

STREET RODDER Magazine

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Here's no magic to the Turbo 400, its just the best transmission ever made!" Now, if that was the opinion of a less knowledgeable man than Jim Bell, I would be tempted to take it with a grain of salt. But the proprietor of Kenne-Bell Performance Products is widely known as *the* expert on high performance Buick/Turbo Hydro combinations.

The popularity of the Turbo Hydra-Matic 400 is undisputed. Many hot rodders, like Jim Bell, feel it represents the state of the art as far as automatic transmission engineering goes. It is a sophisticated, heavy duty transmission that requires only minimal beefing even for competition purposes.

There is more than one kind of "400" however, and we don't mean simply bellhousing configuration and tailshaft length. There is an earlier variety that incorporated some pretty slick design features. Features that every street rodder thinking of running an automatic behind a GM motor should know about.

The big cars in, the '1965-67 Buick, Cadillac, Oldsmobile, and Pontiac lineup came with Turbo Hydros that had a "Variable Pitch" stator in the torque converter. But before we delve into the "VP" perhaps we should back up a bit and review the function of torque converters which are a special kind of fluid couplings.

In automotive usage, the fluid coupling is the device which delivers the flow of power from the engine to the transmission through a fluid (oil) rather than through a mechanical system such as a friction clutch.

The fluid coupling resembles a huge doughnut. Within it are two members, each containing a set of blades. When the *driving* member (attached to the engine crankshaft) rotates under power, it carries the fluid (the oil) with it. As rotational speed increases, centrifugal force throws the oil into the *driven* member (attached to the transmission gears). In this way torque is imparted from the engine to the transmission. But a fluid coupling imparts torque at max-

imum efficiency *only when both members are turning at close to the same speed*. If the driving member turns appreciably faster than the driven member, the oil bounces back and the efficiency of torque delivery drops.

The device designed to prevent oil bounce-back is the torque converter. It not only maintains the delivery of torque at a 1:1 ratio, under certain conditions it *multiplies* engine torque. Without going into some rather complex hydraulic relationships, let us just say that, functionally, the converter compares with a conventional transmission in low gear - where a reduction in speed increases torque to the rear wheels. In operation, the torque converter, when required, supplements the planetary gears in the automatic transmission.

The Turbo 400 torque converter is made up of two vaned sections that face each other in an oil-filled housing. It also contains a smaller vaned section called the stator. The stator funnels oil back to the converter pump at high rpm. In essence, it is the stator that changes the unit from a simple fluid coupling to a torque converter. And that brings us back to the subject at hand.

As we said earlier, the stator assembly in some earlier 400's is a variable pitch

unit. That is, the blades or vanes are operated at either of two positions - maximum or high angle (26°), and a minimum or low angle (18°). High angle means greater redirection of the fluid and increased torque multiplication for maximum performance. (Paradoxically, when the engine is idling in gear, high angle position *reduces* the efficiency of the converter to inhibit forward "creep.") Minimum or low angle results in a more efficient torque converter for cruising and overall gas economy.

