

# KENNE BELL

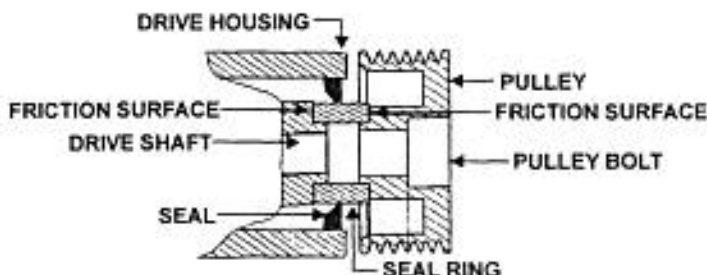
Hi Tech Performance Products

## IMPORTANT NOTICE

### "When Changing Pulleys"

Obviously, we like to see our kits develop as much boost (horsepower and torque) as possible. If we thought your supercharger kit would tolerate more boost, we would have installed a higher boost pulley at the factory.

#### SIDE VIEW FRONT SECTION - DRIVE ASSEMBLY



WHEN INSTALLING A SMALLER SUPERCHARGER DRIVE PULLEY TO OBTAIN MORE BOOST, YOU RISK

## **SEVERE ENGINE DAMAGE**

IF YOU DO NOT RUN THE PROPER OCTANE FUEL AND/OR RETARD THE IGNITION TIMING. **BEFORE** YOU INSTALL THE PULLEY, DRAIN ALL EXISTING FUEL, INCREASE THE OCTANE OF YOUR FUEL BY USING NOS BRAND OCTANE BOOSTER (Off Road Formula ONLY, this is the ONLY brand we recommend) OR USE HIGHER PUMP OCTANE FUEL BY AT LEAST 1.5 - 2.0 POINTS AND/OR RETARD THE TIMING TYPICALLY .1 DEG PER ADDED LB OF BOOST. IF YOU HEAR ANY PINGING OR KNOCKING (DETONATION), GET OUT OF THE THROTTLE IMMEDIATELY, OR SEVERE ENGINE DAMAGE WILL OCCUR IN A HURRY.

USE A TORQUE WRENCH TO INSTALL THE PULLEY. DO NOT INSTALL THE PULLEY WITHOUT A TORQUE WRENCH. DO NOT TOUCH THE MATING SURFACES OF THE PULLEY. USE LAQUER THINNER OR CARB CLEANER TO CLEAN FRONT AND BACK OF SEAL RING AND BACK OF PULLEY SURFACES TO REMOVE ANY OIL. THESE ARE FRICTION DRIVE PULLEYS. NO OIL ALLOWED. FOR 10MM BOLTS, TORQUE IS 59 FT.LBS., 75 FT.LBS. ON 12MM.

REMEMBER, YOU ARE THE ONE RESPONSIBLE FOR RAISED BOOST LEVELS ABOVE WHAT YOUR KIT WAS DESIGNED FOR (ALL ARE RATED BASED ON 91 OCTANE). YOU ARE THE ONLY ONE WHO CAN PREVENT DETONATION AND ENGINE DAMAGE.

**Any supercharger pulley used other than a Kenne Bell immediately voids the warranty.**

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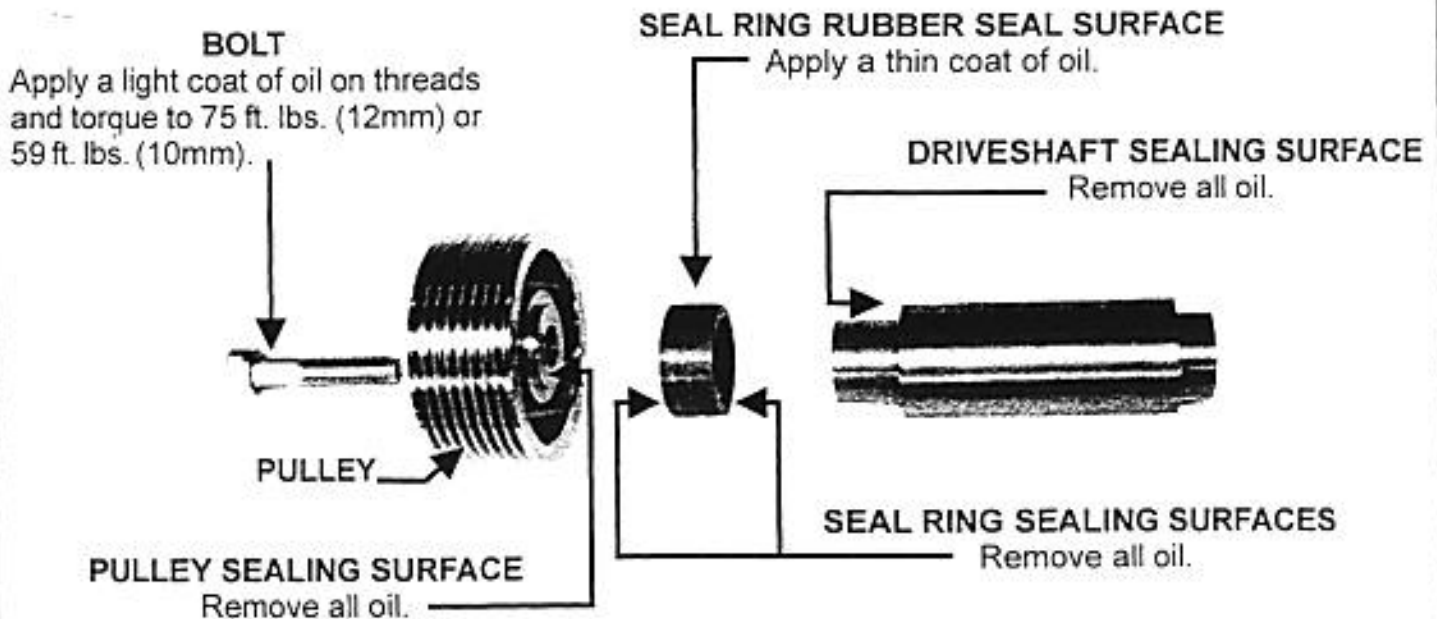
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# KENNE BELL

Hi Tech Performance Products

## SEAL RING, PULLEY, BOLT PREP FRICTION DRIVE



The seal ring is the link (bushing) between the pulley and supercharger drive hub. The seal ring relies on dry metal to metal friction to hold the pulley in place. There can be **NO OIL** between the pulley and seal ring surfaces or the pulley can slip and shear off the drive bolt.

### **INSTALLATION** **(SEAL RING, PULLEY & PULLEY BOLT)**

**SEAL RING** - Remove all oil from the front of the seal ring (between the pulley and seal ring) and the back of the seal ring (between the seal ring and supercharger hub). Use a screwdriver with a rag over the tip coated with carb cleaner or lacquer thinner. Put a light coat of oil **ONLY** on the seal ring surface that contacts the rubber seal.

**PULLEY** - Remove all oil from the pulley surface that contacts the seal ring.

**BOLT** - Put a **LIGHT** coat of oil on the bolt threads and torque to 75 ft. lbs. for 12mm bolts and 59 ft. lbs. for 10mm bolts.

**DO NOT USE ALUMINUM PULLEYS ON OUR SUPERCHARGERS.**  
**IT WILL VOID THE WARRANTY.**



## HOW TO AVOID & ANALYZE SUPERCHARGER PROBLEMS

The Kenne Bell Twin Screw is the most reliable, durable and trouble free supercharger available. If properly cared for with regular oil changes, it will give many years of trouble free service. Bearings are lubricated for life. And it's billet case, huge bearings and shafts, precision gears and rotors make it virtually indestructible. It far exceeds OEM standards. However, as with any mechanical device, it can be made to fail. Kenne Bell has many years of experience with the Twin Screw. We know their limitations. We have destruction tested / purposely destroyed superchargers under every possible condition so we can determine the true cause of ANY Kenne Bell supercharger failure. So let's talk failures and how to avoid them.

**HEAT** - For the most part, component failures are the result of excessive heat, boost and/or rpm, overfilling with oil, "hot air" systems from the brain dead and foreign materials entering the supercharger inlet. Just as an overheated engine seizes pistons in the cylinder bores, the spinning rotors expand and can seize in the billet case. We've never seen a rotor case or bearing actually fail (crack, chip, break, etc.) in a Kenne Bell kit. Heat is what kills the parts. Heat. The same is true for oil starved gears. They become hot, discolor from the heat and burn up from lack of oil. Note: The Twin Screw bearings (supercharger and drive) are lubricated for life so don't need outside lubrication. The rotors rotate or "float" on these huge bearings and never contact the case unless distorted from excess heat and/or rpm.

**OVERFILLING** - Overfilling is the most frequent cause of supercharger failure. NEVER overfill a Kenne Bell supercharger with oil. NEVER. You wouldn't overfill your engine, rear end or trans - unless your goal is to heat up and boil the lubricant. Overfilling a Kenne Bell dramatically increases the oil temperature which hardens the front case seals resulting in high oil consumption. The excessively high oil temperature (400°+) can also melt and dissolve the plastic coupler which "cushions" the drive from the supercharger. With the coupler gone, there is now a 1/2" gap and metal to metal contact and, of course, audible noise (clacking) from the front of the supercharger, particularly at idle or when on and off the gas. A melted coupler can be verified by removing the belt and checking the lash by rotating the pulley back and forth. There should be very little lash. 1/2" of lash indicates the coupler is gone and the supercharger needs to be rebuilt as the seals will also be hardened allowing the oil to now pass from the oil reservoir into the case and rotor assembly. A partially heat destroyed or worn coupler with abnormal gap can emit a slight clacking sound which is accentuated by a rough idling engine. This is NOT a problem.

See "Supercharger Gear Noise" (<http://www.kennebell.net/techinfo/ford-techinfo/Lightning54only/GearNoise.pdf>).

**NO OIL / LOW OIL SUPPLY** - This is easy to diagnose because the gears discolor. As with any metal to metal parts contact, a lack of oil results in excess heat which turns the gears black or blue black. The gear teeth will then wear off from lack of oil. And if the heat from the gears running without oil is sufficient, the green coupler can also melt. Any residue oil splash or spray that contacts the gears will "fry" (burn and turn black).

**RACE APPLICATIONS - SEVERE USE** - Let there be no mistake about this. High rpm or high boost racing conditions ALWAYS create more heat in any supercharger. "Hot Air Kits" (see "Warning: Hot Air Underhood Exposed Filters & Kits" <http://www.kennebell.net/techinfo/general-info/HotAirWARNING.pdf>) and overfilling must be avoided for severe use. An overfilled reservoir with 400°+ boiling oil often overheats the front of the supercharger sufficiently to result in rotor to case or rotor to rotor contact and a ruined supercharger. A tell tale sign is that only the front (hottest) area of the rotors will be scored. Also, the air is hottest at the front of the supercharger. Scuffing the full length of the rotors indicates LOTS OF HEAT from oil, boost and rpm. The same is true for "Hot Air" (underhood exposed filters) which can elevate supercharger temp a whopping 100°. That's the equivalent heat generated by an additional 10 psi of boost. Does anyone really believe sucking hot underhood air helps the engine or supercharger life? For high rpm/boost applications, lower oil level to 1/4" BELOW the bottom notch on dipstick with dipstick screw in.

**BYPASS VALVE** - The bypass valve lowers the supercharger temperature at idle and part throttle/cruise. They seldom, if ever fail, but if it does, the supercharger will run hotter. Periodically check it's operation. Always check the vacuum/boost control line to the bypass valve for leaks. The valve will be "open" at idle (vacuum) and closed under boost (pressure).

**ANALYSIS** - Analysis of problems is easy. Depending on the rpm and run time, an overfilled supercharger will reek of burned oil when disassembled. The oil may appear "jelled" or as sludge. Also present may be the smell of the dissolved plastic coupler. Draining the above and filling with fresh oil may look good on the dipstick, but the tell tale damage remains. The seals didn't just decide to harden, the oil doesn't boil all by itself, nor does the coupler decide it's time for a melt down. Conversely, a lack of oil will always result in discolored (blue and black) gears, worn out teeth and metal shavings. Gears don't "fail." They merely burn up from lack of oil. Defective or worn gears don't turn blue or black. These extremely hot rotating gears also transfer heat to the front of the rotors, causing them to overheat, expand and seize in the case. Not

much different than an engine that melts down from a lack of oil.

**ROTOR FLEX** - Rev anything high enough to exceed it's design limits and you introduce excessive stress, load and flex. When rotors are revved beyond the manufacturers safe rpm, they can flex - enough to contact the case and seize the rotors. This condition is evidenced by end and center rotor contact. Here is a quick summary of the DON'TS.

- DON'T use "Hot Air" Underhood Inlet Kits.
- DON'T overfill the supercharger with oil.
- DON'T exceed 26 psi boost.
- DON'T over rev the supercharger beyond 18000 rpm.
- DON'T de-activate the bypass valve.

<b>NOISE</b>	<b>CAUSE &amp; CURE</b>
<b>Growling</b>	Debris in rotors or slight rotor to case contact. It'll NEVER be a bearing. Rebuild supercharger if case and rotors are useable.
<b>Clacking</b>	Coupler melted. Coupler worn. If clacking at idle, rev engine. If noise goes away, it's rough engine idle from cam or poor tune (see "Supercharger Gear Noise" <a href="http://www.kennebell.net/techinfo/ford-techinfo/Lightning54only/GearNoise.pdf">http://www.kennebell.net/techinfo/ford-techinfo/Lightning54only/GearNoise.pdf</a> ). If supercharger isn't using oil, front seals are O.K. New coupler can be installed with supercharger on car. A melted coupler creates debris that usually damages front seals.
<b>Whistling</b>	Normal air flow through supercharger and inlet tract can make a slight whistling noise. That is normal. The rotors and bearings are silent since there is no rotor to case contact and the bearings ride on oil. Whistling may also be from a vacuum leak.
<b>Gear Whine</b>	Worn gears. Rare unless run low on oil or out of oil. Supercharger must be rebuilt. Gear shavings will damage front seals.
<b>Noise Increase w/ Smaller Pulley</b>	HP/air flow is noisy. Can't be avoided. Smaller pulley - more boost - more HP - greater air flow (noise) - more noise.
<b>Just Noisy</b>	Remove belt and rotate supercharger. If free and quiet, check alternator, water pump, idler pulley etc. Supercharger often gets blamed for other worn engine parts.
<b>Vibration</b>	Supercharger is balanced. Vibration is from engine or drive.

**RUNNING HOT** - It's an air compressor or air tank, even at idle. Compressing air creates heat. It's unavoidable in any supercharger. There is NOTHING else in the supercharger that will make it run "hot" or "hotter" except 1. overfilled oil, 2. excess boost and 3. disabled bypass.

**LEAKING OIL** - An oil leak can only occur between the front cover and billet case. This area is factory sealed. If front cover has been removed, it must be indexed with an alignment tool and resealed.

**USES OIL** - Unless there is a leak in the front cover, the oil can only escape 1. by damaged or worn front seals (won't har the supercharger) or 2. out case or drive vent (old style) or pulley bolt vent (new style).

**BLOWING OIL OUT VENTS OR DRIVE FRONT SEAL LEAKING OR BLOWN OUT** - Racing only. Indicates extreme pressure in front oil cover from high rpm/boost racing and 1. overfilled with oil, 2. drive or front cover vent plugged off (old style) or 3. "catch can" (old style) line is not teed into drive vent line and/or front seals damaged. Install as per Kenne Bell instructions or convert to new vent bolt drive.



### LOWER OIL LEVEL (20-26 PSI)

The recommended oil level (with the dipstick screwed in) covers a wide range from the top mark (maximum) to 3/8" below the bottom mark. For higher boost levels (20-26 psi) lower the oil to 1/4" below bottom mark on dipstick as shown. Air temperature also has an effect on your supercharger oil temp i.e. those "hot air" exposed underhood filters we continually warn about. Remember to CHECK LEVEL FREQUENTLY. 3/8" below bottom mark is MINIMUM oil level. Keep oil in this - 1/4" to -3/8" range with 20-26 psi boost.

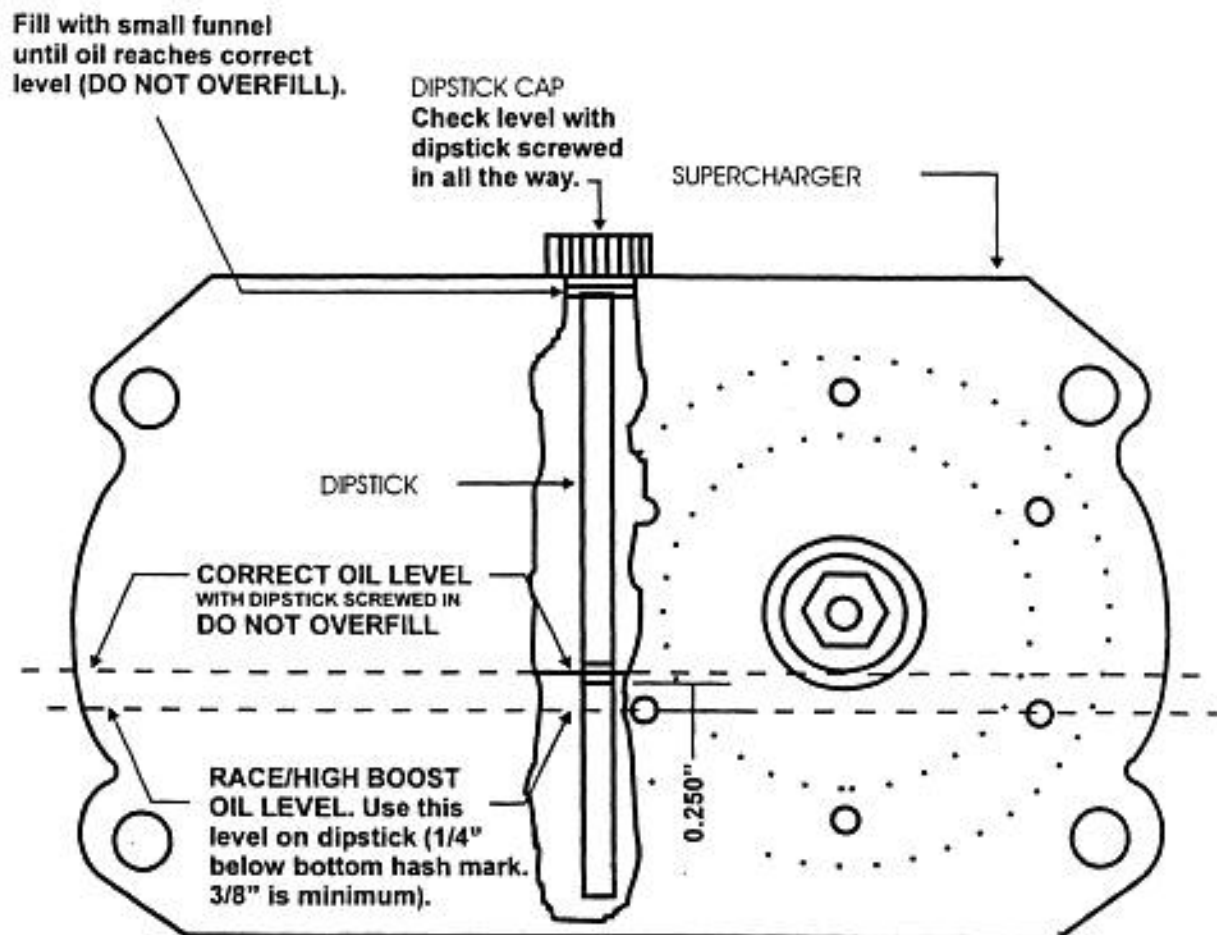
We hope this information will help you to better understand the limitations of your supercharger and avoid any future problems.

