BUSINESS OUTLOOK

GLOBAL
ELECTRONICS INDUSTRY

WALT CUSTER
CUSTER CONSULTING GROUP
www.custerconsulting.com
April 2000

TOPICS

GLOBAL ECONOMY

ELECTRONIC EQUIPMENT

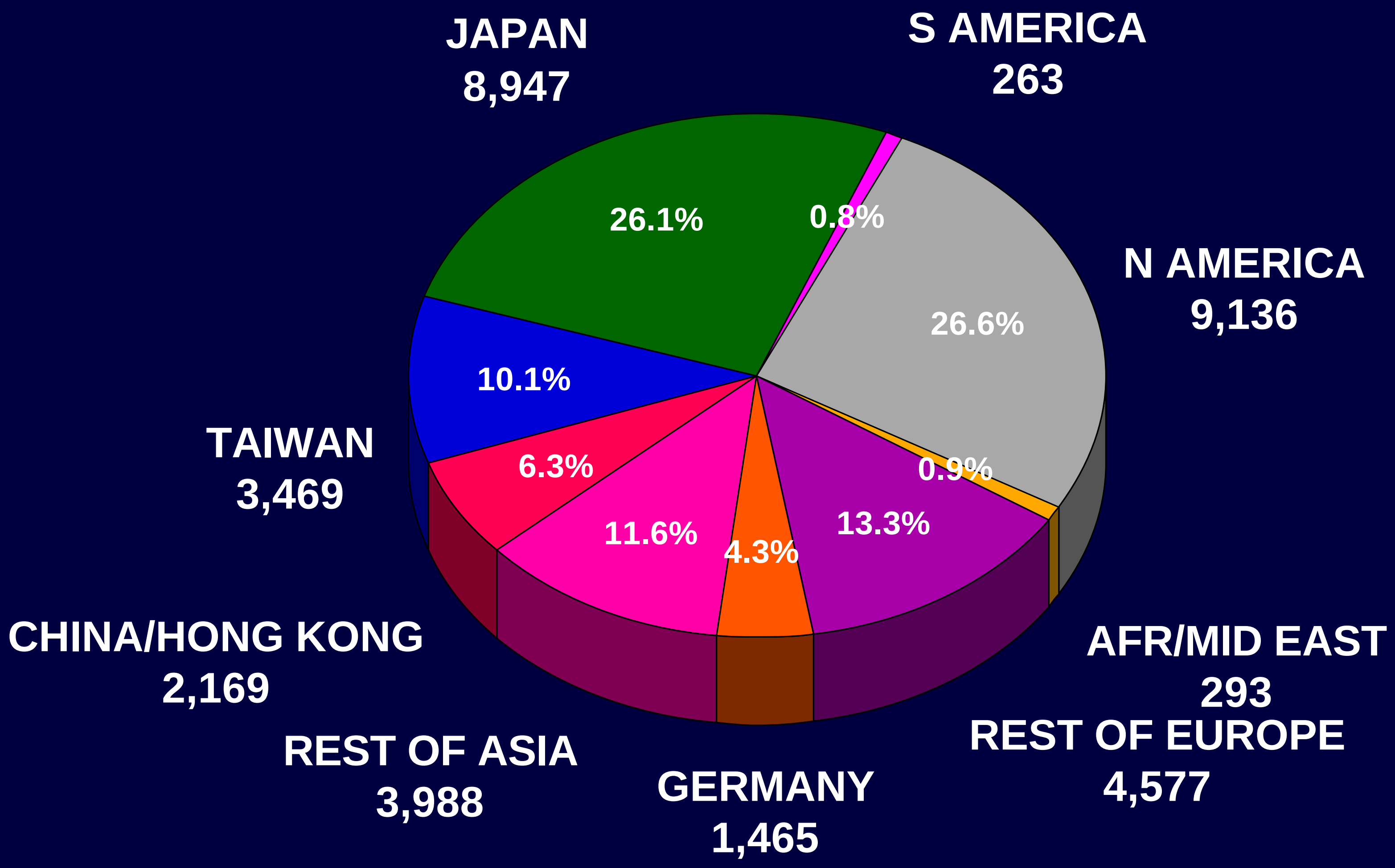
SEMICONDUCTORS

PRINTED CIRCUIT BOARDS

FUTURE OUTLOOK

1998 WORLD RIGID & FLEX PCB PRODUCTION

BY GEOGRAPHICAL AREA ($M)

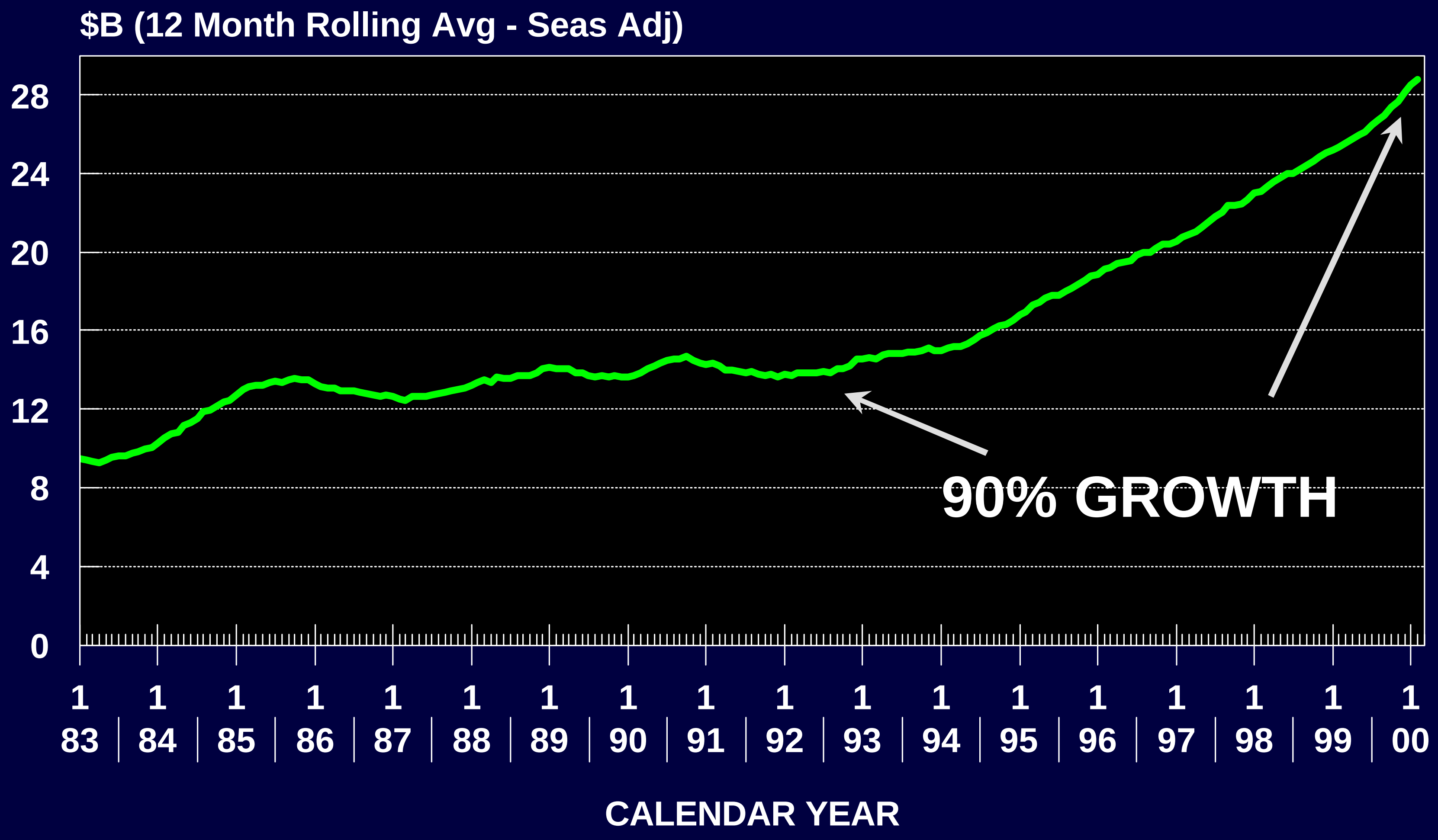


Total: $34.3 Billion

IPC T/MRC 6/99 (includes Buildup PCBs)

US ELECTRONIC EQUIPMENT ORDERS

COMMUNICATION, COMPUTER & OFFICE, MILITARY, INSTRUMENTS



90% GROWTH

US DEPT OF COMMERCE 4/2000

INDUSTRIAL PRODUCTION - WORLD

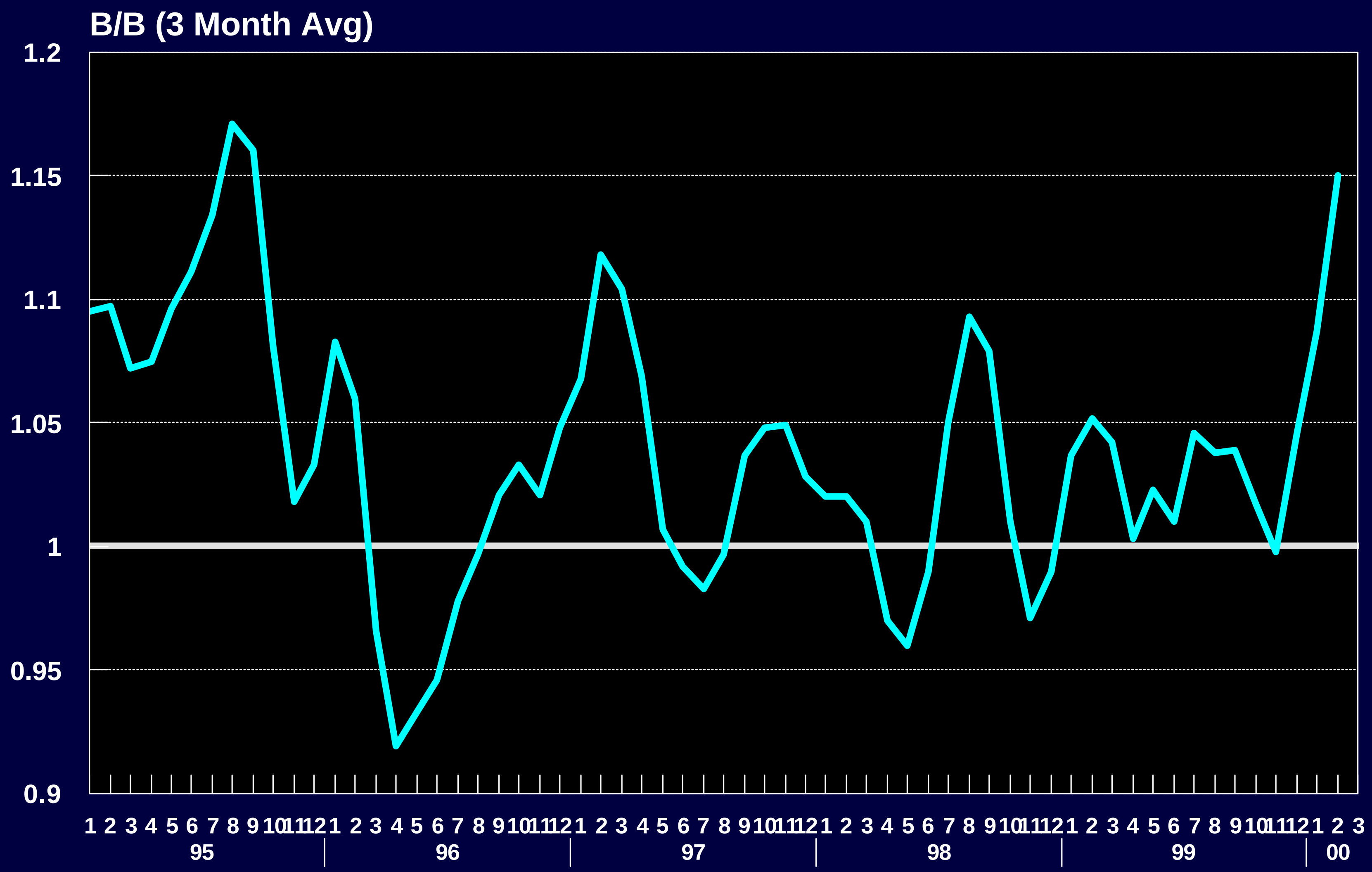
% CHANGE vs ONE YEAR EARLIER

BRITAIN	+1.1 Feb
FRANCE	+4.5 Jan
GERMANY	+6.9 Feb
ITALY	+4.1 Jan
NETHERLANDS	+5.3 Feb
SPAIN	+5.8 Jan
EURO-11	+3.9 Jan
RUSSIA	+13.7 Feb
CANADA	+7.0 Jan
USA	+5.6 Feb
CHINA	+11.9 Mar
MALAYSIA	+23.2 Feb
SINGAPORE	+9.4 Feb
S KOREA	+25.4 Feb
TAIWAN	+18.0 Feb
THAILAND	+9.1 Feb
JAPAN	+8.4 Feb

