

Tested: Canzoomer Stage 1



High Hopes Grounded

BY MARK GAAL (POLAK)
Contributing Writer

Dyno Day #1

APRIL 17TH—After just receiving my shiny new Canzoomer Stage 1, I was anxious to get on the dyno and see my jump in power. We thought it was going to be a simple plug and play job, see an extra 20 or so horse-

power, and go home happy. But I think you can probably already guess that it didn't turn out that way. Deadline for the story was in two days, and I want to thank Turbo-Trix Racing in Edison, NJ for letting us use their dyno on such short notice. When I plugged the unit in, and went for a drive, I was less than overwhelmed. The drivability was poor, and the car felt no faster, if not slower, than before.

Later that day we strapped the car onto the rollers for some conclusive proof of the horsepower results. We did a couple runs with the Canzoomer



ECU, and a couple stock ECU runs, with time in-between for the ECU to relearn. This was one of those times I wanted to be wrong, but unfortunately I wasn't. We actually lost horsepower with the Canzoomer ECU. We contacted Maurice (Canzoomer) about the results, who asked that we return the unit as defective. When the new unit arrived, there was no rush to get on a dyno so I took it out for a few head-to-head runs with a fellow member of the Tri-State RX8 Club, Shaun Vickers. Our cars and our body weights were identical with the exception of my car being equipped with Navigation. There was a minor difference in our ECU/PCM calibration, with his being on the newer M setting, while I was still on L. The only significant difference between the two flashes is M is beefier down low and more docile up top, while L is peaky with most of its power made in the upper rev range.

So back to our race, we down shifted to 3rd gear at about 40 mph and ran it to red-line. My car, then equipped with Stage 1 and L flash, could gain nothing on Shaun, and he couldn't gain on

me—it was a dead heat. Next I uninstalled the Canzoomer unit and we repeated the 3rd gear pulls. My car in stock trim was noticeably quicker, almost a full car length. We pulled into a quaint little neighborhood and decided to give something else a shot by installing the Canzoomer Stage 1 unit into Shawn's car. Thanks to "Old Man Stewart" for lending us that screwdriver, and the nice ladies next door who gave

me a bandage after cutting myself. Once again 3rd gear pulls up to red-line, my car pulled away just as much if not more then the stock to stock comparison run. The unit was obviously not producing the power it should and it was odd that my car was so much quicker stock. So before I wasted more time on the dyno I contacted Maurice with my findings. He shipped me the USB serial cable used to interface with his unit to better diagnose the problem and to custom tune the unit

A Fresh Start

June 5th—While waiting for my cable to arrive I decided it would be prudent to have my dealer flash the car with M,

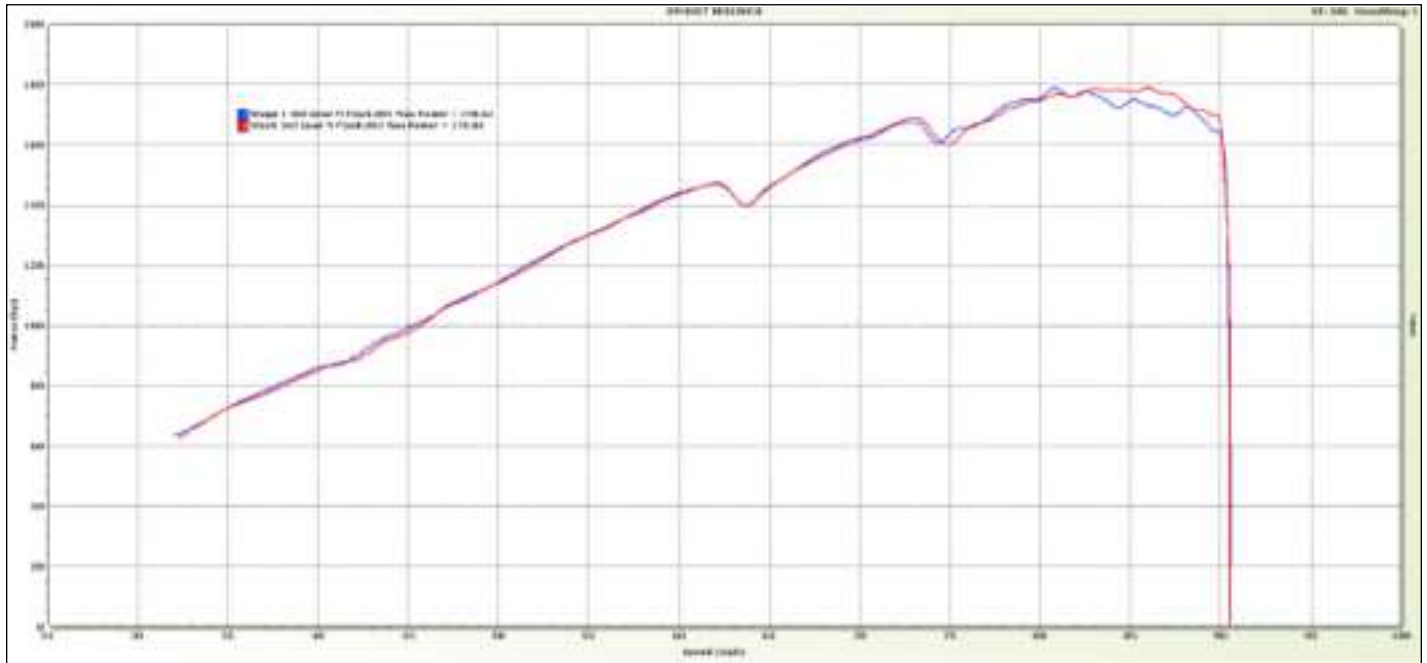
due to it being vastly easier to custom tune CZ-1 with M flash and it simply being a better calibration. Jack and Mike at Flemington Mazda in Flemington, NJ came through by flashing the car on one day's notice

