REMOVING BROKEN STUDS AND BOLTS

I've seen a few posts here about broken studs and bolts. If you're going to work on 'em then eventually you're going to break them! I will list a few points here that may help you in the future, and give ya a few things worth looking for when you go shopping.

Leave yourself plenty of time - don't rush yourself or 'Murphy' will decent upon you. Soak the stud broken off in the hole with penetrating oil (or equal).

BASIC BROKEN BOLT/STUD REMOVAL Part I

For hardened stud/bolts, a high-speed and titanium tipped drill should do the job. For stainless steel or other harder studs/bolts you will need cobalt drill bits. The difference between high-speed and cobalt drills can be amazing. If you are lucky to have access to the more expensive carbide drills, they are probably the best.

When drilling, you can push down a little on the 1/8-inch drill bits, but not too hard or they'll break. The thicker 3/16-inch and larger diameter drill bits can take more downward pressure to speed up the drilling process.

First, the best way to start drilling is to put a small center punch hole right smack dab in the middle of the piece to be drilled, if the stud/bolt has broken off leaving a relatively flat surface. If the surface of the broken stud is NOT flat, grind a flat area with a Dremel Tool that is at least 3/32" diameter. Then start with a small 1/8" (+/-) drill bit and carefully drill through the middle of the bolt as best as you possibly can until you are completely through other end. Keep the drill bit parallel to the stud to avoid hitting threads. Be careful to not drill into the metal beyond the end of the broken stud such as the cylinder head or frame.

As you drill, squirt in light penetrating oil. When the pilot hole has been drilled, increase the drill size to 3/16" - continue to enlarge the hole some more watching the depth of your drill. Try an easy out (broken thread extractor) on the broken stud.

If it still doesn't budge, squirt in more penetrating oil and drill the hole slightly larger making sure not to drill into the hole threads. With the hole enlarged, try a larger easy out. If the easy-out flexes or “twists” without turning the broken bolt, stop and drill a larger hole for a bigger easy-out. Twisting the easy out too much will cause it to break in the hole. If that happens, you have compounded your problem.

NOTE: To avoid bottoming out (i.e., drilling through the bolt/stud into the engine block) you can measure by looking at another identical stud or bolt. If you want a cheap safety to avoid bottoming out, use a piece of dowel on the drill to limit depth. but don't use it too early as you want to see exactly what your doing and it helps to have someone at a right angle to your line of sight to help align true.

If you are running into a lot of broken bolts and studs that, try to find some left hand drill bits similar to those used in screw machines. Many times the drill left hand turns will reverse stud out as it relieves the stress of the stud or bolt core allowing it to loosen! They are out there for sale, but you have to look for them.

Some times you can 'unstick' a stuck bolt by over tightening slightly - that releases the galling of the threads. In this case you might try using a threading tap that is slightly larger than the pilot hole you've drilled

just to get a slight 'over tightening' pressure on it - then try the 'easy-out' again

Easy-outs will work best after this, but easy-outs come in several designs and the ole twisted sister style don't do that good of a job if the stud is stubborn, in fact it can make it much worse, by spreading and quite literally riveting the piece in solid. There is a square easy-out bit that is a little bit better. When you're ready to turn out the stud, apply a little heat to area with a propane torch, just to warm up and expand the metal some. Not too much heat though, please use discretion here.

You can keep drilling slightly larger 'pilot' holes until you get close to the inside diameter of the threaded hole. At times I've found a small punch or pointed chisel and a SMALL ball peen hammer useful to 'roll' the remaining thin exterior of the broken bolt out of the female threads in the casting. This is hard to do if there's a lot of thread corrosion holding the bolt in place.

After you get the bolt/stud out, 'dig out' all the pieces of the drilled out stud with tweezers, then use a tap to 'carefully' chase the threads in the cylinder head. Use liberal amounts of cutting oil on your tap. If your initial tightening (that caused the bolt to break) didn't strip the threads in the hole you'll probably be able to reuse the original size hole. If it's stripped you'll have to drill and re-tap the hole to accommodate a stud with an oversize base.

Then, if all this works and you got the bolt/stud out clean, then go and find some stainless steel replacements, not the soft 10L18 stuff that is so cheap to make into bolts and studs. Don't forget that aluminum likes the use of never seize too. Especially on your spark plugs! ! ! !