Economist 4/2000 http://www.economist.com

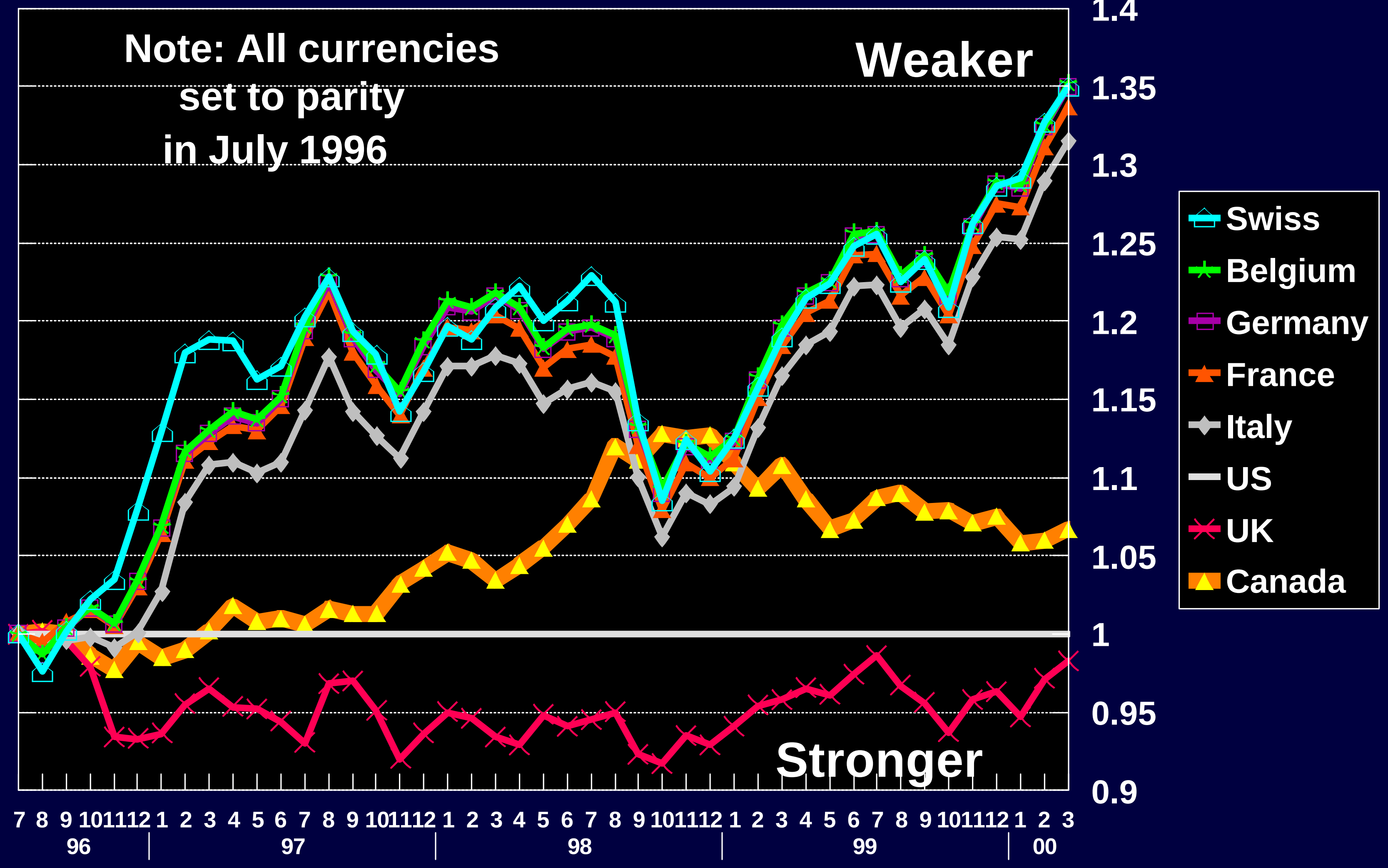
Rigid PCB Book/Bill

N. America



EUROPEAN EXCHANGE RATES vs US $

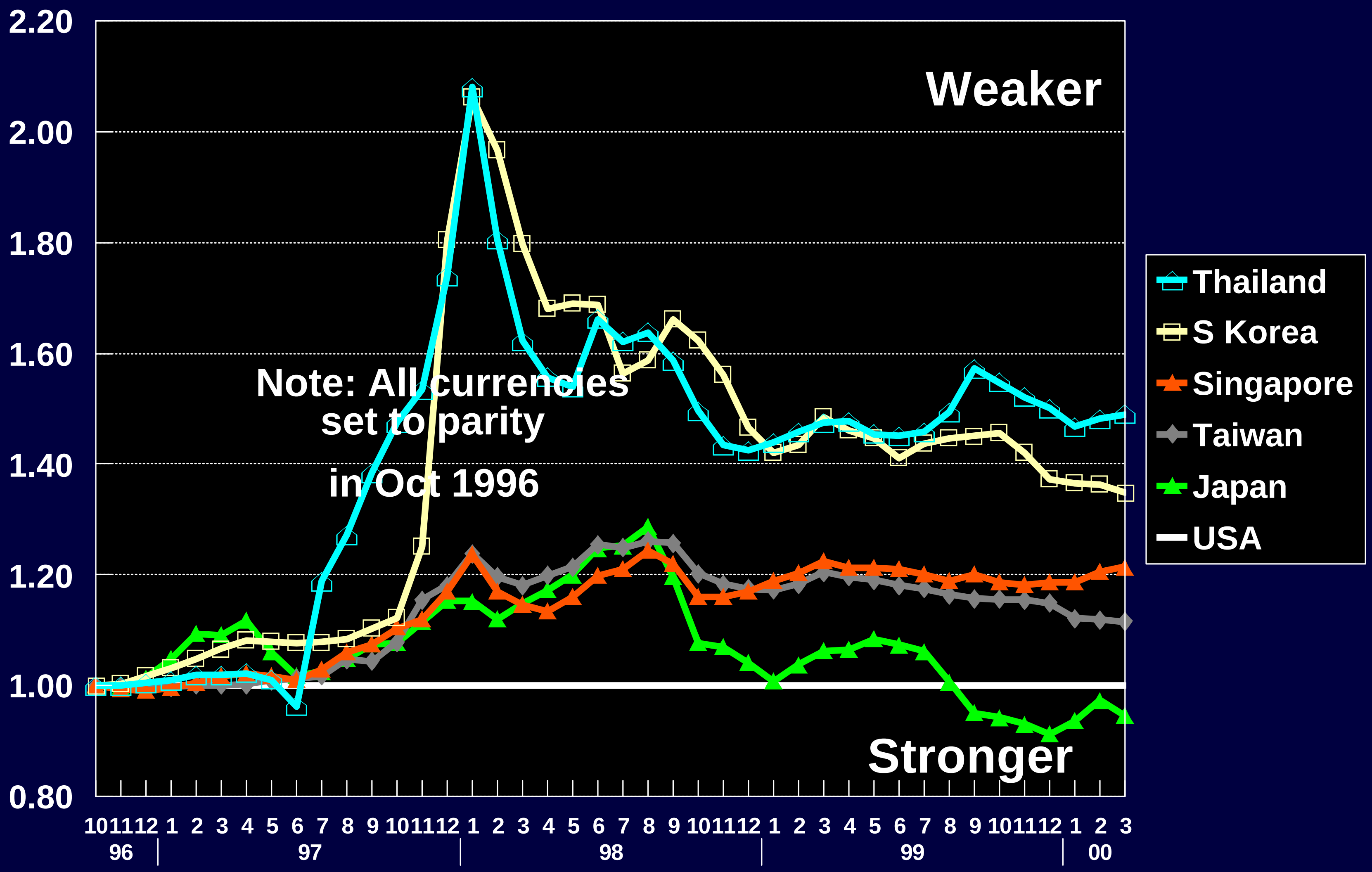
7/96 = 1.00



http://www.stls.frb.org/fred/data/exchange.html

SE ASIA EXCHANGE RATE vs US $

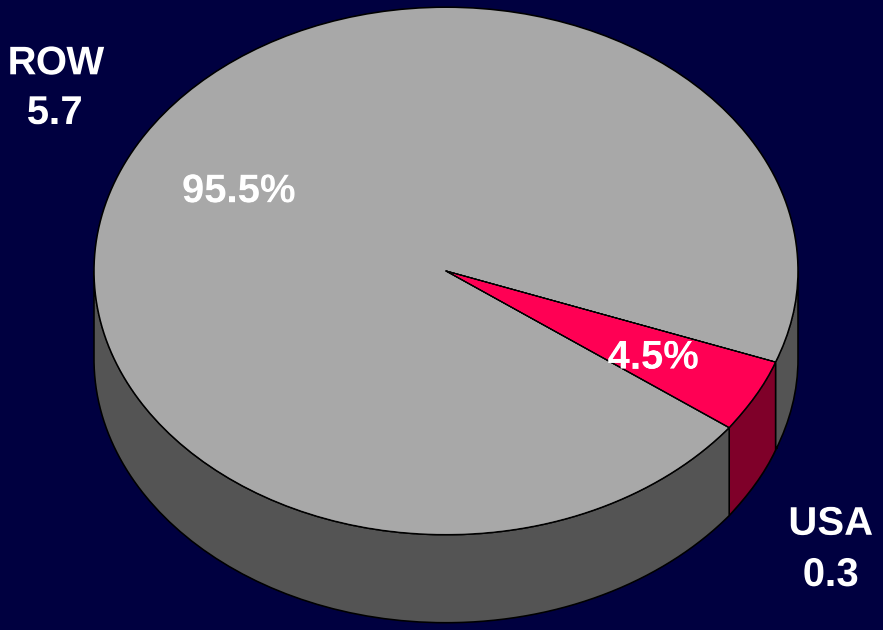
10/96 = 1.00



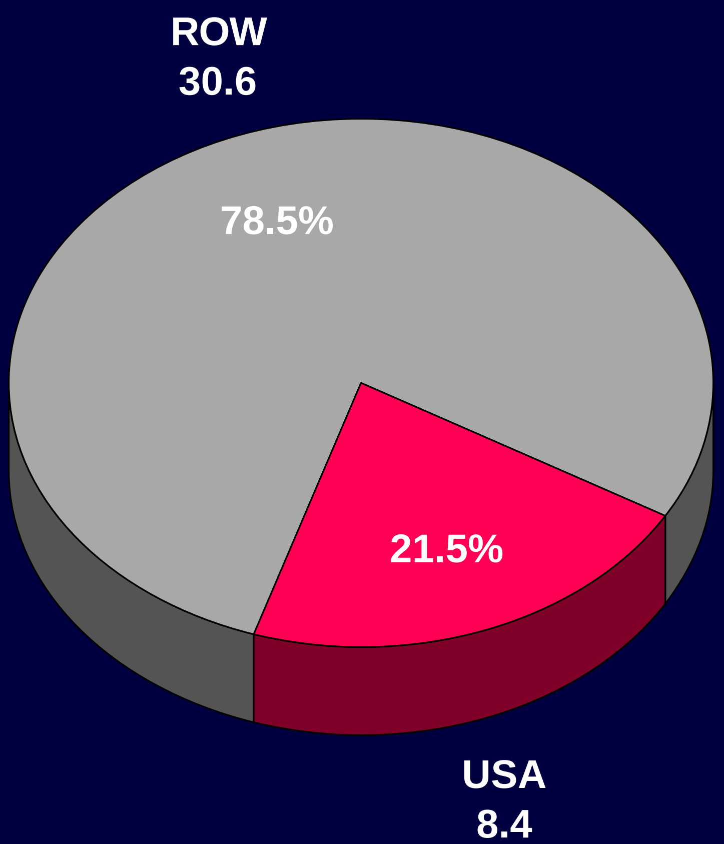
http://www.stls.frb.org/fred/data/exchange.html

USA & WORLD

POPULATION & GROSS PRODUCT - 1998



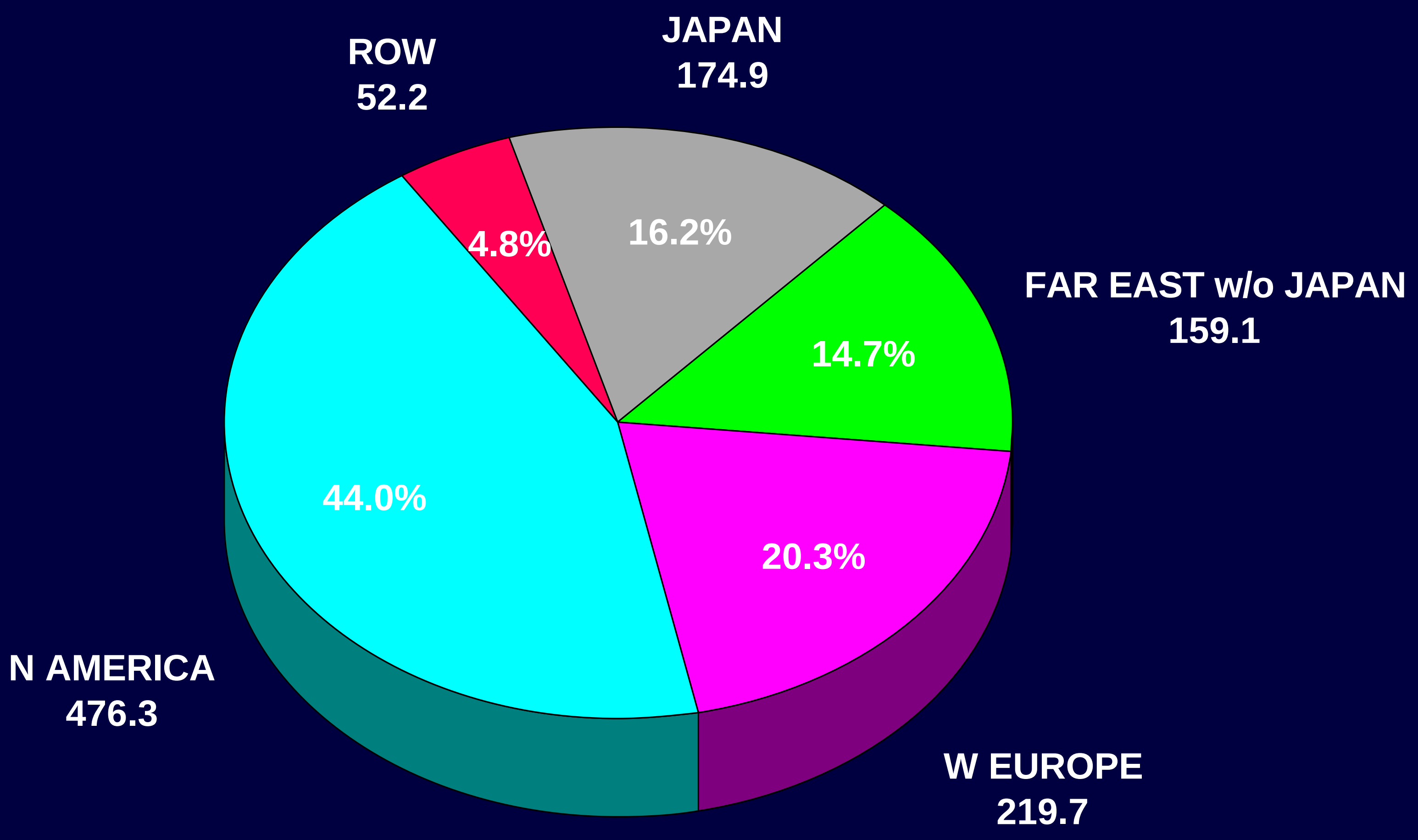
POPULATION
TOTAL: 6.0 B



GROSS PRODUCT
TOTAL: $39 T

WORLD ELECTRONIC EQUIPMENT PRODUCTION

1999

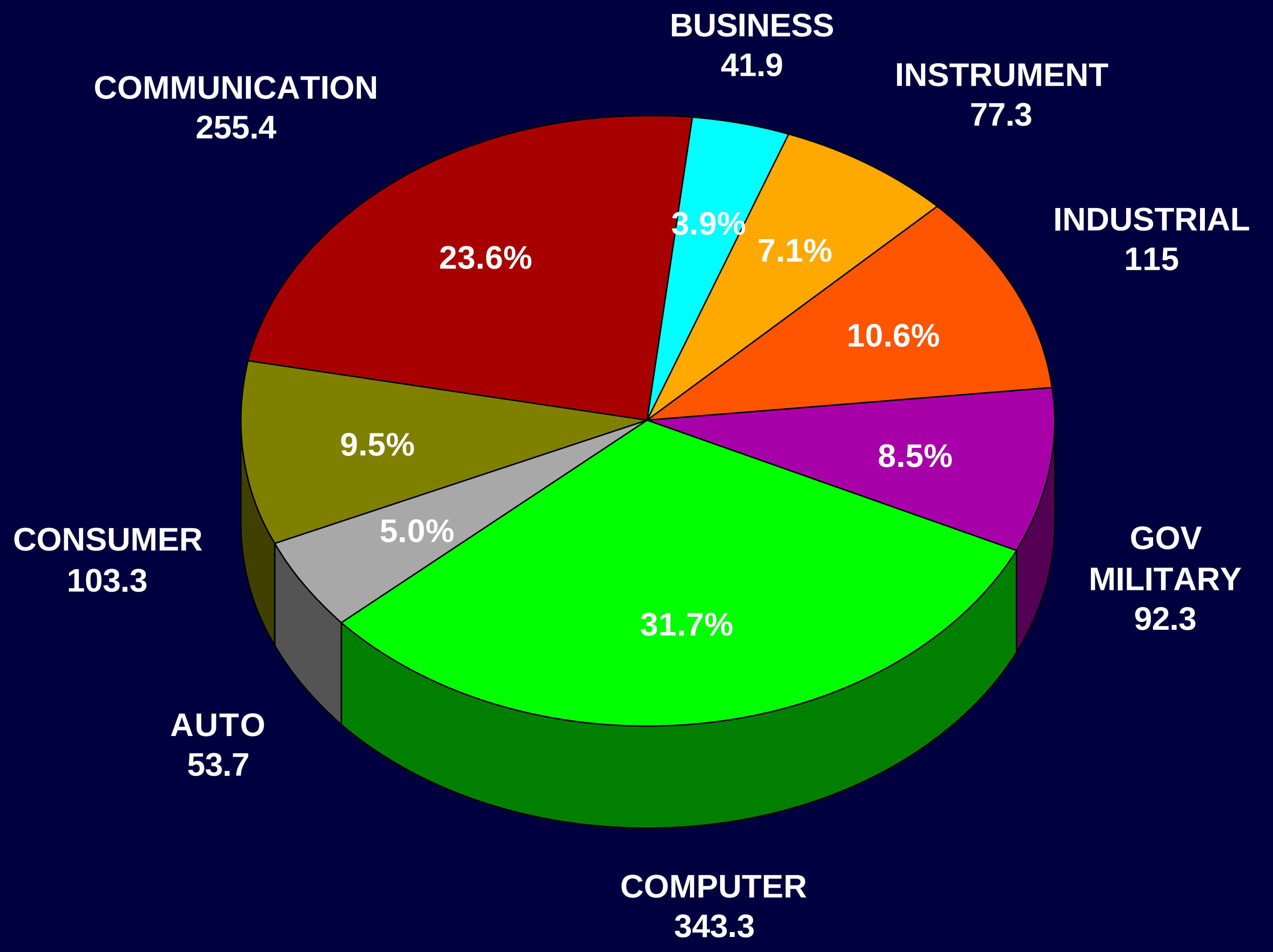


TOTAL $1,082 Billion

ELECTRONIC OUTLOOK CORP: R ANAVY 4/2000

ELECTRONIC EQUIPMENT PRODUCTION

WORLD - 1999 ESTIMATE ($B)

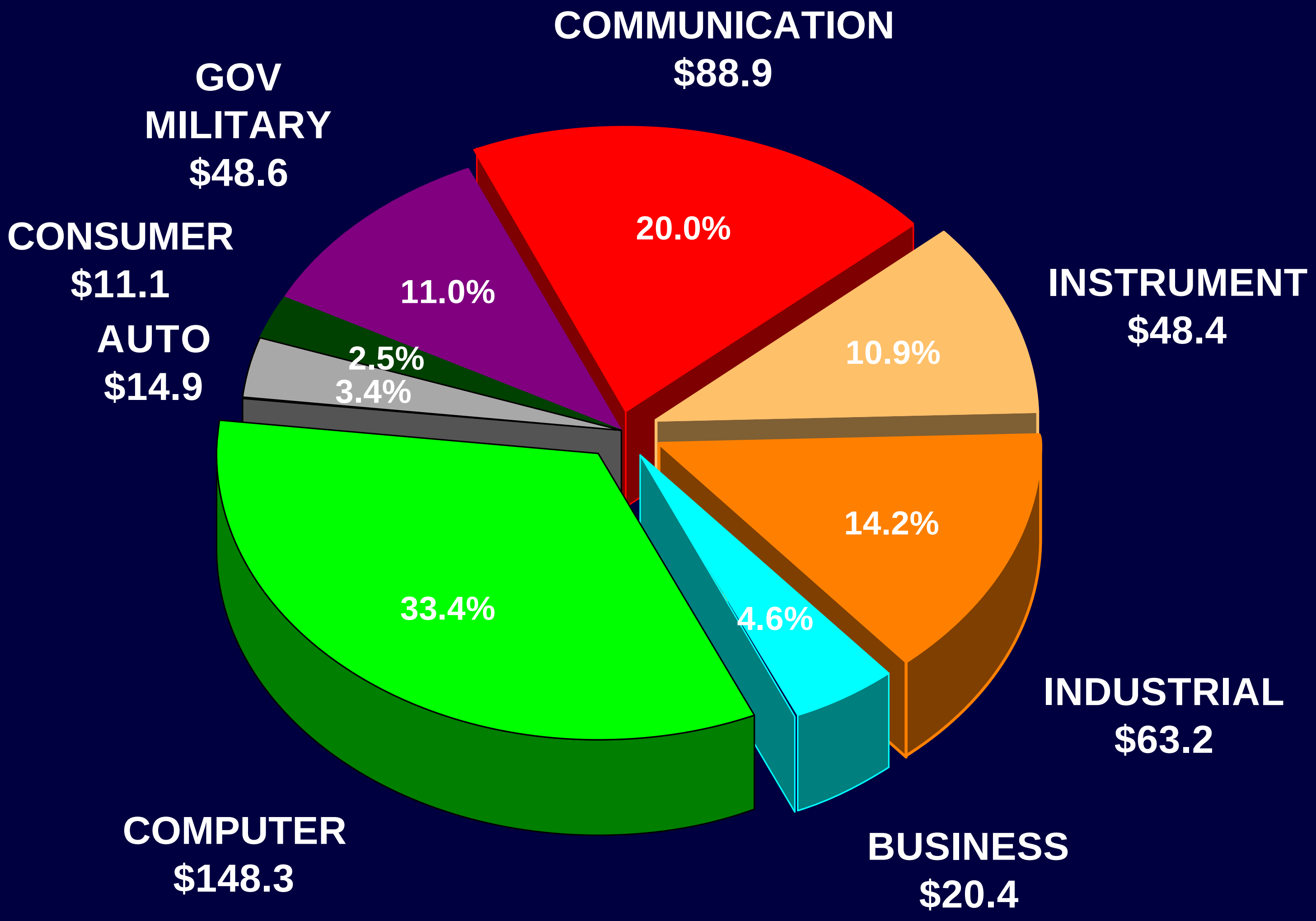


ELECTRONIC OUTLOOK 4/2000

TOTAL $1,082 B

US PRODUCTION OF ELECTRONIC EQUIPMENT

1999 ESTIMATE ($B)

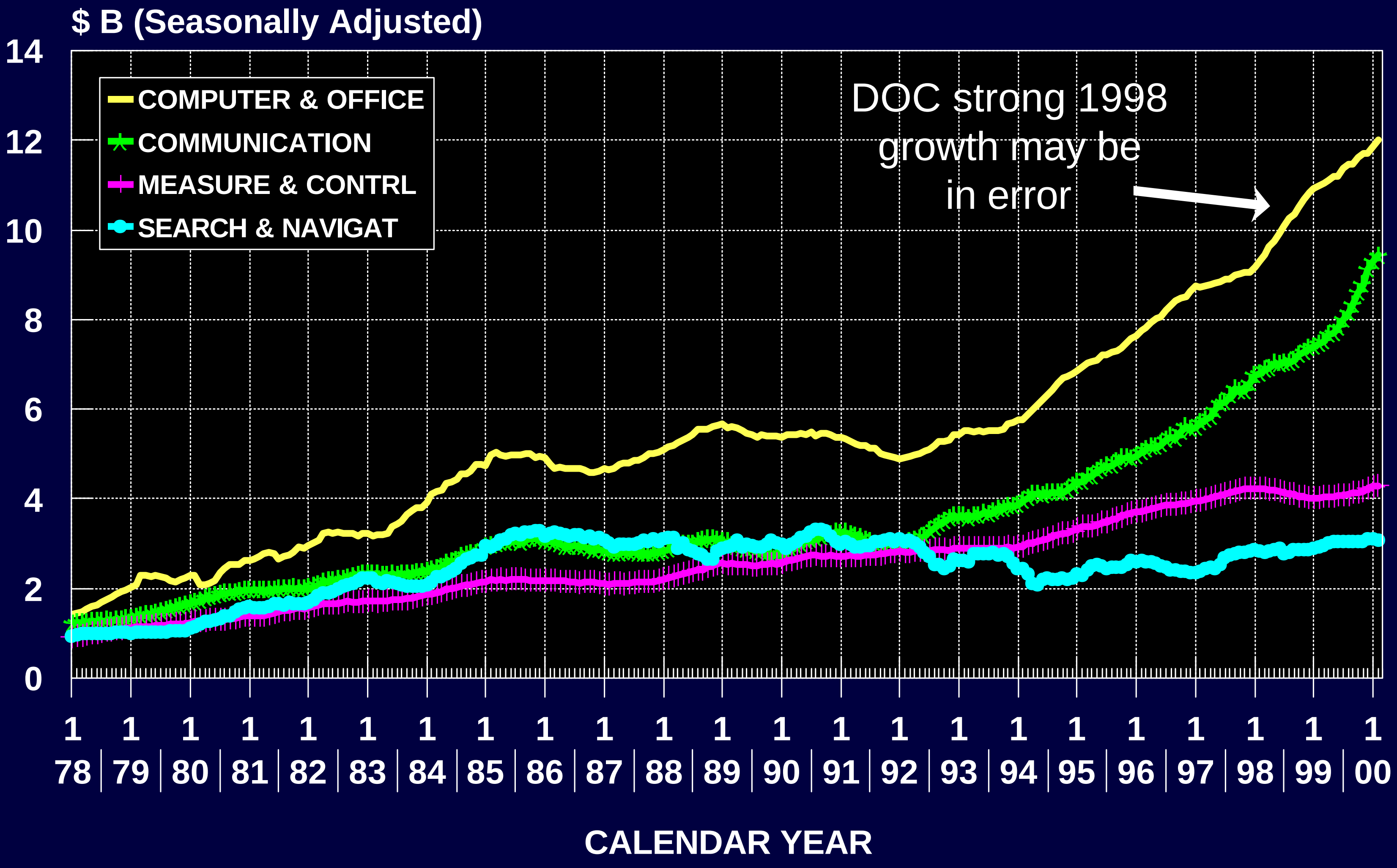


TOTAL = $444 Billion

Electronic Outlook Corp 4/2000

US ELECTRONIC EQUIPMENT BOOKINGS

12 MONTH ROLLING AVERAGE



US DEPT OF COMMERCE 4/2000

Consumer Electronics

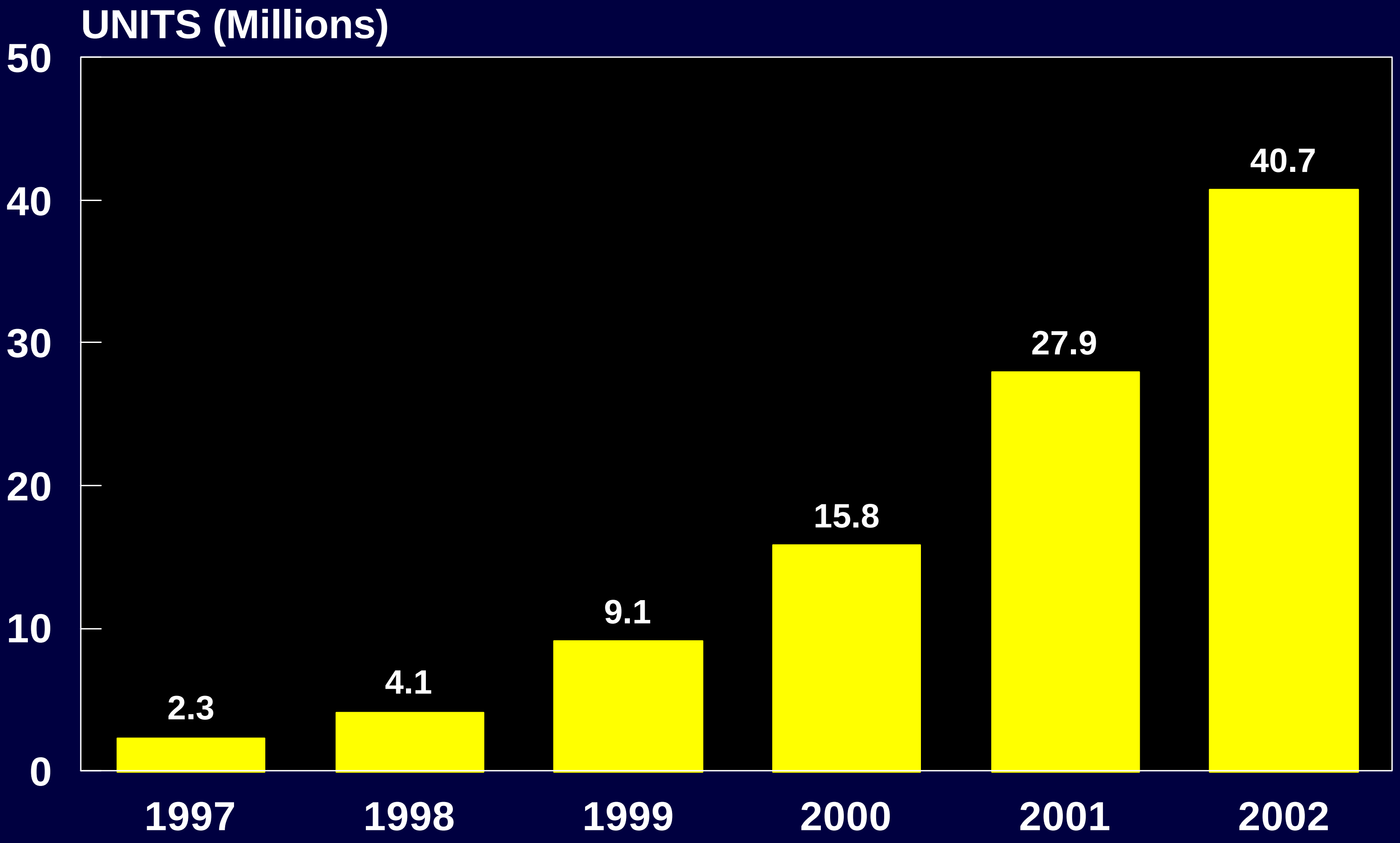
(e.g. TVs, cameras & audio)

