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ELECTRONICALLY REPRINTED FROM APRIL 2010

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PONTIAC

461ci '68 BIRD



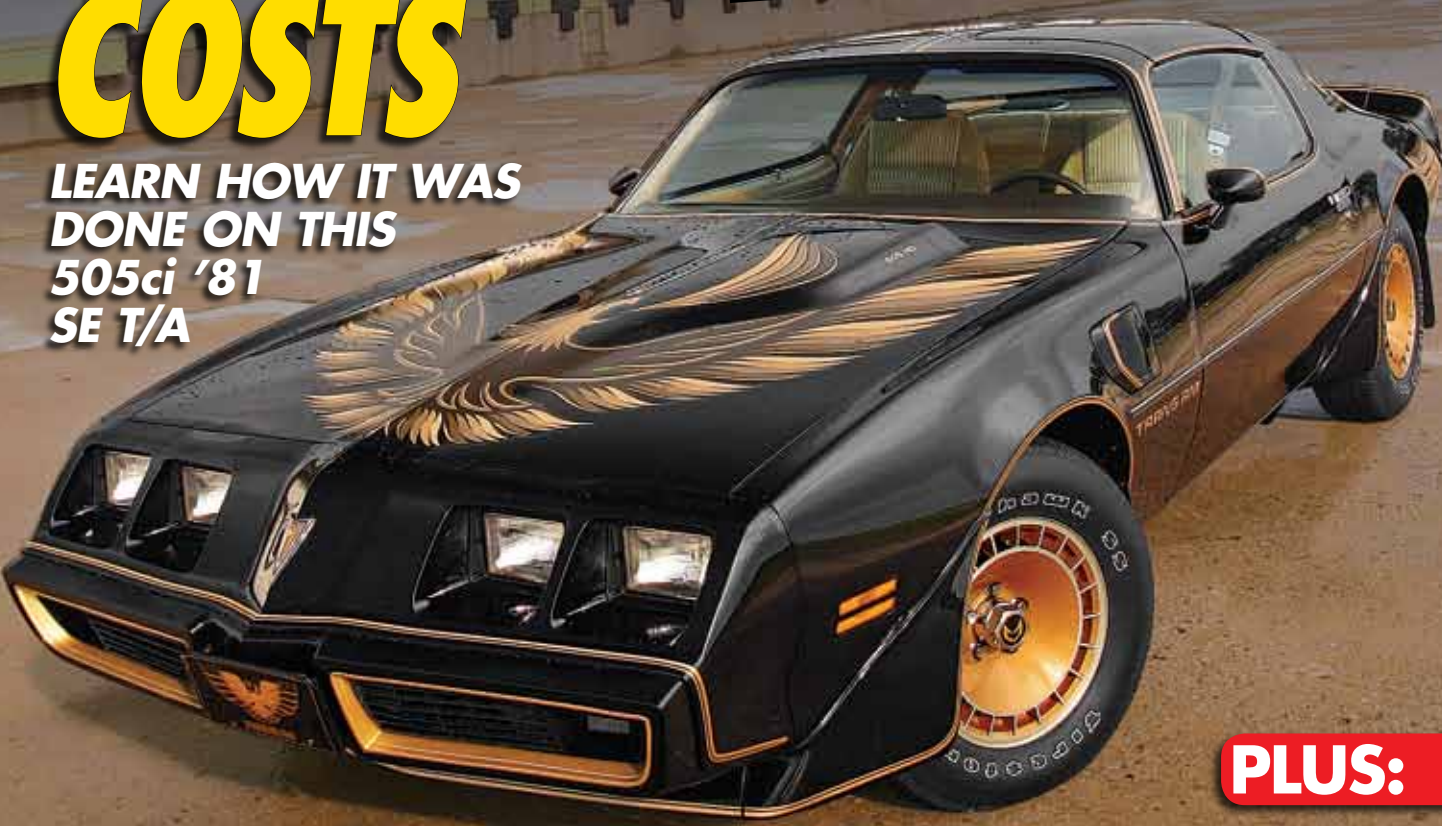
vs.