I saw some stuff on tapping, (you can use Crisco for lube!), and a few other things, but that's another time, if I feel up to it and you want to hear it!
cruiser vroc#2600 classic 1500

TECH TIP: one other thing that I recommend is to not seat studs into bottom of hole with any torque. It is bad enough to fix when they seize and shear without the added aggravation. I don't mind it at all when they come out with nut. Gives me an excuse to re never seize them anyway and makes for an easiest of fix!
cruiser

BASIC BROKEN BOLT/STUD REMOVAL Part II

You have already gotten all sorts of good advice for removing the broken stud... the oil and heat thing will help. You might also consider a left hand drill bit to just turn the stud out... depending on how it feels. In any case, you can get an 8x30mm stud at Napa. If they ain't got it, they

can order it. Stainless sounds sexy but when it gets snug in aluminum, it will gall and you will have a hard time removing it, even with anti-seize compound. Just get regular hardened steel. I use 30mm studs with double nuts on the end (rather than the acorns). You can turn the inner nut against the outer to easily remove the whole stud if you want. To tighten, you put the new stud in, just tighten the top nut after starting both nuts on the stud. Take your time... this is a frustrating deal but you can always just drill the stud out using progressively bigger bits and then clean the threads with an 8mm tap.

BROKEN EASY OUT!! Part I

A broken easy out is almost as bad as a broken tap. There are a number of ways to look at this and without a specific application I will go broadband! First, I'd stay calm and hope for access to at least a little bit of it and some room to work, you didn't mention room!

A fine pointed center punch and some gentle but well applied pecks in as many directions as can be applied can loosen it a bit at times from its lodging, but they do have a tenacity for wedging in and spreading the walls out on the stud. This is generally from drilling a bit too big or close to one side of stud, but it happens.

If that doesn't work, then we need to check again how well can we get to it. If ya had room to drill then you got room to drill again but a standard drill probably won't work, but it might. Easy-outs are generally high carbon not tool steel, so it's not all that hard, and can be drilled but you got to watch it. I'd go to a carbide drill if it is not a real small easy-out and drill at it carefully, using the stud as a guide, but the carbide drill will walk off if allowed to so it is imperative to make a good pock in the easy-out with a punch and follow it. Still a pain in thy arse for sure! I saw a pro welder once touch one with his tungsten and high freq. it for a moment and then just pluck it out! Saw him do that on a tap once that had me seriously worried, and he took it out with the frequency of his arc. I saw it start to move while he soaked it! Not much heat but extreme high frequency! And yes I watched with a shield. I've had to core out taps and pick the pieces. And to be honest it would be easier than tackling an easy-out point in a tight spot. Of course in a bad spot then you'd have to disassemble and go for the heavy guns. I would too but I have access to a fully equipped Jobber machine shop with almost anything the heart could desire. Only problem is the machinery is running all the time and gov jobs are on the bottom of the priority list. I didn't want to bring up the acid trick, because it don't work too well in conjunction with aluminum, tends to eat at the lesser metal fastest, but we know that. Again, heat applied to the core of the problem is often best if the application will allow! It will expand the point and also oxidize some of the fine and take the temper out of the point as well as stress relive the bite of the point and stud too. Some times the heat of a very small oxy acet tip with an oxy flame will loosen things up nicely but best in cast iron or steel, maybe alum but it would have to be watched close, alum goes plastic at 1000 and melts at 1050 so room for error!

BROKEN EASY OUT!! Part II

DON'T shoot yourself in the head!!

You were asking how to get a broken easy-out, out? YES... they can be removed...then after you get it out, NEVER use one again! I have been removing broken bolts in *heads* and exhaust manifolds for over 20 years and NEVER used an easy out! The best way I have found is to HEAT the broken easy-out, (oxymoron), cherry red. That makes the E.O. lose its strength and it can then be drilled out.

The *best way* to remove a broken bolt in a recessed hole, is to fill the recess by welding the top of the exposed bolt/stud, then weld a large washer to the "blob". After welding the washer, add a nut to the top of the washer and weld it also. Let it cool, and then heat the surrounding area with a torch. After the area around the broken part becomes hot, TIGHTEN the welded nut slightly, and then back the nut out WITH the rest of the broken parts.

If you are working with cast iron, you can watch it get cherry red, if you are working aluminum you have to be really careful.... so it doesn't melt into a little puddle. :>}
(it doesn't turn red...ask me how I know!!)