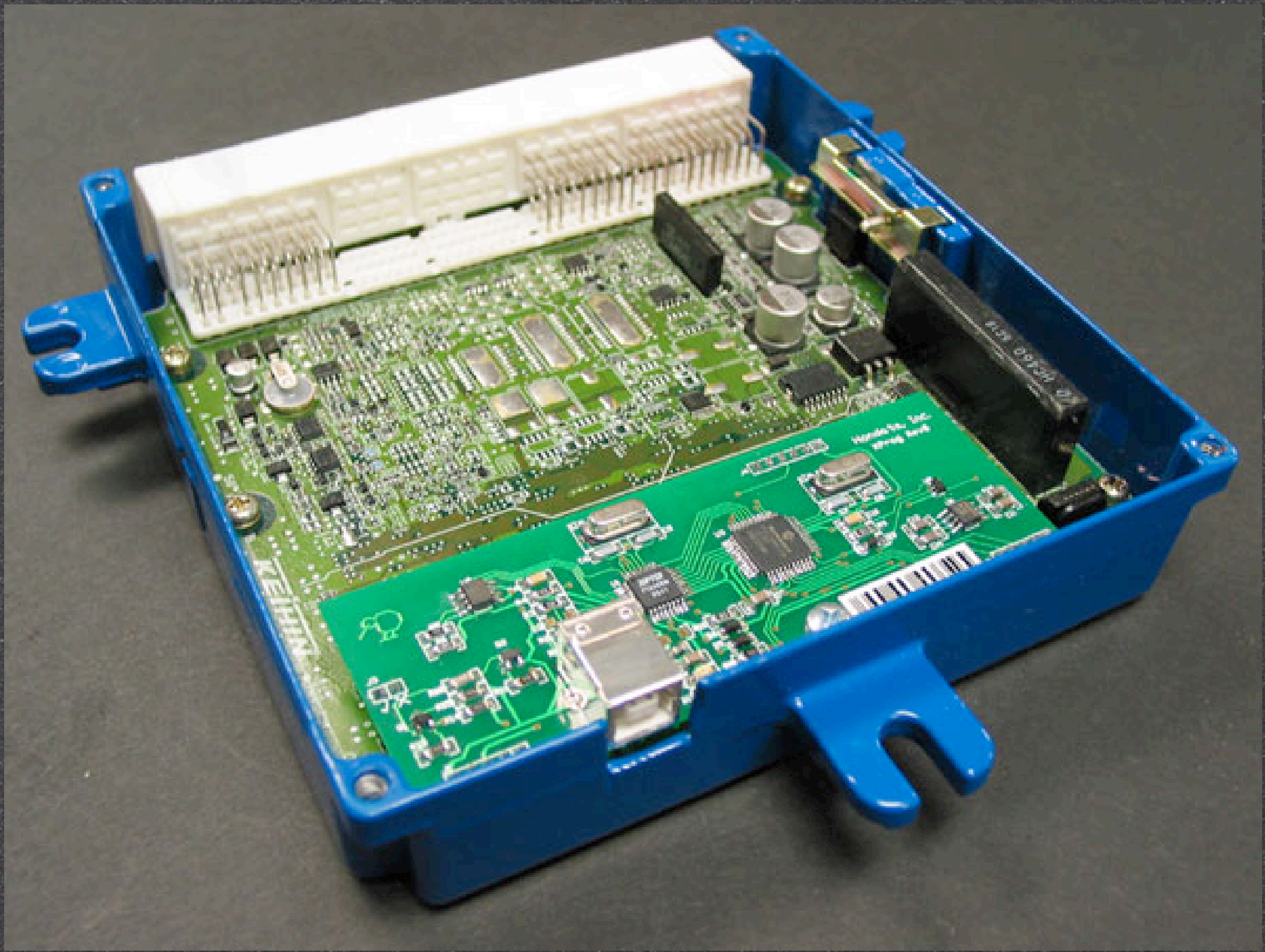


K -Series

- K series : set reflashes by Hondata
- K-Pro programmable ECU
  - Civic Si
  - Euro Civic Type R

K-Pro features

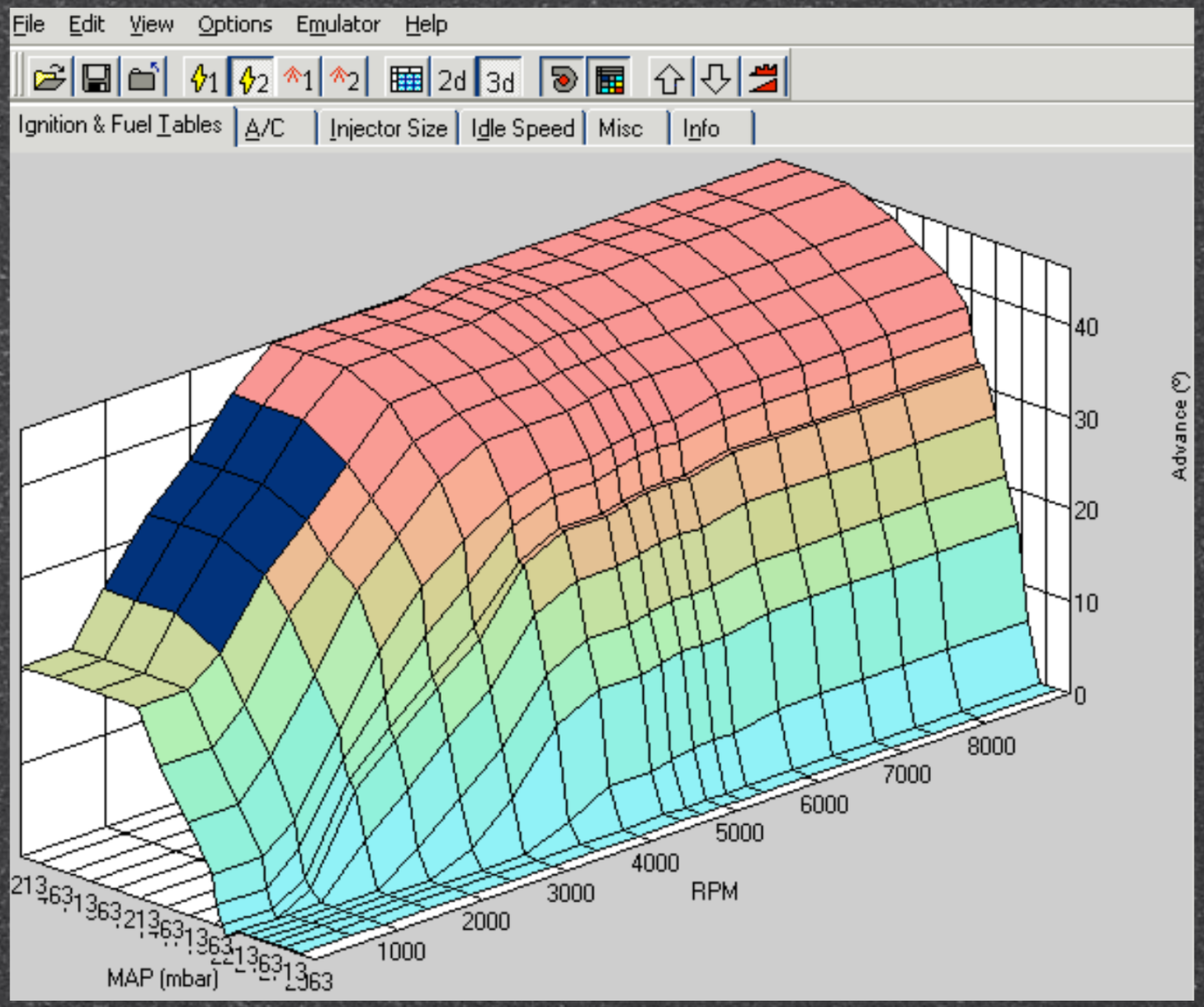
- Laptop USB Programmable
- 12 fuel & 12 ignition maps
- Best management software available
- Programming time 1-3s (first time 30 s)
- Integrated Wide band
- Data-logging (4 hours) & map tracing
- Sensor disabling
- $500 upgrade for existing users!

Why use the Stock ECU

- Honda have spent millions of $$$
- Starts immediately all conditions
- Idles
- Good emissions and economy
- Far less time to tune than replacement ECUs
- OBD II compliant
- SMOG legal - but for off road use only

Whats in the ECU

- Fuel and ignition maps
- Instructions on how to respond
- OBD II emissions checks



RSX-S ECU

- Conservative ignition timing
- Runs rich at high RPM
- Overly sensitive to knock sensor
- Tuned for emissions at high mileage
- Once Tuned:
  - More power
  - same or better emissions
  - Better economy

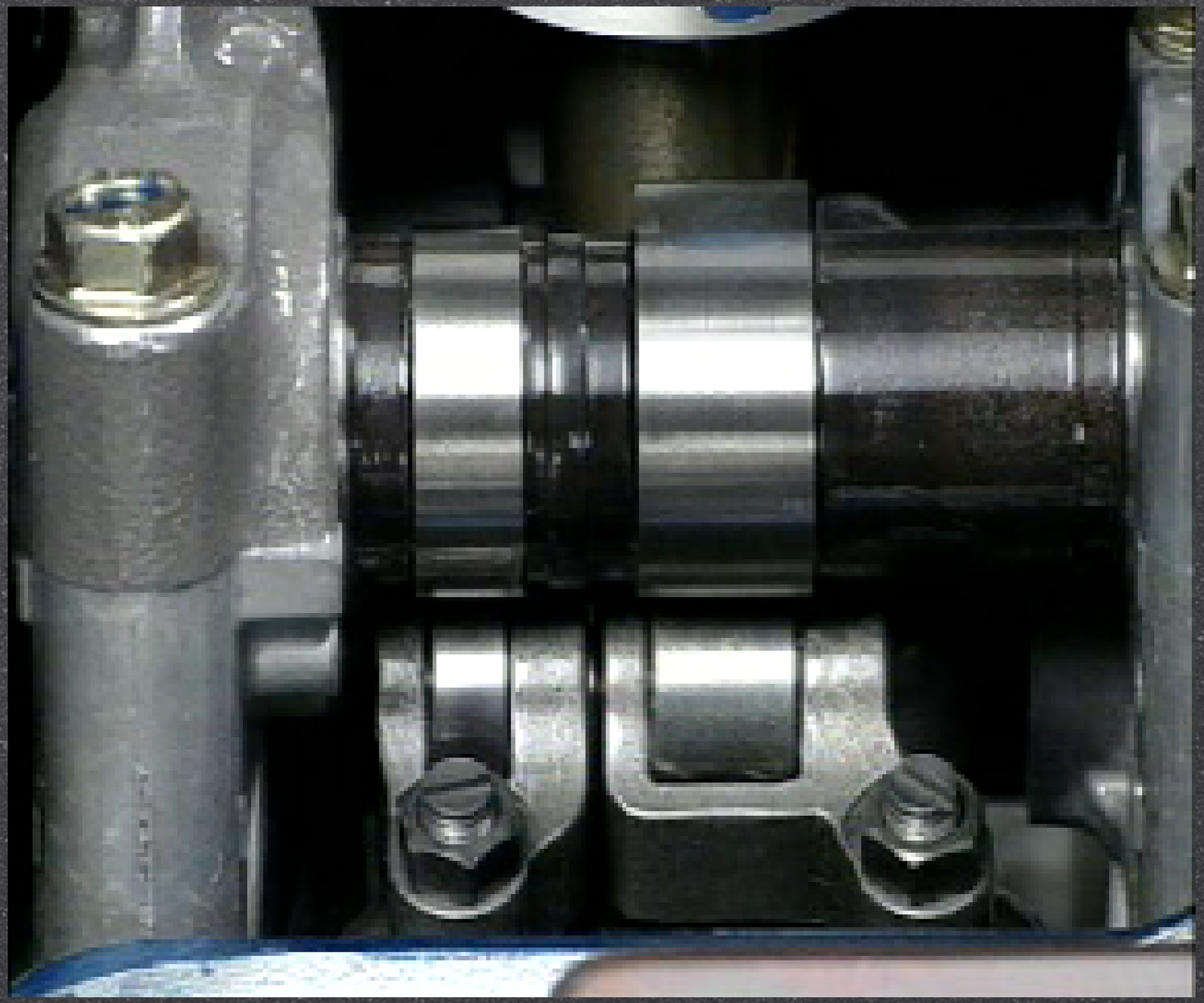
What makes power

- An engine is an air pump
- Cram in as much air as possible
- Give it the right amount of fuel
- Ignite it at the right time
- Expel the exhaust with the least power loss

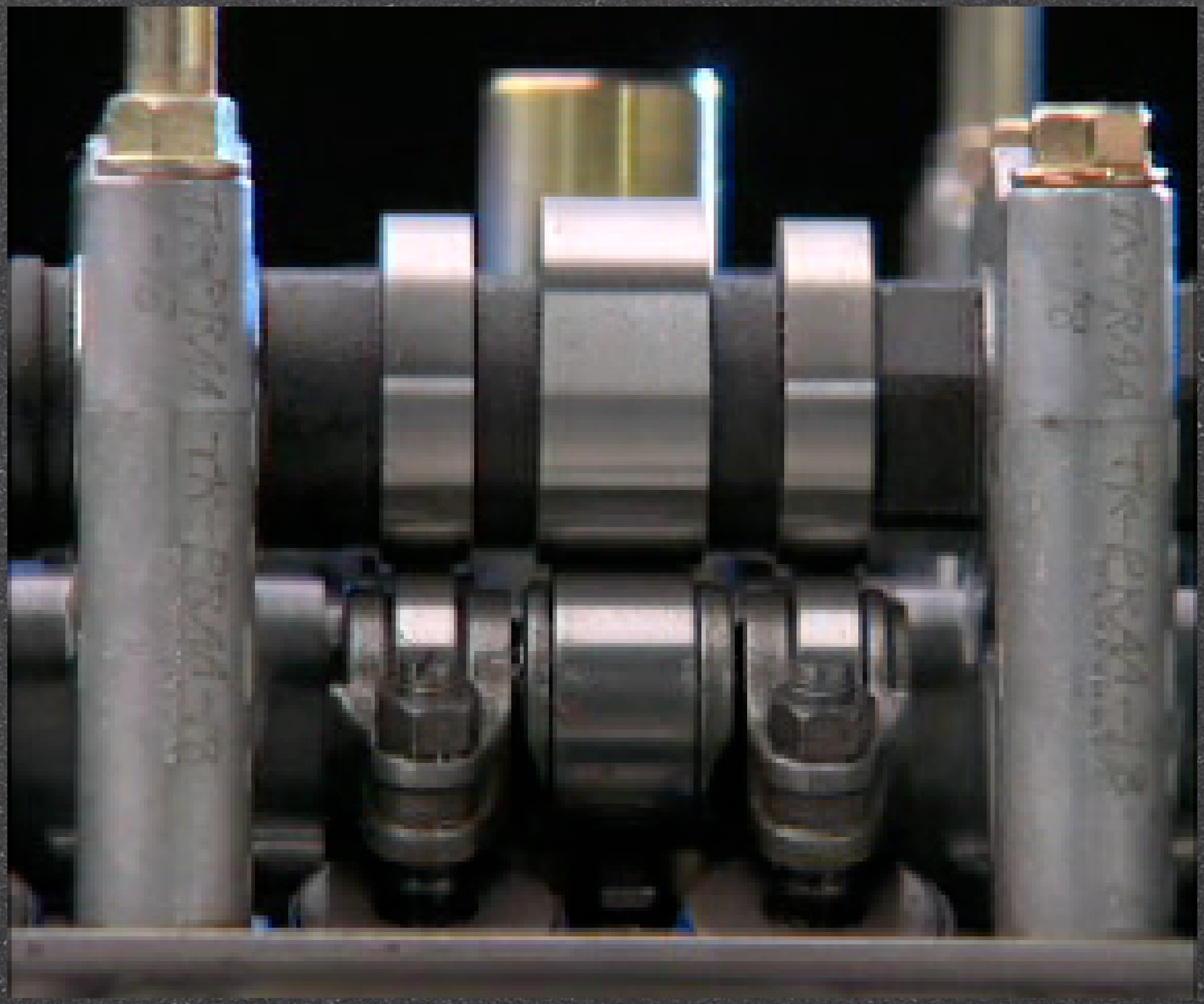
VTEC

- Variable Timing Electronic Control
- Different versions for Economy + power

Civic Si, Base RSX, Accord Video



RSX-S TSX
Video



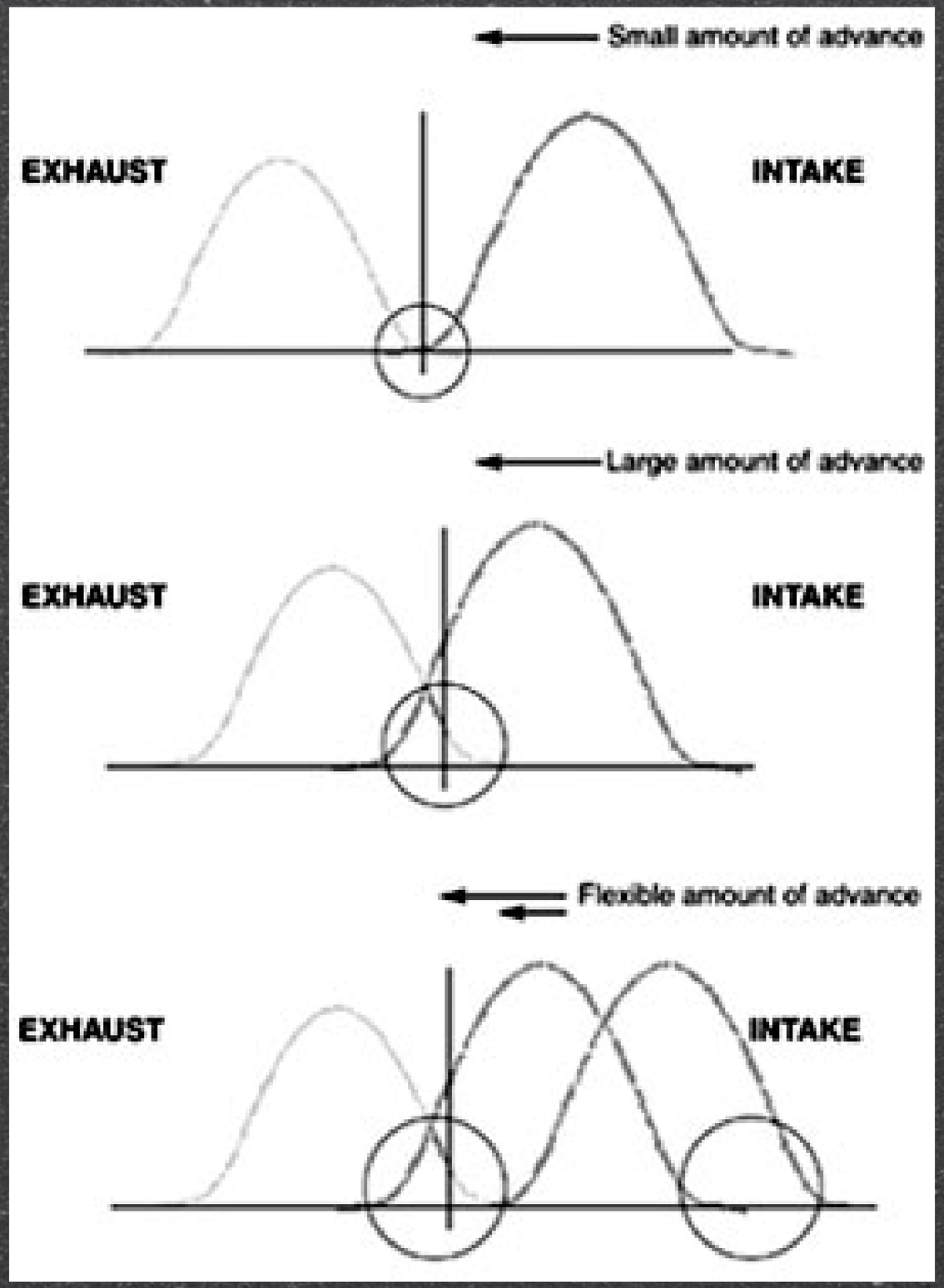
VTC - What is it

- Variable Timing Control
- 50 Degrees Movement
- Constantly changing
- Honda's gift to tuners
- Settings for Power and emissions