With the cable hooked up to the laptop, my buddy Adam and I set off to do some data logging. What this allows us to do is display a set of predetermined variables, per gear if we like, that are read by the Stage1 unit and then recorded via provided software on the laptop. We recorded the MAF input and output voltages per gear, as well as total airflow adjustment, ignition timing, and throttle position. I might have been a little overzealous with the right foot, but it's all in the name of science. Explaining that to a RX Tuner reader is a



no-brainer. Explaining to an officer is a different story, as we soon discovered. We were pulled over for doing 92 mph in a 65 mph zone. Providence shined upon us this day, as I think we were pulled over by the one understanding police officer in New Jersey. Maybe we were just so incredibly nerdy looking, driving a car filled with strewn cables, that sympathy got us off the hook. Whatever the reason, whew.





Third Gear Pull.

An Explanation

After taking a look at the data, Maurice and I found what looked to be an explanation: The Stage 1 units adjust the fuel/air ratios by functioning on the premise of tricking the ECU by giving it “adjusted” readings from the Mass Air Flow (MAF) sensor to make the ECU believe there is less than actual amount of air flow. The ECU then responds by adjusting the amount of fuel

injected, and the mixture is adjusted for richness up or down at will.

A MAF is basically a copper wire heated by electrical current, and sits directly in the path of air being ingested by the intake. Combinations of engine rpm, throttle position, and road speed will vary the volume of air moving over the wire, and cool it proportionally. The Stage 1 unit simply modifies the MAF input voltage, consequentially giving it a new output voltage. This sounds simple, however adjustments in voltages are very slight. The difference between making 20hp and 1hp is approximately a change of



"Integrity, Innovation and a commitment to excellence"

1440 Tottenham Rd, Tottenham, Ontario, L0G1W0 (905) 938-5151

www.cpracing.ca



RX-7



79-85 Front Upper Strut Tri-Bar \$115.00



93+ Front Upper Strut Tri-Bar \$115.00



79-92 4-Point Roll Cage \$275.00



4X110 TO 5X114.3
79-85 \$320.00



CP Racing 1st Gen RX-7



CP Racing & Designs Rack & Pinion Conversion \$650.00



79-85 Fender Flares \$200.00

NEW PRODUCTS



79-85 Flush Lights \$500.00



Mazda RX8



RX-8 Front Upper Tri-Bar \$200.00

As Always CP Racing Prices Include Shipping & Taxes in Canada and Continental US



Fourth Gear Pull.

.15 Volts from the input voltage.

Probing deeper, we discovered that the 4 volt MAF sensor in the RX-8 varies from car to car, some more than others! We assume this is because of manufacturing variables. For instance, my car at 8000 rpm in 2nd gear would register a 3.99V input, and a modified output voltage of 3.69. Maurice's car at the same rpm and gear would be 3.88V, and his modified output voltage (using the same map I used) was 3.729V. This is a relatively small decrease in voltage on his car, however, on my car it's so large that the car ends up not making any power. Most cars seem to be within the acceptable range where the unit will make power, however mine as well as those that report "zero-gain / ping" or "rough idle" with the unit are most likely on an extreme side, either running very lean or very rich in stock form. This also explains why my car was significantly quicker than Shaun's. Out of the box my car runs lean, which in return gives me more HP, which also results in my car pinging with the regular Stage 1 map. After a couple days Maurice tailored a map that was adjusted somewhat to be more specific to my car and would generate the HP I was looking for...or so we thought.

Dyno Day... #2

Armed with a new custom map and a date with the dyno, I was hell bent on making some power. Dyno was located at KD Rotary in Shoemakersville, PA. I was simply amazed by their facilities with 60-plus FDs sitting in their garage. It was rotary nirvana, I nearly creamed my pants.

