

2005 Arctic Cat F7 EFI initial evaluation

Here's a local 03 F7, Patrick Dermody's bone stocker with 5000+ mostly trail miles, all on Amsoil, stock clutches revving to 8100. Wait until Patrick adds a pound of grams to the clutch weights! Note that this one is leaner than the past F7 EFI norm, delivering about 10.5/1 A/F ratio at HP peak, resulting in about 4-5 HP higher than average, out of the box.

Bone Stock 03 F7EFI, well broken in, very well cared for.

F7PD02

F7PD02

EngSpd RPM	STPTrq Cib-ft	STPPwr CHp	Oil P psig	BSFC lb/hph	Fuel A lb/hr	A/F Ratio	Air 2 scfm
5700	58.6	63.6	42.9	0.771	47.5	13.37	139
5800	59.7	65.9	42.9	0.801	51.1	13.34	149
5900	60.4	67.9	42.8	0.776	51.1	13.44	150
6000	62.1	70.9	42.8	0.755	51.8	13.41	152
6100	69.3	80.5	42.7	0.735	57.3	12.87	161
6200	68.8	81.2	42.7	0.731	57.4	12.94	162
6300	73.1	87.6	42.6	0.711	60.3	12.66	167
6400	73.1	89.1	42.6	0.716	61.8	12.68	171
6500	74.1	91.6	42.6	0.706	62.6	12.74	174
6600	76.8	96.5	42.5	0.674	62.9	13.04	179
6700	80.6	102.9	42.4	0.639	63.7	13.51	188
6800	83.8	108.5	42.4	0.631	66.2	13.55	196
6900	85.6	112.4	42.5	0.608	66.2	14.04	203
7000	86.9	115.9	42.4	0.599	67.2	14.22	209
7100	87.8	118.6	42.4	0.588	67.6	14.38	212
7200	87.8	120.3	42.4	0.578	67.4	14.54	214
7300	92.8	129.1	41.5	0.684	85.6	12.21	228
7400	93.8	132.2	41.6	0.781	100.1	10.95	239
7500	93.1	132.8	41.5	0.796	102.6	10.84	243
7600	94.5	136.7	41.3	0.806	106.9	10.65	249
7700	90.8	133.1	41.3	0.852	110.1	10.41	250
7800	88.1	130.9	41.2	0.867	110.1	10.47	252
7900	85.9	129.2	41.2	0.885	110.9	10.48	254
8000	83.2	126.7	41.4	0.862	105.8	11.15	258

Patrick's pal Kim Stout just took delivery a new 05, and here is his 05 ECU on Patrick's broken in 03, apples to apples (both square boxes, square injectors). While not shown here, the 05 ECU is said to open exhaust valves the instant the throttle is whacked, but if throttle is opened slowly, gradually like we do here on the dyno, exhaust valve opening is gradual and late like the 03 and 04s. You can see a great jump in HP right at 7500-7600—this is the result of the exhaust valves popping open at 7200-7300 and the engine surging a bit before the dyno controller catches up with it. Note that with the 05 box, top end fuel flow, same engine, same injectors is a few percent lower and thus HP is a few percent higher.

Bone Stock 03 F7 EFI, replace square stock ECU with new '05 square ECU.
F7PD03

F7PD03

EngSpd RPM	STPTrq Cib-ft	STPPwr CHp	Oil P psig	BSFC lb/hph	Fuel A lb/hr	A/F Ratio	Air 2 scfm
5700	61.4	66.6	42.7	0.773	49.8	13.53	147
5800	61.4	67.8	42.7	0.773	50.7	13.53	150
5900	62.1	69.8	42.7	0.751	50.7	13.76	152
6000	63.8	72.9	42.7	0.738	52.1	13.64	155
6100	64.6	75.1	42.7	0.748	54.3	13.22	157
6200	67.3	79.4	42.7	0.708	54.4	13.38	159
6300	70.5	84.5	42.7	0.681	55.7	13.65	166
6400	71.8	87.5	42.6	0.672	56.9	13.53	168
6500	74.1	91.5	42.6	0.677	59.9	13.51	177
6600	73.8	92.8	42.6	0.673	60.5	13.48	178
6700	75.3	96.1	42.6	0.648	60.3	13.73	181
6800	81.4	105.3	42.5	0.608	62.1	13.87	188
6900	83.2	109.4	42.5	0.621	65.8	13.95	201
7000	84.1	112.1	42.4	0.609	66.1	14.11	204
7100	87.4	118.1	42.4	0.602	68.9	13.98	211
7200	89.3	122.5	42.3	0.585	69.5	14.19	216
7300	93.2	129.6	41.5	0.761	95.4	11.22	234
7400	93.5	131.7	41.6	0.762	97.2	11.19	238
7500	94.2	134.6	41.5	0.767	100.1	11.11	240
7600	95.1	137.4	41.5	0.785	104.3	10.73	244
7700	94.1	137.9	41.4	0.804	107.2	10.59	248
7800	91.2	135.4	41.2	0.824	108.2	10.65	251
7900	87.6	131.7	41.2	0.844	107.7	10.81	254
8000	81.1	123.4	41.3	0.871	104.1	11.38	259

We reinstalled Patrick's stock 03 ECU, then added a 2.2 degree keyway and restricted fuel flow with an orifice in the fuel line. You can see fuel pressure listed as oil pressure. This is our typical pump gas tuneup for people who run high test pump gas and are not WOTUTTID's. We probably could have

made more HP with more timing and less fuel, but this combination has proven safe for more than a dozen conscientious guinea pig F7 riders who tuned here last year, so we feel this is a reasonable HP level on pump gas, noting that BSFC is very close to .70 lb/hphr.