#### TECH NOTE:

Higher rpm and boost will increase oil temperature in any supercharger or engine. For competition and especially high boost street applications, dropping the oil level reduces oil turbulence from the gears and lowers oil temperature and internal pressure.

#### OIL LEVEL GUIDE

6-15 PSI	Between 2 marks
16-19 PSI	Between bottom mark and 1/4" below
20-26 PSI	1/4" below bottom mark







# COOL AIR KIT RECOMMENDATIONS

Gen II Lightning, '03-'04 Cobra, '96-'04 GT, '05 up GT, '96-'02 Cobra

## IMPORTANT

To insure maximum engine and supercharger reliability and maximum power, it is very important that your engine consumes ONLY cool air as originally engineered by Ford. The ONLY "Cool Air" Kits recommended for higher HP '03 Cobra's and Gen II Lightning's are as follows: *(for more information, see Tech Info on "Hot Air" Kits on website and in literature included with these kits)*

1. Lightning: JLP (Johnny Lightning Performance) with sealed top. Part# JLP Forced Air Kit-C.
2. '03 Cobra: Kenne Bell Monster 12" Fenderwell Kit. Part# F1009.
3. '96-'04 Mustang GT 2V: Kenne Bell Monster 12". Part# F1016 (80mm meter), F1019 (90mm).
4. '96-'02 Cobra: Kenne Bell Monster 12". Part# F1016.
5. '05 Mustang 3V: Kenne Bell Kit and 90mm included in kit.



# WARNING

## "HOT AIR" UNDERHOOD INLET KITS

### WARRANTY VOID IF THIS SUPERCHARGER IS USED WITH A "HOT AIR" UNDERHOOD INLET SYSTEM

Let's all sit back and take a deep breath of fresh air (cool air). Now, crawl under the hood of your vehicle, lay across the engine, close the hood over you and take a deep breath of all that hot air from the radiator fan (160°-200°), engine (160°-220°) and headers (up to 1000°). Who the hell would do that, you say? Well, when companies sell you a "cool air" kit with an exposed underhood filter that sucks in the same hot 200° air from that heat soaked engine compartment, how do you think your engine likes all that hot power robbing air vs. the OEM factory set up that inhales isolated ambient 70° fenderwell air? Then there's all that hot air the fan blows around. Remember the fan. It sucks hot air in off the hot radiator. Why do you think that for the last 25 years every vehicle manufacturer on the planet avoids hot underhood air and fan wash like the plague and instead draws cool dense air from the fenderwell, cowl or hood scoops?

We're not exactly inexperienced in this technology ourselves. Kenne Bell engineered and has sold thousands of functional Ram Air/Cool Air kits for the Mustang, Cobras, Buick GN's, Sycloons, Dodges etc. They pull in cool air from the fenderwell, under the bumper or out of a hood scoop. In contrast is the cheapie "cool air" kit gang who proceeds to eliminate all those expensive plastic molded hoses and fittings and "sticks" a filter onto the end of a chrome or plastic pipe and calls it a "cool air," "cold air," "chiller," "hi-flo," or ??? kit.

It is, of course, your decision if you choose for your engine to suck in this hot underhood air with one of these over the counter or "custom" kits. However, these things are not good for our superchargers and we not only don't recommend them, we are warning against the use of them. Look at the facts. 10° of hotter air is equivalent to 1 psi of boost. That means the difference between the fenderwell ambient 70° system and the hot underhood air temp can be an amazing 130° (200°-70°=130°) hotter. That 130° equates to about 13 psi of additional boost (13x10°=130°). So, you thought your engine was only seeing the increased temperature of 100° from 10 psi boost (10x10°=100°). Wrong. It's 100°+130° or 230° plus the ambient. That's the air temp of 23 psi boost! Surprised? Are you getting the picture yet?

The Kenne Bell supercharger - or any supercharger - doesn't like another 130° of air temp that is the fault of someone else's product. Neither does your engine. As the old saying goes, "Don't make your problem my problem." Don't make those "cool air" kit problems Kenne Bell problems. We've had our fill of these things. Lose those lame excuses for an inlet system. Our warranty is void if using one - and we can tell if you did. We apologize for our frank unwavering approach, but the many warnings throughout our literature has failed to curb their use with our supercharger kits - and caused Kenne Bell some expensive warranties. Try sending your supercharger repair bill to one of these "hot air" kit manufacturers and tell them their "hot air" system killed your supercharger. Are these underhood filter kits any less liable than: 1. Tires that split or separate, 2. Wires that catch fire, 3. Sand polluted oil, 4. Spark plug tips that fall off. I think not. There's no warning in the products. They are most certainly detrimental to engine performance. If ANYONE disagrees, get a magazine writer and let's do the tests.

#### FILTER FAN SHROUDS

Did you know that a dyno run with the hood open vs. closed with an underhood exposed filter can be 30HP. We ran this test for 2 different magazines. Then there's the fan wash. Those who believe that "shrouds" actually solve the temperature problem must also believe in the tooth fairy. Shrouds may help the mass air meter signal from being distorted and skewing the fuel delivery to your engine, but in no way do these metal shields magically dissipate that hot underhood air. The hot air then enters the filter from the other side of the shroud.

#### HEADLIGHT KITS

Finally, there's the removed headlight with the filter behind it (in the hot engine compartment, of course). This is just another "hot air" system. It remains underhood and blasted by hot fan air. At best, it's a hot air - cool air mixer at high vehicle speed as it does not - and cannot - pull in only cool air. Every engineer in the universe clearly understands the disadvantages of hot air and therefore designs their inlet systems to ingest cool dense air from the fenderwell, cowl or hood. This is not rocket science. JUST SUPPLY YOUR SUPERCHARGER WITH COOL AIR 100% OF THE TIME. All Kenne Bell supercharger kits connect to the stock cool air inlet system. We may also upgrade and/or offer an optional system for higher HP applications. We even offer some "all out" 5" racing systems. And we are not condemning cool air kit products that are designed to use cool air. Many of them are functional and may be used with our kits.

#### THE TWIN SCREW SUPERCHARGER

The Kenne Bell Twin Screw Supercharger is essentially an air compressor and an air tank combined. That is why it is so potent and capable of generating full instant boost at the flick of the throttle at any engine rpm. It's akin to an air hose (throttle) connected to the air tank (supercharger). The handle (trigger) regulates the air flow (boost) into the engine. Engine rpm has little to do with the boost delivery. Boost is regulated with the gas pedal. A basic law of physics tell us that all air is heated when compressed, regardless of the supercharger or turbocharger type. To lower the superchargers air temperature at idle and cruise, we rely on a bypass valve which "dumps" the hot compressed air in back of the throttle body where it is "decompressed" and the temp is thereby lowered with the help of the cooler incoming ambient air flow through the throttle body. Unfortunately, at idle and cruise, the throttle body is closed or barely open thereby allowing relatively little new cool air flow into the supercharger. So, the last thing on this planet that our supercharger needs is more hot 200° air from those ridiculous, useless, power robbing underhood "hot air" systems. LOSE THEM and use a 4" or 5" hose (depending on HP level) to pull cool air out of the fenderwell just like all the OEM's, racers and the knowledgeable do.

**WARNING: It's an accepted known fact that any engine makes more power on cold air than hot air. Use of this product negatively alters the "cool air" design of the stock OEM inlet system and instead inhales underhood "hot air." This device reduces air density (HP and torque), increases the engines tendency to knock/detonate/ping which can result in lost power and potential engine damage, especially with superchargers or turbos. Not recommended for Kenne Bell supercharger kits. Voids warranty.**

# HOW HOT AIR CAN DAMAGE YOUR SUPERCHARGER & ENGINE

## DOES YOUR SUPERCHARGER & ENGINE HAVE "THE HOTS?"

Overheating your engine or supercharger will damage both. One has pistons - the other uses rotors. Both are aluminum and expand with heat. An '03 Cobra test was recently run on our dyno comparing a fenderwell filter to an open filter with the hood OPEN and a huge fan blowing on it to simulate 90 mph. The temperature difference was a whopping 45° hotter. Oops! An engine's coolant temperature is approximately 160°-200°. That is the temperature deemed "safe" by engineers for over 100 years. Obviously, higher temperatures should be avoided because excess coolant temperature expands the pistons, thereby reducing the piston to bore clearance to a critical "0". The piston then scores and/or seizes in the cylinders. Excessive heat will also cause the rotors to expand and score the supercharger case and/or seize the rotors. Both are typically ruined because of the scoring and metal transfer. Never a pretty sight.

Needless to say, you wouldn't knowingly install some lame product or concept that increases your engine water temperature 130° to a ridiculously hot 290° to 330° and cause your pistons to seize up and ruin your engine, to say nothing of the power loss from this hot air (1% power loss for every 10°). Also, there's the increased potential for detonation and more engine damage. Oops!

Would you buy some kit that removes your engine fan? How about a "concept" that advises you to drain 50% of the engine coolant - or spark plugs 6 heat ranges too hot? Of course you wouldn't. One would have to be totally and technically incompetent, ignorant or brain dead to offer products or suggestions that destroy your engine - right? Wrong, they do - and these people create big problems for the vehicle manufacturer and Kenne Bell. You would have no legitimate or ethical case for getting your engine warranted by the factory. And you can forget about those companies who sold or recommended those products paying the tab.

Your supercharged engine doesn't like it. So why destroy your Kenne Bell supercharger - and possibly your engine - with 130° hotter air from one of these cheap HOT AIR UNDERHOOD OPEN FILTERS? "Hot Air" kits are akin to "interheaters" (the opposite of intercoolers). Don't do it! Use a SEALED filter set up that pulls cool air from the fenderwell, cowl or hood. No underhood air allowed. No half ass baffles either.

*Note: Our supercharger rotors behave identically to pistons when overheated. The only difference is hotter air instead of hotter water causes the failure. 130° is equivalent to the heat generated by another 13 psi of boost. Oops! Keep in mind that we can easily determine if hot underhood air was the cause of the supercharger failure, just as an OEM can determine if his engine was overheated.*

One more time. Avoid all who sell and promote these things for use with Kenne Bell supercharger kits. They obviously don't know, don't care - or both. These products can destroy your supercharger and/or engine with "the hots." **And they void your warranty.**

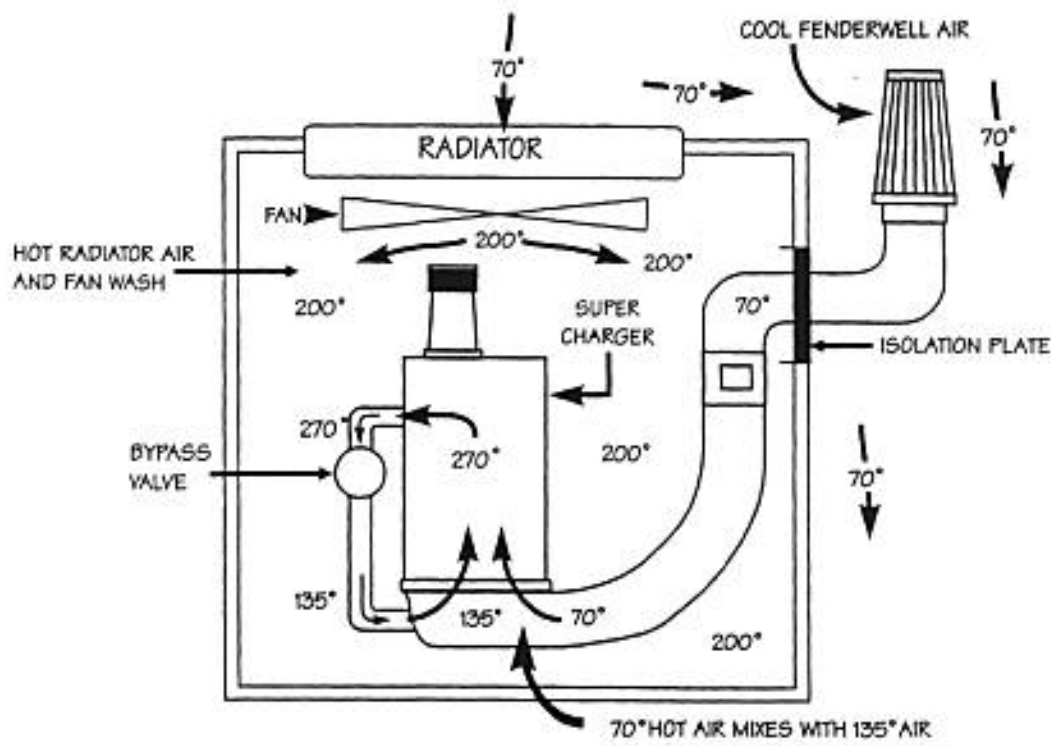
## OPEN HOOD FILTER TEST ('03 Cobra) AIR MIXING & AIR TEMP SENSOR LOCATION

We recently ran a filter temperature comparison on Earl's 700HP 9 second Cobra. The hood was open with a high speed fan blowing cool air into the front of the car. The dyno room temperature remained the same for both the ① fenderwell located cool air filter and ② the hot underhood filter installed on the end of the mass air meter ("hot air" filter) located behind the headlight. However, even with the hood OPEN and the fan blowing air over the top of the filter, temperature was 45° hotter with the filter sucking hot underhood air off the end of the mass air meter. That's the equivalent of approximately 4 psi of boost and a 4% HP loss. Read on.

Did you really believe that a cylindrical filter would magically not suck that bottom hot air from the headers, radiator, etc. and NOT mix it with the "top cool air" at the filter top? Of course, the filter will average the "hot" and "cool" air, but it won't be as cool as the fenderwell air. That is why every OEM manufacturer on the planet avoids hot exposed underhood filter designs. Now, if 10° is equivalent to a 1% drop in HP (that's how you calibrate dynos), doesn't the 45° higher air temp REDUCE HP by 4.5%? Oops!

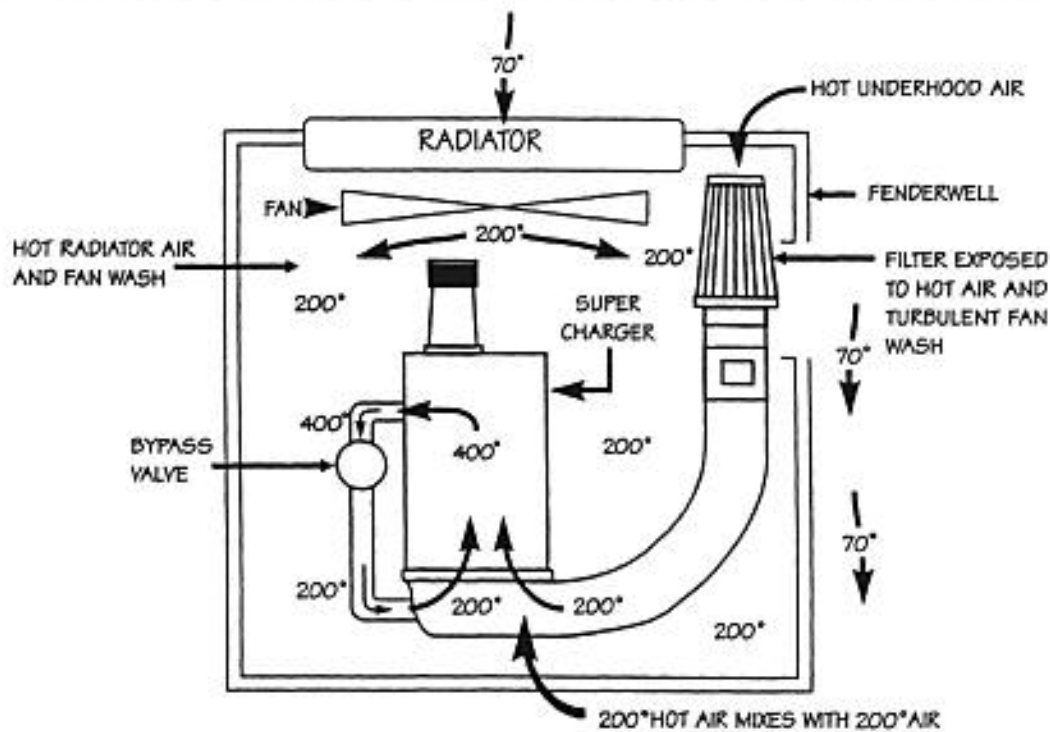
Where does your dyno tuner measure air temp? We've found that the best place to accurately measure air temp is at the entrance of the supercharger. "One of the real dangers in running a test is you are bound to get data." So if you test on a dyno, use the SAE (Society of Automotive Engineers) calibration for the particular weather conditions to insure accuracy, but you must test the RIGHT WAY and use the correct temperature that your engine sees and not the temperature at some random location in the dyno room. The engine is not using the air next to the dyno computer, is it?

It is not our desire to be critical of anyone or their test procedures. We are only pointing out a common variable in dyno testing that we at Kenne Bell have found to effect test accuracy.



## COOL AIR KIT

NOTE: SUPERCHARGER AIR ASSUMED TO BE 200 DEG FROM 20 PSI BOOST (~10 DEG PER POUND OF BOOST) FOR COMPARISON.



## HOT AIR KIT

A 10 DEG RISE IN AIR CHARGE TEMP. RESULTS IN A 1% LOSS IN HP.  
 (example: 50 DEG = 5% = .05 x 300HP = 15HP)  
 THAT'S HOW THE WORLD CALIBRATES DYNOS FOR VARYING AMBIENT TEMPERATURES. SAE IS THE MOST COMMONLY USED CONVERSION.