Rank		1998 Global Segment Revenue ($M)
1	Hitachi	$28,694
2	Pioneer Electronic	$4,114
3	Nintendo	$4,015
4	Casio Computer	$3,773
5	Aiwa	$2,749
6	Sega Enterprises	$2,492
7	NEC	$1,843
8	Kenwood	$1,806
9	Semi-Tech Global (STG)	$1,442
10	Fujitsu	$1,124

Electronic Business: www.eb-mag.com/registrd/issues/9907/0799top3.htm

DIGITAL CAMERA MARKET

WORLD

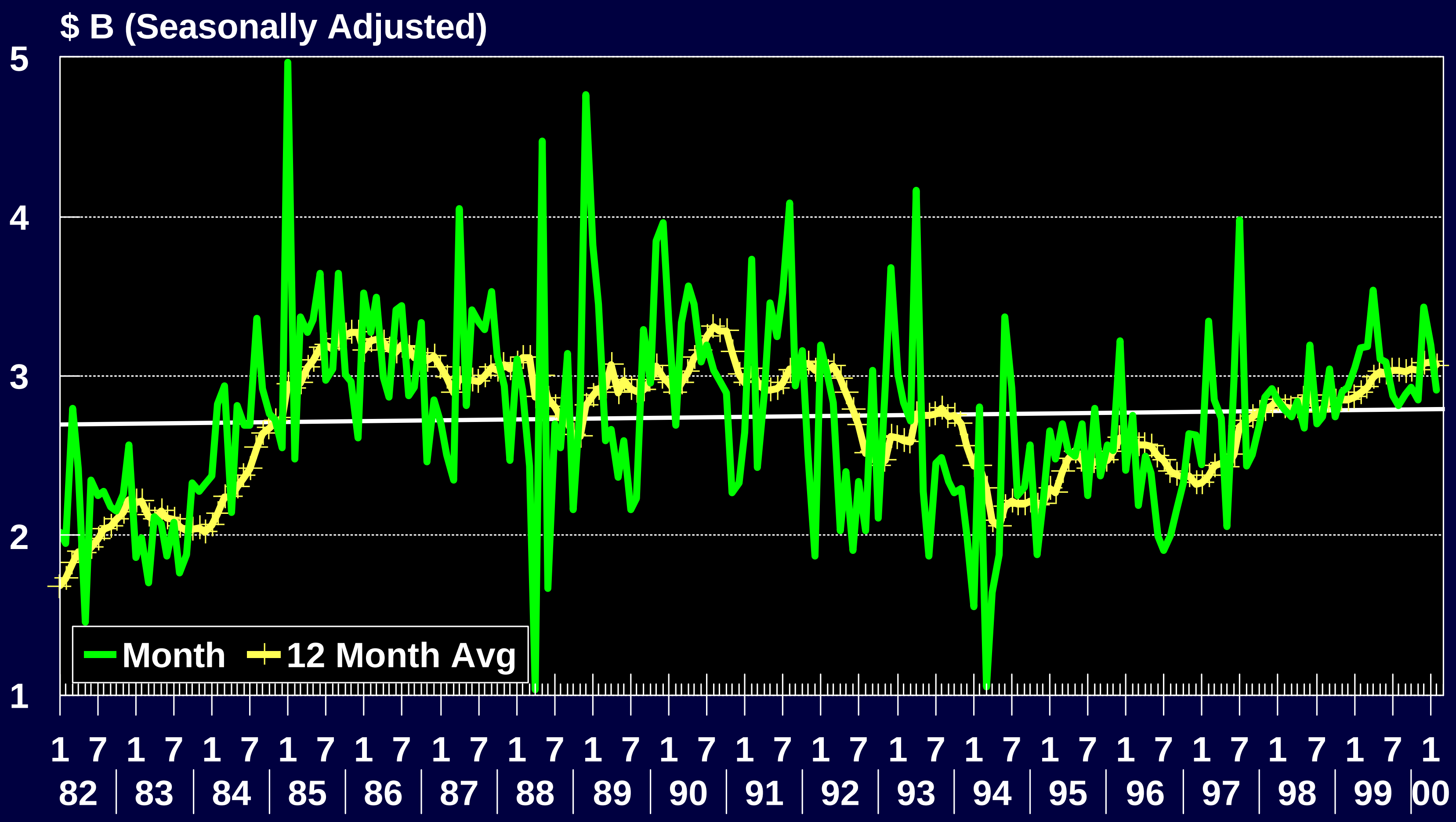


EN: Dataquest 11/98, Semico Research 7/99

SEARCH & NAVIGATION EQUIPMENT

BOOKINGS

PRIMARILY MILITARY ELECTRONICS

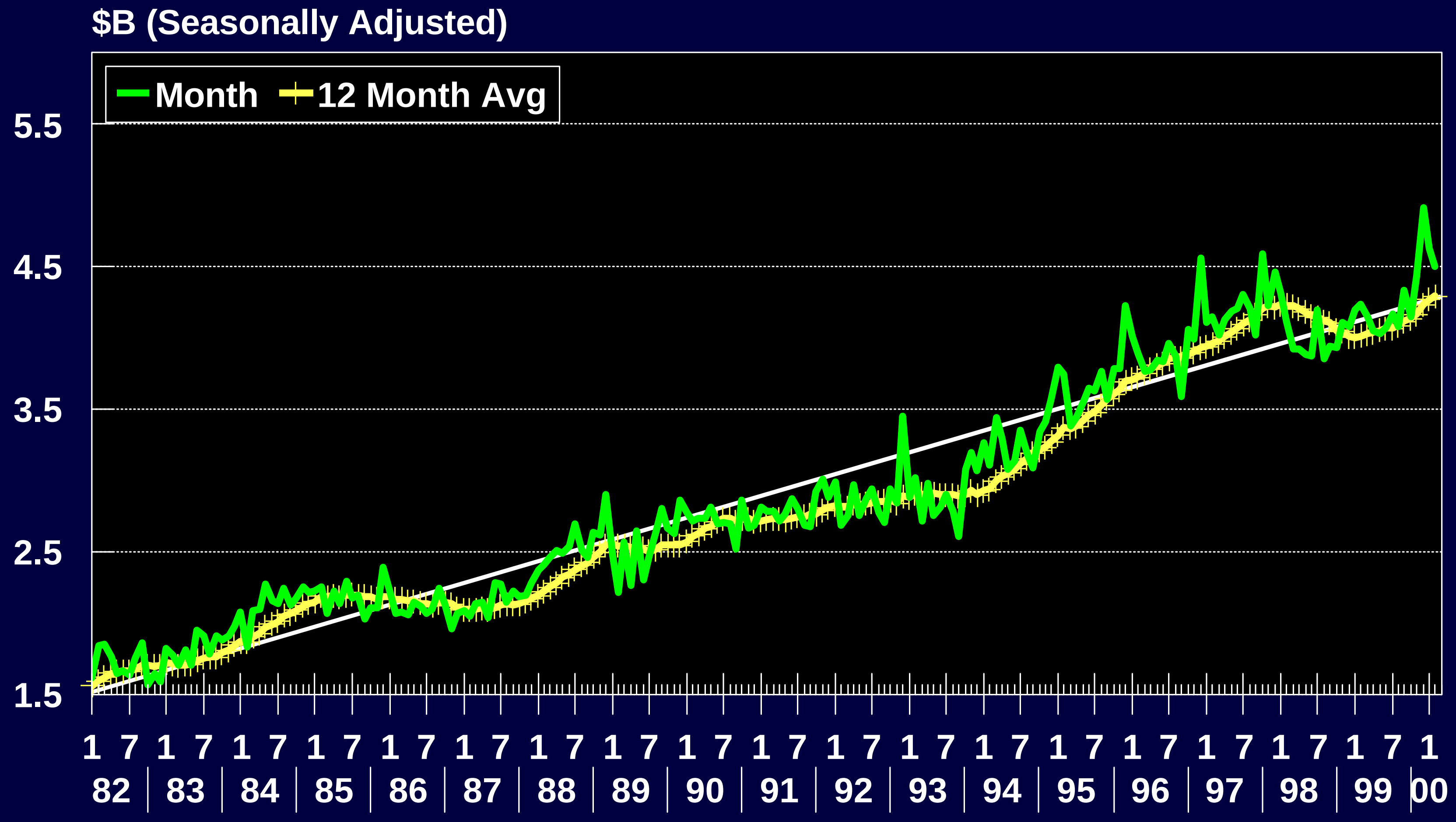


CALENDAR YEAR

COMMERCE DEPT 4/2000

MEASUREMENT & CONTROL EQUIPMENT

BOOKINGS



CALENDAR YEAR

COMMERCE DEPT 4/2000

Industrial Systems

(e.g. automation, controls & security)

Rank		1998 Global Segment Revenue ($M)
1	Fuji Electric	$7,385
2	Rockwell International	$4,707
3	BTR Siebe	$4,665
4	Omron	$4,598
5	Emerson Electric	$4,430
6	Honeywell	$4,213
7	Johnson Controls	$3,512
8	General Electric Co. (GEC)	$3,511
9	Eaton	$3,320
10	General Electric Co	$2,926
11	Nikon	$1,818
12	Matsushita Electric Works	$1,612
13	Pittway	$1,128
14	NEC	$1,106
15	Symbol Technologies	$978
16	Sensormatic Electronics	$975
17	Dover	$908
18	Allied Signal	$816
19	Texas Instruments	$761
20	Diebold	$711

Electronic Business: www.eb-mag.com/registrd/issues/9907/0799top3.htm

Instruments, Test & Measurement

Rank		1998 Global Segment Revenue ($M)
1	Hewlett-Packard	$4,246
2	Thermo Electron	$1,888
3	Perkin-Elmer	$1,504
4	Teradyne	$1,221
5	KLA-Tencor	$926
6	Tektronix	$886
7	Danaher	$485
8	Honeywell	$421
9	EG&G	$270
10	Teac	$135

Electronic Business: www.eb-mag.com/registrd/issues/9907/0799top3.htm

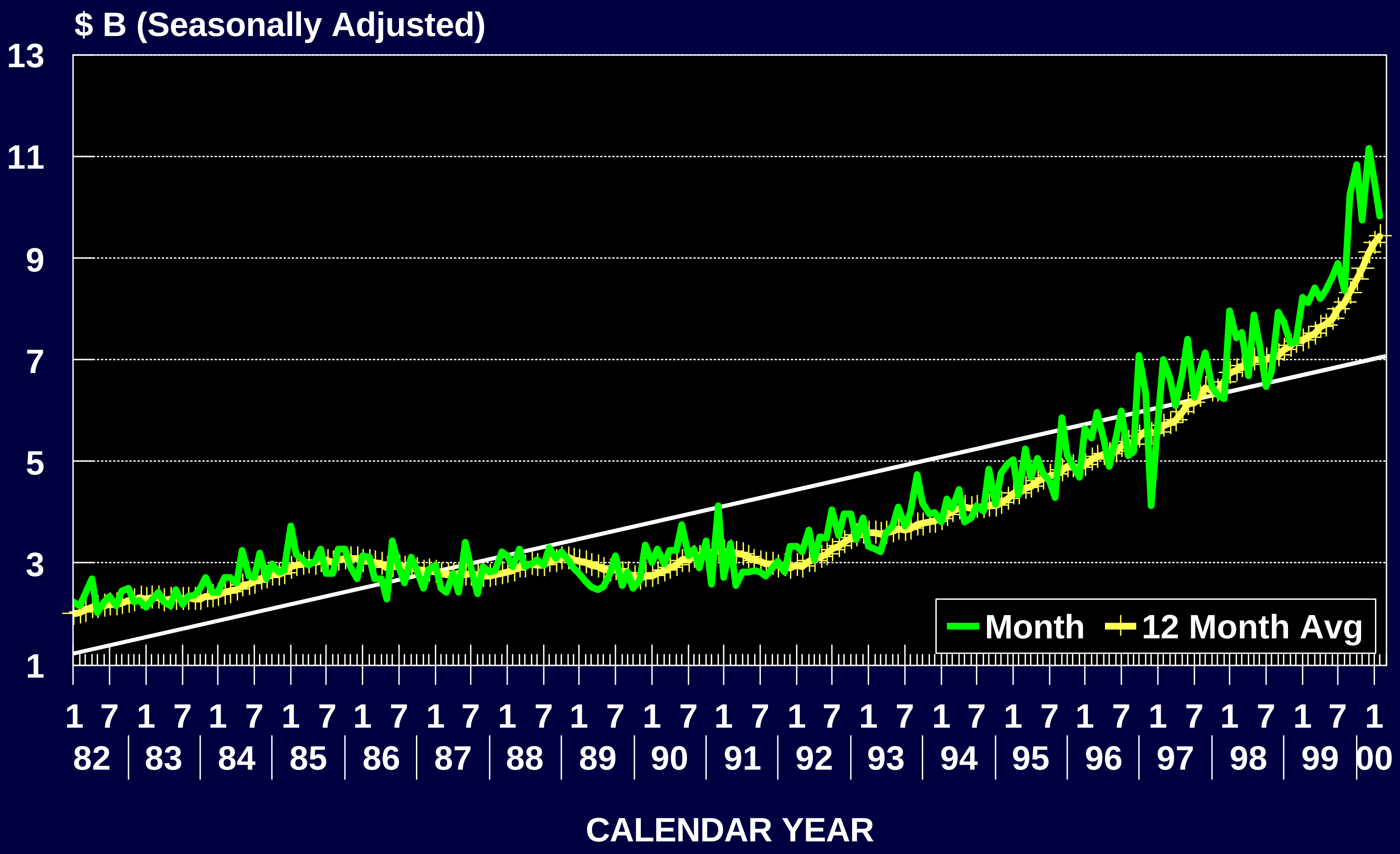
Medical Equipment

Rank		1998 Global Segment Revenue ($M)
1	Medtronic	$2,258
2	Hewlett-Packard	$1,416
3	Imation	$318
4	Eastman Kodak	$280
5	Fuji Photo Film	$230

