



1991 Engine RPM

Ref. (743) published a list of the RPM of all competing 1991 engines obtained by sound recording and analysis at the finish line on the Estoril circuit during the Portuguese GP meeting. The occasion was the 1st Practice session on 20 September 1991, so the *caveat* is that teams may not have been using all the RPM available. At that place and time it would not be expected that the engines were reaching the “Red line” RPM.

The places obtained in the GP have been added.

<u>RPM rank</u> 1 st Practice	<u>Engine type</u>	<u>All engines 3.5L NA</u> <u>RPM</u>			<u>GP</u> <u>Result</u>
		<u>V8</u>	<u>V10</u>	<u>V12</u>	
1.	Renault RS3B		14,330		1 st
2.	Honda RA121E/B			14,051	2 nd
3.	Ferrari 037			13,790	3 rd
	[Minardi customer Ferrari			n.a.	4 th & 9 th]
4.	Honda RA101E		13,079		13 th
5.	Judd GV		12,925		DNF
6.	Yamaha OX99			12,875	12 th
7.	Lamborghini 3512			12,808	11 th & 16 th
8.	Ford –Cosworth HB5	12,676			5 th , 6 th , 8 th , & 10 th
9.	Ilmor 2175A		12,671		7 th & 17 th
10.	Hart-Cosworth DFR	11,750			15 th
11.	Cosworth DFR	11,334			DNF or failed to Qualify(Judd EV V8 was 14 th)

The slowest engine on this occasion was therefore 21% below the fastest. This is accounted for by the difference in Stroke (S), as shown on the following table of Mean Piston Speed (MPS). The various forms of valve gear are identified as:-

Pneumatic Valve Control System: PVRS Ti-alloy valves: Ti 4 valves/cylinder: 4v/c
Steel Coil Valve Return System: CVRS Steel-alloy valves: St 5 valves per cylinder: 5v/c

All 3.5LNA; all DOHC & 4v/c; except where shown 5v/c

<u>Engine type</u>	<u>Bore (B)</u>	<u>Stroke (S))</u>	<u>B/S</u>	<u>N</u>	<u>MPS</u>	<u>BN</u>	<u>Valve gear</u>
	<u>mm</u>			<u>RPM</u>	<u>m/s</u>		
Renault RS3B	93	51.5	1.806	14,330	24.6	22.2	PVRS Ti
Honda RA121E/B	86.5	49.6	1.744	14,051	23.2	20.3	PVRS Ti
Ferrari 037	88	47.9	1.837	13,790	22.0	20.2	CVRS Ti 5v/c
Honda RA101E	92	52.55	1.751	13,079	22.9	20.0	CVRS, Ti*
Judd GV	94	50.4	1.865	12,925	21.7	20.2	?
Yamaha OX99				12,875			CVRS St 5v/c
Lamborghini 3512	87	49	1.776	12,808	20.9	18.6	CVRS St 5v/c
Ford-Cosworth HB5	94	63	1.492	12,676	26.6	19.9	CVRS Ti
Ilmor 2175A	86.6	59.4	1.458	12,671	25.1	18.3	CVRS St
Hart-Cosworth DFR	92.6	64.8	1.429	11,750	25.4	18.1	CVRS St
Cosworth DFR	90	68.6	1.312	11,334	25.9	17.0	CVRS St

*The RA101E customer engine was *assumed* to be CVRS Ti.

Average MPS (sample of 10)

23.8 + or – 12%

Valve gear:-Renault, the pioneer of PVRS with 6 years experience, at about 22 m/s in BN shows a 10% advantage from the Honda RA121E/B, both using Ti-alloy valves. The preceding standard, CVRS St, averages just under 18 m/s so the advantage of the new “Top-end” with PVRS Ti was about 24% in BN. The BN gain from Ti valves alone is about 12% (HB5).