## What **NOT** to do . . .

At Kenne Bell, we strongly believe the best decisions are only possible when all the facts are made available. We therefore place considerable emphasis on the education and support of Kenne Bell customers which should be obvious by the amount of technical information posted on our website.

There is another Kenne Bell customer obligation that we feel is important - avoiding future problems for our customers by making them aware of WHAT NOT TO DO as would relate to the preventative maintenance, tuning, dyno data, modifications, other products, installation, etc of Kenne Bell Supercharger Kits. As always, our primary goal is satisfied customers.

- Never modify, re-route, re-design or substitute ANYTHING in a Kenne Bell kit without consulting us first. We engineered and calibrated the kit. We know it best.
- Do not limit your information to opinions, theories and bench racing. Also consider information that is derived from actual controlled testing and experience (see "Jim Bell's Supercharged/Turbocharged Performance Guide" at <http://www.kennebell.net/techinfo/general-info/jimbells-supercharged-perf-guide.pdf>).
- Never jump to a decision and assume that the Kenne Bell supercharger is the problem and not one or all of the "other" products - or the installation. Always remember that the supercharger is merely a couple of rotors that increase engine boost at wide open throttle. If the supercharger produces boost, it has done it's job, so look elsewhere.
- Do not assume that your problem is the "chip - or the computer has gone bad" when one can't solve an engine or trans problem. We've only seen 3 defective ECM's in 14 years.
- Never assume other products or product concepts that supposedly "work" are not the problem. The first question our tech people ask when a customer calls about ANY problem is "Tell us what else you have changed - ANYTHING YOU HAVE CHANGED" - and 9 out of 10 times THAT is the problem.
- Do not change, modify or replace any part that doesn't make HP or increase reliability. *"If it ain't broke, don't fix it."*  
*Smokey Yunick*
- Never use a "hot air" exposed underhood filter. See "Warning - Hot Air Underhood Exposed Filters & Kits. How They Can Damage Your Supercharger & Engine" at:  
<http://www.kennebell.net/techinfo/general-info/HotAirWARNING.pdf>).
- Never use mass air meter "adjustors" or "tuners."
- Never relocate or rotate a mass air meter from it's original recommended position.
- Do not replace any mass air meter without totally re-calibrating the transfer function (see "A Note Regarding Aftermarket Mass Air Meters at <http://www.kennebell.net/techinfo/general-info/anote-regarding-massair-meters.pdf>).
- Do not use throttle body or "plenum" spacers. They don't make even 1HP on our kits.
- Never substitute aluminum supercharger pulleys for genuine Kenne Bell steel pulleys. This voids the warranty as they can damage the supercharger. Do not modify Kenne Bell pulleys in any way.
- Do not overfill your Kenne Bell supercharger with oil. It will damage the supercharger.
- Do not believe all those exaggerated or generic "up to 20-50HP" ads. If it isn't a back to back controlled test on your specific vehicle, it's probably misleading. See "Supercharging vs. Conventional Bolt Ons" at:  
<http://www.kennebell.net/techinfo/general-info/supercharging-vs-conventional.pdf>
- Do not add up all those "up to's" and assume their accumulative total will be accurate. It rarely, if ever, is.



- Do not believe that all engines are different so you must "custom tune" or "re-tune" your Kenne Bell kit.
- Do not port your supercharger. We have hundreds of hours of testing. If it would increase HP, we would have done it.
- Don't be duped into believing there is a "3rd dimension" of performance tuning. ONLY 1.) air fuel ratio and 2.) ignition timing can increase HP. The rest is BS! We know what the ideal settings are and we are totally in tune with all our kit calibrations (see "Do I need my Kenne Bell Supercharger Kit Re-Tuned?" at [http://www.kennebell.net/techinfo/general-info/Supercharger\\_ReTuned.pdf](http://www.kennebell.net/techinfo/general-info/Supercharger_ReTuned.pdf)).
- Don't necessarily believe that "seeing is believing" with a dyno test. There are many variables to consider.
- Do not believe that air fuel ratio and tweaking ignition timing is all there is to a calibration. They are the two that make HP. There is also DRIVEABILITY (see "Dyno Testing Variables and Air Fuel Ratio Readings - The Pitfalls & Problems" at <http://www.kennebell.net/techinfo/general-info/DynoTestVariables.pdf>).
- Do not attempt to analyze any engine or transmission issue without a scan tool. That's what they are for.
- NEVER - NEVER attempt to "tune" or "fix" a vacuum leak, defective sensor, worn out component, "other product" problem etc. with a "re-calibration" or "new tune." You are wasting your money. It is impossible to repair a failed sensor or alternator with a "custom tune."  
*NOTE: THE NUMBER ONE DRIVEABILITY PROBLEM WITH ANY NEW VEHICLE IS VACUUM LEAKS.*
- Do not use chemical sprays to detect the most common problem - vacuum leaks. USE A SMOKE DETECTOR like the real pros use.
- If dyno tuning your vehicle, NEVER rely on ANY "cheapie wide band" air fuel ratio device (dyno or stand alone) that cannot be calibrated before being used on your vehicle (see "Do I Need My Kenne Bell Supercharger Kit Re-Tuned?" at [http://www.kennebell.net/techinfo/general-info/Supercharger\\_ReTuned.pdf](http://www.kennebell.net/techinfo/general-info/Supercharger_ReTuned.pdf)).
- NEVER rely on the accuracy of ANY tail pipe sniffer style air fuel ratio devices to tune your car (see "Dyno Testing Variables and Air Fuel Ratio Readings - The Pitfalls & Problems" at <http://www.kennebell.net/techinfo/general-info/DynoTestVariables.pdf>).
- NEVER assume that the AF ratio measured on a dyno - even with an OEM quality device - is the same as it will be on the street. IT WILL NOT BE.
- NEVER assume the Kenne Bell Supercharger Kit calibration is wrong because some dyno's \$38 cheapie un-calibratable "wide band" sensor doesn't agree with the Kenne Bell stated calibration. The most commonly used dyno "wide band" O<sub>2</sub> sensor is the \$38 production Volkswagen Jetta made by Bosch. WE USE AN OEM QUALITY AIR FUEL MEASURING SYSTEM just like Ford, GM, Chrysler etc. This is currently our customers number one problem. And if anyone is getting tired of hearing us complain about inaccurate dyno AF sensors, then go ahead and get your car dynoed, and then YOU can wonder whether the sensor tuned YOUR car to a pig rich or dangerously lean AF ratio. Not a good feeling, is it? (see "Dyno Testing Variables and Air Fuel Ratio Readings - The Pitfalls & Problems" at <http://www.kennebell.net/techinfo/general-info/DynoTestVariables.pdf>).
- Do not allow custom tuners to alter the rpm shift points or top speed and rpm limiters in the Kenne Bell supercharger kit calibration. This can over rev and damage your engine and/or supercharger. Again, Kenne Bell should be the best judge of what is good or bad for our supercharger kits (see "Do I need my Kenne Bell Supercharger Kit Re-Tuned?" at [http://www.kennebell.net/techinfo/general-info/Supercharger\\_ReTuned.pdf](http://www.kennebell.net/techinfo/general-info/Supercharger_ReTuned.pdf)).
- Do not increase the boost of a Kenne Bell kit unless it is recommended by us! If there are special circumstances, such as using racing fuel, give us a call for specific requirements for pulley, belt, fuel, ignition etc.
- Do not let yourself be talked into a "re-calibration" if your engine pings. If it didn't ping before, it shouldn't ping now - unless there is a vacuum leak or some engine part or sensor has experienced a routine failure. So fix it. Why would you want to pay someone to screw with a tune that works only to fix a part that doesn't? Doesn't it make more sense to instead find and fix the defective part? And when you do fix the defective part, you'll have to re-tune the car to the new part(s).

- Do not tap into wires, particularly sensor or ignition related wires, without prior knowledge of the consequences.
- Do not use complex CD ignition systems that require dozens of wires and many hours of labor to install when a simple easy to install one wire voltage modifier/regulator system, like the Kenne Bell BOOST-A-SPARK™, will do a better job. Wire connections can create serious problems.
- Never replace or upgrade fuel pumps in lieu of the Kenne Bell BOOST-A-PUMP™ supplied in our kits (see "Fuel Pump Figuring" at <http://www.kennebell.net/media/articles/FUELPUMP.pdf>).
- Do not believe that "bigger injectors make more power." Wrong. Power only increases if the engine is lacking fuel. A 36, 42 and 60 will all make 500HP.

## SUMMARY

Kenne Bell is a hi-tech company rich in engineering heritage, supercharger experience and all phases of high performance products and tuning. Above all, we believe that we know our supercharger kits, their tuning limitations and the related product applications better than anyone else.

At Kenne Bell, we engineer and in-house calibrate supercharger kits for specific vehicle applications and fuel octane. Our objective is perfection in design and trouble free operation. Therefore, we cannot - and will not - endorse or encourage tuners or other suppliers to modify or "improve" in any way, the unique and complex calibration of a kit that they are not totally familiar with. Therefore, our position is to recommend against our customers allowing anyone to modify or tweak a Kenne Bell kit or it's calibration. If our customers do have an issue with our kits, then by all means, give us a call and let's discuss it. We have some of the most experienced and knowledgeable tech people in the business. You will save a lot of time, money and agony by doing so. The exceptions are:

- ❶ **Tuner Kits.** We offer some competition kits that require custom tuning by QUALIFIED and EXPERIENCED tuners. We recognize that these kits are often made up of non Kenne Bell components (meters, injectors, pumps, throttle bodies etc.) that we cannot support without devoting dyno time to get it right - and we do not provide this service.
- ❷ **5.0 Mustang Kits.** Kenne Bell has calibrated thousands of these vehicles, with and without superchargers. Unfortunately, the chips are now outdated and there are now far too many variations and combinations for us to support. For example: We have over 6000 calibrations for the '86-'94 Mustangs alone.



## **KENNE BELL MINIMUM SUGGESTIONS and GUIDELINES FOR RUNNING YOUR CAR / TRUCK ON THE DYNO V 1.05**

If you are planning on having your car/truck dynoed, and you wish to report the results to us, follow the guidelines below to insure optimum power measurements when dyno testing (there are other conditions, but these are the basic minimum recommended guidelines):

*Be sure to check to make sure you have the latest version of this document. This one is dated 10/14/05. Discard any prior to this date (or if they don't have this little paragraph) and use this one as your guide.*

Be aware while in the SHOOTOUT mode, the traction control will be deactivated (OFF, LIGHT ON), as with all Kenne Bell Shootout calibrations. Also, as we always recommend, NEVER, EVER run in SHOOTOUT mode unless running straight 100 octane fuel or better or engine damage will occur. We recommend hiding the switch so only you know where it is located to prevent someone else from inadvertently changing it to Shootout mode without your knowledge.

NOTE: Kenne Bell will only consider reviewing DynoJet Dynamometer horsepower and torque readings, as some other dynos have been proven to be inaccurate. We do not make use of DynoJet air/fuel data unless the data is taken from an ECM or Horiba instrument. Even if using the ECM or Horiba, please, no "tailpipe sniffer" air/fuel readings. They also can be very inaccurate, unless exact lab procedures are followed. If you would like more proof of air/fuel discrepancies, please check with Dave Darge at Powertrain Electronics at (805) 466-5252, and / or Jerry Wroblewski at SCT at (407) 774-2447.

### **GENERAL**

INSURE THE DYNO IS SET TO READ S.A.E. ONLY. MEASUREMENTS WILL BE DIFFERENT WHEN CORRECTING FOR OTHER "STANDARDS".

INSURE DYNO ATMOSPHERIC CONDITION SENSORS ARE READING CORRECTLY AND THE PROPER ELEVATION FOR THE LOCATION OF THE DYNO IS CORRECT.

INSURE TIRE PRESSURES ARE CORRECT - LOW PRESSURE = LOW HP READINGS

TEMPERATURE PLAYS A VERY IMPORTANT ROLE IN THE OUTCOME OF HP AND TQ READINGS! MAKE SURE THE RADIATOR, INTERCOOLER HEAT EXCHANGER AND SUPERCHARGER INLET SYSTEM ARE VENTILATED PROPERLY WITH LARGE CFM HI-SPEED FANS (do not blow directly into open filter).

### **SWITCH CHIP POWER MODE**

MAKE SURE THE TANK IS OVER 1/4 FULL WITH PURE 91 OCTANE OR BETTER.

SHUT OFF THE TRACTION CONTROL SWITCH PRIOR TO ANY DYNO RUN.

IF YOU WISH TO OBTAIN THE BEST HP AND TQ VALUES, RUN THE VEHICLE WHEN AS COLD AS POSSIBLE (however, make sure the car has run at least 3 minutes from a cold start prior to making the first run so it does not run in the wrong "cold fuel mode table" - air/fuel readings will indicate rich in this mode). AGAIN, TEMPERATURE AFFECTS THE HORSEPOWER AND TORQUE OUTPUT - AS TEMPERATURE INCREASES, HP AND TQ DECREASES AUTOMATICALLY (IN THE KB CHIP) TO PROTECT THE ENGINE AND CONTROL KNOCK.

RUN THE VEHICLE IN THE TRANSMISSION GEAR THAT IS A 1:1 RATIO (THIS IS ALMOST ALWAYS 3<sup>RD</sup> GEAR IN AN AUTOMATIC AND 4<sup>TH</sup> GEAR IN A STICK CAR).

### **SWITCH CHIP SHOOTOUT MODE**

DRAIN OUT ANY FUEL WITH AN OCTANE OF LESS THAN 100. MAKE SURE THE TANK IS OVER 1/4 FULL WITH PURE 100 OCTANE OR BETTER.

THE TRACTION CONTROL SWITCH (if applicable) SHOULD NOT HAVE TO BE MANUALLY SHUT OFF PRIOR TO ANY DYNO RUN, AS THE KB CHIP KEEPS THIS OFF WHILE IN SHOOTOUT. THE T/C LIGHT SHOULD ALWAYS REMAIN ON (deactivated), EVEN IF PRESSED TO RESET OR RESTARTING THE ENGINE.

ALTHOUGH TEMPERATURE WILL ALSO AFFECT THE SHOOTOUT HP AND TQ OUTPUT, THERE WILL BE LESS EFFECTIVE REDUCTION IN POWER - THIS POSITION WILL ALLOW FULL SPARK TIMING UNTIL REACHING HIGHER ENGINE OPERATING TEMPERATURES.

### **SUGGESTED DATA TO BE RECORDED DURING DYNO RUNS**

WE RECOMMEND OBTAINING THE MINIMUM DATA PARAMETERS (REQUIRES SCAN TOOL OR AUTOTAP) FOR EACH RUN:

*RPM, LOAD, LOOP (OPEN/CLOSED), MAF (A/D COUNTS OR VOLTS, NOT grams/second, or lbs/minute, or kilograms/second, or anything else.... just A/D COUNTS, OR VOLTS), INLET AIR TEMPERATURE (IAT), ENGINE COOLANT TEMPERATURE (ECT), TOTAL SPARK ADVANCE, THROTTLE POSITION. OF COURSE BOOST AND FUEL PRESSURE IS HANDY IF YOU CAN GET IT. AT THE VERY LEAST - CHECK BOOST AND FUEL PRESSURE.*

**IT DOES NO GOOD TO LOG 4 MILLION OTHER PARAMETERS THAT MEAN NOTHING - ALL THIS WILL DO IS SLOW THE SAMPLE RATE DOWN AND SKEW THE LOGGING, JUST GET THE ONES ABOVE IF YOU ARE GOING TO WANT US TO LOOK AT IT. THANK YOU.**

Again, these are the minimum recommended guidelines for obtaining useful dyno horsepower and torque readings. Follow all other safety guidelines as instructed by your dyno operator.

Good luck with your tests!

Let us know how everything comes out. If you decide to contact us with your results, please make sure the dyno operator gives you the ACTUAL run files from the Dyno Jet, so you can email them to us. If the dyno operator is reluctant to do this, then we recommend finding another dyno shop that will give you the files.

Regards,

Kenne Bell





## "DO I NEED MY KENNE BELL SUPERCHARGER KIT RE-TUNED?"

There's a lot of discussion going around about what to do regarding tuning your vehicle with the Kenne Bell supercharger kit, particularly when already furnished with a Kenne Bell factory calibrated chip or program. Many are suggesting that you go and have the vehicle "dyno tuned," or get a tune from some chip supplier or manufacturer other than Kenne Bell. After reviewing numerous negative customer experiences about this approach to tuning, we decided it was time to respond. Kenne Bell belongs to and actively participates in quite a few performance enthusiast forums. We determined from most of the forums we visit, they could generally be summed up into five basic categories or "rules":

- 1) There is a massive amount of great information to be had and it is a fantastic way to "mass communicate" and pass along experiences. Sifting through it all to find the right answers is the hard part, as we're sure most would agree.
- 2) There appear to be a whole lot more people trying to get real facts than those qualified to give them.
- 3) There appear to be a whole lot of people swayed into believing opinions instead of facts.
- 4) Many "opinions" and "advice" are offered by Vendors - companies who have a biased agenda and priorities of their own. In other words, they are primarily interested in selling you their products or services. So, should they be allowed to comment freely about their competition or their competitors products without a response from us? We think not.
- 5) Too often replies to posts are filled with negative comments, many are left open to misinterpretation as "flames, insults, or just plain bs". Others are blatantly rude, crude and uncouth and should never be allowed on any forum anywhere.

We're not out to change the way the world or how the internet works, but we certainly believe we're the most qualified to give the real facts when it comes to our products. You won't very often find us commenting on anything but Kenne Bell products or the effect that other products or services may have in conjunction with the use of our products, good and bad.

At the risk of sounding "cliche", no one is an expert at everything, and everyone makes mistakes. What we are expert at is supercharging and tuning, particularly Kenne Bell kits that were designed and tuned by Kenne Bell. Our expertise is based on many years of real world experience backed up by thousands of actual test results (Kenne Bell refers often to these as "facts" until proven otherwise). If asked about subjects "outside our area of expertise", we say we do not know, and are reluctant to offer opinions if they cannot be backed up by facts. Kenne Bell makes mistakes too once in a while, but "It's what you do about your mistakes that count" to quote Jim Bell.

Many are being misled by posts suggesting you must have your Kenne Bell Supercharger kit "re-tuned" because the same tune can't possibly be used on the more than one vehicle (same engine, trans, supercharger), or that the "local tuner" can get more power out of their kit than Kenne Bell can. This is simply untrue and something we take issue with.

