NORTHSTAR CHEVELLE CLUB

MINNESOTA'S '64 - '87 CHEVELLE and EL CAMINO CLUB

2013

President: Stan Shinker
Vice President: Tom Brokaw
Treasurer: Mike Sabby
Webmaster: John Delke
Secretary: Chris Reid
Events: Chad & Shawna Linkert
Newsletter: Bryan Flattem
Merchandise: Craig Savina

This month members had the opportunity to tour the QA1 Precision Products facility in Lakeville. Most of us know QA1 for their performance shocks, but there's more to them than that. In 1993, CEO Jim Jordan used his 25 years of experience in the rod end and spherical bearing industry to start his own company in Burnsville. Starting with just 3 employees in his warehouse, Jim quickly built his business into the leader in the motorsports market. In just 5 short years, QA1 purchased Hal shocks and started manufacturing drag racing shocks. After improving the products and adding street and circle track lines, QA1 purchased Carrera Shocks. Quickly, QA1 became the #1 manufacturer of performance racing shocks. In 2011, QA1 purchased CAP Auto Products and Edelbrock's suspension line and now has a 100,000 square foot facility in Lakeville where it handles all of its manufacturing. They have sold over 1,000,000 shock absorbers, and sell approximately 1,000,000 rod ends and spherical bearings each year. In the upcoming year, QA1 will be coming out with carbon fiber drive shafts, several new circle track racing shocks, 5th Generation Camaro shocks, struts and related suspension components, and several suspension components for Mopar A, B and E-Bodies all of which will be made in its Lakeville, MN facility. Thank You to QA1 for hosting our club and providing us with a tour of your facilities.


Photo by John D


Photo by John D

Torque Converter Sizing – What's Right for Me?

by Jason Reiss on April 10, 2013, Chevyhardcore.com

When we initially began to do the research for this article, we had conventional wisdom in mind – the less horsepower a car makes, the smaller dimensionally the torque converter can be, but as we covered the topic with our four specialists, we discovered that wasn't necessarily the case. We spent plenty of time discussing torque converter theories with some of the best in the business – TCI Auto's Jeff Reed, Pro Torque's Joe Rivera, ATI Racing's David Caine, and Neal Chance Racing Converters' Marty Chance, and hopefully by the time you're done reading you'll have a better understanding of how torque converters work and what goes into their parts selection.

Stators are selected with specific characteristics – the number of windows and the angle of the fins are important depending on your application.

Torque Converters: The Basics

A torque converter is designed to transfer the torque produced by the engine, and convert that into usable power to be applied to the ground through the transmission, rear-end gears, and ultimately the tires. There are four main parts to a converter – the turbine, the pump, the stator, and the front cover. The cover is the part that bolts to the engine (via the flexplate) and has the pump welded to it externally. The pump (which has fins welded at precise angles inside it) and the front cover are welded together, so they turn at the same speed as the engine. Opposite the pump is the turbine, which is the part that actually connects to the input shaft of the transmission and turns independent of the engine. The pump hub, which is welded to the pump cover, engages the pump in the transmission.

The turbine has fins welded inside it just like the pump does, but at opposing angles from those in the pump. The transmission fluid enters the torque converter from the transmission, fills the converter, flows through the fins in the center of the pump, exits the fins at the outer ring of the pump, and flows back across to the outer section of fins on the turbine, driving the turbine. After that, the fluid exits the turbine through the fins in the center, and moves into the stator. The stator is probably the most important part of the whole equation and is often called the "brain" of the converter, as it is the part that helps to multiply the torque from the engine. After the aforementioned fluid flows out of the center of the turbine, it flows through the stator.

Sizing Guidelines

There are a few basic guidelines to think about when selecting a torque converter. You want to use a torque converter that is designed to keep your engine in its powerband, and not fall below the engine's peak torque RPM. When using a transbrake, stall speed should be selected to be somewhere around 300-400 rpm higher than the peak torque RPM range, since brake-equipped cars tend to drop a few hundred RPM upon release of the brake. Although we do recommend working with an expert to design the one that's right for you, the following list is a good place to start:

- **7-inch Converter: From 6,000 to 9,000 rpm stall speed**
- **8-inch Converter: From 4,000 to 7,000 rpm stall speed**
- **9, 10, and 10.5-inch converter: Typically used in power-adder applications. Stall speed varies based on particular engine combination.**

