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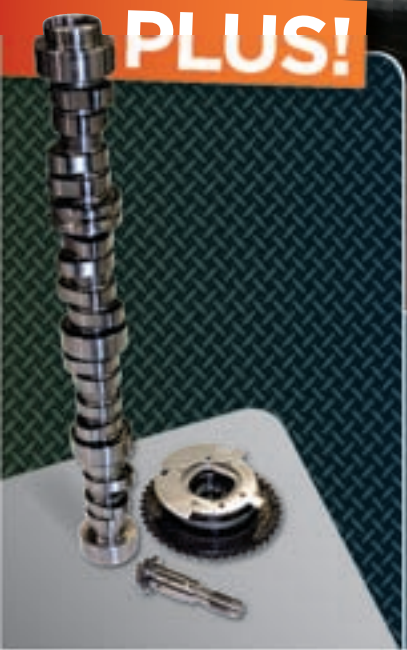

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PART II: LS376/480 CRATE INSTALL, WIRING AND TESTING

BY **RICK JENSEN**
PHOTOGRAPHY BY **THE AUTHOR**

In the February issue of GMHTP, I embarked on an exciting project to replace my 2001 Z28's LS1 with a 480-horsepower crate engine from GM Performance Parts. Down at TT Performance in North Jersey, we got the LS1 pulled and started swapping parts onto the big crate in preparation for installation.

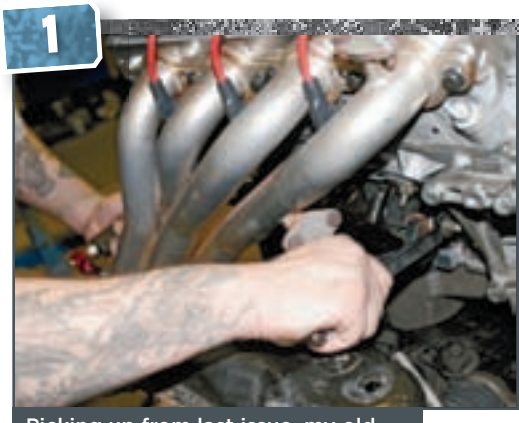
However, this is not a direct swap electronically–in order to benefit from the huge airflow and big power/torque numbers of GM's Generation IV engines, we'd have to do some modifications. For those of you unfamiliar with the old-style 24x/new-style 58x reluctor wheel saga, it wasn't long ago that you had limited options for your late-model F-body: you could use the universal GMPP controller and harness for an easy LS3 (or other Gen IV) connection, but your factory gauges wouldn't work. Or you could completely disassemble the bottom end of your new crate engine to swap on a 24x reluctor wheel (compatible with your LS1 PCM) and swap the cam, cam sprocket, and timing cover. That's a lot of work–around eight hours for a very experienced engine guy, and much longer for novices.

Thankfully, the aftermarket has been working feverishly to create adapters to easily mate the LS3 with the older LS1 harness and PCM–allowing for working factory gauges without tearing apart a crate engine! Early planning for this project had me contacting Lingenfelter Performance Engineering–a legendary name in the EFI GM world–for advice on how to proceed with the swap. LPE had done more than its fair share of Gen IV conversions, and informed me that its 58x to 24x Trigger Conversion Module was now in the catalogue and at my disposal. I've been in this business for a long time now, and when undertaking a complex project, the words "conversion" and "module" invariably mean less hassle! LPE also provided more goodies to simplify this swap; I'll show 'em to you in the captions.

I've chosen a dual-disc clutch for this project; this is no slight to the SPEC single-disc in 1SC-YA now, as it has held up admirably to some very aggressive driving and revved ultra-quick with its lightweight options. But there has been some great and some not-so-great reports from dual disc clutch users who street-drive them, and I want to experience a "dual" with this swap to get some first-hand experience. I contacted Ram and after a few conversations, had a Street Dual system with its hydraulics sent my way.

