Cooper's Sales & Service' SkiDoo (585-682-9707)
05 440REV Chassis w/ 04 800x engine transplant
pipe comparison and HTG porting/ engine tuneup

Jimmy and his dad Lynn Cooper brought this custom sled for dyno tuning. It's a brand new 440 Rev rolling chassis that they bought to create a stealth hotrod by installing an 04800x twin engine from a low-mile wrecked sled. The larger capacity cooling system and electronics (including electronic reverse) were transferred from the 800 donor sled to the 440 to match the more powerful engine. After dyno tuning and reclutching this sled now sits on their showroom floor stickered at $9500.

Since one of the stock reed petals in the 800 twin was cracked, Jimmy installed a set of Vforce3 reed cages before he came to dyno. Timing was set stock at -1 degree. Carburetor jets were all stock, and as we can see from the dandy A/F ratio the DPM system does a perfect job adjusting for the 50ish degree F air during our test session.

Baseline test is here, stock engine, Vforce3, stock timing, stock pipe, stock muffler.
800rev6
800rev6
800rev, stock engine, Vforce3 reeds, -1 deg timing, stock pipe, stock muffler

EngSpd RPM	STPTrq Clb-ft	STPPwr CHp	FulA+B lb/hr	Air1+2 scfm	Time-S Second	A/F Ratio	BSFC lb/hph	AirTmp degF
6000	76.9	87.8	69.3	179.8	14.53	11.88	0.801	39
6100	77.4	89.9	70.4	183.5	15.21	11.93	0.794	38
6200	78.3	92.4	71.9	185.3	15.57	11.81	0.789	38
6300	80.4	96.5	75.4	189.9	16.41	11.53	0.793	38
6400	81.4	99.2	76.4	193.1	17.04	11.56	0.781	38
6500	82.1	101.5	76.1	193.9	17.32	11.66	0.761	38
6600	84.9	106.7	78.1	199.3	18.21	11.71	0.742	39
6700	86.3	110.1	80.2	201.9	18.82	11.52	0.741	39
6800	87.5	113.3	81.3	205.2	19.45	11.55	0.728	38
6900	90.3	118.7	81.1	209.5	20.19	11.82	0.693	38
7000	90.8	121.1	82.9	211.5	20.55	11.68	0.695	38
7100	94.1	127.1	84.2	217.3	21.54	11.81	0.672	38
7200	95.2	130.5	86.5	220.3	22.17	11.66	0.672	38
7300	96.2	133.7	88.5	223.1	22.81	11.54	0.671	38
7400	95.7	134.9	89.3	225.3	23.14	11.55	0.671	38
7500	97.1	138.7	90.6	229.8	24.12	11.61	0.663	39
7600	97.6	141.2	92.9	232.1	24.67	11.44	0.668	39
7700	97.5	143.1	94.7	235.1	25.27	11.36	0.671	38
7800	96.2	142.9	93.2	237.9	25.95	11.68	0.661	38
7900	94.7	142.5	95.1	238.8	26.71	11.51	0.677	39
8000	91.4	139.2	94.8	239.1	27.08	11.54	0.692	39
8100	87.1	134.2	93.4	239.1	27.51	11.72	0.707	39

Next test is same as 800rev4, except a polished silver ceramic coated DynoPort single pipe was fitted with stock muffler.