Electronic Business: www.eb-mag.com/registrd/issues/9907/0799top3.htm

COMMUNICATIONS EQUIPMENT

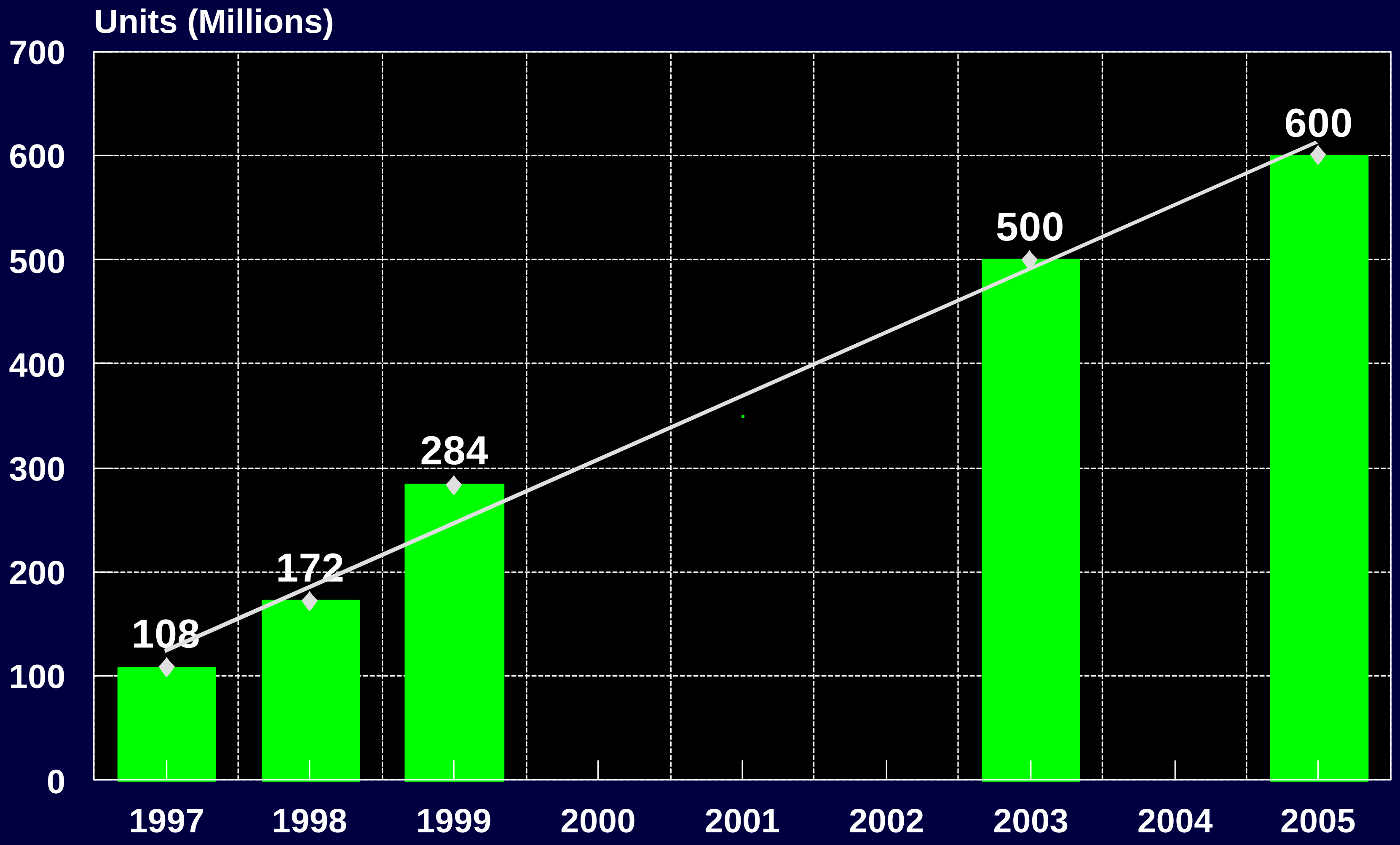
BOOKINGS



COMMERCE DEPT 4/2000

WORLD CELLULAR PHONE GROWTH

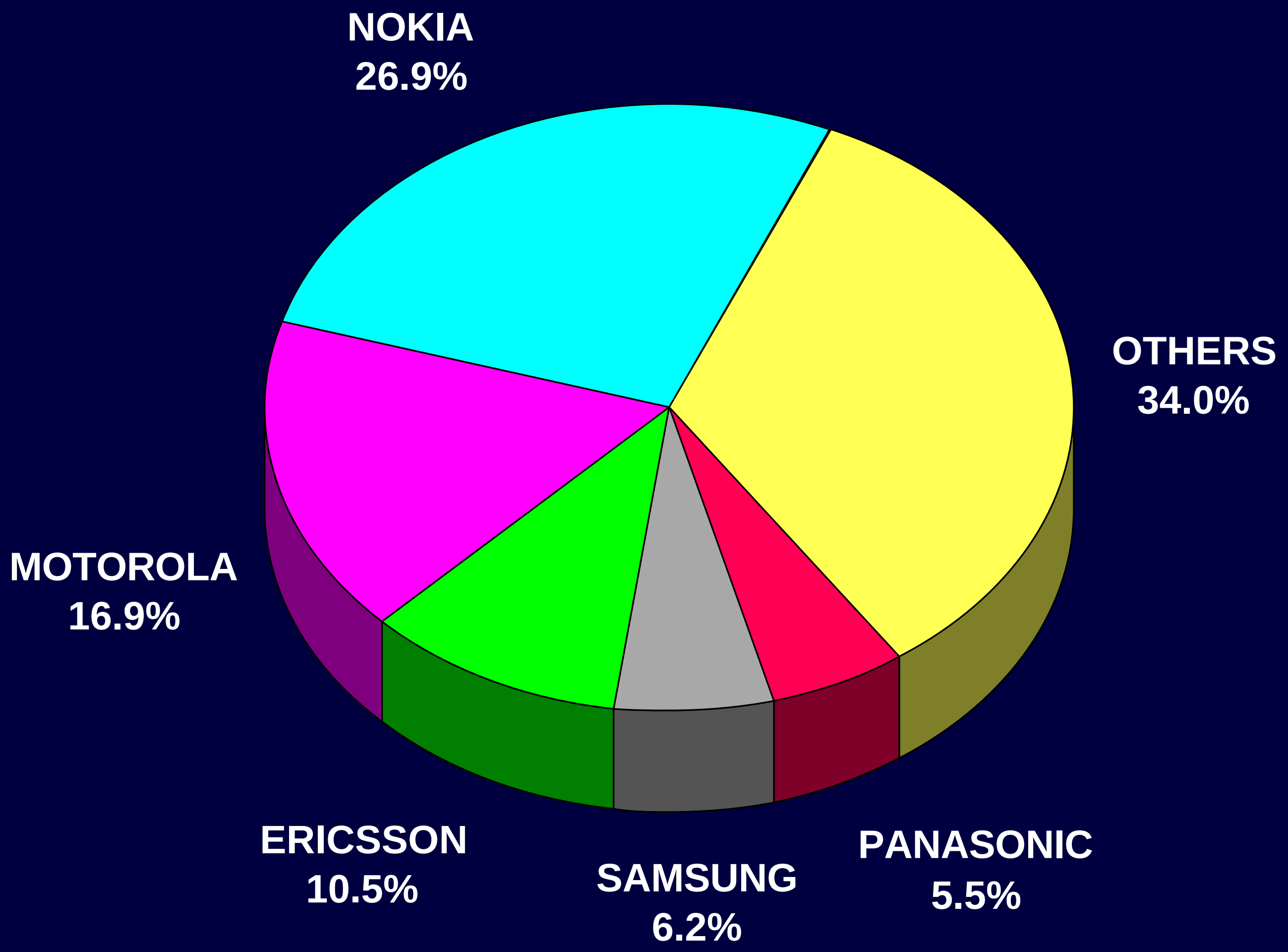
TOTAL SALES - ANALOG & DIGITAL



Ericsson 5/99, Dataquest 2/2000

WORLD CELLULAR PHONE SALES

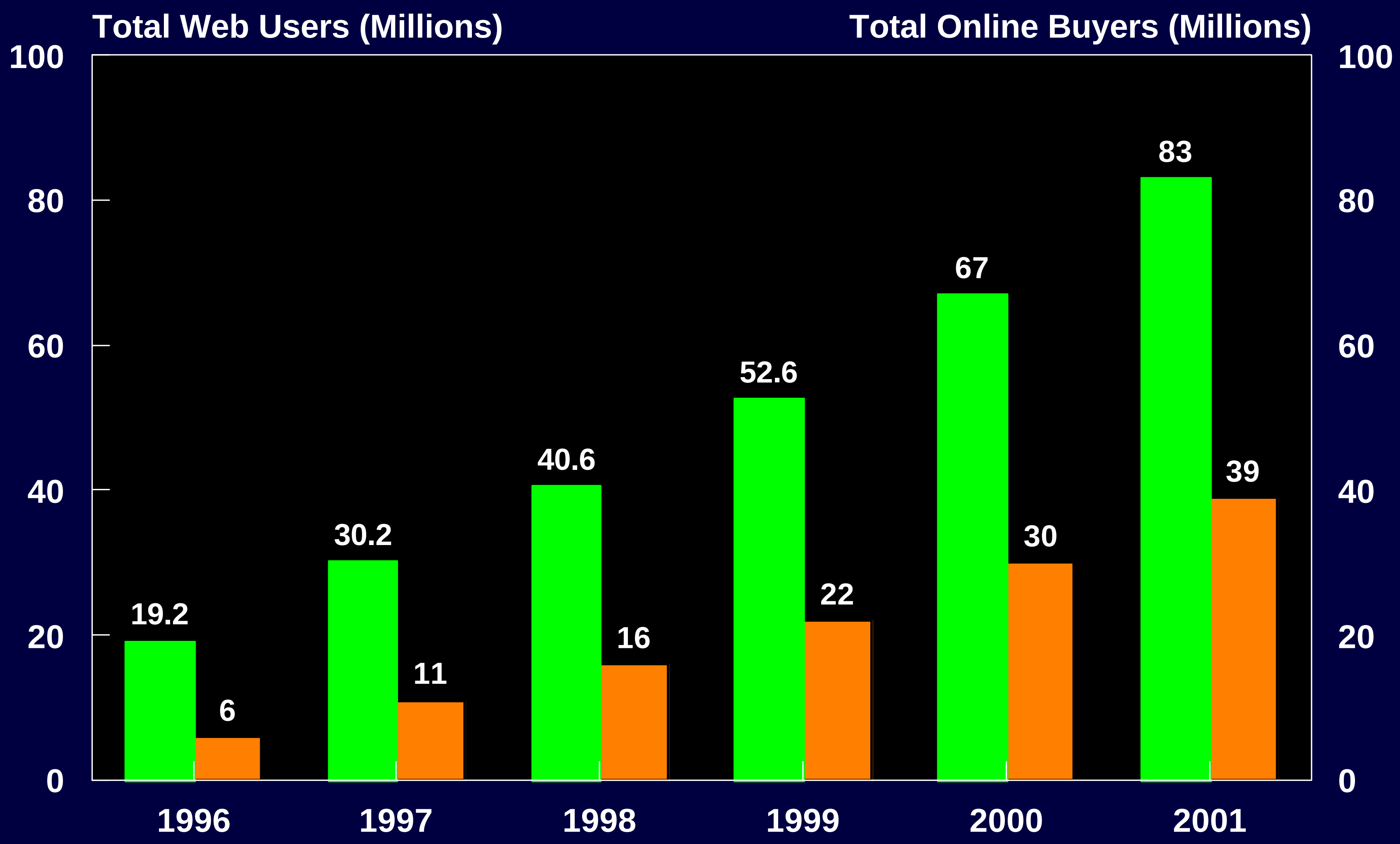
1999



DATAQUEST 2/2000

TOTAL: 283 MILLION UNITS

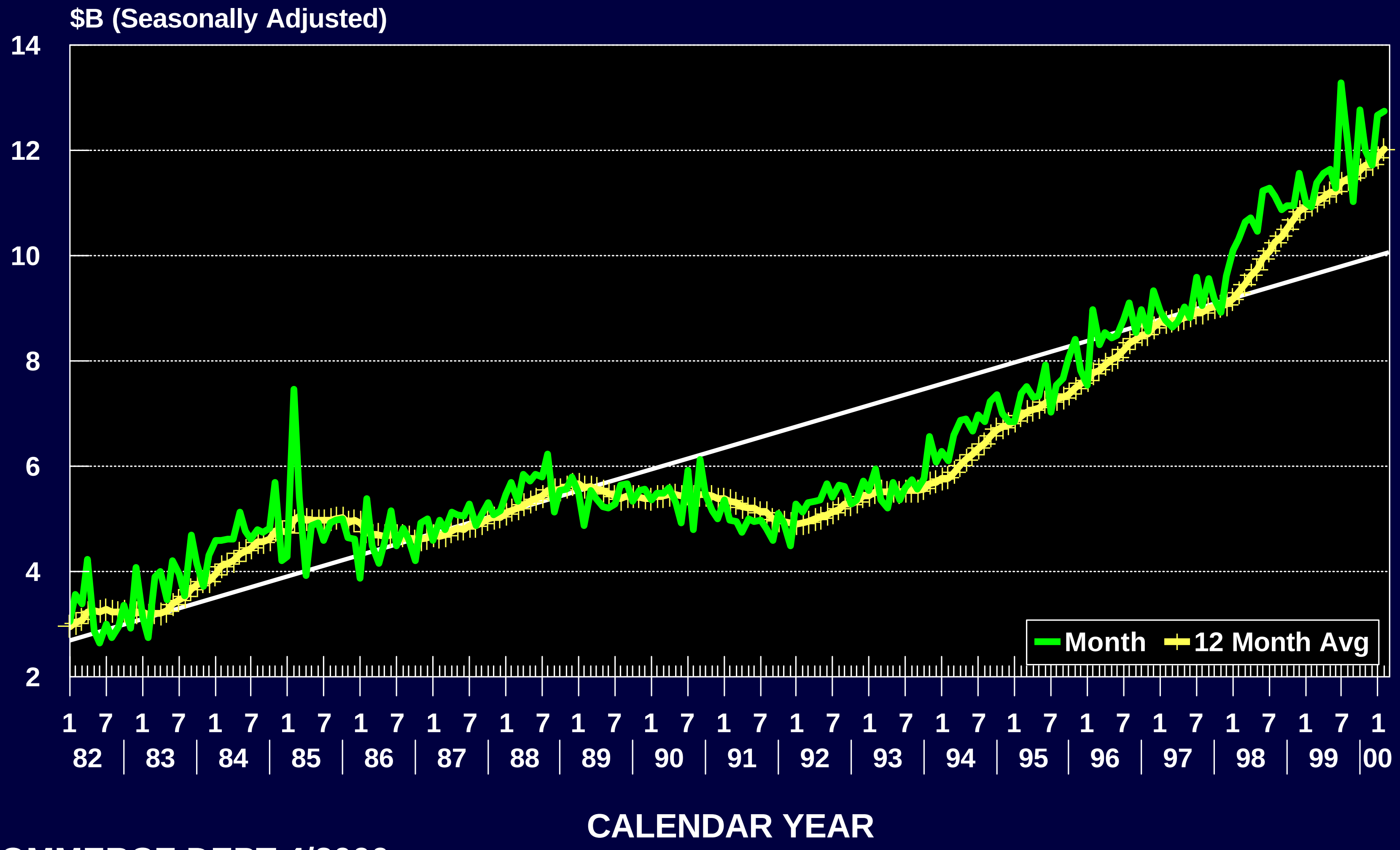
Growing Market - US Online Consumers



Infoworld: IDC 1/99

COMPUTER & OFFICE EQUIPMENT

BOOKINGS



COMMERCE DEPT 4/2000

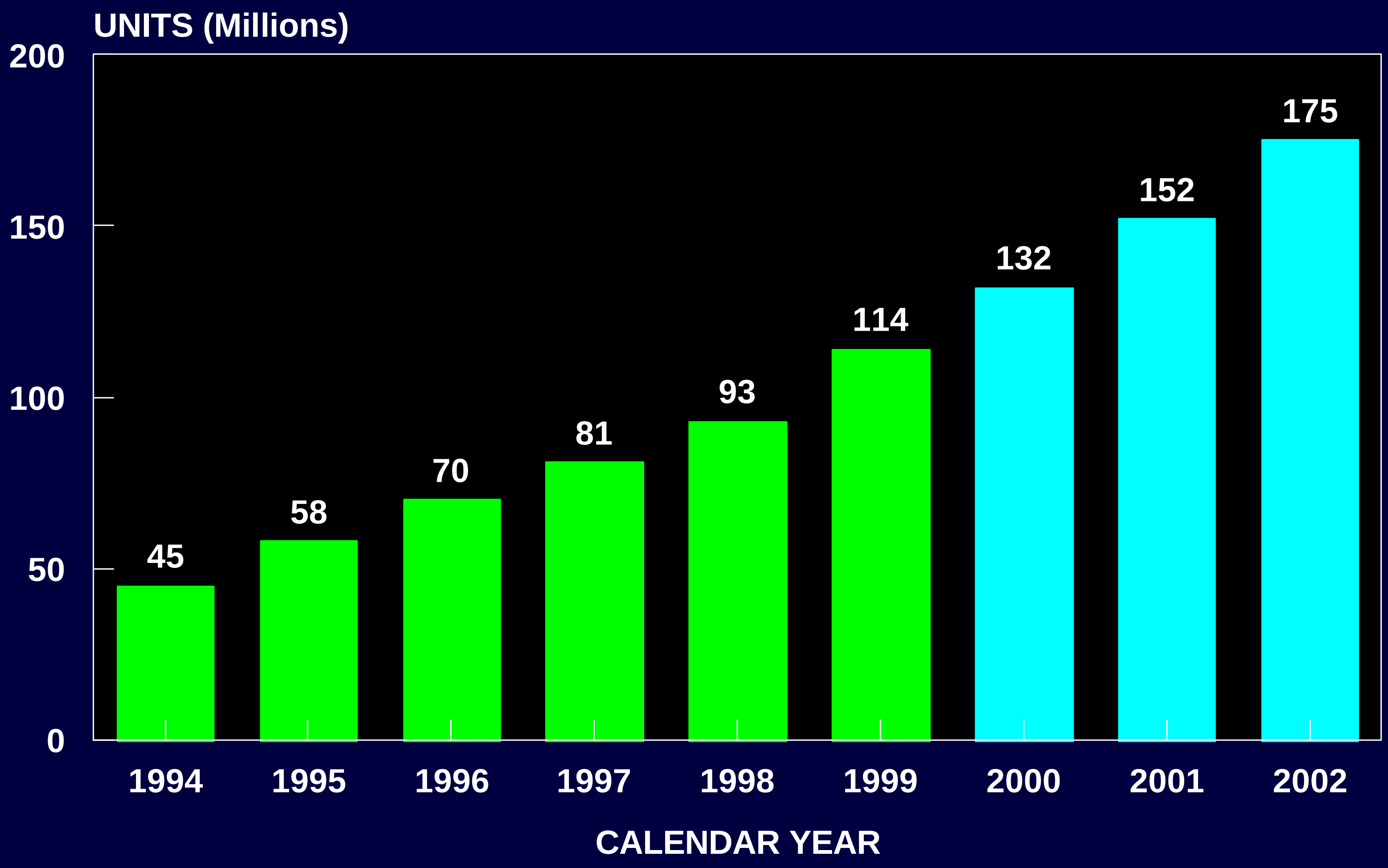
Computer Hardware

Rank		1998 Global Segment Revenue ($M)
1	IBM	$35,117
2	Compaq Computer	$27,429
3	Fujitsu	$25,850
4	Hewlett-Packard	$18,873
5	Dell Computer	$16,966
6	NEC	$12,161
7	Siemens	$9,087
8	Sun Microsystems	$7,888
9	Gateway	$7,169
10	Acer	$6,700
11	Apple Computer	$4,555
12	OKI Electric Ind. Co.	$2,873
13	Unisys	$2,523
14	Silicon Graphics	$2,227
15	Bull	$1,964
16	Micron Technology	$1,368
17	Legend Holdings	$758
18	Data General	$629
19	Molden	$544
20	Intergraph	$516

Electronic Business: www.eb-mag.com/registrd/issues/9907/0799top3.htm

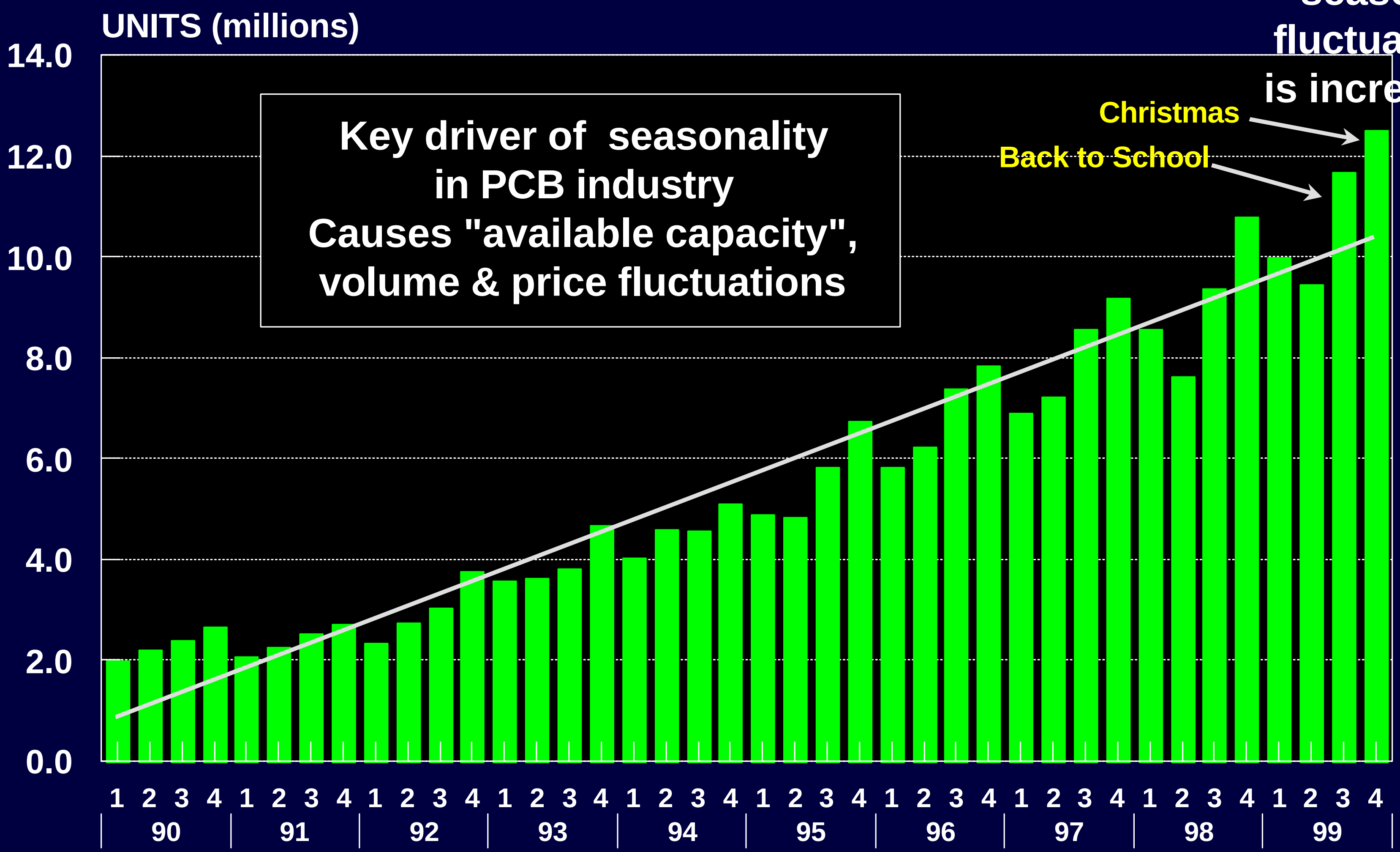
PERSONAL COMPUTER GROWTH

GLOBAL SALES



EBN:IDC, John Peedie Assoc 8/97, Dataquest 1/99 & 1/2000, Custer 1/2000
Desktops, Notebooks, Ultraportables - does not include Servers

MICROCOMPUTER SHIPMENTS TO THE U.S.