And finally, I mentioned last month that this Z's engine harness is toast–thankfully, Scoggin-Dickey can still get original GM harnesses at a decent price, so I jumped on that and they sent it out. I recommend a new wiring harness any time a major swap is performed on an older or high-mile car, it usually saves electrical headaches down the road. My hardtop is aching to hit the dyno, strip and street, so let's get to it.

1



Picking up from last issue, my old LS1 had been removed from the cradle, which the TTP staff graciously de-greased, as it was pretty dirty for only 46,000 miles. The LS376/480 was hoisted carefully onto the cradle; the bolts are threaded through the new GM motor mounts, and are torqued to 70 ft-lb.

2

I've never owned a dual-disc clutch, and was looking forward to testing RAM's new Street Dual Disc unit (part No. 90-2100, $1,300). This piece is comprised of an aluminum flywheel, an "easy pedal effort" diaphragm pressure plate, a special floater plate/retainer system, and RAM's 300-series clutch discs. The hard parts combine with the organic material to live behind 900-plus foot-pounds of torque–with very manageable pedal power. It needs an adjustable master, so we used RAM's unit (part No. 78165, $350) and also its new slave setup (part No. 510, $175).

3

RAM's new dual-disc clutch is disassembled. Rob marks where all the stands need to go (three composite, three metal are used for this mostly street-driven car for quiet operation–for lots of track action you'll want to use all metal and live with a little more noise).

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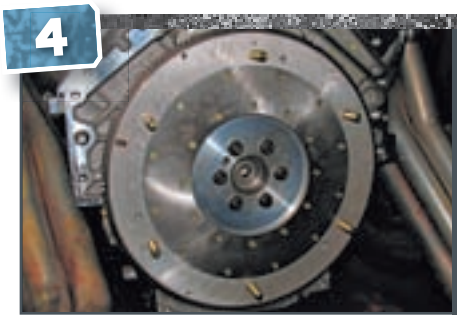
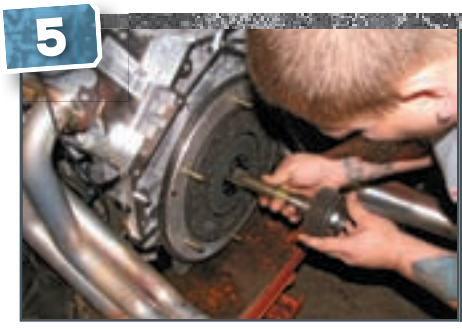


The flywheel is bolted down with our Loc-tited ARP bolts, and torqued to 85 foot-pounds.

5



He uses an actual input shaft to install the clutch disc for accurate alignment.

6

The floater disc is installed with three Loc-tited bolts, and tightened. The pressure plate, floater disc, and flywheel all are marked for proper alignment.

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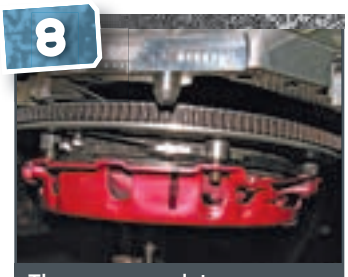
The second clutch disc is installed, and then he installs the stands.

8



The pressure plate goes on, and he checks alignment again with the input shaft. Rob Loc-tites the nuts and runs them down. The steel stands get torqued down to 30 foot-pounds, and the composite stands get 20 foot-pounds, with Flores holding the flywheel with a pry bar edge on the teeth.

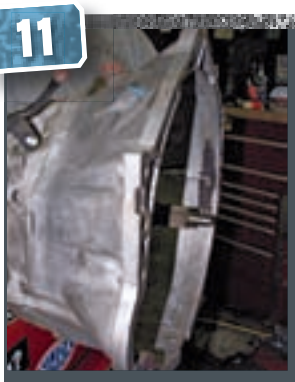
9

TTP installed an early version of RAM's new slave cylinder, which still has lines that use compression fittings (RAM says an updated version will use an adapter fitting). We were somewhat puzzled at the amount of shims needed until we realized that the directions called for one way to install, but the correct F-body way was different.

