

Stock Apex with CPR turbo system

Art Andre's son A.J. wants to keep up with his dad (MPI SC Apex) and brother Damien (MachZ twin pipe w/ N2O). A.J. purchased this Simons CPR "front mount" turbo system from Ulmer Racing, and installed it himself. A.J. was pleased with tech support from Allen Ulmer, Jeff Simon and Ted Jannetty (Jannettyracing.com) who supplied the digital boost controller on the sled.

The intercooled turbo system from CPR came complete with a replacement stainless header that mounts the quick-spooling Garrett ball bearing turbocharger close to the rear of engine ["front mount" compared with "rear mount" turbo systems that place the turbo in the stock muffler area]. This turbo location requires replacement of the stock fuel tank with one supplied by CPR with a cutout area for header/ turbo clearance.

CPR also wisely supplies a higher capacity Bosch external EFI fuel pump and boost referenced the bypass valve returning excess fuel back to the tank. Measuring fuel flow on the dyno we use one flowmeter (A) to measure fuel flow from pump to injector rail, and a second flowmeter (B) to measure the fuel flow being bypassed to the fuel tank. Net fuel flow lb/hr is shown as A minus B. On A.J.'s sled the main feed fuel flow from the Bosch pump supplied with the CPR kit was 230 lb/ hr at 51 psi so theoretically the Bosch pump could supply adequate fuel for well over 400 observed HP.

The Techlusion turbo fuel controller supplied with the kit is like the one on Art's SC Apex, and on the turbo sled the tuning was decent. We were able to maintain within a point of mechanical A/F readings from low revs to top end. At 11 psi (where A.J. plans to ride it) we set the controller just lean enough to run cleanly at WOT, but as rich as possible to run on the 87 octane gas that he is likely to get approximately 10% of the time he purchases 93 at the pump. And to help make the engine even safer to trail ride on bar gas, A.J. installed two extra headgaskets to lower compression ratio and increase squish clearance.

It would have been good to test at even lower boost, but 11 PSI was as low as the digital boost controller would go. This was probably due to the design of the fairly crude but inexpensive Garrett internal waste gate/ small diaphragm controller. Note that at the lowest setting, boost pressure in midrange was lower than peak boost pressure on top end. Once A.J. set the boost up to 14 PSI it was flat from low revs to high. He will always run 100 plus octane when boost is turned up (which is what we ran in the sled during dyno tuning).

Also this sled has an Excell stainless straight through muffler and tailpiece, no restriction (good for the turbo) and reasonably quiet.

Comparing this dyno data to Art Andre's SC, A.J.'s boost (two in hg = one psi) is measured between the intercooler and throttle bodies. Art measured his boost pressure after the throttle bodies where pressure is lower (one or two PSI drop?). Also I've included the Innovate wide band A/F data (LAMAF1) for reference purposes.

