	E							203-6005	
VOLKSWAGEN/AUDI									
Audi 5-cylinder	L							104-6007	
Formula Vee (cap screw type) M9	E	104-6005	104-6025						
Super Vee (cap screw type) Audi-style rod	E							104-6003	104-6023
1600cc air cooled	K	104-6001							
1600cc water-cooled Rabbit & Corrado G60	K	104-6002							
1.8L & 2.0L water cooled	L			104-6004	104-6024				
2.7L (APB/BEL) Turbo & 2.8L (AFC/ACK/AHA/ATQ) Non Turbo V6	E							204-6201	
2.8L & 2.9L VR6	E							204-6006	

Red part numbers indicate new items

2008 UIM P1 world champion

Corey Kruseman - Team owner and 2006 USAC Champion

HOW TO: INSTALL CAP-STYLE ROD BOLTS

Replace your original connecting rod cap screws with these ARP products for enhanced durability and improved strength. Use whenever cap screw-style bolts are used for rod cap retention.

TECH TIP

Be sure the torque spec used when *re-sizing* a rod **and** final engine *assembly* are the **same**. Communicate with your machinist! Use a stretch gauge for both functions, if possible.

***NOTE*: The only way to know if a bolt is ready to fail is if it has permanently yielded .001" or more.** *See page 27.*

1. Clean and inspect all hardware for obvious damage. If necessary, chase or re-tap con rod threads to ensure proper thread engagement and accurate torque readings.

2. Position washer under bolt head to ensure it clears the under head radius. NOTE: Improper installation will cause premature bolt failure.

3. Assemble cap to rod, then lubricate with ARP Moly lube and install bolt & washer. Measure pre-torqued bolt length. You should keep a log of the original free standing length. *A sample is on page 28.*

4. Using a stretch gauge or micrometer to measure fastener stretch, torque rod bolt until recommended bolt stretch is achieved. *A rod bolt stretch chart is on page 25.*

5. Once properly preloaded, have the rods resized before assembling them to the pistons, then install in engine using the prescribed bolt-stretch method.

HOW TO: INSTALL OEM-STYLE ROD BOLTS

Improved reliability and optimum strength are the main attributes of ARP's replacement rod bolts. These are the finest fasteners available today, and are recommended for all high performance applications.

TECH TIP

Be sure the torque spec used when *re-sizing* a rod **and** final engine *assembly* are the **same**. Communicate with your machinist! Use a stretch gauge for both functions, if possible.

1. Inspect rods to ensure there is adequate chamfer to clear radius under heads, then install bolts after inspecting for damaged hardware.

2. Reinstall the rod cap, then measure bolt length using a micrometer (free standing length).

3. Lubricate rod nuts with ARP Moly lube, torque nuts to achieve recommended bolt stretch. *A rod bolt stretch chart is located on page 25.*

4. With proper preload applied, have rods resized. This procedure is recommended any time rod bolts are replaced.

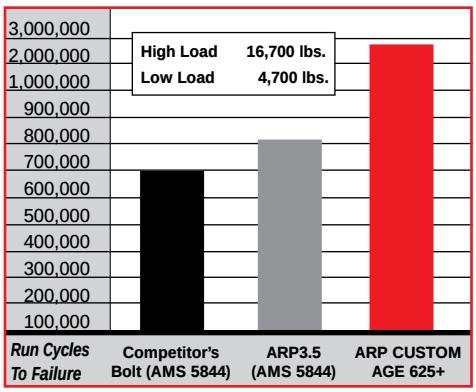
5. Install rod and piston assemblies in engine using the prescribed bolt stretch method or by following recommended torque values.

PRO SERIES CONNECTING ROD BOLTS

A large number of connecting rod manufacturers have chosen ARP bolts as standard equipment. They're proud to advertise their products as being equipped with ARP rod bolts. And for good reason. The "weak link" in a connecting rod has always been the bolt, and racers know that nobody builds a better bolt than ARP. However, it is critically important to monitor the stretch of each bolt and replace it when it has permanently elongated by .001″. Below you will find an extensive listing of aftermarket connecting rods and replacement bolt specifications.

In some instances, you may want to go to an ARP rod bolt made from a better grade of material. This will provide you with improved reliability. However, please understand that when you want bolts made from exotic, super high strength materials, the cost will increase significantly. If you're on a budget, it's best to go with the most cost-effective solution. This is typically defined by the loads that are carried by the bolts in terms of piston/rod weight and the rotational speed of the engine. The most cost effective design is the one in which the bolt strength is just great enough to handle its anticipated load – plus a safety margin for the occasional overloads. Using a material which has far more strength than required is not as cost effective – but will definitely give you an extra margin of safety and longer service life.

You should also know that ARP rod bolts are superior to those from other manufacturers. Especially in the area of fatigue strength. Testing has shown ARP rod bolts to have ten times the fatigue strength of other bolts. In the chart below, you'll find a bar chart that graphically shows the difference between ARP Pro Series rod bolts and the fastener made by a leading competitor. It's easy to see why ARP bolts are superior. As such, it makes good sense to rely on ARP for optimum connecting rod service and reliability. Make the most of your racing budget and rely on ARP rod bolts. You'll find the ARP name proudly stamped on each bolt as your assurance of quality.



- *Forged in-house at ARP using only the finest quality materials*
- *Heat-treated using special vertical racks to assure complete 360° penetration*
- *Threads rolled after heat-treat to provide up to 10-times longer fatigue strength*
- *Precision CNC-machined to exacting specifications*
- *Specially designed for optimum reliability in each application*

ARP connecting rod bolts are used in everything from exotic 18,000 rpm Formula 1 engines to 6,000 horsepower nitro-burning Top Fuel motors

It's important to note that a number of premium quality connecting rods come from their respective manufacturers with ARP rod bolts as standard equipment. We are pleased to consider these key firms our "Performance Partners" and embarked upon a program to recognize this alliance. ARP also manufactures replacement connecting rod bolts for products from other firms. We feel that our fasteners are substantially better than those OEM offerings, and they will serve to increase the durability and service life of these rods. For information pertaining to obtaining replacement bolts for these rods, contact our tech department.

Application	Material	UHL (in.)	Thread Dia. (in.)	Wrench Dia. (in.)	Set Qty	Complete Set	2-Piece Pack
Ford 427 (LeMans) and general replacement for aluminum rods, w/ washer	8740	1.800	7/16	7/16	16	200-6001	200-6021
Venolia, BRC, aluminum rod replacement, with washer	8740	1.800	7/16	7/16	16	200-6002	200-6022
Manley Elgin replacement	8740	1.800	7/16	7/16	16	200-6003	200-6023
General replacement, aluminum rods, with washers, under cut	8740	2.000	7/16	7/16	16	200-6004	200-6024
Manley replacement	8740	1.600	7/16	7/16	16	200-6006	200-6026
Manley replacement, rod part number 14051 and 14055	ARP2000	1.850	7/16	7/16	16	200-6201	200-6221
Carrillo replacement for CARR bolt, with washers	ARP2000	1.800	7/16	1/2	16	200-6202	200-6222
Carrillo replacement for H-bolt, without washers	L19	1.725	7/16	1/2	16	200-6203	200-6223
Lentz replacement with washers	ARP2000	1.800	7/16	1/2	16	200-6204	200-6224
Lentz replacement without washers	ARP2000	1.725	7/16	1/2	16	200-6205	200-6225
Venolia, Brooks, KB, Aluminum rod replacement with washer	ARP2000	2.000	7/16	1/2	16	200-6206	200-6226
General replacement, steel rods	ARP2000	1.600	3/8	7/16	8	200-6209	200-6219
General replacement, steel rods	ARP2000	1.500	5/16	3/8	8	200-6210	200-6220
Venolia, Brooks, KB, BRC, Aluminum rod replacement with washer	L19	2.000	7/16	1/2	16	200-6506	200-6526
Venolia, Brooks, KB, Aluminum rod replacement with washer	Custom Age 625+	2.000	7/16	1/2	16	300-6706	300-6726
Carrillo, Lentz, Ferrea replacement without washer	ARP3.5	1.750	7/16	1/2	16	300-6601	300-6621
Carrillo, Lentz, Ferrea replacement without washer	Custom Age 625+	1.750	7/16	1/2	16	300-6701	300-6721
Carrillo replacement	ARP3.5	1.600	3/8	7/16	16	300-6602	300-6622
Carrillo replacement	Custom Age 625+	1.600	3/8	7/16	16	300-6702	300-6722
Carrillo replacement	ARP3.5	1.600	3/8	7/16	8	300-6603	300-6623
Carrillo replacement	Custom Age 625+	1.600	3/8	7/16	8	300-6703	300-6723
Carrillo replacement	ARP3.5	1.500	5/16	3/8	8	300-6608	300-6628
Carrillo replacement	Custom Age 625+	1.500	5/16	3/8	8	300-6708	300-6728
General replacement, steel rods	ARP2000	1.500	3/8	7/16	8	200-6207	200-6227
General replacement, steel rods	ARP2000	1.750	3/8	7/16	8	200-6208	200-6228
General replacement	Custom Age 625+	1.500	3/8	7/16	8	300-6704	300-6724

MATERIALS USED IN THE MANUFACTURE OF CAP SCREW TYPE CONNECTING ROD BOLTS

8740 CHROME MOLY: Until the development of today's modern alloys, chrome moly was popularly considered a high strength material. Now viewed as only moderate strength, 8740 chrome moly is seen as a good tough steel, with adequate fatigue properties for most racing applications, but only if the threads are rolled after heat-treatment, as is the standard ARP production practice. Typically, chrome moly is classified as a quench and temper steel, that can be heat-treated to deliver tensile strengths between 180,000 and 210,000 psi.

AERMET 100: With a typical tensile strength of 280,000 psi, Aermet 100 is a new martensitic super-alloy that is stronger and less expensive than the super-alloy austenitic materials that follow. Because it is capable of achieving incredibly high clamping loads, it is ideal for short but extreme environments like top fuel, funny car and some short track applications. Although Aermet 100 is a maraging steel that is far superior to other high strength steels in its resistance to stress corrosion, it must be kept well-oiled and not exposed to moisture.

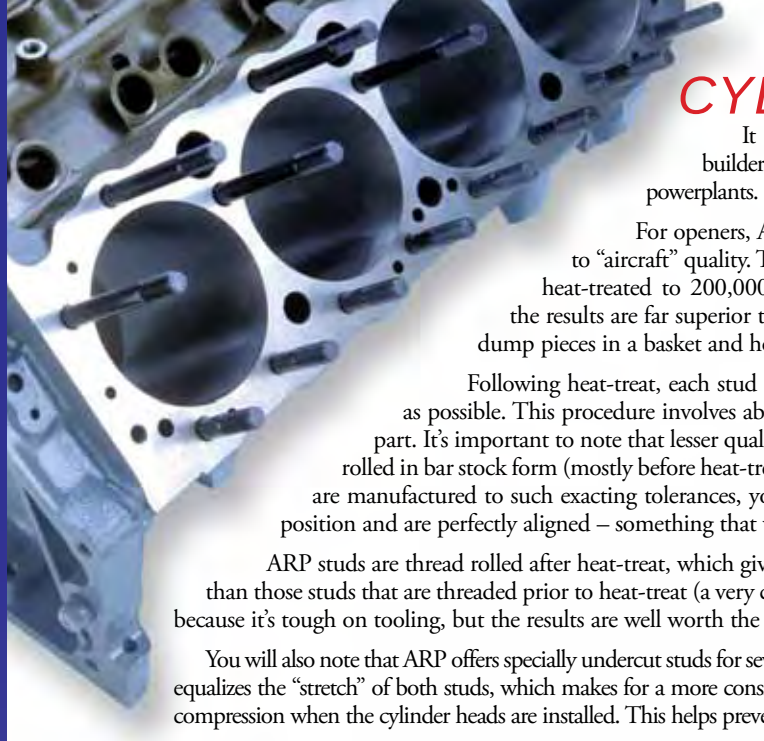
ARP2000: An exclusive, hybrid-alloy developed to deliver superior strength and better fatigue properties. While 8740 and ARP2000 share similar characteristics – ARP2000 is capable of achieving a clamp load at 220,000 psi. ARP2000 is used widely in short track and drag racing as an up-grade from 8740 chrome moly in both steel and aluminum rods. Stress corrosion and hydrogen embrittlement are typically not a problem, providing care is taken during installation.

L19: This is a premium steel that is processed to deliver superior strength and fatigue properties. L19 is a very high strength material compared to 8740 and ARP2000 and is capable of delivering a clamp load at 260,000 psi. It is primarily used in short track and drag racing applications where inertia loads exceed the clamping capability of ARP2000. Like most high strength, quench and temper steels – L19 requires special care during manufacturing to avoid hydrogen embrittlement. This material is easily contaminated and subject to stress corrosion. It must be kept well-oiled and not exposed to moisture.

INCONEL 718: A nickel based material that is in the high temperature, super-alloy class, it is found to be equally suitable in lower temperature applications. This material delivers tensile strengths into the 220,000 psi range and exhibits improved fatigue properties. Best of all, Inconel 718 is completely immune to hydrogen embrittlement and corrosion.

ARP3.5 (AMS5844): While similar to Inconel 718, these super-alloys are found in many jet engine and aerospace applications where heat and stress attack the life of critical components. The high cobalt content of this alloy, while expensive, delivers a material with superior fatigue characteristics and typically tensile strength in the 260,000 psi range. The immunity to hydrogen embrittlement and corrosion of these materials is a significant design consideration. These materials are primarily used in connecting rods where extremely high loads, high RPM and endurance are important factors – Formula 1, Winston Cup and CART applications.

CUSTOM AGE 625 PLUS: This newly formulated super-alloy demonstrates superior fatigue cycle life, tensile strength and toughness – with complete resistance to atmospheric corrosion and oxidation. ARP is the first to develop manufacturing and testing processes for fasteners with Custom Age 625+. Best of all it is less expensive and expected to soon replace MP-35 as the material of choice in the high strength, super-alloy field. Typical tensile strength is 260,000 psi.



CYLINDER HEAD STUDS

It is for good reason that virtually every top professional engine builder relies on ARP Pro Series head studs for their all-out competition powerplants. Simply stated, there's not a better stud setup on the market today.

For openers, ARP uses a premium grade 8740 alloy that is rated far superior to "aircraft" quality. Then, each stud is placed vertically in special racks and precisely heat-treated to 200,000 psi. This procedure ensures complete heat penetration and the results are far superior to those lesser quality studs from other manufacturers who just dump pieces in a basket and hope for the best.

Following heat-treat, each stud is centerless ground to make it as close to perfectly concentric as possible. This procedure involves about ten very slight cuts and results in an exceptionally straight part. It's important to note that lesser quality studs are not even centerless ground – the material is thread rolled in bar stock form (mostly before heat-treat, when the material is easier to machine). Because ARP studs are manufactured to such exacting tolerances, you will note that gaskets and cylinder heads literally glide into position and are perfectly aligned – something that won't happen with inferior quality head studs.

ARP studs are thread rolled after heat-treat, which gives them about 1000% (that's ten times) better fatigue strength than those studs that are threaded prior to heat-treat (a very common industry practice). It costs a lot more to do it this way, because it's tough on tooling, but the results are well worth the extra effort.

You will also note that ARP offers specially undercut studs for several engines. This procedure (done only to the shorter studs) more equalizes the "stretch" of both studs, which makes for a more consistent clamping force – and one that compensates for head gasket compression when the cylinder heads are installed. This helps prevent blown head gaskets, and assures optimum engine sealing!

Premium quality heat-treated 8740 chrome moly steel head stud kits are available for most every domestic and import applications. You won't find a better quality stud on the market from any other source. Look for ARP stamped on each stud as your assurance of quality.

Clearly, they are the best on the market today, and the favorite of leading professional engine builders in all forms of racing.

HEAD STUDS vs. BOLTS... A TECHNICAL DISCUSSION

ARP's factory Tech Representatives are often asked which is better, cylinder head studs or bolts. The answer, invariably, depends on the installation. On many street-driven vehicles, where master cylinders and other items protrude into the engine compartment, it's probably necessary to use head bolts so that the cylinder heads can be removed with the engine in the car.

For most applications, however, studs are recommended. And for good reason. Using studs will make it much easier to assemble an engine (especially a racing powerplant which must be serviced frequently and quickly!) with the cylinder head and gasket assured of proper alignment.

Studs also provide more accurate and consistent torque loading. Here's why. When you use bolts to secure the head, the fastener is actually being "twisted" while it's being torqued to the proper reading. Accordingly, the bolt is reacting to two different forces simultaneously. A stud should be installed in a "relaxed" mode – never crank it in tightly using a jammed nut.

If everything is right, the stud should be installed finger tight. Then, when applying torque to the nut, the stud will stretch only on the vertical axis. Remember, an undercut shorter stud will have a rate similar to a longer, standard shank stud. This provides a more even clamping force on the head. Because the head gasket will compress upon initial torquing, make sure studs and bolts are re-torqued after the engine has been run.

Application	Hex Nuts	Hex Nuts U/C Studs	12-Point Nuts	12-Point Nuts U/C Studs
AMC				
258 cid inline 6	112-4001			
290-343-390 cid (1969 & earlier) 7/16"	114-4001		114-4201	
304-360-390-401 cid (1970 & later) 1/2"	114-4002		114-4202	
401 cid with Indy heads			114-4203	
BMC/TRIUMPH				
A Series, 9 studs			206-4201	
A Series, 11 studs			206-4204	
A Series, 11 studs, shaved head			206-4206	
B Series			206-4202	
1.3L & 1.5L Spitfire			206-4203	
2.0L GT6 & 2.5L TR6			206-4205	
2.0L SOHC TR7				206-4208
2.1L TR4			206-4207	
BMW				
2002 Coupe, 318i, 320i 4-cylinder				201-4601
530, 535, 635, 735				201-4602
2.5L (M50), 3.0L (S50US) & 3.2L (S52US) inline 6 ARP2000			201-4302	
E46 M3/S54 inline 6 ARP2000			201-4303	
Mini Cooper			201-4301	
BUICK				
V6 Stage I (1977-85)	123-4001		123-4201	
V6 Grand National and T-Type (1986-87)	123-4003		123-4203	

Red part numbers indicate new items

Application	Hex Nuts	Hex Nuts U/C Studs	12-Point Nuts	12-Point Nuts U/C Studs
BUICK (CONTINUED)				
V6 with 1986-87' block and GN1 Champion heads			223-4204	
V6 Stage II	223-4002		223-4202	
V6 Stage II with Champion heads			223-4203	
215 cid	124-4002		124-4202	
215 cid, Rover V8	124-4003			
350 cid	124-4001		124-4201	
401-425 cid, nail head	124-4004		124-4204	
455 cid	125-4001		125-4201	
CADILLAC				
472-500 cid with 6 & 12 pt nuts for clearance	135-4007			
CHEVROLET, SMALL BLOCK				
23° OEM cast iron and aluminum Chevrolet, Gen III Vortec/Truck; LT1 Airflow Research, Brownfield; Brodix -8,-10,-11, Track I, Dart Sportsman and Dart II & most Edelbrock, Trick Flow	134-4001	234-4401	234-4301	234-4601
18° standard port	234-4107	234-4507	234-4307	234-4707
18° raised port	234-4108	234-4508	234-4308	234-4708
18° with raised intake 3/8˝ #10134363 and 64			234-4321	234-4721
with Bowtie aluminum and cast block, .950, coarse thread			234-4320	234-4720
18° with 3/8˝ holes			234-4322	
18° Chevy heads, w/ Brodix, Rodeck aluminum block			234-4710	
7/16˝-3/8˝ stepped	234-4015		234-4315	
Aluminum Block with Brodix -12 & 12x heads	234-4123			
Aluminum Bowtie splayed bolt head			234-4213	
Brodix, -12, and Brodix 18°	234-4103	234-4503	234-4303	234-4703
Brodix, -12 rollover (angle mill)			234-4311	
Brodix, 18° rollover			234-4310	
Brodix, -18c,-18x with 3/8" step stud			234-4727	
Brodix, canted valve			234-4312	
Brodix-Pontiac raised port	234-4106	234-4506	234-4306	234-4706
Brodix-Pontiac standard port	234-4105	234-4505	234-4305	234-4705
Brodix, w/ -8, 10, 11, 11x, Track 1 heads, w/ Brodix, Rodeck aluminum block			134-4301	
Brodix, w/ 12x, 12RP/GB2000 heads, w/ Brodix, Rodeck aluminum block			134-4302	
Brodix, w/ 23° production style heads, w/ Brodix, Rodeck aluminum block			134-4303	
Brodix, w/ Brodix Weld-Tech Jones GB2200 heads, w/ Brodix, Rodeck aluminum block			134-4304	
Brodix, w/ BD1010 & BD2000 heads, w/ Brodix, Rodeck aluminum block			134-4305	
Brodix, All Pro heads, w/ Brodix, Rodeck aluminum block			134-4306	
Brodix, w/ 12/18° WT/Clone Brodix head 3/8 ctr bolt holes, w/ Brodix, Rodeck aluminum block			134-4307	
Brodix, w 12/18° Brodix head, 7/16˝ studs, w/ Brodix, Rodeck aluminum block			134-4308	
Brodix, w/ Weld-Tech Jones GB2300 heads, w/ Brodix, Rodeck aluminum block			134-4309	
Brodix , w/ 16° Brodix head, w/ Brodix, Rodeck aluminum block				234-4726
Brodix canted valve head, w/ Brodix, Rodeck aluminum block			234-4711	
Bowtie Block with 14° Pro Action head			234-4725	
Bowtie cast iron and aluminum block with Brodix 12 Weld-Tech				234-4723
Dart II, Brodix Track I, 23° Pro Action, Iron Eagle II, iron block	234-4109	234-4509	234-4309	234-4709
Dart, 18°			234-4323	
Dart, 18° II Generation steel block	234-4036		234-4336	
Dart, Buick	234-4102	234-4502	234-4302	234-4702
Dart, Oldsmobile 14°	234-4104	234-4504	234-4304	234-4704
Dart Sportsman, .950, coarse thread	134-4002	234-4402	234-4332	234-4602
Pro Action 14°			234-4334	
Pro Action 14° Tall Deck			234-4335	
Pro Action head			234-4333	234-4433
SBC w/ -12 aluminum block			234-4324	
SB2				234-4722
SB2, Brodix, Rodeck aluminum block			134-4310	
SB2-2 7/16˝ block w/ 220 ksi			234-4724	
SB2-2 3/8˝ block w/ 220 ksi			300-4202	
SB2-2 3/8˝ block w/ 260 ksi			300-4201	
Gen III/LS Series small block (2003 & earlier)	234-4110		234-4316	
Gen III/LS Series small block (2004 & later) w/ all same length studs			234-4317	
Gen III/LSX small block ARP 2000			234-4319	
CHEVROLET, BIG BLOCK				
348-409 cid	135-4002		235-4202	
396-402-427-454 Cast iron OEM, Mark IV, aluminum factory heads, also early Bowtie	135-4001	235-4401	235-4201	235-4601
Bowtie	235-4110		235-4310	
Late Bowtie, Dart Merlin, iron and aluminum Dart 360, Edelbrock, Dart Pro 1, AFR, Profiler 24° long exhaust studs, **ONLY 8 PIECES** (with nuts and washers)	235-4103 235-4106	235-4503	235-4303 235-4306	235-4703
Brodix, -2, -4, 2x, 3x, Canfield, Holley, Big Duke	235-4102	235-4502	235-4302	235-4702
With Edelbrock Performer RPM heads, Pro Top Line	235-4018	235-4518	235-4318	235-4718
With Edelbrock Victor heads	235-4019	235-4519	235-4319	235-4719
Brodix, Pontiac Pro Stock	235-4107	235-4507	235-4307	235-4707
Symetrical-spread port Chevy	235-4104	235-4504	235-4304	235-4704
With GM aluminum block, 7/16˝ diameter	135-4005	235-4505	135-4205	235-4705
With GM aluminum block, 1/2˝ diameter	135-4006	235-4506	135-4206	235-4706
Dart Big Chief	235-4112	235-4512	235-4312	235-4712
Oldsmobile DRCE	235-4109	235-4509	235-4309	235-4709

Red part numbers indicate new items

Application	Hex Nuts	Hex Nuts U/C Studs	12-Point Nuts	12-Point Nuts U/C Studs
CHEVROLET, BIG BLOCK (CONTINUED)				
Mark V, Mark VI with Brodix/Canfield heads	235-4114	235-4514	235-4314	235-4714
Mark V, Mark VI crate with Dart or AFR heads	235-4113	235-4513	235-4313	235-4713
Mark V, with Mark V heads or Edelbrock heads	235-4108	235-4508	235-4308	235-4708
Merlin - World	235-4016		235-4316	235-4716
Brodix, 14.5°			235-4320	
Brodix, Sonny Lenard 14.5° Pro Stock head & PS head, w/ Brodix aluminum block			135-4301	
Brodix, fits BB1 OEFI, 2, 2t, 2x, 2extra, 3, 4, 4extra, 5 heads, w/ Brodix aluminum block			135-4302	
Brodix, w/ Dart Pro 1 or 360 heads, Pro Top Line, w/ Brodix aluminum block			135-4303	
Brodix, w/ Big Duke/Big Chief heads, w/ Brodix aluminum block			135-4304	
ZL1 Limited Edition, block #12370850, head #12363390/392/399			235-4321	
CHEVROLET, 4 AND 6-CYLINDER				
GM 2.2L Ecotec				231-4701
GMC Vega 140	131-4002			
Inline 4-cylinder (1962 & later)	131-4001		131-4201	
Inline 6-cylinder (1962 & later)	132-4001		132-4201	
2.8L 60° V6 M11	233-4003		233-4303	
4.3L 90° V6	233-4001	233-4401	233-4301	233-4601
4.3L 90° V6 with 18° raised port	233-4108	233-4508	233-4308	233-4708
4.3L 90° V6 with 18° standard port	233-4107	233-4507	233-4307	233-4707
4.3L 90° V6 with Oldsmobile 14° heads	233-4104	233-4504	233-4304	233-4704
4.3L 90° V6 with Pontiac raised runner	233-4102	233-4502	233-4302	233-4702
CHRYSLER, SMALL BLOCK				
273-318-340-360 Wedge	144-4001		144-4201	
318-340-360 Wedge with W2 or W-2 Econo heads	144-4002		144-4202	
318-340-360 Wedge with W-5 or W-7 heads & 318-360 Magnum with factory or Edelbrock Magnum heads	144-4003		144-4203	
318-340-360 Wedge with Edelbrock RPM heads	144-4005			
318-340-360 Wedge with B1-BS heads	144-4004		144-4204	
5.7L & 6.1L Hemi			244-4300	
CHRYSLER, BIG BLOCK				
383-400-413-426-440 Wedge with factory heads or Edelbrock RPM heads	145-4006		145-4206	
383-400-413-426-440 Wedge with B-1 heads	145-4007		245-4307	
383-400-413-426-440 Wedge with Koffel BTS full	145-4012			
383-400-413-426-440 Wedge with Indy 440 heads	145-4011		245-4311	
331-354-392 factory Hemi & Edelbrock RPM heads	145-4001		145-4201	
426 factory Hemi & 426-472-528 Hemi Crate Motor 7/16˝	145-4003		245-4203	
426 factory Hemi (modified for 1/2˝)	145-4002		245-4202	
KB Hemi, inner			245-4306	
KB Hemi, short deck, 1/2˝			245-4308	
KB Hemi, standard deck, 1/2˝	245-4005		245-4305	
KB Hemi, long deck, 1/2˝			245-4309	
KB Hemi, standard deck, 9/16˝			245-4310	245-4710
CHRYSLER, 4 AND 6-CYLINDER				
2.2L 4 cylinder (non-turbo only) M11		241-4501		241-4701
170-225 cid Slant Six	142-4001			
DIESEL				
Chevy GMC 6.2L M12	130-4062			
Chevy Duramax 6.6L (2001& later) (LB7/LLY/LBZ/LMN) ARP2000			230-4201	
Chevy Duramax 6.6L (2001& later) (LB7/LLY/LBZ/LMN) Custom Age			230-4202	
Dodge Cummins 5.9L 12V (1989-98) ARP2000			247-4203	
Dodge Cummins 5.9L 12V (1989-98) Custom Age			247-4205	
Dodge Cummins 5.9L 24V (1998 & later) ARP2000			247-4202	
Dodge Cummins 5.9L 24V (1998 & later) Custom Age			247-4204	
Ford 6.9L International	150-4069			
Ford 6.0L Powerstroke ARP2000			250-4202	
Ford 7.3L Powerstroke (1993-03) ARP2000			250-4201	
Oldsmobile 5.7L , 350 cid	184-4003			
DODGE				
2.0L SOHC Neon, block #4667642, head #4556737			141-4203	
2.0L DOHC Neon, block #4667642, head #4667086			141-4202	
2.4L DOHC, block #4621443/445, head #4667086			141-4204	
3.0L (6G72) DOHC ARP2000				207-4205
Viper Gen II (1996-03) ARP2000			247-4201	
FORD, SMALL BLOCK				
289-302, 5.0L with factory heads or AFR 185 with 7/16˝ holes	154-4001	254-4401	154-4201	254-4701
289-302, 5.0L with 351 Windsor head, 7/16˝-14 cylinder block thread M-6049-J302, SVO high port & M-6049-L302, AFR 185 with 1/2" holes Edelbrock aluminum , GT-40 style with insert "T" washer	154-4005	254-4405	154-4205	254-4705
Boss 302	154-4002		154-4202	
351 Windsor with factory heads, M-6049-J302, SVO high port and M-6049-L302 GT-40 style, Edelbrock aluminum and Iron Dart with 1/2-13 cylinder block threads	154-4003	254-4503	154-4203	254-4703
351 Cleveland, 351-400M	154-4004		154-4204	
351 SVO and Fontana aluminum blocks w/'94 or later Yates heads	254-4102	254-4101	254-4302	254-4301
351 SVO high port and improved SVO high port, M-6049-C302, M-6049-C320B	254-4107		254-4307	
351 SVO Yates design	254-4109		254-4309	