There is much discussion on the internet about tuning and how no two tunes can possibly be the same even though the vehicles they speak of have identical powertrains. The general word out is each vehicle must be tuned individually to extract every last bit of power. There are many "tuners" jumping right on in to milk this cash cow, however, we'd like to give another perspective on the subject.

When GM, Ford, Daimler-Chrysler, etc.. turn out groups of vehicles off their assembly lines with the same powertrains (engine family, transmissions, axle ratios, GVW, etc.), you can be assured of one thing: they are all programmed EXACTLY the same, because they are the same. Literally thousands roll off the line like this on a daily basis. This is not only because all the vehicles of the same type (engine family) can and should be programmed alike, but because they must be programmed alike. All vehicle manufacturers must do this because it is mandated by Federal law (EPA) so they can get their emissions certifications. If the OEMs make any gear or transmission changes, they have to notify CARB and re-certify their calibrations. And if the HP and/or tunes did vary, then how could the OEM ever rate their engines? Think about it. A 260HP Ford GT engine varies between 240 and 280HP?

To even suggest the same tunes can't be used on two vehicles with the same powertrain would be exactly like saying the same intake manifolds cannot be used or water pumps, or transmissions, etc.... this is what "assembly line manufacturing" is all about. So the very same parts; upholstery, tires, paint colors, and yes, even calibrations can and are being used on more than one vehicle.

The fact that people are all individuals and like to accessorize their vehicles differently to distinguish themselves from the "crowd" would be a correct statement, and one we agree with. Kenne Bell also totally agrees that people have different driving habits. What we do not agree with is that one vehicle is so different from one next door of same make, model, year, powertrain etc. they must be individually "tuned to get the most out of them", even if the two have been slightly "performance modified" from each other. This is a myth, a farce and quite often a "pitch". It takes a substantial horsepower modification like a supercharger, turbo, nitrous, stroking the engine, high compression pistons and/or heads for example before a new tune need even be considered. Your vehicle's mass air flow sensor (if equipped) takes care of a number of variations in horsepower from installing things like filters, mild cams and

headwork, headers, and exhaust systems. The mass air meter "corrects" and adds additional fuel if the mass flow increases (hp increase). It is designed to do this. The vehicle's computer does not require another "tune" when bolting on anything as simple as a cat-back exhaust system! Since many performance bolt-ons amount to very little, if any gains at all (we're using test results here), your MAF meter will easily handle it. Just don't install an aftermarket mass air meter if your vehicle is supercharged (more on this later)! For speed density applications, the MAP sensor also compensates for slight hp adders and will not require re-tuning.

Contrary to popular belief, *"The advertised hp of each add-on will virtually never equal the sum of them all"*.

### **THE EXCEPTION**

So far, it appears we have been negative about re-tuners, and justifiably so. We've seen plenty of bogus dyno runs, blocks under gas pedals, wrong AF ratio info and skewed tests. See Kenne Bell's list of "Variables in Dyno Testing" at the following link: <http://www.kennebell.net/techinfo/techinfo-general.htm>

However, there are legitimate reputable tuners who perform an invaluable service. We keep a current list of references. For example: Kenne Bell offers special "tuner kits" wherein we leave all the tuning to them. These kits are basically racing applications that require custom tunes to bring together various components by other vendors such as injectors, mass air meters, inlet systems, fuel systems, modified O<sub>2</sub> and other sensors, exhaust, headers (leaks are always a tuning issue), etc., etc. There are simply far too many combinations of untested products and variables for Kenne Bell to test, evaluate, offer specific tunes for - and then support via the phone or internet. It's just not feasible.

Again, these are complex selectively pieced together systems that our supercharger is only one part of. That doesn't mean that these custom kits are not powerful great performers.

Finally, some supercharger companies choose to not develop or even be involved in the complex arena of tuning and therefore do not offer chips (tunes) for their kits, even though the kits/application requires custom tuning. An example is the '03-'04 kits that cover a range of 400-700RWHp. Kenne Bell offers tested and proven chips/calibrations for 42, 55 and 60 lb injectors with the stock 90mm and new 2400kg meters and 4" cool air kits. We've sold hundreds with virtually zero reported problems.

### **THINK ABOUT IT**

Many suggest you go and have your vehicle "dyno tuned", or get a tune from someone other than Kenne Bell. This does not make a lot of sense to us since we supply tunes with virtually every kit we sell (GM, Ford, DC, etc). All our tunes are performed in-house; optimized for power and emissions (our kits must be 50 state legal in order to sell them in the state of California). Would it be fair to say that with 94 octane, there is a potential of making about 20 more horsepower than with 91 octane? Yes. Did we tune for 91 octane? Yes. Do you need to go to a tuner to extract another 20 hp from your Kenne Bell kit when you can get 94 octane all the time? *No, absolutely not.* There's a heck of a lot cheaper way to make 20 more hp than paying for a re-tune. More boost! A simple pulley change! 2 minutes and \$75 (\$49 for the pulley, \$25 for the special wrench to change it with). It works out to about 1.5 octane per pound of boost over 91. So with 3 more octane, it could be possible to run as much as 7-8 psi boost, instead of 5-6. Not only that, a pulley can be changed BACK again in case you run into trouble (2 minutes). What if you have to travel and can't get 94 octane? Are you going to have to go back to your tuner again before your trip for a 91 octane tune (oops, the one you had in the first place from Kenne Bell)?

To say we are heavily involved in the supercharger kit manufacturing business would be an understatement. Our definition of a kit means supplying the customer with everything they need. No going to outside sources for any more parts or work to be done other than possibly installation of the kit itself. We believe there is no other way to offer a supercharger kit. To us, a "kit" is not a true kit unless everything you need is supplied. Virtually every kit we manufacture is supplied with all the tuning included. We even supply special or non-ordinary tools often in many kits if we feel it may burden our customers to obtain them in order to do the installation. Although we do sell "tuner kits" that require some added tuning and/or parts, this is for ultra high HP applications and is the "exception" rather than the "rule."

We've been tuning our own kits for over 13 years since the very beginning when we decided to get into the twin screw supercharger business. We spend a lot of time at it and possess the ability and capability in-house to do anything we want with virtually all ECU's for Ford, GM and Chrysler all the way up to the very latest in technology. We spend a tremendous amount of time on each and every tune to provide the "Best of All Worlds" because 1) we have to make 50 state emissions, and 2) we want to make the vehicle behave as if the supercharger was installed by the factory - cold starts, hot starts, idle quality, and driveability all are of paramount concern to us - and 3) extract every bit of power we can on the available gas at the pump. This is no quick and easy task. This cannot all be done in an hour, a few hours, or even a day on a dyno by a "chip maker". It takes weeks, sometimes months to adjust PCM stock parameters and determine everything that must be altered and refined or remapped in order to provide the best of all worlds in a supercharger tune. We find it quite humorous that anyone could think all this can be accomplished on a dyno in an hour, day or two, or even a week.

To suggest we are the greatest tuners of all time is a misnomer. We rarely if ever offer tuning for stock vehicles. That's "child's play" i.e. advancing spark and/or leaning AF ratio, adjusting rev and speed limiters, shift points, shift firmness or adjustments for gear

and tire size changes. Let the "tuners" do those, and leave the ultra complex task of supercharger tuning and calibration to us. For us to say we are the best at tuning and calibrating our own supercharger kits is correct and serious business to us, so we will defend this to the bitter end.

If anyone wants to re-tune your Kenne Bell supercharger, you may want to ask if they have over 45 years collective experience at it and invested over \$225,000 on a dyno, state-of-the-art scantools and high speed mass storage datalogging and OEM air/fuel monitoring equipment (not just some "wide band" sensor) and just how much time they plan on spending on your "individual tune" (surely they will be starting completely from scratch every time, right)? If they are true "tuners", they will start from scratch each time, otherwise they are just "tweakers" using a copied tune from another tuner or a copied tune from someone else's vehicle using "Joe's tune from the last time". Give them this basic "checklist" and see if they plan on actually testing and recalibrating:

- ACT SPARK
- ECT SPARK
- ECONOMY MODE MAIN SPARK TABLE
- PERFORMANCE MODE MAIN SPARK TABLE
- ETC AIRFLOW CORRECTION
- NORMAL SHIFT MODES
- HOT SHIFT MODES
- PERFORMANCE SHIFT MODES
- SHIFT TORQUE CONTROL
- TV LINE PRESSURE RECALIBRATION - ALL GEARS
- TORQUE REDUCTION TABLES AND FUNCTIONS
- TIP-IN TORQUE CONTROL
- TORQUE CONVERTER LOCKUP / UNLOCK SCHEDULES
- KNOCK RETARD RAMP RATES - UP/DOWN
- KNOCK SENSOR GAIN REMAPPING & CORRECTION
- TIP-IN KNOCK CONTROL
- ADJUSTMENT OF REV LIMITERS FOR DETONATION CONTROL
- INJECTOR FLOW RATE / VOLTAGE COMPENSATION / CRANK FUEL
- P/T AND WOT FUEL MAPPING
- OPEN LOOP vs WOT FUEL CONTROL
- REV AND MPH LIMITERS BY GEAR / ETC
- REMAPPING TO PREVENT "REDUCED POWER MODES"
- MAKE IT LEGAL TO PASS 50 STATE EMISSIONS

These are only a few of a huge list of parameters we adjust (some apply to different manufacturers and others proprietary), but you may want to use it as your "minimum changes check list" for your tuner if considering having it done. As you can see, "total calibrating" involves more than "tweaking" or a power tune (advancing spark and leaning out the fuel). Hopefully, your tuner will make your new calibration both safe and 50 State legal for emissions. You will no longer be able to use a Kenne Bell CARB Exemption Order number for your emissions test because the Kenne Bell kit has been "altered by others" and is no longer approved.

It's a bad idea in order to "get more power" out of the Kenne Bell supercharger for any tuner to attempt to make him/herself look like "they know more than we do" by advancing the timing and / or leaning the engine out. This can easily push the engine into the "red zone" for detonation and engine damage. BTW: surely the tuner realizes that we too know how to advance spark timing and lean the fuel out to gain power? Of course we do - this is the oldest and easiest trick in the book. Just beware of the consequences of doing this. If we could have advanced the spark more and leaned it out more, we would have, but that would not be safe for today's low octanes and winter vs. summer "blended and oxygenated" fuels. If all a tuner plans on doing to your Kenne Bell tune is to go into the Kenne Bell calibration and simply advance WOT timing and lean out WOT AF ratio, then he should tell you so.

There are quite a few things "not to do" when supercharging. We arranged a few things here in a "Question and Answer" format to make it easier to pick out specific responses to common questions you may have. These are real questions from real customer experiences:

**Q: Why after I had my shift points increased by my tuner does my engine ping at the shifts and the engine "lay down"?**

**A:** Of course it does. A truck / SUV engine's VE (Volumetric Efficiency) typically drops off rapidly as rpm increases, causing boost to rise beyond the designed Kenne Bell boost pressure - up to a totally unacceptable and dangerous boost level. That is not good for any engine, intercooled or non-intercooled on pump gas. We recommend leaving our calibrated shift points alone. If your engine "lays down" after a "re-tune", it is because it is pinging (detonating) and the PCM is attempting to reduce the spark because it detects knock from the knock sensor if equipped. This reduces the engine's output by about 4 hp per degree of ignition timing



retard. You lose in this game, not gain.

**Q: What would cause my engine to surge and ping? It didn't ping before. All I changed was to add an aftermarket mass air flow (MAF) meter and cat-back exhaust - I think I need someone to re-tune it. I think it's too lean.**

A: Good question, but..... No! No! If you have the Kenne Bell tune, DO NOT have it "re-tuned". The aftermarket meter is the problem. While these may be fine for use on non-supercharged vehicles, they are NOT fine on ones that are Kenne Bell supercharged. These meters produce a "lower than factory" signal output to the PCM essentially fooling it into thinking the load is less than it really is, so the PCM advances the timing, and in most cases lean the fuel at WOT and part throttle. This can make some power on a non-supercharged vehicle, but will cause pinging on the supercharged one. You DO NOT want to advance timing beyond the Kenne Bell cal with a supercharger - this is BAD. The timing must actually be retarded in some parts of the timing tables and functions. Did you know that even rotating or slightly re-locating a stock MAF can result in major changes in AF ratio - up to 2 full points depending on application.

Regarding the cat-back exhaust, if it makes any hp at all (we know many of you do not want to hear this, but most make very little if any from tests we've performed), then the stock MAF will compensate for any added power that is gained. The mixture will not lean out. Again, that is part of what a factory MAF is for. We aren't dealing with carburetors here, the MAF will compensate for slight hp gains and the motor will not lean out. So, why pay a tuner to do what the stock MAF will already do? Richening the air/fuel ratio is not the answer for the aftermarket MAF or the cat-back exhaust. Remove the aftermarket MAF and your pinging will go away.

**Q: I bought a Kenne Bell kit but didn't use the Kenne Bell calibration (tune). I chose a local tuner to calibrate it. Now the tuner claims there is a problem with the Kenne Bell kit. Boost is 12 psi instead of 6 psi and it pings like crazy. What is wrong with your kit?**

A: The exhaust may be restricted, so the engine can't expel or "exhaust" enough air, so the boost builds up in the engine. Our guess is your tuner did not recalibrate the larger injectors that came in our kit or you installed a stock PCM and tried to run it without the new larger injector calibration in it. This can cause the catalytic converters to melt and plug within less than 5 minutes, because the stock PCM tells the new larger injectors to run way too much pulsewidth (opening time - almost double). Your computer thinks you have the factory small injectors, so the pulsewidth is way too much. Too much fuel flows into the cylinders, is unburned, then exhausted into the cats causing the catalysts to overheat and melt down into blobs inside your exhaust system, plugging it up almost instantaneously. That is a \$1000 bill just for the new cats, plus labor to R&R them. Don't believe the cats are plugged? Check the back pressure right before them. Normal back pressure under boost here is about the same as the 6 psi boost the kit develops. Instead of 6 psi, it will be double that, even as high as 30 psi. We've seen this happen more than once.

**Q: My tuner installed an underhood K&N filter, now my engine pings. He thinks the supercharger has gone bad. What do you think?**

A: Don't think "the supercharger went bad" at exactly the same time he installed the K&N open element filter under the hood. Your underhood temperatures can exceed 200° F. Compare that to your Kenne Bell filter that is pulling in all that cool 70° outside air. The 130° difference is the equivalent to the heat generated by an additional 13 psi of boost! Also, every 10° F increase in inlet temperature reduces power 1% or 13% for 130° air. When will some of the aftermarket suppliers of filters ever get this right? Why do you suppose every OEM for about the last 30 years spent all that money on canisters and ductwork to isolate the engine compartment heat from the inlet?

**Q: I'm adding headers, exhaust, cat back, throttle body, and even a larger mass air meter. Do I need a re-tune?**

A: Unfortunately, many owners are duped into believing they will achieve big power gains with these components. They add up all the advertised gains and get scared of the tune because of all the power they assume will be surging through their engine. Let's take the popular '03-'04 Cobra, for example. At Kenne Bell, we test a lot of bolt on products besides our superchargers and our competitions superchargers. We take pride in our tests and sincerely believe we are performing a service to our customers. For example: We state in our '03-'04 Cobra Tech Tips "that we have never seen any big gains with cat back exhaust (claims of 25-35HP) and headers (claims up to 50HP). Our tests indicated the following: Headers 9RWHP, Exhaust 0-10RWHP depending on HP tested at.

**Q: I haven't seen anything here that pertains to me, yet for some reason, my engine is still pinging with your supercharger kit. It did not do this when it was first installed. Has it gone bad?**

A: One thing you can be sure of. The supercharger itself has not "gone bad", nor does it cause pinging by itself. We've been selling supercharger kits since 1991 and have never seen one "go bad" and suddenly start mysteriously making the engine ping. In the simplest of form, the Twin Screw is merely a couple of rotors that spin and pump air. If they quit spinning, you'll know it. Here are a few things to consider and check when an engine pings, and we've never seen an OEM PCM "go bad" or fail. Also, chips rarely, if

ever, "go bad," so let's look at the most common causes of pinging.