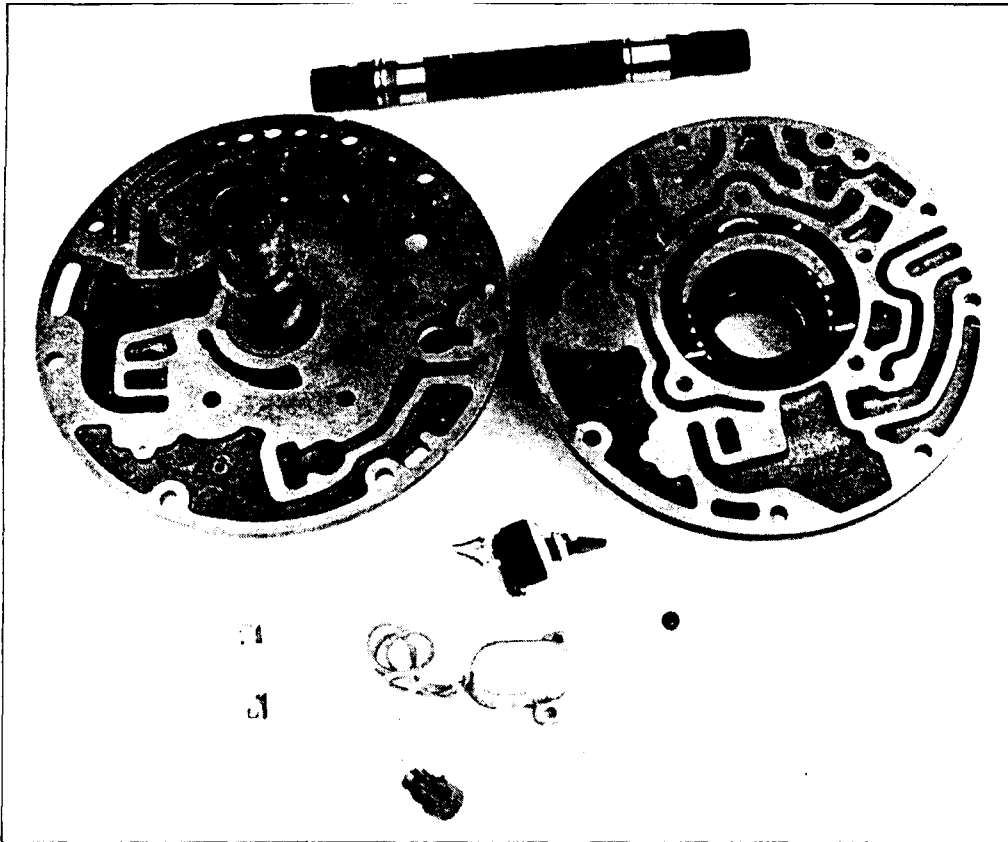
In the stock '65-'67 Turbo 400, a solenoid was used to "switch the pitch" or stator angle. In most GM installations the solenoid was activated by a signal from a switch on the carb linkage. In others, the solenoid was activated by the brake light switch.

If all this sounds good to you, you may be wondering why GM suddenly dropped this feature in their Turbo's. Well, we are told the reason was simply one of economics. The Variable Pitch 400 was more expensive to produce, and the cost analysts (bookkeepers, not engineers) felt it was a non-essential refinement. As a result, the 1968 and later transmissions all came with a fixed pitch stator. The vanes are stationary and set at a compromise angle of 23°.

Let's say you have a fairly heavy street machine running a hot Buick V8 equipped with a Turbo. If you have a reground cam that kicks in at 3000 rpm, and you floorboard it on the line, the engine just goes to about 2000 rpm and

SWITCH the PITCH





LEFT-If your Turbo Hydro 400 is a fixed pitch model, this is what you need to turn it into a variable pitch. high-stall/low-stall stromer /n the transmission proper-the pump assembly, the specially drilled pump shaft, and the solenoid. The switch is usually mounted on the dashboard or tied in to the brake light

BELOW-The variable pitch torque converter rounds off the change-over It contains a stator with moveable blades for either a low stall or high stall configuration