Bone stock 03 F7 EFI, add timing key, reduce top end fuel pressure.

F7PD07

F7PD07

EngSpd RPM	STPTrq Cib-ft	STPPwr CHp	Oil P psig	BSFC lb/hph	Fuel A lb/hr	A/F Ratio	Air 2 scfm
5700	69.8	75.7	41.6	0.681	49.8	14.32	156
5800	71.1	78.4	41.5	0.662	50.1	14.41	158
5900	73.2	82.2	41.3	0.654	51.9	14.19	161
6000	75.1	85.7	41.2	0.646	53.6	13.99	164
6100	75.6	87.8	41.1	0.646	54.8	13.97	167
6200	76.8	90.7	40.9	0.641	56.2	13.72	169
6300	78.5	94.2	40.8	0.635	57.8	13.65	172
6400	79.4	96.7	40.6	0.639	59.7	13.46	176
6500	81.3	100.6	40.5	0.636	61.9	12.31	180
6600	83.2	104.5	40.4	0.632	63.8	13.17	184
6700	84.3	107.6	40.4	0.611	63.5	13.48	187
6800	86.5	112.1	40.2	0.587	63.5	13.93	193
6900	87.3	114.7	40.2	0.591	65.3	14.02	200
7000	88.5	118.1	40.2	0.582	66.3	14.11	204
7100	89.4	120.8	40.1	0.566	66.1	14.41	208
7200	91.2	125.1	39.9	0.561	67.7	14.31	212
7300	96.9	134.7	38.1	0.611	79.4	13.09	227
7400	97.4	137.3	37.3	0.656	87.1	12.42	236
7500	98.1	140.1	36.9	0.675	91.3	12.04	240
7600	99.1	143.4	36.1	0.693	96.1	11.81	248
7700	98.8	144.8	35.8	0.696	97.4	11.71	249
7800	96.1	142.6	35.4	0.734	101.2	11.33	251
7900	92.2	138.4	35.4	0.764	102.2	11.31	253

Do you think all F7EFI's should carry 35psi fuel pressure on top end? Most F7's need a different final pressure to achieve .70. Wait till you see Kim's 04 F7 EFI fuel flow at stock rail pressure, see following dyno results. Kim will wait to get some miles on his new 05 before dyno tuning here, but was anxious to dial in his other F7, his 04 from last year. He was expecting to add a key, drop fuel pressure to achieve his desired 140+ HP for trail riding. Now this 04 is stock but has a Speedwerx single pipe (usually good for 2 HP), Vforce reeds and a larger intake in the airbox. His original ECU is

square, with square injectors. Here is Kim's 04 with the same '05 ECU that gave Patrick's 03 square injectors 108 lb/hr fuel flow on top end.

Bone stock 04 F7 EFI, Vforce reeds, Speedwerx single pipe (stock muffler) stock fuel pressure, stock timing.

F7KS03

F7KS03

EngSpd RPM	STPTRq Clb-ft	STPPwr CHp	Oil P psig	BSFC lb/hph	Fuel A lb/hr	A/F Ratio	Air 2 scfm
5600	70.8	75.5	43.6	0.675	49.3	16.11	172
5700	70.7	76.7	43.6	0.678	50.3	15.69	172
5800	71.2	78.6	43.6	0.653	49.7	16.06	174
5900	75.4	84.7	43.5	0.642	52.6	15.54	179
6000	77.4	88.4	43.5	0.628	53.7	15.63	183
6100	79.3	92.1	43.5	0.602	53.6	15.91	186
6200	79.1	93.3	43.5	0.606	54.7	15.82	189
6300	81.7	98.1	43.5	0.587	55.7	15.89	193
6400	80.7	98.3	43.5	0.593	56.4	15.91	196
6500	81.4	100.8	43.5	0.574	56.1	16.09	197
6600	83.6	105.1	43.4	0.557	56.6	16.09	199
6700	88.3	112.7	43.3	0.552	60.2	15.63	206
6800	87.9	113.8	43.3	0.564	62.1	15.24	207
6900	92.1	121.1	43.2	0.572	66.9	14.51	212
7000	91.9	122.5	43.2	0.569	67.4	14.56	214
7100	92.8	125.4	43.2	0.576	69.9	14.31	218
7200	93.5	128.2	43.1	0.574	71.1	14.46	224
7300	93.4	129.8	43.2	0.566	70.9	14.54	225
7400	95.1	133.9	43.1	0.548	70.9	14.75	228
7500	103.2	147.4	42.3	0.687	97.9	11.65	249
7600	102.1	147.7	42.3	0.697	99.5	11.63	253
7700	100.2	146.9	42.3	0.705	100.1	11.64	255
7800	95.9	142.4	42.1	0.723	99.6	11.79	257