These particular guidelines are only a starting place, and if there's anything we learned during the creation of this article, there is no perfect torque converter for all applications – every car, engine, and transmission combination will require something different, so do your research and buy accordingly. What happens when the fluid flows to the stator is nothing short of amazing. The fluid flows through the center of the stator, which also has angled fins on it, and back into the pump. The stator has a one-way clutch inside it that allows the fluid to turn it only in one direction, which is the direction it needs to reverse the fluid angle as it flows back towards the pump. This is where the torque multiplication comes from as the fins in the stator redirect the fluid and speed up its flow as it reverses the direction of the fluid. By increasing the fluid flow, the stator pushes the fluid through the pump faster, which drives the turbine harder, and attempts to make the turbine catch up to the pump in speed (engine speed). At idle, the stator is not moving, and actually blocks the flow from driving the pump so that the car will stand still with only light pressure on the brakes.

Now, oddly enough, once all of these fluid direction changes have occurred, and the stator has done its job of helping to multiply the torque to get the car moving, the car reaches higher speeds and the stator stops moving, directing fluid where it needs to be without actually doing anything. That's the point of the one-way clutch in the center of the stator, so that the stator can freewheel once the turbine speed reaches nearly the same speed as the pump (and essentially, the engine) does in high gear, to minimize slip and maximize performance.

Does Size Matter?

Now that you've got the basics down of exactly what's happening inside your transmission's bellhousing, let's bring our experts to the table. One of the common threads we discovered during our conversations was that size is not necessarily the most important thing about a converter, but on the same level, size plays an important part. Basically, what you're trying to achieve during converter selection is to ensure that the converter itself has enough volume to handle the power level, while still retaining a physical size that will not be too large – a delicate balancing act that is at the forefront of what each company does to provide the proper unit for power transfer.

"As the car goes down the track, if you are making too much power for the converter selected, the converter will slip, and you'll need to run a tighter converter. – David Caine, ATI Racing"

"We do tons and tons of Stock and Super Stock converters – most of the cars in NHRA have an ATI converter inside. Torque converters are very sensitive to horsepower; if you're making a lot, you need to have a converter to harness it all," said David Caine from ATI Racing. Caine continued, "The absolute basics we need to know are how much power the customer is making, along with the weight of the car, and from there we can figure out what the best solution will be for them.

"The more power you have, the harder the engine will try to drive the converter, and a smaller converter would be very inefficient in an application like that." According to Reed, the stator will be locked up while the car is on the brake, and at some point in the run, depending on combination, it freewheels, trying to catch up with the pump and turbine at that point to direct the fluid where it needs to be internally. The fluid will lock the stator and keep the windows in the stator where they need to be in order for the fluid to flow properly and the converter to be efficient.

Left: TCI's 9.5 and 10-inch Pro-X converters are used in classes like X275, where Jason Lee and Bob Kurgan have used them with great success. Right: One of TCI's lockup converters designed for use with the 6L80E transmission found behind many LS engines. It uses a fluid-activated clutch to assist in lockup.

Power Adder Combos

Power-adder combinations will all require a different physical converter due to their inherent manner of power application. For example, Reed says, "In a supercharged X275 car, the converter will typically be a 10-inch size, but a turbocharged car might use a 9.5-inch converter. The key to making horsepower in a blown car is getting the supercharger spinning into its happy place, somewhere around 7000 to 7500RPM. But in an X275 turbo car, you'll want a lower stall speed, and the flash will typically be somewhere around 5700rpm. It all comes down to efficiency and getting the engine in the place where it needs to be in order to apply the power."

Reed continued, "Turbo and nitrous combinations want to be lugged along a little bit to help load the converter up, and today's progressive nitrous systems apply the power much like a turbocharged combination. A small cubic inch supercharged engine flashes somewhere around 7700, and shifts at 9000, but on the gear change, the converter needs to fall right back into the powerband of where the blower wants to operate. A turbocharged or nitrous car, on the other hand, will need a little bit more of a drop on the gear change in order to help load the turbocharger and spin it harder."

A Different Approach

The conversation with Joe Rivera from Pro Torque went in a completely different direction. His company's approach is that the physical size of the converter itself doesn't matter one bit. He said, "Size doesn't make a bit of difference – I take a completely polar opposite position. Many people believe that size means everything when it comes to vehicle application, but my approach is completely different. Sizing is not as important as overall capacity. I can get more capacity out of smaller diameters because of the way we construct our parts.