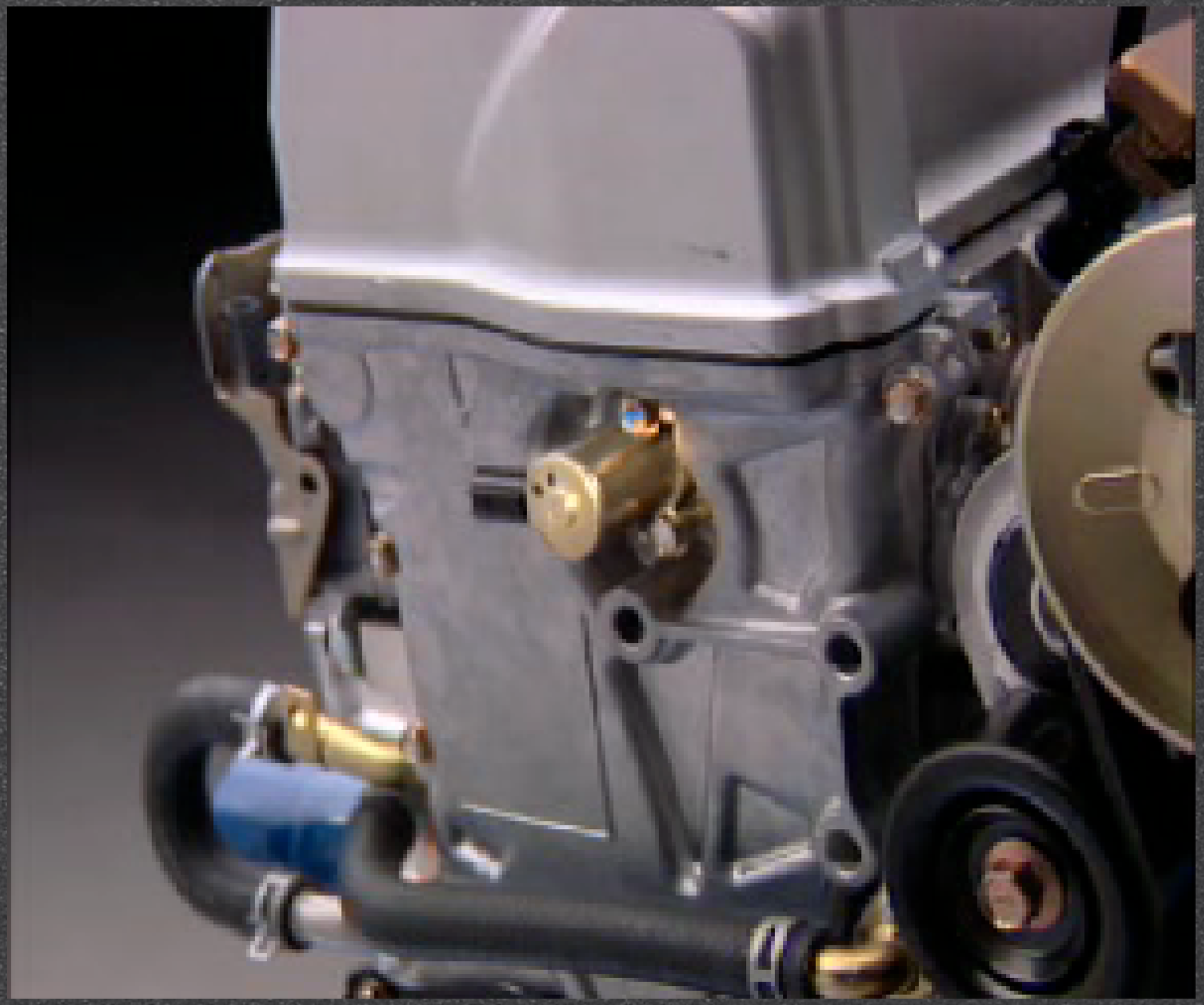
VTC basics

- Cam angle swing 50 deg
- 6 maps 0-50 (show on K-Pro)
- Engine efficiency
- Better breathing (esp headers + exhaust)
- more cam advance
- cam centerline about 25 degrees compared B series engines

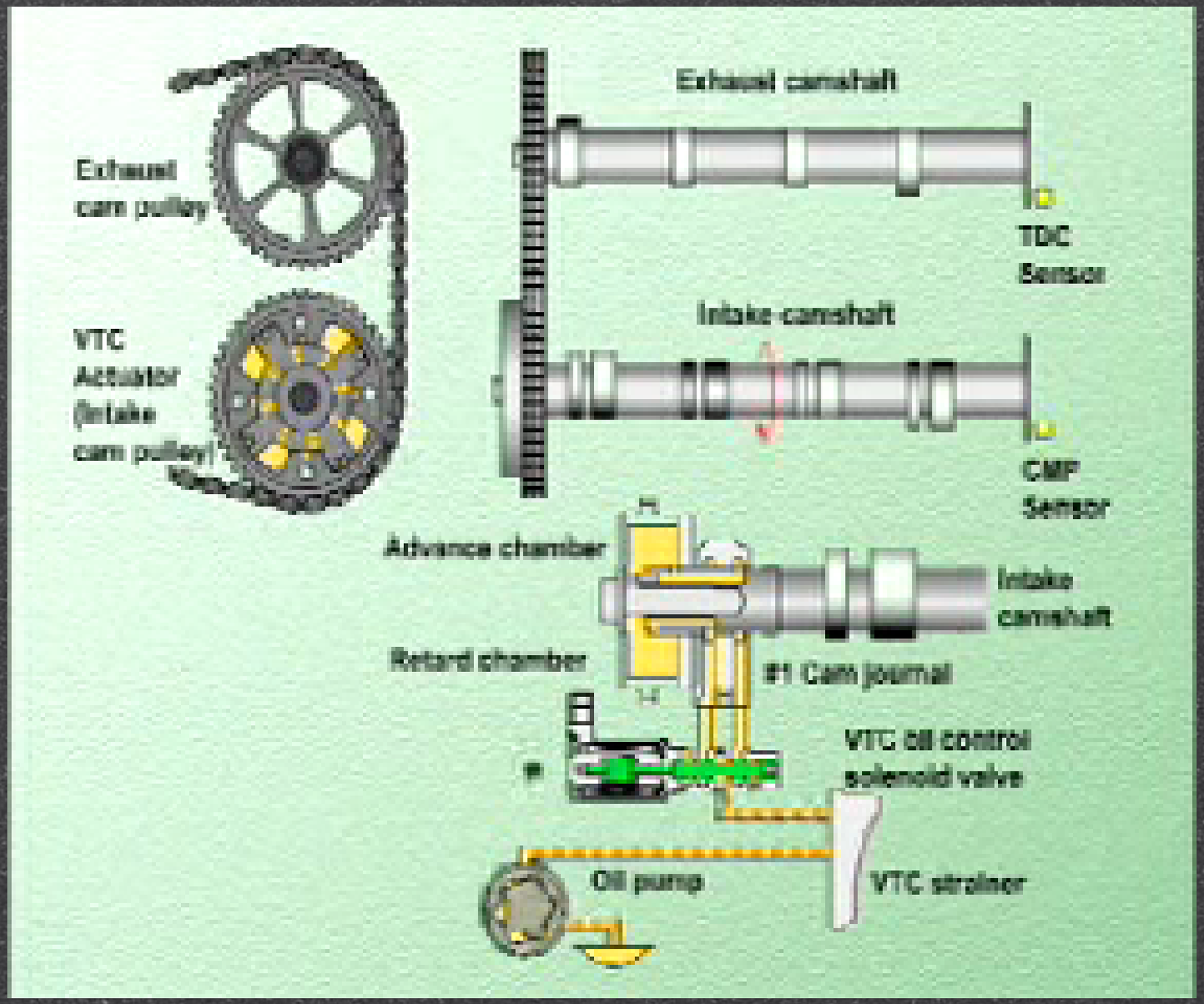
Cam advance


Small amount of advance
EXHAUST
INTAKE
Large amount of advance
EXHAUST
INTAKE
Flexible amount of advance
EXHAUST
INTAKE

VTC Operation Video



VTC Operation Video



The K-Pro software

- USB connection - inbuilt recommended
- Minimum Windows 98 233 64 Mb ram
- Window XP preferred with 512K ram
- Internet connection for updates
- Always check for updates

K-Pro features

- Multiple table editing for VTC
- Boost maps
- Datalogging
- Nitrous control
- Switching features
- Knock display

Dyno Procedure

- Switch ECU to open loop
- warm the car up. especially gearbox oil
- Wait 10 seconds after starting
- Stock engined knock retard variation
- Coolant > 180F
- 3000 rpm for 15 seconds to stabilize IAT

Tour of features

- A look around the different windows
- Combine all tables - Simple tuning (fast)
- Edit individual tables for fine tuning (precise)
- Volumetric efficiency = how much air
- Fuel proportional to air
- Variation from 0-50 degrees
- Cam angle zero = default position

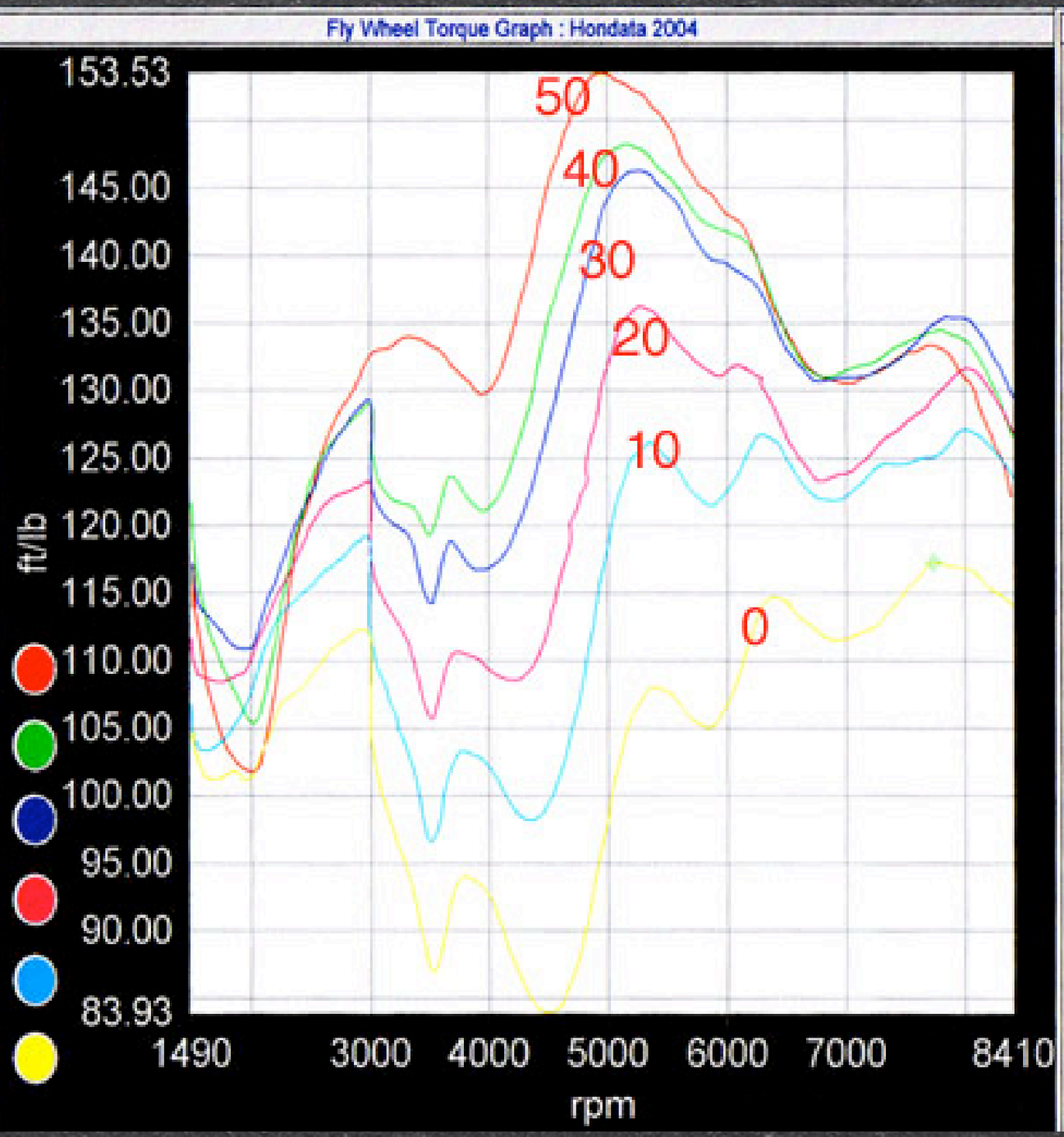
Tuning procedure

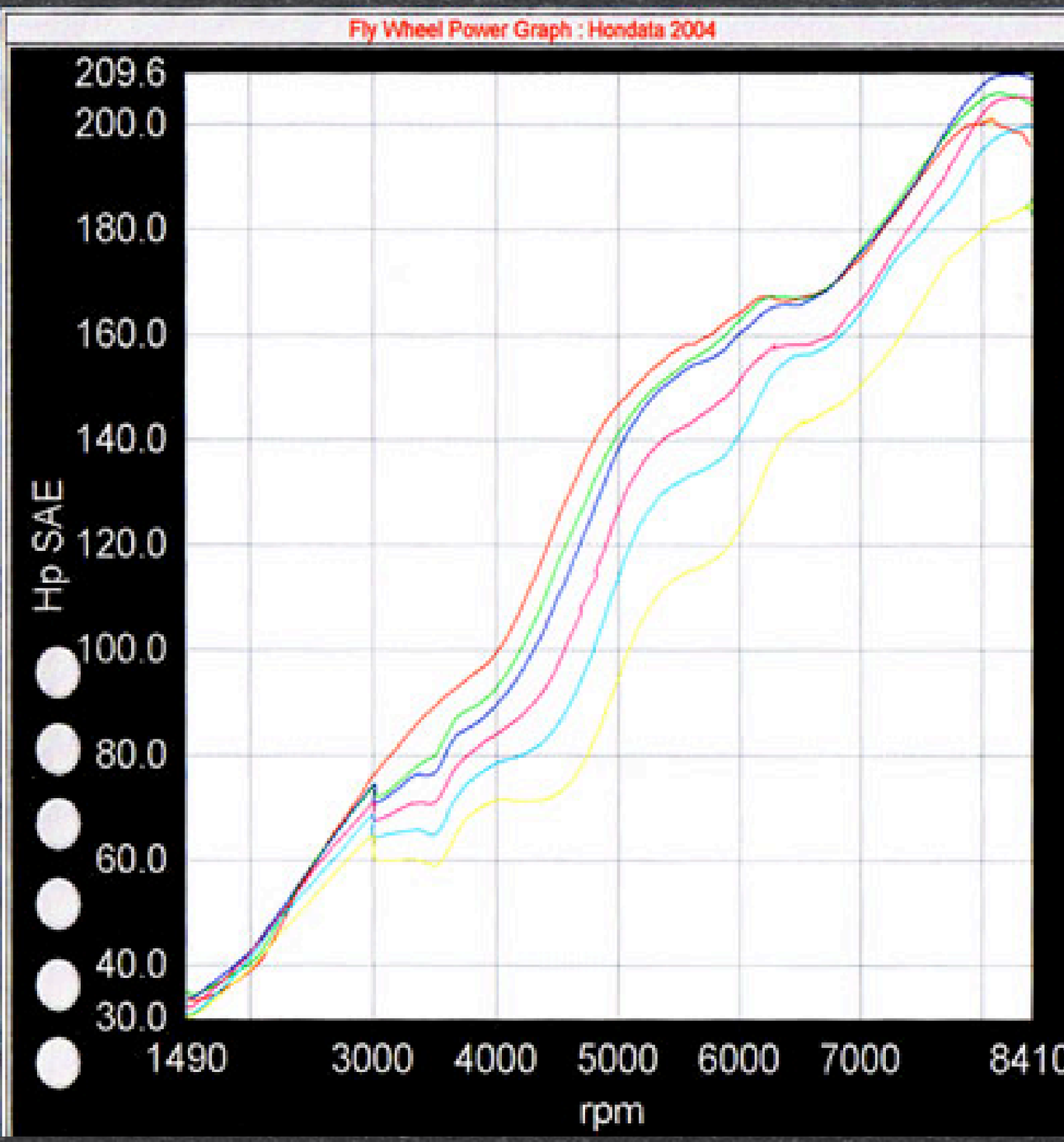
- Set VTEC to 7000 rpm & tune lowcam
- Set cam angle to 0 Tune fuel then ignition
- Select all for ignition
- RPM ranges for fuel
- Set cam angle to 10, 20, 30, 40, 50etc.
- Set VTEC to 3000 rpm and tune Hicam

VTC NA

- Assume Cams, 4-2-1 headers intake and exhaust.
- Low cam VTC 35-45 degrees
- Hi cam VTC 50-55deg to 6500-7500
- Then Retard from 50 to 25 by 8-85 rpm
- 10 degree advance 1 point leaner (from 16 to17:1) at 6000 rpm
- Big cams clay motor, cam centerline differences, physical stop. HC pistons

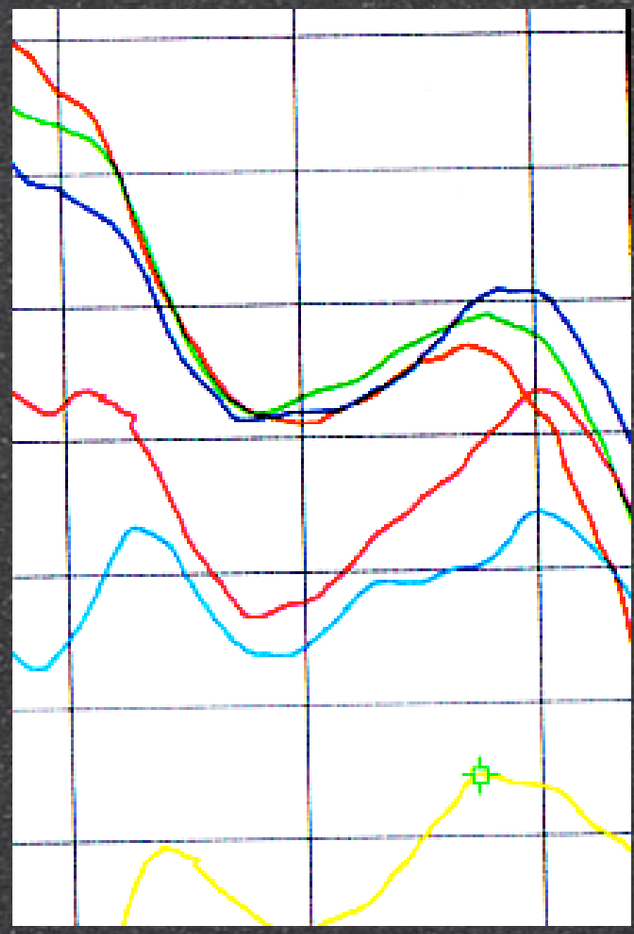
VTC 0-50 deg


Fly Wheel Torque Graph : Hondata 2004
153.53
145.00
140.00
135.00
130.00
125.00
120.00
115.00
110.00
105.00
100.00
95.00
90.00
83.93
ft/lb
50
40
30
20
10
0
1490
3000
4000
5000
6000
7000
8410
rpm


Fly Wheel Power Graph : Hondata 2004
209.6
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
30.0
Hp SAE
1490
3000
4000
5000
6000
7000
8410
rpm

Tuning VTC 6-8k rpm

- Initial composite cam angle map
- 6000 - 50 degrees
- 6500 - 45 degrees
- 7000 - 40 degrees
- 7500 - 35 degrees
- 8000 - 30 degrees

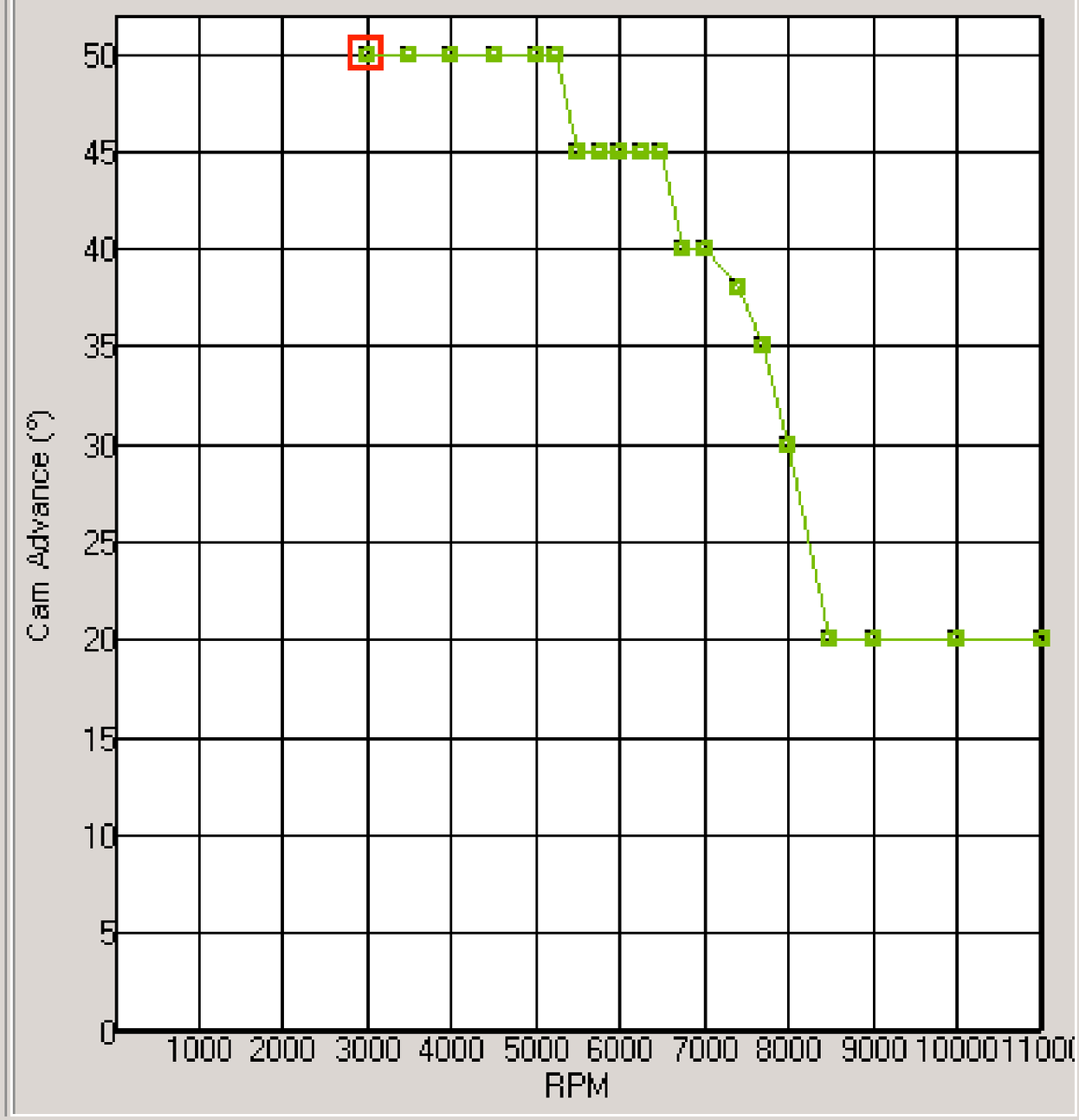


Tuning VTC 6-8k rpm

Table - High Speed Cam Angle

Table: Cam Angle | VTEC: Low Speed / High Speed | Cam Table Edit: All Tables | Cam Angle: 0 degrees | Graph Type: 2D / 3D