- **Vacuum / Inlet Leaks** - this is by far, the most common problem that causes pinging. Loose clamps on inlet hoses, cracked hoses, unsealed inlet mating surfaces or open valve cover breathers can allow unmetered air to enter the engine and lean the air/fuel mixture out. This is the **FIRST** place to check if you experience any pinging.
- **Aftermarket Mass Air Flow Meters** - changes (lowers) signal to PCM than factory to place the PCM code in a lower cell - thereby advancing timing - very bad for a supercharged engine. MAF "Tweakers" fall into this same category - do not use them on our kits!
- **Insufficient Fuel Octane or "Oxygenated" (blended) Winter Fuels** - be sure your "tune" is safe for both types of fuels, because a tune done on summer fuel for the max power will very likely ping in the winter. Never run mid or low-grade fuel in your supercharged vehicle. Always run with the highest octane you can find from reputable service stations. If your vehicle sits for extended periods without driving it, the fuel can actually degrade (lose octane). This will absolutely cause ping and knock.
- **Excess Boost** - never change the pulley that drives your supercharger to a smaller diameter or the crank pulley to a larger diameter than came with the kit. To do so will change the ratio at which the supercharger spins, increasing boost and this will cause the engine to ping. If anyone tells you to do this, then they'll also want to get you to buy a special "tune" with their pulley set-up. Why? Because they will have to retard (less hp - every 1 deg ~ 4 hp) the ignition timing to run more boost, thereby nulling the effect of more boost. Octane is octane folks. It will only support so much boost (hp) without retarding the timing to prevent knock (see, this is a losing proposition for the customer, but not the tuner). Here's an old dyno trick. "I can run 14 psi with the Kenne Bell 9 psi kit and pick up 65HP (5 psi x 13 = 65HP)." The customer gets charged for the magic tune but later determines that the car makes the same HP because the timing was also retarded 16° (16° x 4HP/degrees = 64HP). This tactic reduces power by 64HP - and the retarded timing is now burning up exhaust valves along with your hard earned tune up money.
- **Kenne Bell Calibration was Changed / Altered / Redone** - everyone already knows how we feel about this. Do not do it. Contact us with any PCM related issues.
- **Spark Plugs Left Stock or Replaced with Incorrect Type** - this is a very common mistake. People think their stock plugs will be OK - "They hardly have any miles on them". They are not OK - change them! Go to at least one heat range colder plug. Factory stock spark plugs are designed to run hotter - this is not good when supercharging.
- **Underhood Exposed Air Filters / Clogged Air Filters** - Never run an open, exposed under hood filter (can you say 200 degrees inlet temperature?). Service your Kenne Bell filter regularly - it is washable and can be re-oiled. We include a full 3 page warning about these things in all our instructions.
- **Excessive Engine RPM** - No raising of engine rev limiters that Kenne Bell has lowered for your protection. The engine will ping. More rpm is not always better. Actually, the factory shift points are usually ideal for acceleration - or they would have raised them.
- **Insufficient Fuel Pressure / Clogged Fuel Filter** - Make SURE the fuel pressure regulator (if equipped) has a boost reference. The fuel pressure must go up equally as boost increases or the engine will lean out and ping. Check and replace your fuel filter on a regular scheduled basis. This is a common mistake - people tend to forget fuel filters, then they clog, fuel pressure drops, and the engine leans out. We recommend fuel pressure gauges on all supercharged vehicles.
- **Clogged or Incorrect Fuel Injectors** - Never go with any fuel injectors other than the ones we recommend. Contrary to what many lead you to believe that more fuel equals more horsepower, it is the "ideal" air/fuel ratio that makes the most horsepower. Injectors can also clog with varnish from fuel after many miles (50,000 + miles), especially if the vehicle sits for long periods of time between driving. Also note when a vehicle sits for a long time, the octane can be reduced. This is bad.
- **Wrong Fuel Pump or Non-functional Boost-A-Pump™** - never change your fuel pump unless it's back to the factory pump. That is what the kit was designed for. Don't let someone talk you into some "High Output" pump. It may turn out to flow LESS than the pump you had to begin with and it may surge or create excess noise and heat. Always make sure the Boost-A-Pump™ (if supplied) is functional. Bigger fuel pumps are like bigger injectors - more fuel does not make more horsepower. Only if the horsepower level exceeds what the system can deliver at the correct air/fuel ratio should dictate increasing a pump's size.
- **Excessive Oil in the Combustion Chamber** - incorrect routing of PCV hoses, wrong PCV type or missing PCV will cause excess oil to be drawn into the air/fuel mixture. This will cause detonation / ping / knock as engines don't like burning oil instead of gas. Do not assume the supercharger is doing this. It is normal to see some oil from the PCV in the inlet manifold or supercharger.
- **High Coolant Temperature** - was the thermostat changed to the lower temperature one we recommended or included in the kit? Is the engine running at about 160-180 deg F? Anything higher can cause ping. Make sure this was changed when the kit was installed. The factory gauge is a joke if you are looking at it for the correct temperature. If you are having pinging issues, get a scantool or SCT Raptor (highly recommended) and get the real temperature.

•**Clogged / Restricted Exhaust** - do yourself a favor - before you change to a new "High Dollar High Performance Exhaust System", check the back pressure before the cats, then after the cats between the cats and mufflers. Record the pressures at WOT. An exhaust system cannot suck horsepower out of the engine if there is no exhaust pressure (restriction) to begin with.

**Q: What is the difference between a "Piggy Back System" and "flashing" or reprogramming the stock PCM as Kenne Bell does? (GM Kits)**

A: Just that. We reprogram the code and reflash the PCM just like the GM calibration engineers. There are numerous disadvantages to a "Piggy Back":

1) Any modifications must be made by tricking or fooling the stock PCM. This has to be done by hacking into your sensitive PCM wiring harness and interrupting / shorting / deviating the input and output signals of the PCM. Remember what we said about the aftermarket MAF meters and what happens when you try to "trick" the PCM?

2) Typically, auxiliary injectors are used to spray the additional fuel required into a "dry manifold design" not set-up for this purpose. This is done because imagine if you had to tap into all eight injectors so their signals could also be modified like so many others with the "Piggy Back" computer approach! Unfortunately, spraying fuel into a dry design manifold results in uneven fuel distribution, puddling of fuel in the manifold (bad for emissions) and less desirable performance and mileage. Since some cylinders also end up rich and others lean from this type of system, there is a tendency for the engine to detonate or ping more easily. All GM Kenne Bell kits include 8 new hi flow injectors and add the extra fuel into the ports where it belongs.

3) The "Piggy Back" can't modify the torque management tables so you will feel it "bog" off the line.

4) The "Piggy Back" can't modify the spark tables, only "trick" the PCM into reducing spark

5) The "Piggy Back" can't modify the fuel tables, this must be done via auxiliary injectors.

6) The "Piggy Back" can't modify the knock tables and functions, no extra protection here.

7) The "Piggy Back" can't modify the trans shift points.

8) The "Piggy Back" can't modify the trans shift firmness and shift speed.

9) The "Piggy Back" can't modify the torque converter lockup schedules.

10) The "Piggy Back" can't modify the tire and gear types, or raise limiters.

There's so much the "Piggy Back" can't modify, but you get the idea. Yes, it's true, we've seen where you can buy an extra PCM programmer to go "Piggyback on the Piggyback" so to speak. That sounds a little ridiculous to us but it does give you the ability to get rid of some of the torque management, but what about all the other disadvantages? What about the extra cost? Again, we prefer to recalibrate the stock PCM that operates the vehicle, just like GM does.

**Q: Why doesn't Kenne Bell just let the "Chip Companies" tune their kits for them, like some of the others?**

A: Because we can tune them ourselves. Chip companies don't have a fleet of new supercharged test vehicles at their disposal at all times to further develop calibrations, update, test and troubleshoot potential customer problems. Chip companies don't design supercharger kits. That's what Kenne Bell does.

**Q: Why does Kenne Bell have to request the PCM be returned to them for re-calibration rather than offering a hand held?**

A: Whenever possible, we lock all our calibrations so no tuners can get in and "hack around". If they want to truly "re-tune" a vehicle, let them start from scratch like we do, and make sure it still passes all the emissions standards and provide safe performance and reliability - and paste a disclaimer on it with their phone number so when there are problems or the vehicle is sold this tune doesn't become our problem. While it is somewhat inconvenient to have to send a PCM to us, it is the best way to keep your kit 100% "connected" to Kenne Bell for warranty and support. When our kits are re-tuned by others, it results in way too many problems for us to support.

Another Jim Bell quote: "Re-tunes are like ex-wives. They always return to haunt you."

We've seen cases where simple vacuum leaks or some failed OEM part or header leak, aftermarket MAF or other defective aftermarket product resulted in customers wrongly being talked into re-tuning because there's "obviously something wrong with that Kenne Bell tune". This has happened too often to be left unsaid. Example: The tuner starts from scratch, burns up a set of cats, the engine knocked and melted a piston from excessive boost and rpm and being too lean. He was "gonna tune 'er for high rpm". \$4500 and 3 months later, the customer calls complaining to us about all the money he had to spend to have our calibration "fixed" by his local tuner. We then asked the customer "It's been almost 2 years since you bought the kit from us. You never called us once. Did it run good for the past 1-1/2 years?" "Yes", he replies. Isn't it interesting how a vacuum leak, failed sensor, "another aftermarket product" or trans rebuild, etc.. can end up being the fault of the original Kenne Bell calibration that worked so great for 1-1/2 years? Rest assured calibrations don't "go bad" like milk and meat. Neither do superchargers or ECM's.



These are some of the reasons you may want to stay with your Kenne Bell tune and contact us if you have any issues. We purposely "lock" our calibrations whenever possible so the local tuners can't get in and "tweak" them. Nor, do we want any "chip companies" playing with our calibrations or "re-tuning" our kits. We prefer that they stick to the relatively easy task of working on non-supercharged vehicles, advancing timing, leaning them out, removing speed limiters and raising rev limiters and changing shift points. This pales in comparison to the complex task of engine and transmission calibration for a supercharger kit. Now, if a tuner decides to start from scratch and modify all that is required to accomplish this - GOOD LUCK! Just don't call us.

It has been at our experience if we allow tuners to modify our calcs or kits in any way, it inevitably results in more serious time consuming problems and expense for our customers and us. When those problems arise, it turns into a finger pointing contest as to who's problem it is, all at the customer's expense. In the end, it's only too often perceived as a "Kenne Bell kit problem" and we're the bad guys if we don't analyze and fix it over the phone. Our #1 priority at Kenne Bell is our customers and if we decide locking our tunes is in our best interest, then so be it. We have some excellent Kenne Bell Installers who do a great job of installing our products, so we are not anti-tuner - anti-dyno testing. Again, we are merely pro anti-tampering. As the old saying goes, "If it ain't broke, don't fix it."

"The easiest thing to do is to work on the wrong part of the car".

This is our take on tuners. We've said everything we wanted to say here. We know there will still be some who do not agree, but we're not going to debate it anymore. Let the tuners do anything they want, just leave the Kenne Bell supercharger calibrations to us.





# WARNING

## BYPASS VALVE VACUUM

**10" MINIMUM REQUIRED TO KEEP VALVE OPEN AND PREVENT SUPERCHARGER DAMAGE**

Supercharger Warranty is void with "low vacuum" cams that do not open the bypass valve. The Kenne Bell Kits with bypass valves require these valves be OPEN when not in boost to avoid supercharger damage. This is especially important at high street boost levels during idling and cruising at low speeds when the throttle body is almost or completely closed and little or no fresh cooler air is entering the supercharger to cool it.

### CAMS

The cam manufacturers don't tell you that their "big cams" can destroy your supercharger, but we will. **BEWARE.** The bypass system **MUST** have 10" Hg minimum vacuum to open and close properly. If using a "big" cam with low vacuum (stock cams are 18"-20") and the vacuum is below 10" Hg, use the Kenne Bell **#5" Custom Vacuum Canister** which opens down to 5" Hg. Cost is \$99. Fits all Lightning bypass valves.

### GAUGES

Always be sure the vacuum line to the bypass is "dedicated" and not used to feed gauges, etc. which may have leaks in the lines or fittings. And - many gauges are "off" by 1"-2" Hg so it is best to always visually check your bypass valve for opening.

### VACUUM CANISTER

The **#11" Standard Vacuum Canister** is Kenne Bell's production canister. For applications with low vacuum (11" Hg and lower) cams, use the **#5" Custom Vacuum Canister**. Cost is \$99 extra.

### NOTE:

Vacuum readings with cams are not "steady" and vacillate. Example: Average 10" may vary from 8"-12". To be sure, always check and verify if the bypass is fully open with the engine idling.

### CHECKING VACUUM

CHECK BYPASS VALVE VACUUM AT THE VALVE AND NOT IN THE MANIFOLD. NEVER ASSUME THAT JUST BECAUSE YOUR ENGINE VACUUM IS 16" THAT THE TINY LINE TO THE BOOST VALVE ALSO HAS 16". IT MAY BE 10" OR BELOW BECAUSE THERE IS A PINCHED LINE, BROKEN OR LEAKING LINE, FITTING OR CONNECTION OR A LEAKING GAUGE LINE THAT WAS TAPPED INTO THE BOOST LINE.

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# DYNO TESTING VARIABLES

In the '50's, I would tune my new cars at the Pomona Drag Strip by being first in line when the gates first opened. That way I could beat the crowd, get in the lanes and make back to back runs without delay. The carburetor jets would be all laid out in .001" sizes. I could change jets in a mere 4 minutes and be back in line for another run. Once I got all 4 corners jetted ideally - I would know when I had it right because the 1/4 mile speed wouldn't change or it would drop - I'd turn the distributor 1" at a time with a special "adjustable screw cable" I had designed for testing. Typically, 10HP would vary 1/4 mile trap speed by 1 mph, 5HP would vary .5 mph, etc. In those days, I didn't have an accurate Dynojet dyno or air fuel ratio sensors, but my approach worked - "one change at a time with no other variables." I was able to determine the ideal timing and carb jet size because the testing conditions did not vary. So here we are, 50 years later, still attempting to "tune" or optimize timing and AF ratio, the ONLY two (2) tuning parameters that vary engine HP. Only today, the vehicles are far more complicated and difficult to tune because of an ever increasing number of variables.

Comparing the advertised horsepower claims on high performance products can be both confusing and misleading. At Kenne Bell, we run thousands of dyno tests every year on a variety of vehicles. We are very familiar with all the GM, Ford, Chrysler etc. OEM calibrations and their operation. We know all the games, tricks and variables about making horsepower "numbers."

Let's take a closer look at how and why dyno horsepower claims may vary - knowingly or unknowingly. It is not our intent to question the integrity of tunes. We are only attempting to make our customers aware of the ways HP readings can vary from dyno to dyno, vehicle to vehicle etc. We hope you find it informative and helpful. In the final analysis, we strongly believe that the best way to evaluate a product is to look at the percentage HP and torque gain and where it occurs - and the company's reputation and experience in dyno testing.

Most important in any test is to verify the product comparison is performed under identical conditions on the same vehicle with only 1 change - the product itself. "If you change 2 products or more than one calibration change for a dyno comparison, you've changed too many." Ambient temperature, dyno type, dyno calibration, vehicle gear, IAT temp, ECT temp, torque converter (locked or unlocked), best run vs. worst run, rear end gear ratio, correction factor etc. are but a few of the variables that can affect a dyno reading. Read on.

1. Dyno Type
2. Dyno Calibration
3. Dyno Curve Smoothing
4. Tire Pressure
5. Wheel & Tire Weight
6. Loading
7. Tire Position on Rollers
8. Gear Selection
9. Torque Converter Lock Up
10. Fuel Octane
11. Fuel Octane, Ignition Timing & Boost
12. IAT Sensor
13. ECT
14. Engine Knock
15. Torque Management / Electronic Throttle Control
16. Catalytic Converter
17. Tuning
18. Dynojet Dyno Accuracy
19. Testing 1 Product at a Time
20. Best Run - Worst Run
21. Cold Run vs. Hot Run
22. Transmission & Differential Efficiency
23. Rear End Gears
24. MPH vs. RPM
25. Other Products
26. OEM Variables
27. Hood Open vs. Hood Closed
28. Cool Air & Hot Air Inlet Systems
29. Iced Inlet Systems
30. Iced Intercoolers
31. Underhood "Hot Air" Filter Temp Measurement
32. Inlet Turbulence
33. Determining HP from 1/4 Mile Times
34. Superchargers
35. Dyno Operator Variables
36. Engine vs. Chassis Dynos
37. Con Artists

**1. DYNO TYPE** - The Dynojet inertia rear wheel dyno has been referred to as the "Industry Lie Detector" because of its accuracy and reliability. We purchased the very first Dynojet rack dyno in the West in 1996. The data from other dynos that take into account aerodynamic drag and road load is of no interest whatsoever to us as we cannot compare the data to our dyno or any other Dynojet. Our tests on the same vehicle has shown these dynos to be 25-30HP off. We believe our customers simply want to know how much HP their vehicle puts to the rear wheels. They don't care about factoring in aerodynamics or road load/vehicle weight. We also decline to consider any HP numbers from the old style "friction dynos." These things rely on the friction between relatively small rollers and the vehicle tires to measure HP. The rollers attempt to slow the spinning tires. I'll just say this. In 1960, I dyno tested my 5500lb '59 Buick Invicta on a friction dyno. There were 3 of us sitting on each of those big rear fins trying to load enough weight on the rollers to keep the tires from slipping and get an accurate run - and it was only a 325HP engine. 200HP, 220HP, 190HP - which one should I have used? I never wasted my time chassis dyno testing a vehicle until 1995 when Dynojet demonstrated their big

drum inertia dyno. We've run it, almost on a daily basis, ever since with full confidence in it's output data.

**2. DYNO CALIBRATION** - If the air temp varies by 40° between two runs, for whatever reason, and the dyno is not calibrated for the specific change, the HP will change approximately 4%, or about 1% for every 10°. A dyno must be re-calibrated for any temperature, relative humidity, vapor pressure or barometric pressure change. We use the standard SAE (Society of Automotive Engineers) calibration. It is used by all the OEM's to compensate for varying weather conditions - and it works. Do you really think that the OEM's just sit around and wait for duplicate 70° and 30% days to run a comparative test? The Dynojet also has a "STD" correction factor which is around 3% higher and used by some dyno operators who must show higher than SAE numbers for personal gains. Kenne Bell uses the SAE calibration.

**3. DYNO CURVE SMOOTHING** - The smoothing function "flattens" or "smooths" the peaks on the curve thereby increasing/reducing the HP reading. Peaks originate from the slight jerking motion of the tires on the dyno rollers, surging or torque converter flashing spikes at the shifts. Disregard these spikes. Note: At Kenne Bell, we use the unsmoothed curves as it has proven valuable in our analysis and data collection. For example: An out of balance tire or a slight ignition misfire could show up as spikes that shouldn't be disregarded by smoothing. Smoothing can vary power readings by approximately 10HP.

**4. TIRE PRESSURE** - We once spent hours diagnosing why our 720HP Cobra lost 40HP overnight. The tire pressure in the slicks had dropped from 35-15 psi.

**5. WHEEL & TIRE WEIGHT** - Yes, the reciprocating mass of the rear wheels and tires will affect the dyno numbers. We haven't done extensive testing but we've seen 6HP.

**6. LOADING** - Always load the dyno the same. Tightening the tie down straps excessively affects HP.

**7. TIRE POSITION ON ROLLERS** - Place the tires on the center of the rollers to prevent erroneous HP readings. There's 5HP here.

**8. GEAR SELECTION** - The trans gear ratio that is 1:1 will make the most power as it is the most efficient. For example, a 4 speed manual trans with 1:1 will make more power than 3rd gear. 2nd and 1st gear will make progressively less power. Typically run automatic trans vehicles in 3rd gear and 4 speed cars in 4th gear. All Kenne Bell dyno tests are run that way - unless, of course, you want a dyno run with less power. Try a 3 gear run on the Dynojet and you'll see for yourself. If the HP is identical in all gears, get a new dyno. We've observed 20HP variance between 2nd and 3rd gear or 3rd and 4th gear.

**9. TORQUE CONVERTER LOCK UP** - The difference between the torque converter clutch engaged or locked up is 20-30HP. A "locked" torque converter will typically improve 1/4 mile times by .25 sec and 2.5 mph. At least that's been our experience for the last 20 years. Always compare HP in the same gear with the converter locked or unlocked. Note: Torque converters can't be engaged in low gear. They are typically operated by the vehicles computer so the engagement and/or engagement rpm, speed and gear may be modified. Also trans, engine and rear end fluid temp can affect HP. Allow to stabilize.