Red part numbers indicate new items

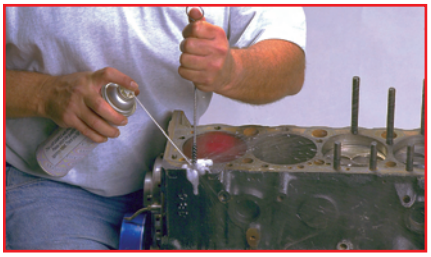
Application	Hex Nuts	Hex Nuts U/C Studs	12-Point Nuts	12-Point Nuts U/C Studs
FORD, SMALL BLOCK (CONTINUED)				
351 SVO Yates 1994 design	254-4110		254-4310	
351 "R" block with C3 heads	254-4111	254-4501	254-4311	254-4601
351 "R" block w/6049-N351 heads	254-4112		254-4314	
Std. 351 Block w/6049-N351 heads	254-4113		254-4315	
351 "R" block with Brodix/Neal heads or Blue Thunder heads			254-4312	
FORD, BIG BLOCK				
390-428 FE series with factory heads or Edelbrock heads	155-4001		155-4201	
390-428 FE series with Blue Thunder heads			155-4204	
427 SOHC	155-4002		155-4202	
429-460 cid with factory heads & 429CJ SVO alum #M-6049-A429, also Edelbrock, KAASE	155-4003		155-4203	
460 SVO aluminum, M-6049-A460 & M-6049-B460, C460 (must use 12pt. nuts)			255-4304	
460 cid with Blue Thunder heads	255-4101		255-4301	
460 cid with Trick Flow "Pro Stock" heads			255-4305	
FORD, 4 AND 6-CYLINDER				
1600cc, Escort M10			151-4203	
2.0L DOHC Cosworth Sierra/Escort M12				251-4701
2.0L Zetec				251-4702
2000cc Pinto			151-4201	
2300cc Pinto			151-4202	151-4702
2.3L Duratec (2003 & later)			151-4204	
2.5L Duratec V6			253-4701	
3.8L V6 Super Coupe T-bird	153-4001		153-4203	
4.5L SVO inline valve V6, head #M6049-H380	253-4102		253-4302	
240-300 cid inline 6	152-4001		152-4201	
FORD, MODULAR				
4.6L & 5.4L 2V/4V	156-4101		156-4301	
4.6L & 5.4L 2V/4V ARP2000	256-4001		256-4201	
4.6L & 5.4L 3V ARP2000	256-4002		256-4202	
GENERAL MOTORS				
2.2L Ecotec				231-4701
HOLDEN				
Commodore V6 7/16˝	205-4002			
308 cid	205-4001			205-4601
308 cid 7/16˝				205-4602
308 cid 1/2˝			234-4201	
HONDA/ACURA				
Acura B18A1, M11				208-4302
Acura VTEC B18C1, M11, GSR				208-4303
B16A				208-4601
B20B, w/B16A head				208-4306
Civic D16Y			208-4305	
F20 S2000				208-4702
Honda D16Z - Only, M10			208-4301	
Honda H22A4, VTEC				208-4304
H23A				208-4307
K20A (A2 & A3)				208-4701
MAZDA				
1.6L (B6) & 1.8L (BP) DOHC Miata			218-4701	
2.0L FS-DE (1998-02)			218-4703	
2.3L DOHC 16V (2003 & later)			218-4702	
MITSUBISHI				
2.0L (4B11) DOHC Turbo ARP2000 (without installation tool)			207-4207	
2.0L (4B11) DOHC Turbo ARP2000 (with installation tool)			207-4206	
2.0L (4G63) DOHC (1993 & earlier) M12			207-4201	207-4701
2.0L (4G63) DOHC (1994 & later) M11			207-4203	207-4702
2.6L (G54B)			207-4202	
3.0L (6G72) DOHC V6 ARP2000				207-4205
NISSAN/DATSUN				
A-12 engines			202-4202	
A-14 engines			202-4203	
L20 series, 4-cylinder			202-4201	
L24, L26, L28 series, 6-cylinder			202-4206	
1.6L (CA16DE/DET) & 1.8L (CA18DE/DET)				202-4702
RB20, RB20DET, RB25, RB25DET			202-4301	
RB26DETT, GTR ARP2000			202-4207	
2.0L (SR20DE) DOHC (1991-01) M11				102-4701
2.0L (SR20DET/RN14) DOHC Turbo (1991-94) M12			202-4303	
VQ30, VQ35				202-4701
OLDSMOBILE				
2.3L Quad 4			281-4301	
215 cid, aluminum heads	184-4002		184-4202	
403 cid	184-4004		184-4204	
Batton	184-4005		184-4205	
455 cid with factory heads or Edelbrock heads 7/16˝	185-4001		185-4201	

Red part numbers indicate new items

Application	Hex Nuts	Hex Nuts U/C Studs	12-Point Nuts	12-Point Nuts U/C Studs
PONTIAC				
Iron Duke 4 cylinder 1/2"	191-4001		191-4201	
Super Duty 4 cylinder with "Iron Duke" head	290-4101		290-4301	
3800 supercharged V6 (L67 Regal, SC Monte Carlo, Impala) (1999 & later)	193-4001		193-4002	
Ram Air 2 & 455			190-4201	
Ram Air 5	190-4005		190-4205	
350-400-428-455 cid with D port heads (1967 & later)	190-4002		190-4202	
400 Ram Air 2 and 4, 455 HO and 455 Super Duty with Round port heads (1968-74)	190-4003		190-4203	
400-455 cid with Edelbrock heads (mfg. before 3/15/02)			190-4304	
400-455 cid with Edelbrock heads (mfg. after 3/15/02)			190-4305	
PORSCHE				
911 & 930 Turbo, premium austenitic studs - Dilivar replacement				204-4206
996				204-4210
ROVER				
K Series				206-4209
SATURN				
1.9L DOHC (1991-99)			165-4202	
1.9L SOHC (1999-02)			165-4201	
SUBARU				
EJ Series 2.0L, 2.2L, 2.5L, DOHC				260-4701
EJ Series Phase 2 (1999 & later) SOHC				260-4702
SUZUKI				
GSX 1300R Hayabusa with cylinder spacer (1999-05)				271-4701
TOYOTA				
1.6L (4AGE) DOHC			203-4203	
1.6L (2TC) & 1.8L (3TC)			203-4206	
1.8L (1ZZFE) DOHC ARP2000				203-4703
2.0L (3SGTE) DOHC			203-4204	
2.4L (22R)			203-4201	
2.8L (5MGE) & 3.0L (7MGE/GTE) inline 6 (1981-92) Supra			203-4202	203-4701
3.0L (2JZGE/GTE) inline 6 (1993-98) Supra			203-4205	203-4702
VAUXHALL/OPEL				
2.0L 16V			209-4301	209-4701
2.5L V6 Opel			209-4302	209-4702
VOLKSWAGEN/AUDI				
Audi 5 cylinder, 10 valve			204-4205	204-4703
Audi 5 cylinder, 20 valve			204-4207	204-4704
1.8L & 2.0L 8V Golf/Jetta & 1.6L Super Vee			204-4203	204-4701
1.8L & 2.0L 16V Golf/Jetta			204-4204	204-4702
1.8L DOHC 20V Turbo M10/ARP2000 (without installation tool)			204-4103	
1.8L DOHC 20V Turbo M10/ARP2000 (with installation tool)			204-4104	
1.8L DOHC 20V Turbo M11/ARP2000 (without installation tool) (early AEB)			204-4101	
1.8L DOHC 20V Turbo M11/ARP2000 (with installation tool) (early AEB)			204-4102	
2.8L & 2.9L VR6				204-4705

Red part numbers indicate new items

TECH TIPS: HEAD STUD INSTALLATIONS

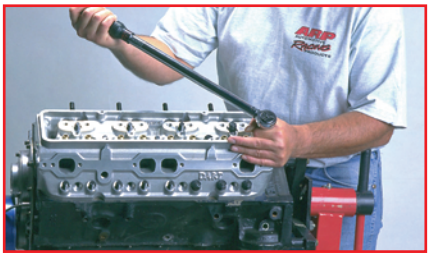


1. Clean and chase all bolt threads in block to ensure proper thread engagement and accurate torque readings.

2. All hardware should be cleaned and inspected for possible shipping damage prior to installation.

3. Since most studs extend into the water jacket, coat threads with ARP thread sealer and screw in hand tight ONLY.

4. Install gasket and head, then lubricate washers and nuts with oil or ARP moly assembly lubricant prior to their installation.



5. Following the engine manufacturer's torque sequence, tighten the nuts three times to the recommended torque value found on the instructions provided with each kit.

NOTE: To ensure positive sealing of "wet" head studs, a hardening or semi-hardening sealant, such as Loc-Tite or Permatex, etc. should be used. Some engine builders employ a sealer in the coolant, such as Aluma-Seal, Silver Seal or K&W sealer, etc. You may also use high temperature RTV silicone. Whatever product is used, it is imperative that the cylinder head is installed and torqued to proper levels ***BEFORE THE SEALANT HAS CURED!***

CYLINDER HEAD BOLTS

HIGH PERFORMANCE SERIES

High Performance head bolts are available with a reduced wrenching hex or 12-point and wide area flanged head that eliminates the need for valve train removal to facilitate cylinder head retorquing. All High Performance Series bolts are 180,000 psi (which is 15% stronger than Grade 8) and kits come complete with hardened parallel-ground washers.

PROFESSIONAL SERIES

All Pro Series bolts are cold-forged to ensure molecular integrity, heat-treated prior to thread rolling and machining, and are rated nominally at 200,000 psi. ARP Pro Series head bolt kits are application specific – designed for use with typically competition only components. These fasteners deliver superior strength and meet the ARP "ZERO defect – ZERO failure" quality standard. Hardened and parallel-ground washers are included with each kit to ensure even load distribution and accurate torque readings. All Pro Series head bolts have a reduced wrenching hex or 12-point head and wide area flange to eliminate the need for valve train removal for cylinder head retorquing and permits the use of larger diameter valve springs. Most applications have undercut short bolts that can help eliminate head gasket failures through providing more "stretch" to compensate for the additional compression of gaskets.

Refer to Main & Head Bolt Instructions on page 45.

All kits come complete with hardened parallel-ground washers.

Application	High Performance		Pro Series		Stainless	
	Hex	12-Point	12-Point	12-Pt. U/C	Hex	12-Point
AMC						
258 cid inline 6 with 1/2″ bolts	112-3601					
290-343-390 cid (1969 and earlier) 7/16″	114-3601					
290-343-390 cid (1969 and earlier) with Edelbrock heads 7/16″	114-3605					
304-360-390-401 cid (1970 & later) 1/2″	114-3602					
304-360-390-401 cid (1970 & later) with Edelbrock heads 1/2″	114-3604					
401 cid with Indy heads	114-3603					
BMW						
Mini Cooper			206-3601			
BUICK						
V6 Stage I (1977-85)	123-3601	123-3701	223-3701		423-3601	423-3701
V6 Grand National and T-Type (1986-87)	123-3603	123-3703	223-3703			
V6 with 1986-87' block and GN1 Champion heads			223-3705			
V6 Stage II			223-3700			
V6 Stage II with Champion heads			223-3704			
V6 with Duttweiler and M&A aluminum heads	123-3602					
455 cid	125-3601					
CHEVROLET, SMALL BLOCK						
23° Cast iron OEM, Gen III Vortec/Truck, most Edelbrock, LT-AFR, Brodix-8,-10,-11,-11xb, LT-1, Dart Pro-1 & Trick Flow heads	134-3601	134-3701	234-3701		434-3601	434-3701
23° Cast iron OEM, Gen III Vortec/Truck, most Edelbrock, LT-AFR, Brodix-8,-10,-11,-11xb, LT-1, Dart Pro-1 & Trick Flow heads (black oxide inner rows, stainless steel outer row)	134-3603	134-3703				
23° Pro Action head		134-3604				
12-Rollover Brodix, 18° Brodix	134-3602	134-3702	234-3702			
18° standard port	134-3607		234-3707	234-3723		
18° hi-port	134-3608		234-3708	234-3720		
18° hi-port with 3/8″ holes, casting #10134363 and 64			234-3721	234-3722		
Bowtie with Brodix 12 - Weld-Tech, Dart II, WP Sportsman II, Brodix Track I			234-3703			
Dart-Buick			234-3709			
Oldsmobile 14°			234-3705			
Pontiac Brodix aluminum heads, raised intake, -10xz RI			234-3704			
Gen III/LS Series small block (2003 & earlier) hex			134-3609			
Gen III/LS Series small block (2004 & later) w/ all same length hex bolts			134-3610			
CHEVROLET, BIG BLOCK						
348, 409, Cast iron OEM	135-3602					
396-402-427-454 Cast iron OEM	135-3601	135-3701	235-3701		435-3601	435-3701
396-402-427-454 Cast iron OEM (black oxide inner rows, stainless steel outer rows)	135-3604	135-3704				
Mark IV or Mark V block with Brodix aluminum heads	135-3609	135-3709	235-3709			
MarK IV or Mark V block with Brodix-2, -4 and Canfield aluminum heads	135-3606	135-3702	235-3702			
Mark IV block with Edelbrock heads 60409, 60429, 60459, 60479, 60499, 60559	135-3610	135-3710				
Mark IV or Mark V block with Edelbrock heads 77609, 77659, 7760, 7765	135-3611	135-3711		235-3711		

Application	High Performance		Pro Series		Stainless	
	Hex	12-Point	12-Point	12-Pt. U/C	Hex	12-Point
CHEVROLET, BIG BLOCK (CONTINUED)						
Mark IV or Mark V block with AFR Casting #315/335/357		135-3712				
Mark V with 502 heads		135-3706	235-3706			
Mark V block with World Merlin, late Bowtie and Dart aluminum, AFR	135-3607	135-3707	235-3707			
Dart aluminum head exhaust bolts only, (8 pieces)	135-3605	135-3705	235-3708			
Late Bowtie aluminum, World Prod. Merlin, Iron Dart, Pro-1, Pro Top Line	135-3603	135-3703	235-3703			
Pontiac Pro Stock aluminum head, Brodix			235-3704			
Pontiac Pro Stock aluminum head, Dart Big Chief			235-3705			
CHEVROLET, 6-CYLINDER						
90° V6			233-3701			
90° V6 with 18° standard port	133-3607		233-3707			
90° V6 with 18° hi-port			233-3708			
90° V6 hi-port 3/8″ holes			233-3721			
CHRYSLER, SMALL BLOCK						
273-318-340-360 Wedge	144-3602					
318-340-360 Wedge with W-2, W-2 Econo heads or Edelbrock RPM heads	144-3601					
318-340-360 Wedge with W-5, W-7 cylinder heads	144-3604					
318-360 Magnum with factory heads or Edelbrock Magnum heads	144-3605					
CHRYSLER, BIG BLOCK						
383-400-413-426-440 Wedge with factory heads or Edelbrock RPM heads 60919/929/149/189	145-3606	145-3706		245-3706	445-3606	445-3706
383-400-413-426-440 Wedge with Edelbrock Victor heads 77919, 77929	145-3609					
383-400-413-426-440 Wedge with Indy 440 heads	145-3607					
426 factory Hemi & Mopar 426-472-528 Hemi Crate Motor 7/16”	145-3901					
CHRYSLER, 4-CYLINDER						
2.2L & 2.5L M11			241-3701			
FORD, SMALL BLOCK						
289-302 with factory heads or Edelbrock heads 60259, 60379	154-3601	154-3701			454-3601	454-3701
302 Boss	154-3602	154-3702	254-3702		454-3602	454-3702
302 with 351 Windsor heads 1/2″-7/16″ insert washer with 7/16″ bolts	154-3605	154-3705			454-3605	454-3705
302 with 351 Windsor heads 1/2″-7/16″ stepped bolt			254-3708			
351 Cleveland & 351-400M	154-3604		254-3704			
351 Cleveland SVO, iron block			254-3701			
351 Windsor with factory heads or Edelbrock heads 60259, 60379	154-3603					
351 SVO, Yates design			254-3709			
351 SVO, Yates 1994 design			254-3710			
351R block with C3/C3L heads			254-3711			
FORD, BIG BLOCK						
390-428 FE series with factory heads or Edelbrock heads 60069, 60079	155-3601					
390-428 FE series with Blue Thunder heads	155-3604					
427 SOHC	155-3602					
429-460 cid			255-3701			
429-460 cid with Edelbrock heads 60669, 60079, 61669, 61649	155-3603					
FORD, 6-CYLINDER						
4.5L SVO inline valve V6			253-3702			
HARLEY DAVIDSON MOTORCYCLE						
’48-’84 All pan heads & shovel heads					460-3601	
’57-early ’73 XL’s					460-3602	
HOLDEN						
308 cid	205-3601			205-3701		
MITSUBISHI						
2.0L (4G63) DOHC (1994 & later) M11				207-3900		
OLDSMOBILE						
350-455 cid with factory heads or Edelbrock heads 60519, 60529 (1976 & earlier) 7/16”	180-3600	180-3700	280-3700		480-3600	480-3700
307-350-403-455 cid (1977 & later) 1/2”	180-3601					
PONTIAC						
326-347-370-389-421 cid with D port heads (1964 and earlier)	190-3608					
326-389-421 cid with D port heads (1965-66 only)	190-3602					
350-400-428-455 cid with D port heads (1967 & later)	190-3607					
400 Ram Air II/IV & 455 HO, Ram Air II, Super Duty with Round port heads (1968-74)	190-3601					
400-455 cid with Edelbrock heads 60579, 60599 (mfg. before 3/15/02)	190-3604					
400-455 cid with Edelbrock heads 60579, 60599 (mfg. after 3/15/02)	190-3605					
TOYOTA						
2.8L (5MGE) & 3.0L (7MGE/GTE) inline 6 (1981-92) Supra			203-3902			
VOLKSWAGEN/AUDI						
1.8L DOHC 20V Turbo M10/ARP2000 (without installation tool)			204-3901			
1.8L DOHC 20V Turbo M10/ARP2000 (with installation tool)			204-3902			

Red part numbers indicate new items

MAIN STUD KITS

STUDS vs. BOLTS

ARP recommends the use of main studs over bolts whenever possible for several key reasons. First is the ability to obtain more accurate torque readings because studs don't "twist" into the block. All clamping forces are on one axis. By the same token, there is less force exerted on the block threads, which contributes to improved block life (very critical on aluminum blocks). Finally, there are factors of easier engine assembly and proper alignment of caps every time.

There are many important reasons to use ARP main stud kits, including the elimination of main cap walk and fretting, as well as protecting the threads in your engine block. All kits come complete with hardened parallel-ground washers and high quality nuts. Some applications have provisions for mounting windage trays and have specially designed standoff studs with serrated lock nuts to position the windage tray and lock it securely in place. The studs are manufactured from 8740 chrome moly steel, heat-treated in-house to 200,000 psi tensile strength, and precision J-form threads rolled after heat-treat to create a fastener that has threads 1000% stronger than others.

TECH TIPS: MAIN STUD INSTALLATION

There are a number of important considerations when installing ARP main studs. First and foremost is making sure the block and studs are as clean as possible. Foreign matter and debris can easily affect the quality of thread engagement and cause erroneous torque readings. Do not re-cut threads in the block – *use the special "chaser" taps as listed on page 87 of this catalog.* This will preserve the integrity of the threads and provide better engagement. Calibrate your torque wrench – even new wrenches have been known to be off by as much as 10 foot pounds! Use consistent tightening techniques.

1. Clean and chase appropriate threads in block to ensure proper thread engagement and accurate torque readings.

2. All hardware (and caps) should be cleaned and inspected prior to installation, looking for any shipping damage or defects.

3. Screw studs into block, finger tight ONLY. For permanent installation, apply Loc-tite (or similar adhesive) sparingly to threads. Be sure and install the caps promptly before the cement sets to prevent misalignment of studs in block.

4. Install main caps, checking for binding and misalignment. Lubricate threads, nuts and washers with oil or ARP moly assembly lubricant before installation. Note that torque specs will vary by lubricant. Moly lube is most consistent. Have block align honed.

5. Following the engine manufacturer's torque sequence, tighten the nuts three times to the recommended torque value found on the instructions provided with each kit. NOTE: If using Loc-Tite or similar cement, proper preload must be achieved prior to it setting up.

Application	2-Bolt Main	4-Bolt Main
AUDI		
5-cylinder	204-5404	
BMC/TRIUMPH		
A Series	206-5401	
B Series (3 cap main)	206-5402	
B Series (5 cap main)	206-5403	
2.0L SOHC TR7	206-5404	
Austin Healey 6-cylinder	206-5405	
BMW		
M10 & S14 4-cylinder	201-5001	

Application	2-Bolt Main	4-Bolt Main
BMW (CONTINUED)		
M50, M52, S50US & S52US inline 6	201-5000	
S54 inline 6	201-5002	
BUICK		
V6 Stage I & II	123-5401	
V6 Stage II without windage tray		222-5602
V6 Stage II with splayed cap bolts		322-5802
215 cid aluminum V8	124-5401	
350 cid	124-5402	
401 cid (nail head)	124-5404	

Application	2-Bolt Main	4-Bolt Main
BUICK (CONTINUED)		
400-430-455 cid (hex)	125-5401	
400-430-455 cid (12 pt nuts)	125-5402	
CADILLAC		
472-500 cid	135-5507	
CHEVY, SMALL BLOCK		
400 cid with windage tray		234-5606
400 cid with windage tray & 3.0″ outer studs		234-5607
400 cid with splayed cap bolts & windage tray		234-5605
Large journal (hex)	134-5401	134-5601
Large journal (12 pt nuts)	134-5403	
Large journal with windage tray (except LT-1 & LT-4)	234-5501	234-5601
Large journal with straps (F & R caps)	234-5503	234-5603
Large journal with splayed cap bolts		234-5602
Large journal with straps & splayed cap bolts		234-5604
LT-1 with factory windage tray (1992-97)	134-5502	
Small journal	134-5402	
Small journal with windage tray	134-5501	
SB2 (including 4-bolt F & R caps) w/o windage tray		134-5602
SBC Rocket block		184-5403
Dart Little M with splayed cap bolts		234-5801
Dart Little M with splayed cap outer studs		134-5801
Dart Little M w/ iron main caps & splayed cap bolts		234-5609
Gen III/LS Series small block & GMPP LSX block		234-5608
CHEVY, BIG BLOCK		
396-402-427-454 cid	135-5402	135-5601
396-402-427-454 cid with windage tray	235-5502	235-5701
Mark IV Aluminum block		135-5603
Mark IV Bowtie with windage tray		235-5702
Mark V 502		135-5606
Mark V 502 with windage tray		235-5606
Dart Big M with splayed cap bolts		235-5601
Dart Big M with splayed cap outer studs		235-5603
CHEVY, 6-CYLINDER		
235-261 cid inline 6 (1954-62)	132-5402	
194-230-250-292 cid inline 6 (1963 & later)	132-5401	
90° V6		233-5602
90° V6 with windage tray		233-5702
90° V6 with splayed cap bolts		233-5601
CHRYSLER		
2.0L SOHC/DOHC 4-cyl Neon (block # 4667642)	141-5801	
2.2L & 2.5L 4-cylinder M11	141-5401	
170-198-225 cid Slant Six	142-5401	
318-440 Wedge (hex)	140-5401	
318-440 Wedge (12 pt nuts)	140-5402	
318-340-360 Wedge with windage tray	240-5501	
5.7L & 6.1L Hemi with cross bolts	244-5400	
354-392 Hemi	145-5404	
426 factory Hemi	145-5601	145-5602
KB 426 Hemi	245-5602	
DIESEL		
Chevy Duramax 6.6L (LB7/LLY) (2005 & earlier)	230-5401	
Chevy Duramax 6.6L (LBZ/LMM) (2006 & later)	230-5402	
Dodge/Cummins 5.9L 12V (1997 & earlier)	247-5402	
Dodge/Cummins 5.9L 12V & 24V (1998 & later)	247-5401	
Ford 7.3L Powerstroke (1993-03)		250-5801
Oldsmobile 5.7L, 350 cid	184-5402	
FORD, SMALL BLOCK		
289-302 cid	154-5401	
289-302 cid with windage tray	254-5501	
289-302 cid with girdle (10 studs 1/2″ longer)	154-5408	
289-302 cid with girdle (7 studs 1/2″ longer)	154-5410	
302 cid with dual or rear sump oil pan*	154-5407	
302 SVO		154-5605
302 “R” block (1/2″ dia. studs)		254-5601
302 Iron Eagle		154-5608
Boss 302 with windage tray		154-5602
351 Cleveland	154-5404	154-5604
351 Windsor	154-5403	154-5606
351 Windsor with windage tray	154-5503	
351 Windsor with dual or rear sump oil pan*	154-5409	

Application	2-Bolt Main	4-Bolt Main
FORD, SMALL BLOCK (CONTINUED)		
351 SVO with outer studs (for mains No# 2,3,4)		154-5603
351 SVO with outer bolts (for mains No# 1,2,3,4,5)		354-5604
351 “R” block		354-5605
351 Iron Eagle		154-5607
Ford Australian 7/16″	154-5405	
Ford Australian 1/2″	154-5406	
FORD, BIG BLOCK		
390-428 cid FE series (hex)	155-5401	
390-428 cid FE series (12 pt nuts)	155-5421	
429-460 cid	155-5402	155-5501
429-460 cid with Ford Motorsports windage tray	255-5502	255-5702
FORD, MODULAR (side bolts not included)		
4.6L & 5.4L 2V/4V (without windage tray)	156-5401	156-5802
4.6L 4 valve with windage tray		256-5701
4.6L supercharged Cobra w/ windage tray (2003-04)	156-5403	
FORD, 4 AND 6-CYLINDER		
1600cc Escort	151-5403	
2.0L Zetec (1997 and earlier)	151-5406	
2.0L Zetec (1998 and later)	151-5404	
2.3L Duratec (2003 & later)	151-5405	
2000cc Pinto	151-5401	
2300cc Pinto	151-5402	
240-300 cid inline 6	152-5401	
4.5L SVO inline valve V6	253-5401	
HOLDEN		
308 cid	205-5401	205-5501
HONDA/ACURA		
1.6L (B16A)(12 pt nuts)	208-5402	
1.8L (B18C1) Acura	208-5403	
1.8L (B18A1/B1) Acura	208-5404	
2.2L (H22A) & 2.3L (H23A) (12 pt nuts)	208-5401	
MAZDA		
1.6L (B6) & 1.8L (BP) DOHC Miata (12 pt nuts)	218-5401	
2.3L DOHC 16V (2003 & later)	218-5402	
MITSUBISHI		
2.0L (4G63) DOHC	207-5401	
2.6L (G54B)	207-5402	
3.0L (6G72) V6 (1993 & later)		207-5801
NISSAN/DATSUN		
L20 Series 4-cylinder	202-5401	
L24, L26 & L28 Series 6-cylinder	202-5406	
2.0L (SR20DE/DET)	202-5402	
3.5L (VQ35) DOHC V6		202-5801
OLDSMOBILE		
2.4L Quad 4	281-5401	
350-403 cid	184-5401	
455 cid	185-5401	
DRCE-iron block	285-5801	
PONTIAC		
Super Duty 4 cylinder - cast block	291-5801	
Super Duty 4 cylinder - mag block	291-5802	
3800 V6 supercharged (1999 & later) (hex)	193-5401	
3800 V6 supercharged (1999 & later) (12 pt nuts)	193-5402	
400-455 cid	194-5401	194-5601
SATURN		
1.9L DOHC (1991-99)	165-5402	
1.9L SOHC (1999-02)	165-5401	
TOYOTA		
1.6L (4AGE) & 2.0L (3SFE) DOHC	203-5403	
2.0L (3SGTE) DOHC	203-5404	
2.4L (22R)	203-5406	
3.0L (7MGTE) Supra (1986-92) w/ bolts for #3 cap	203-5402	
3.0L (2JZGE/GTE) Supra (1993-98)	203-5405	
VAUXHALL/OPEL		
2.0L 16 valve	209-5401	
2.5L V6	209-5402	
VOLKSWAGEN		
1.6L & 2.0L Rabbit, Golf & Jetta	204-5402	
2.8L & 2.9L VR6	204-5403	

Red part numbers indicate new items

* includes stud to mount oil pickup tube

MAIN BOLTS

Far superior to any other main bolt kit offered for use in competition engines, ARP main bolts are designed to meet the exacting standards and demands of professional engine builders. Forged from 8740 chrome moly, all bolts feature generous under-head radius and rolled threads for the utmost reliability. The threads are rolled after heat-treating, which makes them about 1000% longer fatigue life than most main bolts, which are threaded prior to heat-treating. Available in the popular **High Performance Series**, which, at a nominal rating of 180,000 psi, is a premium replacement for OEM fasteners, or the 200,000 psi nominal rated **Pro Series**, application-specific main bolts with reduced wrenching head and are designed for use in competition applications. Parallel-ground, hardened washers are included with each kit.

Application	High Perf. Part No.	Pro Series Part No.
BUICK		
V6 Stage I, 4-bolt main	123-5201	
V6 Stage II	123-5202	
455 cid, 2-bolt main	125-5201	
CHEVROLET, SMALL BLOCK		
Large journal, 2-bolt main	134-5001	
Large journal, 4-bolt main	134-5202	
Large journal, 4-bolt main (12 pt)		234-5201
Large journal, 4-bolt w/ 1/2″ straps on F&R caps		234-5203
Small journal, 2-bolt main	134-5002	
CHEVROLET, BIG BLOCK		
396-402-427-454 cid, 2-bolt main	135-5002	
396-402-427-454-502 cid, 4-bolt main	135-5201	
CHEVROLET, 6-CYLINDER		
90° V6, 4-bolt main		233-5201
90° V6, 4-bolt main with 1/2″ straps on F&R caps		233-5203
CHRYSLER		
318-440 Wedge, 2-bolt main	140-5001	
426 Hemi, 2-bolt main with cross bolts	145-5201	
FORD, SMALL BLOCK		
289-302 cid, 2-bolt main	154-5001	
289-302 cid, 4-bolt main	154-5201	
351 Windsor, 2-bolt main	154-5003	
351 Windsor, 4-bolt main	154-5203	

Application	High Perf. Part No.	Pro Series Part No.
FORD, SMALL BLOCK (CONTINUED)		
351 Cleveland, 351-400M, 2-bolt main	154-5004	
351 Cleveland, 4-bolt main	154-5204	
SVO 351 cid, 4-bolt main, 3/8″ outer bolts		254-5202
SVO 351 cid, 4-bolt main, 7/16″ outer bolts		254-5203
FORD, BIG BLOCK		
390-428 cid FE Series	155-5201	
429-460 cid	155-5202	
FORD, 6-CYLINDER		
4.5L SVO inline valve V6		253-5201
HOLDEN		
308 cid	205-5001	
MGB		
2 cap main		206-5001
5 cap main		206-5002
OLDSMOBILE		
350-403 cid, 2-bolt main	184-5001	
350 cid diesel, 2-bolt main	184-5002	
455 cid, 2-bolt main	185-5001	
SUBARU		
2.0L, 2.2L & 2.5L SOHC/DOHC EJ Series Crankcase thru bolt kit		260-5401
TOYOTA		
1.6L (4AGE) DOHC		203-5001

MAIN & HEAD BOLT INSTALLATION

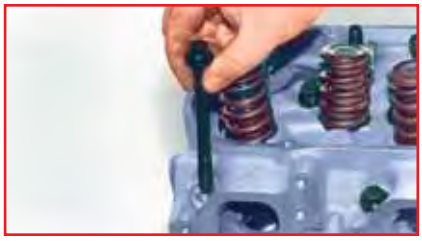
Recommended for applications requiring the utmost in reliability and the convenience of bolts. ARP bolt kits yield optimum reliability.

SPECIAL NOTE: Where the stretch method cannot be used, the bolts must be installed by torque and several factors should be taken into account. *Please refer to the "Using a Torque Wrench" section on page 27.*

1. Clean and chase all block threads to ensure maximum thread engagement and accurate torque readings.

2. Inspect all hardware prior to installation, then clean and lubricate with ARP moly assembly lubricant.

3. Seal all threads extending into the water jacket with ARP thread sealer.



4. Install the main cap or head gasket and head, checking for improper fit or binding. Make sure all mating surfaces are fully seated. Install all bolts hand-tight.

