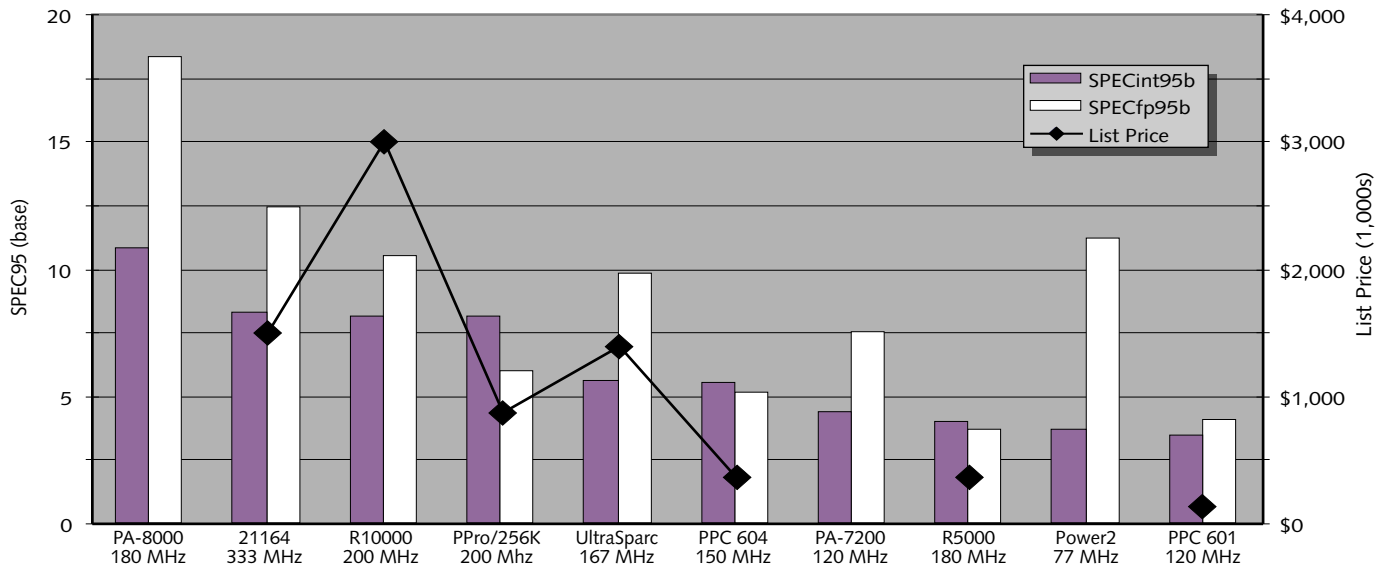
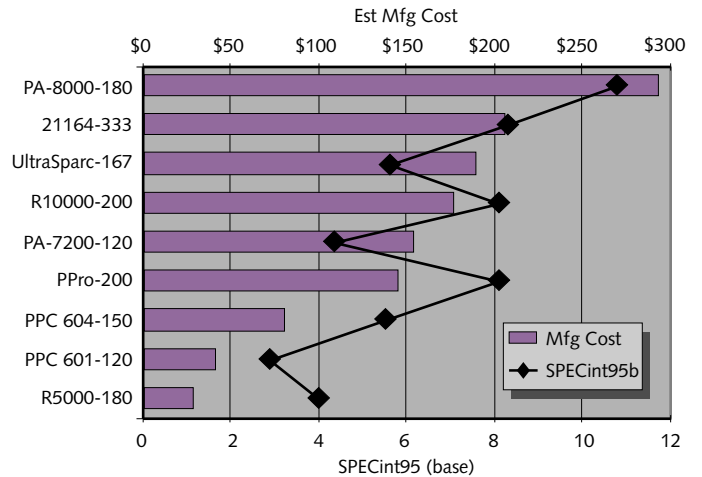


CHART WATCH: WORKSTATION PROCESSORS



The table below gives the vital statistics for processors that play a major role in workstations. All are either shipping now or later this quarter, except for the PA-7300LC. The chart above compares only currently shipping processors on integer and floating-point performance; for those processors that are commercially available, the 1,000-unit list price is also given. The graph at right compares the estimated manufacturing cost (per the MDR Cost Model) for these chips, with their SPECint95 (base) score for comparison.



