

# TRANSMISSION

D I G E S T

The Automotive Powertrain Industry Journal

## *e-Shifted Street Rod*



- **Hard-Parts Focus**
- **Identifying GM Sticks**
- **Allison Lockup Surge**

Allison 1000/2000/2400 • Altima • Audi 01J • 50-42 LE  
GM M10, M12, M86, MA5, MG5, ML6, MM6, MN5, MT2, MU3, MV1, MW3

# *e-Shifted Street Rod*



**Mike Hoy's 1948 Chevy Sedan Delivery was the first vehicle outfitted with the CompuShift system.**



**The original prototype CompuShift was wired and hand-soldered on a breadboard.**



**Eric Bailey has worked at Hoy's Torrance Transmission shop for about 25 years, currently as manager. As Mike becomes more involved with CompuShift, Bailey is taking over all retail-shop operations.**



**The AccuLink allows the CompuShift to acquire a TPS signal from carbureted engines.**

**M**ike Hoy's desire to outfit a street rod with a 4L80-E transmission led to the creation of HGM Automotive Electronics, parent to the CompuShift line of aftermarket computer controllers. At the time, Hoy said, there was only one controller on the market and he wasn't satisfied with the way it worked.

"I tried to do the controller on my own for a few years but couldn't quite get it to perform the way I'd envisioned. One day, I was talking to one of my shop customers, a senior electronics engineer at Boeing named Hap Cardwell. He took an interest and was able to design the circuitry that allowed us to build our own computer from the ground up."

Hoy's shop, Torrance Transmission (Torrance, Calif.) celebrated its 30th anniversary last year (See *Transmission Digest*, October 1996). Hoy says that as the HGM project has grown, he has been spending more time with it while turning the retail-shop operation over to longtime manager Eric Bailey.



**Finishing several final assemblies, Guy Cardwell also designed the digital circuitry and has authored more than 6,000 lines of computer code to make CompuShift perform all its varied functions.**



**A CompuShift kit ready for shipping. HGM has produced more than 2,000 of these kits since 2000.**



**Hap Cardwell, an electronics engineer, designs the circuitry for the CompuShift Line.**

“By specifically designing the hardware and software to our purpose, what we end up with isn’t a modified controller originally designed to do something else,” he explained. “CompuShift is a programmable controller fully capable of monitoring and controlling shifting across a wide variety of electronic-transmission applications. From the start in 1995 it took five years to perfect.”

Cardwell designed the circuitry for the unit and called upon his son, Guy, to design digital circuitry and write the instruction set used by the computer. In the end, Hoy says, they had a flawlessly functioning unit. The HGM partnership (Hap, Guy, Mike) prototyped and then produced the first working model of close to 2,000 CompuShift units manufactured to date.

The CompuShift computer controller and display unit are the same in each kit. Each does, however, contain transmission-specific cables and connectors to complete the installation job.

“We make kits for all the popular Ford and GM electronic transmissions: 4L60-E, 4L65-E, 4L80-E, 4L85-E and the 4L60-E transaxle found in the Corvette,” Hoy said. “Ford coverage includes AODE, 4R70W, E4OD and 4R100. We also can handle the electronic transmissions that would be behind a diesel engine. In that vein, we’re seeing a lot of Cummins conversions where guys are taking the Ford trucks and putting in the Cummins diesel. We have programming for that built into the unit. It’s a case of bolt it in, turn it on and drive it away.

“We often are called upon to pull out an old three-speed and replace it with an electronic four-speed. One of the most-common changeovers we do here in the shop is to pull out a 700-R4 and replace it with the 4L60-E. The converter clutch works so much better with the 4L60-E because it’s all computer controlled. CompuShift allows us to set when it comes on and when it goes off as a percentage of throttle. The guys

## Profitable Opportunity

**M**ike Hoy reflects that he was lucky to have established his specialized street-rod business early on at Torrance Transmission. As transmissions are being designed to last longer, he says, traditional transmission work is not as profitable as it once was. “We’ve changed with the times as the transmission industry has changed. In order to stay busy and keep the bays full and the employees working, we have to take what comes. We’ve all made our bread and butter over the years with the customer who’s shopping to have his transmission rebuilt. When those people come to you, they don’t want to have to fix their transmission and don’t want to spend \$2,000 or \$3,000 on their Toyota Camry.

“But the street-rodder or muscle-car owner who comes in here often wants to spend \$20,000 to do a complete re-power on the car. He’ll give you \$10,000 up front and say, ‘Call me when you need more.’ That’s the kind of customer we want to find, to satisfy and to keep. It’s working for us and we’re staying busy. The shop’s full and we’ve got additional work scheduled and lined up waiting.”

Hoy points out that shops around the country should look to build profitable business. He says the custom work they’ve done on street rods is not only profitable but also fun. He finds that the customer becomes more of a partner with the shop as everyone tries to create the perfect ride.