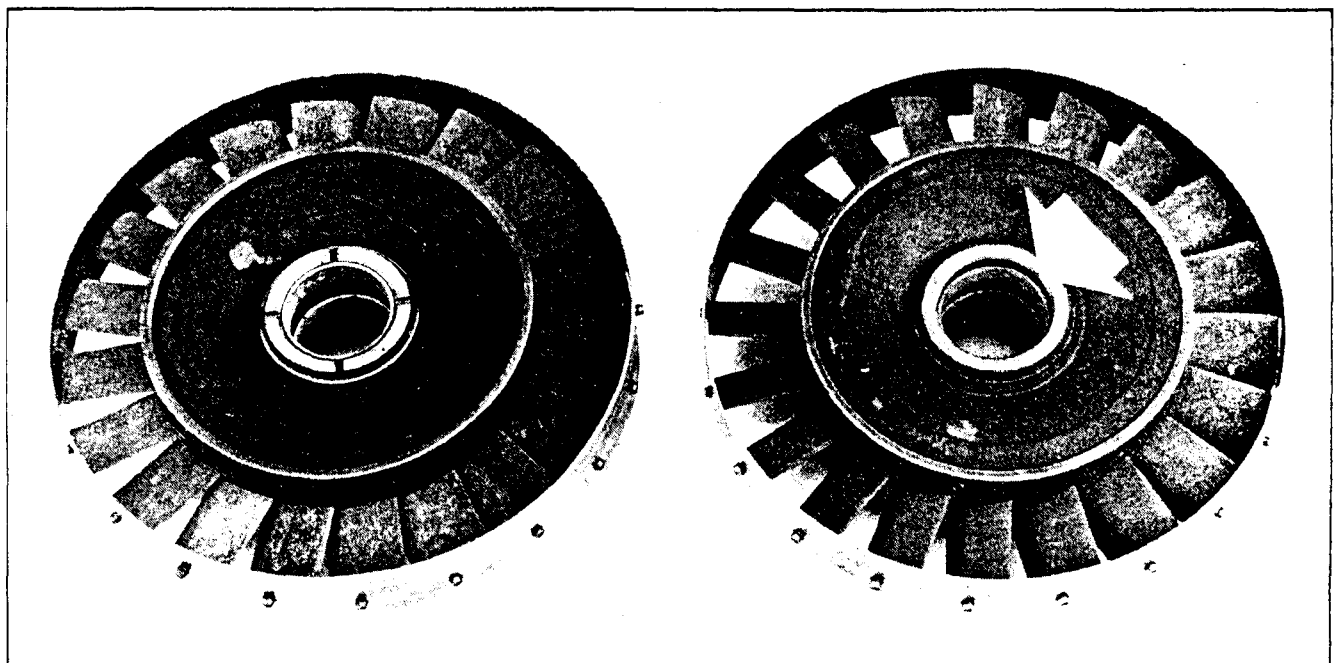
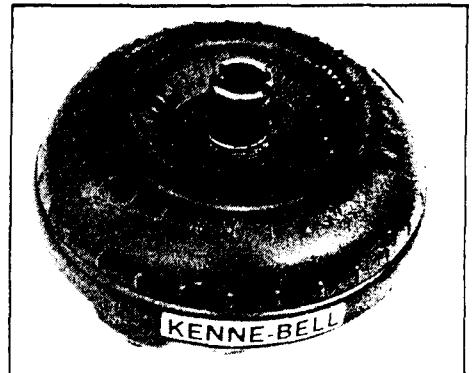
BOTTOM-Open up a variable pitch torque converter and you'll find a stator with moveable blades K-B machines the piston Inside the drum (arrow) so that the drum moves further permitting the blades to open (or close) further.

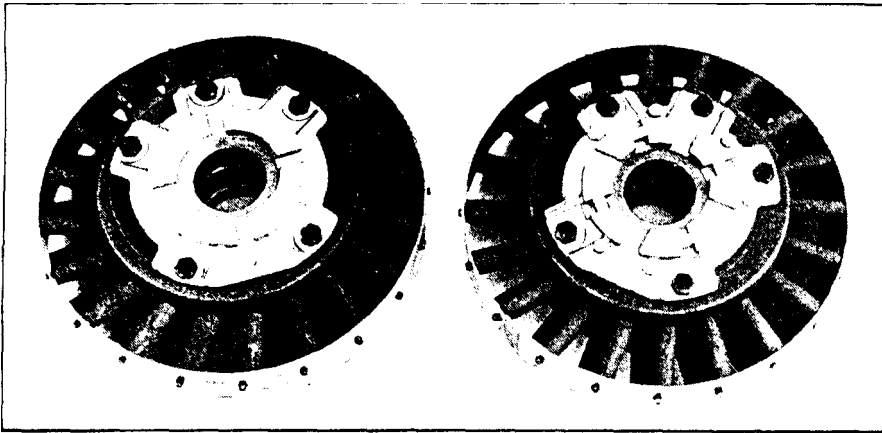
lugs. This was why performance trans rebuilders started putting in "high stall converters" many years ago. With a high stall. when you step on the gas, the engine can scream to about 3,500, the cam comes on strong and the car roars away.