Kim was pleased the unusually low fuel flow—100 lb/hr with the 05 ECU that gave Patrick 108 lb/hr, accompanied by amazingly excellent HP and, though his 04 ECU gave him 2 more lb/hr fuel flow and a bit less HP, he wisely opted to leave fuel pressure and timing alone. We all understand that 145 HP out of a pump gas 700cc twin is more than plenty, and he will have great fun beating up on the modified F7's and F8s that make way less HP than that (unless they have been tuned on a dyno or are lucky enough to have injector flow rates like this one).

EPILOGUE—

This may be a case of injector variation. I can understand that some injectors will flow more than others, but this is such an anomaly to see an 05 square ECU deliver 108 lb/hr on one set of square injectors then deliver 100 lb/hr on another set of square injectors with identical air temp, water temp and fuel pressure! Could it be that the crafty Cat engineers are seeding the snowmobile world with just a few wickedly powerful, lean F7's to see what warranty costs will be? This is a 150 HP engine, detuned to something less with retarded timing and overcooled with gobs of unneeded fuel. Most come off the assembly line w/ 130 HP. Could Arctic Cat be experimenting to see if, say, 140 HP might be acceptable, and keep the AC beancounters from going mad with warranty costs?

I have resisted sending out fuel line jet kits to people who are requesting them. If we had run Kim's sled with 35 psi with those stingy and powerful injectors, it could have been fried (unless it was caught by a savvy dyno operator before damage occurred). Every F7 owner needs to dyno tune somewhere before he or she drops top end fuel pressure and expects to be reliable. I really must try to create a listing of reputable places where this can be done.

After breakin, Kim is planning to bring his 05 here for optimal tuning. I will try to get him to bring what I think are magical injectors out of his 04, and do a fuel flow/ HP comparison.

FINALLY—

I get so many Emails about so and so dynoing at so and so's dyno after tuning/engine work, and make way more HP than we show here with similar engine states of tune. My dyno and everyone's dyno can be tweaked to deliver any numbers desired by the operator (please read the Dyno Detective in our archives). To demonstrate here, I adjusted a dozen or more extra lb/ft of torque on Patrick Dermody's F7 after tuning it to 145 HP. Neither Patrick nor anyone else could have seen me do that. Dyno tuning consumers like tuning here because I don't G.A.F. what power anyone makes. It is what it is and lets optimize what we have. Please understand that not everyone "knobs" their dynos like this, but "knobbing" is rampant. I will write a book someday. Some dyno sheets are valuable and useful, and others (like the one that follows) can only be used for paper in the bathroom.

Patrick's 145 HP F7 with a lot of extra pretend torque "knobbed" in.
 F7PD08 FAKE F7 DYNO TEST

F7PD08

EngSpd RPM	STPTrq Clb-ft	STPPwr CHp	Oil P psig	BSFC lb/hph	Fuel A lb/hr	A/F Ratio	Air 2 scfm
5900	85.2	95.7	41.3	0.575	53.2	13.91	162
6000	84.9	97.1	41.2	0.578	54.2	13.71	162
6100	87.2	101.3	41.1	0.555	54.3	13.86	164
6200	88.4	104.3	40.9	0.546	55.1	13.85	167
6300	89.6	107.4	40.7	0.555	57.6	13.62	171
6400	91.4	111.4	40.7	0.548	59.1	13.48	174
6500	93.6	115.8	40.5	0.546	61.2	13.22	177
6600	94.1	118.2	40.4	0.538	61.5	13.34	179
6700	96.7	123.3	40.3	0.529	63.1	13.59	187
6800	98.1	127.1	40.2	0.518	63.7	13.81	192
6900	99.8	131.1	40.1	0.511	64.6	14.09	199
7000	100.6	134.1	40.1	0.504	65.3	14.31	204
7100	101.8	137.7	40.1	0.508	67.6	14.14	209
7200	101.8	139.6	40.1	0.495	66.9	14.46	211
7300	103.1	143.3	39.8	0.505	70.1	14.15	216
7400	110.4	155.6	37.1	0.579	87.1	12.45	237
7500	110.7	158.1	36.6	0.609	93.1	11.91	242
7600	111.7	161.6	36.1	0.617	96.3	11.67	246
7700	110.4	161.9	35.7	0.628	98.3	11.55	248
7800	108.4	161.1	35.3	0.655	101.9	11.21	249
7900	104.3	157.1	35.3	0.673	102.1	11.28	252