Key driver of seasonality
in PCB industry
Causes "available capacity",
volume & price fluctuations

Magnitude of
seasonal
fluctuations
is increasing

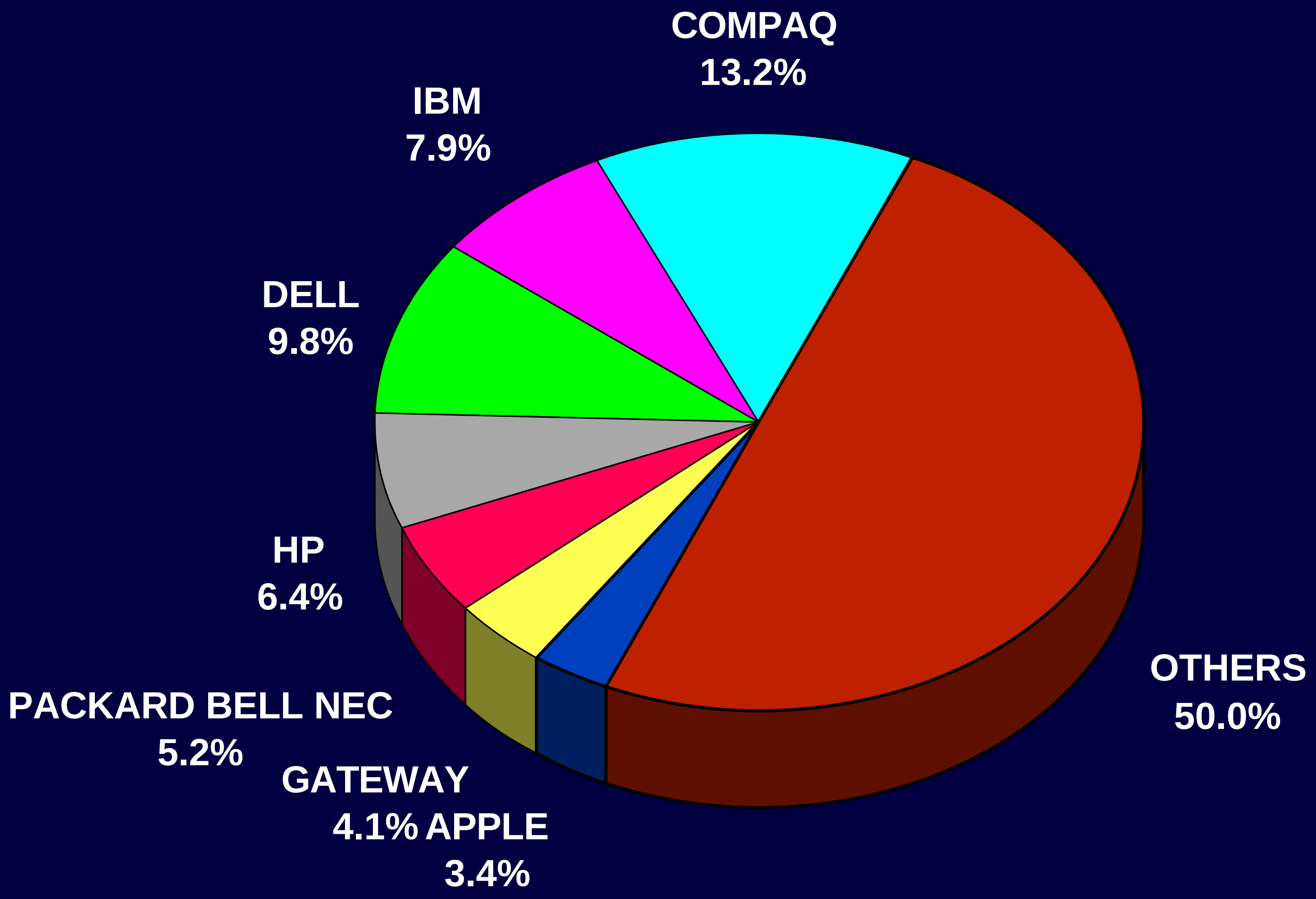
Christmas

Back to School

Electronic Outlook: US Microcomputer Statistics Committee

WORLD PERSONAL COMPUTER MARKET

1999

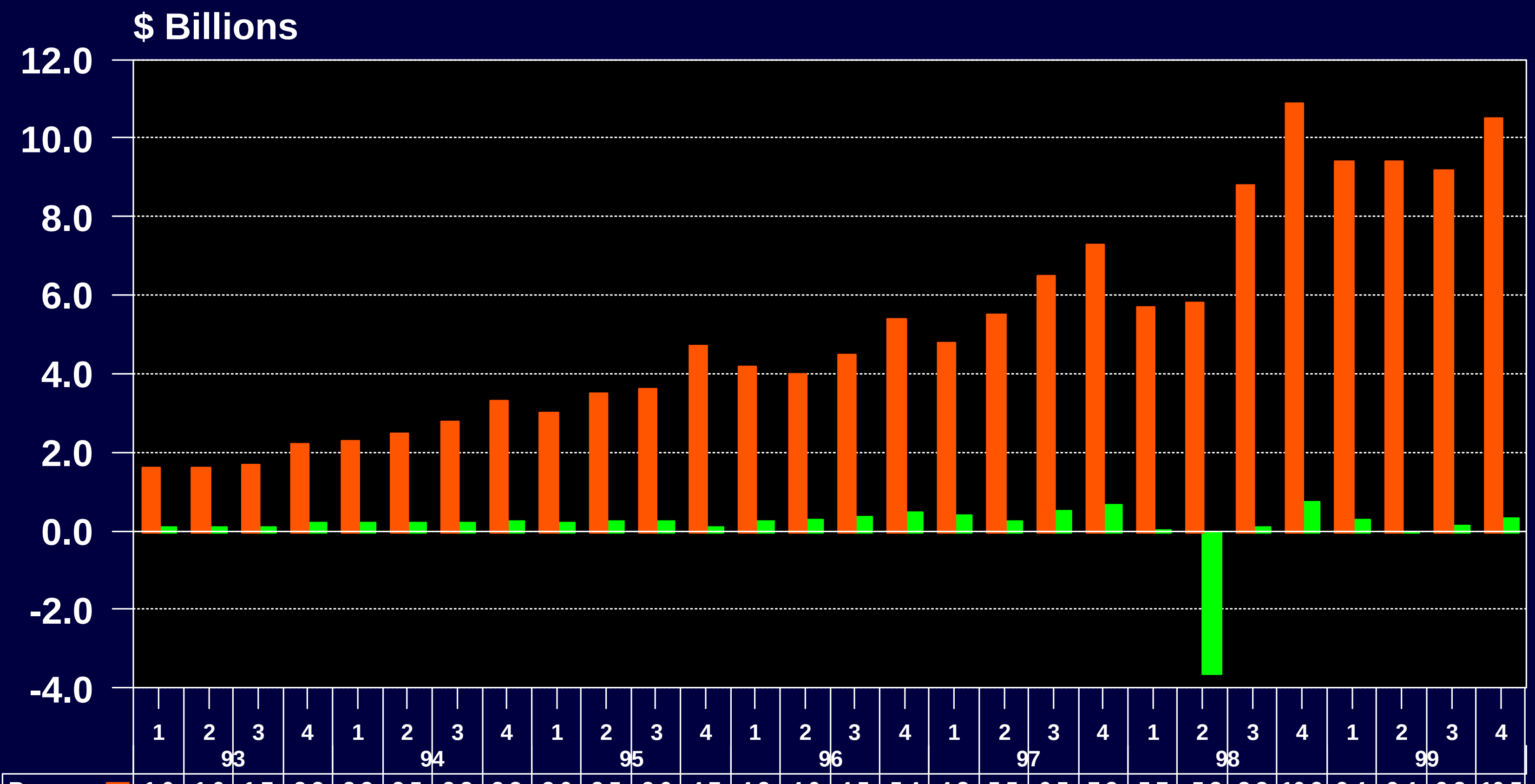


DATAQUEST 1/2000
Preliminary, Servers not included

TOTAL: 113.5 M UNITS

Compaq Computer

Revenue & Net Income



	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	93				94				95				96				97				98				99			
Revenue 🟧	1.6	1.6	1.7	2.2	2.3	2.5	2.8	3.3	3.0	3.5	3.6	4.7	4.2	4.0	4.5	5.4	4.8	5.5	6.5	7.3	5.7	5.8	8.8	10.9	9.4	9.4	9.2	10.5
Income 🟩	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.1	0.2	0.3	0.4	0.5	0.4	0.3	0.5	0.7	0.0	-3.6	0.1	0.8	0.3	0.0	0.1	0.3

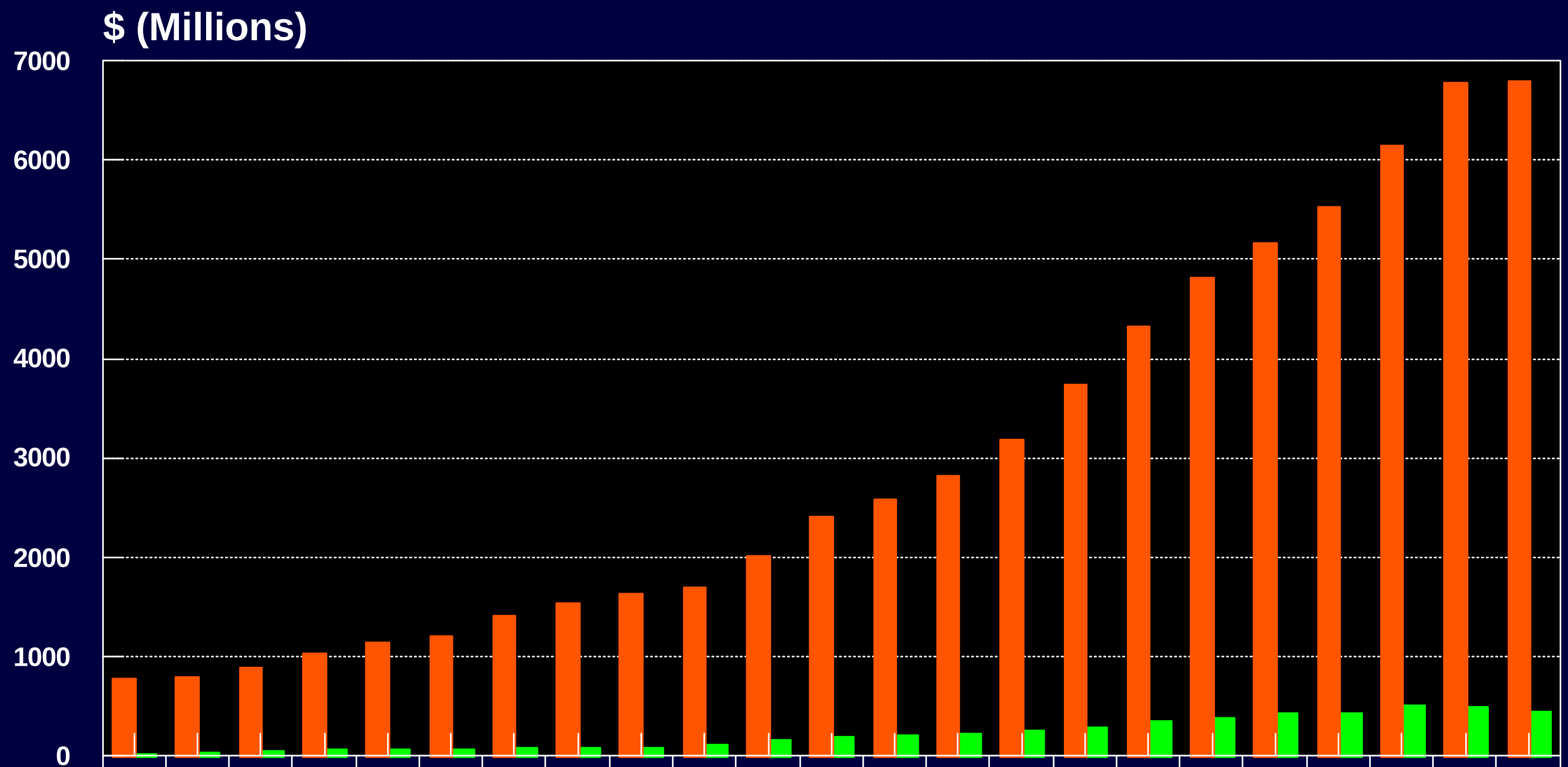
CY

FY=CY

CPQ

DELL COMPUTER

Revenue & Net Income



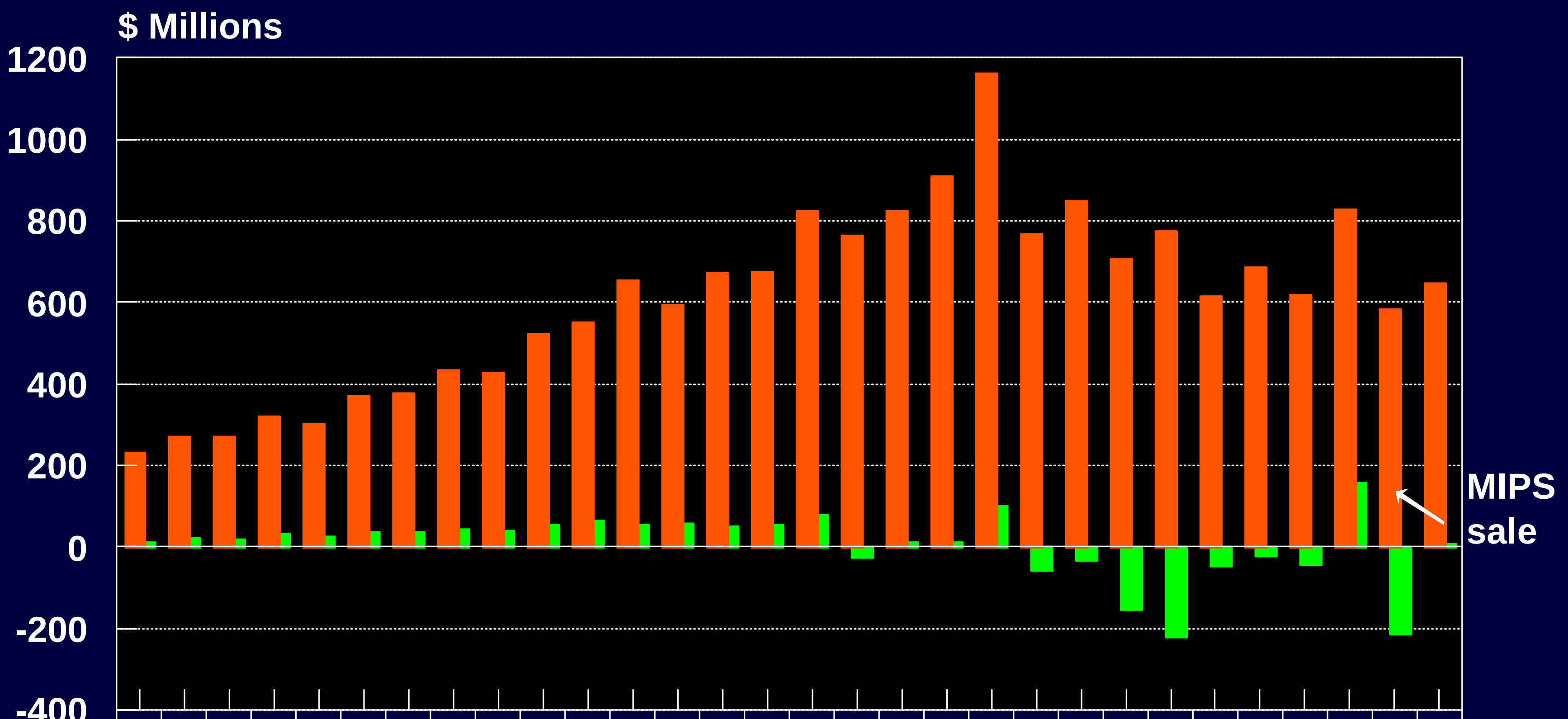
	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	94			95				96				97				98				99			
SALES 🟧	767	792	885	1033	1136	1206	1416	1539	1638	1690	2019	2412	2588	2814	3188	3737	4331	4818	5173	5537	6142	6784	6801
PROFITS 🟩	19	29	41	58	62	65	75	70	82	112	149	188	198	214	248	285	346	384	425	434	507	483	436

CY

FY ends October

Silicon Graphics

Revenue & Net Income



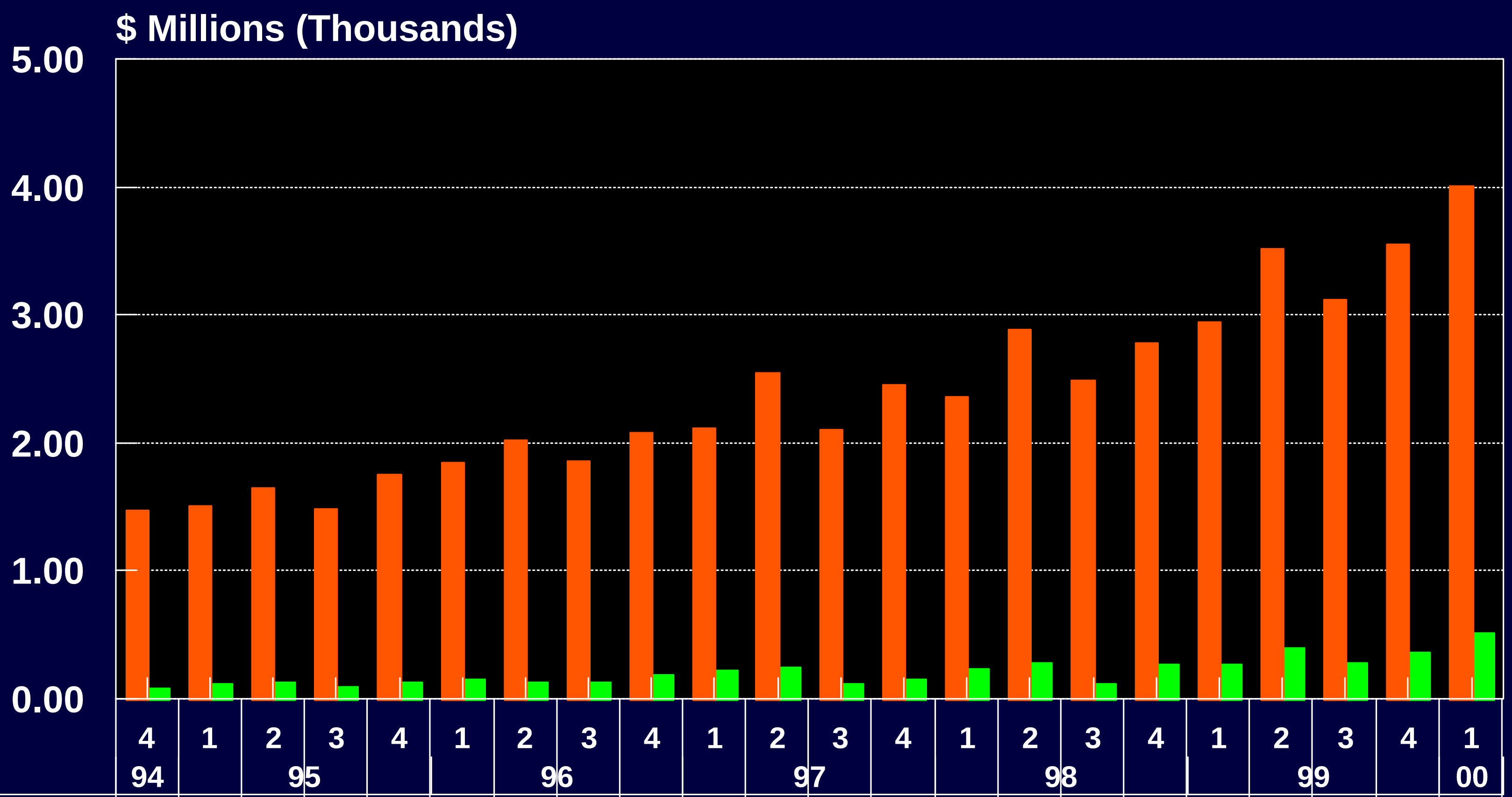
	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	92			93				94				95				96				97				98				99		
Revenue 🟥	231	270	271	319	302	370	376	433	427	524	552	653	595	672	677	826	766	825	909	1162	768	851	708	774	616	685	619	829	585	648
Income 🟩	13	22	20	32	26	36	35	44	42	54	64	53	58	52	53	81	-22	13	11	102	-56	-31	-153	-220	-44	-20	-40	158	-213	9

CY

SGI

Sun Microsystems

Revenue & Net Income



	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1
	94	95				96				97				98				99				00
Revenue 🟧	1.48	1.51	1.65	1.49	1.75	1.84	2.02	1.86	2.08	2.12	2.54	2.10	2.45	2.36	2.88	2.49	2.78	2.94	3.52	3.12	3.55	4.01
Income 🟩	0.08	0.11	0.13	0.09	0.13	0.14	0.12	0.12	0.18	0.22	0.24	0.11	0.15	0.23	0.27	0.11	0.26	0.26	0.40	0.27	0.35	0.51