10

In what ended up needing two shim stacks, Rob and Matt measured from the installed bearing face to the face of the trans, and from the clutch fingers to the face of the trans. The numbers are as follows: 1.924 inches from bearing face to face of trans (front of bellhousing mount), and 2.155 inches from the clutch fingers to the face of trans (front of bellhousing mount). So 2.155 minus 1.924 equals .231-inch. As RAM calls for a reading over .200-inch, we should be in the ballpark.

11



During teardown, TTP finally discovered the source of my powershifting problems: due to either an incorrect fit or incorrect clocking of the SFI bellhousing put on during the six-speed swap, the clutch was never fully releasing, causing constant heat and wear. (The SPEC showed not only way too much wear for so few miles, but uneven wear as well). This problem pretty much doomed any attempt at clean, fast shifts. As I did not want to have a repeat of those problems, I reached out to Six Speeds Inc in Houston (888/937-4411) to see if they had a stock bellhousing. Amber was able to get one out to me ASAP, and even included the factory bolts. Thanks Amber! The bellhousing is installed to the trans with eight bolts.

12

Finally, Rob lubes up the dowel pins and with assistance from Nick, slowly guides the transmission onto the back of the engine. The clearance looks good so the eight bolts are tightened down to around 35 foot-pounds.

13

Time to install RAM's adjustable master cylinder. This is a two-man job; Jay sits in the engine bay with a 13mm end wrench and holds the master. Rob crawls under the dash and uses a 13mm socket to install the bolts.

14

Though the LS3 has its own MAP sensor installed on the top front of the engine, the calibration is not right for our LS1 ECM. The LS3 MAP stays in to keep the hole plugged, but we'll be utilizing the plugged-off port in the rear of the intake manifold as a source for the stock LS1 MAP sensor. Best to do this now before the engine gets reinstalled! A pair of pliers takes the cover off and a punch clears the hole so vacuum can be accessed. The HVAC vacuum line will be reconnected here.

15

The time comes to reconnect the subframe with the car. This is done by using a jack with the engine/subframe and also lowering the car down. When this is done, special care must be taken with the wiring harness, brake lines, A/C compressor and its lines, shifter, fans, and other accessories (you can see here that the power steering pump has been reinstalled).

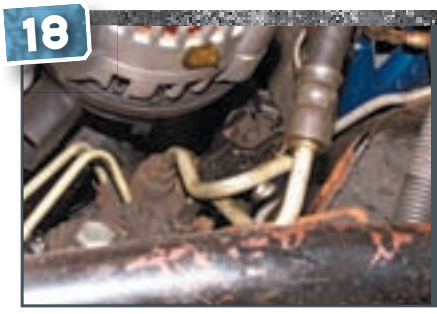
16

Rob watches how the shifter goes into place. Also, the torque arm needs to be monitored in relation to the reverse lockout solenoid on the trans, and the steering shaft also needs to be aligned correctly.

17

Finally, the alignment pins look good, so Rob drops the car to meet the subframe. Three bolts on each side connect the subframe to the body; an impact with an 18mm socket tightens them. The trans crossmember and spindles can also be reconnected.

18



Finally, he uses a pry bar to gently align the steering arm and the rack. There is a groove to allow it to install the right way, and it's retained with one bolt. The crate is in!

20

Prior to bolting the new crate engine in, Rob took the time to position the new wiring harness in the engine bay so it would be ready to connect to the big mill.

19

I'm a firm believer in always replacing beat-up wiring–regardless of mileage–when doing an engine swap. Why? Cause it's a few hundred bucks more to ensure there are no problems with your several thousand-dollar engine! Scoggin-Dickey supplied this OEM M6 harness (part No. 12177653, $549).