But there is a real problem with high stall converters on the street - they're slipping a little bit all the time and that means heat and poor gas mileage. High stall transmissions absolutely require an

extra trans cooler, but even so, the high stall converter just isn't that great an idea for the street rodder.

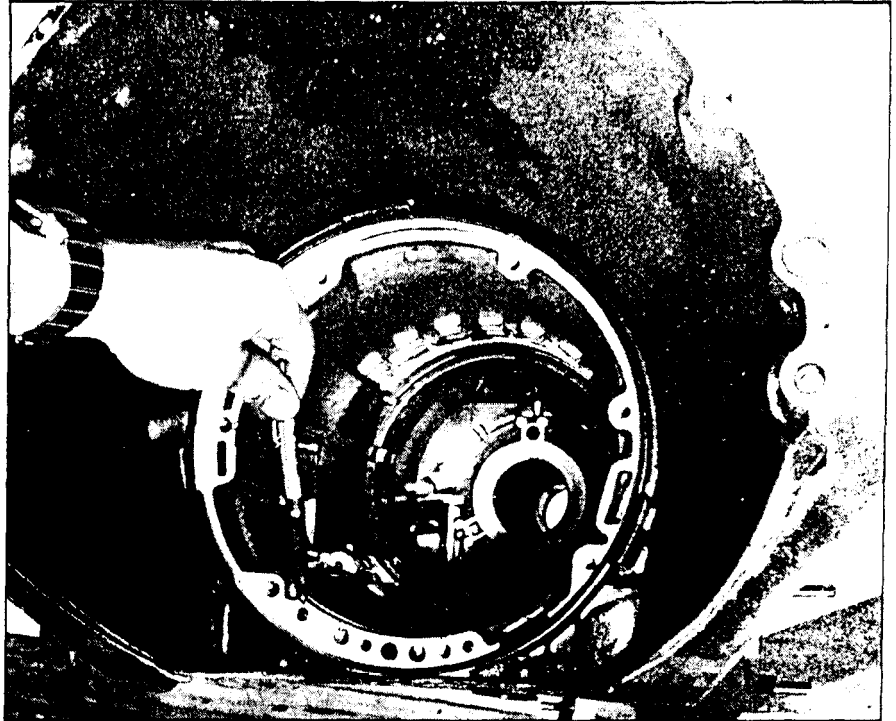
But that "old fashioned" Variable Pitch - now that's something else. For the racer . . . and for the street. That's where Kenne-Bell comes in. Back when Buicks first came out with the VP, Pop Kennedy, the drag racing founding father of K-B, was pulling hole shots on everybody. And the competition couldn't figure out why. Up until that