Col	1	2	3	4	5	6	7	8	9	10
mBar	127	213	299	413	528	643	757	872	987	0.5
3000	50	50	50	50	50	50	50	50	50	50
3500	50	50	50	50	50	50	50	50	50	50
4000	50	50	50	50	50	50	50	50	50	50
4500	50	50	50	50	50	50	50	50	50	50
5000	50	50	50	50	50	50	50	50	50	50
5250	50	50	50	50	50	50	50	50	50	50
5500	45	45	45	45	45	45	45	45	45	45
5750	45	45	45	45	45	45	45	45	45	45
6000	45	45	45	45	45	45	45	45	45	45
6250	45	45	45	45	45	45	45	45	45	45
6500	45	45	45	45	45	45	45	45	45	45
6750	40	40	40	40	40	40	40	40	40	40
7000	40	40	40	40	40	40	40	40	40	40
7400	38	38	38	38	38	38	38	38	38	38
7700	35	35	35	35	35	35	35	35	35	35
8000	30	30	30	30	30	30	30	30	30	30
8500	20	20	20	20	20	20	20	20	20	20
9000	20	20	20	20	20	20	20	20	20	20
10000	20	20	20	20	20	20	20	20	20	20
11000	20	20	20	20	20	20	20	20	20	20

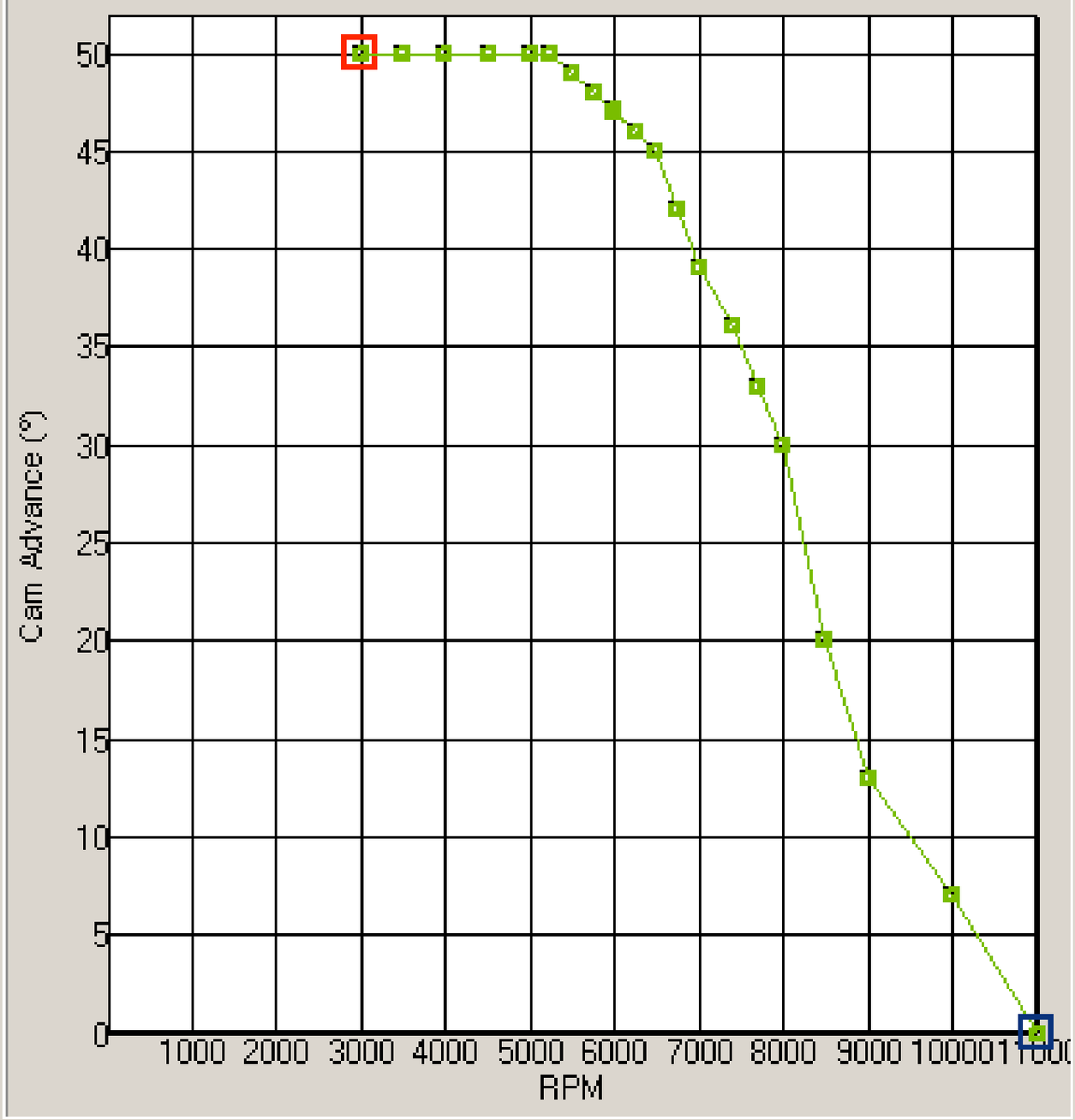


VTC FINAL SMOOTH CURVE

Table - High Speed Cam Angle

Table: Cam Angle | VTEC: Low Speed / High Speed | Cam Table Edit: All Tables | Cam Angle: 0 degrees | Graph Type: 2D / 3D

Col	1	2	3	4	5	6	7	8	9	10
mBar	127	213	299	413	528	643	757	872	987	0.5
3000	50	50	50	50	50	50	50	50	50	50
3500	50	50	50	50	50	50	50	50	50	50
4000	50	50	50	50	50	50	50	50	50	50
4500	50	50	50	50	50	50	50	50	50	50
5000	50	50	50	50	50	50	50	50	50	50
5250	50	50	50	50	50	50	50	50	50	50
5500	49	49	49	49	49	49	49	49	49	49
5750	48	48	48	48	48	48	48	48	48	48
6000	47	47	47	47	47	47	47	47	47	47
6250	46	46	46	46	46	46	46	46	46	46
6500	45	45	45	45	45	45	45	45	45	45
6750	42	42	42	42	42	42	42	42	42	42
7000	39	39	39	39	39	39	39	39	39	39
7400	36	36	36	36	36	36	36	36	36	36
7700	33	33	33	33	33	33	33	33	33	33
8000	30	30	30	30	30	30	30	30	30	30
8500	20	20	20	20	20	20	20	20	20	20
9000	13	13	13	13	13	13	13	13	13	13
10000	7	7	7	7	7	7	7	7	7	7
11000	0	0	0	0	0	0	0	0	0	0



VTC Turbo

- Exhaust backpressure > Na or JRSC
- Cam angle / overlap needs to be reduced
- Low cam VTC 20-30 degrees
- Hi cam VTC 20 deg to 6500-7500
- Maybe retard to 15 degrees from 7000 up
- High Backpressure: retard VTC raise VTEC
- Low backpressure: advance VTC lower VTEC

VTC @ the VTEC point

- One of the most difficult tuning tasks
- Cam takes 0.1s to rotate 10 degrees
- start rotating cam angle before VTEC
- VTEC switch Noise greatly reduced
- Hardest to do on turbo motor
- Sacrifice hp before VTEC to gain after

VTC @ the VTEC point

- VTEC point 4000
- Set VTC @ 5000 to 50 not 37 to match HICAM VTC angle

Col	1	2	3	4	5	6	7	8	9	10
mBar	127	213	299	413	528	643	757	872	987	0.5
500	0	0	0	0	0	0	0	0	0	0
750	0	0	0	5	5	5	5	5	5	5
1000	10	10	10	10	10	10	10	10	10	10
1250	20	20	20	20	20	20	20	20	20	20
1500	20	20	25	25	25	25	25	25	25	25
1750	20	20	30	30	30	30	30	30	30	30
2000	20	20	30	30	30	30	30	32	32	32
2250	20	20	30	30	30	30	30	35	35	35
2500	30	30	30	30	30	30	35	40	40	40
2750	30	30	30	30	30	30	40	45	45	45
3000	30	30	30	30	30	30	45	50	50	50
3500	25	25	30	30	30	30	40	45	45	45
4000	25	25	30	30	30	30	40	50	50	50
4500	25	25	30	30	30	30	30	30	30	30
5000	20	20	20	20	20	20	20	20	20	20
5500	20	20	20	20	20	20	20	20	20	20
5800	20	20	20	20	20	20	20	20	20	20
6000	20	20	20	20	20	20	20	20	20	20
7000	20	20	20	20	20	20	20	20	20	20
8100	20	20	20	20	20	20	20	20	20	20

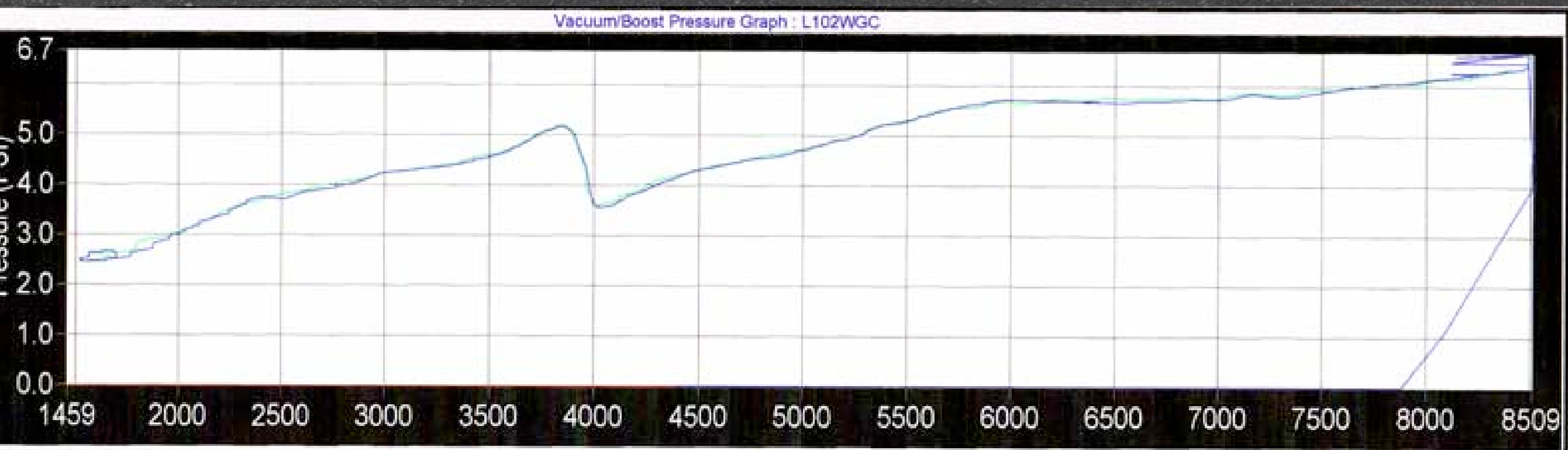
VTC Wild NA cams

- Experimental cams (not yet available)
- really Big bottom end lobes
- reduce overlap in part throttle maps (set VTC to zero
- Add lots of timing at the low end (50-100 ft pounds gain in one example)
- Raise idle speed
- less vacuum lean out columns

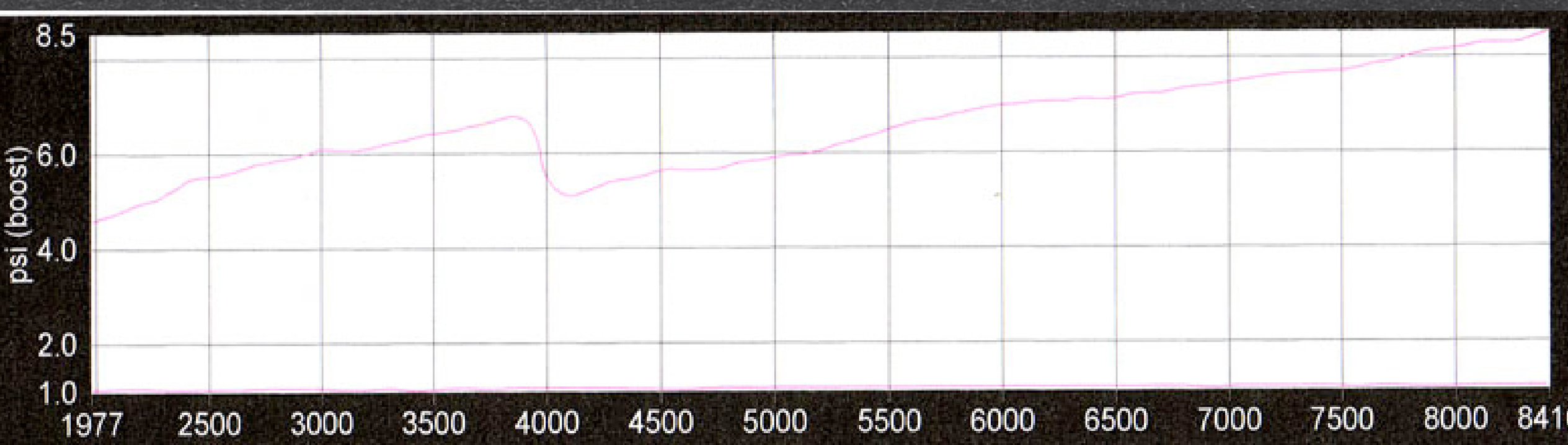
VTC Supercharging

- Similar to tuning big cam H.C. motor
- Assume Cams, intake 4-2-1 headers and ex.
- Low cam VTC 45-50 degrees
- Hi cam VTC 50 deg to 6500-7500
- Maybe retard to 40 degrees from 7000 up
- Loves overlap
- Cam angle alters boost level in manifold
- Boost does not = power
- Picture of 2 boost curves /vtec point

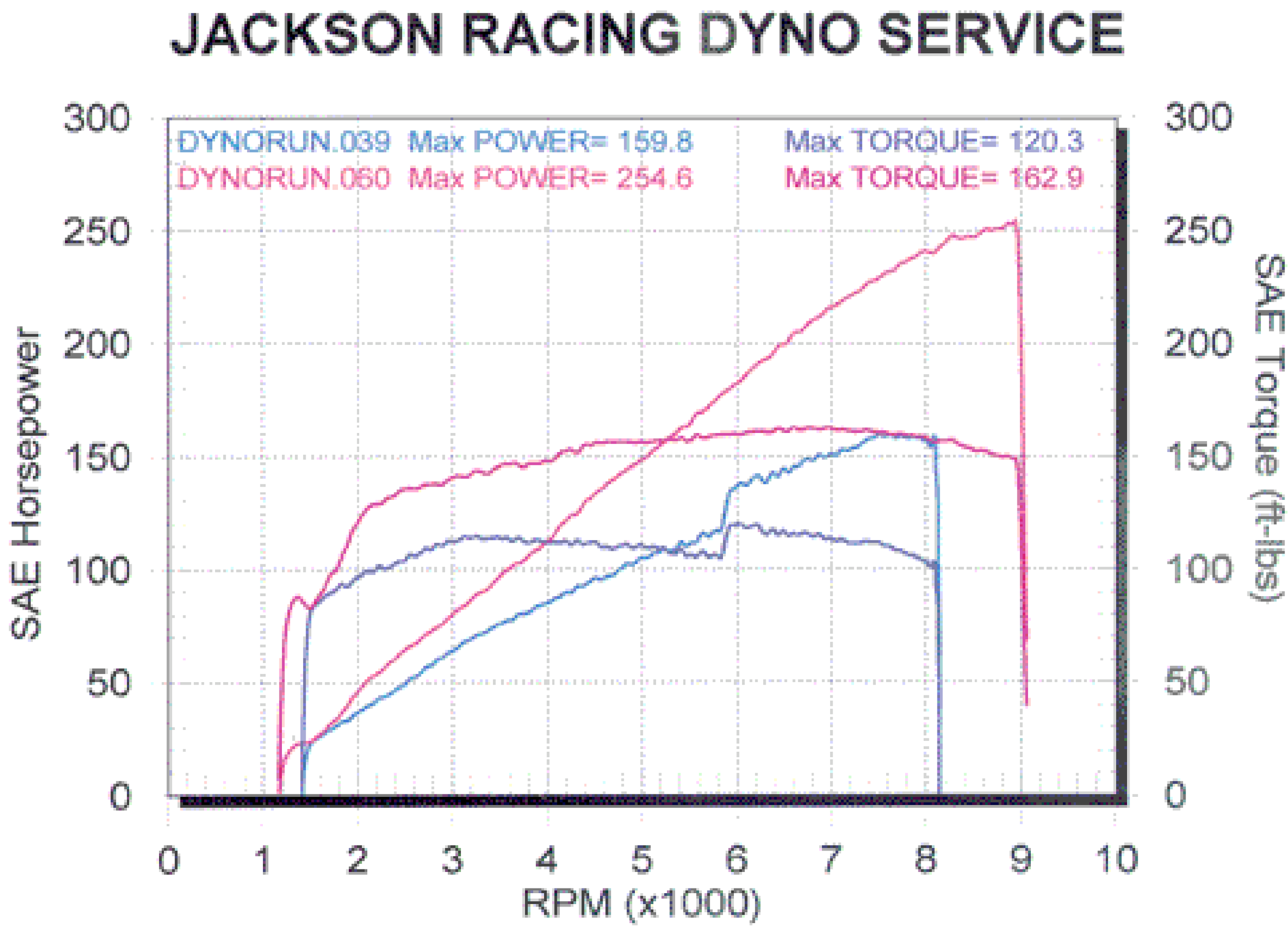
JRSC boost curve 5 & 8 psi



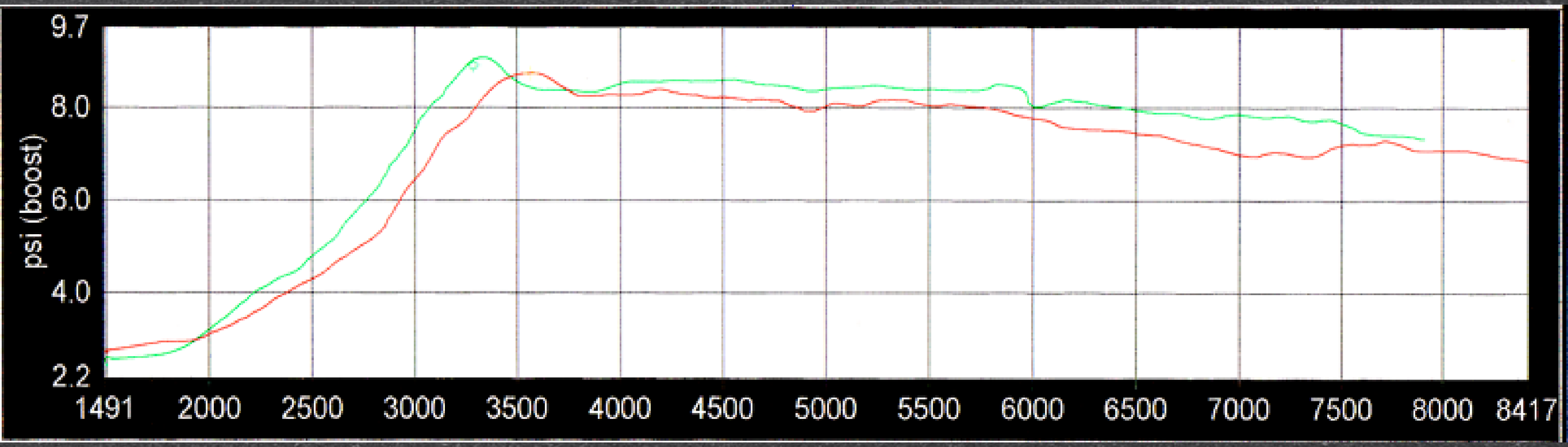
- Top curve may have intake restriction > 6K