	Digital 21164	PowerPC 620	PowerPC 604e	Sun UltraSparc	Micro Sparc-2	HP PA-8000	HP PA-7300LC	MIPS R10000	MIPS R5000	Pentium Pro
<b>Clock Rate</b>	400 MHz	166 MHz*	166 MHz	167 MHz	110 MHz	180 MHz	160 MHz*	200 MHz	180 MHz	200 MHz
<b>Cache Size</b>	8K/8K/96K	32K/32K	16K/16K	16K/16K	16K/8K	none	64K/64K	32K/32K	32K/32K	8K/8K
<b>Issue Rate</b>	4 issue	4 issue	4 issue	4 issue	1+branch	4 issue	2 issue	4 issue	1+FP	3 x86 instr
<b>Pipe Stages</b>	7 stages	5 stages	6 stages	6/9 stages	5 stages	7-9 stages	5 stages	5-7 stages	5 stages	12-14
<b>Out of Order</b>	6 loads	16 instr	16 instr	none	none	56 instr	none	32 instr	none	40 ROPs
<b>Rename Regs</b>	none	8 int/8 fp	12 int/8 fp	none	none	56 total	none	32/32	none	40 total
<b>BHT Entries</b>	2K x 2-bit	2K x 2-bit	512 x 2-bit	512 x 2-bit	none	256 x 2-bit	none	512 x 2-bit	none	≥512
<b>TLB Entries</b>	48 I/64 D	64 I/64 D	128/128	64 I/64 D	64 unified	96 unified	96 unified	64 unified	48 unified	32 I/64 D
<b>Memory B/W</b>	~400 MB/s	1.2 GB/s	~180 MB/s	1.3 GB/s	~100 MB/s	768 MB/s	213 MB/s	539 MB/s	~160 MB/s	528 MB/s
<b>Package</b>	CPGA-499	CBGA-625	CQFP-304	CPGA-521	CPGA-321	flip-chip	CPGA-464	CPGA-527	SBGA-272	MCM-387
<b>IC Process</b>	0.35µ 4M	0.35µ 4M	0.35µ 4M	0.5µ 4M	0.4µ 3M	0.5µ 4M	0.5µ 4M	0.35µ 4M	0.35µ 3M	0.35µ 4M
<b>Die Size</b>	209 mm <sup>2</sup>	240 mm <sup>2</sup> *	148 mm <sup>2</sup>	315 mm <sup>2</sup>	233 mm <sup>2</sup>	345 mm <sup>2</sup>	259 mm <sup>2</sup>	298 mm <sup>2</sup>	84 mm <sup>2</sup>	196 mm <sup>2</sup>
<b>Transistors</b>	9.3 million	6.9 million	3.6 million	3.8 million	2.3 million	3.9 million	9.2 million	5.9 million	3.6 million	5.5 million
<b>Est Mfg Cost*</b>	\$165	\$210	\$60	\$190	\$90	\$290	\$100	\$250	\$30	\$145±
<b>Power (max)</b>	20 W	30 W	24 W	30 W	9 W	30 W	15 W	30 W	10 W	35 W±
<b>SPEC95bt</b>	11.2/15.2	7.0/7.0*	6.0/5.3	5.6/9.8	2.2/1.8*	10.8/18.3	5.5/7.3	8.1/10.5	4.0/3.7	8.1/6.0
<b>Availability</b>	2Q96	2H96	2Q96	4Q95	2Q95	2Q96	3Q96	1Q96	1Q96	4Q95
<b>1K List Price</b>	\$1,913	not avail	not avail	\$1,395	\$450	not public	not avail	\$3,000	\$365	\$857

†SPEC95 baseline (int/FP)

‡includes 256K L2 cache

(Source: vendors except \*MDR estimates)