**10. FUEL OCTANE** - More boost, leaner mixtures and advanced ignition timing require higher fuel octane to avoid knock/detonation/pinging. Many vehicles utilize their knock sensors to regulate ignition timing. The addition of a supercharger and the change in sound wave frequency also changes the sensitivity of the sensors and can alter ignition timing and HP i.e. 4HP per degree. Therefore, if for any reason, an engine knocks and the knock sensor automatically retards timing, the HP will be less. The solution is to always dyno test with adequate fuel octane and THE SAME IGNITION TIMING. Fuel octane, by itself, will not affect dyno HP i.e. higher octane fuel does not produce more power.

**11. FUEL OCTANE, IGNITION TIMING & BOOST** - Some new vehicle calibrations will adjust ignition timing (and HP output) to the specific fuel octane 87, 89, 91, 92, 93 or 94). Again, 1° of ignition timing is 4HP, 4° = 16HP. Since 1° of timing equates to approx. 1 octane, 87 octane will use 20° whereas 91 octane will use 24°. Excessive boost can also cause the engine to knock and lose power. You'll see the "jerks" on the dyno curve of a Dynojet if unsmoothed. We've seen 10-20HP loss before the pistons went South. It takes 1.5 octane to support 1 psi of boost. Accurate and repeatable dyno tests are not possible if ignition timing varies or the engine knocks. If the engine knocks, reduce the boost and eliminate the timing variables.

**12. IAT SENSOR** - The IAT (intake air temp) sensors job is to monitor the air temperature entering the engine and then adjust the ignition timing power whereas lower temperatures result in advanced timing/more power. 4° of timing change equals 16HP. The IAT sensor may also adjust air fuel ratio. Again, low temps mean richer mixtures and high temps will allow leaner mixtures. There can be up to 15HP between 11 and 12.5 AF ratio. IAT sensor temp may be observed in a factory scan tool, but we never recommend because they are so far behind the actual event. Use the SCT Raptor scanner/software. It's dead accurate. Because air temp is so critical to accurate dyno calibration, it should be obvious that the temperature AT THE AIR FILTER be used and NOT the temp reading by the dyno computer, on a wall etc. This is one of the most common mistakes we see on dyno tests. Kenne Bell measures air temp at the air filter because that is the air the engine breathes. Would you take YOUR temperature in your mouth or in the kitchen? Again, 10° temp variation is around 1% in power. And remember that the vehicles IAT sensor operates INDEPENDENTLY of the dyno room temp.

**13. ECT** - The ECT (engine coolant temp) sensor also adjusts engine timing and fuel based on engine coolant temp so be sure it's the same when comparing runs. Again, a few degrees of timing can be 12HP, 4° = 16HP, 5° = 20HP etc. While on the subject of ignition timing and it's effect on HP, think about this one. The new 3V '05 Mustang 4.6 engine is 8HP per degree! Convinced yet about the importance of stabilizing ignition timing? An accurate comparison test requires both the ACT and ECT readings be identical on both runs. That's the way we do it. We often "lock" or "fix" the voltage to a sensor to totally negate any possibility of AF or timing variations. Note: Supercharged vehicles with air to water intercoolers have other variables (intercooler water temp and before and after intercooler ACT) to consider. Gets a little confusing, doesn't it? Not really? Just be aware of all the variables and verify the readings.

**14. ENGINE KNOCK (DETONATION, PRE-IGNITION)** - As mentioned earlier in FUEL, OCTANE, IGNITION TIMING & BOOST, knock can affect dyno readings because of the knock sensors or heat from detonation. If you lack the equipment to stabilize timing and/or eliminate knock - or you're sneaking up on a tune, it's better and safer to step up to racing fuel and eliminate the variables. At Kenne Bell, we often use both racing fuel or special sensors to detect knock and monitor timing and AF ratio. If we can't eliminate the variables, the test is worthless.

**15. TORQUE MANAGEMENT** - Calibration engineers now use ignition retard to "kill" HP for softer shifts and reducing transmission stresses. Anytime the engineer feels the transmission integrity is challenged, regardless of gear, the engine torque and HP is lowered anywhere from 10-50HP via reduced engine spark timing. How does one know when this is happening on the dyno? Get a scanner and data logger and record it so there is an accurate comparison of ignition timing retard. And never overlook that ETC (electronic throttle control) that modulates the throttle and HP/torque independently of your foot. It's extremely complex but has no problem "killing" HP when you least expect it. Thoroughly understand it before dyno testing.

**16. CATALYTIC CONVERTERS** - First of all, we've never seen a "hi-flow cat" that makes more power so don't bother removing them unless it's a race car. You may just end up with more variables. An excessively rich or lean mixture can ruin or partially damage a converter, create additional restriction and skew a dyno comparison. Check for abnormal back pressure if suspect. Since exhaust temp is largely determined by intake mixture and ignition timing, the engine computer is constantly monitoring these parameters via "cat modeling" which can affect power output up to 20HP. Some change fuel mixture when the key is turned on and off to protect the cat against heat soaking and potential damage.

**17. TUNING** - Let there be no mistake about the following statement: "All else equal, there are 2, and only 2, tuning parameters that affect engine output - ignition timing and air fuel ratio." Contrary to what you've heard from tuners or would like to believe, if both the timing and AF ratio



(approx. 12.5:1) are optimized, there is no other magical or secret 3rd, 4th or 5th dimension to making maximum power. Vary these two and your engine may or may not vary much - or it may vary considerably depending where the baseline timing and AF ratio were. A good tune requires a modern scanner like the SCT Raptor and an ACCURATE, REPEATABLE & CONSISTENT AIR FUEL RATIO DEVICE AND SENSOR. Forget about the OEM scanners. Their slow response to a dyno run isn't even close. Inaccurate AF ratio meters are our number one customer service problem at Kenne Bell. Sorry, but Kenne Bell has had enough of the "cheapie" sensors supplied by the dyno manufacturers. How can one possibly eliminate dyno testing variables if the AF ratio sensor or meter is not accurate? We recommend the more expensive Horiba, ECM or Powertrain Dynamics. Tuning is complex enough without injecting another big variable. You can bet your house on one thing: Ford, GM and Chrysler don't calibrate their vehicles with these low cost dyno sensor systems. No way. We have documented cases where 2 dynos across the street from each other varied a full point - yet the HP was identical. A noted and respected magazine writer brought his car from one dyno to another, and discovered a 1.5 difference in AF ratio. Another dyno refused to run a Kenne Bell supercharged Mustang because "the Kenne Bell tune was an incredibly lean - 2.5 points." Yet another dyno test on the identical car was 2.5 points richer or 11.1. One of the best Ford tuners in the U.S. tuned 6 cars all with the same inaccurate sensor. They, of course, had to be re-tuned. One of Kenne Bell's best Installer/Tuners had been re-tuning cars a full AF ratio point off for a year while assuming it was the Kenne Bell tune that was off. It goes on and on and on.

**18. DYNOJET DYNO ACCURACY** - Kenne Bell is their biggest supporter. We wouldn't rush to blaming the dyno itself for HP variations. Dyno to dyno, Dynojet tests should be quite accurate, within 10HP IF THE DYNO IS CALIBRATED CORRECTLY, THE IDENTICAL "SAE", "STD" OR "UNCORRECTED" CALIBRATION IS USED AND THE ACT READING IS MEASURED AT THE FILTER. Your goal should never be to "compare dynos" but instead, to compare on the same dyno. A respected Primedia magazine conducted extensive tests with the same vehicle on 7 different types of chassis dynos. They varied a whopping 33% in HP from the lowest to the highest.

**19. TESTING 1 PRODUCT AT A TIME** - Some still prefer to test a product - but in conjunction with another product or products (see "Supercharging vs. Conventional Bolt Ons" "Real vs. Advertised Comparisons"). How in the Hell can anyone determine which one made power and which one didn't? Did they both lose power, both make power or did one make power and the other lose power? If so, how much did that one lose and the other one gain? Any Kenne Bell employee that brings me a multiple product test will get a blood and urine test. Accurate dyno testing a single product is difficult enough. This is a variable (multiple product testing) that should be avoided if the true loss or gain of a single product is to be determined. However, if your goal is to make a particular product that doesn't make power look good, just keep adding other products until something makes HP and the claim "one needs the other to perform best."

**20. BEST RUN - WORST RUN** - We suggest making 3 runs to establish accuracy and to verify that there is no "best" or "worst" run variation. Again, remember that 1" of timing or 10° of temperature can make a difference so a "cold" run can't be compared to a "hot run" etc. If the dyno runs are not consistent for 3 runs, then the test is flawed because you'll never know which of the 3 was the right one.

**21. COLD RUN vs. HOT RUN** - The oldest and easiest variable. Run the engine "hot" the first time, let the dyno fan cool it down and then run it "cold." The cold run will typically make more power. If it doesn't, you have another variable to investigate. Be sure to warm up the rear end, trans coolant and engine lubricants before making any meaningful dyno run.

**22. TRANSMISSION & DIFFERENTIAL EFFICIENCY** - Both suffer from a 3-10% mechanical loss. For example: A GM 12 bolt rear is 93% efficient whereas a Ford 9" is 89%. A Ford AODE trans is 93% with converter locked up and 84% unlocked. To determine overall efficiency, multiply the rear end efficiency by the trans efficiency i.e. 93% x 84% = 78% overall driveline efficiency. Also changing from a 3.08 to a 4.30 rear gear set is a 3% reduction in efficiency.

**23. REAR END GEAR** - Higher ratio gears consume more HP than lower numerical gears. Our 4.6 2V Mustang test car once made 652HP with 3.27 gears, an automatic trans and locked up converter. With only a gear change to 3.55's, it lost 10HP. Another example" A 4:10 gear rear end is 93% efficient vs. 91% for a 4:30. Always do comparison dyno testing with the same gears. And yes, a Cobra IRS rear is 3% less efficient than the non IRS (3% x 400HP = 12HP). Get it?

**24. MPH vs. RPM** - Higher numerically ratio gears consume more HP, which is more apparent as vehicle speed increases. The HP loss on any product that has more parasitic loss or restriction (headers, exhaust, inlets, etc.) is directly proportional to rpm and vehicle speed. Just how this is interpreted on the "RPM" or "MPH" graphs requires considerable discussion beyond the scope of this paper.

**25. OTHER PRODUCTS** - Never blame the dyno for a particular part you purchased that didn't increase HP or meet advertised claims. It either did make power or it didn't. The part tested is always the "variable." And don't get duped into believing "Well, it didn't make any power, but this part I sold you likes more timing - or likes to be leaner." That's B.S. Don't blame the dyno or your engine's tune, blame the part. It didn't work as advertised.

**26. OEM VARIABLES** - You can bet your house on this one. The OEM computers rarely "go bad." The conditions, the dyno calibration, the tuner etc. can vary, but we've never seen an OEM Ford, Chrysler or GM computer "fail" or "act up" in 20 years. In fact, we've never seen much variation in production vehicles. They're not "all different" as many would like you to believe.

**27. HOOD OPEN vs. HOOD CLOSED WITH OPEN FILTER** - This one should be self explanatory. We've seen up to 30HP here. If you don't think it's hotter under the hood and all that hot air kills HP, try crawling under the hood and breathing all that nice hot air - like that cheapie underhood exposed aftermarket filter is forced to do. IT FEEDS HOT AIR TO YOUR ENGINE INSTEAD OF THE COLD AIR. Lose it!

**28. COOL AIR & HOT AIR INLET SYSTEMS** - Do you really drive around with your hood open so as to feed cool air to that underhood filter. Isn't the cool air in the fenderwell cooler than hot air from the engine, headers and radiator? These "hot air" underhood filters are a big variable in dyno testing. To avoid this variable, use the air temperature at the entrance of the filter. We've measured up to 200° underhood temps on a 100° day. For more information, read "Hot Air Underhood Inlet Warning."

**29. ICED INLET SYSTEM** - You're only fooling yourself and creating a new variable. Either test with the inlet system iced on every run or leave it as is. And be careful you don't ice down the ACT sensor, or you may also alter the timing and AF ratio.

**30. ICED INTERCOOLER WATER** - This is one variable that you need not be concerned with. Cooler intercooler water does not increase HP.

**31. UNDERHOOD "HOT AIR" FILTER TEMP MEASUREMENT** - If you must use one of these things, then never measure air temp at the top (cool side) of the filter or the bottom (hot side). We've measured a 40° difference from top to bottom on an '03 Cobra with an open hood and a dyno fan. To eliminate this variable, a sensor in back of the filter in the inlet tract is necessary as that's the true air temp the engine "sees."

**32. INLET TURBULENCE** - Turbulent air flow from the engine fan will affect the air flow into an underhood air filter and more importantly, the mass air meter. The turbulent air flow can seriously skew the meter readings and alter the meter readings / air fuel ratio / HP of your engine. Even rotating the meter can affect dyno accuracy. And don't count on one of those "filter shields" to solve the problem. We've seen 30HP variance in runs. Are you getting to like underhood filters yet?

**33. DETERMINING HP FROM 1/4 MILE TIMES** - The Dynojet and the Superflow inertia dynos are extremely accurate in HP

measurement. "My car may be 100HP short of his on a quick dyno run but I'll run 11's all day long at the track just like him." B.S. That is false analogy and a cop out for a car 100HP short on power. There is a definite relationship between rear wheel Dynojet HP and track times (drag strip and oval track). That's why NASCAR checks the cars with a Dynojet. Kenne Bell has been at this game for nearly 40 years. We've compared chassis dynos and engine dynos to chassis dynos. And we've compared all dynos to drag strip times. There is a tangible and easy to calculate relationship. Use one of those Power Speed Calculators - like Kenne Bell and Moroso used to sell - and you'll be amazed at the accuracy. For example: In the 100-120 mph range, 10HP will net you around .1 sec and 1 mph in the 1/4 mile. 100HP will get you approx. 10 sec and 10 mph. As compared to a manual trans, an automatic trans car will typically run .3 sec/3 mph slower with an unlocked converter and only .1 sec/1 mph slower with a locked converter. If using one of these Power Speed Calculators, look ONLY at the 1/4 mile trap speed to compare HP. The ET will vary with driver, traction, gears, tires etc. but the 1/4 mile speed IS a dyno run and can be compared directly to the dyno HP.

**34. SUPERCHARGERS** - The Kenne Bell Twin Screw is manufactured with such precision that it is virtually impossible for it to be responsible for a dyno variation. It either works or it doesn't. If it has a problem, there will be a corresponding noise at WOT indicating there is foreign matter in the rotors.

**35. DYNO OPERATOR VARIABLES** - We've seen and heard it all. Blocks under the gas pedal, riding the brakes, three quarter throttle runs, skewed dyno calibrations, tweaked sensors etc. can make any HP number you want and vary the dyno readings 50, 75, 100, 125HP. If you ever have to question the integrity of a dyno run, request the dyno "hard data" (correction factor, temp, relative humidity, vapor pressure and HP and torque printed numbers) and the SCT Raptor data. This Raptor will print out the timing, commanded AF ratio, ACT, ECT, etc., etc. and other data from the OEM computer in real time. Both sets of data are necessary for a valid analysis and comparison (see attached Minimum Suggestions and Guidelines).

**36. ENGINE vs. CHASSIS DYNOS** - Kenne Bell had done extensive testing comparing the two dyno types. That is a very complicated discussion we'll have to save for another time.

**37. CON ARTISTS** - Most companies have to deal with these people at one time or another. They knowingly jack up or inflate dyno numbers to promote their tune or products. Fortunately, the websites are of some help in identifying these people. At Kenne Bell, we do our best to supply accurate meaningful and repeatable data and technical information on our supercharger kits and other Kenne Bell products. In addition to our HP test data and graphs, we publish complete boost, pulley size, ratios and even 1/4 mile times accompanied by the Kenne Bell "Tech Tips" for the specific vehicles and kits. The following is a short summary of the most important variables to consider when dyno testing.

- ❶ Choose a reputable Dyno Shop.
- ❷ Select a Dynojet that uses an accurate, repeatable air fuel ratio meter. Power Train Electronics (805) 466-5252 is the most popular and competitively priced. We have 3 of them and a Horiba. Horiba and ECM also supply OEM grade air fuel measurement systems.
- ❸ Select a dyno that also uses SCT (Superchips Tuning) (407) 774-2447 software and the SCT Raptor Diagnostic Data Scanner so you can look at the ignition timing, ACT, ECT, etc. throughout the dyno run.
- ❹ In addition to the unsmoothed dyno curves, always request the hard data from each run (AF ratio, calibration correction factor, temp, relative humidity, barometric pressure, vapor pressure and the hard dyno numbers). Then you can at least be comparing apples to apples. See if the dyno operator will give you the actual dyno run files on a disc. If he won't, you should consider going to another dyno.
- ❺ Run the vehicle in 3rd gear if automatic trans and 4th gear for 5 speed manuals.
- ❻ Utilize the same dyno for before and after tests.
- ❼ Make all runs at same temperature with engine, trans and rear end warmed up.
- ❽ Lose any underhood exposed "hot air" filter - where no one else can find it.
- ❾ Finally, do not generate any new unnecessary variables for yourself. In other words, "If it ain't broke, don't fix it." We are not opposed to custom tuning, but if your vehicle has a Kenne Bell Supercharger Kit and a Kenne Bell Calibration, think very hard before getting our tune "modified," "tweaked," "re-tuned," "replaced" etc. You may very well create some new variables in the form of a monster that Kenne Bell cannot fix over the phone. At least check with us first. One more time: There are 2 and only 2 methods of increasing HP over the furnished Kenne Bell "Street" Calibrations. The tuner must 1. advance the timing and/or 2. lean out the AF ratio. There are no secrets. No 3rd dimension to tuning. No magic. Kenne Bell most definitely knows how to 1. advance timing and 2. lean out fuel mixture. It's easy. We've been doing it for 40 years. Kenne Bell clearly states the power gains to be expected by advancing timing and leaning air fuel ratio. Neither Kenne Bell or the OEM calibrations vary on a stock vehicle. Tweaking is not necessary. However, if you are introducing new variables such as injectors and mass air meter or products and combinations from other companies that Kenne Bell does not support, then you must seek out a custom tuner.

This paper was written to help our customers better understand dynos, testing and the variables. We hope it has helped.

## **KENNE BELL MINIMUM SUGGESTIONS and GUIDELINES FOR RUNNING YOUR CAR / TRUCK ON THE DYNO**

If you are planning on having your car/truck dynoed, and you wish to report the results to us, follow the guidelines below to insure optimum power measurements when dyno testing (there are other conditions, but these are the basic minimum recommended guidelines):

*Be sure to check to make sure you have the latest version of this document. This one is dated 08/12/04. Discard any prior to this date (or if they don't have this little paragraph) and use this one as your guide.*

Be aware while in the SHOOTOUT mode, the traction control will be deactivated (OFF, LIGHT ON), as with all Kenne Bell Shootout calibrations. Also, as we always recommend, NEVER, EVER run in SHOOTOUT mode unless running straight 100 octane fuel or better or engine damage will occur. We recommend hiding the switch so only you know where it is located to prevent someone else from inadvertently changing it to Shootout mode without your knowledge.