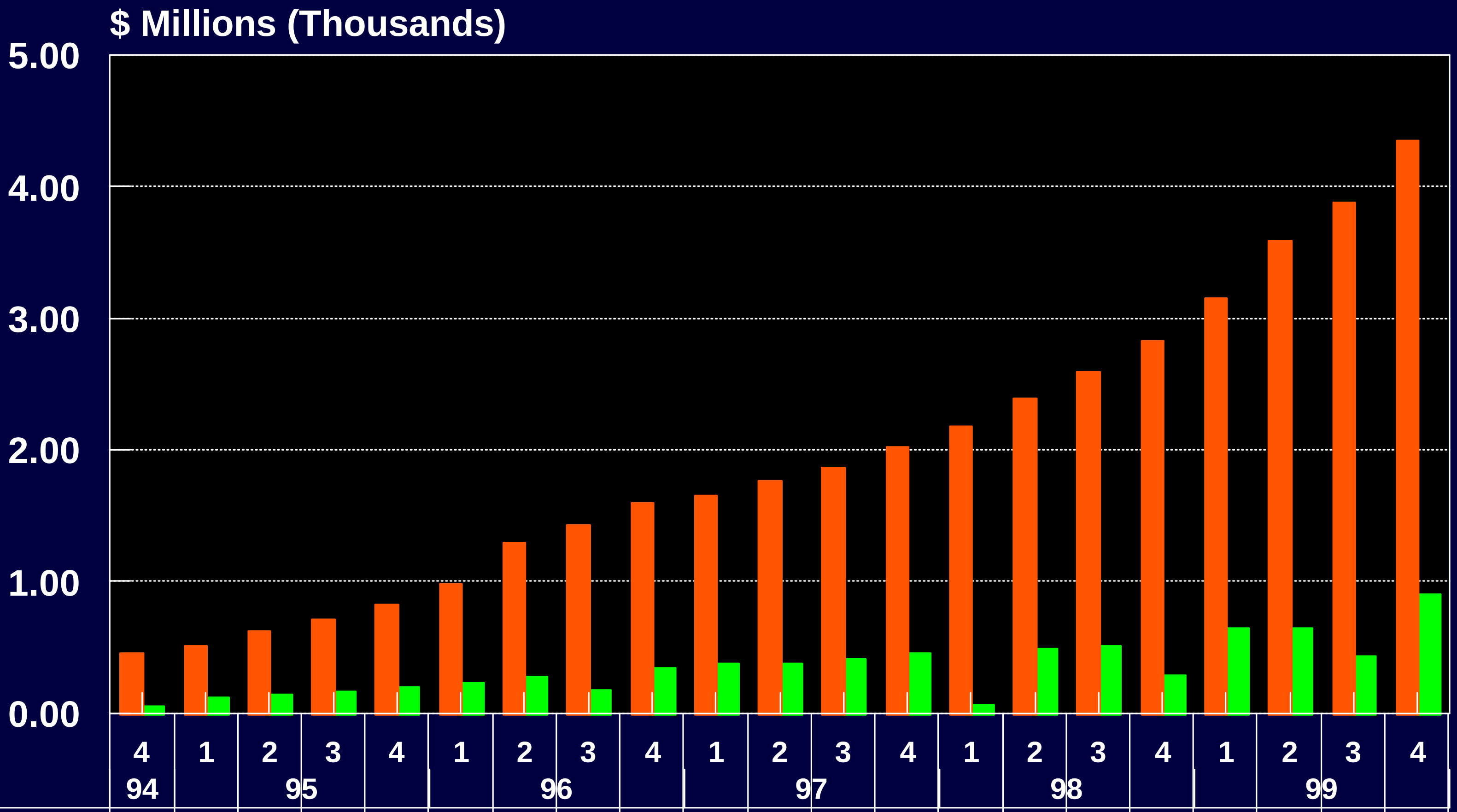
CY

FY ENDS 6/30

SUNW

CISCO SYSTEMS

Revenue & Net Income



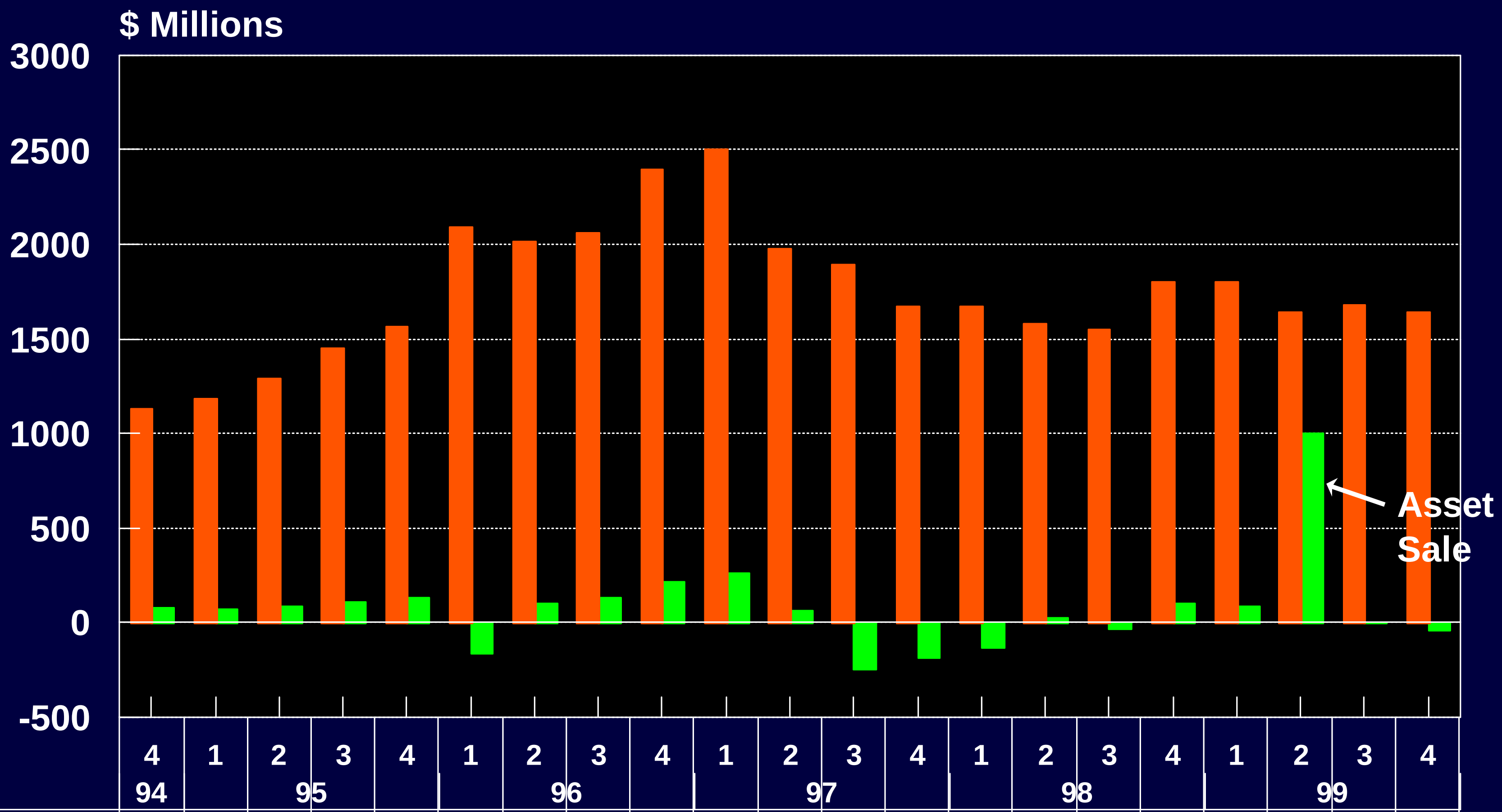
	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	94	95				96				97				98				99			
Revenue 🟥	0.46	0.51	0.62	0.71	0.83	0.99	1.29	1.43	1.59	1.65	1.77	1.87	2.02	2.18	2.39	2.60	2.83	3.15	3.58	3.88	4.35
Income 🟩	0.05	0.13	0.14	0.17	0.20	0.23	0.28	0.18	0.34	0.38	0.38	0.42	0.46	0.07	0.49	0.51	0.29	0.65	0.65	0.44	0.91

CY

CSCO

Seagate

Revenue & Net Income

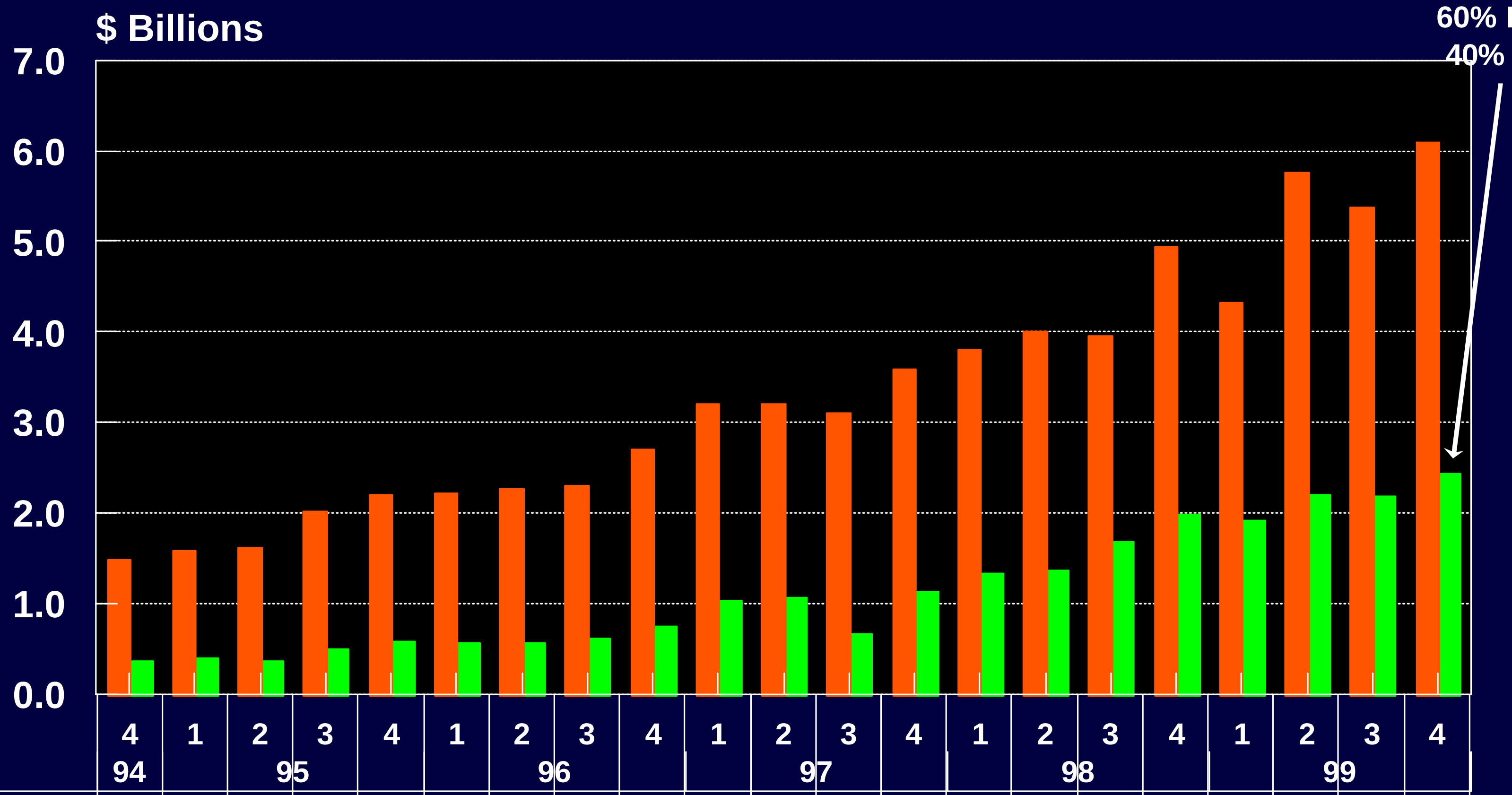


	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	94	95				96				97				98				99			
Revenue 🟥	1130	1185	1292	1454	1563	2093	2015	2061	2400	2502	1977	1896	1673	1675	1580	1553	1801	1805	1640	1682	1645
Income 🟩	79	70	88	108	128	-158	101	129	213	257	59	-240	-183	-129	22	-30	104	82	1002	2	-35

CY

Microsoft

Revenue & Net Income



60% PTI
40% NI

	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	94	95				96				97				98				99			
Revenue 🟧	1.5	1.6	1.6	2.0	2.2	2.2	2.3	2.3	2.7	3.2	3.2	3.1	3.6	3.8	4.0	4.0	4.9	4.3	5.8	5.4	6.1
Income 🟩	0.4	0.4	0.4	0.5	0.6	0.6	0.6	0.6	0.7	1.0	1.1	0.7	1.1	1.3	1.4	1.7	2.0	1.9	2.2	2.2	2.4

CY

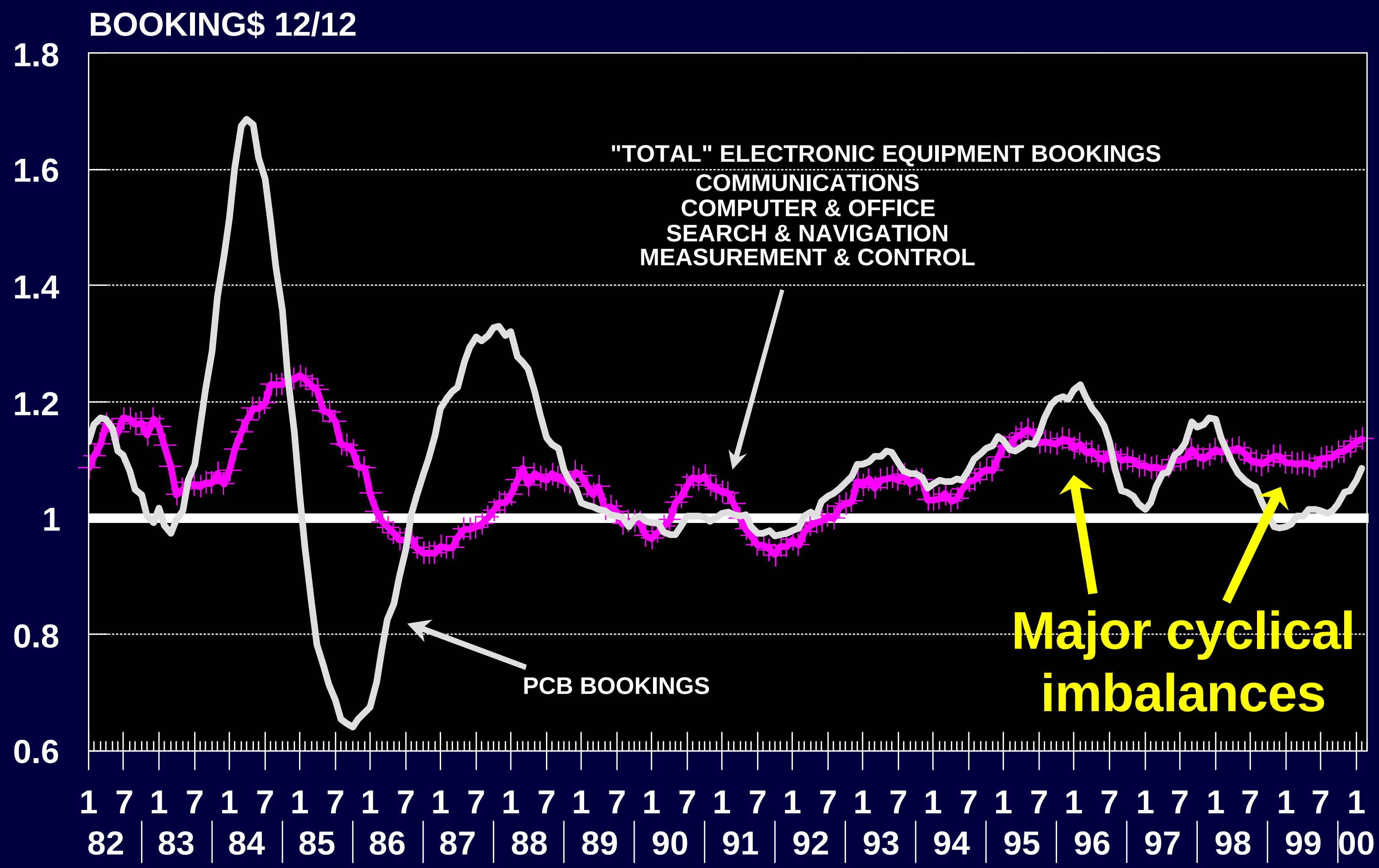
FY ends June

PC PRODUCT SPENDING BY LARGE US FIRMS

1999 to 2000 - ACTUAL & PROJECTIONS

CRN 1/24/2000

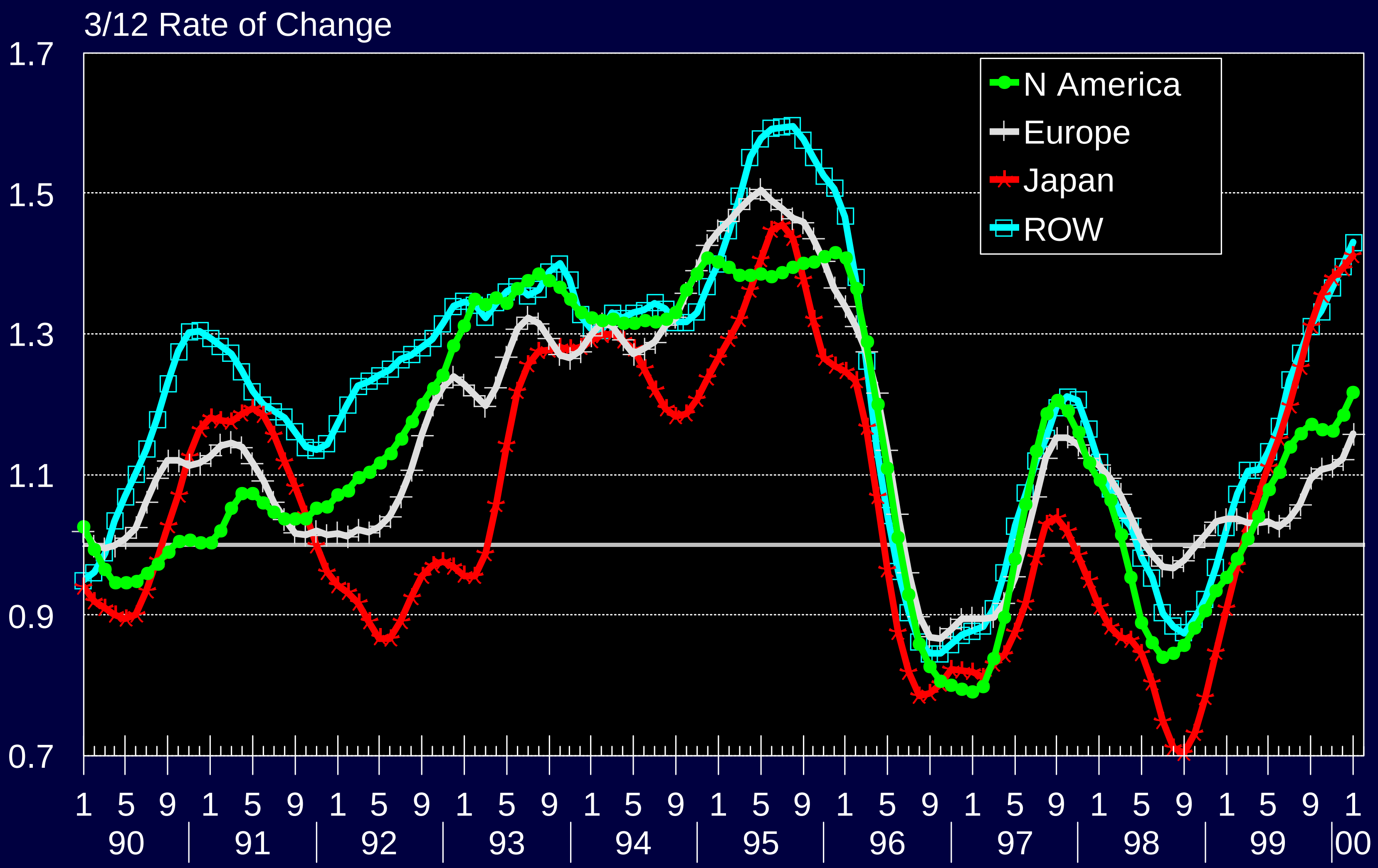
U.S. PCBs vs Total Electronic Equipment



4/2000

SEMICONDUCTOR GROWTH RATES

TOTAL $ SHIPMENTS TO AN AREA



Total $ Shipments From All Countries To An Area
SIA website: www.semichips.org/

MONTHLY SEMICONDUCTOR SHIPMENTS
$ Billions

	2/99	2/00	% CH
Americas	3.56	4.44	24.7%
Europe	2.50	3.12	25.1%
Japan	2.30	3.28	42.5%
Asia Pacific	2.55	3.71	45.4%
Total	10.92	14.56	33.4%