As for the dyno runs I was pleased that we didn't lose HP. Due to the RX-8 running different fuel maps per gear we did a total of four runs:

- 3rd gear with stock ECU
- 4th gear with stock ECU
- 3rd gear with Canzoomer ECU
- 4th gear with Canzoomer ECU

In-between the swap from the stock to Canzoomer ECU, I took the car off the dyno and for a drive. This was to make sure there was time for the ECU to "re-learn" the maps. In 3rd gear we were not able to gain any noteworthy amounts of HP (see graphs), however in 4th gear we did manage to squeak out 5WHP. I believe that there is room for more gains.

When presented with the result, Maurice commented on the oddities in regards to my air to fuel values not common to any car he's tested on. We

have fine tuned his custom map and will be testing again in the near future. He explains the situation with my car as becoming more common due to the greater number of variances being exploited by M flash. He suggests that those people who are experiencing problems with Stage 1.1, such as "zero-gain" purchase a USB tuning cable and do exactly what I did; design a map that is ideal for your car. And if you want to get as much HP as possible out of the engine, look into getting Dan Harrison's CANscan tool in order to record your air to fuel ratios from the wide and narrowband sensors, which will allow you to tune your air flow adjustment map with greater ease.

If nothing else, it's been a learning experience, both for me and for Maurice. Certainly the Canzoomer ECU's will benefit from this testing.

A special Thanks to Skip Gorman, Dave Barninger, and KD Rotary.

Canzoomer's Counterpoint: The Difficulties of Tuning the RX-8, and Tools Making it Easier

BY MAURICE HILARIUS

Contributing Writer

Tuning a modern computer like that in the Mazda RX-8 is a daunting challenge. When tuning, two parameters are adjusted:

- The Air/Fuel Ratio, also referred to as AFR
- Ignition timing and advance.

At partial throttle, most cars including the RX-8, try to keep the AFR close to 14.7:1 (stoichiometric). This is where all fuel is burned completely, creating a very efficient combustion process. However, under heavy acceleration, 14.7:1 is not the best idea. Doing so would cause loss of power or engine damage from pinging, due to the high temperatures that result from such an AFR. Instead, we try to tune for a 'safe zone' of around 12.7:1 to 13.7:1. Testing has shown that this is the maximum power area on an RX-8, without creating pinging. The problem is that, as the prior story illustrates, there are numerous variables that are factored into the creation of the proper AFR. And until recently, many of these variables were some sort of hidden black magic, which made proper tuning something less than a perfect science.

So how do we gather all available data from the RX-8's ECU, to get a clear-

er picture of just exactly what is happening? The RX-8 ECU uses a communication protocol CAN. If one could tap into this data, you could see the real-time streams of data that are published via the CAN protocol. Doing this would give you a point-in-time look at what all the major sensors of the car are seeing. This is exactly what we need to create the perfect tune for the car.



CANScan Tool.

To create this, I have been working with Dan Harrison. Dan currently manufactures a tool for doing diagnostic work on modern OBDII equipped cars. His company, called Harrison R&D has years of expertise in just what we need for pulling the CAN data. Initially, when Dan provided me a sample of his diagnostic product

for the RX-8, I thought it was very nice, but unsuitable for proper tuning. We needed a faster sampling rate for more real time data, and ability to track more streams of data, among others. After working together, Dan started on the changes for which I asked.



After a series of revisions, and some back and forth of new ideas, we're very close to having a final product ready. Here is a screen capture from the data logging screen of the CANScan software. From

this screen we can select up to 6 different data sets to display, capture and log to a file in the computer.

Why is this software so significant? With the advent of some of the more recent PCM flashes that Mazda is releasing, it is becoming more and more difficult to produce a generic high performance tune for all RX-8's. It's more



Here is a capture of the screen that shows and logs AFR versus Lambda versus RPM in real time.

and more important to fine tune each individual car based on it's unique characteristics. While most RX-8's respond in a similar fashion, about 1/3 are sufficiently aberrant so that a generic tune can only work if kept to a conservative level. We found that while the majority of

Canzoomer Stage 1 customers are happy, a significant number had problems. This needed to be addressed, and now, with the advent of this CANScan tool, we have the ability to address the problems as noted by the minority of our customers.

In addition, even if you bought a CZ-1 ECU and are happy with the results, you can likely gain another 10 to 15 horsepower through fine tuning using this CANScan tool. That's cheap, easy, and reliable horsepower.

The bottom line is this. If you ever wanted to tune a modern car, or simply wished to take a peek "under the digital hood" this is the tool to do it with, and more. If you own a programmable tuning system for your car, this is the tool to use to monitor and adjust it to achieve a matched and calibrated level of tuning, without the need to spend a fortune. Selling for \$185 for the RX-8 tuning model, it costs less than a decent gauge. **RX**

Atkins
Rotary.com

CAMDEN
SUPERCHARGERS

- >Engine Rebuild
- >Parts
- >Performance
- >Stock Parts
- >Race Applications
- >SuperChargers
- And More

NEW
ROTARY
OVERHAUL VIDEO
AVAILABLE!

16715 Meridian East Bldg K-A
Puyallup, WA 98375

(253)-848-7776
Info@AtkinsRotary.com