NOTE: Kenne Bell will only consider reviewing DynoJet Dynamometer horsepower and torque readings, as some other dynos have been proven to be inaccurate. We do not make use of DynoJet air/fuel data unless the data is taken from an ECM or Horiba instrument. Even if



using the ECM or Horiba, please, no "tailpipe sniffer" air/fuel readings. They also can be very inaccurate, unless exact lab procedures are followed.

## **GENERAL**

INSURE THE DYNO IS SET TO READ S.A.E. ONLY. MEASUREMENTS WILL BE DIFFERENT WHEN CORRECTING FOR OTHER "STANDARDS".

INSURE DYNO ATMOSPHERIC CONDITION SENSORS ARE READING CORRECTLY AND THE PROPER ELEVATION FOR THE LOCATION OF THE DYNO IS CORRECT.

INSURE TIRE PRESSURES ARE CORRECT - LOW PRESSURE = LOW HP READINGS

TEMPERATURE PLAYS A VERY IMPORTANT ROLE IN THE OUTCOME OF HP AND TQ READINGS! MAKE SURE THE RADIATOR, INTERCOOLER HEAT EXCHANGER AND SUPERCHARGER INLET SYSTEM ARE VENTILATED PROPERLY WITH LARGE CFM HI-SPEED FANS (do not blow directly into open filter).

SWITCH CHIP POWER MODE

MAKE SURE THE TANK IS OVER 1/4 FULL WITH PURE 91 OCTANE OR BETTER.  
SHUT OFF THE TRACTION CONTROL SWITCH PRIOR TO ANY DYNO RUN.

IF YOU WISH TO OBTAIN THE BEST HP AND TQ VALUES, RUN THE VEHICLE WHEN AS COLD AS POSSIBLE (however, make sure the car has run at least 3 minutes from a cold start prior to making the first run so it does not run in the wrong "cold fuel mode table" - air/fuel readings will indicate rich in this mode). AGAIN, TEMPERATURE AFFECTS THE HORSEPOWER AND TORQUE OUTPUT - AS TEMPERATURE INCREASES, HP AND TQ DECREASES AUTOMATICALLY (IN THE KB CHIP) TO PROTECT THE ENGINE AND CONTROL KNOCK.

RUN THE VEHICLE IN THE TRANSMISSION GEAR THAT IS A 1:1 RATIO (THIS IS ALMOST ALWAYS 3<sup>RD</sup> GEAR IN AN AUTOMATIC AND 4<sup>TH</sup> GEAR IN A STICK CAR).

## **SWITCH CHIP SHOOTOUT MODE**

DRAIN OUT ANY FUEL WITH AN OCTANE OF LESS THAN 100. MAKE SURE THE TANK IS OVER 1/4 FULL WITH PURE 100 OCTANE OR BETTER.

THE TRACTION CONTROL SWITCH (if applicable) SHOULD NOT HAVE TO BE MANUALLY SHUT OFF PRIOR TO ANY DYNO RUN, AS THE KB CHIP KEEPS THIS OFF WHILE IN SHOOTOUT. THE T/C LIGHT SHOULD ALWAYS REMAIN ON (deactivated), EVEN IF PRESSED TO RESET OR RESTARTING THE ENGINE.

ALTHOUGH TEMPERATURE WILL ALSO AFFECT THE SHOOTOUT HP AND TQ OUTPUT, THERE WILL BE LESS EFFECTIVE REDUCTION IN POWER - THIS POSITION WILL ALLOW FULL SPARK TIMING UNTIL REACHING HIGHER ENGINE OPERATING TEMPERATURES.

## **SUGGESTED DATA TO BE RECORDED DURING DYNO RUNS**

WE RECOMMEND OBTAINING THE MINIMUM DATA PARAMETERS (REQUIRES SCAN TOOL OR AUTOTAP) FOR EACH RUN:

*RPM, LOAD, LOOP (OPEN/CLOSED), MAF (A/D COUNTS OR VOLTS, NOT grams/second, or lbs/minute, or kilograms/second, or anything else... just A/D COUNTS, OR VOLTS), INLET AIR TEMPERATURE (IAT), ENGINE COOLANT TEMPERATURE (ECT), TOTAL SPARK ADVANCE, THROTTLE POSITION. FUEL PRESSURE IS HANDY IF YOU CAN GET IT.*

**IT DOES NO GOOD TO LOG 4 MILLION OTHER PARAMETERS THAT MEAN NOTHING - ALL THIS WILL DO IS SLOW THE SAMPLE RATE DOWN AND SKEW THE LOGGING, JUST GET THE ONES ABOVE IF YOU ARE GOING TO WANT US TO LOOK AT IT. THANK YOU.**

Again, these are the minimum recommended guidelines for obtaining useful dyno horsepower and torque readings. Follow all other safety guidelines as instructed by your dyno operator.

Good luck with your tests!

Let us know how everything comes out.

Regards,  
Kenne Bell



# AIR FUEL RATIO READINGS - THE PITFALLS & PROBLEMS

## Recommended reading for anyone planning to dyno test

"You are always better off with no information than bad information"

We have reached the point where the current inaccuracies of dyno and in car AFR readings with "wide band O<sub>2</sub> sensors has created so many problems for us that we are hesitant to even recommend our customers dyno test their cars. This situation must be resolved.

### THE PROBLEMS

The most difficult customer tech problem Kenne Bell is forced to deal with is incorrect "wide band" O<sub>2</sub> air fuel ratio (AFR) readings from dynos that are testing vehicles with Kenne Bell calibrations/chips (supercharged and non supercharged). The readings do not coincide with the Kenne Bell kit or chip calibration data the majority of the time. They are simply WRONG and/or the result of problems unrelated to the supercharger and chip. Subsequently, we are spending too much time convincing our customers it is NOT the Kenne Bell "tune" that is wrong, but instead the wide band O<sub>2</sub> sensor reading. And it's a difficult task because our customers feel they've paid good money for a dyno tune - and their Kenne Bell Supercharger Kit and Chip - only to be informed by the dyno that "according to our dyno, your Kenne Bell tune is a little lean, too lean, dangerously lean, etc. And you'll have to get Kenne Bell to re-program the chip or pay us to do it." WHOA! Take a deep breath and read on. Kenne Bell cannot and will not "re-tune" to any bogus AFR number and burn up a set of expensive catalytic converters or ruin an engine. This is not the solution to the AFR problems.

First of all, Kenne Bell has been tuning cars for a LONG time and we understand exactly what we are doing. We use expensive "industrial" sensors that cost 2-4 times more than those "automotive" sensors used on dynos and in car AFR meters. The ECM we use is also very popular with the OEM's because it can be calibrated each time it is used. How can one know if the sensor is accurate if it can't be calibrated or checked prior to a dyno run - or if it can't be compared to an accurate sensor reading?

### TEST SENSOR LOCATION (Bung vs. Tailpipe)

Then there's the rear tailpipe sniffers. Does anyone really believe that there is no delay in AFR signal with the sensor in the tailpipe end vs. the header pipe. So are your AFR readings 1000 rpm late? If there's 2 sensors (before and after the cat), we suggest removing the stock O<sub>2</sub> and installing the new sensor - or installing a new bung if it's an earlier model vehicle.

### HOW TO SOLVE THE PROBLEM

When we have a customer who doesn't accept our explanation, we recommend that he check his car on another dyno just to prove the readings are erroneous. Inevitably, when compared, HP is typically the same, but the AFR is 1, 2, 3 or 4 points leaner. Same dyno type, the AFR ratio varies from 15.1 to 11.0 - BUT THE HP IS THE SAME? 36% less fuel and no HP drop. No way. What does that tell you? AFR cannot vary even 1 point (12 to 11) and not change HP. In many cases the AFR is 11.1, just as Kenne Bell had calibrated it. SCT (Super Chips Tuning) tuners have had some horrible experiences tuning scores of vehicles to a "bad" dyno AFR reading. After their customer determines the car is too rich, it must then be re-tuned with an accurate AFR set up. The exhaust is black and the scanner reads rich, so it's rich. The traveling SCT company tuners now carry their own new "fresh" sensor. That's how they solve the problem. Our customers tell us that the sensor furnished with the Dynojet Dyno is approx. .5 ratio off from the OEM quality ECM or Horiba counterparts. A dependable .5 ratio variation isn't that serious a problem because it can be deducted - if, of course, one believes our data. We won't get into the many specific examples that we've documented, but there has been far too many reports where "the car is so lean we're afraid to run it." Our customer panics. However, when the vehicle is re-tested with an ECM or Horiba or a Dynojet with a fresh sensor installed, it checks O.K. At 11.1 or 11.5. The question that really bothers us is when the customer compares 2 dynos and then asks Kenne Bell which one is right, the 14.1 or 13.1. NEITHER! They are both wrong - it's 11.1.

### THEY ARE DIFFERENT BUT THEY'RE THE SAME

Sorry, but all Ford factory and Kenne Bell calibrations for a specific OEM vehicle or a Kenne Bell Kit are IDENTICAL. Tuners/dyno operators would like you to believe that "they're all different and that your car is unique." That's B.S. And a come on for someone who wants to take your money. On top of that they tune your car to an incorrect AFR? Do the cars vary or is it the AFR readings that vary? In all fairness to dyno operators, many aren't even aware that their sensors are providing faulty readings. Dynojet has assured us that they are working with their customers on an improved maintenance program.

### FUEL SUPPLY FUNDAMENTALS

Let's discuss the 3 fundamentals of fuel delivery - ① fuel injector/nozzle size, ② fuel pressure and ③ injector dwell. Dwell or pulse width is how long the injector is "open" or "on", which is a simple calculation.

$$\text{Max Pulse Width} = 2 \times \frac{60}{\text{engine rpm}} = \frac{120}{6000} = 20 \text{ milliseconds.}$$

After 20 ms, the engine is coming around for another cycle so that is all the time the injector has to supply fuel. To better understand the simplicity of fuel flow and AFR, let's compare fuel delivery to the water hose and trigger nozzle in your yard. Point the trigger nozzle on your hose into a bucket and squeeze the nozzle for 3 seconds. If you want less water in 3 seconds, then turn down the hose bib (reduce pressure) or screw in the trigger nozzle adjusting knob (reduce flow). To further alter the amount of water in the bucket, do a little on-off action on that trigger nozzle. So, if at WOT a ① given injector size has the ② correct pressure and is ③ "open" for the maximum time, then there CAN BE NO VARIABLES in fuel delivery and Kenne Bell can't have "screwed up cal." Right? That fuel combined with 11 parts of air will net 11.1 AFR - and not 12, 13, 14 or 15 - unless we reduce the pressure or flow of fuel. There is one other big factor that can affect AFR and that is AIR - the other part of the ratio we've been discussing. Air leaks after the mass air meter are not measured so the engine will show lean even if the WOT Kenne Bell chip program is correct. Should we re-tune for this "air leak?" Absolutely not.

### THE CRISIS

Hopefully, you now understand that the WOT fuel flow calibration by Kenne Bell is NOT the problem and re-calibrating the chip - by anyone - can result in some serious consequences. Try this example. The customer doesn't heed our advice when we argue that the dyno says it's 13.1, but it's really 11.1. So, the calibration is richened 2 points to 11.1, which is ACTUALLY 9.1. Oops! At 9.1, the overly rich mixture can damage expensive cats and sensors, foul plugs and wash cylinder walls. Also, the car then stalls, bogs, sputters, power is down and there's black smoke out the exhaust - and now you want to blame Kenne Bell because we won't re-calibrate it and the dyno can't fix it. It is precisely this confrontation or crisis that we are attempting to avoid by posting this information for our customers. And this by no means implies that Kenne Bell is right and

dyno AFR's are wrong 100% of the time. There can be other contributors to excessively lean or rich mixture. More on that later.

## THE AFR VARIABLES

It may sound as if we're beating up on Dynojet's AFR systems. That is not our intent. They make the best dyno on the planet. Ours is used daily. It has been trouble free and dead accurate for 8 years. So let's briefly explore the other problems - other than inaccurate AFR equipment - that can vary AFR with any tuners calibration. And why does a specific supercharger kit calibration vary from car to car? Well, here's a clue. It's NOT the supercharger, the radio or the rear seat. As already mentioned, it's AIR, or more specifically the measurement of air flow into the engine by the engines sensors. If it's 25% off, then 25% of 11.1 is 13.75. Any one or combination of the below will affect the AFR of ANY vehicle. We've listed the problems in order of "most frequently diagnosed."

### PROBLEM

1. Incorrect Fuel Pressure
2. Relocated MAF meter
3. Rotated MAF meter
4. Aftermarket MAF meter
5. Pegged (maxed) MAF meter
6. Aftermarket "Cold Air" kits
7. Aftermarket inlet tubes (after the MAF)
8. Fan turbulence on the MAF meter
9. Defective or damaged MAF meter
10. Defective sensors (ACT, ECT, O<sub>2</sub>, etc.)
11. Inlet vacuum leaks (unmetered air)
12. Plugged injectors
13. Wrong injector size
14. Fuel filter
15. Spark plugs
16. Dirty MAF - or a combination of any of the above

**Keep in mind that the AFR reading may be off because of either or both 1. bogus AFR sensing and 2. excess air readings, leaks or delivery from engine components. The trick is to figure out which is the culprit.**

## SCANNERS

How anyone can attempt to diagnose or tune today's vehicles without a scanner is beyond our comprehension. A good scanner, such as the SCT Raptor (phone# 407-774-2447) is an invaluable tool that can diagnose most problems AND data log critical engine sensor functions such as injector dwell, vacuum leaks, spark, MAF signal, temperatures, etc. We use and recommend the highly accurate repeatable AFR System by Powertrain Electronics Co. (Phone# 805-466-5252). It's most important feature is the sensor can be calibrated for accuracy each time it is to be used. It is based on ECM equipment, a major supplier of industrial sensors. Owner Dave Dardge has worked for Horiba and has spent many years working with AFR. We have conducted side by side comparison tests between Horiba, ECM and PEC. All are near identical in accuracy and can be calibrated. It even measures AFR for alcohol fuels. If you're interested, some of the dynos that use the PEC/ECM System are:

HP by Hermann Ph#(410) 451-3790 (Crofton, Maryland)

Johnny Lightning Performance Ph#(717) 786-4670 (New Providence, Pennsylvania)

Swanson Automotive Ph#(310) 787-7800 (Torrance, California)

Westech Ph#(951) 685-4767 (Alta Loma, California)

Innovative Tuning Performance Ph#(302) 312-1767 (Elkton, Maryland)

Modular Powerhouse Ph#(770) 751-0333 (Alpharetta, Georgia)

## THE SOLUTION

Here's our position. We hope you all understand. Kenne Bell has done it's part in educating our customers to the pitfalls of inaccurate AFR. No one else has gone to these lengths to explain the problems. We do not sell any AFR equipment. Kenne Bell simply no longer wishes to be involved in disputes between our customers and tuners and we will resist any attempts by either party to convince us to "re-tune" and possibly damage a customers vehicle because of inaccurate AFR equipment. Our recommendation is to NOT RE-TUNE A KENNE BELL KIT. Leave it as is. If there's a problem, call us. And until further notice, the only AFR data we can accept is from PEC, ECM or Horiba . . . And possibly data from a brand new Dynojet sensor installed in a welded bung (no tailpipe sniffer readings are acceptable at this time). Dynojet is making an effort to educate their dyno operators in the maintenance of their equipment, particularly the tailpipe sniffers. In summary, our advise is that if you decide to dyno test your Kenne Bell equipped vehicle, think long and hard about whether or not to allow changes to be made based solely on the AF data. Let's don't make someone else's problem our problem.

We have many more examples, but below are a couple customer problems that reflect what was discussed above.

**Customer:** "I dynoed by car, but the dyno said it was dangerously lean and couldn't run another test. They might burn it down. The AF ratio was 13.5. I called Ken at Kenne Bell and he insisted the AF was set at 11.1 and the dyno was wrong or I had other problems which he could not fix with a chip. At his request, I tested my car at another dyno the same day. I was surprised. Now the AF was 12.1, but the car made the same HP. Now I'm suspicious of the dyno AF devices. How can my car vary 1.5 AF ratios and not make a difference in HP. I asked Kenne Bell which one was right and they said neither. They are both wrong. I scanned my car with an SCT Raptor. No vacuum leaks and everything else is O.K. There is no detonation, the car hauls ass and driveability is superb. I wish I had taken your advice and never tested it on the dyno, but I wanted to know my HP. Now I'm confused and I'm still worried. I asked both dynos to test again with a new sensor but they refused. Now I'm stuck. All I can do for peace of mind is to bring my car to a dyno with the ECM you recommend. Please send me a list. I'm sorry I was such a pain in the %". Kenne Bell was right. I feel for your tech guys if you have to go through this with all your customers. At least I didn't allow them to nichen your tune 1.5 ratios and screw my car up."

**Customer:** "I'll make this brief. I tested my engine on an engine dyno which uses top of the line ECM AF ratio equipment. My engine was tuned with a FAST Stand Alone so the tuning is fixed. I read 11.1. I re-tested the same engine and tune on a chassis dyno once I installed the set up in my car. It read 12.5.1. Can I test it on your dyno. I know you use ECM equipment."

We'll keep you updated on any new developments.



# **KENNE BELL**

Hi Tech Performance Products

## **\$50 CHECK**

### **NOTE REGARDING INSTALLATION INSTRUCTIONS**

Every effort has been made by Kenne Bell to insure the accuracy and completeness of our installation instructions. We know that occasionally, due to minor differences in California emissions vs. Federal emissions vehicles and mid-year production changes by manufacturers, this can sometimes cause confusion where our instructions vary from the specific vehicle being worked on.

There are instances for example, where a vehicle manufacturer has relocated vacuum hoses, bracketry, cables or other minor changes that may not match our instructions exactly. Often, we take the blame for not having the changes noted. Manufacturers never notify us when they make changes mid-year or remove / relocate / redesign engine components, so sometimes it takes our customers to make us aware of the changes. We strive to make our installations as easy as possible without confusion, but changes will continue to happen, outside our control or knowledge. This is normal.

We greatly appreciate input from our customers regarding discrepancies to our instructions. One thing we can do to help the situation is to offer you something in return for helping us correct or update our instructions.