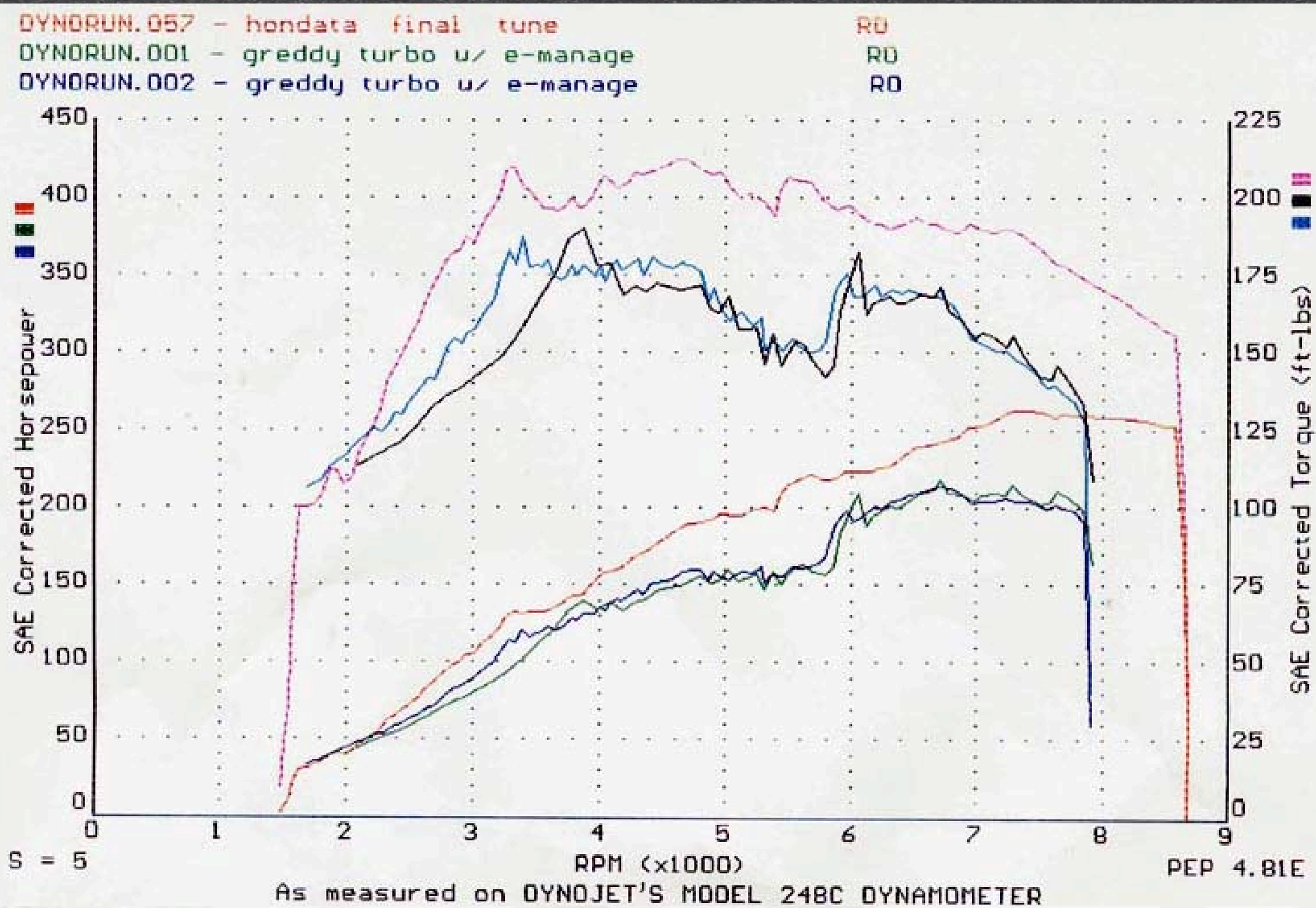
JRSC DYNO CHART



Greddy RSX-S boost



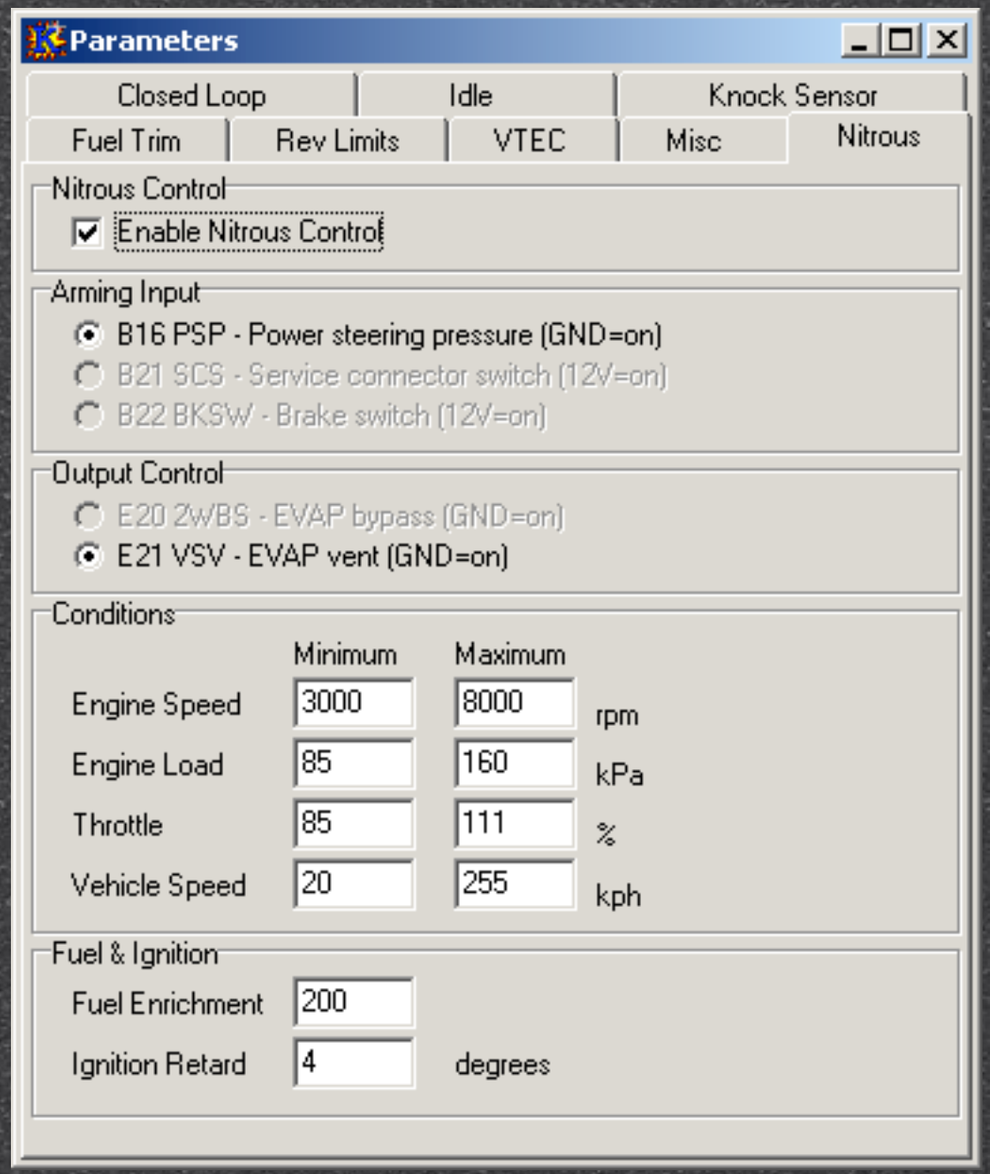
Greddy K-pro tuning

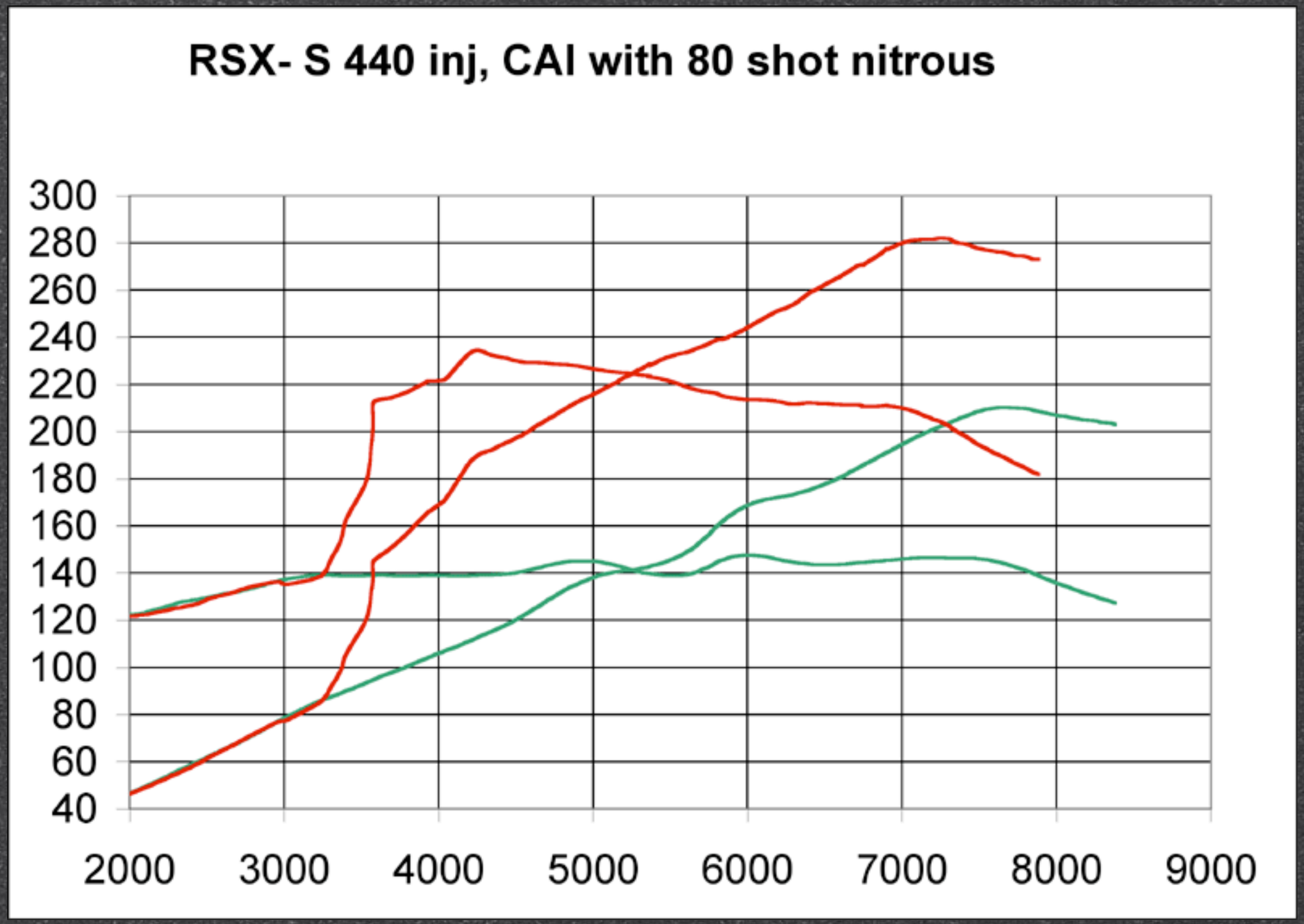


PRECISION TUNING WITH DYNOJET 248 DYNO BY ADAMS AUTOMOTIVE (850)-683-3966

Nitrous

- Much safer with K-Pro
- Best: dry shot
- Great with boost
- Use bigger injectors
- Wet - poor fuel distribution
- Low gear wheelspin
- Switch off before redline
- Must retard ignition
- Too much too low = boom



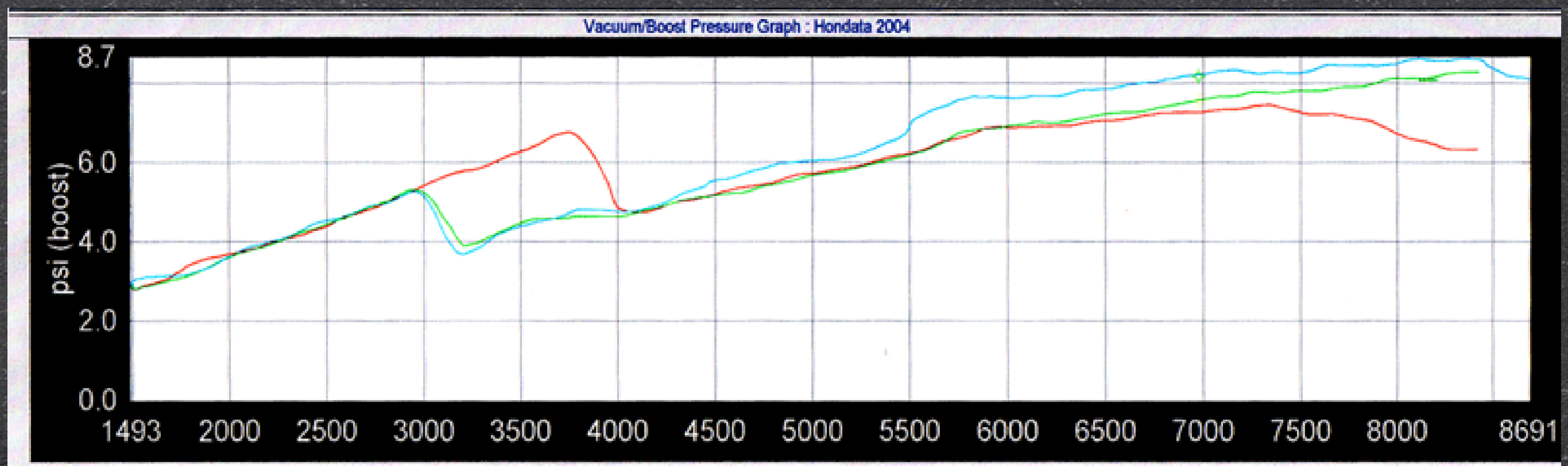

RSX- S 440 inj, CAI with 80 shot nitrous
300
280
260
240
220
200
180
160
140
120
100
80
60
40
2000
3000
4000
5000
6000
7000
8000
9000

Nitrous and Boost

- Nitrous Intercooler!
- Supercharger makes a good nitrous mixer
  - Increases boost 0.4 psi on JRSC
- Turbocharger
  - small shot at low RPM spools turbo

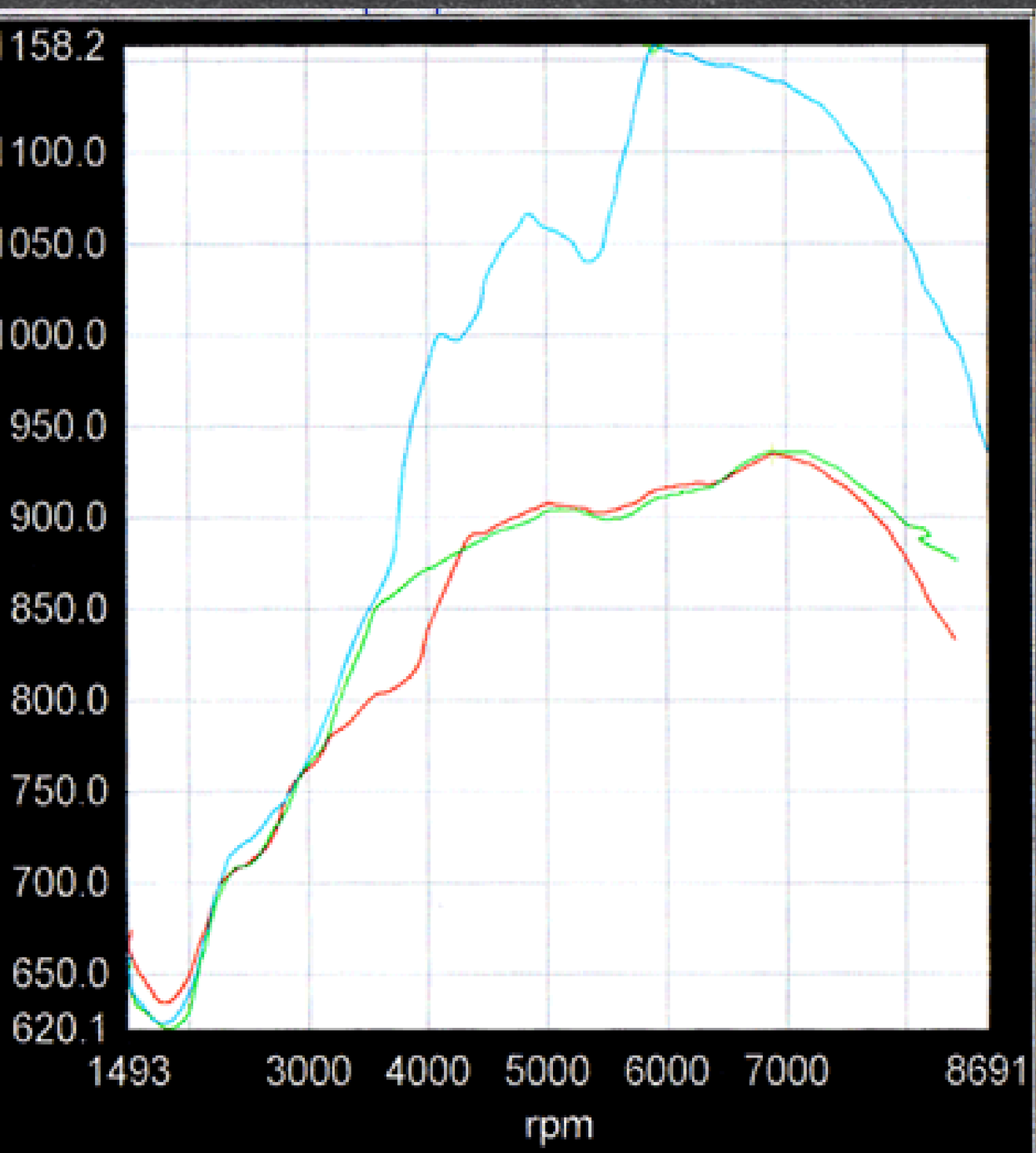
JRSC 7 psi + N_2O + VTEC

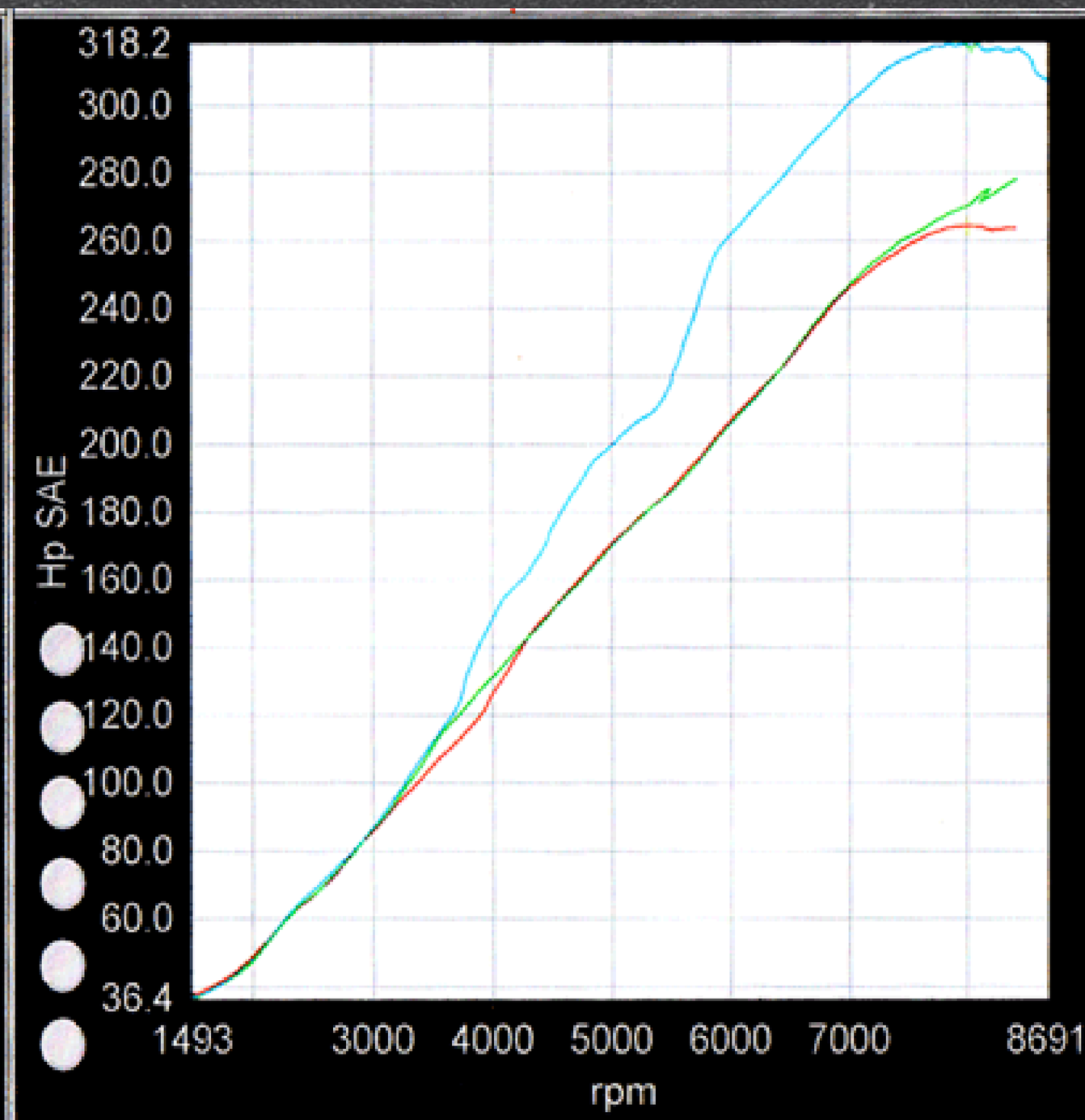
- VTEC @ 3K more power than VTEC @ 4K even though boost is more
- Nitrous cools & adds boost (0.5-0.7 psi)
- belt slipping after 7500 rpm (red line)