5. Following the engine manufacturer's torque sequence, tighten the bolts three times to the recommended torque value found on the instructions provided with each kit.

ROCKER ARM STUD KITS

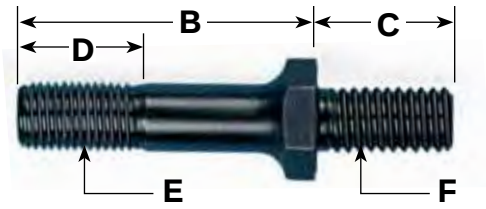
If you have ever installed a rocker stud into a cylinder head and watched it wobble as it screwed in – you knew from the beginning that the rocker geometry was going to be inconsistent all over the place. ARP rocker studs are concentric within .005 T.I.R. thread pitch to thread pitch. They run-in straight and true. Lengths are exact – designed to provide positive seating every time. An extra-large radius base offers greater resistance to flex. Available in both High Performance and Pro Series models. **NOTE: Not to be used with OEM-style, self-locking nuts.** To be used with ARP's patented Perma-Loc™ adjusters (see next page).

HIGH PERFORMANCE SERIES

Made of 8740 chrome moly forgings and heat-treated to **180,000 psi**. Excellent for E.T. Bracket Racing, limited rule oval track competition and street use. Tip ground flush for optimum adjuster seating.

PRO SERIES

Designed for competition applications, ARP's Pro Series rocker arm studs are made of premium grade 8740 chrome moly steel and heat-treated to a tensile strength of **200,000 psi**.



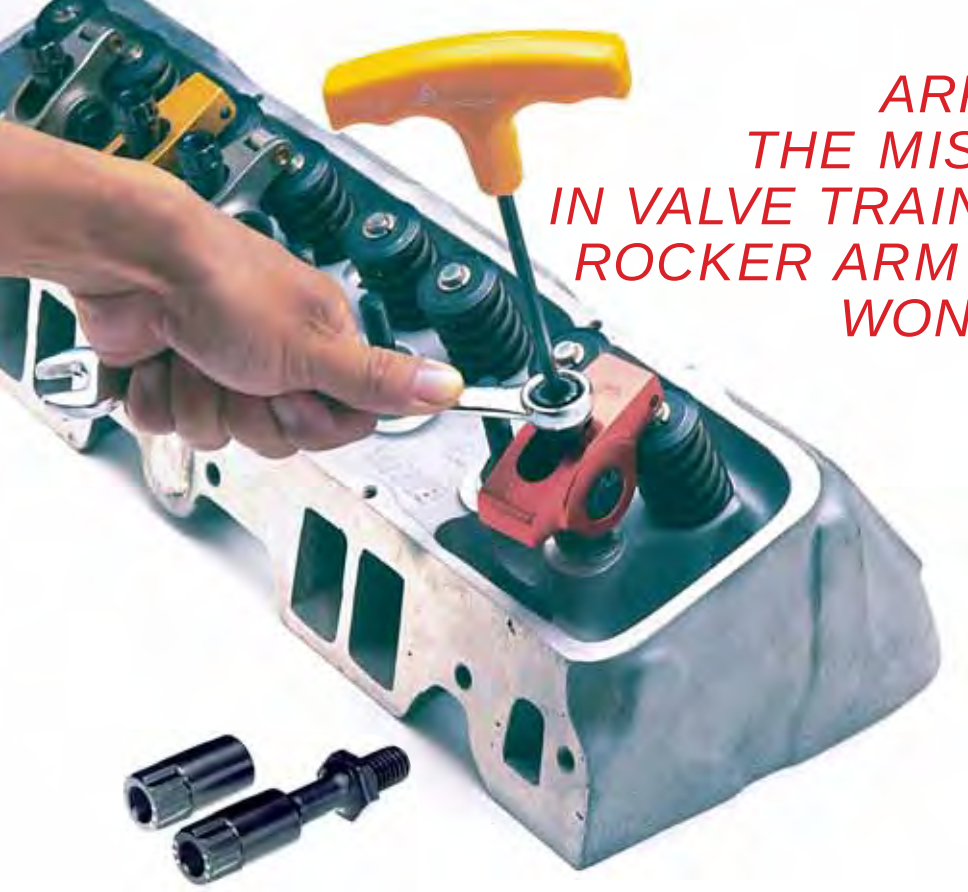
*NOTE: To verify the application and part number, please review the various dimensions: **B)** overall stud height, **C)** screw-in thread depth, **D)** adjuster thread depth, **E)** shank diameter and thread, **F)** base diameter and thread.*

Application	B	C	D	E	F	High Perf.	High Perf. (2 PC-Pack)	Pro Series
3/8″ typical small block application ❷	1.750	.700	.800	3/8-24	7/16-14	134-7101	134-7121	234-7201
3/8″ with roller rockers ❻	1.895	.710	1.000	3/8-24	7/16-14	134-7104	134-7124	
7/16″ typical small block application	1.770	.700	.670	7/16-20	7/16-14	134-7103	134-7123	234-7202
Aluminum heads, intake studs only, 8 pieces ❶	2.000	.820	.700	7/16-20	7/16-14			235-7204
Dart aluminum, 16 pieces ❶	2.000	1.3, .820	.700	7/16-20	7/16-14			235-7205
Aluminum heads, exhaust studs only, 8 pcs. ❶	2.000	1.650	.700	7/16-20	7/16-14			235-7203
Mark V	1.900	.750	.750	7/16-20	3/8-16	135-7102	135-7122	
With roller rockers and stud girdle ❶	2.100	.750	.800	7/16-20	7/16-14			334-7203
With roller rockers and stud girdle ❶	2.000	.750	.800	7/16-20	7/16-14			334-7204
With roller rockers and stud girdle ❶	2.100	.850	.800	7/16-20	7/16-14			334-7202
With roller rockers and stud girdle	1.900	.860	.830	7/16-20	7/16-14			234-7205
With roller rockers and stud girdle ❸	1.900	.660	.830	7/16-20	7/16-14			334-7201
7/16″ typical small block application ❹	1.900	.750	.850	7/16-20	7/16-14			200-7202
7/16″ typical big block application ❶	1.750	.800	.850	7/16-20	7/16-14	135-7101	135-7121	235-7201
With roller rockers and stud girdle	1.900	.850	.850	7/16-20	7/16-14			234-7206
Chevrolet big block (aluminum heads)	2.350	.850	.850	7/16-20	7/16-14	135-7202	135-7222	
With roller rockers and girdles	1.900	.750	1.000	7/16-20	7/16-14	100-7101	100-7121	200-7201
Typical Ford small block ❺	1.900	.750	1.000	7/16-20	7/16-14	100-7101	100-7121	200-7201
Dart aluminum heads, 16 pieces	2.000	1.3, .820	1.000	7/16-20	7/16-14			235-7202
Aluminum heads, exhaust studs only, 8 pieces	2.000	1.650	1.000	7/16-20	7/16-14			235-7206
Aluminum heads, intake, 8 pieces	2.000	.820	1.000	7/16-20	7/16-14			235-7207
7/16″ with 1/2″ coarse, Pontiac (1964 & later)	2.000	1.025	1.050	7/16-20	1/2-13			290-7201
SVO 351 cid, with roller rockers and girdle	2.700	.850	1.300	7/16-20	7/16-14			354-7204
SVO 351 cid, with roller rockers and girdle	2.800	.800	1.500	7/16-20	7/16-14			354-7203
SVO 351 cid, with roller rockers and girdle	3.000	.660	1.930	7/16-20	7/16-14			354-7202
SVO 351 cid, with roller rockers and girdle ❶	3.000	.950	1.750	7/16-20	7/16-14			254-7201
Chevrolet late model Vortec	1.750	.600	.850	3/8-24	M8 x 1.25	134-7201	134-7221	
GM 4.3L Vortec V6	1.595	.800	.580	3/8-24	M10 x 1.50	100-7201	100-7221	
Chevrolet big block 496 cid (8100 series)	1.750	.750	.600	7/16-20	M10 x 1.50	135-7201	135-7221	

❶ These parts have a shank portion under hex to locate guide plate.
❷ Fits most stock SBChevy with 3/8 screw-in studs
❸ Fits most stock SBChevy with 7/16 screw-in studs
❹ Fits most stock BBChevy with 7/16 screw-in studs
❺ Fits most SBFord with 7/16 screw-in studs
❻ Fits most SBFord with 3/8 screw-in studs

IMPORTANT TECH NOTE

It is highly advisable to determine what the optimum rocker arm stud length is for your particular application. This is especially true when "long" pushrods and valves are employed – you should raise the "installed height" of the rocker arm to compensate for the longer-than-stock components.



ARP HAS THE MISSING LINK IN VALVE TRAIN RELIABILITY ...A ROCKER ARM ADJUSTER THAT WON'T LOOSEN!

- **Exclusive 12-point head**
- **Patented design**
- **Heat-treated premium grade A 8740 chrome moly steel**
- **190,000 psi tensile strength**
- **Precision machined threads**
- **Locking set screw ground flush with rocker arm stud**
- **Doesn't require special tools**

PERMA-LOC™

PERMA-LOC™ SPECIAL FEATURES:

CUT-AWAY VIEW

12-point head with special shouldered "stop" to hold wrench. Eliminates need for special adjusting tools.

Forged in-house from 8740 alloy chrome moly steel and heat- treated throughout (not simply case hardened, as others are).

Bottom flush-ground perpendicular to threads.

Threads are precision CNC-machined exactly perpendicular to the bottom of adjuster to ensure an optimum seat and even pressure.

Set screw has flush-machined tip for optimum contact and seating on stud.

Threads machined for maximum engagement.

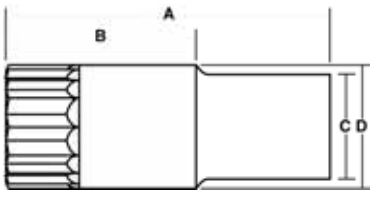
Patent #5,323,741

One of the more aggravating things found in many high performance engines is constantly having to re-adjust rocker arms. Until ARP introduced the patented Perma-Loc adjuster, there wasn't a "poly lock" on the market that you didn't have to continually tighten.

There are several important reasons why ARP's exclusive Perma-Loc rocker arm adjusters won't loosen like others. First, the adjuster body is heat-treated all the way through (not just case hardened). This eliminates the thread "movement" common to others. Secondly, the threads are machined exactly perpendicular to the bottom of the adjuster, so it seats evenly and applies pressure on a full 360° circle. Lastly, the set screw is machined flush on the bottom (not pointed) so it will have optimum contact on the rocker arm stud.

You'll find ARP Perma-Loc's easy to use, too. The compact 12-point head is designed to hold your wrench in position while you lock the set screw with an Allen wrench.

All in all, they're the best you can buy!



Application	Length (A)	Thread Size	Body Dia (D)	16pc-Pack
Stamped steel rocker	1.200	3/8-24	.620	300-8241
Stamped steel rocker	1.200	7/16-20	.640	300-8242
Aluminum rocker	1.200	3/8-24	.550	300-8243
Aluminum rocker	1.200	3/8-24	.600	300-8244
Aluminum rocker	1.200	7/16-20	.550	300-8245
Aluminum rocker	1.200	7/16-20	.600	300-8246

Because there are many different style rocker arms made by each manufacturer, we suggest that you verify the physical dimensions and thread requirements prior to ordering. If you have any questions, call ARP's tech staff toll-free for details.

Application	Length (A)	Thread Size	Body Length (B)	Shank Size (C)	Body Dia (D)	16pc Pack
Stud girdle	2.050	7/16-20	1.200	.600	.750	300-8247
Stud girdle	2.615	7/16-20	1.485	.600	.750	300-8248
Big block with girdle	2.050/2.615	7/16-20	1.200/1.485	.600	.750	300-8249

VALVE COVER BOLTS & STUDS

To ensure proper sealing of valve covers, ARP manufactures a variety of special application-specific bolt and stud kits. Many professional engine builders prefer to use studs because of their ability to properly position the gasket and guide the cover into position. ARP offers studs and bolts in a choice of chrome moly steel with a black oxide finish or stainless steel. You have a choice between conventional hex head bolts and nuts or compact, easy access 12-point designs. The nuts feature a wide base for better load distribution and sealing, while the compact head is easily accessed. Stud kits come complete with nuts and washers, while bolt kits are shipped with the required flat washers.

Special bullet nose accurately guides nuts into position

Choice of studs or bolts in polished stainless steel or black oxide finish

Application NOTE: Studs come with flanged lock nut. Bolts come with washers.			STUD OAL	STUD KITS				BOLT KITS			
				Black Oxide		Stainless 300		Black Oxide		Stainless 300	
	Qty.	Size	BOLT UHL	Hex	12-Point	Hex	12-Point	Hex	12-Point	Hex	12-Point
CHRYSLER											
KB Hemi	20	1/4-20	2.450		245-7601						
CAST ALUMINUM COVERS											
Bolt kit	8	1/4-20	.812					100-7507	100-7503	400-7507	400-7503
Bolt kit	14	1/4-20	.812					100-7504	100-7508	400-7508	400-7504
Chevy SB2 w/ nyloc nuts	16	1/4-20	1.800			434-7609					
Stud kit	8	1/4-20	1.500	200-7603	200-7613	400-7603	400-7613				
Stud kit	12	1/4-20	1.500	200-7610	200-7620	400-7606	400-7616				
Stud kit	14	1/4-20	1.500	200-7604	200-7614	400-7604	400-7614				
Stud kit	16	1/4-20	1.500	200-7605	200-7615	400-7605	400-7615				
Stud kit, Dart, Brodix, B&B	8	1/4-20	3.500	200-7606	200-7616						
Stud kit, Dart, Brodix, B&B	14	1/4-20	3.500	200-7607	200-7617						
Stud kit, Dart, Brodix, B&B	16	1/4-20	3.500	200-7608	200-7618						
Stud kit, BB Chevy	14	1/4-20	1.500/ 4.500		200-7619						
Bolt kit, Brodix hd., SB	4	1/4-20	4.000					100-7511	100-7514	400-7511	400-7514
Bolt kit, Brodix hd., SB	4	1/4-20	4.250					100-7512	100-7515	400-7512	400-7515
Bolt kit, Brodix hd., SB	4	1/4-20	4.500					100-7513	100-7516	400-7513	400-7516
Bolt kit, Brodix hd., BB	7	1/4-20	4.000					100-7517	100-7520	400-7523	400-7526
Bolt kit, Brodix hd., BB	7	1/4-20	4.250					100-7518	100-7521	400-7524	400-7527
Bolt kit, Brodix hd., BB	7	1/4-20	4.500					100-7519	100-7522	400-7525	400-7528
Chevy, Gen III/LS Series small block (.165 thick washer)	8	M6	2.755					100-7524	100-7523	400-7529	400-7530
STAMPED STEEL COVERS											
350 Chevy, cntr blt'd vlv cvr	8	1/4-20	3.250					100-7509	100-7510	400-7509	400-7510
Bolt kit	8	1/4-20	.515					100-7505	100-7501	400-7505	400-7501
Bolt kit	14	1/4-20	.515					100-7506	100-7502	400-7506	400-7502
Stud kit	8	1/4-20	1.170	200-7601	200-7611	400-7601	400-7611				
Stud kit	14	1/4-20	1.170	200-7602	200-7612	400-7602	400-7612				

Main & Poteet's 4-cylinder record-setting Bonneville car

Johnson Hot Rods used ARP for their first foray onto the salt.

HEADER BOLTS & STUDS

ARP manufactures a variety of premium grade bolt and stud kits to facilitate installation of exhaust headers including the popular stainless stud kit with 12-point nuts. The Stainless 300 material is not affected by corrosion or extreme heat, making it ideal for the application. What's more, the compact 12-point nut lets you easily slip a socket close to the pipe. Each ARP accessory stud or bolt kit includes the specific number of parts for your application, plus premium-quality washers and hex or 12-point nuts, as required. Studs are manufactured with a unique nut-starter nose that helps prevent cross-threading. Studs and bolts come either black oxide chrome moly or Stainless 300. Both are nominally rated at **170,000 psi** tensile strength; substantially stronger than Grade 8 hardware. Specially drilled "NASCAR" models are available for those who wish to safety wire their header bolts to prevent loosening.

Special "NASCAR" model header bolts are available that are drilled for use of safety wire. Perfect for any racer who desires the ultimate in security. Available for small block and big block Chevrolet engines, plus many "universal" applications.

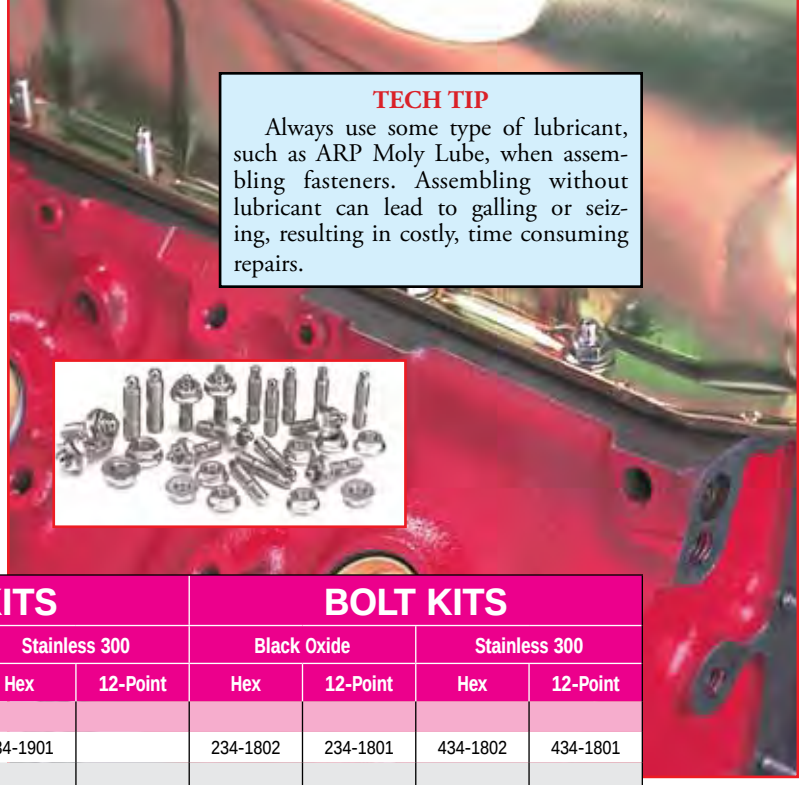
NOTE:

8mm stainless studs listed on page 75.

Application NOTE: Studs come with flanged lock nut. Bolts come with washers.			STUD OAL	STUD KITS				BOLT KITS			
				Black Oxide		Stainless 300		Black Oxide		Stainless 300	
	Qty.	Size	BOLT UHL	Hex	12-Point	Hex	12-Point	Hex	12-Point	Hex	12-Point
BUICK											
3.8L V6	12	3/8	1.670	120-1412	120-1402	420-1412	420-1402				
350-455 cid	14	3/8	1.670	120-1411	120-1401	420-1411	420-1401				
350-455 cid	14	3/8	.750					120-1101	120-1201	420-1101	420-1201
CHEVROLET, SMALL BLOCK											
3/8″ dia. bolt, 3/8″ wrench	12	3/8	.750					100-1101	100-1201	400-1101	400-1201
3/8″ dia. bolt, drilled, 3/8″ wrench	12	3/8	.750					100-1103	100-1203	400-1103	400-1203
3/8″ dia. stud	14	3/8	1.670				400-1400				
3/8″ dia. stud	12	3/8	1.670	100-1412	100-1402	400-1412	400-1402				
Gen III/LS Series small block	12	M8	1.750				434-1301				
3/8″ dia. bolt, 3/8″ wrench	12	3/8	1.000					100-1111	100-1211	400-1111	400-1211
CHEVROLET, BIG BLOCK											
3/8″ dia. bolt, 3/8″ wrench	16	3/8	.750					100-1102	100-1202	400-1102	400-1202
3/8″ dia. bolt, drilled, 3/8″ wrench	16	3/8	.875							400-1104	400-1204
3/8″ dia. stud	16	3/8	1.670	100-1413	100-1403	400-1413	400-1403				
3/8″ dia. bolt, 3/8″ wrench	16	3/8	1.000					100-1112	100-1212	400-1112	400-1212
CHRYSLER											
5/16″ dia. bolt	14	5/16	.750					144-1102	144-1202	444-1102	444-1202
KB Hemi, stud w/prov for blower brackets, Mopar 340-360 cid	16	3/8	1.670/ 2.000	245-1311	245-1301	445-1311	445-1301				
Neon, Spt, PT Cruiser 2.4 turbo	10	M8	2.000				441-1302				
Neon, SOHC & DOHC	8	M8	2.000				441-1301				
FORD											
3/8″ bolt	16	3/8	.750					100-1102	100-1202	400-1102	400-1202
3/8″ stud	16	3/8	1.670	100-1414	100-1404	400-1414	400-1404				
OLDSMOBILE											
330-455 cid	14	3/8	.750					180-1101	180-1201	480-1101	480-1201
330-455 cid	14	3/8	1.670	180-1411	180-1401	480-1411	480-1401				
UNIVERSAL											
Bolt kit, 5/16″ wrench	12	3/8	.750					100-1107	100-1207	400-1107	400-1207
Bolt kit, 5/16″ wrench	16	3/8	.750					100-1108	100-1208	400-1108	400-1208
Bolt kit, 5/16″ wrench	12	3/8	1.000					100-1109	100-1209	400-1109	400-1209
Bolt kit, 5/16″ wrench	16	3/8	1.000					100-1110	100-1210	400-1110	400-1210
Bolt kit, drilled, uses 3/8″ socket	16	3/8	.750							400-1105	400-1205
Bolt kit, drilled, uses 3/8″ socket	12	3/8	.875							400-1106	400-1206
Stud kit	16	3/8-5/16	1.500	100-1401	100-1411						
Stud kit, broached w/ 12-pt, locking nut, 3/8″	14	3/8	1.125	100-1405	100-1415						

OIL PAN BOLT & STUD KITS

The engineers at ARP spent quite a bit of time developing these highly effective, unique oil pan studs. They're designed to make it as easy as possible to install a pan and seal it properly. You'll note that the studs have a radiused bullet nose that serves to locate the pan rails, then allow the nuts to be easily installed without the worry of cross-threading. For those who prefer bolts, ARP's got you covered, too. Both are available in black oxide finished chrome moly steel or rust-proof stainless steel. Also, you may choose between conventional hex style or the space-saving 12-point nuts. The stud kits come complete with a special locking flanged nut, while the bolt kits come with washers.



TECH TIP

Always use some type of lubricant, such as ARP Moly Lube, when assembling fasteners. Assembling without lubricant can lead to galling or seizing, resulting in costly, time consuming repairs.

Application NOTE: Studs come with flanged lock nut. Bolts come with washers.	STUD KITS				BOLT KITS			
	Black Oxide		Stainless 300		Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point	Hex	12-Point	Hex	12-Point
CHEVROLET, SMALL BLOCK								
265-400 cid	234-1901	234-1902	434-1901		234-1802	234-1801	434-1802	434-1801
350 cid with girdle, 5/16″ diameter	334-1902							
Gen III/LS Series small block					134-6901	134-6902	434-6901	434-6902
CHEVROLET, BIG BLOCK								
396-454 cid	235-1901	235-1902	435-1901	435-1902	235-1802	235-1801	435-1802	435-1801
CHEVROLET, 6-CYLINDER								
90° V6	333-1901							
CHRYSLER, SMALL BLOCK								
318-340-360 Wedge & 318-360 Magnum	200-1901	200-1902	400-1901	400-1902	200-1802	200-1801	400-1802	400-1801
CHRYSLER, BIG BLOCK								
KB Hemi, 1.300″ U.H.L	245-1901	245-1903						
KB Hemi, 1.700″ U.H.L	245-1902	245-1904	445-1902	445-1904				
FORD, SMALL BLOCK								
289-302-351C & 351W (early model)	254-1901	254-1902	454-1901	454-1903	254-1802	254-1801	454-1802	454-1801
302-351W (late model with side rails)	254-1903	254-1904	454-1902	454-1904	254-1804	254-1803	454-1804	454-1803
FORD, BIG BLOCK								
390-428 cid FE Series					255-1802	255-1801	455-1802	455-1801
PONTIAC								
350-455 cid	200-1901	200-1902	400-1901	400-1902	200-1802	200-1801	400-1802	400-1801

OIL PUMP BOLTS & STUDS

You've probably heard many a horror story about someone losing an engine when the oil pump fell off into the pan because of a broken bolt. Well, you can put your mind at ease when using ARP's premium grade oil pump bolt and stud kits. You have a choice of black oxide finished 8740 chrome moly steel or low maintenance stainless steel. Both are nominally rated at **170,000 psi** tensile strength to provide you with plenty of clamping force. Moreover, take your pick between conventional hex style or 12-point designs. This is "insurance" that no conscientious engine builder should be without! The studs come with flat washers and nuts, while the Ford bolt kit has flat washers only. These inexpensive fasteners can literally save your engine.

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
CHEVROLET				
Small block, stud kit	230-7001	230-7002		
Small & big block, 3.125″, high volume, stud kit	230-7003	230-7004		
FORD				
3/8″ & 5/16″ 4 piece bolt kit	150-6902	150-6901	450-6902	450-6901
Oil pump to pickup, stud kit	154-7005			

FRONT COVER, WATER PUMP & ALTERNATOR KITS

ARP's timing cover bolts are available in both polished stainless steel or black oxide finish chrome moly. You also can choose between standard hex head bolts or compact 12-point fasteners. Also available as part of ARP's complete Engine & Accessory kits. *Please go to page 61 for listings of available Engine & Accessory kits.*

Studs are preferred by many Pro engine builders because they eliminate the chance of pinching gaskets and contribute to easier engine assembly. You will note that ARP studs feature a special "bullet nose" to guide the nut accurately into place. Available in black oxide finish 8740 chrome moly or polished stainless steel with hex or 12-point nuts.

Alternators that come loose are a pain, so that's why ARP came up with these super tough bolts (your choice of chrome moly steel or polished stainless (ARP 300 - both rated **170,000 psi**). The stainless has the added advantage of being rust and corrosion resistant. It's the fastener of choice!

Application NOTE: Studs come with flanged lock nut. Bolts come with washers.	STUD KITS				BOLT KITS			
	Black Oxide		Stainless 300		Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point	Hex	12-Point	Hex	12-Point
CHEVROLET								
90° V6, timing cover	333-1401							
3/8″ alternator pivot bolt							430-3303	430-3304
All V8, alternator bracket bolts					130-3302	130-3301	430-3302	430-3301
All V8, timing cover	200-1401	200-1411	400-1401		200-1502	200-1501	400-1502	400-1501
All V8 with Jesel belt drive or gear drive	334-1401							
All V8, water pump long					130-3202	130-3201	430-3202	430-3201
Gen III/LS Series small block, timing cover					134-1501	134-1502	434-1501	434-1502
Gen III/LS Series small block, water pump with thermostat housing bolts					134-3201	134-3202	434-3201	434-3202
Gen III/LS Series small block, rear motor cover					134-1503	134-1504	434-1503	434-1504
CHRYSLER								
KB Hemi, timing cover	245-1511	245-1501	445-1511	445-1501				
FORD								
289-302, aluminum timing cover & water pump					154-1504	154-1503	454-1504	454-1503
289-302, cast-iron timing cover & water pump					154-1502	154-1501	454-1502	454-1501
351 SVO, timing cover	354-1401							
351W, alternator bracket bolts					150-3302	150-3301	450-3302	450-3301
PONTIAC								
All V8, alternator bracket bolts					190-3302	190-3301	490-3302	490-3301
All V8, timing cover and water pump					190-1502	190-1501	490-1502	490-1501

FUEL PUMP BOLT KITS

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
CHEVROLET	130-1602	130-1601	430-1602	430-1601
PONTIAC	190-1602	190-1601	490-1602	490-1601

Make sure that mechanical fuel pumps stay properly aligned by using ARP's durable black oxide finished chrome moly or rust-proof stainless bolts (both materials are rated at **170,000 psi** and considerably stronger than Grade 8 hardware). Your choice of either conventional hex heads or 12-point head. Washers are included.

MOTOR MOUNT BOLT KITS

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
Chevy, V6 & V8 mount to block	130-3102	130-3101	430-3102	430-3101
Chevy, V6 & V8 mount to frame	130-3105		430-3105	
Chevy, LS Series small block mount bracket to block	134-3102	134-3101	434-3102	434-3101
Ford, 289-302-351W	150-3102	150-3101	450-3102	450-3101
Pontiac, All V8	190-3102	190-3101	490-3102	490-3101

Secure any engine with complete confidence with ARP's rugged motor mount bolts. You can choose between black oxide finished 8740 chrome moly or corrosion-resistant stainless steel; choice of hex or 12-bolt head. Kits come complete with flat washers.

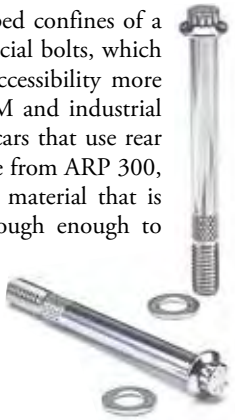
BELLHOUSING STUD KITS

Here's just what you need to secure a bellhousing in place. The studs are designed with a bullet nose to guide the bellhousing into position and accept nuts without the fear of cross-threading. Choice of rugged 8740 heat-treated alloy or rust-proof stainless steel. Complete with nuts and flat washers.

Application	Dia.	Length	Pro Series	Stainless
Chevy, Chrysler KB Hemi	3/8	2.000	245-0901	445-0901
Top fuel motor plate, std.	7/16	2.140	245-0202	
Top fuel motor plate, w/ 1/4″ spacer	7/16	2.400	245-0201	

STARTER BOLT KITS

Installing starter motors in the cramped confines of a race car is simplified by use of ARP's special bolts, which feature small diameter heads to make accessibility more convenient. They are stronger than OEM and industrial grades, and especially suited for use on cars that use rear motor plates. These starter bolts are made from ARP 300, a 100% maintenance free stainless steel material that is stronger than Grade 8 hardware and tough enough to easily withstand the strain of a 10 to 15 pound starter cantilevered off the back of an engine. Bolts have standard shank knurling. Rated at **170,000 psi**. Includes washers, as required.