Here's the scoop: If you find something that does not match our instructions on your vehicle (vehicle must be 100% stock), write it up in detail (the same way we do) and take as detailed photo(s) as possible. Submit the change(s) to us, we will review them and *if we decide we can use them to update our instructions*, we will send you \$50 for your efforts. If you send us any update information, please fill out the form below, detach it, and mail it in with your corrections. Thank you very much for your continued support of Kenne Bell Products!

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**SUBMIT TO :** KENNE BELL INC. - TECH DEPT.  
10743 BELL COURT  
RANCHO CUCAMONGA, CA 91730

CUSTOMER NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY and STATE: \_\_\_\_\_

ZIP CODE: \_\_\_\_\_

PHONE NUMBER: \_\_\_\_\_

FAX NUMBER: \_\_\_\_\_

VEHICLE TYPE / YR / ENGINE: \_\_\_\_\_

NOTE: PLEASE INCLUDE A COPY OF YOUR ORIGINAL INVOICE..





# KENNE BELL Jim Bell's SUPERCHARGED / TURBOCHARGED PERFORMANCE GUIDE

This data is intended as a guide only. It's the result of thousands of dyno runs and street testing with our company Ford, Mazda, Dodge, GM, Buick and Sycrone/Typhoon vehicles.

- 1 psi boost = .5 point CR (effective CR)
- 1 point CR = 2 psi boost (CYLINDER PRESSURE)
- 1 point CR = 2% HP
- 1 psi boost requires 1-1.5 octane (minimum)
- 1 psi boost = 6.8% HP max (1 ÷ 14.7 = 6.8%)
- 1 point CR = 3 - 5 octane
- 1 AF ratio = 2 octane
- 1° advance = 1/2 - 3/4 octane point
- 10° engine coolant (160° -180° range) = 1 octane
- 20° ambient = 1 octane
- 1 can NOS Octane Boost = 1.5 - 3.6 octane (see table)
- 1000' altitude = -1 octane point
- 1000' altitude = .5 psi (2" Hg)
- 6°F temp change = 1% air density
- 30% humidity = 1 octane
- 10° air charge temperature = 1% HP
- 20° charge temp reduction through intercooling = .5 psi additional boost with same octane
- RAM PSI =  $\frac{Ad \times V^2}{4287}$  Ad = atmos. density .076 lbs/cu ft at sea level  
V = speed in mph
- ENGINE CFM =  $\frac{CID \times RPM \times VE^*}{2 \times 1728}$  \*70% for the average engine 90% racing engines
- 10% HP increase = 7% AF ratio (based on 70% VE) or 10% AF ratio with 100% VE
- 10 psi fuel pressure = 8% AF ratio: 5 psi = 4% AF ratio
- 3/4 PSI DROP = 5% pressure (5% x 14.7 = .75 psi)
- HP = CFM (int @ 28") x .257 x no. cylinders
- 10HP = .1 sec / 1 mph 1/4 mile
- 100 lbs = .1 sec / 1 mph 1/4 mile

## LOWER FUEL OCTANE LOSSES A CASE FOR THE KENNE BELL BOOST-A-PUMP The Latest Fuel Tip

**Problem:** If at all possible, avoid fuels that use alcohol as an additive to increase fuel octane. We understand that Mobil doesn't use alcohol in most states. Alcohol, being more volatile than gasoline, tends to evaporate and lower fuel octane. Large in tank or in line pumps "re-circulate" excess fuel at idle, part throttle and cruise. This results in hotter fuel and increased alcohol evaporation (octane reduction) from not only the "re-circulation" but the continuous pressurizing and depressurizing of the fuel. Why do you think Ford has gone to returnless (no return) fuel systems? One reason was to reduce fuel octane losses.

**Solution:** Use the Kenne Bell BOOST-A-PUMP to increase fuel pump delivery. It activates ONLY at wide open throttle thereby minimizing "re-circulated," heated and depressurized fuel. The fuel supply will be cooler with higher octane and the engine will be less prone to detonation (pinging).

**LEAST KNOWN FUEL TEMPERATURE FACT:**  
Did you know that gasoline begins to boil at 95°F?  
Always keep fuel as cool as possible.

NOTE: NOS (Nitrous Oxide Systems) Phone# 714-545-0580 or FAX# 714-545-8319 is the ONLY octane booster we recommend.

NOS OCTANE BOOSTER	OCTANE INCREASE FROM (1) CAN	
	8-1/2 gallons	17 gallons
#12007 OFF ROAD (RED)	2.5	1.5
#12010 RACING (SILVER)	3.6	2.2



# **KENNE BELL**

## *Supercharger*

### **BASIC LIMITED WARRANTY**

The Kenne Bell supercharger carries a **1 YEAR LIMITED WARRANTY** from date of purchase from either Kenne Bell or our Dealer's.

If the supercharger is used in the manner intended by Kenne Bell, any part or component found to be defective in material or workmanship will be repaired at no charge to the customer.

This warranty is extended only to the original purchaser and excludes hoses, filters and all electronic components. These carry a **1 YEAR LIMITED WARRANTY**.

Electronic equipment supplied in the kit that is manufactured by another company carries their standard warranty.

Kenne Bell will honor any warranty claim at its sole discretion and only after inspected by Kenne Bell Technicians at the Kenne Bell factory.

Freight damage claims must be held and filed against the freight company.

**Kenne Bell will not be liable for any incidental or consequential damages.**

No warranty will be honored if:

1. An underhood non-OEM "exposed" filter with no protective canister or housing is substituted so as to ingest hot underhood air vs. the OEM "cool air" from the fenderwell, front of radiator, hood etc.
2. Supercharger is over-revved (13,000 rpm maximum).  
$$\frac{\text{CRANK PULLEY DIAMETER}}{\text{SUPERCHARGER PULLEY DIAMETER}} \times \text{ENGINE RPM} = \text{MAXIMUM SUPERCHARGER RPM}$$
3. The gear case is overfilled. **DO NOT** overfill!
4. Lack of lubricant in gear case.
5. Foreign materials (rocks, sand, metal parts etc.) that are in or have passed through the supercharger.
6. Any supercharger kit where the serial number has been altered, defaced, removed or tampered with.

### **CLAIM PROCEDURE**

If the Kenne Bell supercharger fails during the 1 year warranty period, follow this procedure:

- A. Call, write or FAX Kenne Bell for a RA (Return Authorization Number). No returns are accepted without this RA number. This number must be clearly marked on the box.
- B. Supply copy of invoice.
- C. Make, year and model of vehicle.
- D. Description of perceived failure and/or problem.
- E. Fill out our Warranty Claim Form. This must be mailed in with RA number when returning the supercharger for inspection.
- F. Give the address to which returned product is to be shipped after inspection and/or repair.
- G. Send UPS freight prepaid. **Insure package for full value.** **NOTE:** Be careful when packaging your unit for return shipping. **DO NOT USE STYROFOAM PACKING "PEANUTS."** Be sure there is sufficient packing material around the unit and that components are not touching each other. Tape up all openings on the supercharger.

H. Return unit to: Kenne Bell  
10743 Bell Court  
Rancho Cucamonga, CA 91730

### **WARRANTY**

If Kenne Bell's Limited Warranty applies, the part(s) will be replaced or repaired at our option and returned to you by FEDEX Ground, freight prepaid.

### **NON WARRANTY**

If the Warranty does not apply, you will be notified of the reason(s) and informed of the cost involved.

***NOTE:** A \$50.00 inspection fee will apply for non-warranty units returned and not repaired per customer request. This fee will be waived with repair/rebuild. All non warranty units left over 30 days will be considered abandoned and property of Kenne Bell unless prior arrangements have been made.*

### **EXCLUSIONS**

The following voids the Kenne Bell Supercharger Warranty. These may seem to be simple common sense "don't's" but we have seen it happen. We are repeating the following exclusions and their "indicators" as they are the most common reasons for supercharger failure.

1. **OVERFILLING** the oil reservoir. **DO NOT OVERFILL.** It will cause the oil to overheat resulting in damage to the seals and/or the supercharger itself.  
*Indicator* - Burned oil.
2. **LACK OF OIL** in the reservoir.  
*Indicator* - Oil starved and worn front gears.
3. **FOREIGN MATERIAL** (rocks, sand, metal particles, washers, bolts etc.) will damage the supercharger just as it would your engine.  
*Indicator* - Gouges or knicks in the rotors and case.
4. **AFTERMARKET NON-OEM "UNDERHOOD FILTER KITS"** that ingests hot underhood air which can reach temperatures as high as 200 degrees vs. 70 degrees air from the fenderwell, front of radiator etc.  
*Indicator* - Overheated and damaged supercharger.

# **KENNE BELL**

Hi Tech Performance Products

## **A NOTE REGARDING AFTERMARKET MASS AIR METERS**

KENNE BELL has long been opposed to aftermarket mass air meters for the simple reason that the meter alone cannot "recalibrate" the factory computer. Meters such as these cause nothing but problems. Hard starting, idle problems, detonation, excessive leanout and/or rich conditions, and over advancement of timing, just to name a few.

The ONLY way to properly install a larger mass air meter than stock is to do it the KENNE BELL way and use an OEM factory calibrated meter and install the proper transfer function (voltage vs mass flow values) for the new meter in a chip! A great deal of effort goes into the manufacture of OEM mass air flow meters. They must pass stringent tests for repeatability and accuracy in order to be used on ultra low emissions vehicles of today.

Practically every function in the computer is dependent on accurate flow signals from the mass air meter. Anything other than a factory meter and chip kit like the ones from KENNE BELL cannot possibly provide the correct readings your computer is dependent on.

All aftermarket meters essentially work the same way: they "skew" the output signal to your computer and give it false information on true airflow. This is the ONLY way they can do things like "calibrate" for larger injectors.

In a nutshell, here's how they work: Let's use this example: You want to put 30# injectors in where you had factory 19# injectors. You call the "meter guys" and tell them this is what you want: a meter "calibrated" for 30# injectors.

The meter guy says "no problem" and sells you a meter that's had the signal skewed like something like this:

ORIG INJ SIZE: 19    NEW INJ SIZE: 30

$19 / 30 = .6333333$  so new skewed meter must output 63% of the factory airflow signal to make the injectors work. How else could they get the computer to deliver a lower fuel pulsewidth for the bigger injector than to lie to the computer about the true air flow? Let's just pick a true flow rate number with the stock meter and injector combination:

At 2.10 volts a 80MM factory meter flows 3.795 lbs. mass of air per minute (true airflow).

New meter must be skewed to output this much voltage:

$2.10 \times .633333 = 1.33$  volts at 3.795 lbs. mass of air per minute (true airflow), they are telling the computer the airflow is about 2.403 lbs. mass of air per minute (false airflow) to make the 30# injector output the same fuel as the smaller 19# factory injector. Remember, you haven't told the computer the truth about the real airflow, you've given it a LOWER voltage reading from your skewed meter than the real airflow to compensate for the larger injector output.

Now, you say "What's wrong with that?". Here's what's wrong: ALL the calculations for spark (among many other things) are based on LOAD (true load). The meter true airflow is critical to the true LOAD calculation. Because the skewed meter tells the computer the airflow is always .63 less than reality, the computer calculates LOAD based on this false value. Since many of the tables and functions for the computer that run your engine are critical to LOAD, all the preprogrammed values will be incorrect! THERE'S NO WAY A SKEWED METER CAN PROVIDE A CORRECTED SIGNAL TO THE COMPUTER!!

Sorry, but we are not interested in doing chip recalibrations to try and fix what the meter guys have "skewed up". No telling what they've done. These meters result in far too many callbacks and tuning problems for us to support.

### **VERY IMPORTANT INFORMATION**

If you have installed ANY type of aftermarket mass air meter on your vehicle, YOU MUST REINSTALL THE FACTORY MASS AIR METER for your new supercharger kit to function properly. FAILURE TO OPERATE THE VEHICLE WITHOUT THE FACTORY MASS AIR METER CAN LEAD TO POOR DRIVEABILITY AND POSSIBLE ENGINE DAMAGE!





# **NOTICE**

**WHEN REMOVING ANY VACUUM LINES, COOLANT LINES OR ELECTRICAL CONNECTIONS, TAKE SOME MASKING TAPE AND LABEL WHERE EACH LINE CAME FROM AND WHERE IT GOES TO AND APPLY TO END OF EACH HOSE OR CONNECTOR. THIS CAN SAVE YOU A LOT OF FRUSTRATION LATER WHEN YOU PUT EVERYTHING BACK TOGETHER.**

**WHEN USING ANY TYPE OF SEALERS (SILICONE, 518,TEFLON PASTES, ETC..) MAKE SURE YOU ALLOW AT LEAST 8 (EIGHT) FULL HOURS CURE TIME OR YOU WILL DEVELOP A VACUUM LEAK!!!!!!**

# **NOTICE**



# KENNE BELL SUPERCHARGER INSTALLATION INSTRUCTIONS

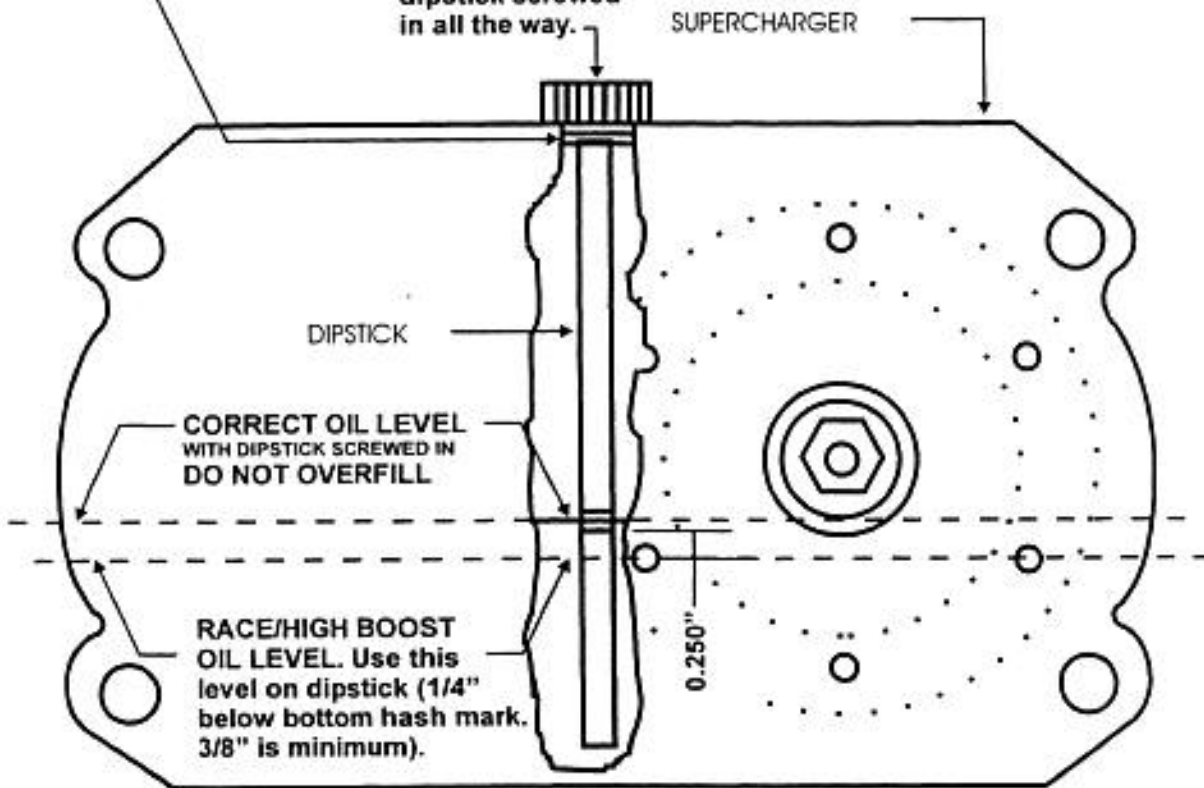
# MAINTENANCE

USE KENNE BELL SYNTHETIC 50 WT OIL ONLY - INCLUDED WITH THE KIT.  
 Drain and refill (DO NOT OVERFILL) once every 12,000 miles. Oil can be obtained from Kenne Bell.  
**DO NOT USE ANY OTHER OIL THAN KENNE BELL OIL - (909) 941-6646 TO ORDER.**  
 TIP: OIL CAN BE REMOVED WITH A SUCTION GUN FOUND AT MOST AUTO PARTS STORES. IF A GUN IS NOT AVAILABLE, ATTACH A VACUUM HOSE TO A PLASTIC SQUEEZE BOTTLE AND SUCK OIL FROM CASE.

**CHECK OIL AT EVERY GAS FILL UP**

Fill with small funnel until oil reaches correct level (DO NOT OVERFILL).

DIPSTICK CAP  
 Check level with dipstick screwed in all the way.



**DO NOT OVERFILL**

**TO BE SAFE, CHECK OIL LEVEL AT EVERY GAS FILL UP**

### OIL CHANGE MAINTENANCE SCHEDULE

Miles on vehicle when installed =		✓					
Next oil change due → +12,000 =							
+12,000 =							
+12,000 =							
+12,000 =							
+12,000 =							
+12,000 =							

### SUPERCHARGER OIL LEVEL & MAINTENANCE SCHEDULE



# WARRANTY CLAIM FORM

Dear Customer,

Please fill out the information below and enclose a copy of this form and a copy of your original invoice so we may process your return and get it back to you as quickly as possible. Please return the compressor, drive and pulley so we can accurately evaluate and diagnose the problem. Note: '97 up F150's, Expeditions and Lincoln Navigators do not have drives.

Please take care in packaging the unit for shipping to avoid damage and insure the package for the full value.

Description of Problem: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Name & Address \_\_\_\_\_ Phone # (\_\_\_\_) \_\_\_\_ - \_\_\_\_\_  
\_\_\_\_\_ Phone # (\_\_\_\_) \_\_\_\_ - \_\_\_\_\_  
\_\_\_\_\_ Fax # (\_\_\_\_) \_\_\_\_ - \_\_\_\_\_

Purchased From: \_\_\_\_\_  
(please specify Kenne Bell, Distributor, Individual etc.)

Date Purchased: \_\_\_\_\_ Serial Number: \_\_\_\_\_

Approximate Miles on Supercharger: \_\_\_\_\_

Vehicle Year \_\_\_\_\_ Make \_\_\_\_\_ Engine Size \_\_\_\_\_

Return freight prepaid to: Kenne Bell  
10743 Bell Court  
Rancho Cucamonga, CA 91730