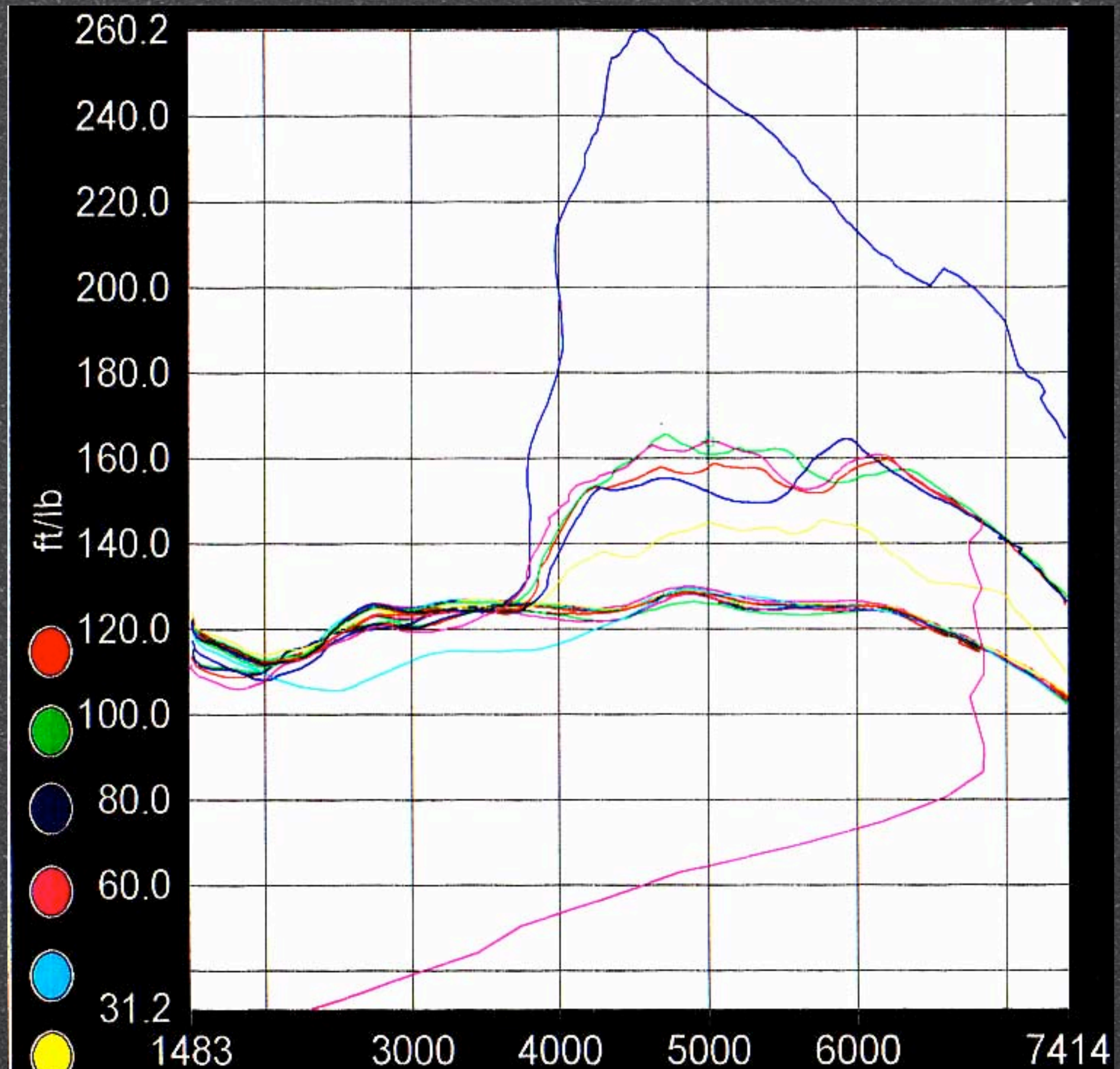
40 shot through JRSC

- 7 pounds boost
- Tightened belt lowered VTEC
- 40 shot at 3500 rpm





Civic Si - no jets installed

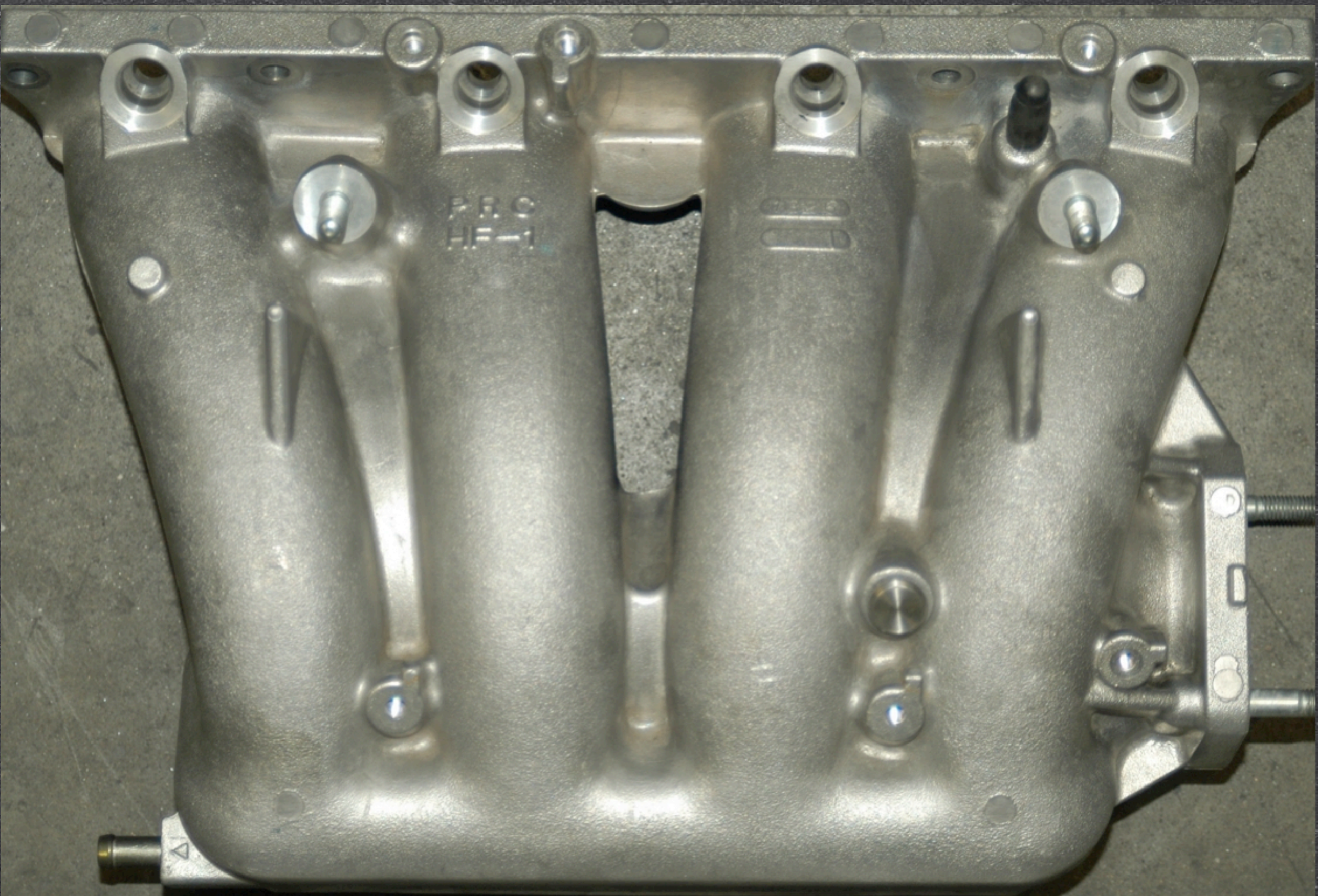


Intakes

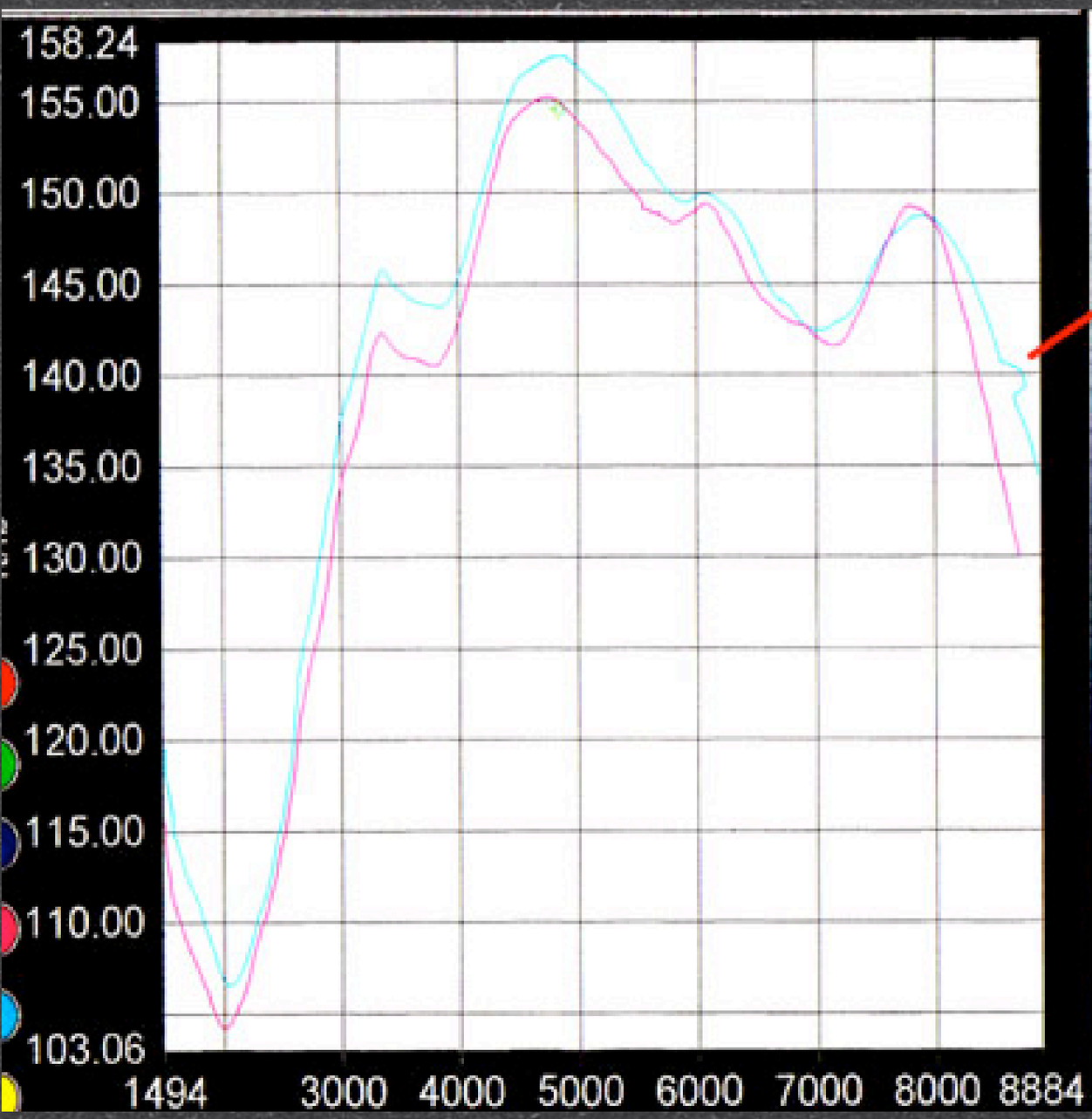
- Torque peak / lean spot at resonance point
- Pressurised intake - 2 mph trap speeds
- Use Datalogging to measure air pressure + temp

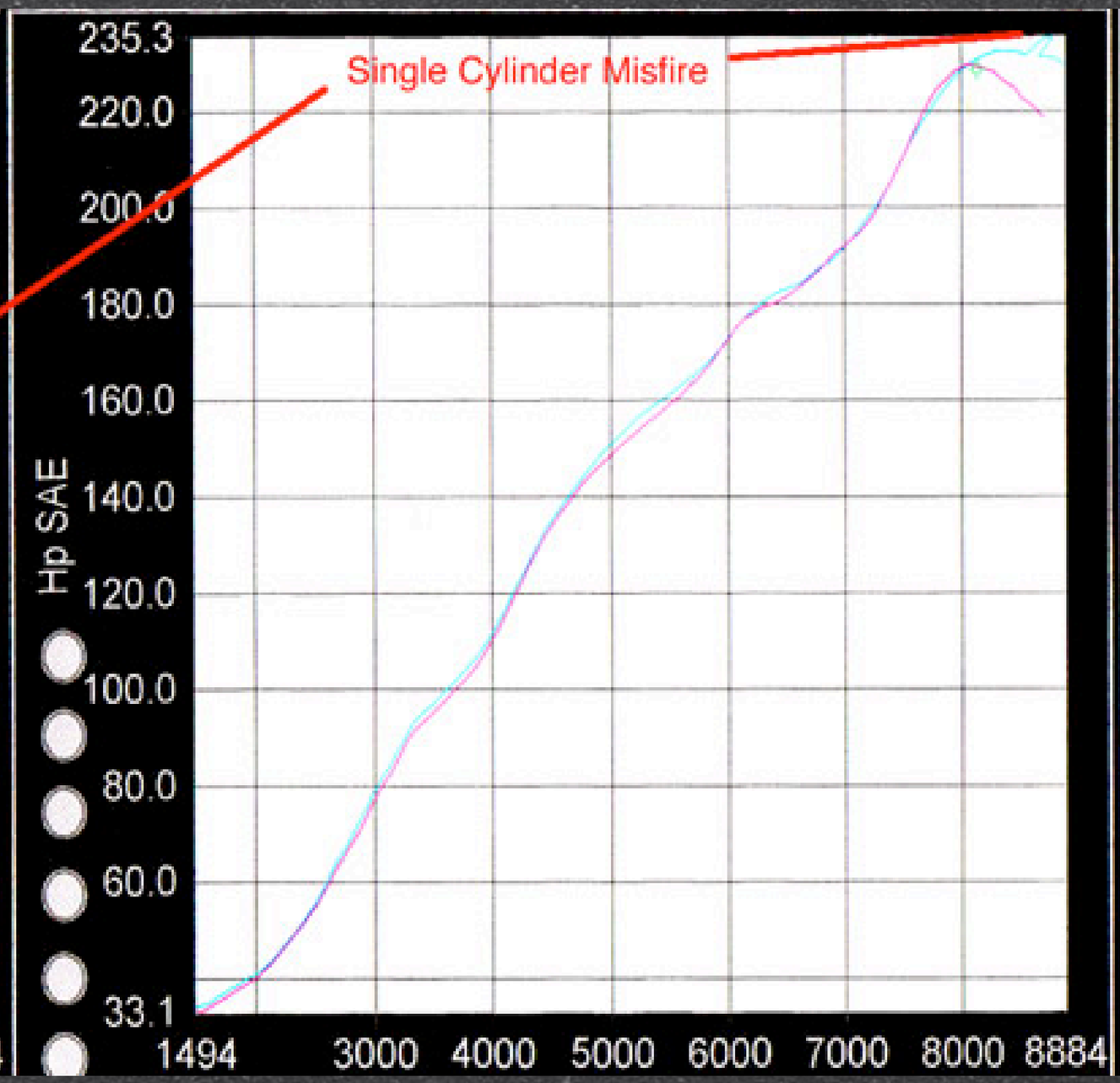
PRB Intake

PRC Intake



ITR intake gains





Toda ITB

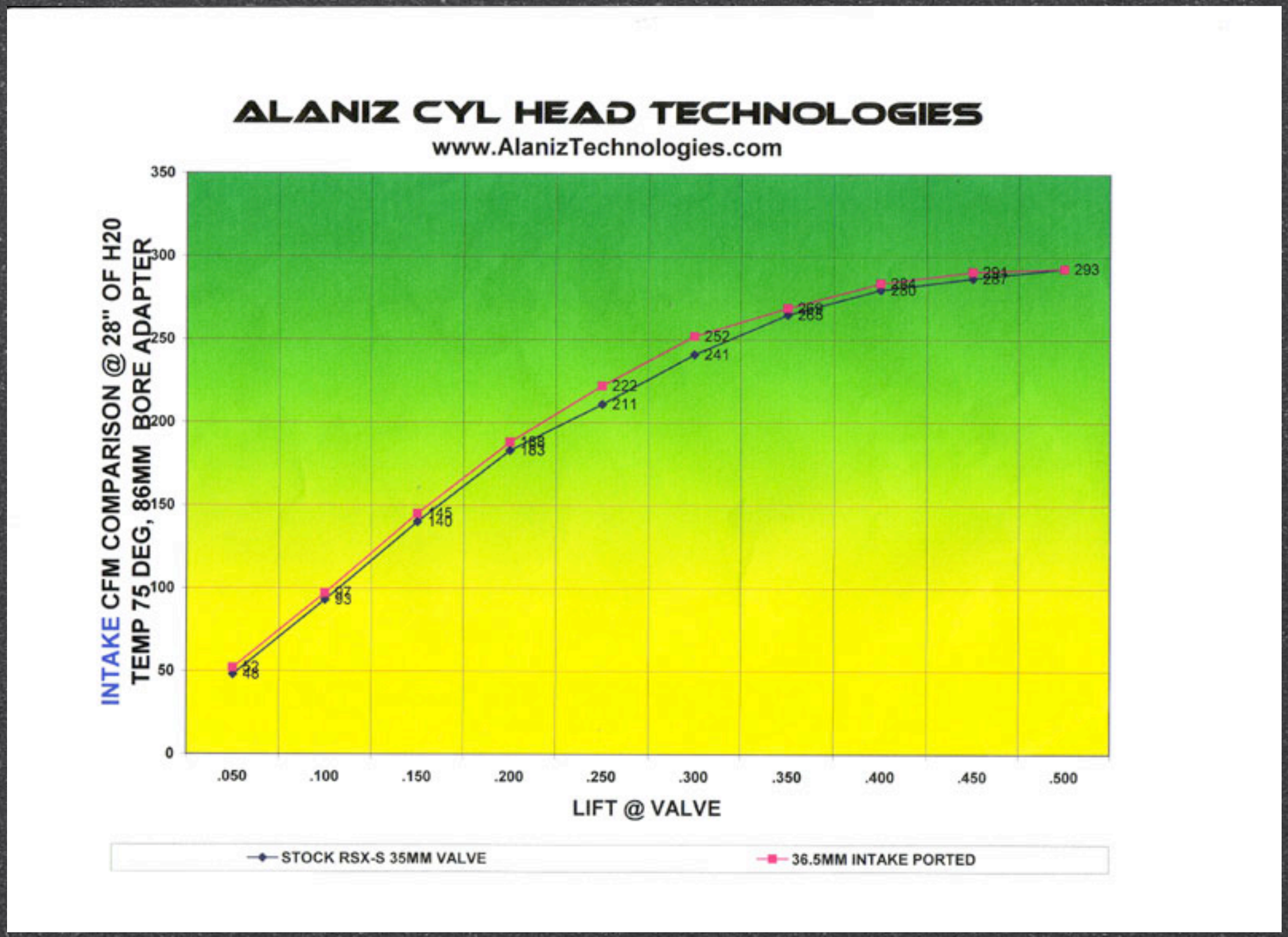
Injector positioning

- Towards the top of the runner
- Machine / cast new bottom end plate
- Bad for emissions good for power
- 20 C fuel temp drop 1% power
- http://www.designengineering.com
- CO2 fuel & intercooler Cooling

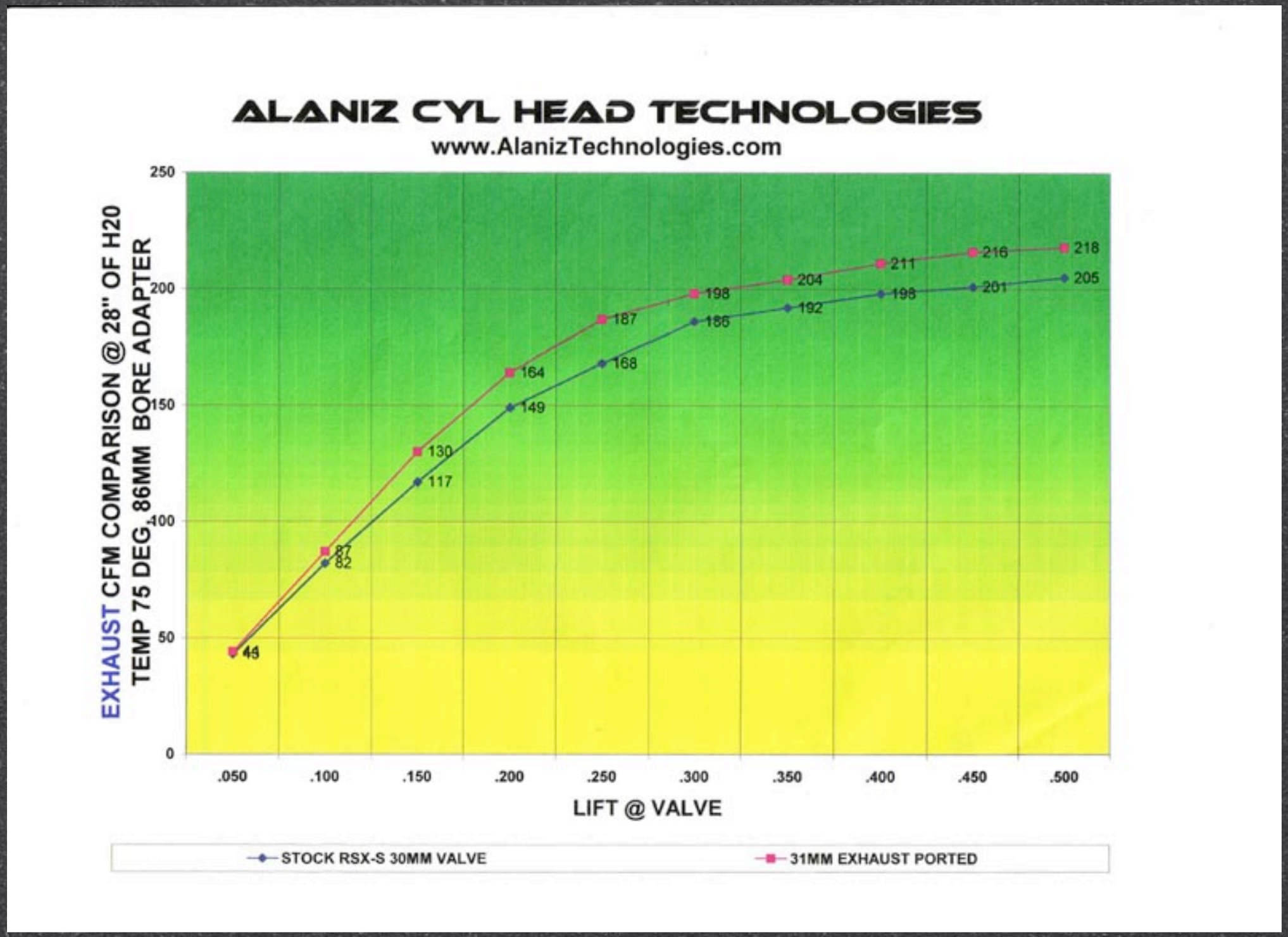
Pitfalls

- Valve Spring pressure too high
- Installing cam correctly
- reversing TPS and MAP
- Supercharging - not relocating map

