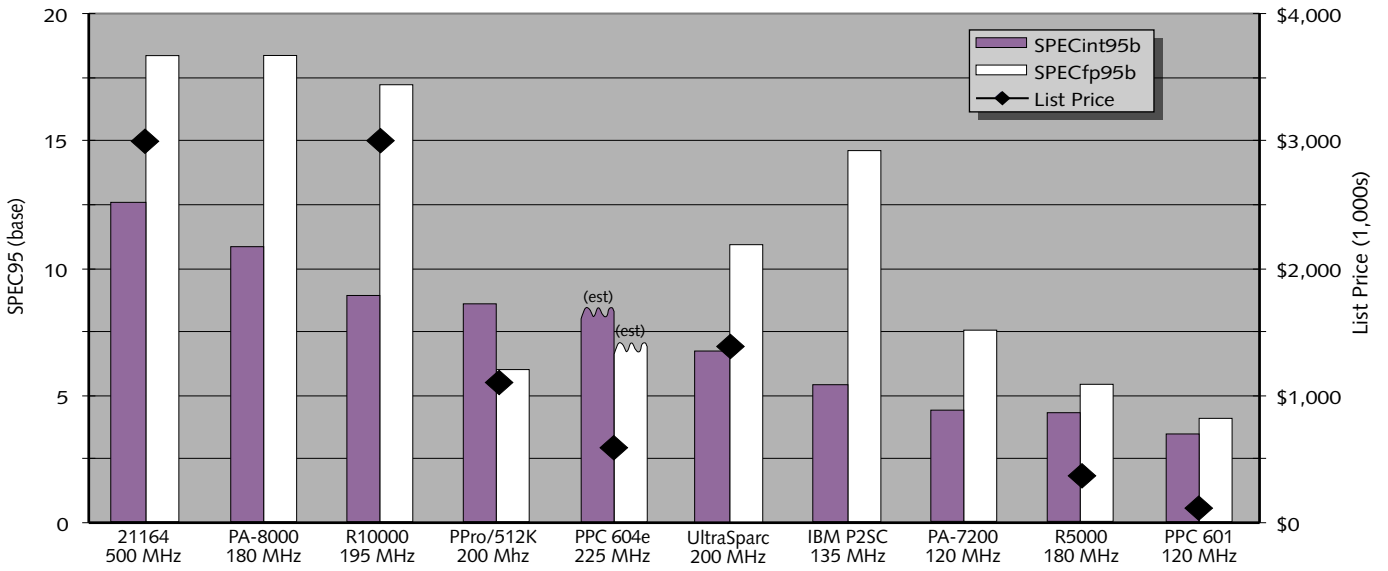
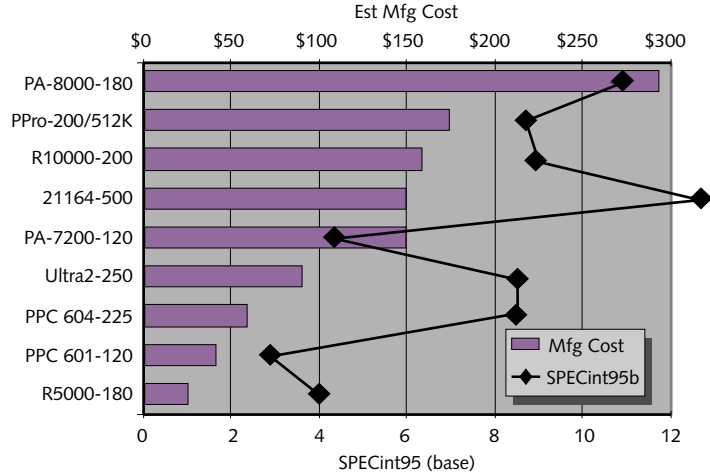


CHART WATCH: WORKSTATION PROCESSORS



The table below gives the vital statistics for processors that play a major role in workstations or servers. All are either shipping now or later this quarter. 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 shows the estimated manufacturing cost (per the MDR Cost Model) for these chips, with their SPECint95 (base) score for comparison.



	Digital 21164	IBM P2SC	PowerPC 604e	Sun UltraSparc	Micro Sparc-2	HP PA-8000	HP PA-7300LC	MIPS R10000	MIPS R5000	Pentium Pro
Clock Rate	500 MHz	135 MHz	225 MHz	250 MHz	110 MHz	180 MHz	160 MHz*	200 MHz	180 MHz	200 MHz
Cache Size	8K/8K/96K	32K/128K	32K/32K	16K/16K	16K/8K	none	64K/64K	32K/32K	32K/32K	8K/8K
Issue Rate	4 issue	6 issue	4 issue	4 issue	1+branch	4 issue	2 issue	4 issue	1+FP	3 x86 instr
Pipe Stages	7 stages	5 stages	6 stages	6/9 stages	5 stages	7-9 stages	5 stages	5-7 stages	5 stages	12-14
Out of Order	6 loads	5 instr	16 instr	none	none	56 instr	none	32 instr	none	40 ROPs
Rename Regs	none	22 fp	12 int/8 fp	none	none	56 total	none	32/32	none	40 total
BHT Entries	2K x 2-bit	none	512 x 2-bit	512 x 2-bit	none	256 x 2-bit	none	512 x 2-bit	none	≥512
TLB Entries	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
Memory B/W	~400 MB/s	2.2 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
Package	CPGA-499	BGA-1,088	CBGA-255	PBGA-521	CPGA-321	LGA-1,085	CPGA-464	CPGA-527	SBGA-272	MCM-387
IC Process	0.35µ 4M	0.29µ 4M	0.35µ 4M	0.29µ 5M	0.4µ 3M	0.5µ 4M	0.5µ 4M	0.35µ 4M	0.35µ 3M	0.35µ 4M
Die Size	209 mm²	335 mm²	148 mm²	149 mm²	233 mm²	345 mm²	259 mm²	298 mm²	84 mm²	196 mm²
Transistors	9.3 million	15 million	5.1 million	3.8 million	2.3 million	3.9 million	9.2 million	5.9 million	3.6 million	5.5 million
Est Mfg Cost*	\$150	\$375	\$60	\$90	\$80	\$290	\$95	\$160	\$25	\$175‡
Power (max)	25 W	30 W	20 W*	30 W	9 W	>40 W	15 W	30 W	10 W	35 W‡
SPEC95bt	12.6/18.3	5.5/14.5	8.5/7.0	8.5/15	1.4/1.9	10.8/18.3	5.5/7.3	8.9/17.2	4.0/3.7	8.7/6.0‡
Availability	3Q96	3Q96	3Q96	3Q96	2Q95	2Q96	3Q96	1Q96	1Q96	2Q96
1K List Price	\$3,000*	not avail	\$594	\$1,995	\$379	not public	not avail	\$3,000	\$365	\$1,072‡

†SPEC95 baseline (int/FP) ‡includes 512K L2 cache (Source: vendors except *MDR estimates)