800rev4

800rev4

800rev stock engine, Vforce3 reeds, -1 deg timing, DynoPort pipe, stock muffler

EngSpd RPM	STPTrq Clb-ft	STPPwr CHp	FulA+B lb/hr	Air1+2 scfm	Time-S Second	A/F Ratio	BSFC lb/hph	AirTmp degF
6000	73.9	84.4	65.5	176.8	13.01	12.36	0.788	39
6100	74.7	86.7	66.7	178.4	14.01	12.24	0.781	39
6200	75.1	88.5	67.8	179.1	14.47	12.09	0.777	39
6300	76.6	91.9	70.4	182.5	15.16	11.87	0.778	40
6400	78.1	95.1	71.6	184.6	15.82	11.81	0.766	41
6500	78.6	97.3	72.1	187.9	16.36	11.93	0.754	41
6600	81.2	102.1	72.9	192.2	16.97	12.07	0.726	41
6700	82.5	105.2	73.8	193.9	17.41	12.03	0.713	41
6800	84.1	108.9	74.3	198.2	18.19	12.21	0.692	39
6900	86.4	113.5	75.8	201.1	18.91	12.14	0.678	40
7000	87.8	117.1	78.2	205.5	19.71	12.03	0.678	40
7100	90.3	122.1	80.6	208.6	20.38	11.85	0.671	40
7200	91.6	125.6	82.6	211.6	21.06	11.73	0.668	40
7300	92.4	128.4	82.3	213.2	21.34	11.86	0.651	40
7400	94.1	132.6	85.6	217.9	22.11	11.65	0.655	40
7500	96.2	137.3	87.6	222.5	23.05	11.63	0.648	41
7600	96.3	139.3	89.7	224.6	23.56	11.46	0.655	41
7700	96.9	142.1	90.1	227.8	24.06	11.57	0.644	40
7800	97.2	144.3	90.4	230.3	24.81	11.66	0.636	40
7900	96.8	145.6	91.1	233.8	25.65	11.76	0.635	40
8000	95.2	145.1	94.2	234.8	26.54	11.41	0.661	41
8100	92.9	143.3	95.6	236.1	27.28	11.31	0.677	40
8200	90.1	140.7	95.5	236.2	27.92	11.32	0.691	40
8300	86.3	136.4	97.2	235.8	28.52	11.11	0.724	40

Jimmy had with him a Bender fairly quiet nickel-plated 800 can muffler (almost as quiet as stock until valve opening where the dBs climbed noticeably higher than stock). This test is the same as 800rev4 except the Bender can replaced the stock muffler.

800rev2

800rev2

Rev 800 stock engine, timing -1 deg, Vforce3 reeds, DynoPort pipe, Bender muffler

EngSpd RPM	STPTrq Clb-ft	STPPwr CHp	FulA+B lb/hr	Air1+2 scfm	Time-S Second	A/F Ratio	BSFC lb/hph	AirTmp degF
6000	74.7	85.3	69.2	178.1	0.33	11.78	0.825	42
6100	75.5	87.7	70.9	179.4	1.03	11.58	0.822	41
6200	76.6	90.5	71.6	180.8	1.49	11.56	0.804	41
6300	78.8	94.5	73.1	186.7	2.41	11.71	0.785	41
6400	79.5	96.9	73.6	188.9	2.85	11.75	0.771	40
6500	79.8	98.8	72.4	189.9	3.31	12.01	0.744	40
6600	81.7	102.7	75.1	193.2	3.99	11.79	0.741	39
6700	84.4	107.6	75.9	195.9	4.79	11.81	0.715	39

6800	85.5	110.7	77.4	198.2	5.33	11.72	0.711	40
6900	87.9	115.5	77.3	201.4	6.11	11.93	0.679	40
7000	89.1	118.7	79.1	203.4	6.57	11.79	0.677	41
7100	90.4	122.3	80.9	206.6	7.17	11.69	0.672	40
7200	91.6	125.5	81.1	210.1	7.89	11.87	0.655	40
7300	92.4	128.4	83.1	213.7	8.67	11.77	0.657	40
7400	93.7	132.1	84.9	216.6	9.14	11.68	0.653	40
7500	96.1	137.3	88.3	220.1	9.94	11.41	0.654	41
7600	97.7	141.3	90.9	222.9	10.62	11.23	0.654	41
7700	98.2	143.9	91.4	224.9	11.16	11.26	0.646	42
7800	98.9	146.8	91.4	228.9	11.97	11.46	0.633	41
7900	98.3	147.8	90.9	230.3	12.37	11.61	0.625	41
8000	96.9	147.7	94.4	233.1	13.43	11.31	0.649	40
8100	94.5	145.8	95.9	233.6	13.97	11.15	0.668	40
8200	91.3	142.5	95.1	235.1	14.97	11.31	0.678	40
8300	88.1	139.1	96.3	236.1	15.73	11.22	0.702	39
8400	83.3	133.2	95.1	235.7	16.05	11.35	0.724	39

After baseline testing was complete, Jimmy removed the cylinders and brought them to HTG Racing in Grand Island, NY for trail porting. HTG port grinder Jason modified the exhaust ports and exhaust slides by raising both about one mm, and did some apparent blending of the transfers. Combustion chambers were left bone stock. This additional port timing reduced low end airflow CFM but from 7750 RPM and beyond airflow was higher by about 3%, and HP peak was increased by 2.3%. However, the trailported cylinders gave us a hockey-stick shaped curve, and an easy to clutch 500 RPM span where HP varied between 149.5 to 151.2. Note that all testing with ported cylinders was with DynoPort pipe and Bender muffler. This first test with ported cylinders is with stock timing, and other than cylinder porting the same as 800rev2.