Intake flow improvements



Exhaust flow improvements

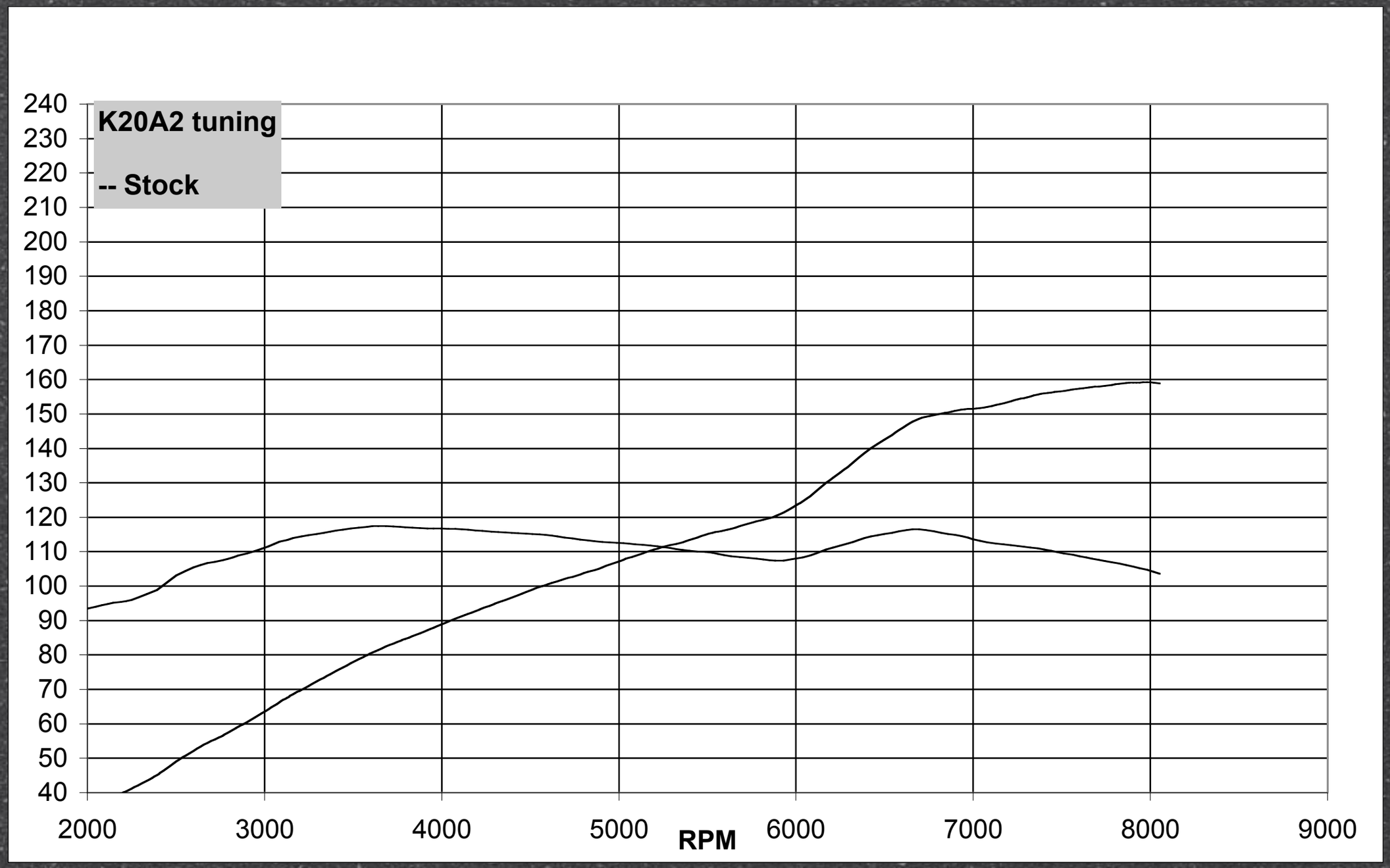


The Effect of...

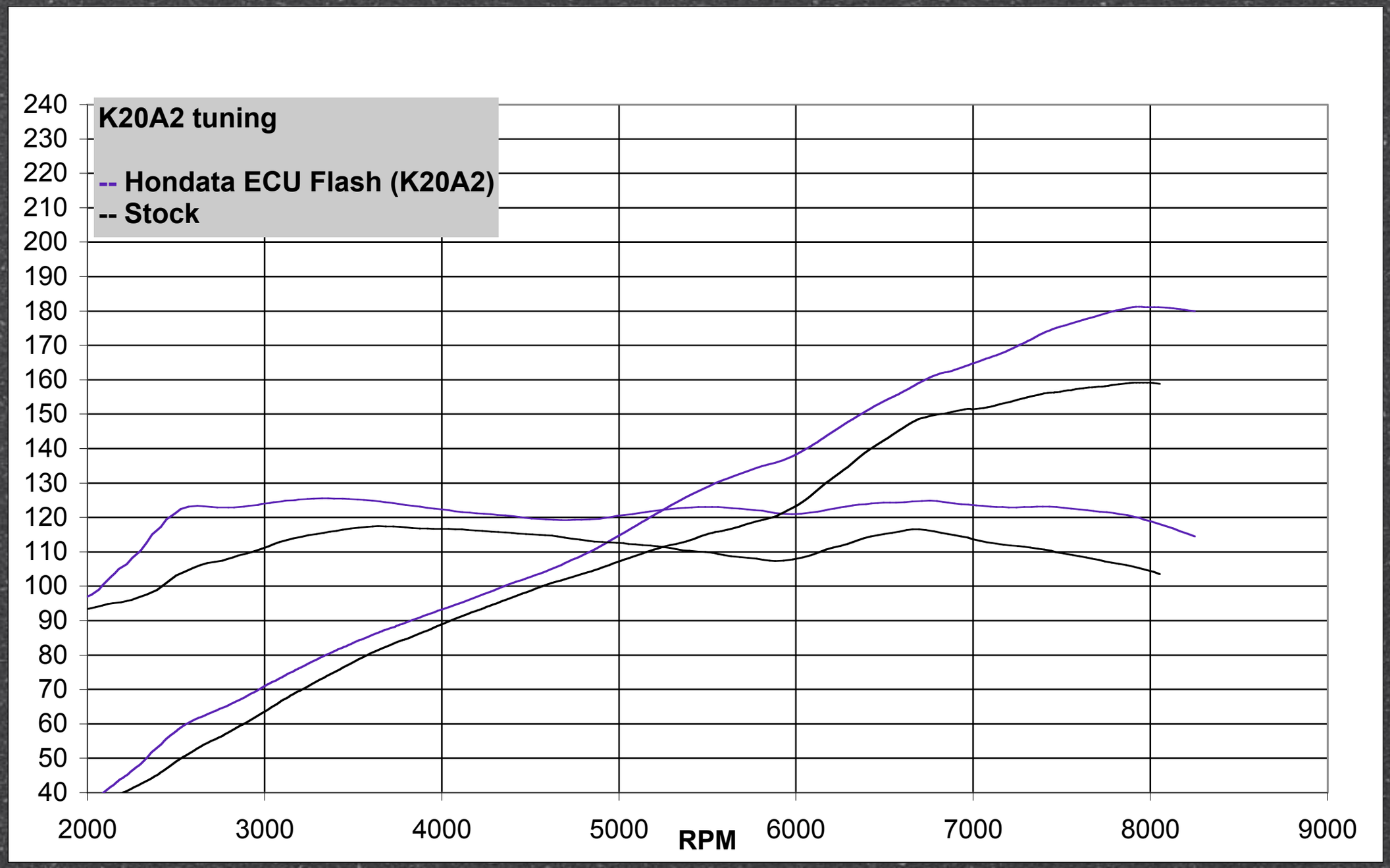
- Cold Air intake
- Hondata intake gasket
- ITR intake manifold
- Headers
- cams
- Exhaust
- throttle body
- higher Compression
- porting

Engine Buildups

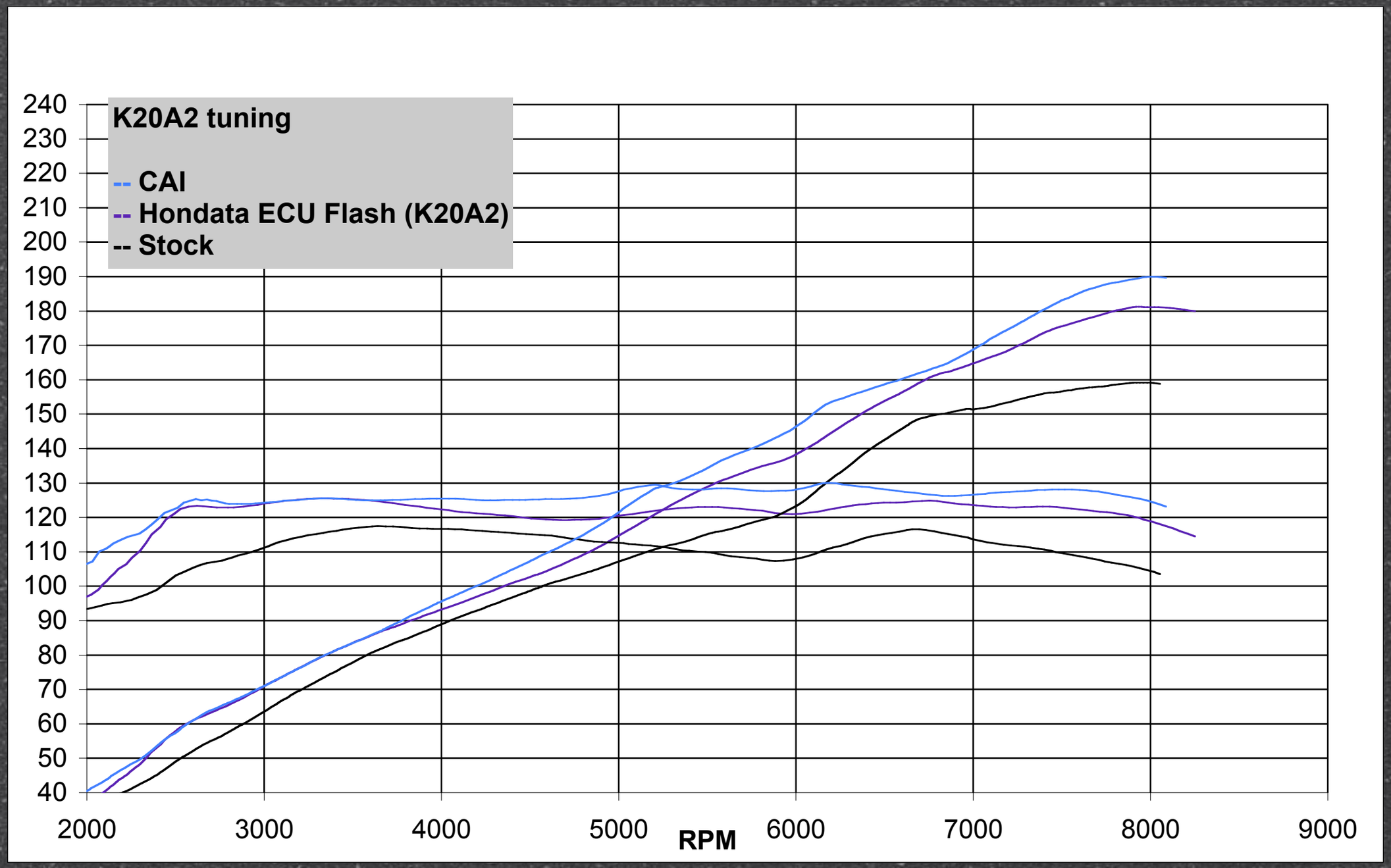
K20 Engine Stock



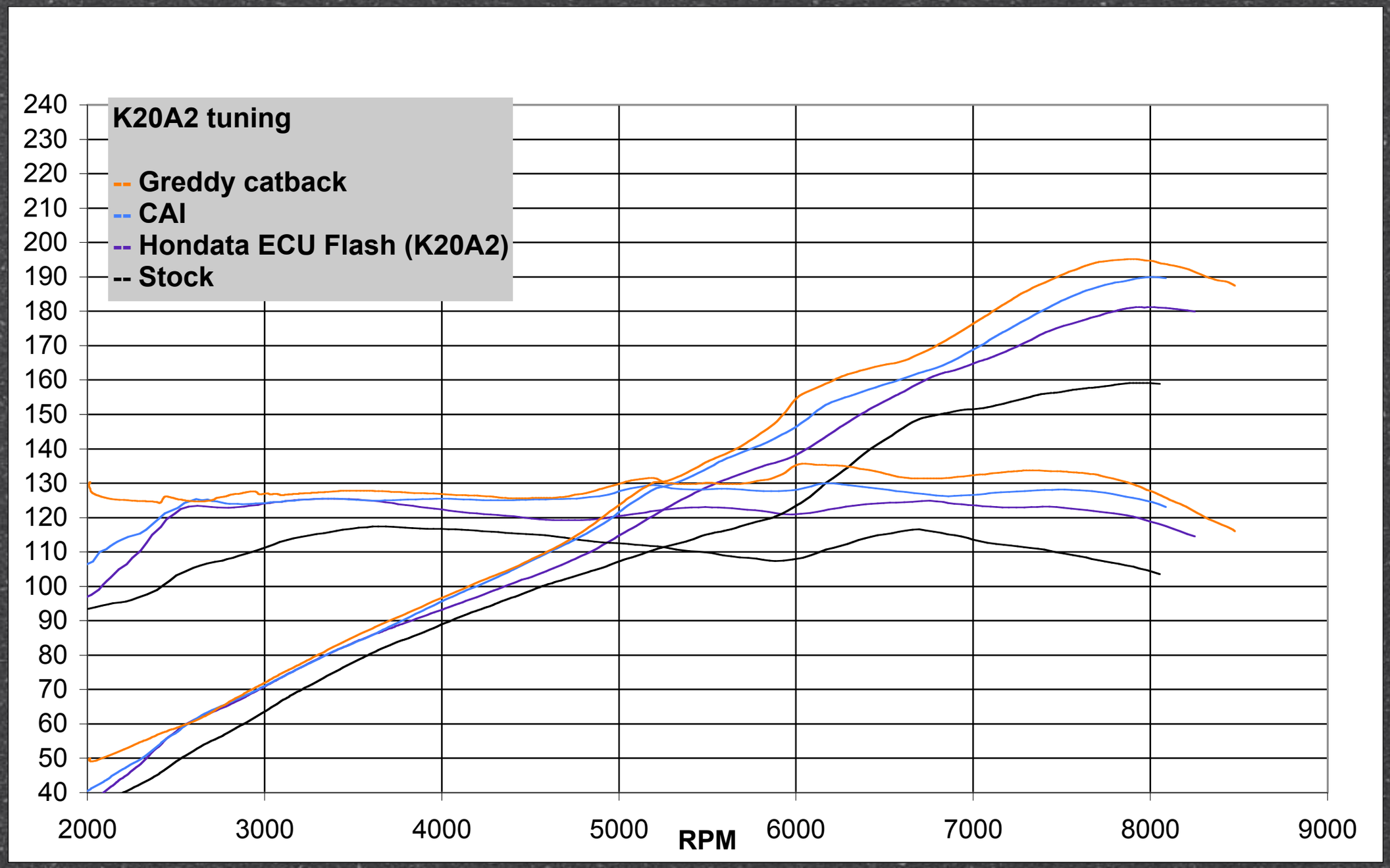
Hondata Reflash



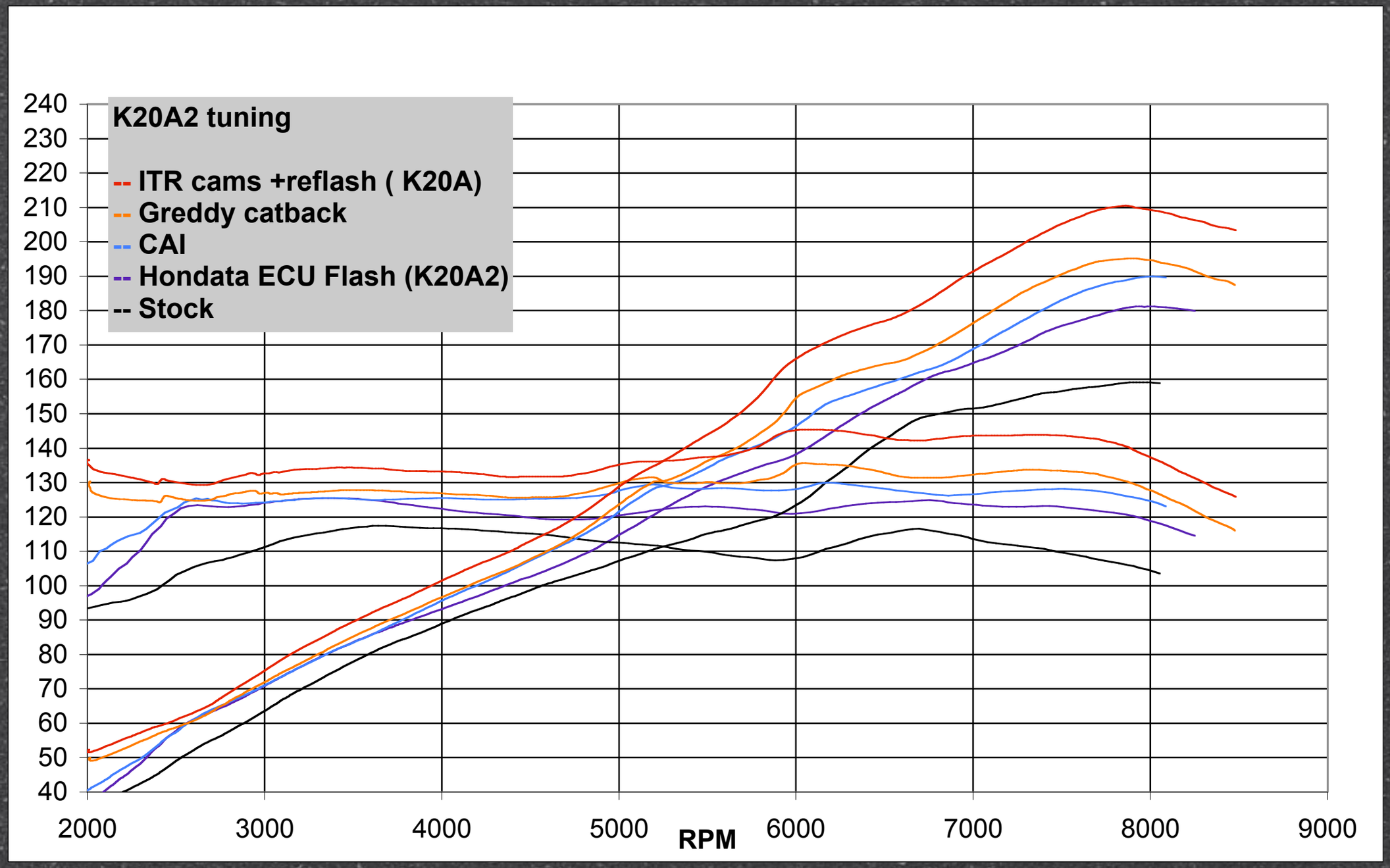
C.A.I.


K20A2 tuning
-- CAI
-- Hondata ECU Flash (K20A2)
-- Stock
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
2000
3000
4000
5000
6000
7000
8000
9000
RPM