**Mike Hoy handles both sales and support calls from his office/lab at HGM Automotive Electronics.**



**This El Camino has a built 454 engine replacing the original 400. That vehicle didn't like highway driving, so a 4L80-E transmission was installed. Adding the electronic transmission means that it can be driven on the freeway without being tied to the engine speeds that would have applied to the original 400 engine.**



**A bottom view of a 1960 Buick convertible with a 502 Chevrolet crate engine, 4L80-E and a 3.55-1 differential. Before the CompuShift modifications the car churning 3,000 rpm at highway speeds; after the changeover the range is 2,000-2,200 rpm.**

trying to use 700s don't have that control and have to choose to have the converter clutch either on or off.

"Each unit comes with a pre-programmed shift table for each particular transmission unit. But, you can get into the setup mode and adjust shift characteristics and shift points. One of the setup inputs is to tell the computer if the engine is gasoline or diesel. Since diesels typically run at lower rpm, we have a different shift table developed for various diesel-engine applications.

"There's also a mode selection that allows a choice between automatic shifting, automatic push-button shifting, automatic with tow-mode control or full manual mode. You can do your TPS calibration from the display or on the computer. The same is true for adjusting pressures and shift speed. Additional inputs



**The HGM partners constructed this bench-test machine to give every unit a full battery of tests before being packaged and shipped.**

include gear ratio, tire size and vehicle weight. The gear-ratio and tire-size inputs are used to calculate the output going to the speedometer. CompuShift even has an included dynamometer feature. Given the weight, gear ratio and tire size, the unit measures the rate of acceleration and gives a very close measurement of horsepower.

"It offers total adjustability for the lockup clutch as well. If the transmission was designed with the hydraulic ability to call for lockup in a given gear, then the CompuShift can call for lockup in that gear as well. Apply and release speeds are programmable. Pressure boost can be adjusted as well as tow-speed features that allow pressure rise or shift-speed rise when towing a heavy trailer. It also has passing-gear adjustability.

"There's a complete diagnostic system on board as well that looks at pressure, temperature, switches etc. We offer telephone support by having the customer put it in that diagnostic mode and looking at what's happening. This is useful in finding, for instance, a wiring issue. All of that information is available right on the display unit."

One of the challenges the group faced was to interface the CompuShift, which requires a throttle-position reading, with street-rod configurations that used carburetors instead of fuel injectors. "We designed the Acculink system to afford anybody who wants to use a carbureted engine with a computerized transmission to do so with the CompuShift," Hoy said.

"Acculink puts a throttle-position sensor on most all the popular carburetors. The TPS is aligned linearly with the carburetor and, therefore, is extremely accurate. And it's self-calibrating. Once you've installed it you turn on the ignition, push a button and stroke the throttle. Now, you're ready to go drive the car.

"The shift pattern established by the CompuShift



**Component boards, the heart of CompuShift, are readied to be tested and assembled.**

relies on inputs that include the throttle position. In the case of carbureted engines, that signal has to be added before the CompuShift can be used to control transmission functions. We designed the linkage and mounting system of the Acculink so that Holley, Edelbrock, Rochester, Demon or Barry Grant carburetor systems can be used in conjunction with an electronic-shift automatic transmission.”

Hoy explained that each specific application kit can be bought with Acculink or, for fuel-injected applications, without it.

Hoy believes that HGM customers have come to expect a normal service life for transmissions controlled by CompuShift. “CompuShift controls line pressure very aggressively. In my ‘48 Chevy (nine-clutch heavy-duty pack) that we used during the development and testing of the computer, we drove it and flogged it over a five-year period. We took the transmission apart two or three times during that period to see what was going on inside and never did find any damage or excessive wear in the clutches. We install these and never see them again because they don’t fail.

“If the transmission is set up right and the line pressure is properly controlled, there shouldn’t be any issues whatsoever in the changeover. Setting up the transmission involves using the right converter and the right input shaft integrated with the CompuShift. Guys with larger engines are using the 4L80-E and putting 850 horsepower, or more, into them all the time without experiencing any failures or difficulties.

“The CompuShift kit with electronic connector harnesses and all will run about \$1,100. The cost of a changeover depends on the vehicle itself. There are fabrication issues including modified driveshafts, cross members and things like that. Often the owner is looking at a five- or six-thousand-dollar changeover. But, street rods that are being built today are commonly worth upward of \$200,000. And the ini-



**A 1966 Mustang is receiving a complete re-power. It gets a new 5-liter crate engine, CompuShift-controlled 4R70W, a new differential setup, exhaust system and rewiring.**

tial outlay to accommodate the electronic transmission is only a couple of thousand dollars. It works better, lasts longer, and street-rod customers aren’t turned off by spending the extra money.”

As we toured the HGM shops, Hoy pointed out several new projects in the development stage that represent new opportunities for street-rodders and the ease of installation of the CompuShift kits and electronic transmissions.

Standing in front of a Rolls-Royce street rod, Mike tells us: “You know, my plan is to completely turn over the retail operation to Eric within the near future and to spend my time with the CompuShift line. I’m not thinking of quitting or retiring or anything like that; I’m still having way too much fun!” **TD**