800rev8

800rev8

800rev, HTG trail port, Vforce3 reeds, -1degree timing, DynoPort pipe, Bender muffler

EngSpd RPM	STPTrq Clb-ft	STPPwr CHp	FulA+B lb/hr	Air1+2 scfm	Time-S Second	A/F Ratio	BSFC lb/hph	AirTmp degF
6000	67.9	77.5	57.2	163.8	33.28	13.11	0.758	50
6100	69.5	80.7	63.6	174.6	34.28	12.57	0.809	50
6200	69.5	82.1	63.5	175.1	34.53	12.62	0.795	50
6300	72.9	87.4	69.3	181.1	35.39	11.96	0.813	49
6400	74.7	91.1	73.9	185.3	36.16	11.48	0.833	50
6500	74.8	92.6	73.5	186.2	36.38	11.61	0.815	50
6600	77.1	96.9	76.2	192.2	37.25	11.55	0.806	49
6700	78.9	100.7	80.6	196.1	37.91	11.13	0.821	49
6800	81.2	105.1	78.9	199.5	38.52	11.57	0.771	50
6900	82.4	108.3	79.2	202.9	39.17	11.73	0.751	50
7000	84.5	112.6	79.5	207.9	39.93	11.97	0.724	49
7100	87.6	118.5	81.7	212.9	40.74	11.93	0.707	49
7200	87.4	119.9	82.3	214.2	40.99	11.91	0.704	49
7300	88.7	123.2	83.4	217.1	41.43	11.91	0.694	49
7400	90.5	127.5	86.2	220.8	42.22	11.73	0.694	51

7500	91.5	130.7	88.7	224.9	43.14	11.61	0.697	51
7600	91.1	131.9	88.1	225.9	43.27	11.74	0.686	51
7700	96.1	140.8	92.7	231.1	44.16	11.41	0.676	51
7800	99.5	147.8	93.3	235.7	45.05	11.56	0.648	50
7900	100.6	151.2	93.5	237.2	45.76	11.61	0.635	51
8000	99.1	151.1	96.4	239.2	46.51	11.36	0.656	51
8100	97.5	150.3	100.3	240.5	47.17	10.98	0.685	51
8200	95.7	149.5	100.4	242.3	47.91	11.05	0.689	50
8300	95.1	150.2	101.1	243.8	48.47	11.04	0.691	49
8400	93.6	149.7	106.1	245.5	49.45	10.61	0.726	49

The ported engine would prove to benefit greatly now with added ignition timing. The last time Jimmy was here with a stock 800 he gained nothing by bumping timing. But the trail ported engine was different, maybe because of the stock compression. Here's the trail ported 800 with two extra degrees of timing throughout the powerband (reset to +1). Note that the hockey-stick powercurve is back to normal, and some of the midrange is back and three more HP at peak is the ultimate reward.