SIA 4/2000 - Monthly data

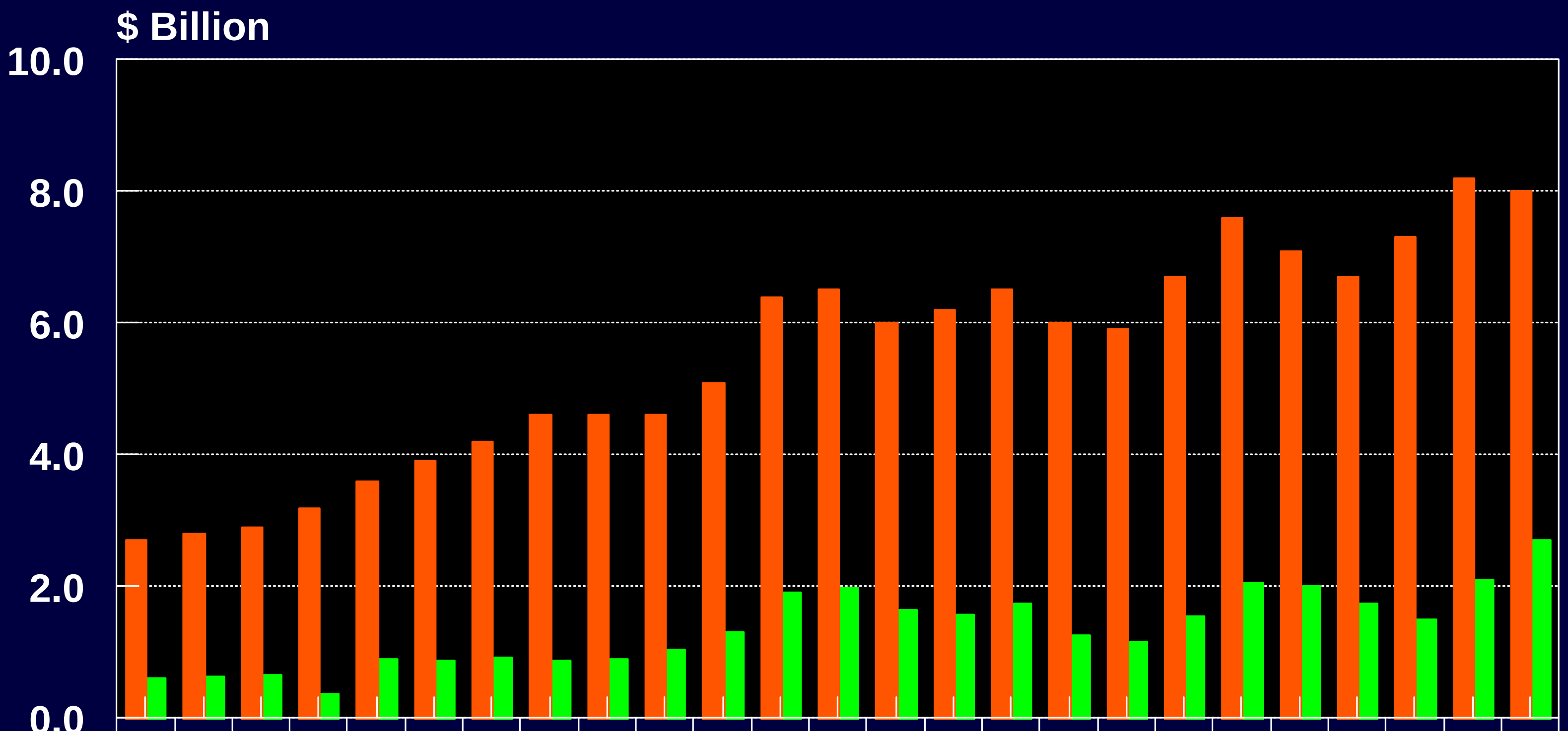
Top 10 Worldwide Semiconductor Vendors ($M)

	1998	1999	99/98 %
Intel	22,784	26,806	17.7
NEC	7,947	9,210	15.9
Toshiba	5,913	7,618	28.8
Samsung	4,743	7,125	50.2
Texas Instruments	5,820	7,120	22.3
Motorola	7,088	6,394	-9.8
Hitachi	4,668	5,554	19.0
Infineon	3,909	5,223	33.6
STMicroelectronicsN.V.	4,199	5,077	20.9
Philips4,448	5,074	14.1	
Others	67,167	83,378	24.1
Total Market	138,686	168,579	21.6

Source: Dataquest 1/2000

Intel

Revenue & Net Income



	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1
	94				95				96				97				98				99				00
Revenue 🟧	2.7	2.8	2.9	3.2	3.6	3.9	4.2	4.6	4.6	4.6	5.1	6.4	6.5	6.0	6.2	6.5	6.0	5.9	6.7	7.6	7.1	6.7	7.3	8.2	8.0
Income 🟩	0.6	0.6	0.7	0.4	0.9	0.9	0.9	0.9	0.9	1.0	1.3	1.9	2.0	1.7	1.6	1.7	1.3	1.2	1.6	2.1	2.0	1.8	1.5	2.1	2.7

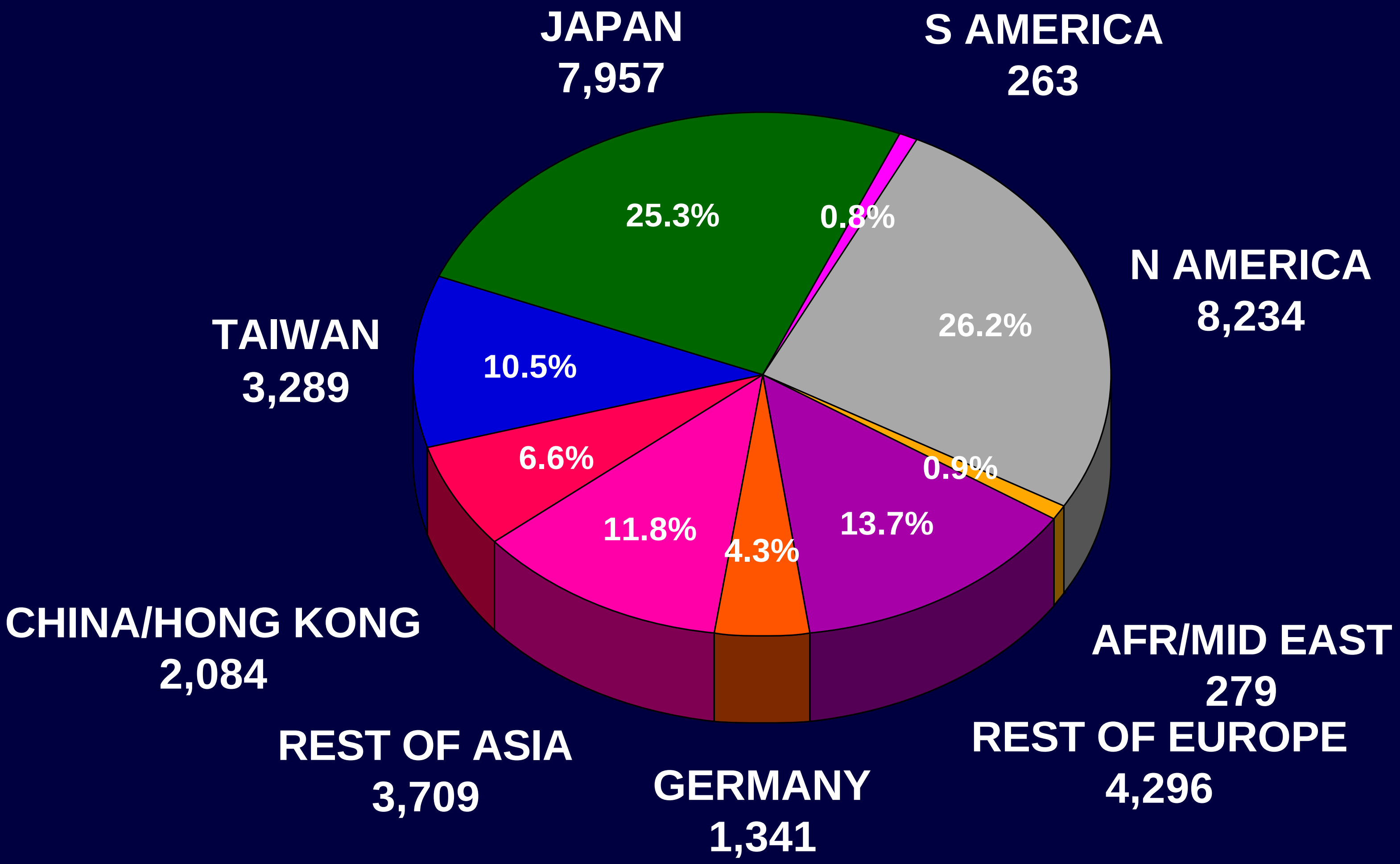
CY

INTC

FY=CY

1998 WORLD RIGID PCB PRODUCTION

BY GEOGRAPHICAL AREA ($M)

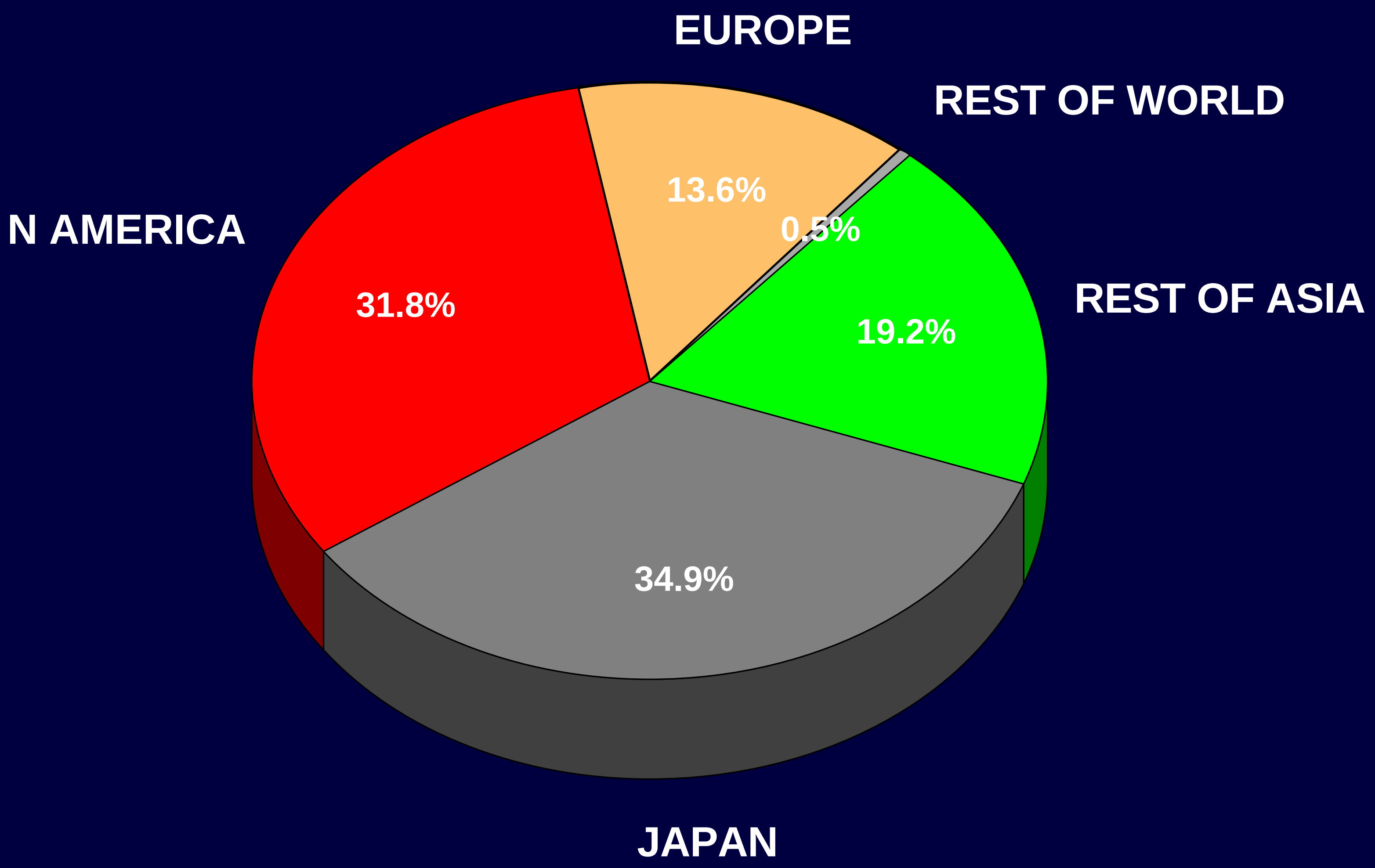


Total: $31.5 Billion

IPC T/MRC 6/99 (includes Buildup PCBs)

1998 WORLD FLEXIBLE CIRCUIT PRODUCTION

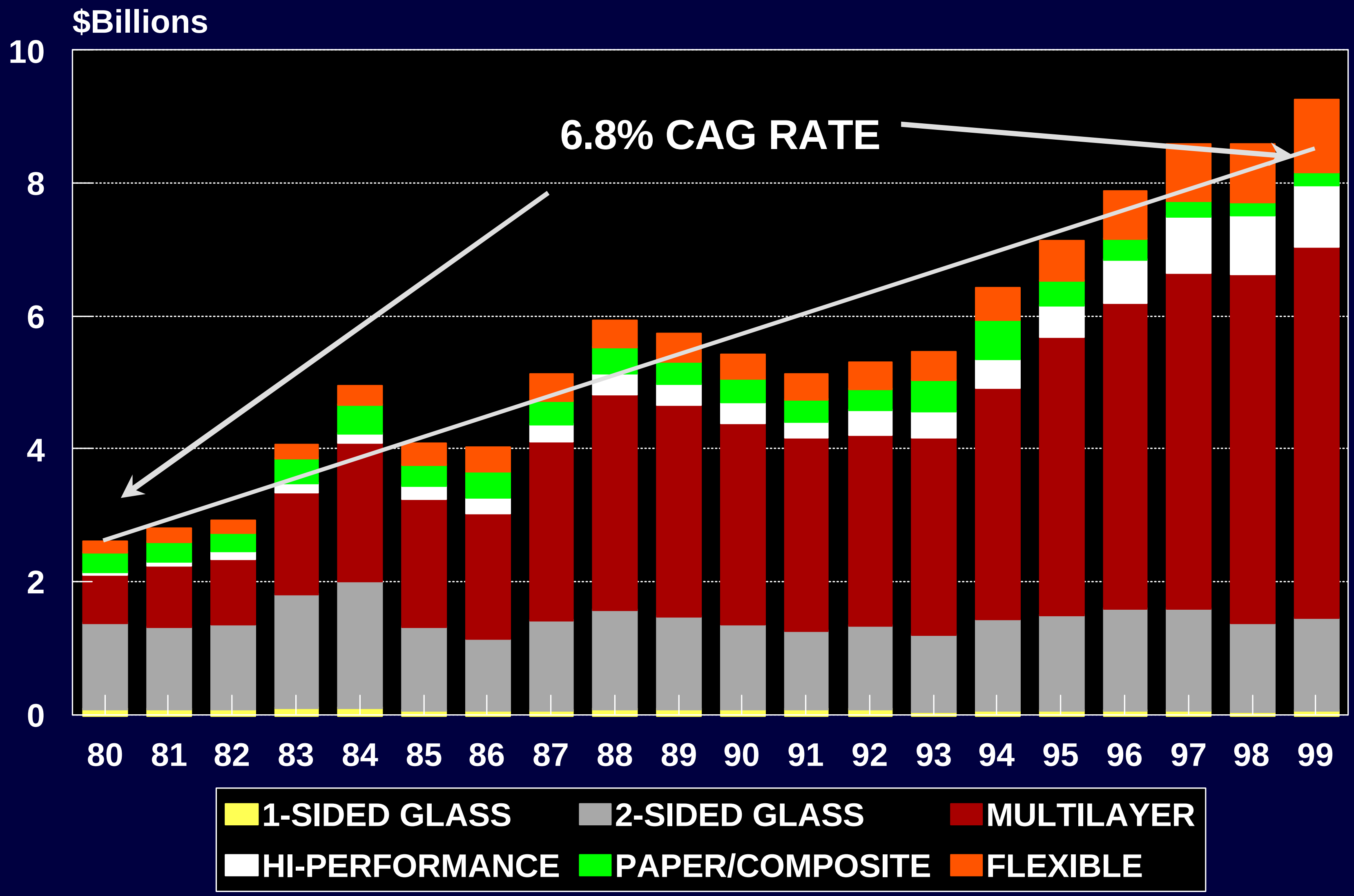
BY GEOGRAPHICAL AREA ($ BASIS)



