HILBORN NOZZLE FLOW CHART, at 30psi and .792sg (methanol)

-According to Vern Tomlinson of Fuel Injection Engineering (Hilborn), the Hilborn nozzle number is a designation of its' flow in gallons per minutes.
-Example #1 is #4 nozzles flows .04GPM each at 30PSI and using .792specific gravity fluid, so eight #4's equals .32GPM.
-Example #2 is #20 nozzles flow .20GPM each so eight flow 1.60GPM.
-These charts have been made to show the flow in PPH (Pounds Per Hour) based from square root calculations of the 30psi column using the formula: **new pressure divided by old pressure, square root, times old flow = new flow.**

---------------at 30 PSI--------------		**--------------------psi----------------------**						
		30	**40**	**50**	**60**	**70**	**80**	**90**
		sq. rt.	(1.155)	(1.118)	(1.095)	(1.080)	(1.069)	(1.061)
Nozzle/diam-/---SIA-----GPM--pph---8xGPM	**SIA x 8**	**-------------eight nozzles-PPH-----------------**						
#4A---.016" /.0002011--- .04---15.84--- .32	.0016088	127	146	164	179	194	207	219
#5A---.017" /.0002270--- .05---19.80--- .40	.0018160	158	183	204	224	241	258	274
#6A---.020" /.0003142--- .06---23.76--- .48	.0025136	190	219	245	269	290	310	329
#7A---.0215"/.0003631---.07---27.72--- .56	.0029048	222	256	287	314	339	363	384
#8A---.0225"/.0003976---.08---31.68--- .64	.0031808	253	293	327	358	386	413	438
#9A---.024" /.0004524---.09---35.64--- .72	.0036192	285	329	368	403	435	465	494
#10A---.025" /.0004909---.10---39.60--- .80	.0039272	317	366	409	448	484	518	549
#12A---.028" /.0006158---.12---47.52--- .96	.0049264	380	439	491	538	580	621	658
#14A---.028" /.0006605---.14---55.44--- 1.12	.0052840	444	512	573	627	678	724	768
#16A---.032" /.0008042---.16---63.36--- 1.28	.0064336	507	585	655	717	774	828	878
#18A---.033" /.0008553---.17---71.28--- 1.44	.0068424	570	658	736	806	871	931	988
#20A---.035" /.0009621---.20---79.20--- 1.60	.0076968	634	732	818	896	968	1035	1097
---.037"/.0010750----.22---88.51---1.788	.0086000	708	817	914	1001	1081	1156	1226

-------------------------------main jet diameters and square inch areas-----------------------------

.070"/.0038485	.095"/.0070882	.120"/.011310	.145"/.016513
.075"/.0044170	.100"/.0078540	.125"/.012272	.150"/.017672
.080"/.0050265	.105"/.0086590	.130"/.013273	.155"/.018869
.085"/.0056745	.110"/.0095033	.135"/.014314	.160"/.020106
.090"/.0063617	.115"/.0103870	.140"/.015394	.165"/.0213825

------4 nozzles for 122ci Pinto @ Bonneville------

psi @ 30-------40-------50-------60------70------80------90------100

#4A
#5A
#6A
#7A
#8A---126.5---146.5---163.5---179-----193----206.5---219-----231
#9A---142.5---164.5---184-----201.5---217.5--232.5---247-----260
#10A
#12A
#14A---222-----256-----286.5---313.5----339---362-----384----405.3
#16A
#18A
#20A---317----366------409------448------484---517.5---548.5--578.8

JUSTIN BUKOVINSKY: Set up Crower stack fuel injection for gas, 406 drag race at 4200 elevation.

$ 35-make a circular clear plastic jet and shim holder.

$ 18-check out the 2 used Kinsler jet cans, the hi-speed diaphragm relief and the one way check valve for what they are and what they need.

#1-a gold/red colored quick disconnect can is for the main jet, has a .016" diameter wire spring. It is OK as is. The spring controls the poppet at 1.5PSI

-The baseline starting point jet will be a .125" Hilborn jet with the numbers on the jet facing the flow .

#2-the gold/red can is for the secondary bypass off the front of the barrel valve. Changed the spring from a .022" to a .025" wire.

-It pops off at 7-1/4# with no shims but with a rubber o-ring down inside.
-It pops off at 9# with one .065" shim installed
-It pops off at 11-1/4# with two .065" shims

The idea here is to start with no shims which will limit the fuel pressure to 7-1/4# at part throttle like when doing a burnout at part throttle or setting the timing and when the throttle closes at the end of the burnout and at end of a run.

-If the engine spits and pops at light loads and at part throttle, shims will need to be added .065" at a time to bump the part throttle fuel pressure up about 2# per shim

-Shouldn't need over 2 shims or 11-1/4#. If you do then something else may be wrong.