"Traditional thinking is that the larger the diameter, the more the capacity but the lower the stall for bigger engines, and the smaller the diameter, the more slip, for the lesser horsepower and high-revving engines. Our 10-inch converter actually has more capacity than our 10.5-inch converter – so that line of thinking is absolutely untrue. To debunk the myth that size has everything to do with stall speed and efficiency, we have smaller converters that have more capacity than some of our larger converters."

Our interest was piqued when Rivera brought up the word capacity. We then talked a bit about the differences between how he'd select a torque converter for something like a naturally-aspirated combination versus some of the higher-horsepower, drag-radial style cars competing today.

> ***"I use the smallest possible diameter torque converter for any given application that meets the capacity needs of the engine and vehicle combination. – Joe Rivera, Pro Torque"***

"A naturally-aspirated small-block Ford requires less capacity than a twin-turbo piece, so we'll use the smallest converter we can and still harness the power. Think of it this way – you wouldn't use a 12-inch clutch in an application where a 6-inch clutch would be effective – the 6-inch clutch has enough capacity for the engine," said Rivera. Continuing Rivera explained, "The smaller the diameter, the less the rotating mass, and generally the smaller the diameter the lighter the converter. Less rotating mass – it's the same reason someone uses titanium wheel studs. I'm more interested in getting the converter to have the right capacity for the application, rather than the size of the box. Generally speaking, the smaller the diameter, the lower the capacity – you can't get away from that, but there are differences depending upon application."

Marty Chance of Neal Chance Racing Converters was happy to discuss the subject of torque converter selection with us. Chance explained, "Conventionally, what most people do in a limited-tire application, is to set the engine up so that the converter lessens the shock value, or the inertia, in the driveline at the release of the brake, and use a converter that grabs the engine at a lower RPM than what would normally be optimum." One of Neal Chance's full-billet racing converters is designed to lessen rotating weight while retaining strength in all the right places.

Left: All of the manufacturers surveyed for this article furnace-braze the internal fins for strength. Here is a before-and-after shot of a turbine after undergoing the brazing process. Right: Balancing is necessary regardless of what type of torque converter you have - unwanted vibration must be kept to a minimum.

"The best way to run a car, in a perfect world, is to leave at nearly peak power RPM, and accelerate from there to bring the driveshaft to the engine RPM. The technology that has brought us to the point where we are today, helps to put the power to the tire less aggressively, without losing the G-meter, which is your most valuable bit of data. What we're working on now is some new stuff that lets us leave at a higher RPM and control the tire, to help bring the driveshaft to the engine faster and accelerate the mass more quickly," he says. Putting that into practice has always been the challenge, and Neal Chance is working to design a converter that only has as much flash as what the suspension and tire combination can take at the hit, and then bring the power in as quickly as possible.

The R&D Edge

Chasing research and development for all of these companies is what keeps them at the forefront of the industry; it's a constant, ongoing process that doesn't allow for any downtime. One common thread that we found during all of our conversations is that the manufacturers rely on their racer contingent to constantly test, test, test, and provide them with data both before and after the converter's installation, in order to better analyze what's happening with each of the particular torque converter combinations they're using. That's what allows for the constant improvement in elapsed times, especially in today's ever-quicker racing world. Each company has customers that have been very successful with their products, across all different styles of heads-up racing. Pro Torque's team includes racers like Pro Mod record-setter Jose Gonzalez, Outlaw 10.5 superstars Tim Lynch and Mike Murillo, and also eight-time NMRA Super Street Outlaw champion John Urist. Neal Chance has been setting records for years with racers like Charlie Booze, Jr., Frankie Taylor, and Frank Manzo, while TCI's converters are behind the engines of X275 players Jason Lee, Shawn Ayers, Bob Kurgan, Dan Pharris, and even in Reed's own machine. ATI's pieces are making noise in X275 with the aforementioned Bruder Brothers, Dean Marinis, and Al Marlow.

Regardless of application, they are all trying to maximize the benefit to the end-user, and those R&D efforts are what allow them to do so. Each manufacturer was adamant about the fact that there is no one-size-fits-all torque converter, and each application is completely different. The more data you can provide them on the front side, the better your chances are of getting the correct product when that pretty box shows up on the big brown truck. Each also stressed the idea that the first converter you get may not be the best torque converter, especially if you're a heads-up racer looking for that last bit of elapsed time to keep up with, or be better than, your competition. Providing your manufacturer of choice with as much data as possible is the single most important element of selecting the proper torque converter for your application, and maximizing its performance on the track.