Apex CPR turbo 11 psi peak boost

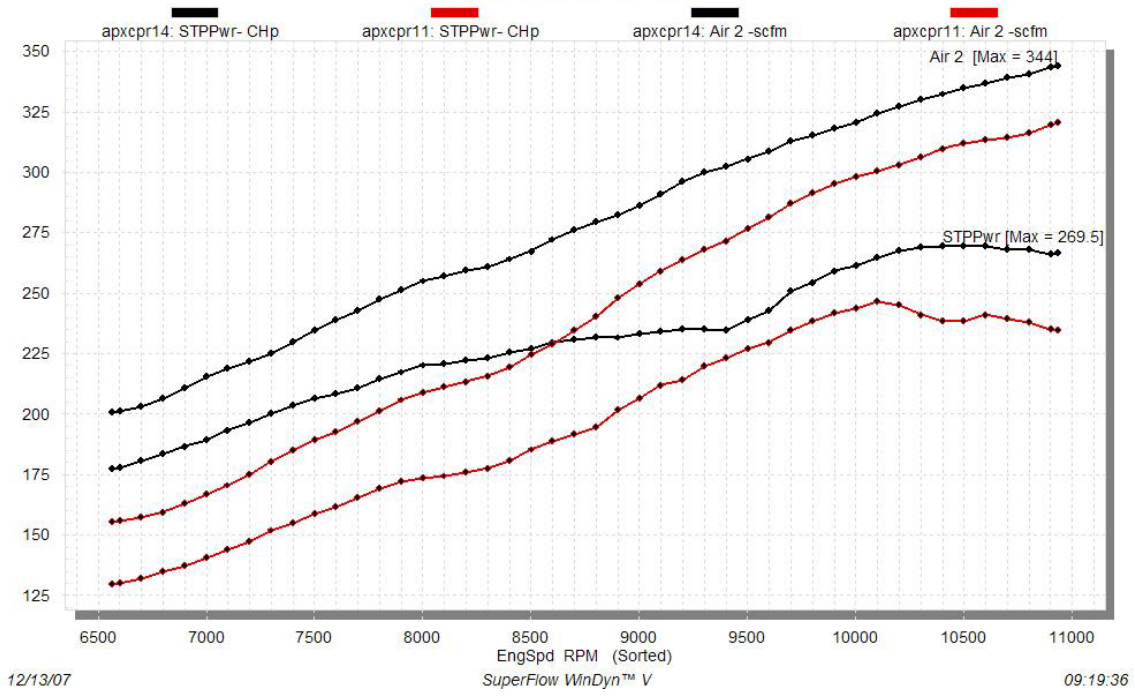
EngSpd	STPTRq	STPPwr	BSFA-B	FulA-B	A/FA-B	Air 2	LAMAF1	BOOST
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	scfm	Ratio	IN HG
6567	103.6	129.5	0.47	57.8	12.31	155	11.7	13.8
6600	103.6	130.2	0.48	59.9	11.90	156	11.6	13.8
6700	103.5	132.0	0.48	60.9	11.82	157	11.9	13.9
6800	104.2	134.9	0.50	64.3	11.35	159	12.3	14.1
6900	104.6	137.4	0.52	67.8	10.99	163	12.6	14.4
7000	105.3	140.3	0.53	71.6	10.65	167	12.4	14.6
7100	106.3	143.8	0.54	74.3	10.50	170	12.1	14.8
7200	107.5	147.4	0.53	75.6	10.59	175	11.8	14.9
7300	109.2	151.7	0.51	75.0	11.01	180	11.5	15.1
7400	109.9	154.8	0.50	75.2	11.26	185	11.4	15.2
7500	111.0	158.6	0.50	76.8	11.29	189	11.3	15.4
7600	111.7	161.6	0.52	80.0	11.02	192	11.3	15.7
7700	112.8	165.3	0.53	84.1	10.72	197	11.3	16.1
7800	114.1	169.4	0.54	87.1	10.59	201	11.2	16.6
7900	114.5	172.2	0.56	91.4	10.30	206	11.1	17.0
8000	114.0	173.6	0.55	91.5	10.45	209	11.0	17.3
8100	113.0	174.2	0.55	91.0	10.62	211	11.0	17.5
8200	112.5	175.7	0.53	89.5	10.91	213	11.0	17.6
8300	112.3	177.5	0.54	90.8	10.88	216	11.0	17.6
8400	113.1	180.8	0.54	93.7	10.71	219	10.8	17.7
8500	114.4	185.2	0.54	96.4	10.66	224	10.7	18.0
8600	115.4	188.9	0.54	97.1	10.80	229	10.6	18.2
8700	115.7	191.6	0.54	99.8	10.76	234	10.6	18.5
8800	116.2	194.6	0.55	102.8	10.71	240	10.6	18.9
8900	119.1	201.8	0.56	108.2	10.48	248	10.5	19.5
9000	120.5	206.6	0.56	111.5	10.41	254	10.5	20.0
9100	122.3	211.9	0.57	115.2	10.30	259	10.4	20.4
9200	122.3	214.1	0.58	119.6	10.10	264	10.4	20.7
9300	124.2	219.9	0.58	121.7	10.08	268	10.4	21.0
9400	124.6	223.1	0.58	123.3	10.08	272	10.4	21.2
9500	125.6	227.1	0.56	121.4	10.43	276	10.5	21.3
9600	125.6	229.5	0.56	123.6	10.43	281	10.6	21.5
9700	127.1	234.6	0.56	124.5	10.55	287	10.7	21.8
9800	127.7	238.3	0.57	129.0	10.34	291	10.8	21.9
9900	128.2	241.7	0.55	126.7	10.67	295	10.8	22.0
10000	128.0	243.7	0.56	129.2	10.56	298	10.8	22.0
10100	128.3	246.7	0.55	128.5	10.71	300	10.8	22.0
10200	126.3	245.2	0.58	134.5	10.32	303	10.9	22.0
10300	122.9	241.0	0.61	139.9	10.02	306	11.0	21.9
10400	120.3	238.3	0.63	144.0	9.85	310	10.9	21.9
10500	119.3	238.5	0.63	143.2	9.98	312	10.8	21.9
10600	119.4	241.0	0.62	143.2	10.03	314	10.6	21.8
10700	117.5	239.4	0.63	144.2	9.98	314	10.5	21.8
10800	115.7	237.8	0.65	147.4	9.82	316	10.4	21.8
10900	113.3	235.1	0.66	148.2	9.88	320	10.3	22.0
10933	112.8	234.7	0.66	148.8	9.86	321	10.2	22.0