511ci '02 BIRD



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SHIFTLESS PLEASURE

Bolting a 4L85-E SuperMatic Transmission Into a 503-Horse/522-lb-ft of Torque '74 SD-455 Trans Am PART III: Cooling and Electronics

BY THOMAS A. DeMAURO
PHOTOGRAPHY BY THE AUTHOR
AND THE HPP STAFF

As promised in Part II, we will tackle the cooling and electronics aspects of the GM Performance Parts (GMPP) 4L85-E SuperMatic trans swap in this article. First, here's a brief review.

Part I (Feb. '10) of this series covered the history and development of GM's four-speed overdrive transmissions and introduced GMPP's latest unit, the 4L85-E SuperMatic, which shares its forward gear ratios of 2.48:1, 1.48:1, and 1:1 with the vintage Turbo 400, but adds an Overdrive gear of 0.75:1, electronic control, and a much higher torque capacity over the 4L80-E and 4L85-E that came before it. With a torque capacity of 685 lb-ft, the SuperMatic will live

behind many a high-torque Pontiac buildup.

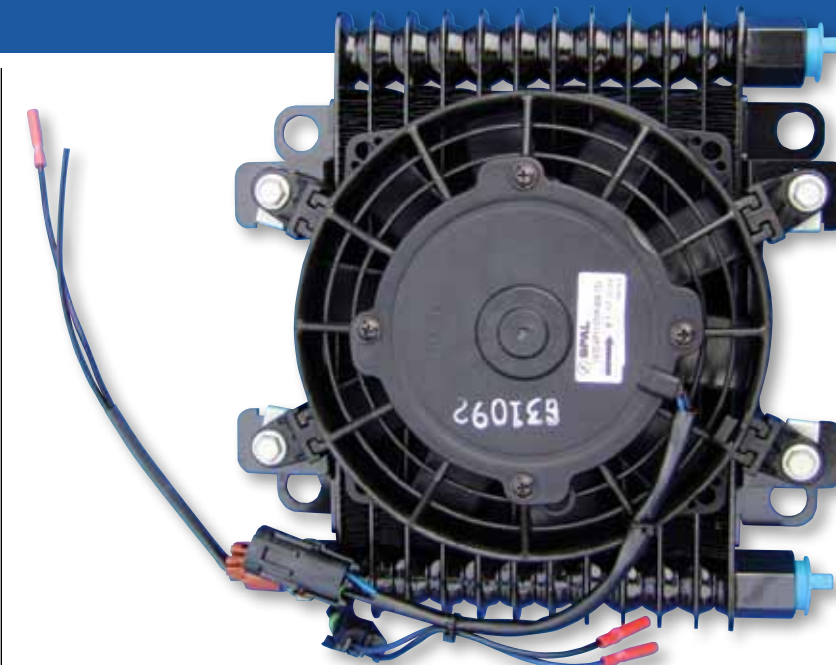
In Part II we highlighted the mechanical aspects of swapping the transmission and the included lockup converter (approximately 1,800-2,000-rpm stall speed) into a '74 SD T/A in place of the factory Turbo 400. We also addressed frequently asked questions regarding a swap such as this.

In this installment, we discuss the installation of the cooling lines and cooler, the required GMPP transmission control unit (TCU), and ancillary components to make the trans function properly. Next issue, we will discuss tuning the trans via a laptop using GMPP's software.

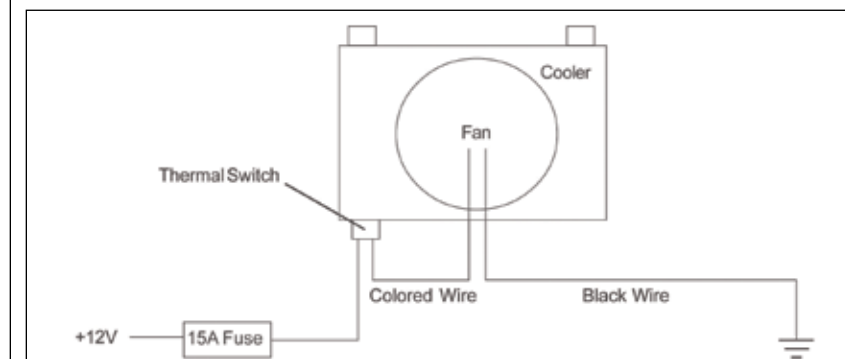
The installation and tuning of the transmission took place at Classic Restorations in Pine Island, New York. The business' owner and HPP contributor, Melvin Benzaquen, also owns the SD T/A. Classic Restorations Technician Scott Hand performed the swap.