Application	UHL	Part No.
CHEVROLET		
All standard, 12 pt	3.700	430-3501
All standard, hex	3.700	430-3502
All with high torque starter, 12 pt	3.700	430-3503
All with high torque starter, hex	3.700	430-3504
All with long and short, hex	1.880 & 4.450	430-3505
All with long and short, 10mm, hex	1.775 & 4.470	430-3506
All, 2 ea. long, 3/8″ bolt, hex	4.450	430-3507
FORD		
2-bolt, 12 pt	1.500	450-3501
3-bolt, 12 pt	1.500	450-3502

SEAL PLATE & ACCESSORY CAM DRIVE

SPECIFICATIONS

- Drive: forged ARP2000, 220,000 psi alloy chrome moly steel with corrosion-resistant oxide finish.
- Concentricity: .001 T.I.R., between shaft and hex, 1″ and 1.5″ length
- Threads: form rolled 9/16″ x .625″ on cam end, 3/8″ hex on drive
- Seal Plate: CNC-machined 7075-T4 aluminum with Viton seal

If the survivability of your camshaft drive, through an entire race without stripping or breaking, has been a matter of concern – ARP's new cam drive should put your mind to rest. We built this setup to be "bulletproof." Totally reliable. A through-hardened, not just case hardened, chrome moly shaft, premium grade Viton seal, plus anodized aluminum plate are manufactured in-house to insure that every part is guaranteed ARP quality.

Application	1.0″	1.5″
All 9/16-18 x .625	934-0005	934-0006

The perfect compliment to our "bulletproof" cam drives are these precision seal plates. They're made of CNC-machined 7075-T4 alloy aluminum and anodized to resist corrosion. Available in 2.100″ and 2.380″ diameters to fit most any OEM or aftermarket block.

Application	Diameter	Part No.
Small Block GM, 2.100 O.D. block	2.100	934-0007
Dart, aluminum block	2.380	934-0008

Walsh Off-Road Motorsports 1600 car

Dennis Anderson - "Grave Digger"

Special "NASCAR" model bolts have drilled heads (one per set) to facilitate tech official's sealing. These 12-point bolts have a generous flange head for superior load distribution.

INTAKE MANIFOLD BOLT & STUD KITS

Prevent intake manifold leaks with ARP's quality fasteners. They're rated at **170,000 psi** and precision machined for optimum thread engagement. Wide underhead flange and companion washers provide even load distribution. Precision rolled threads prevent galling while promoting more consistent torque loading. Facilitates optimum sealing of gasket surfaces. Available in choice of black oxide finish chrome moly or corrosion resistant stainless steel, as well as hex or 12-point heads. Washers included.

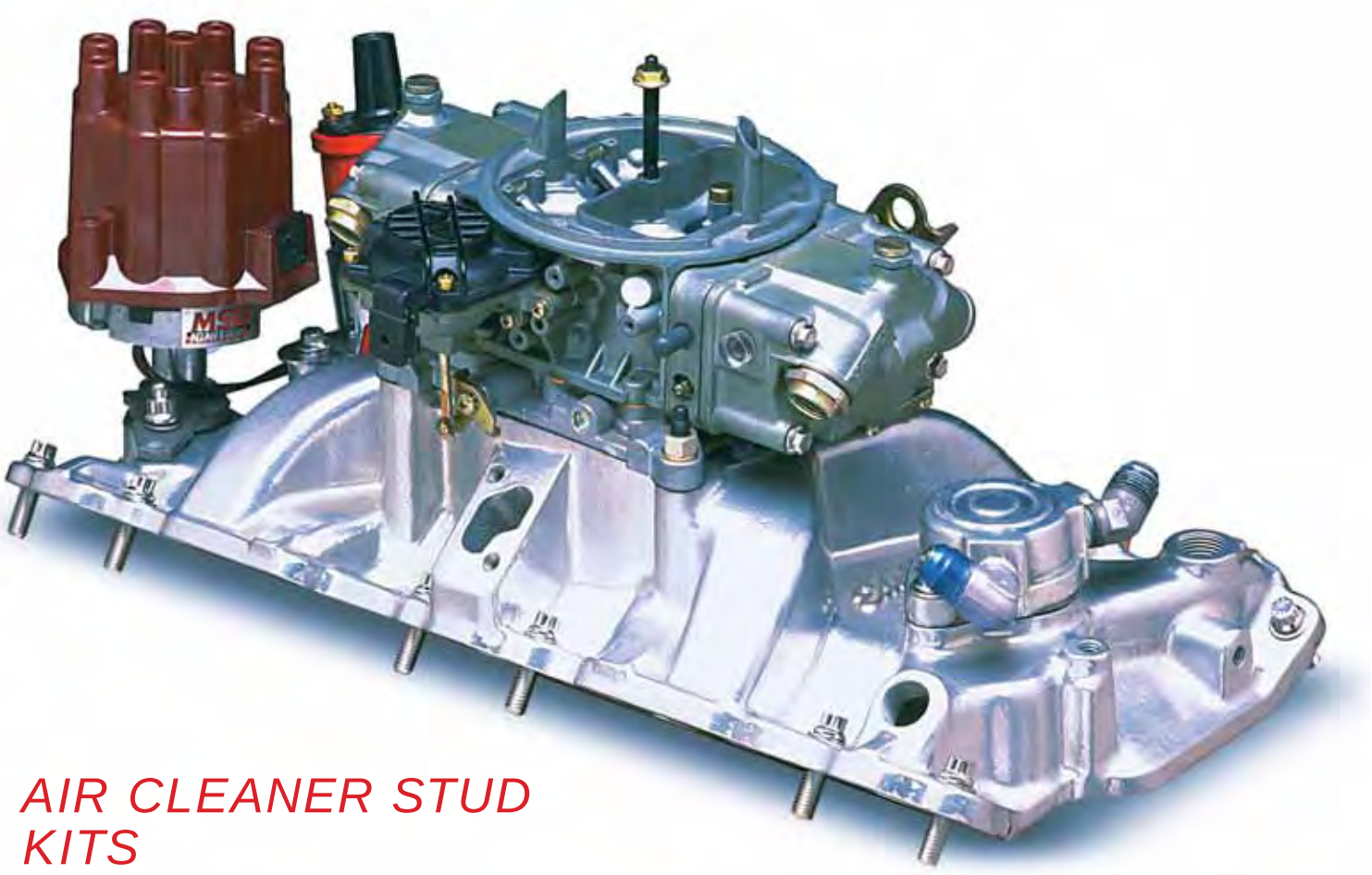
Application	Black Oxide		Stud	Stainless 300		
	Hex	12-Point		Hex	12-Point	NASCAR
AMC						
290-343-390 cid, uses 3/8″ socket	114-2001			414-2001	414-2101	
BUICK						
3.8L V6	123-2001			423-2001		
215 cid, uses 3/8″ socket	124-2001	124-2101		424-2001	424-2101	
CHEVROLET						
90° V6, 1.000″ drilled						333-2101
SB 2, standard deck					334-2104	
SB 2, tall deck, drilled						334-2105
Small block, 1.000″, drilled						334-2102
Small block, 1.250″, drilled						334-2103
265-400 cid, factory OEM	134-2001	134-2101		434-2001	434-2101	
305-350 Vortec, fits most aftermarket alum. intakes	134-2002	134-2103		434-2002	434-2102	
305-350 Tuned Port	134-2004	134-2104		434-2004	434-2104	
LS1, LS4, LS6, 4.8L-RL4, 5.3L-LM7, 6.0L-LQ4	130-2001	130-2101		430-2001	430-2101	
Gen III/LS Series small block, valley cover bolts	134-8001	134-8002		434-8001	434-8002	
396-454 cid, 1.250″ U.H.L.	135-2001	135-2101		435-2001	435-2101	
502 cid, 1.500″ U.H.L.	135-2002			435-2002	435-2102	
CHRYSLER						
318-440 Wedge, uses 3/8″ socket	144-2001	144-2101		444-2001	444-2101	
FORD						
260-289-302, 351W, uses 3/8″ socket	154-2001	154-2101		454-2001	454-2101	
289-302, 351W intake stud kit			354-2103			
351C, 351-400M	154-2004	154-2104		454-2004	454-2104	
351W, uses 3/8 wrenching	154-2002	154-2102		454-2003	454-2103	
351 SVO, Jack Roush design, drilled						354-2102
390-428 cid FE Series	155-2002	155-2102		455-2002	455-2102	
429-460 cid	155-2005	155-2105		455-2001	455-2101	
PONTIAC						
350-455 cid, uses 3/8″ socket	194-2001	194-2101		494-2001	494-2101	

Red part numbers indicate new items

CARB STUD KITS

The best way to make sure that carburetors stay perfectly sealed to the intake manifold is through the use of ARP's carb studs, which feature J-form threads to resist loosening from vibration. They're offered in a variety of heights to accommodate most any combination of carb and spacer, and are available in 8740 chrome moly with a black oxide finish or rust-proof stainless steel. Special ARP Pro Series NASCAR type stud **kits have one of the studs drilled** to facilitate sealing the carburetor in the engine by race officials. All carb stud kits come with hex nuts and washers.

Application	Qty.	Size	O.A.L.	Black Oxide	Stainless 300	Pro Series
Standard	4	5/16	1.700	200-2401	400-2401	
1/2″ spacer	4	5/16	2.225	200-2403	400-2403	
1″ spacer	4	5/16	2.700	200-2402	400-2402	
2″ spacer	4	5/16	3.700	200-2404		300-2404
3″ spacer	4	5/16	4.700	200-2405		
1-1 /4" Moroso spacer	4	5/16	3.200	200-2408	400-2408	
2″ Moroso spacer	8	5/16	1.250 & 1.700	200-2409		
Dominator with 1/2″ or 1″ spacer	4	5/16	3.200	200-2412	400-2412	
Dominator carb stud, no spacer	4	5/16	2.225	200-2414	400-2414	
Dominator carb stud, with spacer	4	5/16	4.400	200-2415		
HP Dominator carb stud, no spacer	4	5/16	2.225	200-2416		
HP Dominator carb stud with 1/2″ spacer	4	5/16	2.700	200-2417		
HP Dominator carb stud with 1″ spacer	4	5/16	3.200	200-2418		
Standard (drilled for NASCAR wire seal)	4	5/16	1.700			300-2401
2″ spacer (drilled for NASCAR wire seal)	8	5/16	1.700 & 2.225			300-2406
1″ spacer (drilled for NASCAR wire seal)	4	5/16	2.700			300-2403
1/2″ spacer (drilled for NASCAR wire seal)	4	5/16	2.225			300-2402
1″ Moroso spacer (drilled for NASCAR wire seal)	4	5/16	2.700			300-2407
1-1/4″ Moroso spacer (drilled for NASCAR wire seal)	4	5/16	3.200			300-2408
2″ Moroso spacer (drilled for NASCAR wire seal)	8	5/16	1.250 & 1.700			300-2409
Quadrajet (all), with 1/4″ base gasket (2 stud, 2 bolt)	4	5/16	1.700 & 4.400	200-2413	400-2413	



AIR CLEANER STUD KITS

Keep your air cleaner firmly in position with an ARP stud kit. Includes your choice of a black oxide finished chrome moly or stainless steel stud with an appropriate nut. Vastly superior to the cheap fasteners that sometimes get used.

Application	Black Oxide	Stainless 300
5/16 x 2.225″ OAL	200-0301	400-0301
5/16 x 2.700″ OAL	200-0302	400-0302
5/16 x 3.200″ OAL	200-0303	400-0303
1/4 x 2.225″ OAL	200-0304	400-0304
1/4 x 2.443″ OAL	200-0307	400-0307
1/4 x 2.700″ OAL	200-0305	400-0305
1/4 x 3.200″ OAL	200-0306	400-0306

THERMOSTAT HOUSING BOLTS

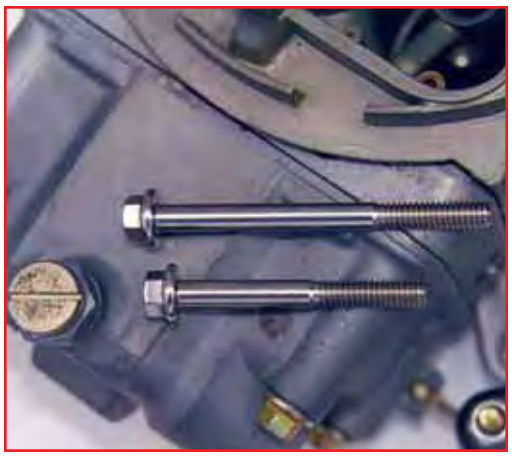
Nobody likes water leaks. And here's ARP's contribution to the solution. These premium grade bolts are engineered to properly engage the manifold threads and resist loosening. They're application- specific, and come in your choice of black oxide finished chrome moly or rust-proof stainless steel, with handy 12-point or standard hex heads. Washers included.

Application	UHL	Black Oxide		Stainless 300	
		Hex	12-Point	Hex	12-Point
CHEVY (3 PC)	1.00/2.00	130-7402	130-7401	430-7402	430-7401
CHEVY LS SERIES SMALL BLOCK	20mm	134-7402	134-7401	434-7402	434-7401
FORD FE	2.250	155-7402	155-7401	455-7402	455-7401
FORD 351W	0.875	150-7402	150-7401	450-7402	450-7401
PONTIAC	1.000	190-7402	190-7401	490-7402	490-7401

COIL BRACKET BOLTS

Add a touch of class to your coil bracket installation with an ARP bolt kit. Available in black oxide finished chrome moly or rust-proof stainless steel, as well as with a conventional hex head or 12-point (great for tight, hard-to-reach coils). Washers included.

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
CHEVY	130-2302	130-2301	430-2302	430-2301
CHEVY LS SERIES SMALL BLOCK	134-2302	134-2301	434-2302	434-2301
FORD WINDSOR	150-2302	150-2301	450-2302	450-2301



CARBURETOR FLOAT BOWL KITS

The smart way to attach a Holley float bowl is with ARP's special new bolts. They're made from 304 stainless steel and are virtually impervious to corrosion. A polished finish makes them an enhancement to any carb. They are 5/16″ wrenching and nominally rated at **170,000 psi**. Available for both single and dual metering block applications.

Application	Pieces	Part No.
2-barrel, hex	4	400-0312
Dual metering blocks, hex	8	400-0310
Single metering blocks, hex	8	400-0311

BREAK-AWAY BLOWER STUDS

Engineered to minimize damage to either manifold or blower housing during unexpected blower explosions – these break-away blower studs are designed to allow separation of manifold and blower. Use of these special studs could save you thousands of dollars! Manufactured from premium-quality aluminum and heat-treated to provide the optimum balance between keeping the supercharger in place and breaking under a predetermined amount of force. Kit comes complete with anodized studs, 12-point, quality steel nuts and heavy-duty parallel-ground and hardened steel washers.

Application	Diameter	OAL	Part No.
Blower stud kit (blue)	7/16	2.880	100-0601
SSI blower stud kit (red)	7/16	2.500	100-0602

DISTRIBUTOR STUD KITS

One of the most critical – yet often overlooked – fasteners used in any engine locks the timing in place. ARP offers these premium grade studs, which are equipped with vibration-resistant J-form threads, in black oxide finished chrome moly or rust-proof stainless steel. A special bullet nose helps guide nut into place without crossthreading. Choice of conventional hex or space-saving 12-point nuts. Washers included.

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
CHEVY	130-1702	130-1701	430-1702	430-1701
FORD	150-1702	150-1701	450-1702	450-1701
PONTIAC	190-1702	190-1701	490-1702	490-1701

Steve Matusek of Aeromotive depends on ARP

Gregg Hopp, Unlimited lights hydro champion

HARMONIC BALANCER BOLT KITS

Application	Socket Size	Diameter/ Thread Size	UHL	Part No.
BUICK				
All V6 & V8	13/16	3/4-16	1.300	120-2501
CHEVROLET				
Small block	5/8	7/16-20	2.470	134-2501
Small block	13/16	7/16-20	2.470	234-2501
Small block	1-1/16	7/16-20	2.470	234-2502
Gen III/LS Series small block (except LS7)	1-1/16	M16 x 2.0	4.325	234-2503
Gen III/LS7 small block	1-1/16	M16 x 2.0	5.225	234-2504
CHEVROLET				
Big block	5/8	1/2-20	1.550	135-2501
Big block	13/16	1/2-20	1.550	235-2501
Big block	1-1/16	1/2-20	1.550	235-2502
CHRYSLER				
318-440 Wedge & 426 Hemi with thin damper	1-1/16	3/4-16	1.420	245-2501
318-440 Wedge with thick damper & Viper V10	1-1/16	3/4-16	2.200	240-2501
FORD				
1.8L & 2.0L Duratec	19mm	M14 x 1.50	1.735	251-2501
4.6L Modular V8	18mm	M12 x 1.50	1.800	156-2501
289-460 cid (except 351C)	5/8	5/8-18	2.050	150-2501
351C	5/8	5/8-18	1.800	154-2501
HONDA				
B Series (B16/18)	19mm	M14 x 1.25	1.350	208-2501
MITSUBISHI				
2.0L (4G63) DOHC	19mm	M14 x 1.50	1.525	207-2501
OLDSMOBILE				
V8	13/16	3/4-16	1.300	180-2501
PONTIAC				
350-455 cid	5/8	5/8-18	1.580	190-2501

Red part numbers indicate new items

As the crankshaft flexes and twists, the balancer absorbs incredible amounts of kinetic energy. To ensure that the balancer is locked in position, ARP has developed these ultra strong **200,000 psi** bolts that let you exert maximum clamping force. Special features include 1/4″ thick, wide area washer and an extra tall 12-point head that accepts a deep socket and eliminates the worry of stripping the head.

SQUARE DRIVE BALANCER BOLTS

ARP offers a special version of its rugged **200,000 psi** rated balancer bolt that can accept a standard 1/2″ drive ratchet or breaker bar to facilitate rotating the crank assembly.

- 1/2″ square drive forged into bolt head, enabling the rotation of an engine with any 1/2″ drive tool
- Made from heat-treated 8740 chrome moly steel with heavy-duty black oxide finish

Application	Part No.
BUICK	120-2502
CHEVY	
Small Block	134-2503
Big Block	135-2503
CHRYSLER	145-2503
FORD	
289-460 cid (except 351C)	150-2503
351C	154-2502
OLDSMOBILE	180-2502
PONTIAC	190-2502

FUEL PUMP PUSHROD KIT

Stock fuel pump pushrods leave a lot to be desired. In fact, they've been known to break at the most inopportune time. To provide you with required reliability and improved performance, ARP has developed these sophisticated and durable pushrods. They're made from premium grade aerospace chrome moly and centerless ground to precise diameter. A hollow core serves to reduce the reciprocating mass, which requires less energy to operate. The less drag on the motor, the more power available to you!

NOTE: Not for use on roller cams!

Application	Diameter	OAL	Part No.
Chevy Small Block	1/2	5.750″	134-8701
Chevy Big Block	1/2	5.750″	135-8701

CAM BOLT KITS

Install an ARP cam bolt kit and end your camshaft timing worries! ARP quality delivers increased pre-load clamping force and assures positive timing gear register. Includes appropriate fasteners for your application. Increased material strength overcomes valve train harmonics and stress. Added features include oversized bolt head flange for cam button retention and reduced socket head size to facilitate easy installation and removal. Available in both **High Performance** and **Pro Series** kits.

Application	Socket Size	Diameter/ Thread Size	UHL	High Perf. 180,000 psi	Pro Series 200,000 psi
BMW					
1.6L Mini Cooper - cam sprocket bolt kit	19mm	M12 x 1.5	2.085		206-1001
BUICK					
All V6	3/8	5/16-18	.560	123-1001	
CHEVROLET					
265-454 cid	1/2	5/16-18	.750	134-1001	234-1001
265-454 cid - with oversize head for use with cam button	7/16	5/16-18	.750		300-1001
Gen III/LS Series small block - cam retainer plate bolt kit	10mm	M8 x 1.25	20mm	134-1002	
Gen III/LS Series small block - cam sprocket bolt kit	10mm	M8 x 1.25	25mm	134-1003	
CHRYSLER/DODGE					
2.0L DOHC & 2.4L DOHC - cam tower stud kit (head# 4667086)	8mm 10mm	M6 x 1.0 M8 x 1.0	1.825 2.115	141-1001	
383-440 Wedge & 426 Hemi - 3 bolt pattern	5/8	3/8-16	.750	144-1001	
383-440 Wedge & 426 Hemi - 3 bolt pattern (reduced head, extended length)	3/8	3/8-16	.875	244-1001	
FORD, SMALL BLOCK					
260-289-302 cid (1965-68)	5/8	3/8-16	1.460	154-1001	254-1001
302-351W cid (1969 & later)	5/8	3/8-16	1.580	155-1001	255-1001
351C, 351-400M	5/8	3/8-16	1.970	154-1002	254-1002
351 SVO - cam retainer plate bolt kit	7/16	1/4-20	.750		250-1001
4.6L Modular V8 - cam sprocket bolt kit (1 per cam required)	18mm	M12 x 1.5	1.800		256-1001
FORD, BIG BLOCK					
390-428 cid FE Series	5/8	7/16-14	1.750	155-1002	255-1002
429-460 cid	5/8	3/8-16	1.580	155-1001	255-1001
FORD, 4-CYLINDER					
2.0L Zetec	18mm	M10 x 1.5	1.600		251-1002
PONTIAC					
350-455 cid	3/4	1/2-20	1.000	190-1001	

OIL PUMP DRIVESHAFT KITS

Many an engine has been destroyed as a result of oil pump driveshaft failure. To cure this all-too-common problem, ARP has designed an extra heavy-duty shaft that will provide you with the necessary reliability. The shaft is made from heat-treated, premium grade aerospace chrome moly steel. Moreover, the shaft diameter is a larger diameter than the OEM unit. These features combine to enable ARP shafts to handle the added torque requirements of increased capacity oil pumps or heavy viscosity lubricants.

CHEVY DRIVES: Made from premium grade 8740 and heat-treated to **190,000 psi**, ARP uses a unique manufacturing process where the alignment sleeve is roll formed onto the shaft (not welded or pinned), enabling the sleeve to float, allowing for slight misalignment.

Application	Part No.
CHEVROLET	
Small block (all)	134-7901
Big block	135-7901
Big block (+.400 tall deck)	135-7902

IMPORTANT NOTE: Make sure you ***ALWAYS*** check clearances: shaft to block and pump to distributor.

FORD DRIVES: Made from ARP2000 and heat-treated to **220,000 psi**. These pump drives feature a CNC milled (not broached) hex, and has the retaining washer installed.

Application	Part No.
FORD	
239-312 Y block	154-7906
289-302 cid & Boss 302	154-7904
351W	154-7901
351C, 351-400M	154-7905
390-428 cid FE Series	154-7902
429-460 cid	154-7903

INDIVIDUAL ACCESSORY BOLT KITS

Just about any fastener type you can think of is available from ARP in convenient skin-packed cards by product group. Look for them at your favorite performance parts retailer. And note that all ARP fasteners are proudly manufactured in the U.S.A. in our own factory. It will pay you to invest in the best.

For your convenience, ARP has taken the most popular combinations and compiled complete Engine & Accessory Bolt Kits. *You'll find them all on page 61 of this catalog.* Each kit contains about a dozen different fastener groups. They're available for engines ranging from Briggs & Stratton to big block Chevy, Ford and Chrysler powerplants.

Also available, display skin-packed in groups of five are "bulk" fasteners that are offered in coarse, fine and metric threads. These 5-packs come in a wide array of lengths, ranging from about 1/2″ to 5 inches. They are offered in polished stainless steel or in black oxide chrome moly. You can also get companion 5-packs of nuts and washers. *See the complete listing on page 82.*

ALTERNATOR STUD KITS

Strange as it may seem, there have been many races lost in oval track, off-road and endurance competition due to the OEM alternator stud failing and the subsequent loss of electrical power. To prevent this from ever happening, conscientious engine builders rely on ARP's "bulletproof" alternator studs. They're made from a premium grade 8740 chrome moly steel alloy and heat-treated to a nominal **200,000 psi** tensile strength. They are very rigid and won't bend under the stress of competition, eliminating problems with alternator pulley alignment. Here's more reliable "insurance" from the innovators at ARP. Available in 5.000″ and 5.250″ lengths. Includes a 12-point nut and flat washer.

Description	OAL	Coarse Thread Length	Fine Thread Length	Part No.
7/16 stud	5.000	1.000	1.000	300-0501
7/16 stud	5.250	1.000	1.000	300-0502

COIL BRACKET BOLT KITS

Add a touch of class to your coil bracket installation with an ARP bolt kit. Available in black oxide finished chrome moly or rust-proof stainless steel, as well as with a conventional hex head or compact 12-point (great for use with those coils mounted in tight, hard-to-reach places). Washers included. Coil bracket bolts also included in ARP's popular Engine & Accessory kits.

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
CHEVY	130-2302	130-2301	430-2302	430-2301
CHEVY LS SERIES SMALL BLOCK	134-2302	134-2301	434-2302	434-2301
FORD	150-2302	150-2301	450-2302	450-2301

DISTRIBUTOR STUD KITS

One of the most critical – yet often overlooked – fasteners used in any engine locks the timing in place. ARP offers these premium grade studs, which are equipped with vibration-resistant J-form threads, in your choice of black oxide finished chrome moly or rust-proof stainless steel. Select from conventional hex or space-saving 12-point nuts. Washers included.

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
CHEVY	130-1702	130-1701	430-1702	430-1701
FORD	150-1702	150-1701	450-1702	450-1701
PONTIAC	190-1702	190-1701	490-1702	490-1701

FRONT COVER, WATER PUMP & ALTERNATOR

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
CHEVROLET				
3/8 alternator pivot bolt kit			430-3303	430-3304
All V8, timing cover bolt kit	200-1502	200-1501	400-1502	400-1501
All V8, water pump, long bolt kit	130-3202	130-3201	430-3202	430-3201
All V8, alternator bracket bolt kit	130-3302	130-3301	430-3302	430-3301
Gen III/LS Series small block, timing cover	134-1501	134-1502	434-1501	434-1502
Gen III/LS Series small block, water pump with thermostat housing bolts	134-3201	134-3202	434-3201	434-3202
Gen III/LS Series small block, rear motor cover	134-1503	134-1504	434-1503	434-1504
CHRYSLER				
KB Hemi, timing cover stud kit	245-1511	245-1501	445-1511	445-1501
FORD				
289-302, aluminum timing cover & water pump	154-1504	154-1503	454-1504	454-1503
289-302, cast-iron timing cover & water pump	154-1502	154-1501	454-1502	454-1501
351W, alternator bracket bolt kit	150-3302	150-3301	450-3302	450-3301
PONTIAC				
All V8, alternator bracket bolt kit	190-3302	190-3301	490-3302	490-3301
All V8, timing cover and water pump	190-1502	190-1501	490-1502	490-1501

We have an assortment of premium quality stainless steel and black oxide finish 8740 chrome moly bolts for the most popular applications. Washers included. These bolts are also available as part of our complete Engine & Accessory Kit packages (*see page 61 for details*).

FUEL PUMP BOLT KITS

Absolute security is yours with ARP's durable fuel pump bolts. Your choice of black oxide finished chrome moly steel or rust-proof stainless steel. Both are nominally rated at **170,000 psi** and considerably stronger than Grade 8 hardware. Hex or 12-point head. Washers included.

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
CHEVROLET	130-1602	130-1601	430-1602	430-1601
PONTIAC	190-1602	190-1601	490-1602	490-1601

HEADER BOLTS

Application	Dia.	UHL	Black Oxide		Stainless 300	
			Hex	12-Point	Hex	12-Point
BUICK						
350-455 cid, 14 pcs.	3/8	.750	120-1101	120-1201	420-1101	420-1201
CHEVROLET, SMALL BLOCK						
12 pieces	3/8	.750	100-1101	100-1201	400-1101	400-1201
12 pieces, drilled	3/8	.750	100-1103	100-1203	400-1103	400-1203
12 pieces	3/8	1.000	100-1111	100-1211	400-1111	400-1211
CHEVROLET, BIG BLOCK						
16 pieces	3/8	.750	100-1102	100-1202	400-1102	400-1202
16 pieces, drilled	3/8	.875			400-1104	400-1204
16 pieces	3/8	1.000	100-1112	100-1212	400-1112	400-1212
CHRYSLER						
318-340-360 Wedge, 14 pcs.	5/16	.750	144-1102	144-1202	444-1102	444-1202
FORD						
16 pieces	3/8	.750	100-1102	100-1202	400-1102	400-1202
OLDSMOBILE						
330-455 cid, 14 pcs.	3/8	.750	180-1101	180-1201	480-1101	480-1201
UNIVERSAL						
12 pcs., 5/16″ wrenching	3/8	.750	100-1107	100-1207	400-1107	400-1207
16 pcs., 5/16″ wrenching	3/8	.750	100-1108	100-1208	400-1108	400-1208
12 pcs., 5/16″ wrenching	3/8	1.000	100-1109	100-1209	400-1109	400-1209
16 pcs., 5/16″ wrenching	3/8	1.000	100-1110	100-1210	400-1110	400-1210
16 pcs., 3/8″ socket, drilled	3/8	.750			400-1105	400-1205
12 pcs., 3/8″ socket, drilled	3/8	.875			400-1106	400-1206

ARP manufactures premium grade bolt kits to facilitate installation of exhaust headers in both stainless steel or 8740 chrome moly steel. The Stainless 300 material is not affected by corrosion or extreme heat, making it ideal for the application. What's more, the compact 12-point nut version lets you easily slip a socket close to the pipe. Each ARP bolt kit includes the specific number of parts for your application, plus premium-quality washers and hex or 12-point nuts, as required. The black oxide finished chrome moly bolts and stainless steel fasteners are nominally rated at **170,000 psi** tensile strength. Specially drilled "NASCAR" models available for those who wish to safety wire their header bolts to prevent loosening.

THERMOSTAT HOUSING BOLTS

These premium grade bolts are engineered to properly engage the manifold threads and resist loosening. They're application-specific, and come in your choice of black oxide finished chrome moly or rust-proof stainless steel, with handy 12-point or standard hex heads. Washers included.

Application	UHL	Black Oxide		Stainless 300	
		Hex	12-Point	Hex	12-Point
CHEVY (3 PC)	1.00/2.00	130-7402	130-7401	430-7402	430-7401
CHEVY LS SERIES SMALL BLOCK	20mm	134-7402	134-7401	434-7402	434-7401
FORD FE	2.250	155-7402	155-7401	455-7402	455-7401
FORD 351W	0.875	150-7402	150-7401	450-7402	450-7401
PONTIAC	1.000	190-7402	190-7401	490-7402	490-7401

INTAKE MANIFOLD BOLTS

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
AMC				
290-343-390 cid, uses 3/8˝ socket	114-2001		414-2001	414-2101
BUICK				
3.8L V6	123-2001		423-2001	
215 cid, uses 3/8˝ socket	124-2001	124-2101	424-2001	424-2101
CHEVROLET				
265-400 cid, factory OEM	134-2001	134-2101	434-2001	434-2101
305-350 Vortec, fits most aftermarket alum. intakes	134-2002	134-2103	434-2002	434-2102
LS1, LS4, LS6, 4.8L-RL4, 5.3L-LM7, 6.0L-LQ4	130-2001	130-2101	430-2001	430-2101
Gen III/ LS Series small block, valley cover bolts	134-8001	134-8002	434-8001	434-8002
396-454 cid, 1.250˝ U.H.L	135-2001	135-2101	435-2001	435-2101
502 cid, 1.500˝ U.H.L	135-2002		435-2002	435-2102
CHRYSLER				
318-440 Wedge, uses 3/8˝ socket	144-2001	144-2101	444-2001	444-2101
FORD				
260-289-302-351W, uses 3/8˝ socket	154-2001	154-2101	454-2001	454-2101
351C, 351-400M	154-2004	154-2104	454-2004	454-2104
390-428 cid FE Series	155-2002	155-2102	455-2002	455-2102
429-460 cid	155-2005	155-2105	455-2001	455-2101
PONTIAC				
350-455 cid, uses 3/8˝ socket	194-2001	194-2101	494-2001	494-2101

Red part numbers indicate new items

Prevent intake manifold leaks with ARP's quality fasteners. They're super strong and precision machined for optimum thread engagement. Wide underhead flange and companion washers provide even load distribution. Precision rolled threads prevent galling while promoting more consistent torque loading. Also facilitates optimum sealing of gasket surfaces. Available in choice of black oxide finished chrome moly or corrosion resistant stainless steel, as well as hex or 12-point heads. Both materials are nominally rated at **170,000 psi**. Washers included.