800rev9
same as 800rev8 but add 2 degrees of timing to +1

EngSpd RPM	STPTrq Clb-ft	STPPwr CHp	FulA+B lb/hr	Air1+2 scfm	Time-S Second	A/F Ratio	BSFC lb/hph	AirTmp degF
6000	69.1	78.9	59.6	173.2	3.23	13.31	0.773	47
6100	68.4	79.5	60.7	173.2	3.42	13.06	0.781	47
6200	70.9	83.7	63.6	176.9	4.09	12.73	0.779	48
6300	73.4	88.1	66.4	182.7	4.81	12.61	0.771	47
6400	75.7	92.2	66.9	186.5	5.43	12.76	0.743	48
6500	77.2	95.6	69.1	190.2	6.12	12.62	0.739	48
6600	77.5	97.4	71.1	190.8	6.51	12.28	0.747	48
6700	80.6	102.8	71.8	196.3	7.41	12.51	0.714	47
6800	82.4	106.7	73.6	200.1	8.02	12.45	0.705	47
6900	85.5	112.3	77.7	205.1	8.86	12.08	0.708	48
7000	85.8	114.4	77.7	206.7	9.08	12.18	0.695	47
7100	89.4	120.8	81.4	213.8	10.12	12.02	0.689	47
7200	89.9	123.2	81.8	216.2	10.55	12.11	0.679	47
7300	91.8	127.6	82.8	222.1	11.27	12.27	0.662	45
7400	94.1	132.6	86.1	225.5	11.92	11.99	0.664	46
7500	95.9	137.1	89.2	228.6	12.66	11.73	0.666	47
7600	98.6	142.6	88.9	231.2	13.24	11.91	0.637	47
7700	100.2	146.9	89.4	233.8	13.79	11.97	0.622	47
7800	100.7	149.6	91.1	236.4	14.38	11.88	0.623	47
7900	101.7	153.1	93.9	239.4	15.41	11.67	0.627	47
8000	101.1	153.9	95.1	240.8	15.83	11.59	0.632	47
8100	100.2	154.6	96.8	242.8	16.57	11.48	0.641	47
8200	98.1	153.1	97.6	244.7	17.59	11.48	0.652	47
8300	96.9	153.1	97.8	245.4	18.01	11.49	0.654	47
8400	95.3	152.5	100.8	245.5	18.99	11.15	0.677	48

Finally, Jimmy bumped the timing as far as he could with the SkiDoo mpem programmer; another two degrees, (final setting +3). This really woke up the midrange, peak torque was up to nearly 104 lb/ft and another three HP was added at peak. Also note that out overrev HP at 8400 was about identical, meaning we were probably close to reaching peak torque/ peak HP timing. And the HP curve still maintains an easy-to-clutch 500 RPM window where HP varies from 154.1 to 157.5 HP. And though some savvy tuners might question this last combo's ability to deliver reliable performance on pump gas, all of these dyno runs are with 120+ degree coolant, 93 octane Mobile unleaded, and about 20 seconds at WOT. And if this sled were to be run on trail on 87 octane for long blasts, a quick timing tweak back to +1 or -1 should create the necessary cushion for safety.

800rev10

800rev10

same as 800rev9, add 2 more degrees timing, max out at +3

EngSpd RPM	STPTrq Clb-ft	STPPwr CHp	FulA+B lb/hr	Air1+2 scfm	Time-S Second	A/F Ratio	BSFC lb/hph	AirTmp degF
6000	71.4	81.6	58.3	173.5	57.74	13.62	0.729	45
6100	72.2	83.8	63.4	177.4	58.67	12.81	0.772	45
6200	73.1	86.3	64.8	178.7	59.21	12.62	0.767	45
6300	73.6	88.3	64.6	179.7	59.41	12.73	0.747	45
6400	76.4	93.2	68.5	185.2	0.33	12.38	0.751	45
6500	78.1	96.6	70.1	189.2	1.01	12.37	0.739	45
6600	81.2	102.1	72.1	194.3	1.89	12.34	0.722	45
6700	81.8	104.3	73.5	197.1	2.31	12.28	0.719	45
6800	86.1	111.3	77.1	202.6	3.19	12.04	0.706	44
6900	86.6	113.8	77.4	205.8	3.78	12.17	0.693	44
7000	86.9	115.9	77.4	206.8	3.98	12.23	0.681	44
7100	91.1	123.1	80.5	213.9	5.01	12.16	0.668	45
7200	94.2	129.1	84.6	219.7	5.73	11.89	0.669	45
7300	96.1	133.6	85.7	223.8	6.36	11.95	0.655	46
7400	96.7	136.3	88.2	226.5	6.99	11.76	0.661	46
7500	99.1	141.5	90.2	229.9	7.62	11.67	0.651	46
7600	100.1	144.9	90.1	231.7	8.16	11.78	0.635	47
7700	101.9	149.5	90.7	234.1	8.76	11.81	0.621	47
7800	103.8	154.1	93.1	238.3	9.63	11.73	0.616	46
7900	103.8	156.1	95.5	241.9	10.36	11.61	0.624	45
8000	103.2	157.1	95.7	243.5	11.11	11.65	0.621	45
8100	102.1	157.5	96.3	243.8	11.64	11.59	0.624	45
8200	100.8	157.4	99.4	244.8	12.39	11.27	0.645	46
8300	98.5	155.6	98.3	245.7	13.23	11.44	0.645	45
8400	95.4	152.6	98.5	245.6	14.07	11.41	0.659	45