Here is the 4L85-E SuperMatic.



B&M's Hi-Tek Cooling System is a plate-fin oil-to-air cooler with its own draw-through fan. A bi-metal temperature switch turns the fan on at 176-degrees (+ or - 5.4 degrees) and turns it off at 140-degrees (+ or - 5.4 degrees). Since the cooler has its own fan, it can be mounted in different locations. However, the fan has to be at least 6 inches from an exhaust source and 2 inches from the closed hood, the wheelwell or the firewall, or 1 inch from the radiator fan. Rubber isolation mounts are recommended, and the unit should not be mounted to an area that will see lots of flex when the car is driving or it may crack the cooler and cause leaks.



Here are the electrical connections for the fan. It's very important to verify correct polarity when wiring the fan or it will turn in the opposite direction and diminish cooling efficiency greatly. A 15-amp inline fuse was employed per the diagram.



This is a test fitting. Scott was able to fit the unit ahead of the A/C condenser, as there was no room behind the radiator. He will remove the unit and reorient it so the thermal switch is at the bottom, instead of the top, to eliminate possible cavitation of the fluid, which would result in false temp readings. He will also install rubber spacers at the attachment points to provide a 1/4- to 1/2-inch air gap from the mounting surface, and also to further isolate the unit from vibrations. Even though this mounting point seems counterintuitive, since the fan is a draw-through design, B&M says it should still work well. Other possible mounting points, according to B&M, are under the car, above the fenderwell, and on the firewall.



The hoses were routed along the pan rail toward the back of the engine. Small brackets were fabricated to keep the hoses in place. (Each one will be fitted with rubber grommets to protect the hoses).



To transport hot trans fluid to the cooler and deliver cool fluid back, pre-bent hard lines pirated from a Chevy truck cooler with ...



... 1/2-inch NPT fittings at the forward end to attach to the braided hoses and ...



... quick-disconnect fittings at the trans end to mate with Dorman quick-disconnect trans line connectors were installed. All fitting threads had anti-seize compound applied. The Dorman fittings were torqued to 28 ft-lb.

FLUID



Lokar's Hi-Tech trans dipstick is designed to mount on the firewall. With firewall space at a premium, Scott made a bracket from the firewall to the A/C box and mounted the Lokar bracket and dipstick tube to it, so the trans fluid level can be easily checked.

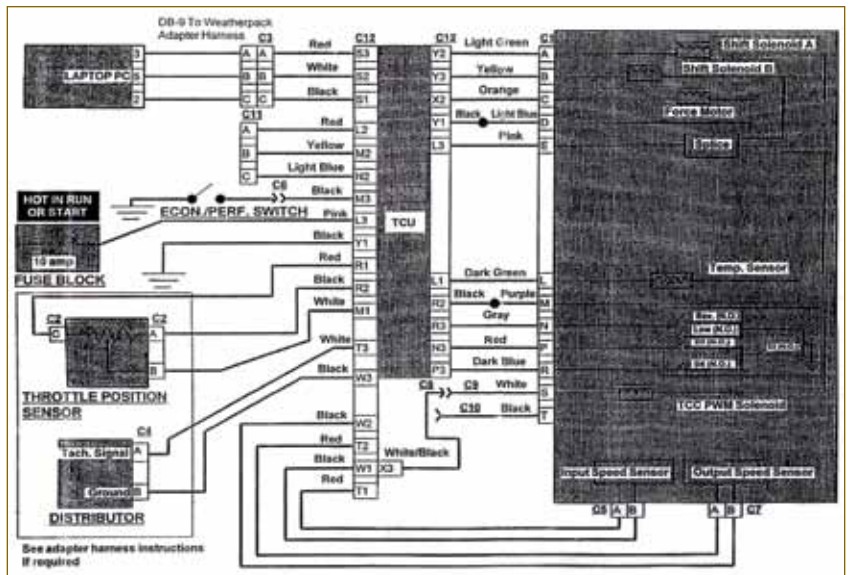


At the business end of the flexible dipstick tube, the double O-ring seal connector will be pushed into the transmission's port. Then the trans will be filled with approximately 7.7 quarts of Dexron VI fluid (8.25 quarts for us given our cooling system). Fluid level should be checked on the dipstick with the trans in Neutral and the engine running at operating temperature.