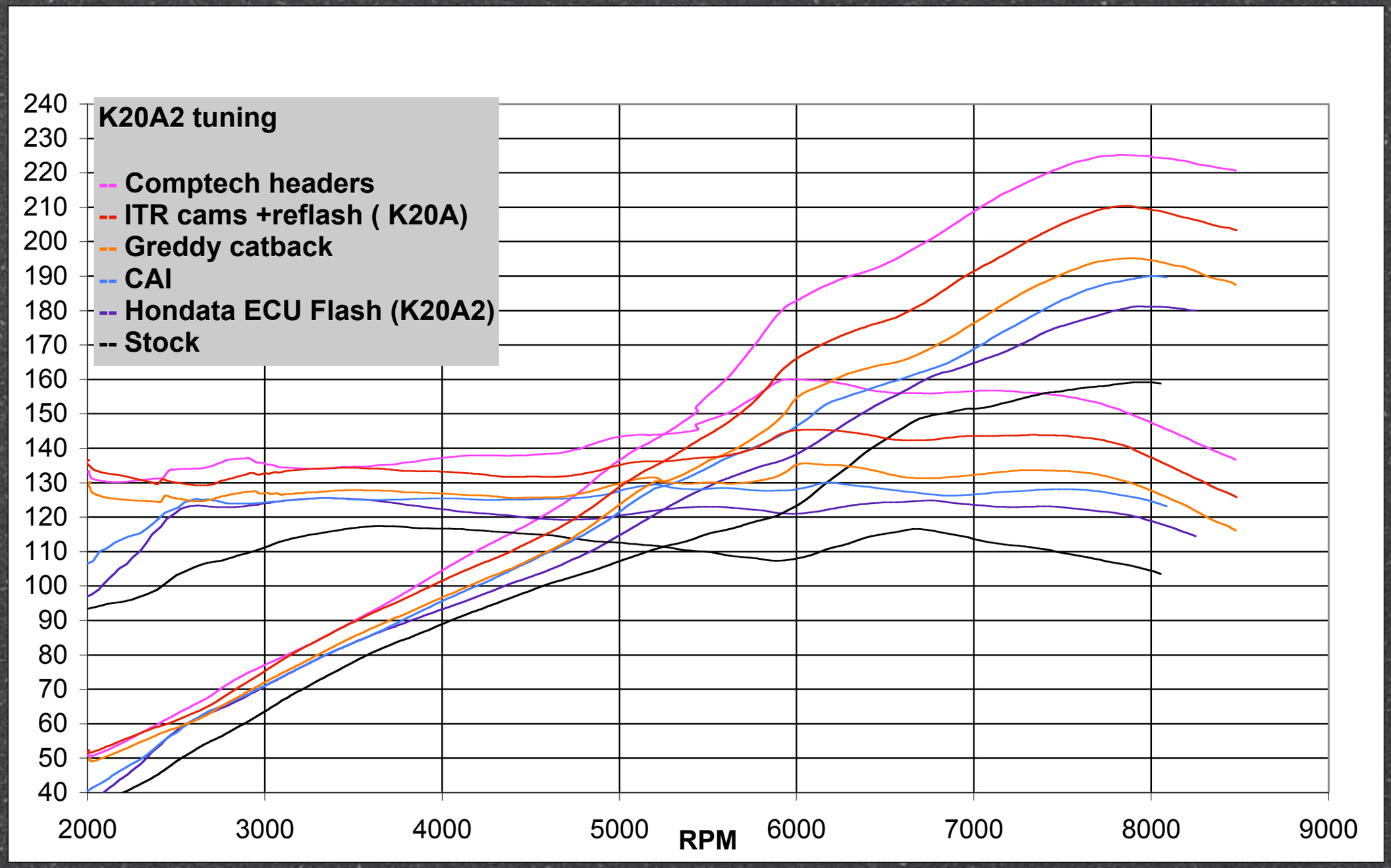
Greddy Catback



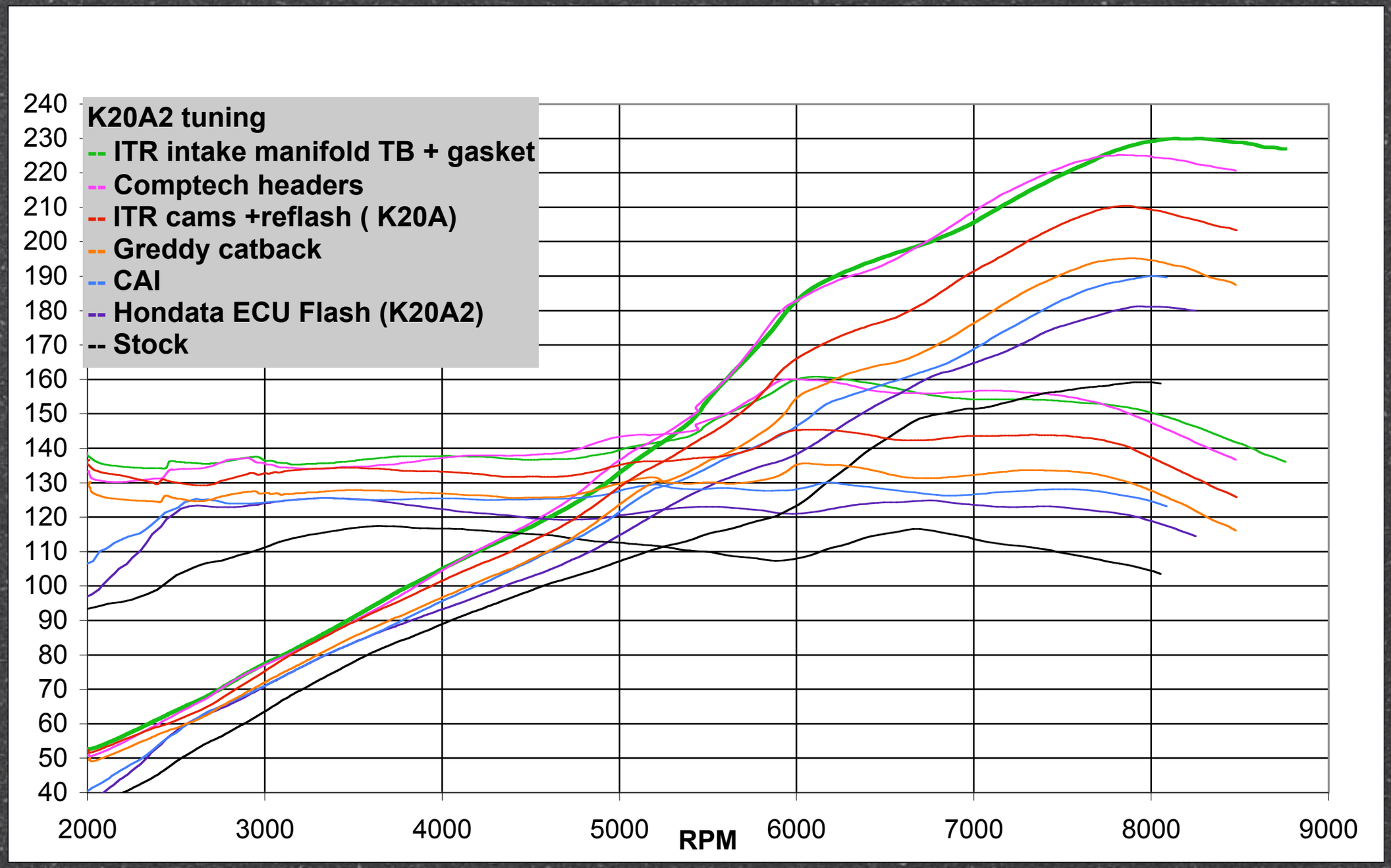
DC5 ITR cams + reflash



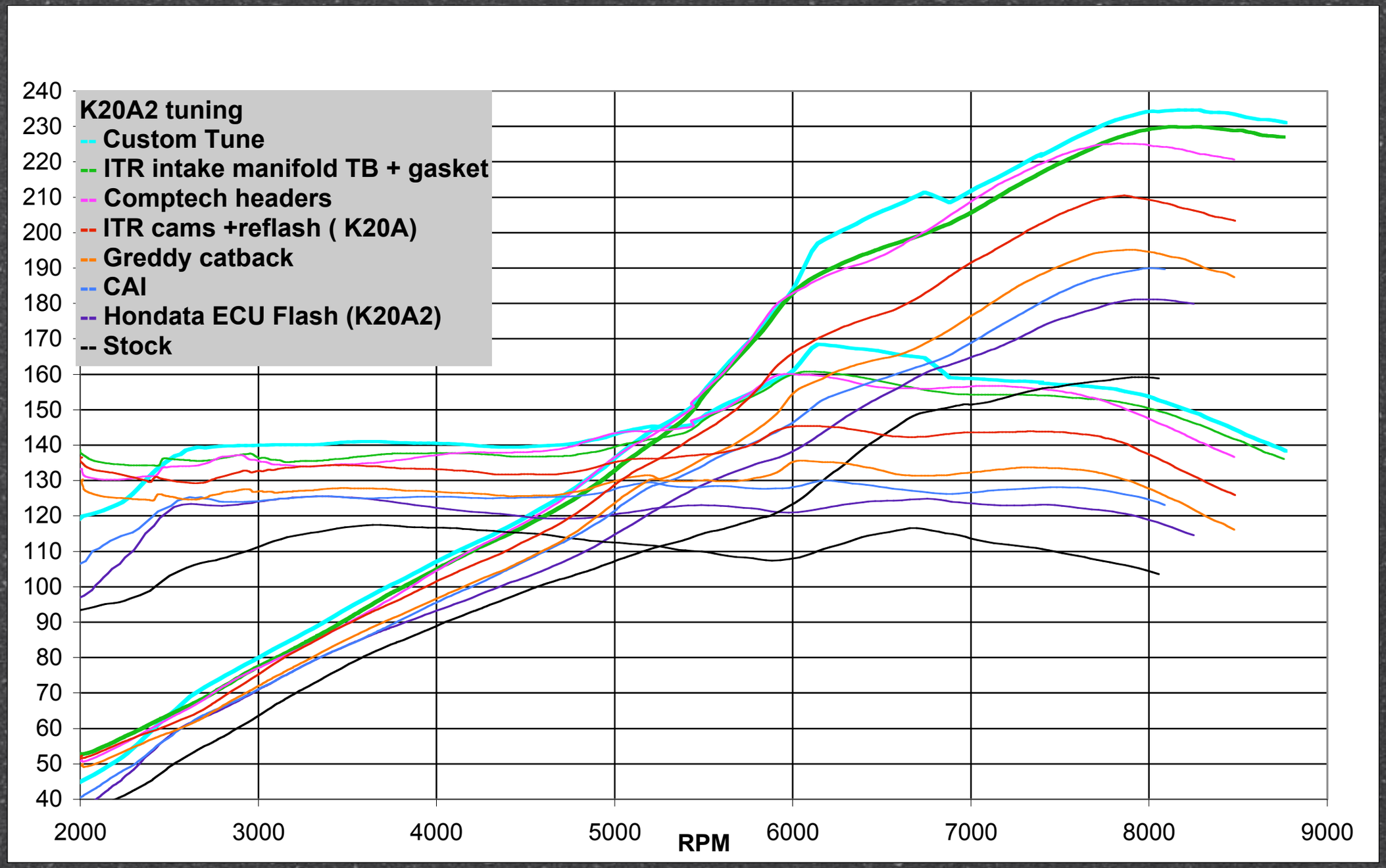
Comptech headers



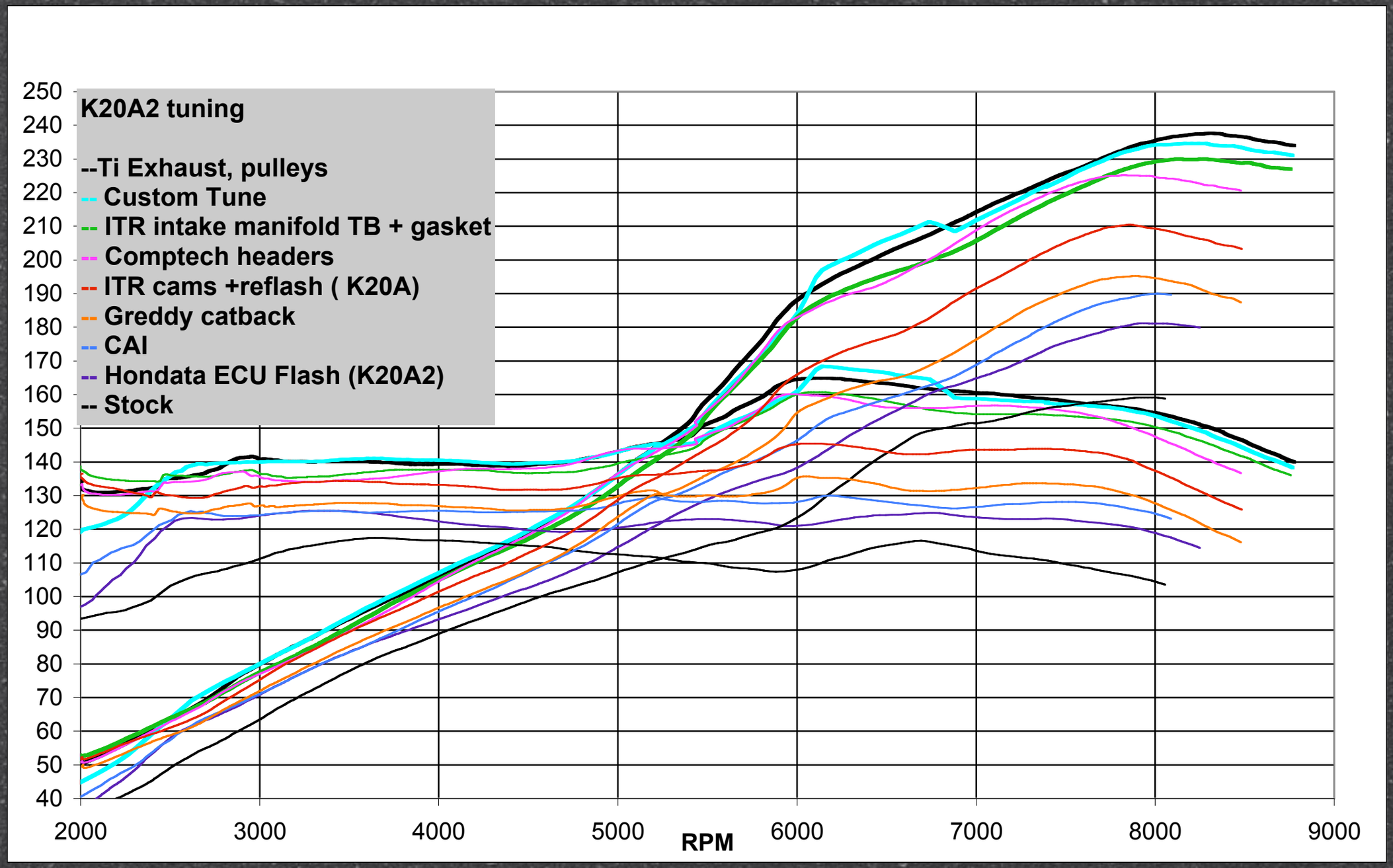
ITR intake, T.B. , Gasket



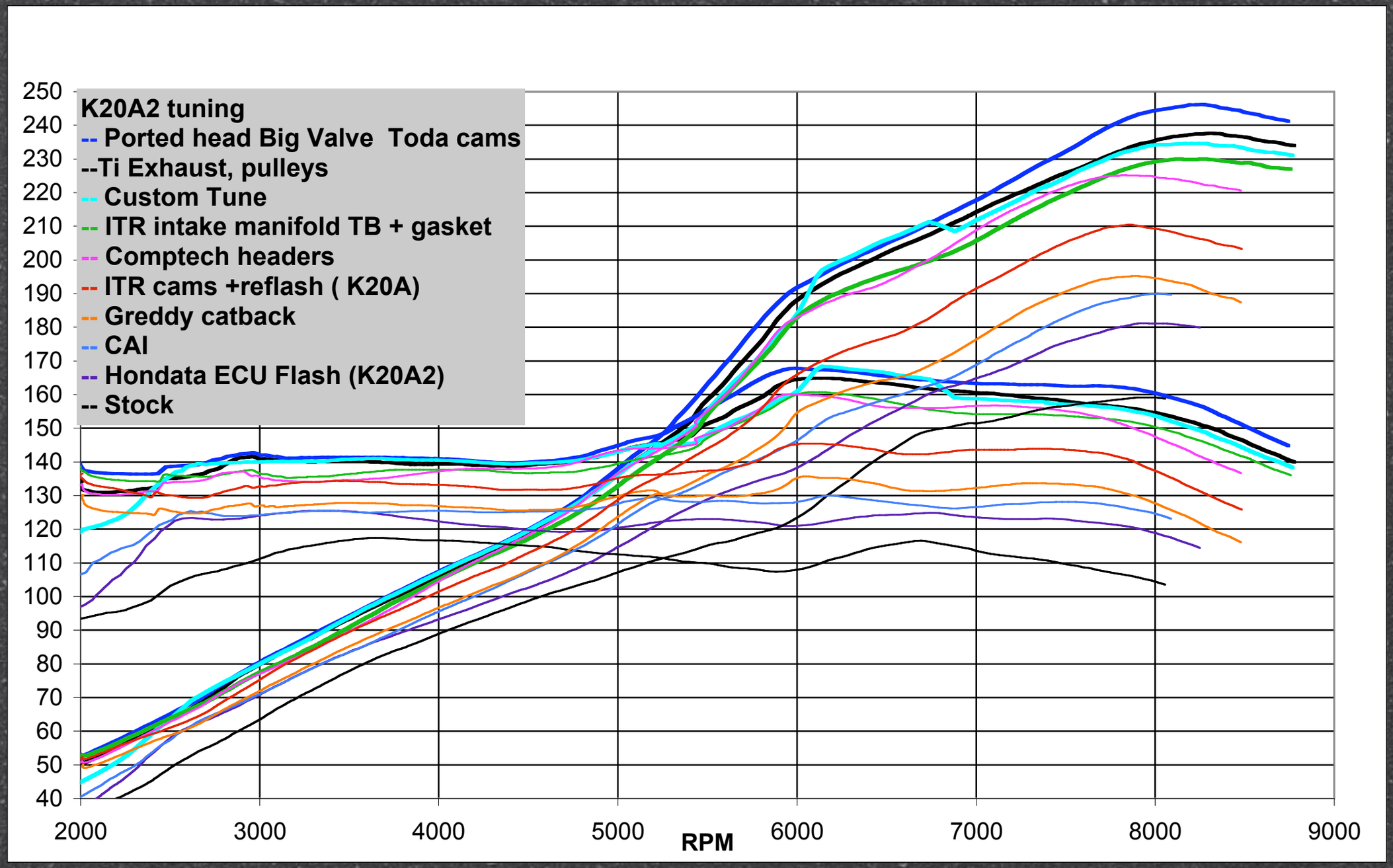
Titanium exhaust + custom ECU tune



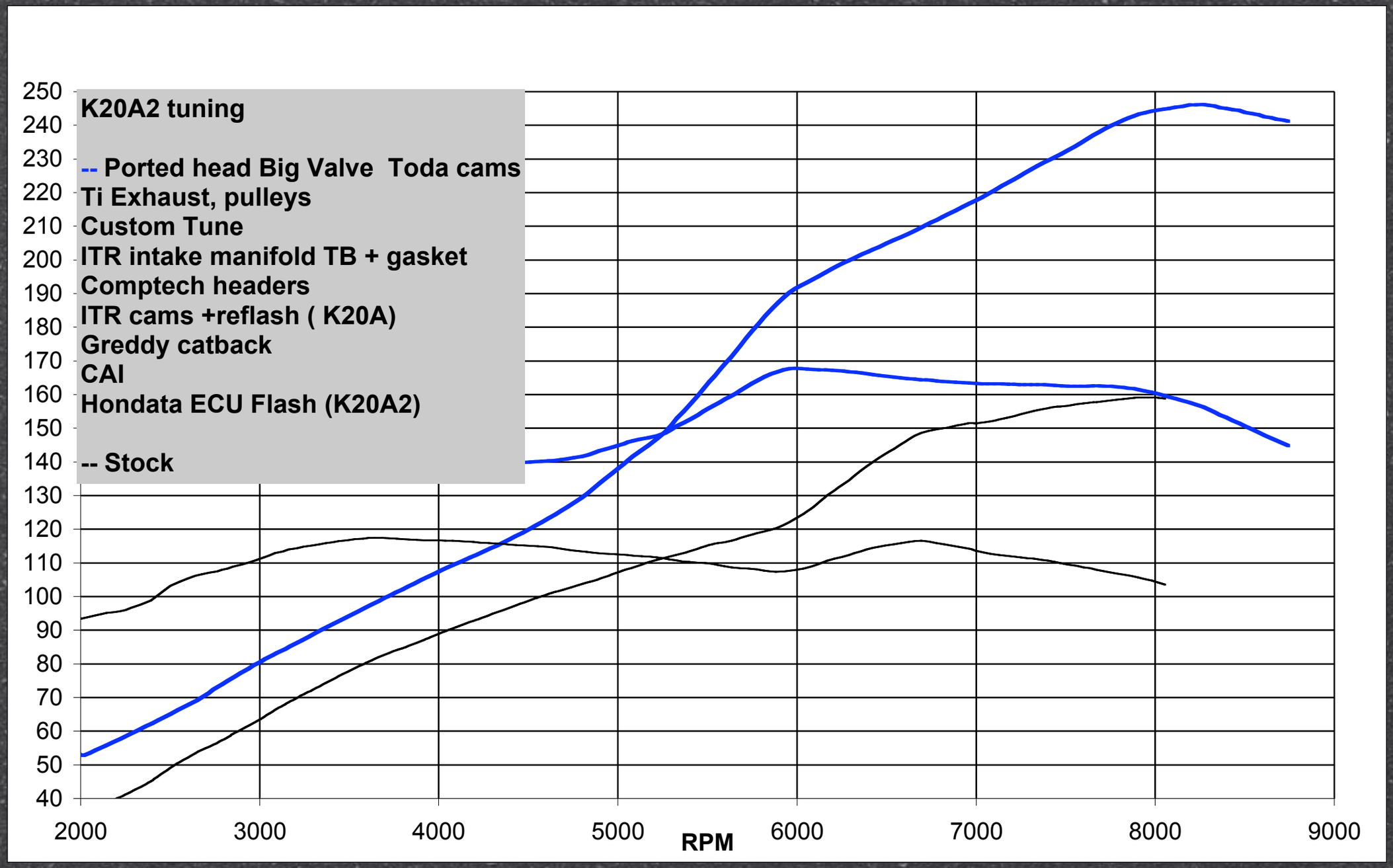
Ti Exhaust, pulleys



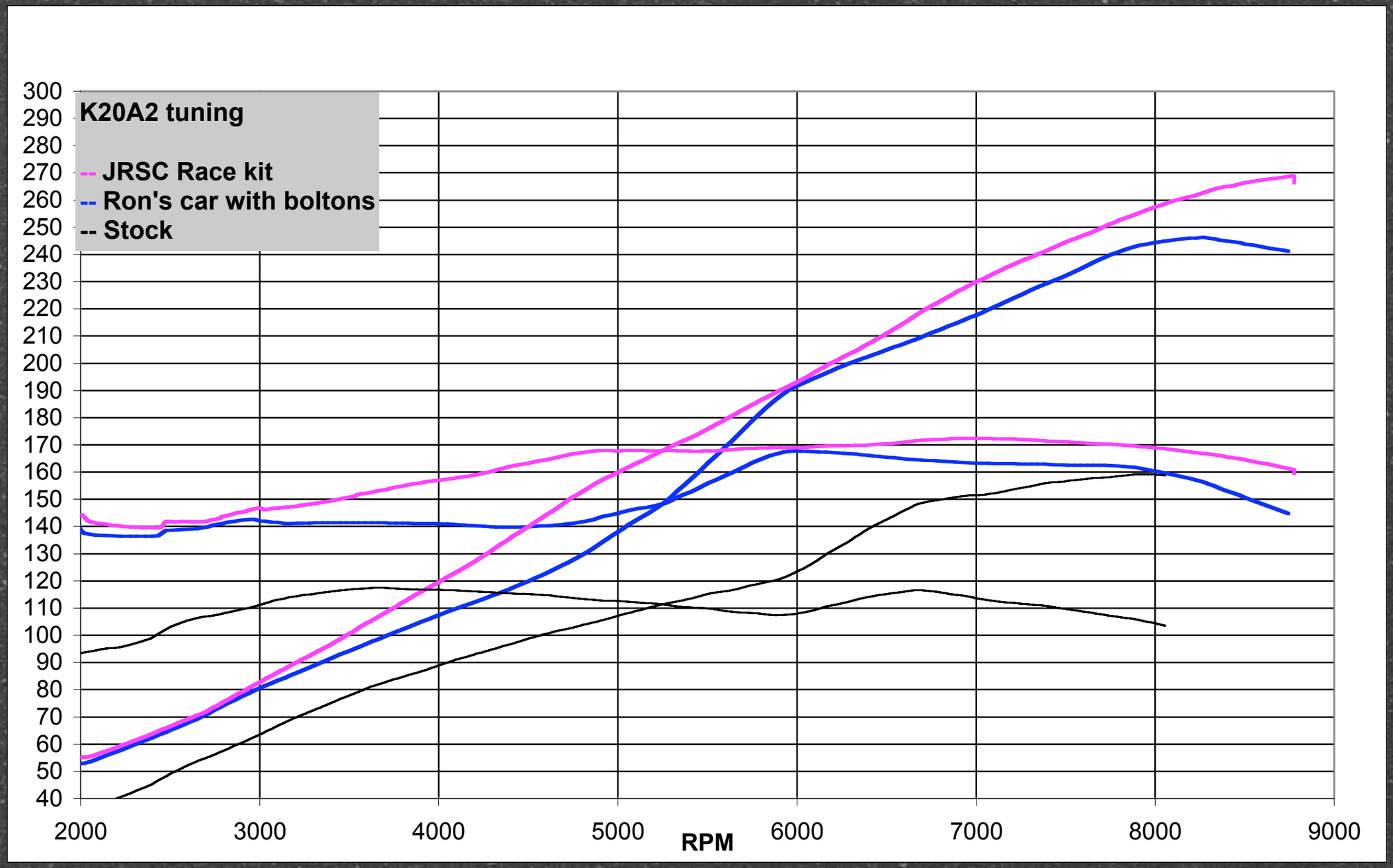
Head port, valves, Toda A cams



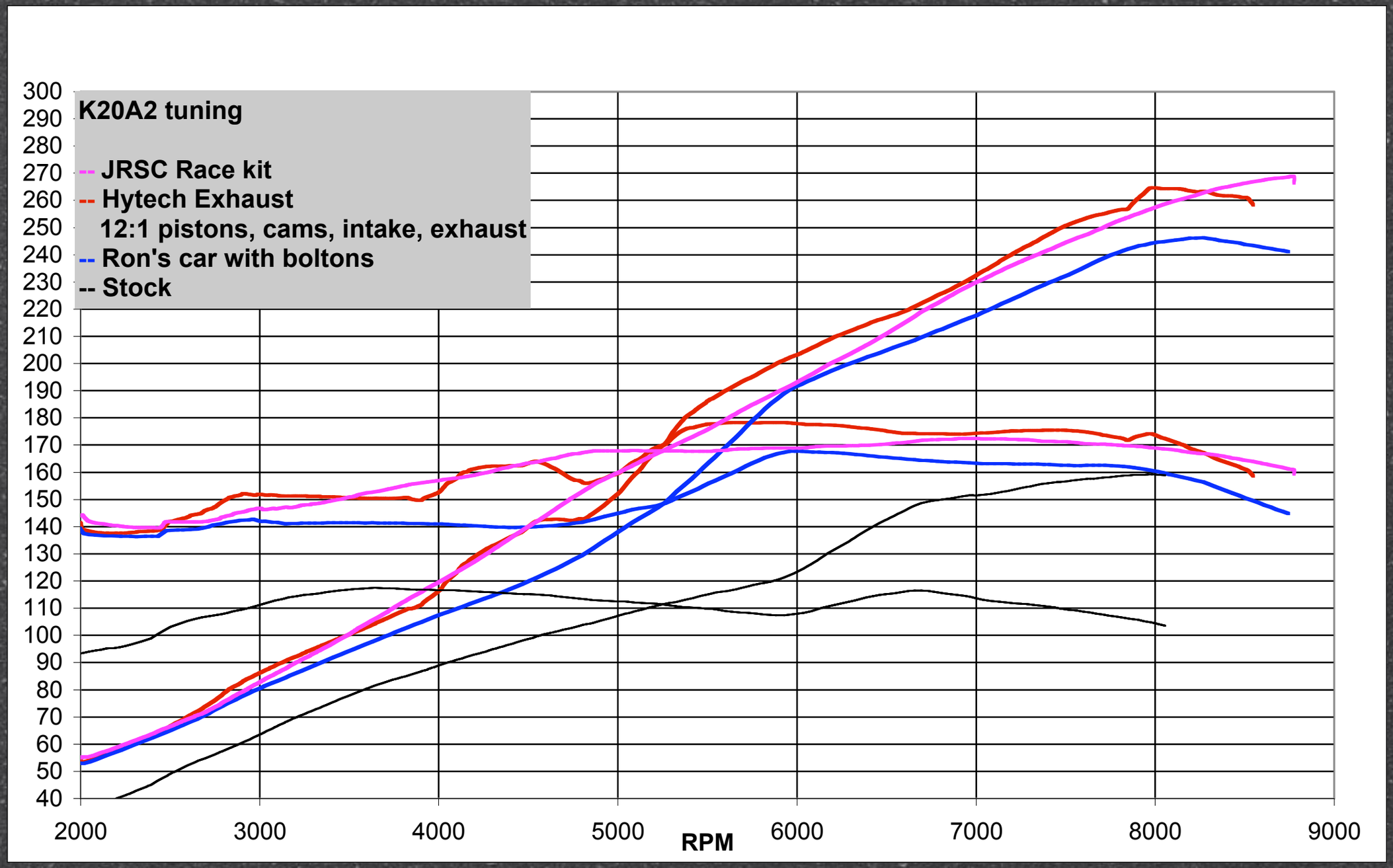
Start to Finish



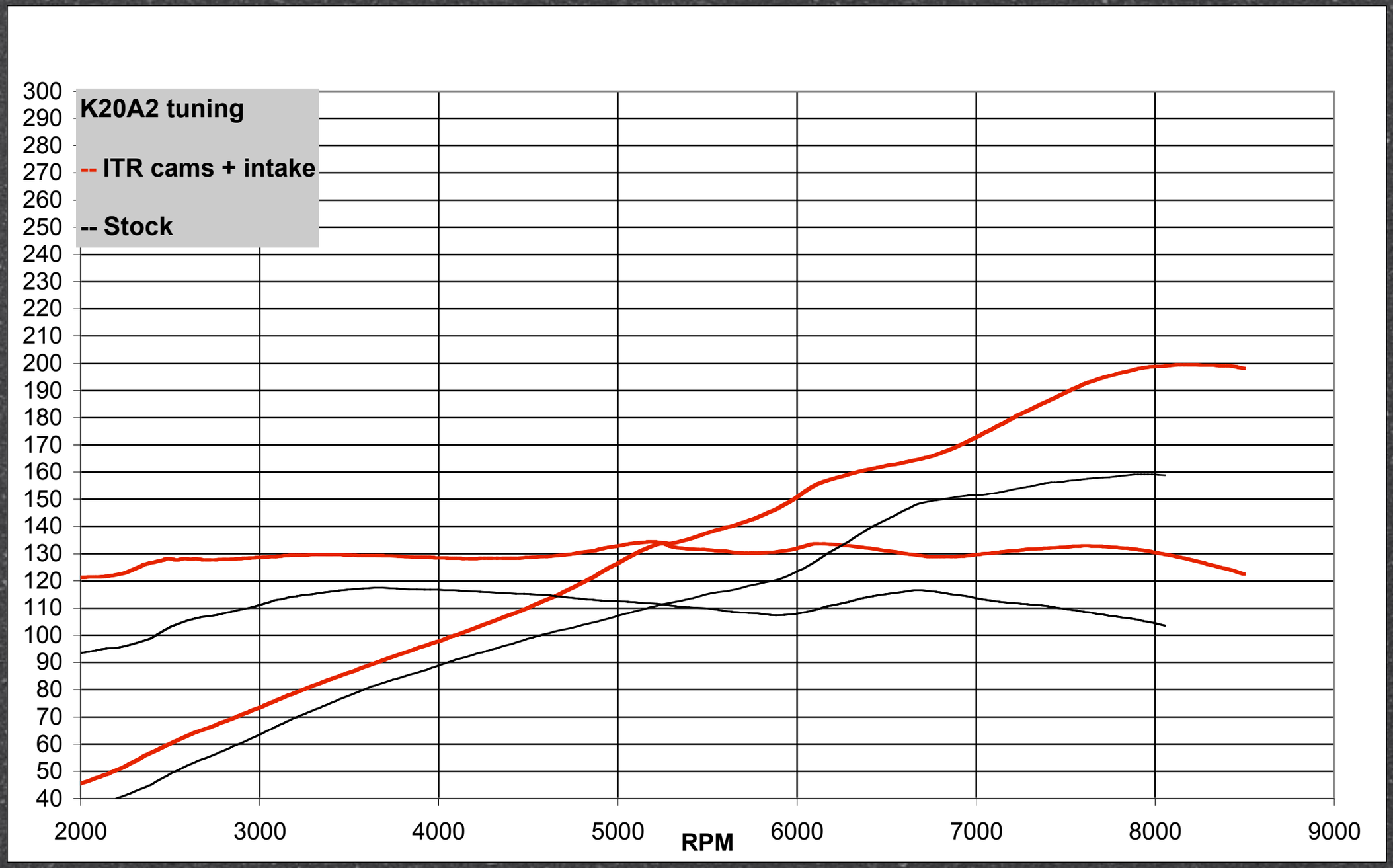
JRSC Supercharger
5 lb boost



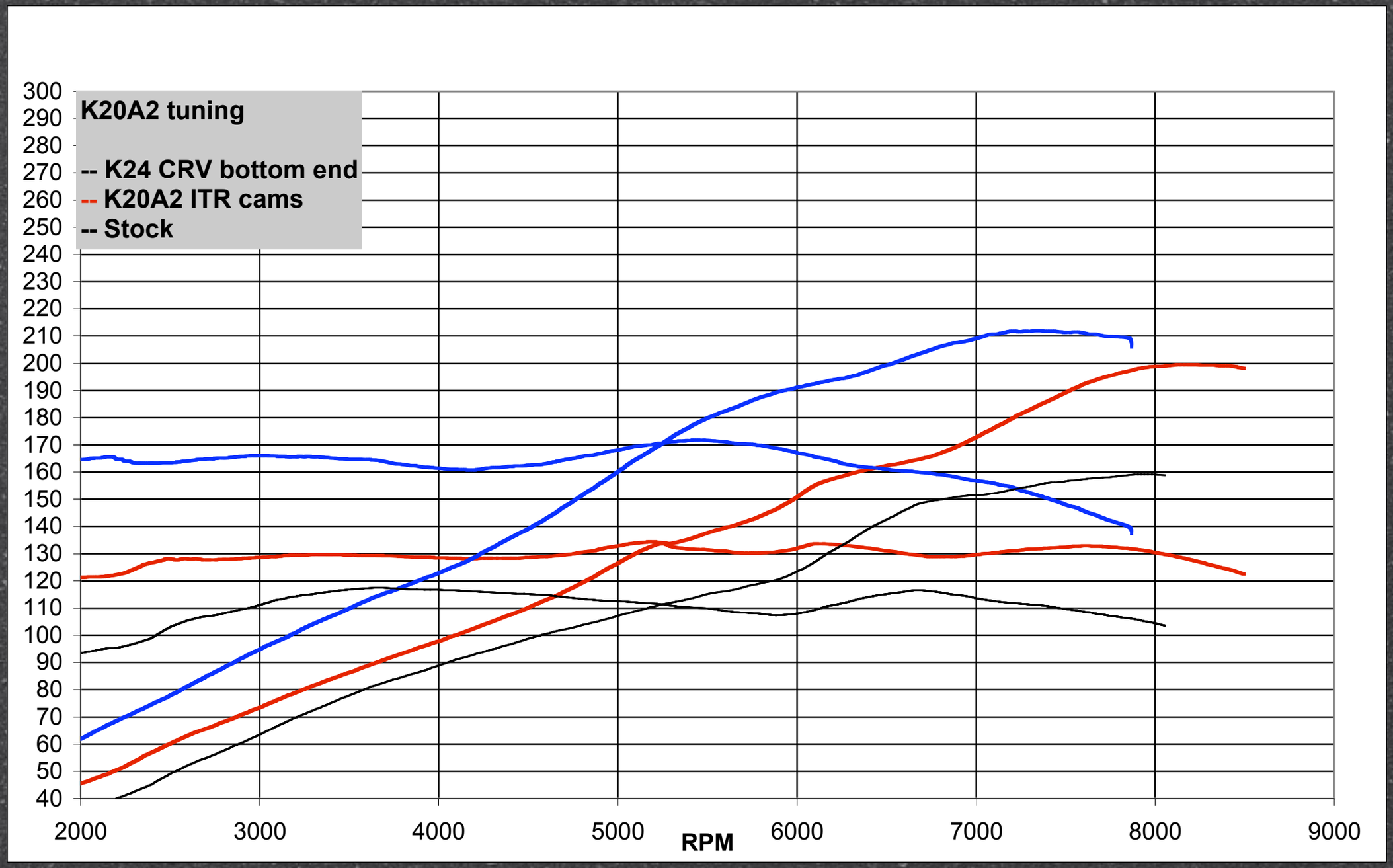
Hytech Exhaust
12:1 Pistons, cams, intake

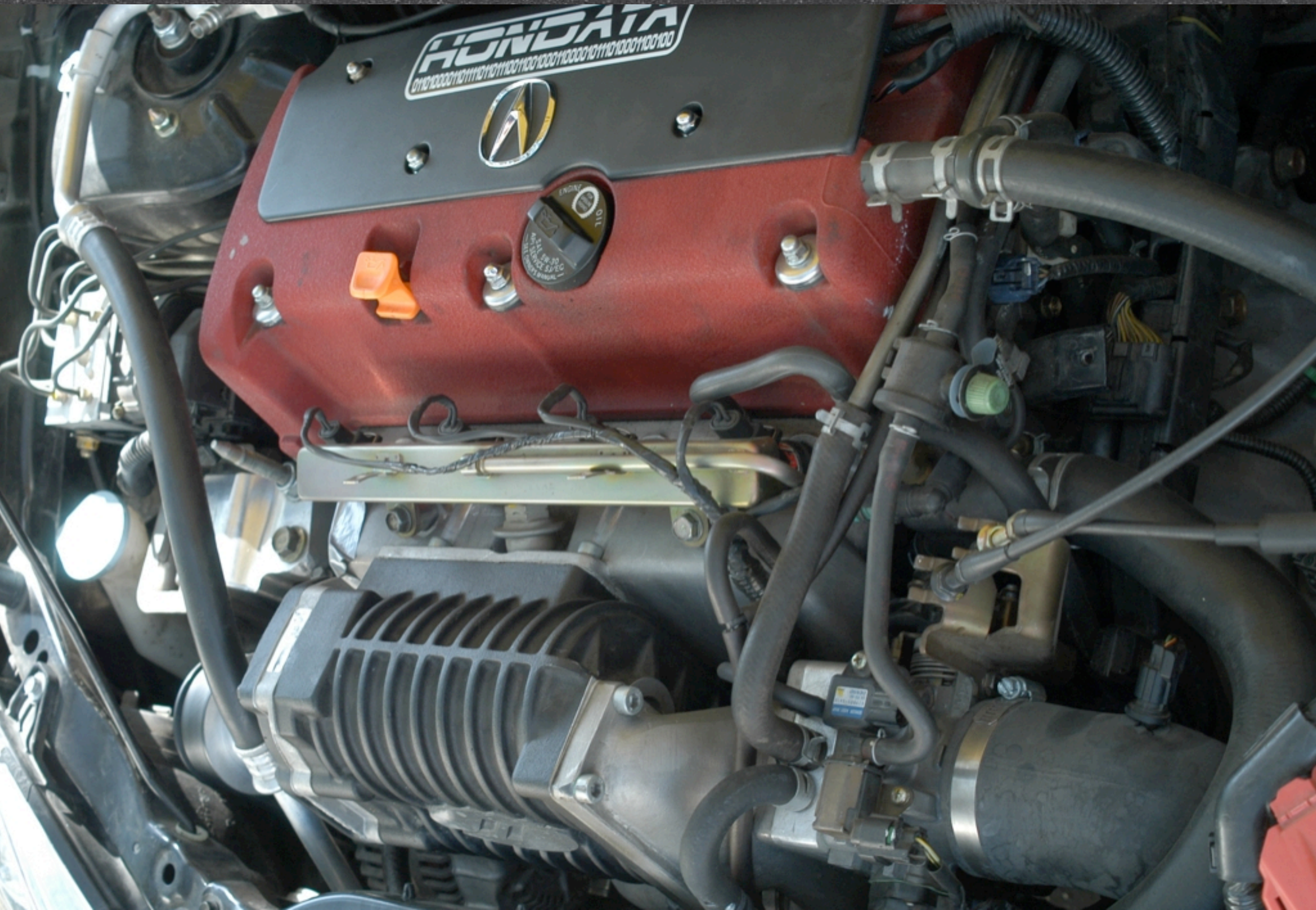


ITR cams, exhaust, CAI

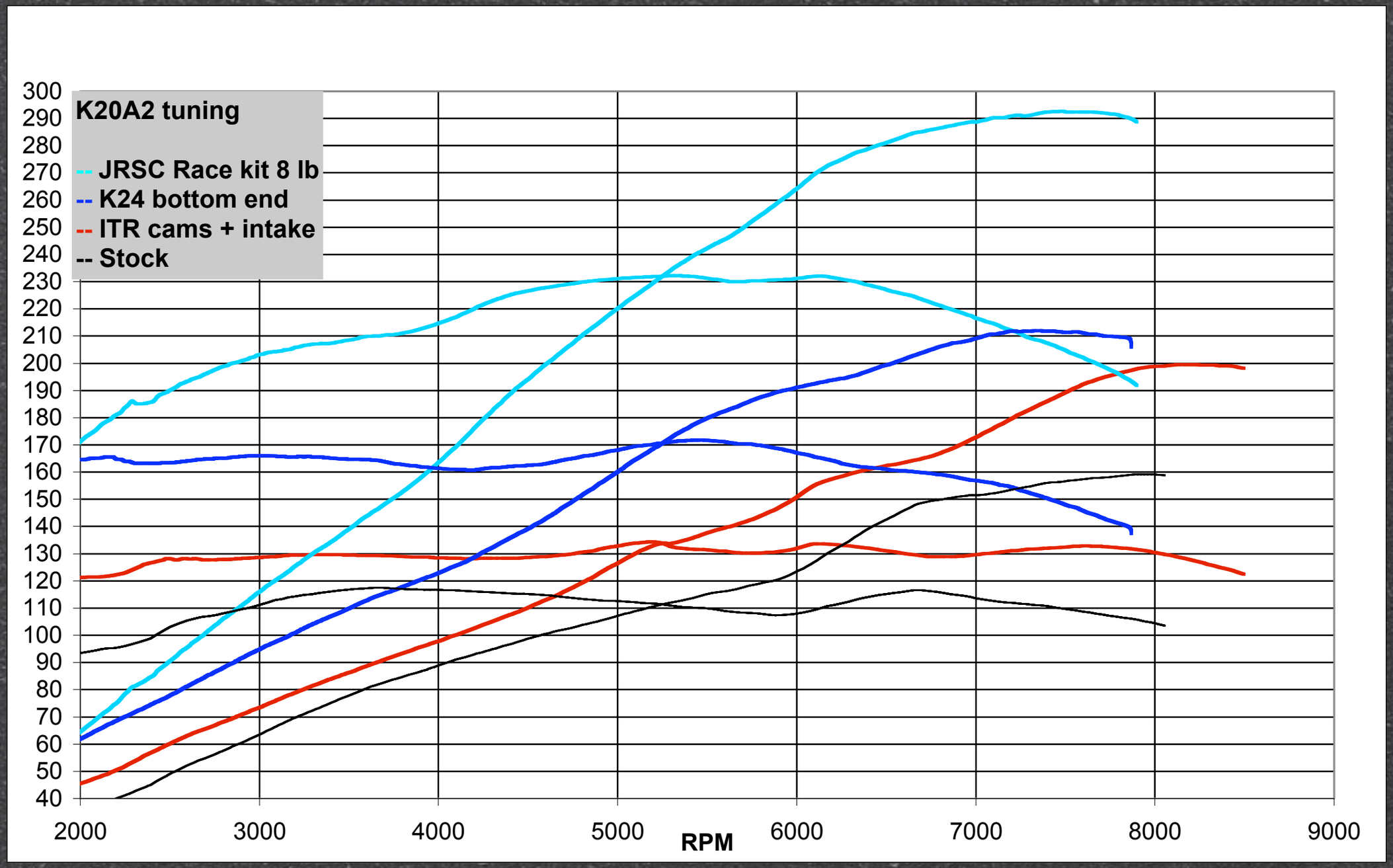


K24 CRV bottom end




HONDATA
OIL

JRSC Supercharger 8 lb



Hasport / Jackson Racing

- 2.4 Supercharged Civic Type R
- 170 ft lb torque @ 2000 rpm
- 293 hp @ 7800 rpm

Who uses Hondata

- HART - Honda America Race Team
  - Improved economy 10% using Hondata
- World's fastest Civic - 204 mph
- Ericks racing 9.99 second 1/4 mile

We have been using your HONDATA ECU for a few months now and are VERY pleased with the performance of it. We feel that it is the best mod we have done to the car so far.

Richie Newman
Honda Engineering North America Inc.

DC Sport RSX-S turbo

Another Happy Customer

K series Bang for the buck

- Cold Air Intake (ram air)
- ECU Reflash
- Intake gasket
- headers / Exhaust
- K-Pro upgrade + tuning
- Nitrous - Boost
- Cams
- K24 bottom end swap

Silly Questions

- Why can't I turn my steering wheel?
- I have my ECU reflash by you guy's and I'm planning to change my clutch to a performance one is that going to affect my reflash?
- I just got my ECU back from you guy's and now my radio doesn't work why?
- I just got my reflash back and now my car has a funny smell

More Silly ??s

- Can I just buy the g-sensor, I want to use it in my plane?
- So If I have a non-vtec engine and I get the Hondata, I will have VTEC right?
- don't know anything about cars or tuning, can you teach me what your system does and how it works real quick?
- So what do you guys do anyway?

Real Questions?