Since we're on the subject, another article……

How to Choose the Right Torque Converter

by **Clifton Klaverweiden** on August 2, 2012 chevyhardcore.com

As illogical as it might sound, if you have a performance car equipped with an automatic transmission one of the best ways to make it faster actually has nothing to do with adding any more power to the engine. Whether you want to be competitive at the drag strip, or just get the most out of your bolt-ons – one of the best things you can do for your automatic car is swap in a performance torque converter. But, torque converters are anything but a one-size-fits all modification. You need a torque converter that fits your car, your engine, and how you drive it.

Just what is a Torque Converter?

The first step to figuring out what torque converter is right for you is understanding just what a torque converter really is, and how it operates. Basically a torque converter is a "fluid coupling" that has two halves, that can spin at different rates, allowing the engine to spin freely at idle or when you come to a stop. One half of the torque converter is bolted to the flexplate of the engine, this is known as the "turbine". The other half is connected to the input shaft of the transmission, known as the "pump". On the inside of the torque converter there is also the "stator", which is essentially the brain of the torque converter, as it changes the directional flow and redirects the force of the fluid as it moves through the torque converter, which ultimately results in a more efficient transfer of torque through the transmission.

Torque converters come from the factory welded up, so it's pretty hard to get a look inside and see what makes them tick. From the right counter-clockwise, you can see the cover (which bolts to the flexplate), the impeller pump (which slides over the transmission input shaft) the turbine, and the stator.

The fins inside the torque converter are like two fans blowing against each other (only with fluid instead of air). Eventually one fan will blow harder and over power the other fan, making it spin in the same direction.

The stator is the brains of this operation. TCI tells us, "The stator changes fluid flow between the turbine and the pump, which is what makes a torque converter a 'torque multiplier', and not just a fluid coupling."

The turbine side of the converter that is bolted to the flex plate will always spin at the same speed as the engine, while the pump side will slip to a certain point and let the engine keep turning, while you come to a stop. Once the engine reaches a certain RPM, the fluid will be moving fast enough through the torque converter that the two sides will begin to couple and the car will start to move forward. The point that the car begins to move is known as the "stall speed."

The pinkish friction surface you see here is the torque converter's lock up clutch on the back of the turbine. If your converter is a lock up unit (many actually aren't), at a certain RPM in top gear the torque converter will lock up thanks to this friction surface, and the torque converter can no longer slip. This is a good thing because now all of the engine's power will get transmitted through the transmission and none will be wasted, helping with gas mileage and drivability.

Quit Your Stallin', and Get Movin'

Torque Converters are all about the stall...you want your torque converter to stall at the RPM where your engine has its peak torque output, giving you the hardest launch possible.

Torque Converters are all about the stall. In a high performance application, particularly a car used for drag racing, you want your torque converter to stall at the RPM where your engine has its peak torque output, giving you the hardest launch possible. There are also two types of stall; the foot brake stall and the flash stall. You can find your car's foot brake stall by pressing on the brake pedal, and slowly pushing on the gas. Eventually the engine won't let the RPMs climb any higher; this is your "foot brake stall." However, in a performance application, where you will be launching the car hard, the "flash stall" is actually what you want to focus on. The flash stall is the point that the RPM's will jump to and hold for a moment once you launch your car. This brief pause in the RPM's is caused by the torque converter needing to catch up to the RPMs of the engine.

Changing the size, shape, and number of fins inside a torque converter will affect what RPM it will stall at.

If you think about it, the internal dynamics of the converter are going to be very different when the output side is being held motionless compared to when it starts to rotate, so a converter manufacturer can tailor both foot brake and flash stall speeds to get the most out of a car without overwhelming the available traction. Ideally, you want a converter that stalls at an RPM that lets the car leave as hard as possible without breaking traction, then flashes up to a speed where the engine is getting into the fat part of the power curve.

A turbo car might need a converter that's a little "looser" in true stall speed, for instance, to let it get up on boost as you foot brake stall, but tighter in flash stall to get the car rolling off the line before the power from the turbo really hits. Nitrous cars on the other hand are an example, where the engine may not be making very much torque at all sitting there on the trans brake, compared to how hard it hits when the first stage of nitrous comes on.