ELECTRICAL



The GMPP Transmission Control Unit (TCU, PN 12489489) is the heart of the Transmission Control System. This system also includes a wiring harness (PN 12489490), TCU/laptop interface cable (PN 12489579), laptop disc (PN12490207), and specifications (PN 12489491). It was mounted on a bracket that Scott fabricated just under the top of the passenger side fender.



FEATURES YOU CAN CONTROL

How much control does the transmission control unit provide the owner?

Wide Open Throttle (WOT) Minimum Shift Time: Set the time delay from the shift signal to the actual shift by the trans.

Part Throttle Shift Time: Set the time delay from the shift signal to the actual shift by the trans.

Minimum TPS % for WOT: Determine the throttle position the TCU recognizes as WOT to make the shift timing rpm controlled.

Maximum TPS % for Idle: Determine the TPS threshold between idle and part throttle.

Downshift Hysteresis MPH: Set the difference in the upshift (acceleration) to downshift (deceleration) mph at part throttle.

Reverse LP Kick %: Determine the percent of additional line pressure added when shifting into Reverse.

Econ/Perf LP Kick %: Determine the percent of additional line pressure added when the TCU is in Performance mode.

WOT Parameters: Dial in upshift rpm for each gear. Set the mph for forced downshift for each gear.

TCC Lockup Parameters: Change several variables of torque converter lockup functions.

Minimum MPH for TCC Lockup: Dial in the mph limit under which you do not want the converter to lockup.

TCC Lockup Rate: Dial in the feel of the converter lockup by adjusting the time it takes to complete the function. The more time (bigger number) the softer the apply will be.

Converter Lockup Delay: Eliminates converter hunting by allowing a settable time value between apply and release.

Engine Braking Parameters: Set the maximum mph at which the trans will make a forced manual downshift.

Slapstick Parameters: Can work with an electronic, manually controllable shifter.

Force Motor Tables: Adjust shift feel for each gear via line pressure curve settings.

The TCU also has dashboard overviews to help monitor vehicle sensors and has data logging capability.

If the idea of dialing in all of these parameters intimidates you, then don't do it. The transmission is delivered to you with default settings that allow you to drive the car normally without reprogramming anything. However, if you want to dial in each aspect of the transmission's operations to your liking, you can. —TD

With an 800-rpm drop at 75 mph thanks to the overdrive gear, the SD-455 T/A has a new character

Here is the wiring diagram for the TCU and transmission for reference. The wiring is coded C1 to C12 for ease of installation. C3 provides a computer hook up for the laptop. C4 goes to the distributor to get an rpm reading so the TCU can set WOT shift points. C6 must be wired to a switch on the dash to enable the Performance shift mode. If the wire is not grounded via a switch, the trans will stay in Economy mode according to GMPP. C8 is plugged into C9 and they control the torque converter clutch function. C10 gets taped off, and C11 is optional for a slapstick-style shifter. C12 plugs into the bottom left-hand port of the TCU and is secured with ¼-inch-head bolt. There is also a black ground wire from the harness to the battery to reduce electrical noise to the TCU, and there's a pink ignition wire that has to be connected through a 10-amp fuse to the fuse box to receive 12 volts only when the ignition is turned to On.

TCI's combination bracket retains both the throttle cable (upper) and the TPS cable (lower). After attaching the cable to the carb linkage, it is adjusted by setting its length at the carburetor, so the TPS is able to travel its full range from closed throttle to wide open throttle (WOT) as the carb linkage travels from closed to WOT. Then the hardware is tightened to lock in the setting.



The connectors were plugged in on the driver's side of the trans. C5 is for the input speed sensor located forward on the case about half-way up. C7 is for the output speed sensor midway up the case toward the back of the trans. C1 is the large connector at the lower rear of the case, which controls all of the internal solenoids. In the next issue we'll discuss programming the trans.