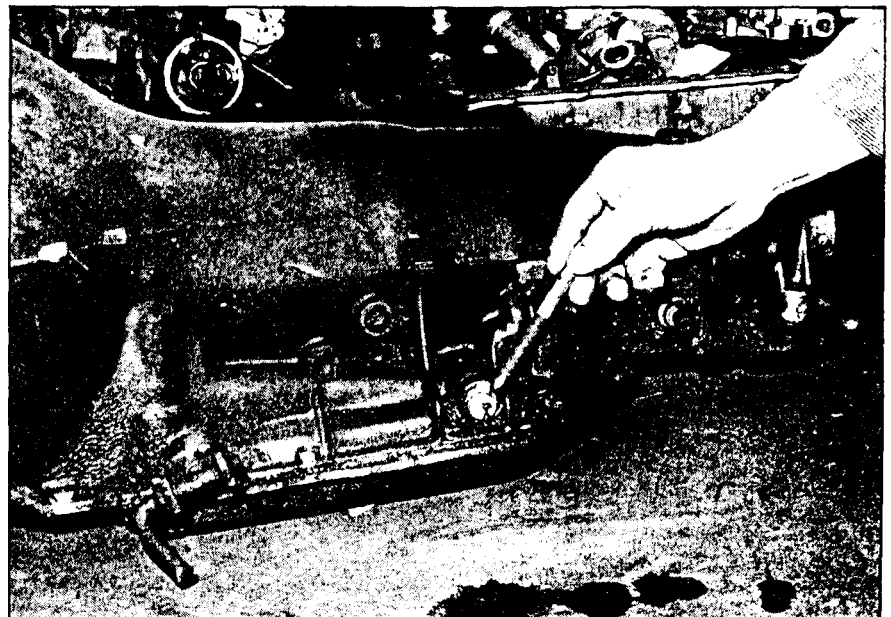


LEFT-When the stator blades are closed to the minimum angle, the low stall position (on the left), you can expect efficient cruising and good gas mileage. When they are open to the high angle-high stall position - there is a greater redirection of oil and increased torque multiplication for maximum performance.

BELOW-The K-B kit should be installed by a professional transmission mechanic w,th Turbo Hydro experience. Just leaving out one small plug here renders the entire conversion inoperative.



BELOW-If you go searching through the wrecking yards for a Variable Pitch Turbo Hydro, you can always identify one by the two pronged electrical connection on the left side of the unit. One prong is for the kick-down solenoid, the other is for the VP.

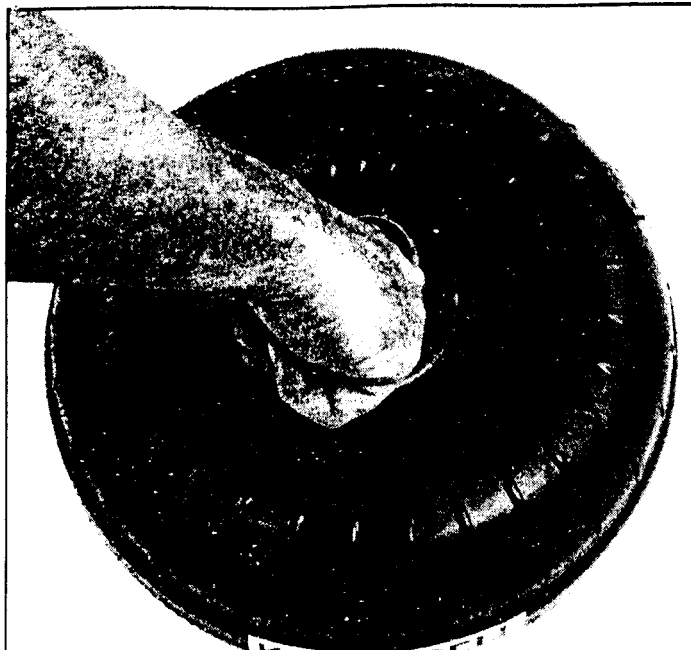


time Buick wasn't exactly a name synonymous with high performance on the strip. At least not since the mid-Fifties and the days of the Buick Century.

But about ten years ago, Pop and Jim Bell, like all successful and enterprising hot rodders, knew that just because something automotive was good didn't mean that it couldn't be made better - by hot rodders. So they literally started digging into variable pitch converters and making some small, but impressive, performance changes. So much so, that what started out as an adjunct to their high performance Buick parts business wound up as their Number One product - "Switch Pitch" kits for all Turbo Hydro 400's.

The K-B conversion consists of a new pump assembly and a rebuilt/modified torque converter. Installed in any Turbo 400 (by a competent transmission shop) it'll make a believer out of you. It sure did for me.