OIL PAN BOLTS

ARP's premium grade pan bolts combine sealing efficiency with good looks. They are available in black oxide finished chrome moly steel or rust-proof stainless steel. Also, take your pick from conventional hex bolt heads and a space-saving 12-point design. Includes washers. *For details on ARP oil pan stud kits refer to page 50 of this catalog.*

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
CHEVROLET				
265-400 cid	234-1802	234-1801	434-1802	434-1801
Gen III/LS Series small block	134-6901	134-6902	434-6901	434-6902
396-454 cid	235-1802	235-1801	435-1802	435-1801
CHRYSLER				
318-340-360 Wedge & 318-360 Magnum	200-1802	200-1801	400-1802	400-1801
FORD				
289-302-351C & 351W (early model)	254-1802	254-1801	454-1802	454-1801
302-351W (late model with side rails)	254-1804	254-1803	454-1804	454-1803
390-428 cid FE Series	255-1802	255-1801	455-1802	455-1801
PONTIAC				
350-455 cid	200-1802	200-1801	400-1802	400-1801

VALVE COVER BOLT KITS

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
CAST ALUMINUM COVERS				
Bolt kit, 1/4-20, 8 pieces	100-7507	100-7503	400-7507	400-7503
Bolt kit, 1/4-20, 14 pieces	100-7504	100-7508	400-7508	400-7504
Chevy, Gen III/LS Series small block	100-7524	100-7523	400-7529	400-7530
STAMPED STEEL COVERS				
350 Chevy, center bolted valve cover	100-7509	100-7510	400-7509	400-7510
Bolt kit, 1/4-20, 8 pieces	100-7505	100-7501	400-7505	400-7501
Bolt kit, 1/4-20, 14 pieces	100-7506	100-7502	400-7506	400-7502

ARP offers special valve cover bolts both as individual packages, or included in complete Engine & Accessory Kits (*see page 61*). The bolts are offered in a choice of chrome moly steel with a black oxide finish or corrosion-proof polished stainless steel (ARP Stainless 300 material) Additionally, you have a choice between conventional hex head bolts and nuts or compact, easy access 12-point designs. The heads feature a wide base for better load distribution and sealing (helps prevent those pesky gasket leaks), while the compact head is easily accessed. Kits are shipped with the required flat washers. *ARP also manufactures valve cover stud kits, which are listed on page 48 of this catalog.*

ENGINE & ACCESSORY FASTENER KITS

It's easy to assemble a show-quality engine when you use ARP's handy Engine & Accessory Fastener Kit. Virtually everything you need comes completely organized in one convenient package (no need to deal with twelve different part numbers)! More importantly, each and every fastener is superior in strength to the OEM bolts, and also significantly better than hardware grades (even Grade 8). You have a choice of two premium quality materials and finishes.

Traditionalists will appreciate the strength and functionality of ARP's heat-treated 8740 Chrome Moly steel alloy bolts, which feature a black oxide finish.

Those who desire a dazzling engine will no doubt prefer fasteners made of ARP's specially alloyed Stainless 300 material, which has the added benefit of being virtually impervious to rust and corrosion. The stainless steel is polished to achieve a brilliant luster, and provides a distinctive, maintenance-free environment. Each kit has a dozen different type fasteners, all neatly organized and labeled in protective vacuum-wrapped packages.

Both materials are nominally rated at **170,000 psi** tensile strength and come in both hex and 12-point heads.

Please note that these kits are designed for carbureted engines. Newer EFI applications may require the purchase of additional fasteners.

- ***Each Kit Contains 12 Groups of Fasteners (except for Briggs & Stratton)***
- ***Black Oxide Finish 8740 Chrome Moly Steel or Stainless Polished Steel***
- ***Stronger Than Any Hardware Grades***
- ***Choice Of Hex or 12-Point Heads***
- ***Available For All Popular Engine Types***
- ***100% Satisfaction Guaranteed.***
- ***Save Time, Money and Hassles!***

Everything you need to attach components and accessories from a long block on up is packaged in one economical, convenient kit!

- **Intake manifold bolts**
- **Valve cover bolts**
- **Thermostat housing bolts**
- **Alternator bracket bolts**
- **Distributor bracket bolts**
- **Motor mount bolts**
- **Oil pan bolts**
- **Coil bracket bolts**
- **Header bolts**
- **Front cover bolts**
- **Water pump bolts**
- **Fuel pump bolts**

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
BRIGGS & STRATTON				
4-cycle, 5 horsepower Jr. Dragster			500-9601	500-9501
CHEVROLET				
350-400 cid with or without headers (1986 & earlier) ❶	534-9801	534-9701	534-9601	534-9501
305-350 cid with headers (1987-95)	534-9802	534-9702	534-9602	534-9502
350 LT1-LT4 with headers (1992-97)	534-9803	534-9703	534-9603	534-9503
305-350 Vortec with headers (1996 & later) except LS1 and LS6	534-9804	534-9704	534-9604	534-9504
Gen III/LS Series small block with or without headers	534-9805	534-9705	534-9605	534-9505
396-454 cid ❶	535-9801	535-9701	535-9601	535-9501
CHRYSLER				
318-340-360 Wedge ❶	544-9801	544-9701	544-9601	544-9501
383-440 Wedge	545-9801	545-9701	545-9601	545-9501
FORD				
289-302 cid ❶	554-9801	554-9701	554-9601	554-9501
Boss 302 ❶	554-9802	554-9702	554-9602	554-9502
351 Cleveland	554-9804	554-9704	554-9604	554-9504
351 Windsor ❶	554-9803	554-9703	554-9603	554-9503
390-428 FE Series	555-9802	555-9702	555-9602	555-9502
429-460 cid ❶	555-9801	555-9701	555-9601	555-9501
PONTIAC				
350-455 cid ❶	594-9801	594-9701	594-9601	594-9501

❶ 1987 & newer EFI engines or those with aftermarket components may require additional fasteners be purchased

Red part numbers indicate new items

FLYWHEEL BOLT KITS

Flywheel and Flexplate bolts play an important role in the performance and safety of race cars and street machines alike. That's why the fastener experts at ARP have developed special bolts that are far superior to OEM hardware. ARP offers two styles of Flywheel/Flexplate bolts: High Performance and Pro Series. They are both forged from aerospace alloy and heat-treated prior to thread rolling and machining. Both feature an exclusive, flat, 12-point head design and larger than stock shank diameter for increased strength and improved flywheel register. The popular High Performance series is rated at **180,000 psi**, and the premium grade Pro Series, originally developed for NASCAR Winston Cup competition, has a **200,000 psi** rating. Complete with washers and nuts where applicable.

NOTE: The thread size of metric fasteners is listed using international designations. For example, "M10" indicates a 10mm thread size.

Application	UHL	Thread Size	High Perf.	Pro Series
BMC				
1600cc A Series	.900	3/8-24		206-2802
CHEVROLET				
90° V6 & 265-454 V8 with 2pc. rear seal	1.000	7/16-20	100-2801	200-2802
90° V6 & 305-502 V8 with 1pc. rear seal	1.000	7/16-20		200-2807
Gen III/LS Series small block	.880	M11 x 1.5		330-2802
V8 with Tilton flywheel, uses 1/2" socket	.875	7/16-20		330-2801
CHRYSLER				
SL6, 3.9L V6 & 273-440 V8 w/ 6 bolt crank	.875	7/16-20		240-2801
Aftermarket 383-440 V8 & Hemi w/ 8 bolt crank	.875	1/2-20		245-2801
FORD				
1.8L & 2.0L Duratec	.990	M12 x 1.0		251-2802
2.0L Zetec	.900	M11 x 1.0		251-2801
2000cc Pinto	1.150	M10 x 1.0		151-2801
4.6L & 5.4L Modular V8	1.000	M10 x 1.0		254-2801
289-460 V8	1.000	7/16-20	100-2801	200-2802
351 NASCAR V8, uses 3/4" socket	.925	7/16-20		350-2802
V8 with Tilton flywheel, uses 1/2" socket	.950	7/16-20		350-2801
HONDA				
1.5L & 1.6L SOHC, D Series (6 pcs.)	.990	M12 x 1.0		208-2801
1.6L, 1.7L, 1.8L & 2.0L DOHC, B Series (8 pcs.)	.990	M12 x 1.0		208-2802
PONTIAC				
Iron Duke 4 cylinder (12 pcs.)	.750	7/16-20		291-2801
350-455 V8 with washers (6 pcs.)	1.000	1/2-20		290-2802
ROVER				
K Series (8 pcs.)	.826	M10 x 1.0		206-2803
TOP FUEL				
8740 with washers (200,000 psi)	1.000	1/2-20		200-2804
L19 with washers (260,000 psi)	1.000	1/2-20		200-2805
TOYOTA				
1.6L (4AGE) DOHC (8 pcs.)	1.050	M10 x 1.25		203-2802
2.0L (3SGTE) DOHC (8 pcs.)	1.000	M12 x 1.25		203-2801
2.2L (20R) & 2.4L (22R) (6 pcs.)	1.040	M11 x 1.25		203-2803
VAUXHALL/OPEL				
2.0L	.985	M10 x 1.25		209-2801

Red part numbers indicate new items

FLEXPLATE BOLT KITS

Application	UHL	Thread Size	High Perf.	Pro Series
CHEVROLET				
90° V6 & 265-454 V8 with 2pc. rear seal	.680	7/16-20	100-2901	200-2902
90° V6 & 305-502 V8 with 1pc. rear seal	.725	7/16-20		200-2906
Gen III/LS Series small block	.880	M11 x 1.5		244-2901
CHRYSLER				
SL6, 3.9L V6 & 273-440 V8 w/ 6 bolt crank	.500	7/16-20		200-2903
Aftermarket 383-440 V8 & Hemi w/ 8 bolt crank	.500	1/2-20		200-2905
5.9L 12V & 24V Dodge/Cummins diesel	.700	M12 x 1.25		147-2901
FORD				
2000cc & 2300cc Pinto	.800	M10 x 1.0		251-2901
289-460 V8	.680	7/16-20	100-2901	200-2902
4.6L & 5.4L Modular V8	.800	M10 x 1.0		254-2901
PONTIAC				
350-455 V8	.675	1/2-20		200-2904

Red part numbers indicate new items

TORQUE CONVERTER BOLTS

Application	UHL	Thread Size	Pro Series
CHRYSLER			
Torqueflite 727 & 904 w/ production converter	.450	5/16-24	240-7301
Torqueflite 727 & 904 w/ aftermarket converter	.500	7/16-20	240-7302
GENERAL MOTORS			
Powerglide, TH350 & TH400 w/ production converter	.750	3/8-24	230-7301
Powerglide, TH350 & TH400 w/ most aftermaket converter	.725	7/16-20	230-7302
Powerglide, TH350 & TH400 w/ race converter - 1/2" thick tabs	1.250	7/16-20	230-7303
200, 700, 4L60 & 4L80 (3pcs. car)	.590	M10 x 1.5	230-7304
200, 700, 4L60 & 4L80 (6pcs. truck)	.590	M10 x 1.5	230-7305
Universal IMCA Brenn drive flange kit (6 bolts)	1.250	7/16-20	230-7306

Red part numbers indicate new items

You can forget about the problem of shearing a torque converter bolt after you install these super strong **200,000 psi** gems. They are designed for each specific application and provide the optimum grip. Kits come with hardened parallel-ground washers.

AUTO TRANS PAN BOLT KITS

Application	12-Point
GENERAL MOTORS	
Turbo 350-400	430-0401

Here's another area in which ARP provides a superior strength fastener that will provide better reliability than the OEM hardware. Made of rust-proof stainless steel, they're attractive, too. Includes washers.

CLUTCH COVER/PRESSURE PLATE BOLT KITS

The importance of pressure plate bolts in a racing or hi-performance street application cannot be emphasized nearly enough. These fasteners play a key role in both the performance and safety of a vehicle. Because of this, ARP has developed special pressure plate bolts that are application specific to ensure the optimum grip length. ARP offers High Performance Series bolts that are made from a premium grade chrome moly and hardened to a nominal tensile strength of **180,000 psi**. The Pro Series bolts, originally developed for NASCAR Winston Cup competition, are stronger and rated at **200,000 psi**. Both models feature a large diameter, low-profile design. Complete with washers.

Application	Thread Size	High Perf.	Pro Series
CHEVROLET			
265-502 V8	3/8-16	130-2201	230-2202
V8 with Tilton flywheel and 3 disk AP clutch	5/16-24		330-2202
V8 with Tilton flywheel (1.500 UHL bolts)	5/16-24		330-2203
Gen III/LS Series small block	M10 x 1.50	134-2201	
FORD			
289-460 V8 (1985 & earlier)	5/16-18	150-2201	250-2201
302-351W V8 (1986-95)	M8 x 1.25	150-2202	
V8 w/ Tilton flywheel and 3 disk AP clutch (hex)	5/16-24		350-2202
V8 w/ Tilton flywheel and 3 disk AP clutch (12pt)	5/16-24		350-2203
HONDA			
SOHC D Series (6 pcs.)	M8 x 1.25	108-2201	
DOHC B Series (9 pcs.)	M8 x 1.25	108-2202	
PONTIAC			
350-455 V8	3/8-16	190-2201	290-2201

Red part numbers indicate new items

BELLHOUSING STUD KITS

Here's just what you need to secure a bellhousing in place. The studs are designed with a radiused head to position the bellhousing and accept nuts without the fear of cross-threading. Choice of rugged 8740 heat-treated alloy or rust-proof stainless steel. Complete with nuts and flat washers.

Application	Dia.	Length	Pro Series	Stainless
Chevy, Chrysler KB Hemi	3/8	2.000	245-0901	445-0901
Top fuel motor plate, std.	7/16	2.400	245-0201	
Top fuel motor plate, w/ 1/4″ spacer	7/16	2.150	245-0202	

PUMP & LOWER PULLEY BOLTS

To provide the reliability required in racing and high performance street applications, ARP offers premium grade **170,000 psi** fasteners to securely attach the water pump and lower pulleys. You can count on them to perform. Washers included.

Application	Thread	UHL	Socket Size	High Perf.	Stainless
LOWER PULLEY					
CHEVROLET					
SB & BB, 12 pt, 3-pc.	3/8-24	.750	3/8		430-6801
SB & BB, 12 pt, 3-pc.	3/8-24	2.125	1/2	334-6801	
FORD					
12 pt, 3-pc.	3/8-16	1.000	3/8	350-6801	450-6803
12 pt, 4-pc.	3/8-16	1.000	3/8	350-6802	450-6803
WATER PUMP PULLEY, 12 PT					
12 pt, 4-pc.	5/16-24	.750	3/8		430-6802

STAINLESS STEEL REAR END COVER

Application	UHL	Thread	Part No.
GM			
10-bolt	.750	5/16-18	437-3001
12-bolt	.750	5/16-18	437-3002

Here's an easy way to enhance the appearance of any GM 10 or 12-bolt rear end setup. ARP's stainless steel rear end cover bolts offer a lustrous contrast to a painted OEM cover or perfectly compliment a chrome plated aftermarket version. These sturdy **170,000 psi** bolts are much stronger than stock (or even Grade 8) hardware, have precision machined threads for secure engagement, and won't rust. The best! Washers included.

MOTOR MOUNT BOLTS

Secure any engine with complete confidence with ARP's rugged motor mount bolts. You can choose between black oxide finished 8740 chrome moly or corrosion-resistant stainless steel; choice of hex or 12-point head. Kits come complete with flat washers.

Application	Black Oxide		Stainless 300	
	Hex	12-Point	Hex	12-Point
CHEVROLET				
V6 & V8 mount to block	130-3102	130-3101	430-3102	430-3101
V6 & V8 mount to frame	130-3105		430-3105	
Gen III/LS Series small block mount bracket to block	134-3102	134-3101	434-3102	434-3101
FORD				
289-302-351W	150-3102	150-3101	450-3102	450-3101
PONTIAC				
All V8	190-3102	190-3101	490-3102	490-3101

RING GEAR BOLT KITS

The tremendous shock loads generated at launch by most any drag racing vehicle equipped with today's sticky tire compounds or the acceleration and deceleration of oval track cars put considerable strain on the ring gear. For this reason, the fastener experts at ARP have developed the Pro Series ring gear bolts. They're forged from premium grade 8740 chrome moly steel and are heat-treated to a nominal rating of **200,000 psi** tensile strength. Specially hardened, precision-ground washers are included where required. Available to fit most any ring gear setup ranging from popular 9" Ford GM 10 & 12-bolt rear ends to the beefy Strange differentials found in Top Fuel and Funny Car applications.

TECH NOTE

It is critically important to properly tighten ring gear bolts and make sure they don't loosen. This is especially important in drag cars with tire shake. It's also a good idea to check bolt tightness on a routine basis. If you use a locking compound (like Loc-Tite), it is best to install the ring gear first without any compound, then remove the bolts one at a time, reinstalling them with the compound. Be sure and torque each bolt before going on to the next one, because the Loc-Tite sets up fast. Install and torque the bolts in an alternating or crossing pattern to distribute the load evenly around the ring gear.

Application	UHL	Thread	Part No.
CHRYSLER			
7 1/4" and 8 3/4" (1972 & earlier) .390 grip	.835	3/8-24 LH	240-3001
Clutch-type LSD- case half bolts with washers	2.800	3/8-24 LH	250-3006
FORD			
8" ring gear bolt kit with washers	.940	7/16-20	250-3009
9" uses 5/8" socket	.940	7/16-20	250-3002
8.8" and 9" uses 3/4" socket	.750	7/16-20	250-3003
Ring gear bolt kit with washers, 1/2" shank	1.060	7/16-20	350-3004
GENERAL MOTORS			
10 and 12-bolt	.800	3/8-24	230-3001
Camaro/Pickup Truck	.850	7/16-20 LH	230-3002
STRANGE			
Top Fuel differential with washers	1.200	7/16-20	250-3001
VOLKSWAGEN			
VW 020 ring gear bolt kit with 12pt nuts	1.200	M9 x 1.00	204-3001
VW 02A ring gear bolt kit with 12pt nuts	1.180	M10 x 1.25	204-3002
VW 02M ring gear bolt kit with 12pt nuts	1.100	M9 x 1.00	204-3003

Red part numbers indicate new items

CARRIER FASTENERS

When assembling a rear end, optimum reliability can be obtained by employing these rugged chrome moly bolts and studs.

Application	UHL	Thread	Part No.
FORD			
8" carrier bearing stud kit	2.600	7/16-14,7/16-20	250-3008
8" and 9" pinion support bolt kit	1.000	3/8-16	250-3007
9" carrier bearing stud kit	3.250	1/2-13, 1/2-20	250-3004
9" carrier bearing stud kit, H case (hex)	3.400	1/2-13, 1/2-20	250-3012
9" carrier bearing stud kit, H case (12pt)	3.400	1/2-13, 1/2-20	250-3013
9" housing stud kit (10 pcs.)	1.645	3/8-24	250-3005
9" pinion support stud kit (12 pt, ss)	2.000	3/8-16, 3/8-24	250-3010
9" pinion support stud kit (hex, ss)	2.000	3/8-16, 3/8-24	250-3011
9" pinion support stud kit (12 pt, blk)	2.000	3/8-16, 3/8-24	250-3020
9" pinion support stud kit (hex, blk)	2.000	3/8-16, 3/8-24	250-3021

Red part numbers indicate new items

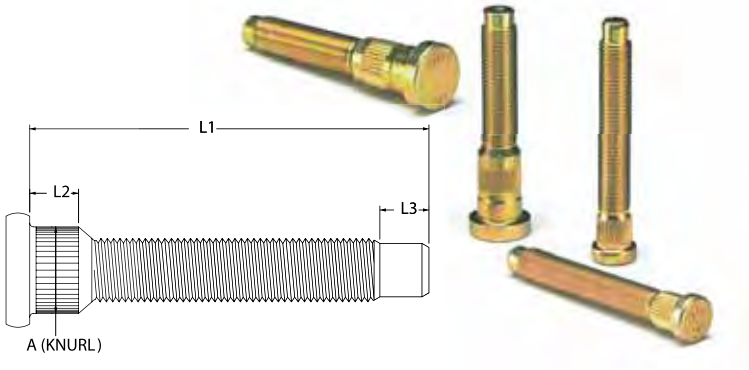
BRAKE HAT BOLT KITS

The perfect upgrade for many original brake hat bolts, this ARP kit features bolts produced from only the finest quality 8740 chrome moly. Features an exclusive 12-point cap screw design and appropriate grip length per the application. All ARP brake hat bolts are drilled to permit safety wiring. Rated **200,000 psi** tensile strength.

Application	UHL	Part No.
5/16-24 with washers	.880	300-0801
5/16-18 with washers	.850	300-0802
1/4-28 (48 pcs.)	.750	300-0803

WHEEL STUDS

ARP's heat-treated 8740 chrome moly wheel studs are a much-needed replacement for any car engaged in oval track or drag racing competition. They have a tensile strength of **200,000 psi** and are able to easily handle the tremendous acceleration shock loads (shear) and lateral forces (elongation) found in racing. The studs are sold in 4 or 5 packs and are cadmium plated for extra durability. Nuts not included. Now available for all popular applications, including General Motors, Ford, Honda and Chrysler replacements, as well as for oval track racing and aftermarket street and strip axles.



Application	A Knurl Dia.	L1 UHL	L2 Knurl Length	L3 Nose Length	Thread Size	Part No.
CHRYSLER						
Chrysler, rear	.680	3.125	.400	.400	1/2-20	100-7705
DODGE						
Neon, front	.585	2.450	.256	.360	M12 x 1.5	100-7721
FORD						
Ford, rear disc brakes/Chrysler front	.625	3.500	.400	.437	1/2-20	100-7703
Ford, front disc brakes, early	.618	3.050	1.000	.250	1/2-20	100-7707
Mustang II front	.554	3.435	.390	.435	1/2-20	100-7714
Mustang (2005 & later) front	.550	3.315	.300	.300	1/2-20	100-7722
Mustang (2005 & later) rear	.615	3.115	.300	.300	1/2-20	100-7723
GM						
Late GM drum brake	.486	3.165	.420	.308	7/16-20	100-7701
Late GM disc brake and early drum brake	.580	3.200	.300	.305	7/16-20	100-7702
Late GM Camaro, Firebird, Corvette	.509	2.500	.315	none	M12 x 1.5	100-7708
Late GM Camaro, Firebird, Corvette	.509	3.250	.315	none	M12 x 1.5	100-7713
HONDA						
Stock replacement (1996 & earlier) 4 pack	.485	1.850	.275	.350	M12 x 1.5	100-7709
Stock replacement (1997 & later) 5 pack	.485	1.850	.275	.350	M12 x 1.5	100-7710
Extended length (1996 & earlier) 4 pack	.485	2.850	.275	.350	M12 x 1.5	100-7711
Extended length (1997 & later) 5 pack	.485	2.850	.275	.350	M12 x 1.5	100-7712
LEXUS						
IS 300	.558	2.600	.230	none	M12 x 1.5	100-7715
MAZDA						
Miata, front and rear (1990-93) & front (1994-05) 4 pack	.507	2.750	.335	.350	M12 x 1.5	100-7719
Miata, rear (1994-05) 4 pack	.579	2.750	.300	.350	M12 x 1.5	100-7720
MITSUBISHI						
Lancer EVO VIII	.565	3.000	.270	.350	M12 x 1.5	100-7717
SUBARU						
WRX	.565	3.000	.270	.350	M12 x 1.25	100-7716
TOYOTA						
Celica GTS (1986-89) front	.565	2.340	.325	.363	M12 x 1.5	100-7718
OTHERS						
Aftermarket axles, 12 pt style head	none	3.470	none	.500	1/2-20	100-7704
Speedway Eng, Pro 4 disc	.568	2.970	.710	.465	1/2-20	100-7706

Red part numbers indicate new items

DRIVE PLATE BOLT KITS

Developed for racers who leave nothing to chance, ARP's special drive plate bolts have many important features, including use of a premium grade chrome moly alloy, heat-treating to **200,00 psi,** J-form thread rolling after heat-treat and a special profile. The bolts come with special precision-ground washers.

Application	UHL	Part No.
7/16-14, 12 pt, drilled (8 pcs.)*	1.500	200-3401
7/16-14, 12 pt, drilled (5 pcs.)*	1.500	200-3402

*For use with most "Wide Five" drive hubs

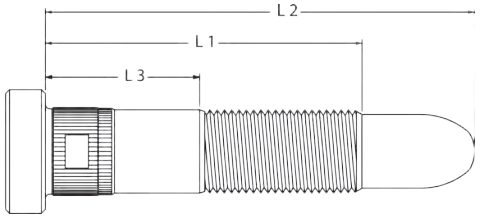
SPRINT CAR DRIVE PINS

ARP sprint car drive pins feature a broached hex for ease of installation and proper pre-load while the rounded end facilitates quick, positive wheel location. All critical shear points feature a large radius for improved reliability and maximum load carrying capacity. Drive pins are rated **200,000 psi** tensile strength.

Application	UHL	Part No.
Front, 2.450˝ OAL	1/2-20	200-2601
Rear, 3.275˝ OAL	1/2-20	200-2602

NOTE: The products listed in this section have been designed to comply with NASCAR® rules. No specific endorsement by NASCAR® is implied.

SPEED STUDS™



Because races can be won or lost in the pits, the engineers at ARP set about to create the ultimate oval track competition wheel stud that facilitates accurate wheel positioning and quicker release/tightening of lug nuts. ARP's new "Speed Studs" (and companion "Speed Nuts") are so good that a large number of NASCAR teams in Sprint Cup, Nationwide and Camping World Truck series use them exclusively. They're made from heat-treated **190,000 psi** chrome moly steel and feature precision J-form threads (formed after heat-treat for improved fatigue strength), exclusive nut-starter and bullet shape radius that all but eliminates cross-threading, shot-peening, special baked-on dry film lubricant (reduces possibility of galling and assures consistent clamp loads), and double magnaflux inspection. A new head design is employed that fits the registers of all popular hubs without grinding, and studs are available in 27 underhead lengths to provide you with the optimum thread engagement for your particular setup. The finest studs available!

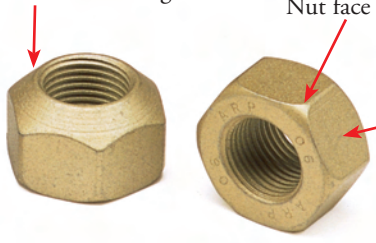
L1 - Thread Length	L2 - UHL	L3 - Knurl Length	Kit Number
FINE THREAD (THREAD SPECS - 5/8-18, KNURL DIAMETER - .660)			
1.600	2.450	.500	300-7710
1.700	2.550	.600	300-7711
1.750	2.600	.650	300-7725
1.800	2.650	.700	300-7712
1.850	2.700	.750	300-7726
1.900	2.750	.675	300-7705
1.950	2.800	.850	300-7727
2.000	2.850	.900	300-7713
2.050	2.900	.825	300-7706
2.100	2.950	1.000	300-7714
2.150	3.000	1.050	300-7728
2.200	3.050	1.100	300-7715
2.250	3.100	1.150	300-7734
2.300	3.150	1.200	300-7716
2.350	3.200	1.250	300-7729
2.400	3.250	1.200	300-7707
2.450	3.300	1.250	300-7730
2.500	3.350	1.400	300-7717
2.550	3.400	1.350	300-7708
2.600	3.450	1.500	300-7718
2.650	3.500	1.550	300-7731
2.700	3.550	1.600	300-7719
2.750	3.600	1.550	300-7709
2.800	3.650	1.700	300-7720
2.850	3.700	1.750	300-7732
2.900	3.750	1.800	300-7721
2.950	3.800	1.850	300-7733
3.000	3.850	1.900	300-7722
3.100	3.950	2.000	300-7723
3.200	4.050	2.100	300-7724
COARSE THREAD (THREAD SPECS - 5/8-11, KNURL DIAMETER - .685)			
1.900	2.650	.500	300-7806*
1.850	2.650	.950	300-7803*
3.220	4.031	.750	300-7804*

*** These kits have black oxide finish.**

Note: All Speed Stud applications fit Stock Car Products and Speedway Engineering Hubs without grinding or modifications.

SPEED NUTS™

190,000 PSI tensile strength



Designed for professional racing environments where split-second improvements in pit stop times can make the winning difference, and "unbustable" reliability is an absolute must. ARP's Speed Nuts feature a profiled nut face for easy installation, quicker socket releases and resistance to jamming. They're made from premium heat-treated chrome moly that's nominally rated at **190,000 psi** tensile strength, shot-peened to remove stress risers and double magnafluxed after heat-treating and thread-forming to assure 100% metallurgical integrity. Coated with Alumotef III gold coating. Speed Nuts are ready for "instant" use (thread chasing not required).

Application	UHL	Part No.
NASCAR, 10-piece, fine	5/8-18	300-7801
IMCA Wide 5, 10-piece, coarse	5/8-11	300-7802

No. 07 Jack Daniel's car, driven by Casey Mears

Jeff Burton drives the Caterpillar Chevy for Richard Childress Racing

INTAKE MANIFOLD BOLT KITS

Not only will these premium quality ARP fasteners help prevent intake manifold leaks, but **one is drilled to allow for a safety wire**. What's more, they're rated at **170,000 psi** and feature precision rolled threads for optimum engagement, to prevent galling and promote more consistent torque loading. Wide underhead flange design and companion flat washers provide even load distribution and facilitates optimum sealing of gasket surfaces. Made of corrosion resistant stainless steel. Washers included and bolt drilled for NASCAR inspector's wire lock.

Application	Part No.
CHEVROLET	
SB 2, drilled	334-2104
SB 2, tall deck	334-2105
Small block, 1.000˝, drilled	334-2102
Small block, 1.250˝, drilled	334-2103
V6 Chevy 90°, 1.000˝, drilled	333-2101
FORD	
SVO 351 cid, Jack Roush design, drilled	354-2102

DRILLED HEADER BOLTS

ARP offers special NASCAR header bolts that have been drilled for use of safety wire. They are made from heat-treated 8740 chrome moly steel (with a black oxide finish - rated at **180,000 psi**) or Stainless 300 that is polished to a bright shine (nominally rated at **170,000 psi** tensile strength – considerably stronger than Grade 8 hardware), and engineered to provide complete reliability in the most severe racing environments. They are available in hex or 12-point heads. Through use of safety wire, exhaust headers will maintain original tightness and can't back off!