Picking the Right Torque Converter for Your Car

Even though changing torque converters is a relatively straight forward process, it's still not the type of job you want to do two, or more, times because you picked the wrong one for your car and how you drive it. And, as we've already touched on a bit, there are numerous factors that you have to take into account when trying to pick a converter the proper foot brake and flash stall.

So how do you pick the correct torque converter for your car? Easy; you ask a professional. We went to the guys at TCI Automotive, who have been making high performance torque converters for some of the most brutal drag cars around for over 40 years. It's safe to say they know a thing or two about torque converters. Scott Miller, Product Manager at TCI tells us, "We like for folks to call us and say 'Hey, this is what I think I need, but I want to make sure.' We want to get you the right converter the first time so you can stay a happy camper."

Simple enough, right? One call and you're done. But, we know you're a hot-rodder, and "because I said so" isn't going to cut it for you. You, no doubt, want to understand why a torque converter is right or wrong for your car. So we asked Miller to give us a rundown of the specific factors that TCI takes into account when recommending a torque converter for a specific car. Miller says, "There are really about seven major factors you need to take into consideration when you are trying to find the right torque converter for your car."

The pros at TCI Automotive were kind enough to walk us through the factors that will determine what kind of torque converter a specific car will need. Ironically, most of those factors have little or nothing to do with the transmission itself. They are…

- **Your rear end gear ratio**
- **How tall your tires are**
- **How heavy your car is**
- **How big your engine is**
- **How high you plan to rev it**
- **The specs of your cam**
- **Whether or not you are going to use boost or nitrous**

Rear Gear Ratio

The first thing you'll need to consider when looking for a torque converter is what rear gears you are running or plan to run. Miller says, "The gear ratio in your rear end determines how much load you are putting against the converter. A 4.30 rear gear isn't going to put as much load against a converter in your average 3,000 pound car as a 3.23 because it is harder to get the car going with the 3.23's. You have to give it a lot more throttle and you're effectively putting a lot more load against the converter." He adds, "With a 4.11 or 4.56, you can go with a higher stall because the torque converter isn't going to slip as much when it's not locked up. Also, gears that tall don't put as much load against the torque converter as a 3.23."

Rear Tire Size

The overall height of rear tires makes a big effect on what kind of flash stall you need. Miller tells us, "Taller tires can actually affect the converter's flash stall. The taller the tire is the more revolutions of the driveshaft it will take to turn it, so a tall tire effectively makes the car behave like it has high gears in it. A shorter tire will take fewer revolutions to turn, so it can make the car seem like it has lower gears. The effect on the torque converter's flash stall once the car starts moving is the same as if you actually swapped rear gears."

Overall Weight of the Car

Even the weight of your car will have an effect on what kind of converter you need. “Again, it has to do with how much load you are putting on the converter.” said Miller. “A heavier car is going to put quite a bit more load on a converter than an light-weight, stripped down track car.” The weight of your car will load down the torque converter as soon as you mash the gas. A light weight car designed for track duty won't put as much load on the converter as a full weight street car, so if you used the same converter in both cars, the drag car would make the converter flash stall higher because of less load.

Engine’s Cam Specs: Lift, Duration and Centerline

Since the cam you are running will have a drastic effect on how your engine behaves, you have to take it into account as well. “You really need to pay attention to your cam specs when picking a torque converter for two reasons.” explained Miller. “First, the bigger your cam is the higher the RPM your engine will idle at. Secondly, the cam you have will play a big part in what your engine’s powerband looks like. If a stock motor starts making power at 2,000 RPM, then you put an aftermarket cam in it with more duration, you will move your powerband up into the 3,500 RPM range or even higher. So you need to have a converter that is set up to stall at an even higher RPM to match the engine’s new powerband with the new cam.”

Cubic Inches of Your Engine

Miller says, “The bigger your engine is, the more torque it will typically make. And the more torque the engine has, the higher the RPM’s it will push the converter.” This means that a torque converter designed to stall at 3,500 RPM with a mild small block might stall might stall at 4,000 RPM behind a fire-breathing LSX454R with 720 pound feet of torque.

Power Adders or Naturally Aspirated

Once again, the more torque your engine makes, the higher your torque converter will stall. Miller explains, “If you’ve got a power adder like a supercharger, turbo, or nitrous you’ll be making a lot more power, and in turn push your converter’s stall speed even higher. Even each one of these power adders will work best at different stall speeds, so it’s important to know exactly what you are planning to run on your engine.”