I don't normally get to drive brand new cars, (Admittedly, I rarely get the



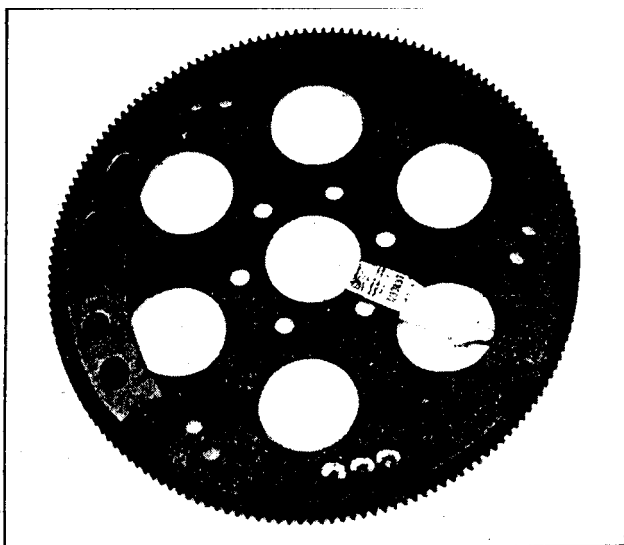
LEFT-Don't forget though, you also need a VP converter. The best way to identify it (short of tearing it apart) is to feel for the internal splines. VP splines are quite deep, so if you can feel them, chances are it is a fixed pitch stator.

ABOVE-The K-8 adapter plate will mate the Buick Pontiac Olds or Cad Turbo Hydra to the Chevy block and most of these are considerably less expensive in wrecking yards than the Chevy Turbo.

urge.) So when Jim tossed me the keys to his late 350" powered Buick, it was just part of the assignment. At first.

Jim's Buick has a pretty hot cam in it. You can hear it lope at idle, but you can't feel it in the car. (All vibration and roughness is absorbed in the converter.) The only outward sign of the Switch Pitch trans is the toggle on the dash. Anyway, I slipped behind the wheel, put the trans in Drive, and flipped the switch to high stall. I stood on the brake, ran the motor up to 3500 and dropped

RIGHT-Different engines use different flex plates. On the Buick, the mounting holes are close together. The outside series is for a 13" converter (2400 rpm stall), the inside series is for an 11" converter (2800 rpm stall). The smaller converter came on the V6's and the smaller V8's and because of its higher stall rpm is considered the better of the two.



SWITCH the PITCH

the hammer . . . uhh, took my foot off the brake, and held on. That big Buick went screaming down the road.

It took a little getting used to, but I had a ball going from low stall to high stall and back again, watching the needle sweep across the face of the tach, and listening to the tires squeal.

What was really tricky was hitting the passing gear, feeling the car move out and then flipping the Switch Pitch to high stall and hearing the motor reach for another 1000 rpm. I have to admit, I could have done that all day long.

Jim's Buick runs 14.50's at the drags with street tires and trim. And he gets 18-20 mpg around town with the low stall. His is probably the most impressive late model American car I've driven in years.

If you're in the market for a variable

pitch Turbo 400, Jim has some advice to pass on. You can probably find an original VP trans in the boneyard, but look for one with the smaller 11" converter. All the big cars had the 13" converter with a high stall of 2400 rpm. The 11" converter came behind the small V8, and the V6, and they have a high stall of 2800 rpm. Low stall on both is around 800 rpm.

Of course, if you can't find an original VP, or if you already have a Turbo 400 that is non-VP, K-B is more than willing to supply a conversion kit either for the street or for competition. (Street specs are 1800/2600 rpm, comp specs are

2200/3400 rpm).

If you are planning on buying a Turbo for a Chevy motor, here's another tip - the Chevy core runs in the neighborhood of \$150 (because of high demand) but you can get a Buick-Olds-Pontiac core for \$25-\$35. Order an adapter plate from K-B along with the Switch Pitch conversion kit and you're in business.

When all was said and done (and we had worn enough rubber off Jim's tires) we had to confess that we were more than pleased with this gear box. GM big car automatic transmissions have come a long way since the days of the Dynaflo!