#3-The grey can with the blue end fittings is one way Kinsler flapper valve. It needed to be machined to accept O-rings and needed one fitting radiused.

-This valve goes in the main fuel hose between the pump and the barrel valve.
-Its purpose is to prevent the fluid to drain backwards to the tank when the engine is off.
- When this happens the engine is hard to start because there is no fuel at the nozzles, just air.

#4-the diaphragm type hi-speed relief appears to work ok on the flow bench. It is set to 68.5 # to start with. It has provisions to install a small jet to allow the fuel pressure to rise slightly after the relief pressure starts to open and fuel starts to bypass. This jet probably will not ever be needed.

$ 40-adjust the throttle blades to .0025" each blade. This required some sanding of several blades to get them to fit decent.

Also disassembled the barrel valve, polish off some burrs, made a brass shim to go between the spool and the spring. Adjusted the barrel valve leakdown to 10% which should be a decent baseline. The leakdown may have to be changed to 12% if the engine wants to spit back when the throttle is opened real quick.

To adjust the idle speed: the idle screw is at the right front (near cyl #2). The throttle blades can be closed about .001" (use feeler gauge to check the throttle blades) to slow the engine speed and/or the barrel valve can be richened up several percent.

Also re-crimped all the nozzle hose ends.

NOTE: the throttle needs to be actuated from the right front throttle shaft position (passengers side). This is very important to keep the idle right and to not twist the shafts against the throttle springs. The heims have a little slop and the springs keep them preloaded

$ 20-replaced the junk short secondary hose with a braided steel/teflon lined hose

$ 15-build a wire bracket to hold the secondary bypass away from the throttle linkage.

$ 15-hook up a pair of throttle return springs at the front linkage.

$ 16-machine 8 nozzles at the 37degree taper to repair bent and dented sealing surfaces.

$ 60-Flowtest the nozzles and some of the jets to get some flow figures.

$219 total

Using Kinsler #294 nozzles (294PPH), .0205" which is like a #6 or a 6-1/2 Hilborn size. These are 90° deflector with a single aeration hole on the top, mounted above the throttle blades.
-Flowtesting with .785SG fluid, figuring for probably using a gasoline of .712SG and then going from some previous experience this is Jones' idea of a baseline
-Flow tests show the flow thru all 8 nozzles. A 1.5# main jet poppet was used but not figured in the flow.

	RPM 5820 PPH/PSI	**RPM 7240 PPH/PSI**	**INCREASE OF PPH/PSI**
.100reversed	342 / 91		
.100	341 / 90		
.105	298 / 70		
.110	294 / 66		
.115	283 / 60	332.5/ 88.5	(49.5/28.5)
.120	254 / 49.5	301.7/ 72	(47.7/22.5)
.130reversed	252 / 48		
.120reversed	247 / 46	291 / 68.5**	(44/22.5) ** (max psi limited by the hi-speed relief)
.125reversed	243.5/ 44.5		
.130	242 / 43	283 / 63.2	(41/20.2)
.125	239 / 42.5	277.9/ 62	(38.9/19.5)
.135reversed	220 / 36	260 / 53.6	(40/17.6)
.135	218 / 34	257.3/ 51	(39.3/17)
.140			

-Jones has picked the .125" main jet as the starting point and Jones set the hi-speed relief at 68.5psi
-Jones did a WAG at the honest horsepower at 4200 elevation and came up with:

at 5820 rpm the horsepower should be about---472 (divided by 2 = 236.0PPH needed)
at 7240 rpm the horsepower should be about---529 (divided by 2 = 264.5PPH needed
at 8160 rpm the horsepower should be about---529 (divided by 2 = 264.5PPH needed)

-This is based on a pretty decent 406 engine making 426 foot pounds of torque at 5820 then the torque falls off 10% at 7240rpm to 383# and falls off 20% at 8160rpm to 341# of torque.

-the pph times 2 equals a horsepower baseline to start from.
-We need to figure in the stall speed , the peak HP and the HP crossing the finish line.
-Jones' test rig allows these particular rpms so that is why we use these particular RPM numbers..

Jones did the following test of the Kinsler HIGH-speed relief regulator. There is an index mark filed into the brass directly in line with the inlet flow. There is a pointer wire welded to the adjustment screw that when it is screwed into the brass and just touches the diaphragm it aligns with index mark. All pressure measurements are taken from that position which is called baseline.

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baseline	= 21.5psi	2-5/8 turns in	= 68.5 ** this is the starting point
one turn in	=38.5	2-3/4 turns in	= 70
1-1/4 turn in	= 43	2-7/8 turns in	= 72.5
1-1/2 turn in	= 47.5	3 turns in	= 75
1-3/4 turn in	= 52.5		
2 turns in	= 57.25		
2-1/4 turns	= 62		
2-1/2 turns in	= 64		