21

He pops on and screws in the PCM connectors and runs one section of the new harness into the cabin.

22

Don't forget that a new engine like the LS3 or this GMPP crate utilize Gen IV-style injector connections–your LS1 harness uses a different connection type. LPE remedies this problem with its LS2/LS7 Injector Connector Kit (part No. 8L480080000, $26). This will entail re-pinning our harness with these adapters.

23

Orange weatherpack insulators are slipped on, then he uses a crimping tool for non-insulated terminals to attach the two pins. Jason starts by snipping off the Gen III-style injector connector.

Next, he slips each one into the connector. FYI, on this harness, the pink wire is power and that goes into Terminal 1 on the connector. The other wire changes color from injector clip to injector clip, but always goes into Terminal 2.

With both pins slipped into the connector, Jason pushes down on the red plastic piece, which locks each pin into place, preventing them from pulling out. He does that process for all eight connectors.

As the knock sensors are moved on the Gen IV engines, TTP uses pre-tapped holes on the side of the block to mount them in.

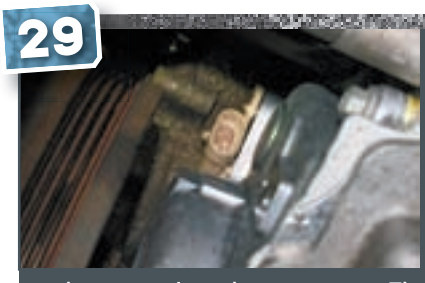
27

An LPE-sourced Knock Sensor Extension Harness (part No. 1RX-LS2-KSRH, $25) allows those knock sensor mods to work in this application.

28

The Lingenfelter TRG-001 58x to 24x Trigger Conversion Module (part No. 1L460065397, $254) is a trick piece that converts a 58x crank/4x cam signal so the newer Gen IV engines can be swapped into other vehicles without changing the reluctor wheels. In an F-body application, it will allow the owner to simply snap together wires–and keep their factory computer and gauges–instead of pulling the crank.

29



The black cam sensor extension harness that hangs down by the crank pulley will not be used in our application, as the plugs are for an LS3. Nick removes it, then runs the LPE box's "cam in" line down and connects it to the cam sensor. The "cam out" harness goes to the engine wiring harness' cam sensor connector, the "crank out" harness goes to the engine wiring harness' crank sensor connector, and the "crank in" line clips into the crank sensor on the side of the engine block.

30

The fully installed TRG-001 in the Camaro's engine bay; that light is red to indicate power, then once the engine is running it turns green to indicate that it's synced. Note that this will NOT be the way you install your LPE Conversion box–this is a prototype box I requested before the production heat-sealed models were finished. Production versions will mount to the firewall with the easy snap connections.

31

The rear intake vacuum port that Rob opened up will still be running our HVAC system. But we also needed to provide a signal for the LS1 MAP sensor. After discussing with Lingenfelter's Jason Haines, we determined that a "T" right near the port would provide a good MAP sensor signal, and would still be able to run the HVAC system too.

32

Scoggin-Dickey's throttle bracket attaches to the back of the throttle body, and allows the use of a cable throttle on F-body applications. As we are keeping the intake insulator on the manifold, Nick grinds off a small part of it to correctly mount the SD bracket. He then bolts up the new SD 90mm throttle body and hooks up the cables and hoses.