Since the SD-455 engine was converted to EFI a few years ago, the wires for the throttle position sensor (TPS) (C2) were simply spliced into the existing EFI wiring harness. The TPS output allows the TCU to determine shift points and firmness.



Since most vintage Pontiacs will be running a carburetor, we'll illustrate how to set up TCI's remote TPS on another car. It's mounted on the fenderwell, the cable runs over to the engine, and is attached to a bracket and the throttle linkage.

BACK ON THE ROAD

Following initial break-in, driving the T/A on the highway has taken on new meaning for Melvin, even in Economy mode with the default programming still in place. "I have always enjoyed the power and the performance of the SD on the road, but highway driving has been stressful, even with the 3.08:1 rear gears," he laments. "I've been spoiled by late-model cars that cruise down the highway in overdrive at much lower rpm. With the T/A, I always had the sense that the engine was working more [and wearing more quickly] than it needed to." Imagine what it would be like if the Pontiac had 3.55s or 3.90s out back.

With an 800-rpm drop at 75 mph thanks to the overdrive gear, the SD-455 T/A has a new character on the highway. "I can actually hear things that I've never heard before—like the radio! And a squeak I have to fix," Melvin says. "At first, I was concerned that adding the OD trans with the 3.08 gear would make the engine lug and feel lethargic in OD, but it hasn't been the case. The T/A still feels powerful, but it's quieter and the engine seems less labored at highway speed." With an effective rear gear ratio of 2.31:1 in OD you can see why Melvin was initially concerned.

Though around town fuel mileage gains will be none or negligible at best, out on the highway, we did document an improvement

of 4.1 mpg based on driving four one-hour-and-fifteen-minute test loops at a steady 70 mph. 🗨️

HIGHWAY RPM CHANGES

MPH	RPM OD	RPM w/o OD
55	1,600	2,250
60	1,750	2,400
65	1,900	2,500
70	2,100	2,750
75	2,200	3,000

SOURCES

B&M Racing and Performance

(818) 882-6422
www.bmracing.com

Classic Restorations

(845) 258-2050
www.classicresto.com

GM Performance Parts

See your participating GMPP dealer
www.gmperformanceparts.com

Shiftworks

(585) 383-0574
www.shiftworks.com

Trans-Dapt Performance

(562) 921-0404
www.tdperformance.com

PARTS AND SERVICES

Part	Part No.	Price
GMPP 4L85-E SuperMatic (converter included)	19154550	\$3,149.95
GMPP Transmission Control System (not PN 1249736 as stated in Part II)	12497316	\$1,200.93
Trans-Dapt Performance Adapter	0061	*\$99.99
ARP Flexplate Bolts	200-2904	*\$26.99
Classic Restorations Crossmember	4L85EX	\$375.00
Shiftworks Shifter Conversion Kit	SC2262	\$89.25
Shiftworks Mechanical Speedometer Kit	SW44-A	\$495.00
Moroso Dowels	37932	*\$11.99
Aeroquip 6 AN Braided Cooling Line, 20-foot Roll	SUM-230820	\$4.25 per ft
Aeroquip Hose End Fitting (2) 6 AN	FBM1012	\$6.75 each
Aeroquip Hose End fitting (2) NPT ½ inch	FBM513	\$7.95 each
GM Silverado Trans Cooler (hard lines used only) <i>(Since the cooler was damaged, it was donated by the dealer, so Melvin could use the lines, as they are not sold separately.)</i>	19171483	\$91.10
Dorman Quick Disconnect Trans Line Connector	800-605	Came with trans
Dexron VI Trans Fluid (9-quarts)		\$4.49 per quart
B&M Hi-Tek Cooling System	70298	\$217.86
Lokar Hi-Tech Trans Dipstick	TD-34L80FM36	\$81.99
Shorten, Rebuild and Balance the Driveshaft	N/A	\$250
**TCI Remote TPS Switch and Mount for a Carb Application	377401	\$162.62
**TCI Carb Bracket, Q-jet	376700	*\$25.99
**TCI Carb Bracket, Holley	376705	

*\$27.99

**Jeeps prices, all others are manufacturer prices except GMPP, which are from GMPP dealers.*

*** Required for carb applications, but Classic didn't use them on the SD-455 since it had been previously modified with EFI.*