Application	Qty	Dia.	UHL	Wrenching	Black Oxide		Stainless 300	
					Hex	12-Point	Hex	12-Point
CHEVROLET								
Chevy small block, drilled	12	3/8	.750	3/8	100-1103	100-1203	400-1103	400-1203
Chevy big block, drilled	16	3/8	.875	3/8			400-1104	400-1204
UNIVERSAL								
Universal, drilled	16	3/8	.750	3/8			400-1105	400-1205
Universal, drilled	12	3/8	.875	3/8			400-1106	400-1206

BRAKE HAT BOLT KITS

The perfect upgrade for many original brake hat bolts, this ARP kit features bolts produced from only the finest quality 8740 chrome moly. Features an exclusive 12-point cap screw design and appropriate grip length per the application. All brake hat bolts are drilled for safety wire lock. Rated **200,000 psi** tensile strength.

Application	UHL	Part No.
5/16-24, 32 pieces	.880	300-0801
5/16-18, 32 pieces	.850	300-0802
1/4-28, 48 pieces	.750	300-0803

DRILLED CARB STUDS

The best way to make sure that carburetors stay perfectly sealed to the intake manifold is through the use of ARP's carb studs, which feature J-form threads to resist loosening from vibration. They're offered in a variety of heights to accommodate most any combination of carb and spacer, and are available in 8740 chrome moly with a black oxide finish or rust-proof stainless steel. Special NASCAR type studs have **one of the studs drilled** to facilitate sealing the carb by race officials. All carb stud kits come with hex nuts and washers.

Application	OAL	Pieces	Part No.
Standard, drilled for NASCAR wire seal	1.700	4	300-2401
1/2″ spacer, drilled for NASCAR wire seal	2.225	4	300-2402
1″ spacer, drilled for NASCAR wire seal	2.700	4	300-2403
2″ spacer, drilled for NASCAR wire seal	3.700	4	300-2404
2″ spacer, drilled for NASCAR wire seal	1.700/2.225	8	300-2406
1″ Moroso spacer, drilled for NASCAR wire seal	2.700	4	300-2407
1-1/4″ Moroso spacer, drilled for NASCAR wire seal	3.200	4	300-2408
2″ Moroso spacer, drilled for NASCAR wire seal	1.250/1.700	8	300-2409

ALTERNATOR STUDS

Strange as it may seem, there have been many races lost in oval track, off-road and endurance competition due to the OEM alternator stud failing and the subsequent loss of electrical power. To prevent this from ever happening, conscientious engine builders rely on ARP's "bulletproof" alternator studs. They're made from a premium grade 8740 chrome moly steel alloy and heat treated to a nominal **200,000 psi** tensile strength. They are very rigid and won't bend under the stress of competition, eliminating problems with alternator pulley alignment. Here's more reliable "insurance" from the innovators at ARP. Available in 5.000″ and 5.250″ lengths. Includes a 12-point nut and flat washer.

Description	OAL	Coarse Thread Length	Fine Thread Length	Part No.
7/16 stud	5.000	1.000	1.000	300-0501
7/16 stud	5.250	1.000	1.000	300-0502

FRONT MANDREL BOLTS

Get maximum reliability through the use of ARP's rugged 8740 chrome moly steel front mandrel bolts. They're undercut to provide the required stretch, shot-peened for extra durability and designed for full thread engagement. Nominally rated at **200,000 psi** tensile strength for durability you can count on! Available for GM and Ford applications.

Application	Dia.	Length	Thread Length	Socket Size	Head Style	Part No.
GENERAL MOTORS						
	7/16	6.000	1.100	1/2	12-point	330-0701
	1/2	6.000	1.100	9/16	12-point	330-0702
	7/16	6.250	1.150	9/16	12-point	330-0703
	1/2	4.000	.750	15/16	Hex	330-0704
	1/2	4.000	.625	15/16	Hex	330-0705
	1/2	3.750	.625	15/16	Hex	330-0706
	1/2	3.250	.750	15/16	Hex	330-0707
	7/16	5.000	1.000	1/2	12-point	330-0708
	7/16	5.500	1.000	1/2	12-point	330-0709
FORD						
	5/8	8.000	1.100	15/16	Hex	350-0701
	5/8	8.375	1.000	15/16	Hex	350-0702
	5/8	7.000	1.000	15/16	Hex	350-0703

THE WORLD'S FASTEST SPORT COMPACT COMPETITORS RELY ON ARP FASTENERS!

Hubie Fuh's amazing Mini features ARP

Titan Motorsports Toyota on the starting line.

CONNECTING ROD BOLTS

ARP manufactures replacement rod bolts for many popular import and domestic Sport Compact engines that are made of premium grade 8740 chrome moly steel and heat treated to a nominal tensile strength of **200,000 psi**. Threads are rolled after heat treat to ensure optimum fatigue strength. They are far superior to OEM fasteners in terms of durability and service life – fully capable of handling the extra stress of high combustion pressure engines. For extreme applications, rod bolts made of special ARP2000 material (rated at a **220,000 psi** nominal tensile strength) are available, including those with the patented Wave-Loc design. Special high strength bolts also available for aftermarket connecting rods. Call for details.

TECH TIP: **Measuring Rod Bolt Stretch**

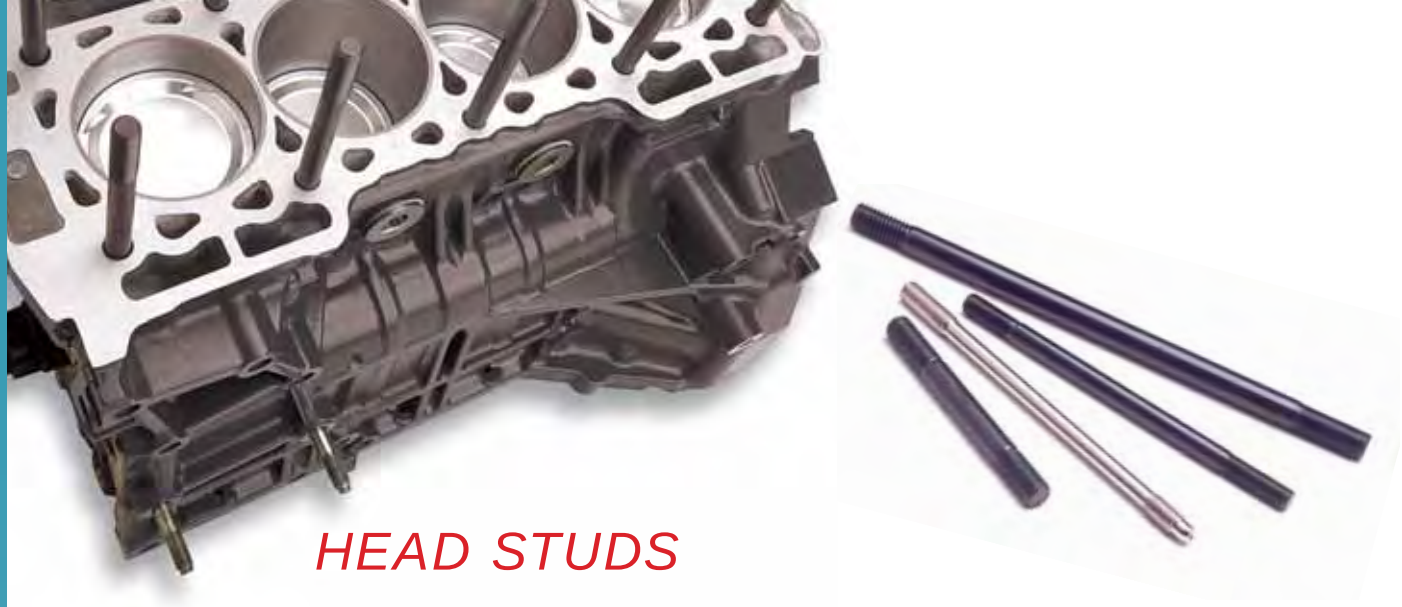
The most accurate method of obtaining the correct torque load on a connecting rod bolt is through measuring the amount of bolt stretch. This is preferred to using a torque wrench. *See chart on page 25* for the appropriate amount to stretch a rod bolt over its relaxed state. ARP's rod bolt stretch gauge *(see page 88)* can also be used to determine the condition of a rod bolt. If it has permanently stretched .001″ or more, the bolt has been compromised beyond its yield. Replace it immediately! Use the rod bolt stretch chart *on page 28* (or a version thereof) to keep track of the bolt's length at installation and prior to removal.

Application	Head Style	Hi-Perf 8740 (complete)	Hi-Perf 8740 (2-PC)	HP Wave 8740 (complete)	HP Wave 8740 (2-PC)	Pro Wave ARP2000 (complete)	Pro Wave ARP2000 (2-PC)	Pro Series ARP2000 (complete)	Pro Series ARP2000 (2-PC)
ALFA ROMEO									
2.0L GTV	A	126-6101							
BMC/TRIUMPH/ROVER									
A Series 3/8″	J	206-6001	206-6021						
A & B Series 11/32″	C	206-6002							
B-Series (1964-68) 18GB & 18GF 3/8″	E	206-6003							
K-Series	E	206-6007							
1.3L & 1.5L Spitfire	E							206-6004	
2.0L GT6 & 2.5L TR6	E							206-6005	
2.0L SOHC TR7	K	206-6006							
BMW									
1.6L Mini Cooper M8 x 43MM UHL	E	206-6008							
2.3L (S14) M11 x 41 MM UHL	E							201-6104	
2.5L (M50/M50TU) inline 6 M9 x 53MM UHL	E							201-6301	
3.0L (S50 EURO) inline 6 M10 x 45MM UHL	E							201-6102	
3.2L (S54) inline 6 M11 x 47MM UHL	E							201-6103	
4.4L (M62/M62TU) V8 M9 x 53MM UHL	E							201-6302	
FORD, 4 AND 6-CYLINDER									
1.6L CVH M8	E	151-6004							
1.6L Zetec M8	E	151-6003	151-6023						
1.8L Duratec	E							251-6202	
2.0L DOHC Cosworth Sierra/Escort	E							251-6301	
2.0L RS 2000 M8	E							251-6201	251-6222
2.0L Zetec M9	E	151-6005							
2000cc Pinto	D	151-6001	151-6021						
2300cc Pinto	F	151-6002	151-6022			251-6402	251-6422		
2.8L & 2.9L V6	B	153-6001							
HOLDEN									
11/32″	B	205-6002							
3/8″	B	205-6001							

Red part numbers indicate new items

Application	Head Style	Hi-Perf 8740 (complete)	Hi-Perf 8740 (2-PC)	HP Wave 8740 (complete)	HP Wave 8740 (2-PC)	Pro Wave ARP2000 (complete)	Pro Wave ARP2000 (2-PC)	Pro Series ARP2000 (complete)	Pro Series ARP2000 (2-PC)
HONDA/ACURA									
1.2L, 1.6L & 1.8L M8	A	208-6001							
1.6L & 1.8L M9	A							208-6401	
2.0L (F20C) & 2.2L (F22C) S2000	E							208-6002	
2.0L (K20A)	E							208-6003	
3.0L (C30A) V6 Acura NSX M9								208-6004	
3.2L (C32B) V6 Acura NSX M8								208-6005	
LANCIA									
2.0L SOHC 8V & DOHC 16V Turbo	E							275-6001	
MAZDA									
1.6L (B6) & 1.8L (BP) DOHC Miata M9	K	118-6401							
MITSUBISHI									
2.0L (4B11) (2008 & later)	E							207-6002	
2.0L (4G63) (1993 & earlier) M9	C	107-6001	107-6021						
2.0L (4G63) (1994-07) M8	A	107-6002	107-6022						
2.6L (G54B)	C	107-6003	107-6023						
3.0L (6G72) & 3.5L (6G74) V6	C	107-6004	107-6024						
NISSAN/DATSUN									
A Series (A12-A12A-A13-A14-A15)	A	102-6002							
L16 Series M8	C	102-6001							
L20 Series 4-cylinder & 2.2L (Z22) M9	C	202-6001							
L24 Series (early) inline 6 M8	C	202-6002							
L24 (late), L26 & L28 Series inline 6 M9	C	202-6003							
2.0L (SR20DE/DET) 11/32″	C	202-6005							
3.0L (VG30E/ET) SOHC V6 M9	C	202-6003							
3.0L (VG30D/DET/DETT) DOHC V6 11/32″	C	202-6004							
3.5L (VQ35) DOHC V6 M8	E							202-6006	
OPEL/VAUXHALL									
1.4L &1.6L 8V M8	E	109-6002							
1.4L 16V M9	E	109-6003							
2.0L 16V M9	E	109-6001						209-6003	
PEUGEOT									
205 & 306	M	117-6101							
PORSCHE									
RSR Ti rod	H					204-6004			
1.7L & 2.0L Type IV	K	104-6006							
2.0L 911S (1969)	H					204-6003			
911, 930 Turbo & 993 M9	H					204-6005			
911 M10	H					204-6001			
944	K					204-6002			
RENAULT									
Clio (F4R) 16V M9	E							216-6301	
R5 Turbo (Mid-Engine)	E							216-6302	
R12 Gordini/Alpine (807g)	E	116-6001							
SUBARU									
1.8L (EJ18) & 2.2L (EJ22) SOHC, 2.5L (EJ25) DOHC Non Turbo & 2.0L (EJ20) DOHC Turbo	I					260-6301			
2.5L (EJ25) DOHC Turbo	E							260-6302	
TOYOTA									
1.6L (4AGE) DOHC & 1.6L (4ALC) SOHC M9	A	203-6001							
1.6L (2TC/2TG) & 1.8L (3TC)	A	203-6003							
2.0L (3SGTE) & 2.4L (22R)	A	203-6002							
3.0L (7MGTE) inline 6 (1986-92) Supra	A	203-6004							
3.0L (2JZGE/GTE) inline 6 (1993-98) Supra	E							203-6005	
VOLKSWAGEN/AUDI									
Audi 5-cylinder	L							104-6007	
Formula Vee (cap screw type) M9	E	104-6005	104-6025						
Super Vee (cap screw type) Audi style rod	E							104-6003	104-6023
1600cc air cooled	K	104-6001							
1600cc water cooled Rabbit & Corrado G60	K	104-6002							
1.8L & 2.0L water cooled	L			104-6004	104-6024				
2.7L (APB/BEL) Turbo & 2.8L (AFC/ACK/AHA/ATQ) Non Turbo V6	E							204-6201	
2.8L & 2.9L VR6	E							204-6006	

Red part numbers indicate new items



HEAD STUDS

Obtaining the optimum cylinder head-to-block sealing is especially critical in small displacement engines employing high compression pistons or power adders like turbochargers, nitrous oxide and superchargers. That's why ARP head studs are popular among leading Sport Compact/Import racers.

You should know that ARP uses a premium grade 8740 alloy that is rated far superior to "aircraft" quality. Then, each stud is precisely heat-treated to **200,000 psi**. Following heat-treat, each stud is centerless ground to make it as close to perfectly concentric as possible. This procedure involves about ten very slight cuts and results in an exceptionally straight part. It's important to note that lesser quality studs are not even centerless ground – the material is thread rolled in bar stock form (mostly before heat-treat, when the material is easier to machine). Because ARP studs are manufactured to such exacting tolerances, you will note that gaskets and cylinder heads literally glide into position and are perfectly aligned – something that won't happen with inferior quality head studs.

ARP studs are thread rolled *after* heat-treat, which gives them about 1000% (that's ten times) better fatigue strength than those studs that are threaded prior to heat-treat.

You will also note that ARP offers specially undercut studs for several engines. This procedure (done only to the shorter studs) more equalizes the "stretch" of both studs, which makes for a more consistent clamping force – one that compensates for head gasket compression when the head is installed. This helps prevent blown head gaskets, and assures optimum sealing!

Premium parallel ground washers are also included with each kit.

Application	Hex Nuts	12-Point Nuts	12-Point Nuts U/C Studs
BMC/TRIUMPH			
A Series, 9 studs		206-4201	
A Series, 11 studs		206-4204	
A Series, 11 studs, shaved head		206-4206	
B Series		206-4202	
1.3L & 1.5L Spitfire		206-4203	
2.0L GT6 & 2.5L TR6		206-4205	
2.0L SOHC TR7			206-4208
2.1L TR4		206-4207	
BMW			
2002 Coupe, 318i, 320i 4 cylinder			201-4601
530, 535, 635, 735			201-4602
2.5L (M50), 3.0L (S50US), 3.2L (S52US) inline 6 ARP2000		201-4302	
E46 M3/S54 inline 6 ARP2000		201-4303	
Mini Cooper		201-4301	
FORD, 4 AND 6-CYLINDER			
1600cc Escort M10		151-4203	
2.0L DOHC Cosworth Sierra/Escort M12			251-4701
2.0L Zetec			251-4702
2000cc Pinto		151-4201	
2300cc Pinto		151-4202	151-4702
2.3L Duratec (2003 & later)		151-4204	
2.5L Duratec V6		253-4701	
GM			
2.2L Ecotec			231-4701
HOLDEN			
Commodore V6 7/16″	205-4002		
308 cid	205-4001		205-4601
308 cid 7/16″	254-4009		205-4602
308 cid 1/2″		234-4201	
HONDA/ACURA			
Acura B18A1, M11			208-4302
Acura VTEC B18CI, M11, GSR			208-4303
B16A			208-4601
B20B, w/B16A head			208-4306
Civic D16Y		208-4305	
F20 S2000			208-4702
Honda D16Z - Only, M10		208-4301	
Honda H22A4, VTEC			208-4304
H23A			208-4307
K20A (A2 & A3)			208-4701

Red part numbers indicate new items

HEAD STUDS (CONT.)

Application	Hex Nuts	12-Point Nuts	12-Point Nuts U/C Studs
MAZDA			
1.6L (BP) & 1.8L (BP) DOHC Miata		218-4701	
2.0L FS-DE (1998-02)		218-4703	
2.3L DOHC (2003)		218-4702	
MITSUBISHI			
2.0L (4G63) DOHC (1993 & earlier) M12		207-4201	207-4701
2.0L (4G63) DOHC (1994 & later) M11		207-4203	207-4702
2.6L (G54B)		207-4202	
3.0L (6G72) DOHC V6 ARP 2000			207-4205
NISSAN/DATSUN			
A-12 engines		202-4202	
A-14 engines		202-4203	
L20 series, 4-cylinder		202-4201	
L24, L26, L28 series, 6-cylinder		202-4206	
CA16DE, CA16DET, CA18DE, CA18DET			202-4702
RB20, RB20DET, RB25, RB25DET		202-4301	
RB26DETT, GTR ARP2000		202-4207	
2.0L (SR20DE) DOHC (1991-01) M11			102-4701
2.0L (SR20DET/RN14) DOHC Turbo (1991-94) M12		202-4303	
VQ30, VQ35			202-4701
SATURN			
1.9L DOHC (1991-99)		165-4202	
1.9L SOHC (1999-02)		165-4201	
SUBARU			
EJ Series 2.0L, 2.2L, 2.5L DOHC		260-4701	
EJ Series Phase 2 (1999 & later) SOHC			260-4702
TOYOTA			
1.6L (4AGE) DOHC		203-4203	
1.6L (2TC) & 1.8L (3TC)		203-4206	
1.8L (1ZZFE) DOHC ARP2000			203-4703
2.0L (3SGTE) DOHC		203-4204	
2.4L (22R)		203-4201	
2.8L (5MGE) & 3.0L (7MGTE) inline 6 (1981-92) Supra		203-4202	203-4701
3.0L (2JZGE/GTE) inline 6 (1993-98) Supra		203-4205	203-4702
VAUXHALL/OPEL			
2.0L 16V		209-4301	209-4701
2.5L V6 Opel		209-4302	209-4702
VOLKSWAGEN/AUDI			
Audi 5 cylinder, 10 valve		204-4205	204-4703
Audi 5 cylinder, 20 valve		204-4207	204-4704
Super Vee		204-4202	
1.8L & 2.0L, 8V Golf/Jetta		204-4203	204-4701
1.8L & 2.0L, 16V Golf/Jetta		204-4204	204-4702
2.8L & 2.9L VR6			204-4705

Red part numbers indicate new items

HEAD BOLTS

HIGH PERFORMANCE SERIES

High Performance head bolts are made of 8740 chrome moly and available with a reduced wrenching hex or 12-point with a wide area flanged head. They are nominally rated at **180,000 psi** and kits come complete with hardened parallel-ground washers.

PROFESSIONAL SERIES

All Pro Series bolts are designed for competition applications and are rated nominally at **200,000 psi**. Available with undercut short bolts that can help eliminate head gasket failures through providing more "stretch" to balance the longer bolts and compensate for the additional compression of gaskets.

Please Refer to Main & Head Bolt Instructions on page 45.

Application	High Performance		Pro Series	
	Hex	12-Point	Hex	12-Point
BMW				
Mini Cooper				206-3601
HOLDEN				
308 cid	205-3601	205-3701	254-3703	
TOYOTA				
2.8L (5MGE) & 3.0L (7MGTE) inline 6 (1981-92) Supra				203-3902
VOLKSWAGEN/AUDI				
1.8L DOHC 20V Turbo M10/ARP2000 (w/o installation tool)				204-3901
1.8L DOHC 20V Turbo M10/ARP2000 (w/ installation tool)				204-3902

Red part numbers indicate new items

MAIN STUDS

ARP main studs are manufactured from 8740 chrome moly steel, heat-treated in-house to **200,000 psi** tensile strength, and precision J-form threads rolled after heat-treat to create a fastener that has threads 1000% stronger than others. All kits come complete with hardened parallel-ground washers and aerospace quality nuts. Reduce crankshaft flex and main cap fretting with these premium quality main studs. Don't settle for anything less than the best!

Application	2-Bolt Main	4-Bolt Main
BMC/TRIUMPH		
A Series	206-5401	
B Series (3 cap main)	206-5402	
B Series (5 cap main)	206-5403	
2.0L SOHC TR7	206-5404	
Austin Healey 6 cylinder	206-5405	
DODGE		
2.0L SOHC/DOHC Neon w/ block #4667642	141-5801	
FORD, 4-CYLINDER		
1600cc Escort	151-5403	
2.0L Zetec	151-5404	
2000cc Pinto	151-5401	
2300cc Pinto	151-5402	
HONDA/ACURA		
1.6L (B16A) (12 pt nuts)	208-5402	
1.8L (B18C1) Acura	208-5403	
1.8L (B18A1/B1) Acura	208-5404	
2.2L (H22A) & 2.3L (H23A) (12 pt nuts)	208-5401	
MAZDA		
1.6L (B6) & 1.8L (BP) DOHC Miata (12 pt nuts)	218-5401	
2.3L DOHC 16V (2003 & later)	218-5402	
MITSUBISHI		
2.0L (4G63) DOHC	207-5401	

Application	2-Bolt Main	4-Bolt Main
MITSUBISHI (continued)		
2.6L (G54B)	207-5402	
3.0L (6G72) V6 (1993 & later)		207-5801
NISSAN/DATSUN		
L20 Series 4-cylinder	202-5401	
L24, L26 & L28 Series 6-cylinder	202-5406	
2.0L (SR20DE/DET)	202-5402	
3.5L (VQ35) DOHC V6		202-5801
TOYOTA		
1.6L (4AGE) & 2.0L (3SFE) DOHC	203-5403	
2.0L (3SGTE) DOHC	203-5404	
2.4L (22R)	203-5406	
3.0L (7MGTE) inline 6 (1986-92) Supra w/ bolts for #3 cap	203-5402	
3.0L (2JZGE/GTE) inline 6 (1993-98) Supra	203-5405	
VAUXHALL/OPEL		
2.0L 16 valve	209-5401	
2.5L V6	209-5402	
VOLKSWAGEN		
1.6L & 2.0L Rabbit, Golf and Jetta	204-5402	
2.8L & 2.9L VR6	204-5403	

MAIN BOLTS

Far superior to any other main bolt kit offered for use in competition engines. ARP main bolts are designed to meet the exacting standards and demands of professional engine builders. Forged from 8740 chrome moly, all bolts feature generous under-head radius and rolled threads for the utmost reliability. The threads are rolled after heat-treating, which gives them about 1000% longer fatigue life than most main bolts, which are threaded prior to heat-treating. Available in the popular High Performance Series, which, at a nominal rating of **180,000 psi**, is a premium replacement for OEM fasteners, or the **200,000 psi** nominal rated Pro Series, application-specific main bolts with reduced wrenching head and are designed for use in competition applications. Parallel-ground, hardened washers are included with each kit.

Application	Pro Series
MGB	
2 cap main	206-5001
5 cap main	206-5002
SUBARU	
2.0L, 2.2L & 2.5L SOHC/DOHC EJ Series Crankcase thru bolt kit	260-5401
TOYOTA	
1.6L (4AGE) DOHC	203-5001

PORSCHE SPECIALTY FASTENERS

ARP engineers have developed a number of special fasteners for Porsche 911 and 930 Turbo and Non Turbo applications that provide the reliability needed for serious competition. These fasteners are manufactured from high grade materials, and are superior to OEM Porsche bolts and studs. A number of special rod bolts are also available for Porsche engines. *They are listed on pages 32 and 71 of this catalog.*

Application	Part No.
Case halves stud kit- 911-930 Turbo	504-9501
Trans mount stud kit-911-930 Turbo	504-9502
Crankcase thru bolt kit- 2.0L-2.7L air cooled engines	204-5407
Crankcase thru bolt kit- 3.0L-3.3L air cooled engines	204-5405
Crankcase thru bolt kit- 3.6L & 3.8L air cooled engines	204-5406
Head stud kit- 3.6L Turbo water cooled engine	204-4210
Head stud kit- 2.0L-3.8L air cooled engines	204-4206

Red part numbers indicate new items

STAINLESS ACCESSORY STUDS

ARP has developed an innovative multi-purposes accessory stud that can be used for exhaust systems, intake manifold and a host of other uses. The studs are manufactured from a proprietary alloy developed by ARP (Stainless 300) and are impervious to the rust and corrosion that plagues ordinary fasteners. This stainless steel alloy is nominally rated at **170,000 psi** tensile strength, which is substantially stronger than Grade 8 hardware. Ideally suited for installing exhaust headers, the 8mm studs have a unique "nut starter" nose and a hex-broached tip – which allows the studs to easily be installed using an Allen wrench. The studs come with "easy wrenching" 12-point nuts, which work great in the tightest of quarters. Flat washers are also included. Offered in five different lengths, in quantities of 4, 8, 10 and 16-packs.

Great for Intake & Exhaust Systems

Application	4-Pack	8-Pack	10-Pack	16-Pack
M8 x 1.25 x 32mm (1.250")	400-8001	400-8011	400-8021	400-8031
M8 x 1.25 x 38mm (1.500")	400-8002	400-8012	400-8022	400-8032
M8 x 1.25 x 45mm (1.750")	400-8003	400-8013	400-8023	400-8033
M8 x 1.25 x 51mm (2.000")	400-8004	400-8014	400-8024	400-8034
M8 x 1.25 x 57mm (2.250")	400-8005	400-8015	400-8025	400-8035

NOTE: #400-8014 fits SOHC & DOHC Neon (exhaust) and #400-8024 fits Neon & PT Cruiser (2.4L engine)

CAM TOWER STUD KIT

Camshaft positioning is critical on overhead cam engines and ARP makes sure that the cam towers are properly secured through use of these durable studs. They're made from 8740 chrome moly steel, with threads rolled after heat treat to ensure the optimum fatigue strength. Far superior to OEM fasteners.

Application	Part No.
CHRYSLER/DODGE	
2.0L DOHC & 2.4L DOHC (head #4667086)	141-1001

STAINLESS STEEL & CHROME MOLY 5-PACKS WITH WASHERS

NOTE:
Packed 5 on a card with washers

Stainless Steel & Chrome Moly Bolts Available In Sizes From 1/4″ to 7/16″ With Underhead Lengths Ranging From 1/2″ to 5″. Hex or 12-Pt. Heads. Packaged In Convenient 5-Pack Cards.

Now you can use premium quality ARP stainless steel or chrome moly fasteners to install most anything on a car, boat or trailer. The specially alloyed "ARP 300" stainless steel and heat-treated 8740 chrome moly bolts (black oxide finish) are nominally rated at **170,000 psi** tensile strength to provide a substantial extra margin of safety over Grade 8 hardware.

What's more, you can't beat the gorgeous looks of ARP's specially polished stainless steel fasteners, and their ability to resist rust. They're truly maintenance free!

You can get **5-packs** (washers included) of any size bolt from 1/4″ to 7/16″ in lengths ranging from 1/2″ to 5″, with a choice of hex or 12-point heads. Matching nuts are also available *(see pages 82-83)*.