Apex CPR turbo 14 psi peak boost

EngSpd	STPTRq	STPPwr	BSFA-B	FulA-B	A/FA-B	Air 2	LAMAF1	BOOST
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	scfm	Ratio	IN HG
6567	141.7	177.2	0.49	82.4	11.14	201	10.7	25.8
6600	141.4	177.7	0.50	84.7	10.89	201	10.7	25.9
6700	141.5	180.5	0.50	86.6	10.74	203	10.7	26.0
6800	141.6	183.4	0.50	88.6	10.67	206	10.6	26.2
6900	142.0	186.6	0.49	88.5	10.89	211	10.6	26.2
7000	142.1	189.4	0.49	90.2	10.94	215	10.6	26.4
7100	143.0	193.3	0.51	94.6	10.60	219	10.5	26.5
7200	143.3	196.4	0.53	99.0	10.25	222	10.6	26.7
7300	144.0	200.2	0.54	103.0	10.01	225	10.5	26.7
7400	144.5	203.5	0.53	103.1	10.20	230	10.5	26.7
7500	144.5	206.4	0.53	104.5	10.27	234	10.5	26.8
7600	144.0	208.4	0.52	103.2	10.59	239	10.5	26.9
7700	143.7	210.7	0.52	105.7	10.51	243	10.5	27.1
7800	144.3	214.3	0.52	106.2	10.67	247	10.5	27.2
7900	144.4	217.2	0.52	107.9	10.66	251	10.5	27.4
8000	144.5	220.1	0.52	110.3	10.58	255	10.4	27.5
8100	143.3	220.9	0.54	113.8	10.35	257	10.4	27.6
8200	142.2	222.0	0.55	118.0	10.07	260	10.4	27.6
8300	141.1	223.0	0.56	118.8	10.06	261	10.4	27.6
8400	140.9	225.4	0.56	121.4	9.96	264	10.4	27.6
8500	140.2	226.9	0.57	123.4	9.92	267	10.3	27.6
8600	140.2	229.6	0.57	125.9	9.89	272	10.3	27.6
8700	139.4	230.9	0.58	127.6	9.90	276	10.2	27.7
8800	138.3	231.8	0.58	128.1	9.98	279	10.2	27.7
8900	136.6	231.5	0.59	131.6	9.83	282	10.2	27.8
9000	136.0	233.1	0.60	134.9	9.71	286	10.2	27.8
9100	135.1	234.1	0.62	139.8	9.53	291	10.1	27.8
9200	134.2	235.1	0.64	143.5	9.45	296	10.0	27.9
9300	132.7	234.9	0.65	146.5	9.37	300	10.0	27.9
9400	131.1	234.6	0.66	148.3	9.33	302	10.0	28.0
9500	132.2	239.0	0.65	149.0	9.39	305	10.0	28.0
9600	132.9	242.9	0.64	148.3	9.53	309	10.0	28.0
9700	135.8	250.8	0.62	148.0	9.68	313	10.0	27.7
9800	136.3	254.4	0.61	149.2	9.67	315	10.0	27.5
9900	137.5	259.2	0.60	149.7	9.73	318	10.0	27.3
10000	137.2	261.2	0.59	148.0	9.92	321	10.0	27.2
10100	137.7	264.8	0.57	145.0	10.24	324	10.1	27.1
10200	137.7	267.5	0.56	143.7	10.42	327	10.1	27.0
10300	137.1	268.9	0.56	144.2	10.48	330	10.1	27.0
10400	136.1	269.5	0.56	145.1	10.48	332	10.2	26.9
10500	134.7	269.4	0.57	146.1	10.50	335	10.2	26.9
10600	133.5	269.4	0.57	146.3	10.54	337	10.2	26.9
10700	131.5	268.0	0.56	142.6	10.89	339	10.2	26.8
10800	130.4	268.1	0.55	141.1	11.05	341	10.3	26.8
10900	128.3	266.3	0.57	144.7	10.87	344	10.3	26.9
10933	128.1	266.7	0.58	147.3	10.69	344	10.3	27.0

Yamaha Apex w/ CPR turbo system w/ conservative fuel flow

red 11 psi boost setting, black 14 psi boost setting



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