33

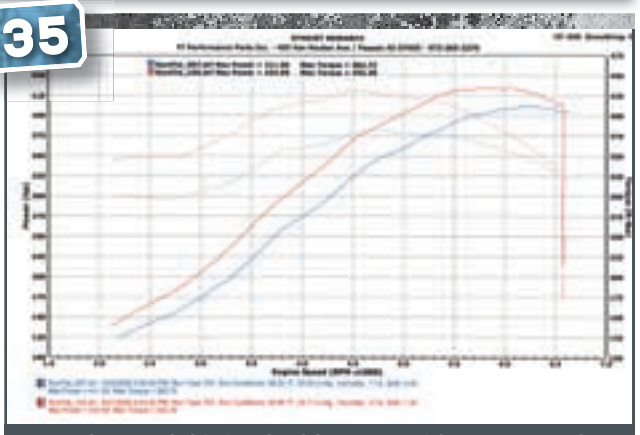
The remainder of the crate's accoutrements are reinstalled, and the fluids are added and checked. Under the dash, Rob adjusted the RAM master, then retained it with an "ojesus" clip. How badass does this thing look in an F-body engine bay?

TESTING

34

Once it was fired up and all systems were go, the TTP crew strapped her down to the dyno and Matt Sorian went to work on the tune. Sorian has done most of the tuning on my Z so he's pretty familiar with it–and this new LS376/480 is flowing mad air!

35

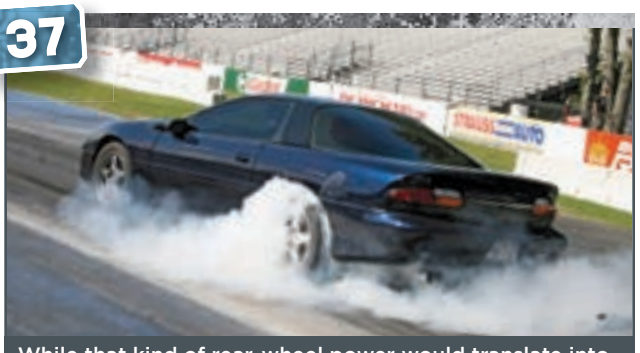


It's understood this is a bad-boy LS3 with a Hot Cam–but I was still bowled over by the grunt the LS376/480 put out. Compared to my high-revving heads/cam LS1, the big 376 churned 434 ponies and 432 foot-pounds to the wheels–that's around 23 more peak horses, and an astonishing 50 foot-pounds of torque!

36

At the last minute I had the TTP crew install BMR's Torque Arm Relocation Kit, as I wanted to test it at the next track day. Benefits of this sucker include a stronger mount for the front of the torque arm for vicious launches, and instant center adjustment as well. Part no. TCC006 costs $254 and fits '98-02 F-bodies with manual transmissions–I got mine in Black Hammertone.

37



While that kind of rear-wheel power would translate into a mid-11 ET in a car set up for drag racing, my Z's handling suspension and 17-inch drag radials would definitely leave some on the table. The torque from GMPP's crate engine meant more power modulation on launch; there was little room for error between a bog and a big spin. I spent all day in the low 12s at 118 range, with a best run of 12.06 at 119 even with a 1.88 60-foot.

CONCLUSION

Though I wasn't able to break 11s with the Z's handling suspension, the 119-mph trap speed told me all I needed to know about this crate engine. And with all of the extra torque, it is so easy to drive on the street–helped in part by the smooth and quiet RAM clutch. Though I did have a clutch problem with a compression fitting leaking, the updated versions should remedy that shortcoming, and I have no qualms about recommending this clutch for street guys who are willing to spend a few bucks more for huge power potential and a stock-like pedal feel. Regarding the wiring upgrades, the Z has been flawless and it appears the LPE box is as reliable as it is revolutionary.

With this crate engine install and test, the 1SC-YA project series has drawn to a close. It picked up a full second and 10 mph on the drag strip, cut 25 feet from its 100–0 braking, and improved its road course times by nearly 7 seconds. And best of all: with the stock-type BMR torque arm setup back in for less NVH, a $25 eBay iPod running through the loud Sony system, and a bullet muffler welded in to the catless Hooker exhaust, this is a fun, rattle-free street Camaro that has massive power on demand and is easy and quiet enough to drive every day, which is exactly what I plan on doing. I'll see you on the street.

SOURCE

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