STANDARD BOLT 5-PACKS

Diameter - Pitch	UHL	Wrenching	Black Oxide		Stainless	
			Hex	12 point	Hex	12 point
1/4˝ BOLTS, 5/16˝ WRENCHING, STANDARD THREAD						
1/4-20	0.515	5/16	650-0515	640-0515	621-0515	611-0515
1/4-20	0.750	5/16	650-0750	640-0750	621-0750	611-0750
1/4-20	1.000	5/16	650-1000	640-1000	621-1000	611-1000
1/4-20	1.250	5/16	650-1250	640-1250	621-1250	611-1250
1/4-20	1.500	5/16	650-1500	640-1500	621-1500	611-1500
1/4-20	1.750	5/16	650-1750	640-1750	621-1750	611-1750
1/4-20	2.000	5/16	650-2000	640-2000	621-2000	611-2000
1/4-20	2.250	5/16	650-2250	640-2250	621-2250	611-2250
1/4-20	2.500	5/16	650-2500	640-2500	621-2500	611-2500
1/4-20	2.750	5/16	650-2750	640-2750	621-2750	611-2750
1/4-20	3.000	5/16	650-3000	640-3000	621-3000	611-3000
1/4-20	3.250	5/16	650-3250	640-3250	621-3250	611-3250
1/4-20	3.500	5/16	650-3500	640-3500	621-3500	611-3500
1/4-20	3.750	5/16	650-3750	640-3750	621-3750	611-3750
1/4-20	4.000	5/16	650-4000	640-4000	621-4000	611-4000
1/4-20	4.250	5/16	650-4250	640-4250	621-4250	611-4250
1/4-20	4.500	5/16	650-4500	640-4500	621-4500	611-4500
5/16˝ BOLTS, 3/8˝ WRENCHING, STANDARD THREAD						
5/16-18	0.560	3/8	651-0560	641-0560	622-0560	612-0560
5/16-18	0.750	3/8	651-0750	641-0750	622-0750	612-0750
5/16-18	1.000	3/8	651-1000	641-1000	622-1000	612-1000
5/16-18	1.250	3/8	651-1250	641-1250	622-1250	612-1250
5/16-18	1.500	3/8	651-1500	641-1500	622-1500	612-1500
5/16-18	1.750	3/8	651-1750	641-1750	622-1750	612-1750
5/16-18	2.000	3/8	651-2000	641-2000	622-2000	612-2000
5/16-18	2.250	3/8	651-2250	641-2250	622-2250	612-2250
5/16-18	2.500	3/8	651-2500	641-2500	622-2500	612-2500
5/16-18	2.750	3/8	651-2750	641-2750	622-2750	612-2750
5/16-18	3.000	3/8	651-3000	641-3000	622-3000	612-3000
5/16-18	3.250	3/8	651-3250	641-3250	622-3250	612-3250
5/16-18	3.500	3/8	651-3500	641-3500	622-3500	612-3500
5/16-18	3.750	3/8	651-3750	641-3750	622-3750	612-3750
5/16-18	4.000	3/8	651-4000	641-4000	622-4000	612-4000
5/16-18	4.250	3/8	651-4250	641-4250	622-4250	612-4250
5/16-18	4.500	3/8	651-4500	641-4500	622-4500	612-4500
5/16-18	4.750	3/8	651-4750	641-4750	622-4750	612-4750
5/16-18	5.000	3/8	651-5000	641-5000	622-5000	612-5000
3/8˝ BOLTS, 3/8˝ WRENCHING, STANDARD THREAD						
3/8-16	0.500	3/8	652-0500	642-0500	623-0500	613-0500
3/8-16	0.750	3/8	652-0750	642-0750	623-0750	613-0750
3/8-16	1.000	3/8	652-1000	642-1000	623-1000	613-1000
3/8-16	1.250	3/8	652-1250	642-1250	623-1250	613-1250
3/8-16	1.500	3/8	652-1500	642-1500	623-1500	613-1500
3/8-16	1.750	3/8	652-1750	642-1750	623-1750	613-1750
3/8-16	2.000	3/8	652-2000	642-2000	623-2000	613-2000
3/8-16	2.250	3/8	652-2250	642-2250	623-2250	613-2250
3/8-16	2.500	3/8	652-2500	642-2500	623-2500	613-2500
3/8-16	2.750	3/8	652-2750	642-2750	623-2750	613-2750
3/8-16	3.000	3/8	652-3000	642-3000	623-3000	613-3000
3/8-16	3.250	3/8	652-3250	642-3250	623-3250	613-3250
3/8-16	3.500	3/8	652-3500	642-3500	623-3500	613-3500
3/8-16	3.750	3/8	652-3750	642-3750	623-3750	613-3750
3/8-16	4.000	3/8	652-4000	642-4000	623-4000	613-4000

STANDARD BOLT 5-PACKS (CONT.)

Diameter - Pitch	UHL	Wrenching	Black Oxide		Stainless	
			Hex	12 point	Hex	12 point
3/8″ BOLTS, 3/8″ WRENCHING, STANDARD THREAD (CONTINUED)						
3/8-16	4.250	3/8	652-4250	642-4250	623-4250	613-4250
3/8-16	4.500	3/8	652-4500	642-4500	623-4500	613-4500
3/8-16	4.750	3/8	652-4750	642-4750	623-4750	613-4750
3/8-16	5.000	3/8	652-5000	642-5000	623-5000	613-5000
3/8″ BOLTS, 7/16″ WRENCHING, STANDARD THREAD						
3/8-16	0.750	7/16	654-0750	644-0750	625-0750	615-0750
3/8-16	1.000	7/16	654-1000	644-1000	625-1000	615-1000
3/8-16	1.250	7/16	654-1250	644-1250	625-1250	615-1250
3/8-16	1.500	7/16	654-1500	644-1500	625-1500	615-1500
3/8-16	1.750	7/16	654-1750	644-1750	625-1750	615-1750
3/8-16	2.000	7/16	654-2000	644-2000	625-2000	615-2000
3/8-16	2.250	7/16	654-2250	644-2250	625-2250	615-2250
3/8-16	2.500	7/16	654-2500	644-2500	625-2500	615-2500
3/8-16	2.750	7/16	654-2750	644-2750	625-2750	615-2750
3/8-16	3.000	7/16	654-3000	644-3000	625-3000	615-3000
3/8-16	3.250	7/16	654-3250	644-3250	625-3250	615-3250
3/8-16	3.500	7/16	654-3500	644-3500	625-3500	615-3500
3/8-16	3.750	7/16	654-3750	644-3750	625-3750	615-3750
3/8-16	4.000	7/16	654-4000	644-4000	625-4000	615-4000
7/16″ BOLTS, STANDARD THREAD, 1/2″ WRENCHING						
7/16-14	1.500	1/2	655-1500	645-1500	624-1500	614-1500
7/16-14	1.750	1/2	655-1750	645-1750	624-1750	614-1750
7/16-14	2.000	1/2	655-2000	645-2000	624-2000	614-2000
7/16-14	2.250	1/2	655-2250	645-2250	624-2250	614-2250
7/16-14	2.500	1/2	655-2500	645-2500	624-2500	614-2500
7/16-14	2.750	1/2	655-2750	645-2750	624-2750	614-2750
7/16-14	3.000	1/2	655-3000	645-3000	624-3000	614-3000
7/16-14	3.250	1/2	655-3250	645-3250	624-3250	614-3250
7/16-14	3.500	1/2	655-3500	645-3500	624-3500	614-3500
7/16-14	3.750	1/2	655-3750	645-3750	624-3750	614-3750
7/16-14	4.000	1/2	655-4000	645-4000	624-4000	614-4000
7/16-14	4.250	1/2	655-4250	645-4250	624-4250	614-4250
7/16-14	4.500	1/2	655-4500	645-4500	624-4500	614-4500
7/16-14	4.750	1/2	655-4750	645-4750	624-4750	614-4750
7/16-14	5.000	1/2	655-5000	645-5000	624-5000	614-5000
7/16″ BOLTS, STANDARD THREAD, 7/16″ WRENCHING						
7/16-14	1.500	7/16	653-1500	643-1500	626-1500	616-1500
7/16-14	1.750	7/16	653-1750	643-1750	626-1750	616-1750
7/16-14	2.000	7/16	653-2000	643-2000	626-2000	616-2000
7/16-14	2.250	7/16	653-2250	643-2250	626-2250	616-2250
7/16-14	2.500	7/16	653-2500	643-2500	626-2500	616-2500
7/16-14	2.750	7/16	653-2750	643-2750	626-2750	616-2750
7/16-14	3.000	7/16	653-3000	643-3000	626-3000	616-3000
7/16-14	3.250	7/16	653-3250	643-3250	626-3250	616-3250
7/16-14	3.500	7/16	653-3500	643-3500	626-3500	616-3500
7/16-14	3.750	7/16	653-3750	643-3750	626-3750	616-3750
7/16-14	4.000	7/16	653-4000	643-4000	626-4000	616-4000
7/16-14	4.250	7/16	653-4250	643-4250	626-4250	616-4250
7/16-14	4.500	7/16	653-4500	643-4500	626-4500	616-4500
7/16-14	4.750	7/16	653-4750	643-4750	626-4750	616-4750
7/16-14	5.000	7/16	653-5000	643-5000	626-5000	616-5000

FINE THREAD BOLT 5-PACKS

Diameter - Pitch	UHL	Wrenching	Black Oxide		Stainless	
			Hex	12 point	Hex	12 point
1/4″ BOLTS, 5/16″ WRENCHING, FINE THREAD						
1/4-28	.515	5/16	750-0515	740-0515	721-0515	711-0515
1/4-28	.750	5/16	750-0750	740-0750	721-0750	711-0750
1/4-28	1.000	5/16	750-1000	740-1000	721-1000	711-1000
1/4-28	1.250	5/16	750-1250	740-1250	721-1250	711-1250
1/4-28	1.500	5/16	750-1500	740-1500	721-1500	711-1500
1/4-28	1.750	5/16	750-1750	740-1750	721-1750	711-1750
1/4-28	2.000	5/16	750-2000	740-2000	721-2000	711-2000
1/4-28	2.250	5/16	750-2250	740-2250	721-2250	711-2250
1/4-28	2.500	5/16	750-2500	740-2500	721-2500	711-2500
1/4-28	2.750	5/16	750-2750	740-2750	721-2750	711-2750
1/4-28	3.000	5/16	750-3000	740-3000	721-3000	711-3000
1/4-28	3.250	5/16	750-3250	740-3250	721-3250	711-3250
1/4-28	3.500	5/16	750-3500	740-3500	721-3500	711-3500
1/4-28	3.750	5/16	750-3750	740-3750	721-3750	711-3750
1/4-28	4.000	5/16	750-4000	740-4000	721-4000	711-4000
1/4-28	4.250	5/16	750-4250	740-4250	721-4250	711-4250
1/4-28	4.500	5/16	750-4500	740-4500	721-4500	711-4500
5/16″ BOLTS, 3/8″ WRENCHING, FINE THREAD						
5/16-24	.560	3/8	751-0560	741-0560	722-0560	712-0560
5/16-24	.750	3/8	751-0750	741-0750	722-0750	712-0750
5/16-24	1.000	3/8	751-1000	741-1000	722-1000	712-1000
5/16-24	1.250	3/8	751-1250	741-1250	722-1250	712-1250
5/16-24	1.500	3/8	751-1500	741-1500	722-1500	712-1500
5/16-24	1.750	3/8	751-1750	741-1750	722-1750	712-1750
5/16-24	2.000	3/8	751-2000	741-2000	722-2000	712-2000
5/16-24	2.250	3/8	751-2250	741-2250	722-2250	712-2250
5/16-24	2.500	3/8	751-2500	741-2500	722-2500	712-2500
5/16-24	2.750	3/8	751-2750	741-2750	722-2750	712-2750
5/16-24	3.000	3/8	751-3000	741-3000	722-3000	712-3000
5/16-24	3.250	3/8	751-3250	741-3250	722-3250	712-3250
5/16-24	3.500	3/8	751-3500	741-3500	722-3500	712-3500
5/16-24	3.750	3/8	751-3750	741-3750	722-3750	712-3750
5/16-24	4.000	3/8	751-4000	741-4000	722-4000	712-4000
5/16-24	4.250	3/8	751-4250	741-4250	722-4250	712-4250
5/16-24	4.500	3/8	751-4500	741-4500	722-4500	712-4500
5/16-24	4.750	3/8	751-4750	741-4750	722-4750	712-4750
5/16-24	5.000	3/8	751-5000	741-5000	722-5000	712-5000
3/8″ BOLTS, 3/8″ WRENCHING, FINE THREAD						
3/8-24	.500	3/8	752-0500	742-0500	723-0500	713-0500
3/8-24	.750	3/8	752-0750	742-0750	723-0750	713-0750
3/8-24	1.000	3/8	752-1000	742-1000	723-1000	713-1000
3/8-24	1.250	3/8	752-1250	742-1250	723-1250	713-1250
3/8-24	1.500	3/8	752-1500	742-1500	723-1500	713-1500
3/8-24	1.750	3/8	752-1750	742-1750	723-1750	713-1750
3/8-24	2.000	3/8	752-2000	742-2000	723-2000	713-2000
3/8-24	2.250	3/8	752-2250	742-2250	723-2250	713-2250

FINE THREAD BOLT 5-PACKS *(CONT.)*

Diameter/Pitch	UHL	Wrenching	Black Oxide		Stainless	
			Hex	12 point	Hex	12 point
3/8˝ BOLTS, 3/8˝ WRENCHING, FINE THREAD (CONTINUED)						
3/8-24	2.500	3/8	752-2500	742-2500	723-2500	713-2500
3/8-24	2.750	3/8	752-2750	742-2750	723-2750	713-2750
3/8-24	3.000	3/8	752-3000	742-3000	723-3000	713-3000
3/8-24	3.250	3/8	752-3250	742-3250	723-3250	713-3250
3/8-24	3.500	3/8	752-3500	742-3500	723-3500	713-3500
3/8-24	3.750	3/8	752-3750	742-3750	723-3750	713-3750
3/8-24	4.000	3/8	752-4000	742-4000	723-4000	713-4000
3/8-24	4.250	3/8	752-4250	742-4250	723-4250	713-4250
3/8-24	4.500	3/8	752-4500	742-4500	723-4500	713-4500
3/8-24	4.750	3/8	752-4750	742-4750	723-4750	713-4750
3/8-24	5.000	3/8	752-5000	742-5000	723-5000	713-5000
3/8˝ BOLTS, 7/16˝ WRENCHING, FINE THREAD						
3/8-24	.750	7/16	754-0750	744-0750	725-0750	715-0750
3/8-24	1.000	7/16	754-1000	744-1000	725-1000	715-1000
3/8-24	1.250	7/16	754-1250	744-1250	725-1250	715-1250
3/8-24	1.500	7/16	754-1500	744-1500	725-1500	715-1500
3/8-24	1.750	7/16	754-1750	744-1750	725-1750	715-1750
3/8-24	2.000	7/16	754-2000	744-2000	725-2000	715-2000
3/8-24	2.250	7/16	754-2250	744-2250	725-2250	715-2250
3/8-24	2.500	7/16	754-2500	744-2500	725-2500	715-2500
3/8-24	2.750	7/16	754-2750	744-2750	725-2750	715-2750
3/8-24	3.000	7/16	754-3000	744-3000	725-3000	715-3000
3/8-24	3.250	7/16	754-3250	744-3250	725-3250	715-3250
3/8-24	3.500	7/16	754-3500	744-3500	725-3500	715-3500
3/8-24	3.750	7/16	754-3750	744-3750	725-3750	715-3750
3/8-24	4.000	7/16	754-4000	744-4000	725-4000	715-4000
7/16˝ BOLTS, 7/16˝ WRENCHING, FINE THREAD						
7/16-20	1.000	7/16	753-1000	743-1000	724-1000	714-1000
7/16-20	1.250	7/16	753-1250	743-1250	724-1250	714-1250
7/16-20	1.500	7/16	753-1500	743-1500	724-1500	714-1500
7/16-20	1.750	7/16	753-1750	743-1750	724-1750	714-1750
7/16-20	2.000	7/16	753-2000	743-2000	724-2000	714-2000
7/16-20	2.250	7/16	753-2250	743-2250	724-2250	714-2250
7/16-20	2.500	7/16	753-2500	743-2500	724-2500	714-2500
7/16-20	2.750	7/16	753-2750	743-2750	724-2750	714-2750
7/16-20	3.000	7/16	753-3000	743-3000	724-3000	714-3000
7/16-20	3.250	7/16	753-3250	743-3250	724-3250	714-3250
7/16-20	3.500	7/16	753-3500	743-3500	724-3500	714-3500
7/16-20	3.750	7/16	753-3750	743-3750	724-3750	714-3750
7/16-20	4.000	7/16	753-4000	743-4000	724-4000	714-4000
7/16-20	4.250	7/16	753-4250	743-4250	724-4250	714-4250
7/16-20	4.500	7/16	753-4500	743-4500	724-4500	714-4500
7/16-20	4.750	7/16	753-4750	743-4750	724-4750	714-4750
7/16-20	5.000	7/16	753-5000	743-5000	724-5000	714-5000

METRIC BOLT 5-PACKS

Diameter x Pitch	UHL	Wrenching	Black Oxide		Stainless	
			Hex	12 point	Hex	12 point
M6 BOLTS, 1.00 PITCH						
M6 x 1.00	12	8mm	660-1016	670-1016	760-1016	770-1016
M6 x 1.00	16	8mm	660-1017	670-1017	760-1017	770-1017
M6 x 1.00	20	8mm	660-1001	670-1001	760-1001	770-1001
M6 x 1.00	25	8mm	660-1002	670-1002	760-1002	770-1002
M6 x 1.00	30	8mm	660-1003	670-1003	760-1003	770-1003
M6 x 1.00	35	8mm	660-1004	670-1004	760-1004	770-1004
M6 x 1.00	40	8mm	660-1005	670-1005	760-1005	770-1005
M6 x 1.00	45	8mm	660-1006	670-1006	760-1006	770-1006
M6 x 1.00	50	8mm	660-1007	670-1007	760-1007	770-1007
M6 x 1.00	55	8mm	660-1008	670-1008	760-1008	770-1008
M6 x 1.00	60	8mm	660-1009	670-1009	760-1009	770-1009
M6 x 1.00	65	8mm	660-1010	670-1010	760-1010	770-1010
M6 x 1.00	70	8mm	660-1011	670-1011	760-1011	770-1011
M6 x 1.00	75	8mm	660-1012	670-1012	760-1012	770-1012
M6 x 1.00	80	8mm	660-1013	670-1013	760-1013	770-1013
M6 x 1.00	90	8mm	660-1014	670-1014	760-1014	770-1014
M6 x 1.00	100	8mm	660-1015	670-1015	760-1015	770-1015
M6 x 1.00	135	8mm	660-1018	670-1018	760-1018	770-1018
M8 BOLTS, 1.25 PITCH						
M8 x 1.25	12	10mm	661-1016	671-1016	761-1016	771-1016
M8 x 1.25	16	10mm	661-1017	671-1017	761-1017	771-1017
M8 x 1.25	20	10mm	661-1001	671-1001	761-1001	771-1001
M8 x 1.25	25	10mm	661-1002	671-1002	761-1002	771-1002
M8 x 1.25	30	10mm	661-1003	671-1003	761-1003	771-1003
M8 x 1.25	35	10mm	661-1004	671-1004	761-1004	771-1004
M8 x 1.25	40	10mm	661-1005	671-1005	761-1005	771-1005
M8 x 1.25	45	10mm	661-1006	671-1006	761-1006	771-1006
M8 x 1.25	50	10mm	661-1007	671-1007	761-1007	771-1007
M8 x 1.25	55	10mm	661-1008	671-1008	761-1008	771-1008
M8 x 1.25	60	10mm	661-1009	671-1009	761-1009	771-1009
M8 x 1.25	65	10mm	661-1010	671-1010	761-1010	771-1010
M8 x 1.25	70	10mm	661-1011	671-1011	761-1011	771-1011
M8 x 1.25	75	10mm	661-1012	671-1012	761-1012	771-1012
M8 x 1.25	80	10mm	661-1013	671-1013	761-1013	771-1013
M8 x 1.25	85	10mm				771-1018
M8 x 1.25	90	10mm	661-1014	671-1014	761-1014	771-1014
M8 x 1.25	100	10mm	661-1015	671-1015	761-1015	771-1015
M10 BOLTS, 1.25 PITCH						
M10 x 1.25	20	12mm	663-1001	673-1001	763-1001	773-1001
M10 x 1.25	25	12mm	663-1002	673-1002	763-1002	773-1002
M10 x 1.25	30	12mm	663-1003	673-1003	763-1003	773-1003
M10 x 1.25	35	12mm	663-1004	673-1004	763-1004	773-1004
M10 x 1.25	40	12mm	663-1005	673-1005	763-1005	773-1005
M10 x 1.25	45	12mm	663-1006	673-1006	763-1006	773-1006
M10 x 1.25	50	12mm	663-1007	673-1007	763-1007	773-1007
M10 x 1.25	60	12mm	663-1008	673-1008	763-1008	773-1008
M10 x 1.25	70	12mm	663-1009	673-1009	763-1009	773-1009
M10 x 1.25	80	12mm	663-1010	673-1010	763-1010	773-1010
M10 x 1.25	90	12mm	663-1011	673-1011	763-1011	773-1011
M10 x 1.25	100	12mm	663-1012	673-1012	763-1012	773-1012
M10 BOLTS, 1.50 PITCH						
M10 x 1.50	20	12mm	662-1001	672-1001	762-1001	772-1001
M10 x 1.50	25	12mm	662-1002	672-1002	762-1002	772-1002
M10 x 1.50	30	12mm	662-1003	672-1003	762-1003	772-1003
M10 x 1.50	35	12mm	662-1004	672-1004	762-1004	772-1004
M10 x 1.50	40	12mm	662-1005	672-1005	762-1005	772-1005
M10 x 1.50	45	12mm	662-1006	672-1006	762-1006	772-1006
M10 x 1.50	50	12mm	662-1007	672-1007	762-1007	772-1007
M10 x 1.50	60	12mm	662-1008	672-1008	762-1008	772-1008
M10 x 1.50	65	12mm				772-1013
M10 x 1.50	70	12mm	662-1009	672-1009	762-1009	772-1009
M10 x 1.50	80	12mm	662-1010	672-1010	762-1010	772-1010
M10 x 1.50	90	12mm	662-1011	672-1011	762-1011	772-1011
M10 x 1.50	100	12mm	662-1012	672-1012	762-1012	772-1012

Red part numbers indicate new items

STANDARD & NYLOC 5-PACKS

To compliment ARP "bulk" 5-pack chrome moly and stainless steel fasteners we have assembled matching groups of nuts. They, too, come in convenient 5-pack skin cards. Take your pick from stainless steel and black oxide finished standard nuts and stainless steel Nyloc self-locking nuts.

	Stainless Hex	Black Oxide Hex	Stainless Nyloc Hex	Cad Plated Nyloc Hex
STANDARD THREAD				
1/4-20	400-8651	200-8651	400-8661	200-8661
5/16-18	400-8652	200-8652	400-8662	200-8662
3/8-16	400-8654	200-8654	400-8664	200-8664
7/16-14	400-8656	200-8656	400-8666	200-8666
1/2-13	400-8657	200-8657	400-8667	200-8667
FINE THREAD				
1/4-28	400-8751		400-8761	400-8771
5/16-24	400-8752		400-8762	
3/8-24	400-8754		400-8764	
7/16-20	400-8756		400-8766	
1/2-20	400-8757		400-8767	

HEX NUTS

Constructed from the finest aerospace-quality materials, these hex nuts are available in most sizes to meet your needs. All hex nuts meet ARP's exacting quality control standards and are black oxided. All hex nuts are rated **180,000 psi** tensile strength.

Thread Size	Socket Size	Hex (1 PC bulk)	Hex (2 PC-Pack)	Hex (10 PC-Pack)
1/4-28 (1)	7/16	200-8601	200-8621	200-8631
5/16-18 (2)	1/2	301-8304	301-8324	301-8344
5/16-24	1/2	200-8602	200-8622	200-8632
11/32-24	1/2	200-8603	200-8623	200-8633
3/8-16 (2)	9/16	200-8704	200-8724	200-8734
3/8-24	9/16	200-8604	200-8624	200-8634
7/16-14 (2)	5/8	301-8305	301-8325	301-8345
7/16-20	5/8	200-8605	200-8625	200-8635
7/16-20	11/16	200-8606	200-8626	200-8636
1/2-20	3/4	200-8607	200-8627	200-8637
9/16-18	7/8	200-8608	200-8628	200-8638

(1) cad-plated (2) flanged hex nut

12-POINT NUTS

Available in a variety of sizes to suit your needs, all ARP 12-point nuts are constructed from aerospace-quality materials and meet their high standards of excellence. Rated **180,000 psi** tensile strength.

Thread Size	Socket Size	12-Point (1 Pc Bulk)	12-Point (2 Pc-Pack)	12-Point (10 Pc-Pack)	12-Point (SS per PC)
STANDARD					
1/4-20	5/16	301-8300	301-8320	301-8340	
1/4-28	5/16	300-8300	300-8320	300-8330	400-8300
5/16-18	3/8	301-8303	301-8323	301-8343	
5/16-24	3/8	300-8301	300-8321	300-8331	400-8301
11/32-24	7/16	300-8373	300-8383	300-8393	
3/8-16	7/16	301-8301	301-8321	301-8341	
3/8-24	7/16	300-8302	300-8322	300-8332	400-8302
3/8-24	1/2	300-8371	300-8381	300-8391	
3/8-24 (3)	1/2	300-8372	300-8382	300-8392	
7/16-14	1/2	301-8306	301-8326	301-8346	
7/16-20	1/2	300-8303	300-8323	300-8333	400-8303
7/16-20	9/16	300-8374	300-8384	300-8394	
7/16-20 (4)	1/2	300-8375	300-8385	300-8395	
1/2-13	9/16	301-8302	301-8322	301-8342	
1/2-20	9/16	300-8304	300-8324	300-8334	
1/2-20	5/8	300-8306	300-8326	300-8336	
9/16-12	11/16	301-8307	301-8327	301-8347	
9/16-18	11/16	300-8305	300-8325	300-8335	
5/8-18	13/16	300-8309	300-8329	300-8339	
METRIC					
M6 x 1.00	8mm	300-8370	300-8380	300-8390	400-8370
M7 x 1.00	9mm	300-8346	300-8356	300-8366	400-8346
M8 x 1.00	10mm	300-8340	300-8350	300-8360	400-8340
M8 x 1.25	10mm	300-8310	300-8311	300-8312	400-8310
M9 x 1.00	11mm	300-8341	300-8351	300-8361	400-8341
M9 x 1.25	12mm	300-8342	300-8352	300-8362	
M10 x 1.25*	12mm	300-8343	300-8353	300-8363	
M10 x 1.25	12mm	300-8344	300-8354	300-8364	400-8344
M10 x 1.50	12mm	300-8345	300-8355	300-8365	400-8345
M12 x 1.00	14mm	300-8347	300-8367	300-8387	400-8347
M12 x 1.25	14mm	300-8307	300-8327	300-8337	400-8307
M12 x 1.25*	14mm	300-8308	300-8328	300-8338	400-8308
M12 x 1.75	14mm	300-8376	300-8386	300-8396	

*small collar (3) .645 flange (4) .600 flange

STANDARD STAINLESS STEEL

Thread Size	Socket Size	12-Point (1 PC bulk)	12-Point (2 PC-Pack)	12-Point (10 PC-Pack)
1/4-28	5/16	400-8300	400-8320	400-8330
3/8-24	7/16	400-8302	400-8322	400-8332
7/16-20	1/2	400-8303	400-8323	400-8333

Red part numbers indicate new items

SERRATED FLANGE NUTS

These serrated hex nuts with flanged collars are available especially for carburetor, valve cover, front cover, oil pan studs and windage tray studs. Made from premium-quality material, they are cad-plated. All general purpose nuts are rated **150,000 psi** tensile strength.

Note: Do not use on cylinder heads, mains, or rods!

Thread Size	Socket Size	Hex (1 PC bulk)	Hex (2 PC-Pack)	Hex (10 PC-Pack)	Hex SS (1 PC bulk)
1/4-28	7/16	200-8609	200-8629	200-8639	400-8609
5/16-24	1/2	200-8610	200-8620	200-8630	400-8610
5/16-24 (4)	1/2	200-8645	200-8655	200-8665	
3/8-24	9/16	200-8600	200-8640	200-8650	
M10 x 1.25	12mm	200-8663	200-8673	200-8683	

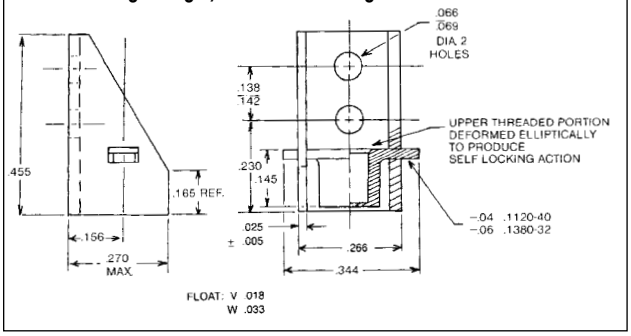
Red part numbers indicate new items

(4) non-serrated

PLATE NUTS

Plate Nuts are a quick and efficient way to provide a captive self-locking nut wherever you might need one. Ideal for use in difficult to reach areas, particularly when in a hurry. Available in a wide variety, these represent a selection of popular applications. Can be riveted, screwed or welded in position. Made of carbon alloy steel. Finished in cadmium and chromate.

Right Angle, Miniature Floating Panel Fastener



Size	NAS	Part No.
FLOATING, WITH REPLACEABLE NUT		
10-32	-3	200-9111
1/4-28	-4	200-9112
5/16-24	-5	200-9113
2-LUG, FIXED		
10-32	-3	200-9101
1/4-28	-4	200-9102
5/16-24	-5	200-9103
3/8-24	-6	200-9104
2-LUG FIXED WITH COUNTER SUNK RIVET HOLES		
10-32	-3	200-9106
1/4-28	-4	200-9107
5/16-24	-5	200-9108
RIGHT ANGLE, MINIATURE FLOATING PANEL FASTENER		
4-40		200-9121

SELF-LOCKING NUTS

For high stress, high temperature and severe vibration – all metal six point Jet-nuts and 12-point K-nuts are ideal for use practically everywhere. Features include elliptically offset, light weight, temperature resistant, positive locking and almost indefinitely reusable. The upper portion of the nut is distorted or offset elliptically. The elastic deformation creates a friction hold sufficient to lock the nut. Made of carbon-alloy steel, cadmium and chromate finish.

Size	NAS	Part No.
HEX (JET NUT)		
10-32	-3	200-8101
1/4-28	-4	200-8102
5/16-24	-5	200-8103
3/8-24	-6	200-8104
HEX, 1/2 HEIGHT, DRILLED		
1/4-28	-4	200-8113
5/16-24	-5	200-8114

Size	NAS	Part No.
12-POINT REDUCED WRENCHING		
10-32	-3	200-8201
1/4-28	-4	200-8202
5/16-24	-5	200-8203
3/8-24	-6	200-8204
HEX, 1/2 HEIGHT		
10-32	-3	200-8107
1/4-28	-4	200-8108
5/16-24	-5	200-8109
3/8-24	-6	200-8110

SPECIAL PURPOSE WASHERS

A true high performance washer from ARP, available in a variety of sizes and thickness, and with or without I.D. (inside diameter) chamfers. All are constructed from premium chrome moly and are parallel-ground, hardened, and finished in black oxide. Our 3/8″ I.D. washers, for example, come in four different sizes (O.D.) and different thicknesses. Special connecting rod washers are available, as are some of the more popular metric sizes. All of the washers are available individually, with most of them also offered in handy 2-piece and 10-piece packages. Build up an inventory of these premium quality washers so you won't get caught short when the need arises.