Operating RPM Range of the Engine

Without a doubt, the most valuable tool you can have when trying to find the right torque converter is a dyno graph of your engine that shows what RPM your engine is making its peak torque. “If you know where your engine is making its peak torque, then you know exactly what you are aiming for, and you’ll be more likely to get it right once you factor in everything else like your rear gear ratio and the weight of the car.” Miller explains.

Knowing at exactly what RPM your engine is making peak torque will help you know what RPM range you need to target for your stall speed. But, once you factor in everything else (weight, rear gears, tire height, power adders) you might find that you need to move the stall speed up or down.

Final Thoughts

Getting the right torque converter for your car isn’t difficult and really boils down to two simple steps. First just gather the specifics on your car, like weight, gear ratio, and your engine’s powerband. Second, give the experts at a top converter company a call. If you follow these steps, you can go forth, armed with all the necessary info to score yourself the right torque converter after just one simple call to the experts. You’ll spend less time installing and experimenting with torque converter combos, and more time enjoying your car.

1-Name/spouse (since the spouses are also members)
I'm John Delke ("John D" on the forum), my wife of 25 years is Sheryl, and we have two children, 18 (John Jr.) and 21 (Samantha/Sammy).

2-What was/were the cars you owned when the club started?
I had a '64 El Camino, 350ci/TH350, that was (being kind) rough. Bought it before I even knew about Team Chevelle – I've just got a thing for Elky's or Ranchero's. It was my very scary daily driver (4:11's, shot front suspension, and drum brakes) for 3+ years. Found out about TC, and it got me inspired to dig into a mechanical rebuild. Then, the idea was hatched for the MN "Team Chevelle'rs" to get together at a picnic… So I really got busy and got the car back together (with a 383) for the inaugural meeting in October, 2002.

3-Do you still have it/them now?
I sold the car in 2008 as a rolling project, after owning it 17 years.
4-Have you had any other cool cars since then?
If you consider late 90's B-body barges "cool", I've had a Roadmaster sedan and a wagon. My current daily is the "Green Mary" – a '95 Caprice Wagon.

5-Have you held any positions within the club?
I have been the Web/Forum-master for the last several years.
6-What's your best memory of the club?
There are many… At the inaugural meeting we got to see the "Benchmark '70", and a real '69 Yenko do burnouts & donuts! Another is how or under what circumstances members earn their nicknames, Gearlube & Pushrod come to mind. Probably the best (and worst) was during the '09 meltdown & rebuild of the Club. This really proved our mettle – the people whose heart & soul were in this thing stepped forward and kept NCC alive.
7-What have you gained from being a part of this club?
That is easy… The friendship of many individuals and couples/families that extends far beyond "Club" events, and into our day-today lives. NCC is great group of people!
8-What's your current ride specs? Future plans for it? Awards, features, etc?
My current ride is a '65 El Camino. It had the original 327/Glide when I got it in '08. Those are now mothballed, and it has gone through a 383/TH350 swap, and now currently runs a '96 LT1/350 & 4L60E powertrain (actually its 2nd LT1/4L60e – I blew up the 1st system at a Club event at Rock Falls!). I've upgraded the suspension with SC&C parts, lowered it, run a PowerTrax locker, and installed 4-wheel disc brakes. Another modification is a functional "Smuggler's Box" in the bed, and LED lighting for the rear. Future plans revolve around just DRIVING the thing!
To date I've garnered a few awards, 1st place at the Jefferson HS car show, "Best Non-Corvette" from Corvette Specialties, and probably the highest honor to date was "Best Judged Cruiser" at the 2012 PowerCruise at BIR. (The PowerCruise award means the most to me. The car was recognized as being DRIVEN 180 miles to the event, flogged on the road-course, and still was nice enough to garner the judge's attention.)
9-Where are you from, what's your occupation?
I'm originally from Chicago – or more correctly the NW Chicago suburbs. Moved to MN in '83 and didn't look back. I've lived in St. Louis Park for 25+ years now. I'm a "Power Limited Technician"… which is a fancy way of saying an electrician that does low-voltage systems. I specialize in card access and CCTV systems.

10-Anything you want to include?
Other than wrenching, my time is spent on home-improvement projects and trying to get "Up North" to our cabin.