Application	Inside Dia.	Outside Dia.	Thickness	1 PC. Bulk	2 PC. Pack	10 PC. Pack
PREMIUM CHROME MOLY, BLACK OXIDE						
Washer, no chamfer	3/8	5/8	.120″	200-8504	200-8544	200-8554
Washer, with chamfer	3/8	5/8	.062″	200-8505	200-8675	200-8685
Washer, no chamfer	3/8	.675	.120″	200-8506	200-8546	200-8556
Washer, no chamfer	3/8	3/4	.120″	200-8507	200-8677	200-8687
Washer, with chamfer	3/8	3/4	.120″	200-8517	200-8547	200-8557
Washer, no chamfer, radiused O.D.	3/8	7/8	.150″	200-8508	200-8678	200-8688
Washer, no chamfer	5/16	.550	.120″	200-8593	200-8578	200-8584
Washer, with chamfer	5/16	.550	.120″	200-8594	200-8579	200-8585
Washer, no chamfer	5/16	.675	.120″	200-8595	200-8580	200-8586
Washer, with chamfer	5/16	.675	.120″	200-8575	200-8581	200-8587
Washer, no chamfer	5/16	13/16	.120″	200-8576	200-8582	200-8588
Washer, with chamfer	5/16	13/16	.120″	200-8577	200-8583	200-8589
Washer, with chamfer	7/16	13/16	.120″	200-8509	200-8529	200-8539
Washer, no chamfer	7/16	13/16	.120″	200-8510	200-8520	200-8530
Connecting rod washer, with chamfer	7/16	.675	.062″	200-8501	200-8671	200-8681
Connecting rod washer, with chamfer	7/16	3/4	.073″	200-8502	200-8672	200-8682
Washer, no chamfer	7/16	3/4	.120″	200-8511	200-8521	200-8531
Washer, with chamfer	7/16	3/4	.120″	200-8518	200-8548	200-8558
Washer, with chamfer	7/16	7/8	.120″	200-8512	200-8522	200-8532
Washer, no chamfer	.471	1.300	.120″	200-8429	200-8439	200-8449
Washer, with chamfer	1/2	7/8	.120″	200-8513	200-8523	200-8533
Washer, no chamfer	1/2	7/8	.120″	200-8514	200-8524	200-8534
Washer, no chamfer	9/16	1	.120″	200-8515	200-8525	200-8535
Washer, no chamfer	6mm	.990	.065″	200-8676	200-8686	200-8696
Washer, no chamfer	8mm	.575	.062″	200-8641	200-8642	200-8643
Washer, no chamfer	10mm	3/4	.120″	200-8519	200-8679	200-8689
Washer, no chamfer	10mm	.850	.120″	200-8590	200-8591	200-8592
Washer, no chamfer	12mm	3/4	.120″	200-8516	200-8526	200-8536
Washer, no chamfer	12mm	7/8	.120″	200-8500	200-8527	200-8537
STAINLESS STEEL						
Washer, with chamfer	5/16	.625	.120″	400-8530	400-8540	400-8550
Washer, no chamfer	3/8	.720	.120″	400-8501	400-8504	400-8508
Washer, with chamfer	3/8	.750	.120″	400-8507	400-8527	400-8537
Washer, with chamfer	7/16	13/16	.120″	400-8509	400-8529	400-8539
Washer, with chamfer	10mm	.630	.075″	400-8503	400-8523	400-8533
Washer, with chamfer	10mm	.750	.120″	400-8519	400-8520	400-8521
Washer, no chamfer	10mm	.750	.120″	400-8524	400-8534	400-8544
Washer, with chamfer	10mm	.865	.160″	400-8502	400-8522	400-8532

Red part numbers indicate new items

GENERAL PURPOSE WASHERS

Note: Do not use on cylinder heads, mains, or rods!

Quality washer for many applications, such as attaching accessories, chassis components, etc. They are not of the hardness required for use on cylinder heads, mains and connecting rods. Available in black oxide and stainless steel. Stainless demonstrates excellent corrosion resistance. Washers have over-sized I.D. (inside diameter) to clear most under-bolt head radii. Available for 1/4, 5/16, 3/8, 7/16, 1/2″ and 10mm shank bolts and studs.

Inside Dia.	Outside Dia.	Thickness	Black Oxide	Stainless	Cad Plated
1/4	1/2	.063″	200-8401	200-8414	200-8416
1/4	9/16	.063″	200-8408	200-8409	
5/16	9/16	.063″	200-8402	200-8403	200-8417
5/16	5/8	.063″	200-8410	200-8411	
3/8	5/8	.063″	200-8404	200-8405	200-8418
3/8	11/16	.075″	200-8412	200-8413	
7/16	3/4	.063″	200-8406	200-8415	200-8419
1/2	7/8	.063″			200-8407
10mm	3/4	.072″	200-8421	200-8422	

Red part numbers indicate new items

INSERT WASHERS

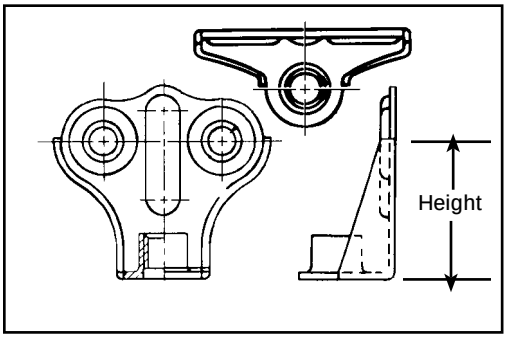
These handy washers are made to protect the top of holes from galling or collapsing around studs or bolts. They're ideal for head bolt holes, mid-motor plates, or any other high-wear area that requires a washer. Easy to install by just oversizing hole and pressing in washer. ARP Insert Washers are fully CNC machined from premium thru-hardened 8740 stock.

Note: Step washers for Ford applications also listed on head bolt pages

Insert ID	Insert OD	OD Size	1 PC-Bulk	2 PC-Pack	10 PC-Pack
1/4	.318	.562	200-8560	200-8565	200-8570
5/16	.380	.625	200-8561	200-8566	200-8571
3/8	.443	.750	200-8562	200-8567	200-8572
7/16	.571	.812	200-8563	200-8568	200-8573
7/16	.529	.875	200-8596	200-8597	200-8598
1/2	.567	.875	200-8564	200-8569	200-8574

STAND-OFF BRACKETS

These handy devices are excellent for attaching hydraulic lines, control cables or wire bundles to the chassis. They're stamped from **125,000 psi** steel, heat-treated, and cadmium plated for extra durability. They have a ribbed back for extra strength. Attach with 10/32 bolts. Available in three heights.



Application	Part No.
10.32 x .465″ Height	200-9301
10.32 x .465″ Height, radiused back	200-9305
10.32 x .665″ Height	200-9302
10.32 x .865″ Height	200-9303

WELD BUNGS

ARP has introduced a line of premium quality weld-in bungs. The parts are CNC machined from solid aluminum billet (6061) or 1018 mild steel. Applications include, but are not limited to: oil or fuel tanks, radiators, valve covers, manifolds, and rear axle housings. Fittings are available with female pipe threads, male AN, and female O-ring types. The fittings come in sizes: 1/4, 3/8, 1/2, 3/4, and 1 inch sizes; NPT -6 thru -20 AN; and -6 thru -20 O-ring sizes.

NPT

Aluminum		Steel	
Size	Part No.	Size	Part No.
1/4	800-8101	1/4	800-8201
3/8	800-8102	3/8	800-8202
1/2	800-8103	1/2	800-8203
3/4	800-8104	3/4	800-8204
1	800-8105	1	800-8205

AN Male

Aluminum		Steel	
Size	Part No.	Size	Part No.
AN6	800-8106	AN6	800-8206
AN8	800-8107	AN8	800-8207
AN10	800-8108	AN10	800-8208
AN12	800-8109	AN12	800-8209
AN16	800-8110	AN16	800-8210
AN20	800-8111	AN20	800-8211

AN O-Ring

Aluminum		Steel	
Size	Part No.	Size	Part No.
-6	800-8112	-6	800-8212
-8	800-8113	-8	800-8213
-10	800-8114	-10	800-8214
-12	800-8115	-12	800-8215
-16	800-8116	-16	800-8216
-20	800-8117	-20	800-8217

ASSEMBLY LUBE & SEALER

It's difficult to determine the amount of torque required to provide the correct preload and clamp force of a given fastener. For example – when tightened, dry uncoated fasteners use up about 95% of the applied torque simply by overcoming the friction between the male and female threads. To ensure that all ARP fasteners provide the optimum level of service, the installed residual stress is calculated and verified experimentally using a superior quality lubricant. It is important to note that the friction coefficients of lubricants vary dramatically, making it difficult to consistently produce the exact amount of stress within the fastener to clamp the components together. That's why ARP developed an ultra-consistent lubricant and recommend the use of our premium grade **ASSEMBLY LUBRICANT** or **THREAD SEALER** in order to precisely duplicate the recommended tightening specifications provided with all ARP fasteners.

Assembly Lubricant

- Premium grade Moly base with rust and corrosion inhibitors.
- Effective lubrication range: -30˚F to 750˚F.
- Load range: 500,000 psi.
- Designed for use with bolts

Thread Sealer

- Teflon based w/rust & corrosion inhibitors.
- Effective range: -30˚ to 550˚F.
- Sealant range: 10,000 psi (pressure).
- Application: delivers a flexible leak-proof seal in aluminum, steel, stainless steel and plastic against coolants, water, gasoline, natural gas and LPG.
- Designed for use with bolts

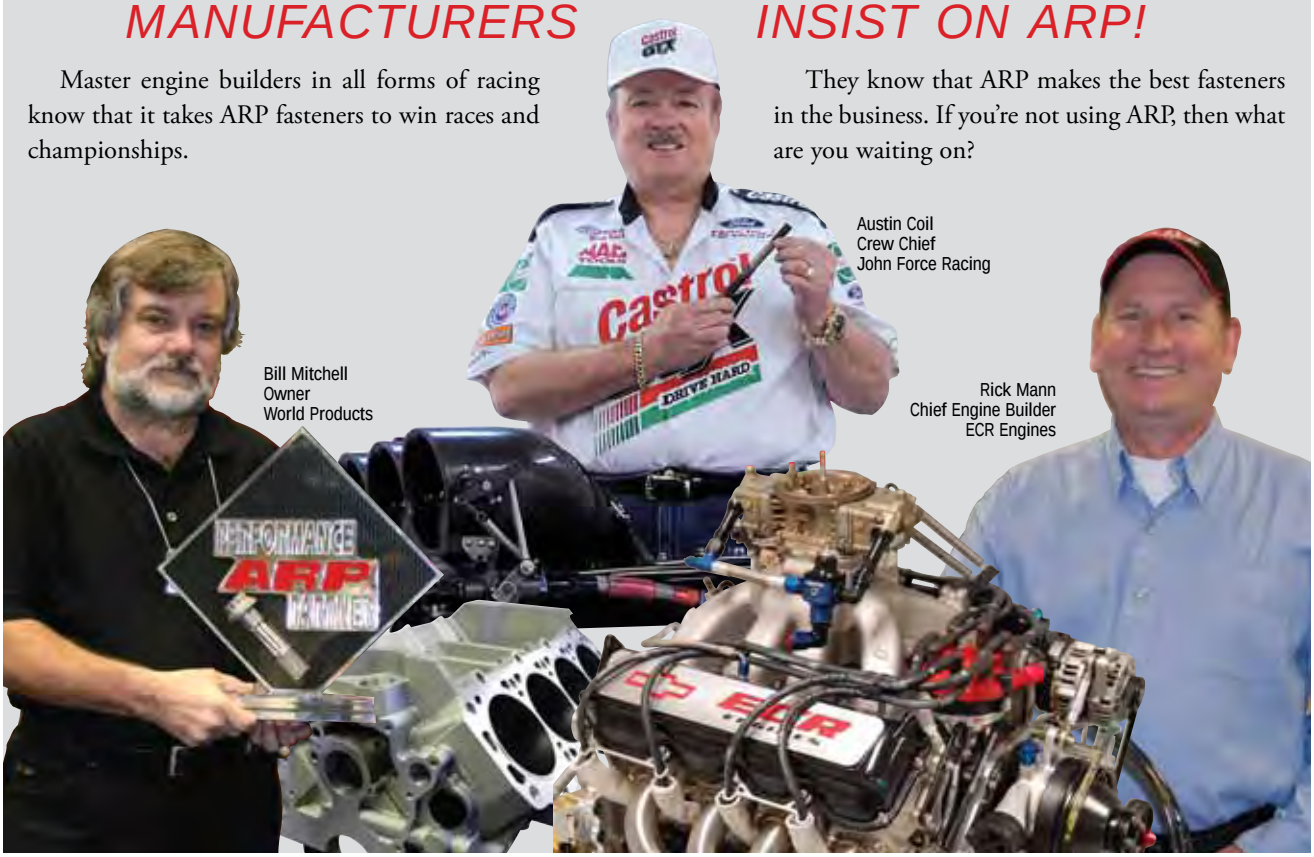
Product	Part #
Assembly Lubricant (0.5 fl. oz.)	100-9902
Assembly Lubricant (1.69 fl. oz.)	100-9903
Assembly Lubricant (1 pt. brush top container)	100-9905
Assembly Lubricant (1/2 pt. brush top container)	100-9906
Thread Sealer (1.69 fl. oz.)	100-9904

NOTE: These products are formulated for use on fasteners. Not recommended for use on rotating components.

TOP ENGINE BUILDERS AND MANUFACTURERS INSIST ON ARP!

Master engine builders in all forms of racing know that it takes ARP fasteners to win races and championships.

They know that ARP makes the best fasteners in the business. If you're not using ARP, then what are you waiting on?



THREAD CLEANING CHASERS

ARP's handy thread cleaning chaser taps are designed with correct thread pitch and diameter to clean dirty blind or thru holes. Taps come in five USS sizes: 1/4″, 5/16″, 3/8″, 7/16″ and 1/2″, as well as metric. They are sold individually or in sets. Please note that these are strictly *cleaning* taps and are not designed to cut thread. They are a handy addition to the tool box of any serious engine builder and an essential aid to preparing any block for final assembly. Don't take a chance on weakening block and cylinder head threads. Use these handy thread cleaning chasers whenever possible!

Size	Part No.
1/4-20	911-0001
5/16-18	911-0002
3/8-16	911-0003
7/16-14	911-0004
1/2-13	911-0005

Size	Part No.
M8 x 1.25	912-0001
M10 x 1.25	912-0002
M10 x 1.50	912-0003
M11 x 1.25	912-0004
M11 x 1.50	912-0005
M11 x 2.00	912-0011
M12 x 1.25	912-0006
M12 x 1.50	912-0007
M12 x 1.75	912-0008

Combination Sets	Specs	Part No.
USS Combo Pack. 5-pc	1/4 through 1/2	911-0006
Metric Combo Pack, 4-pc	1.25 Pitch	912-0009
Metric Combo Pack, 4-pc	1.50 & 1.75 Pitch	912-0010

SPARK PLUG INDEXER

By allowing you to consistently position spark plug ground electrodes out of harm's way, the ARP indexing tool takes the guess-work out of installing spark plugs where the combustion chamber and high dome piston clearances is critical. Designed to fit in the palm of your hand, this tool eliminates the need to perform cylinder head calibration. Best of all, the ARP indexer is made from aluminum alloy with precision machined threads that allows you to proof the quality of spark plug threads before installation in expensive cylinder heads. Anodized for protection and quick recognition. For use with tapered gasket 14mm plugs.

Product	Part #
Spark Plug Indexer	920-0001

OIL PUMP PRIMER KITS

Those first moments an engine runs prior to building oil pressure are when damage can easily occur. ARP's Oil Pump Primer Kit lets you spin the oil pump with a drill motor and bring up the oil pressure prior to starting the engine. This prevents any unnecessary wear or damage to rotating, reciprocating and valve train components. ARP's rugged primer shafts are rated at **170,000 psi** to ensure extended service life of this valuable tool. They feature a special billet aluminum sleeve that accurately positions the shaft and keeps it from wobbling.

Application	Part No.
CHEVROLET	
SB & BB and 90° deluxe, 9.00″ O.A.L.	130-8802
FORD	
Small block, 1/4″ hex drive	150-8801
351C, 351W, 351M, 400, 429/460, 5/16″ hex drive	150-8802

ROD BOLT EXTENSIONS

A long taper and full radius prevents nicking and scratching of crankshaft journals during connecting rod installation. ARP rod bolt extensions act as a guide during piston and rod installation – they will also hold the bearing shell in position in some applications. Available in 5/16″, 3/8″ and 7/16″ extensions are packaged in pairs and are hard anodize color coded for ease of identification.

Size	Part No.
5/16	910-0001
3/8	910-0003
7/16	910-0004
Set of 3	910-0005

TAPERED RING COMPRESSORS

ARP's new ring compressors are CNC machined from 6061-T6 billet tube material and feature a true radius for each different bore diameter. What's more, they are relieved for wire O-rings on bottom. Type 3 anodizing is used for long life, and the bore size is prominently engraved in 3/4″ high numbers for easy identification. Standard stocking sizes from 3.552″ to 4.750″ (SAE) and 75mm to 95.5mm (metric). The true radius design is far superior to conventional "tapered" devices, and widely acclaimed by professional engine builders! This is truly the very best piston ring compressor on the market today.

Available in standard & metric

Size	Part No.
3.552	899-5520
3.572	899-5720
3.800	899-8000
3.830	899-8300
3.900	899-9000
4.000	900-0000
4.005	900-0050
4.010	900-0100
4.020	900-0200
4.030	900-0300
4.040	900-0400
4.060	900-0600
4.070	900-0700
4.080	900-0800
4.090	900-0900
4.100	900-1000
4.105	900-1050
4.110	900-1100

Size	Part No.
4.115	900-1150
4.125	900-1250
4.130	900-1300
4.135	900-1350
4.140	900-1400
4.145	900-1450
4.155	900-1550
4.165	900-1650
4.170	900-1700
4.175	900-1750
4.185	900-1850
4.187	900-1870
4.220	900-2200
4.235	900-2350
4.250	900-2500
4.255	900-2550
4.260	900-2600
4.270	900-2700

Size	Part No.
4.280	900-2800
4.290	900-2900
4.310	900-3100
4.320	900-3200
4.330	900-3300
4.350	900-3500
4.360	900-3600
4.375	900-3750
4.390	900-3900
4.400	900-4000
4.440	900-4400
4.470	900-4700
4.500	900-5000
4.530	900-5300
4.560	900-5600
4.600	900-6000
4.625	900-6250
4.750	900-7500

Size	Part No.
75.00mm	901-7500
75.50mm	901-7550
76.00mm	901-7600
76.50mm	901-7650
77.00mm	901-7700
77.50mm	901-7750
78.00mm	901-7800
78.50mm	901-7850
79.00mm	901-7900
79.50mm	901-7950
80.00mm	901-8000
80.50mm	901-8050
81.00mm	901-8100
81.50mm	901-8150

Size	Part No.
82.00mm	901-8200
82.50mm	901-8250
83.00mm	901-8300
83.50mm	901-8350
84.00mm	901-8400
84.50mm	901-8450
85.00mm	901-8500
85.50mm	901-8550
86.00mm	901-8600
86.50mm	901-8650
87.00mm	901-8700
87.50mm	901-8750
88.00mm	901-8800
88.50mm	901-8850

Size	Part No.
89.00mm	901-8900
89.50mm	901-8950
90.00mm	901-9000
90.50mm	901-9050
91.00mm	901-9100
91.50mm	901-9150
92.00mm	901-9200
92.50mm	901-9250
93.00mm	901-9300
93.50mm	901-9350
94.00mm	901-9400
94.50mm	901-9450
95.00mm	901-9500
95.50mm	901-9550

ROD BOLT STRETCH GAUGE

We highly recommend using a stretch gauge when installing rod bolts and other fasteners where it is possible to measure the length of the bolt after tightening. It is the most accurate way to determine the correct pre-load in the rod bolt. Simply follow manufacturer's instructions, or *use the chart on page 25 of this catalog* for ARP fasteners. Measure the fastener prior to starting, and monitor overall length during installation. When the bolt has stretched the specified amount, the correct preload, or torque, has been applied. We recommend you maintain a chart of all rod bolts, and copy down the length of the fastener prior to and after installation. If there is a permanent increase of .001″ in length or more, or if there is deformation, the bolt should be replaced immediately. Don't chance it! A sample chart is as follows:

ARP offers a highly accurate stretch gauge with a dial indicator that reads in increments of .0005″. Features extra heavy springs for consistent repetition. Comes with a heavy-duty, insulated plastic carrying case for protection. A "must" for any serious engine builder.

Product	Part #
Stretch Gauge	100-9941
Stretch Gauge, billet-style	100-9942

PROMOTIONAL MATERIALS

P.O.P. POSTERS

There are four distinctive point-of-purchase posters available from ARP, each covering an important product group. They measure 24″ by 12″.

Product	Part #
Rod Bolts	999-9901
Cylinder Head & Main Studs	999-9902
Valve Train Components	999-9903
Stainless Steel Accessory Bolts	999-9904

BANNERS

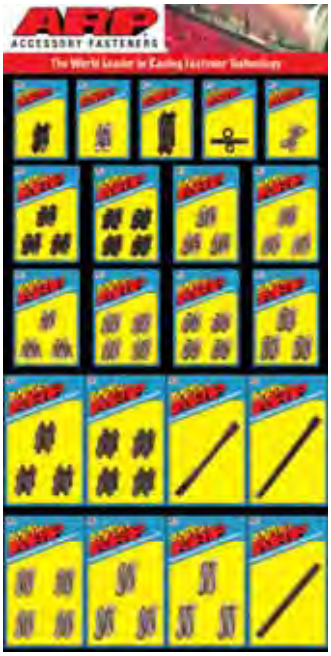
You'll see these familiar banners at race tracks from coast to coast, and you can have one for your facility, too. They're screened on heavy-duty vinyl and have grommets on the corners. They measure 5 feet by 3 feet.

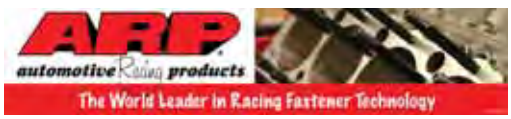
Product	Part #
Banner	999-9950

PLAN-O-GRAMS

These product layouts will help you showcase popular items. They feature full color product photos, with provisions to display the product itself. The Plan-O-Gram is calculated on a 1″ spaced grid pattern so it can be used on pegboard, gridwall, etc. The first offering measures approximately 2′ wide by 4′ tall, with a larger version under development at press time.

Product	Part #
Driveline Planogram - 24″ x 48″	999-9975
Accessory Planogram - 24″ x 48″	999-9976
Driveline Header Card - 24″ x 5″	999-9977
Accessory Header Card - 24″ x 5″	999-9978
General Header Card - 24″ x 5″	999-9979





TRIBUTE TO SMOKEY YUNICK

For many years "Smokey" Yunick served as a valued tech consultant and spokesman for ARP. He was a popular host of our Tech Seminars at trade shows, and his knowledge of fasteners was truly astounding. Smokey passed away in 2001, but his wit and wisdom will live on. Here are a few of his observations and tech tips. R.I.P, Smokey!

Yesterday, fastener technology was pretty much "cut and try." Often times the thinking was, if it breaks go to one size bigger. The game of substituting aircraft fasteners didn't work either. Although the quality was there, aviation fasteners simply didn't exist for across-the-board substitution. They still don't.

In real life there was no bullet-proof manufacturer of fasteners specifically for race cars. There were attempts by various fastener manufacturers to claim expertise on a few special applications like rod bolts and wheel studs. But in reality, results were mixed, from good to terrible.

Hall of Fame Mechanic "Smokey" Yunick

It's this simple; properly designing racing fasteners requires the skills of metallurgists, stress analysts and engineers. And to make them requires special machinery and manufacturing techniques. It is also a fact that there is no way to do this cheaply, or in high volume production.

I was asked to be a spokesman for ARP. Because I had never done this before, I made it a point to visit the ARP manufacturing facilities to see if their products were good enough for me to endorse comfortably. The visit blew my mind. I've been around some nut and bolt joints before, but nothing I'd seen before could compare with the quality of inspection of the raw materials and their manufacturing process.

Examining the "Over-Kill" fallacy

If there's one thing I've heard over and over from visitors to trade shows and races it's, *"Your fasteners are great. I'm not having any problems but I'm being told, by your competitors, that ARP is overkill and therefore I'm wasting some money when I buy ARP pan bolts, manifold bolts or just about everything except for certain critical engine, drive train or suspension fasteners."* My first instinct is to say they are full of _ _ _ _.

But the subject is worth talking about. Cost is an important consideration when you choose a particular vendor's offering. Still, if you use lesser quality fasteners and they were not subject to many assembly and disassembly cycles, by people with varying skills from professional to rank amateur. Maybe, just maybe, you could make a case for minimum grade fasteners that are over designed, size-wise, to allow a reasonably safe application for conservative usage.

Now, lets get back in our world. The real world. We can expect the engines and vehicles to be leaned on, from a little to beyond any sensible extreme. We can expect 10 or more assembly/disassembly cycles. We can expect over-torquing, which will leave the fastener looking 100% but actually in a condition RED, semi-failed mode. We can expect some fasteners that are minimal in quality to end up in a critical, high-stress area. We can't expect everyone to be able to look at a fastener and determine its quality by looks, or even by markings. So we leave ourselves wide open for expensive and possibly dangerous results. For the amount of money saved by "type rating" every fastener's capability, and consideration of a long range view of the best mix of customers, I recommend all fasteners be of a quality that *does* exceed the minimum standards.

"It's to your advantage to know fasteners."

To thoroughly understand it all would require at least 4 specific engineering degrees and 20 years of hands on experience in each. Nothing is forever, but take my word for it, ARP is the only game in town today. Just about every successful racer I know today uses their stuff 100%. You can help yourself in reference to material specs, thread lubes and torque techniques, also in fastener maintenance and handling. If you do a good job here, you'll never lose position in a race from fastener failure.

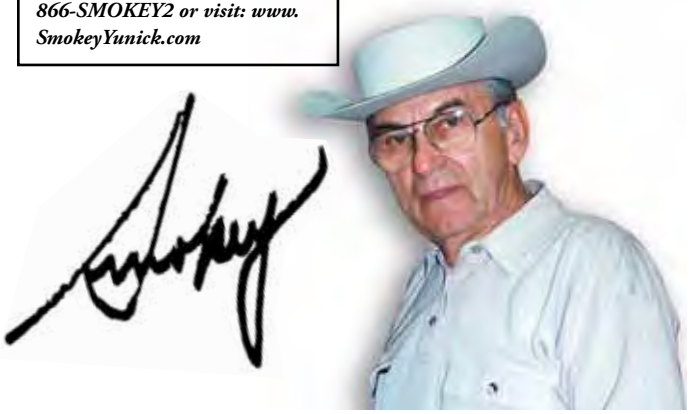
There are many "little things" to consider

1. When you use a locking chemical for studs, bolts or even nuts, consider if you really need it.
2. If you are using a locking chemical, don't force nuts off or studs out without a proper first step, like heat or release chemical.
3. If you can't easily screw a nut and bolt together by hand they shouldn't be used.
4. Consider the importance in regard to how many exposed threads are left when fastener is set. Turns out this has a bearing on necessary torque and ultimate strength of the fastener.
5. Gradually try to understand and learn the difference in the various steels used in fasteners.
6. Turns out, the best way to consider a fastener as a spring of correct elasticity for that specific job. Yup, a fastener works best when stretched a specific amount.
7. You have got to start studying fasteners just like you do pistons, cranks, rods, etc. There's a lot to learn if you know what to look for.
8. The more you understand all the design limitations of fasteners, the better the engine durability will be.
9. If you can't stretch the bolt enough, it can still fatigue, lose torque or get loose.
10. Use a stretch gauge whenever possible. This is the only foolproof method of getting the correct clamping force.
11. Get access to a master gauge to check your torque wrenches. You'd be surprised at how many torque wrenches read incorrect.
12. Don't forget that you'll get different torque readings when using different lubricants.
13. Use ARP's moly lube whenever possible.

Get the "Inside Scoop" in Smokey's book...

In addition to being one of racing's most famous innovators and personalities, Smokey Yunick was known for being opinionated on many matters. He told it like it was, according to Smokey. Before his passing, Yunick spent considerable effort compiling anecdotes from his illustrious career. It's a "must have" book for anyone who is into auto racing. From Daytona Beach to Indy, Smokey lets it rip!

For details on purchasing Smokey's book or apparel call 866-SMOKEY2 or visit: www.SmokeyYunick.com



RACING JACKETS

Take your pick from the traditional black suede-like material or new "checkered flag" motif. There's a full nylon lining with a handy zippered pocket. A heavy-duty metal zipper provides closure, while an elastic waistband and cuffs, plus generous side pockets, round out the technical features. Graphically, there's a large ARP logo embroidered on the back and a smaller version in front. The jackets are available in sizes M to XXXL.

HATS

RACING T-SHIRTS

Our T-shirts are heavy-duty 100% cotton and built to last! Adult sizes are available in three popular colors: white, sand and ash while childrens sizes are available in white, orange and ash. On the back is a large silk-screened full-color graphic with a "blueprint" theme and a small Automotive Racing Products logo is screened on the front. ARP T-shirts are available in sizes Small to XXXL for adults and Small (6-8), Medium (10-12) and Large (14-16) for children. Please state sizes when ordering.

UNIFORM PATCHES

Add color to your jacket, crew uniform, driving suit or shop apron with these top quality embroidered emblems. They measure approximately 5″ wide by 2″ tall.

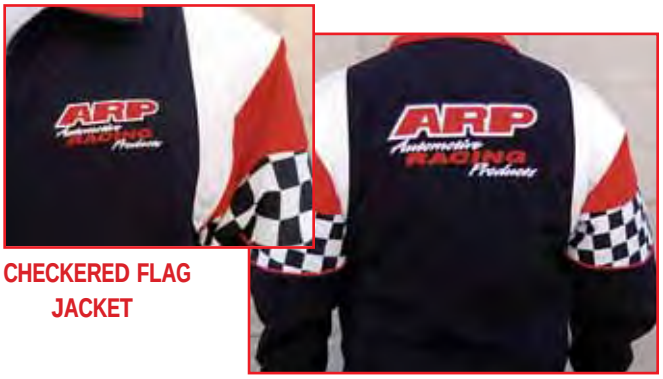
HOODED SWEATSHIRT

ORDERING PROCEDURES

All apparel must be ordered directly from ARP. Our dealers do not handle apparel. You may charge the order to your Visa or Master Card account. Please make sure you order the correct sizes, as we have a very strict return policy. Appropriate shipping charges will be added to each order; plus sales tax for California residents.

APPAREL

BLACK RACING JACKET



CHECKERED FLAG JACKET

RACING T-SHIRTS

SWEATSHIRT

back

All ARP apparel is sold on the basis of your being responsible for sizes. If there is a problem, you must return the garment to ARP within a week of receipt. Any garment that has been worn and soiled, dry cleaned or laundered, cannot be returned.

ARP® Quality Fasteners... The Reliable Way To Assemble An Engine!

Sales Policy & General Information

Hours of Operation: 7:30 AM to 4:30 PM Monday through Friday (Pacific Standard Time). Will Call Hours: 8:00 AM to 4:00 PM Monday through Friday at Ventura location only. For technical assistance, direct all written correspondence to the address below or E-mail us at: info@arpfasteners.com or log onto our website at arp-bolts.com

Orders

Call 805-339-2200 and request the order desk.

FAX orders should be sent to 805-650-0742.

Prices

All prices are subject to change without notice. Warehouse, Distributor and Jobber price lists are available directly from ARP or local parts suppliers. ARP® encourages local retail sales. In the event there is no supplier or special assistance is required, you may contact ARP® directly at 805-339-2200.

A list of international ARP® parts suppliers is continually updated at **arp-bolts.com**.

Terms

Orders may be paid for using VISA, MasterCard or American Express. All orders and open accounts are subject to credit approval by ARP.®

Shipping

Normal shipping is United Parcel Service Ground. Next Day Air, 2nd Day Air, and 3-Day Select are also available. Orders must be processed by 12:00 noon (PST). All orders are shipped freight collect.

Merchandise Returns

Contact a customer service representative if you are not completely satisfied with the performance of a product manufactured by ARP® to obtain an RMA. Always include a copy of the original invoice.

All ARP® Fasteners Are Proudly Made In The U.S.A.

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