TOTAL: $2.8 Billion

IPC 6/99

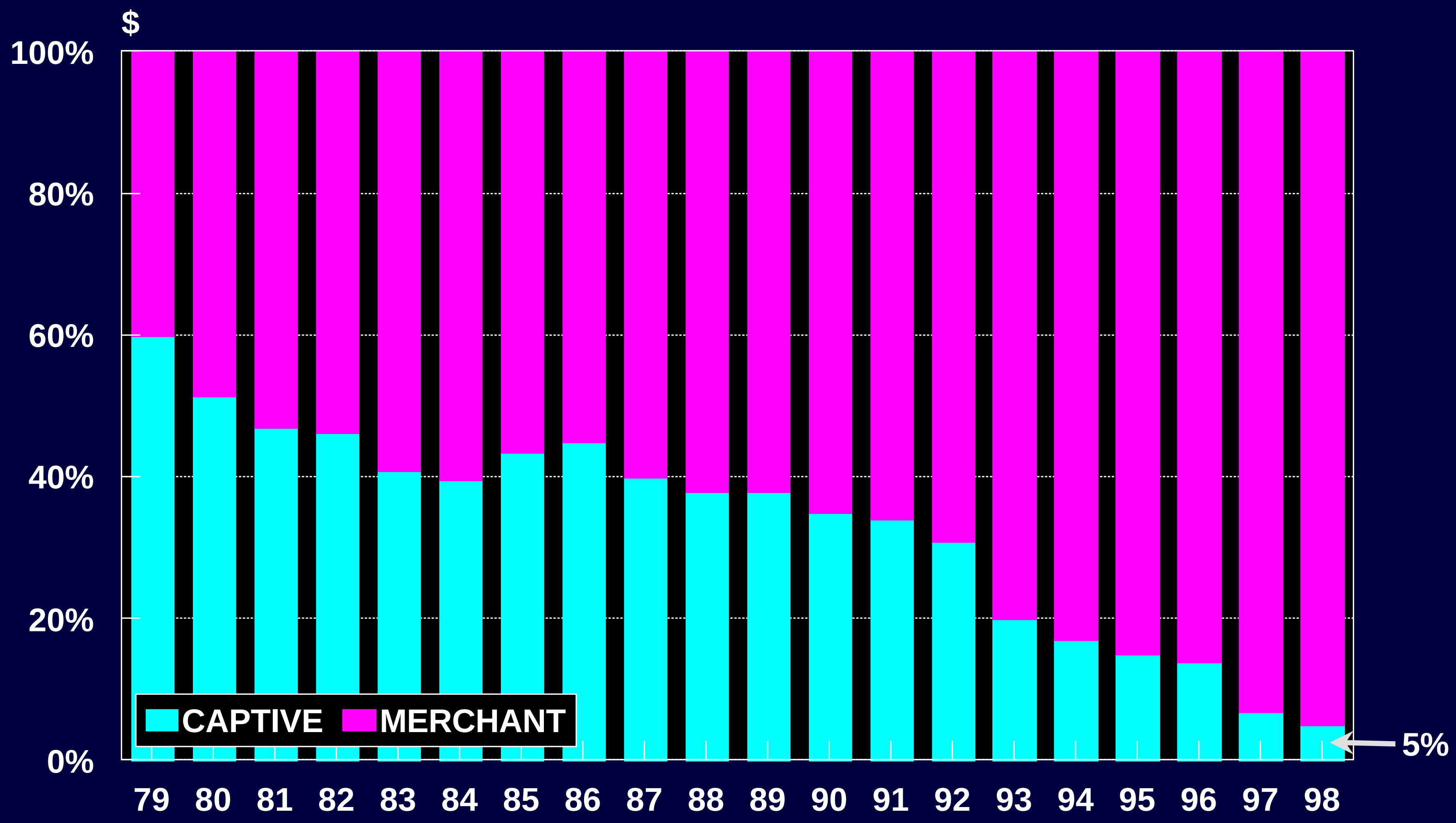
N. AMERICAN PCB SHIPMENTS



IPC T/MRC 6/99 + Custer 1999 estimates 2/2000

RIGID PCBs - MAKE OR BUY

U.S. CAPTIVE vs MERCHANT PRODUCTION

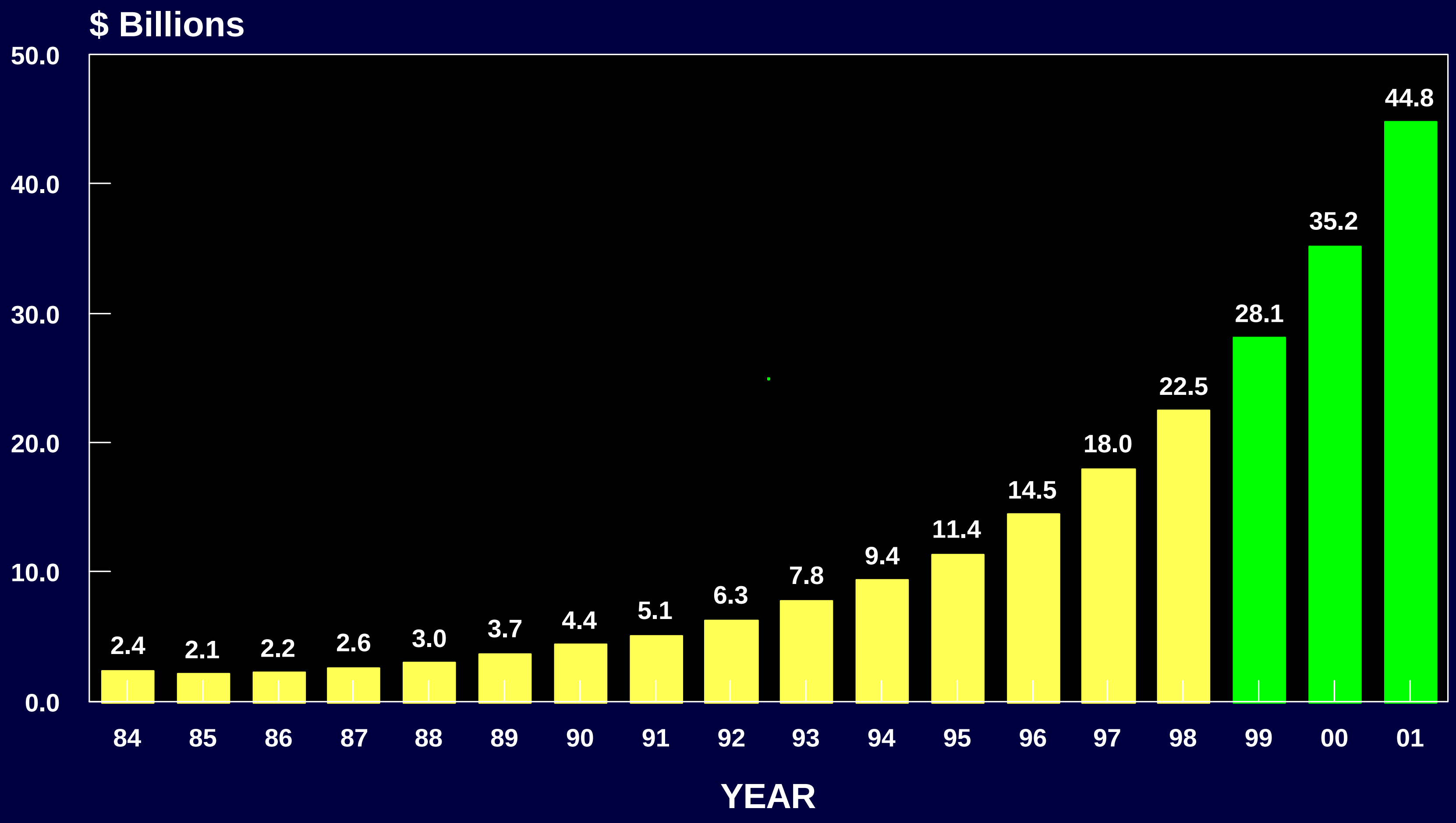


IPC TMRC 6/99

MARKET FOR

ELECTRONIC MANUFACTURING SERVICES

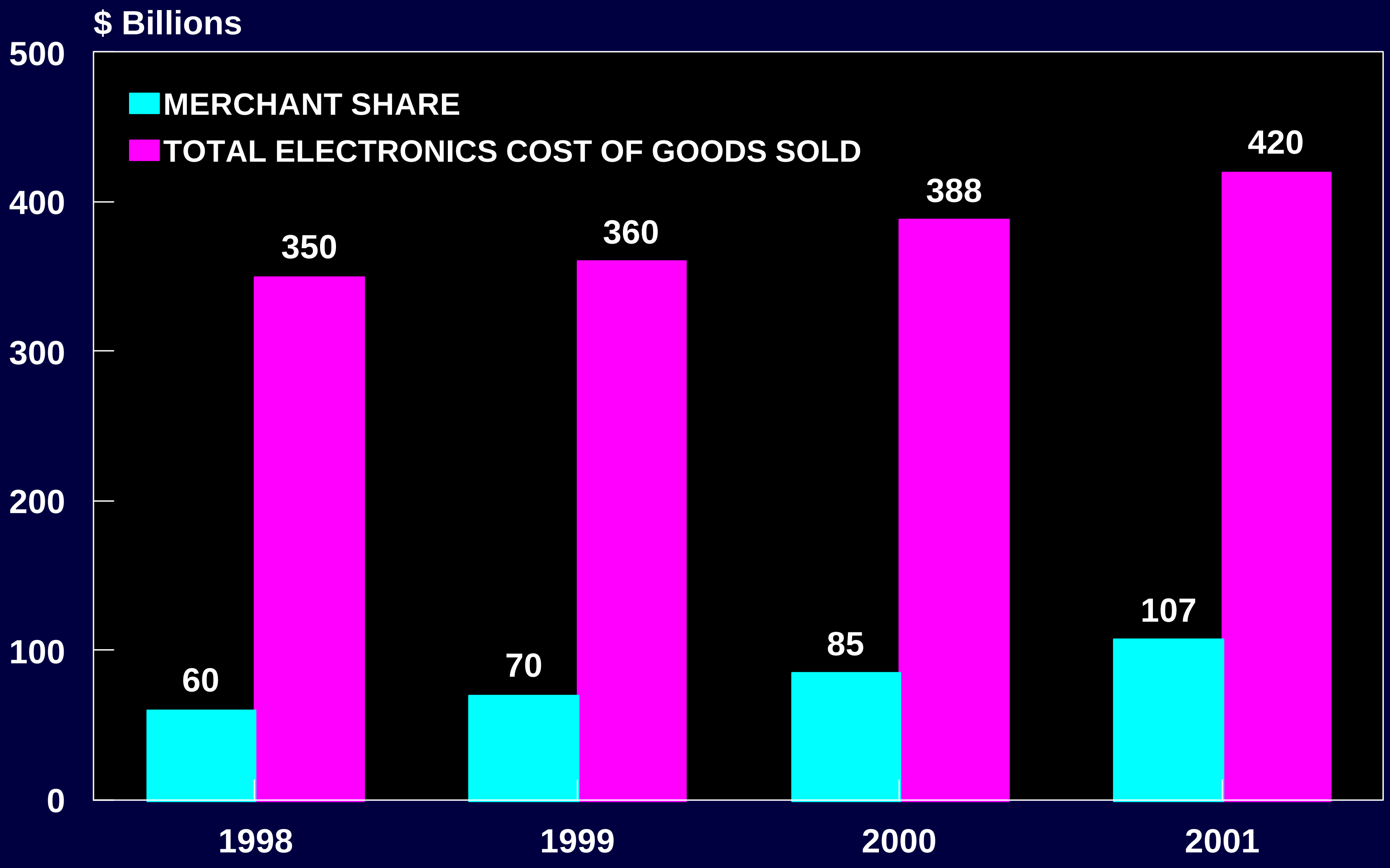
(U.S. CONTRACT ASSEMBLY)



IPC 6/99

CONTRACT ELECTRONIC MANUFACTURERS PICKING UP A LARGER SHARE

MERCHANT MARKET SHARE OF WORLD ELECTRONICS MARKET



EBN: Technology Forecasters 10/99, Custer estimates

TOP CONTRACT MANUFACTURERS

1998

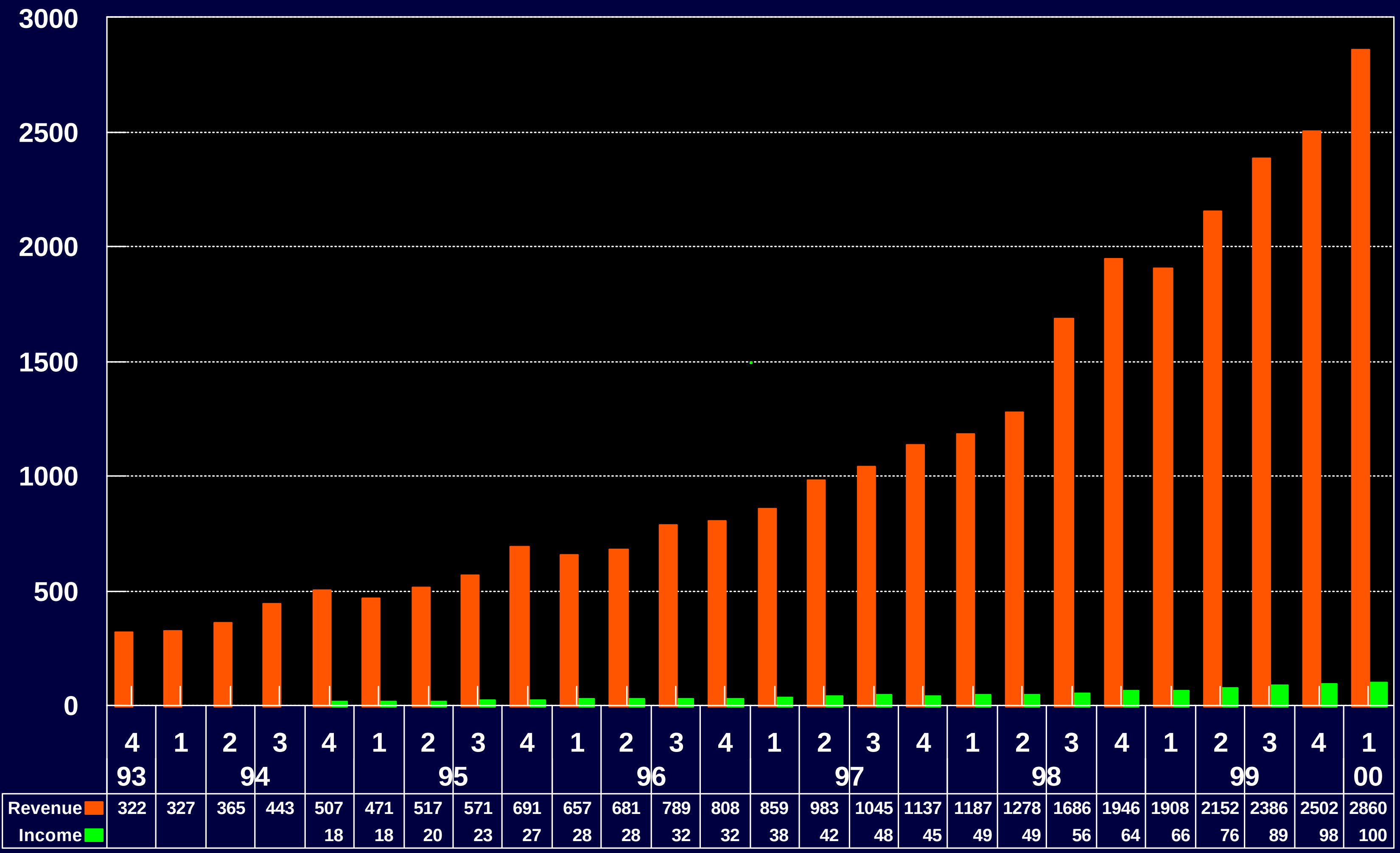
	$ Sales	98/97 Growth %
SCI Systems	6,583	3
Solectron	6,097	52
Celestica	3,249	62
Flextronics Intl	1,630	71
NatSteel Electronics	1,472	76
Jabil Circuit	1,449	27
AVEX Electronics	850	23
Manufacturers' Services	838	49
Sanmina	691	44
Universal Scientific	600	62
Dovatron Intl	589	15
Benchmark Electronics	524	61
Bull Electronics	466	1
Venture Manufacturing	437	-7

Manufacturing Market Insider 3/99

www.mfgmkt.com

SOLECTRON

Revenue & Net Income



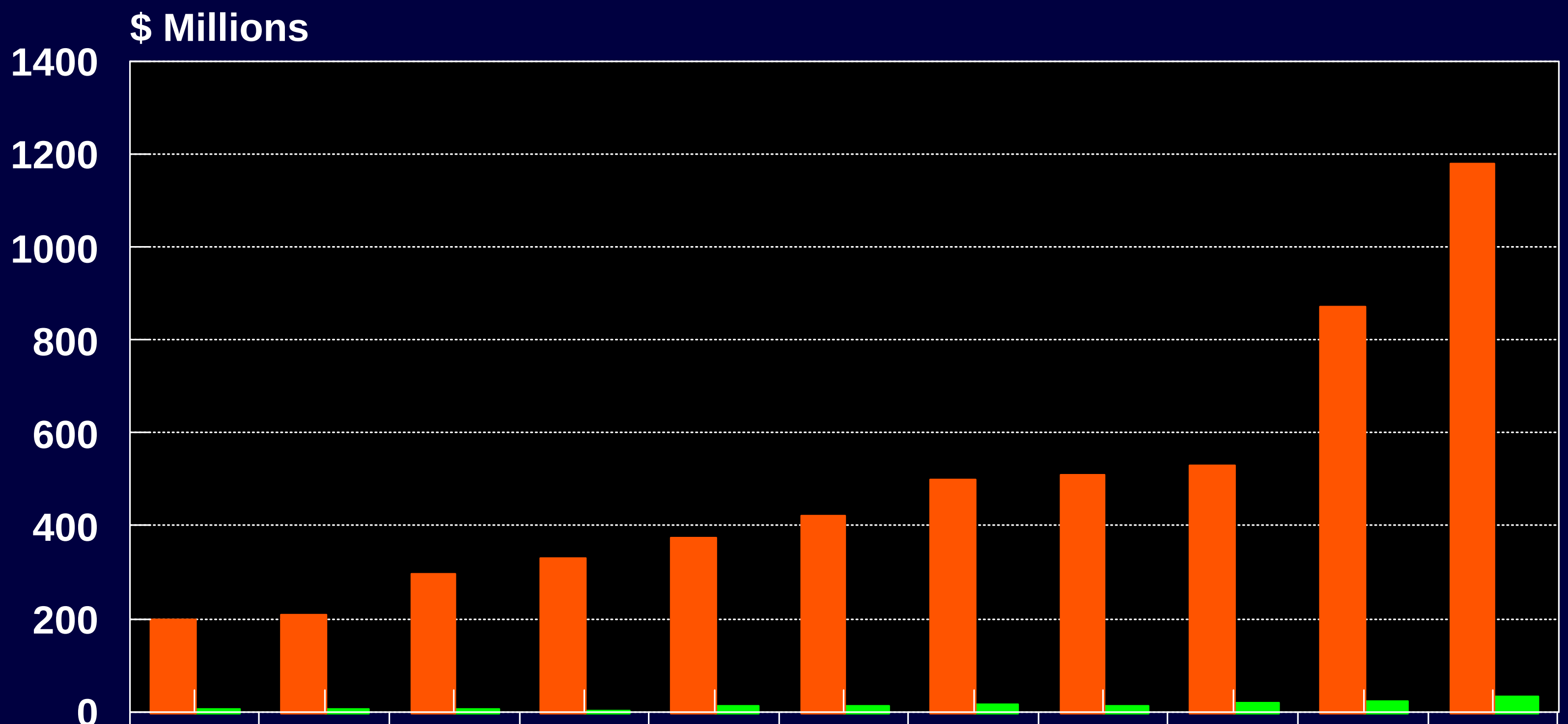
	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1
	93	94				95				96				97				98				99				00
Revenue 🟧	322	327	365	443	507	471	517	571	691	657	681	789	808	859	983	1045	1137	1187	1278	1686	1946	1908	2152	2386	2502	2860
Income 🟩					18	18	20	23	27	28	28	32	32	38	42	48	45	49	49	56	64	66	76	89	98	100

FY ends in August

SLR

Flextronics

Revenue & Net Income



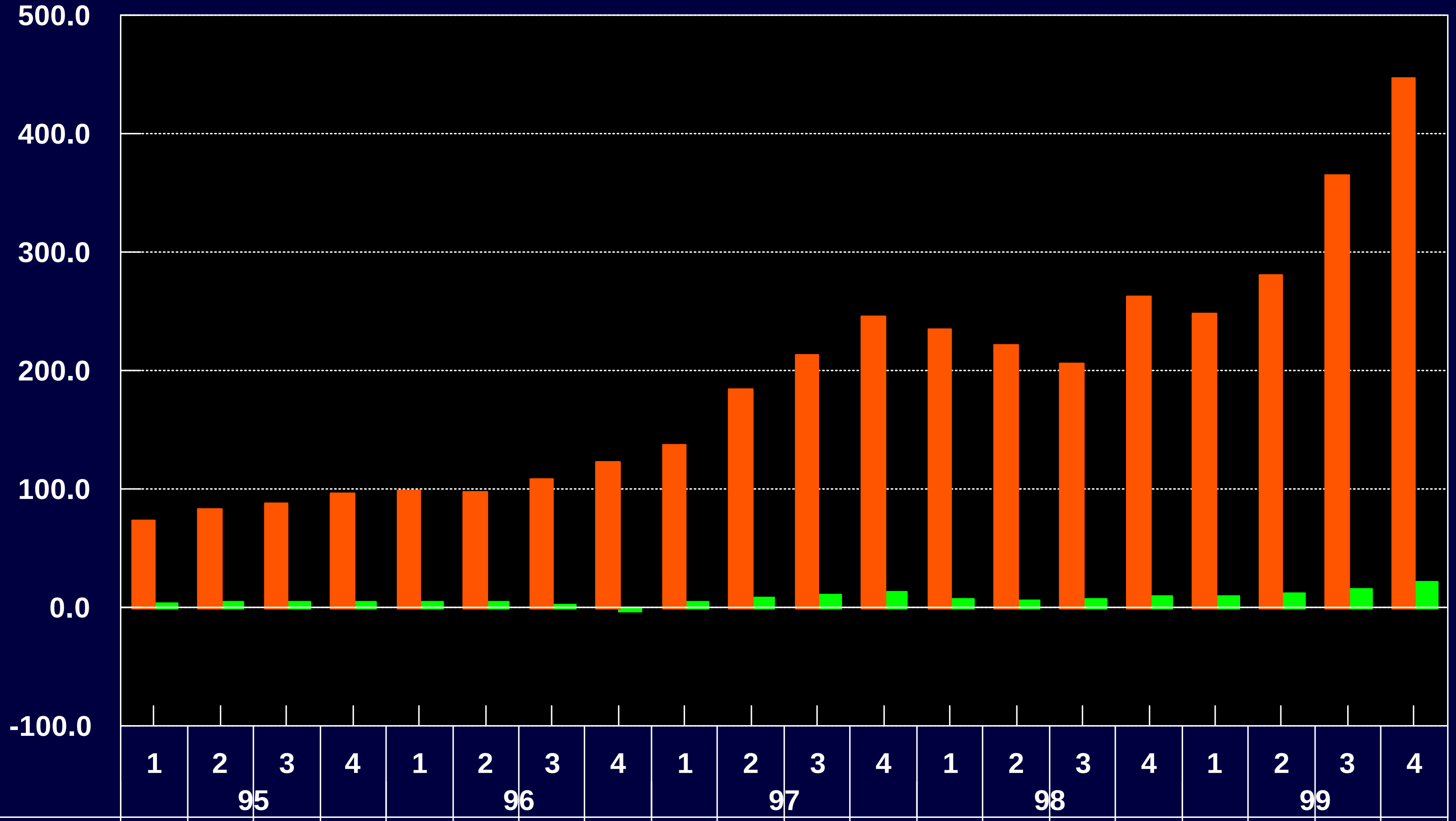
	2	3	4	1	2	3	4	1	2	3	4
	97			98				99			
Revenue 🟧	197	210	295	331	376	423	500	509	530	871	1179
Income 🟩	5.3	6.5	5.9	0.8	11.7	12.9	15.5	11.5	17.6	23	34.3

FY ends 3/31

CY

DII Group (DOVatron)

Revenue & Net Income

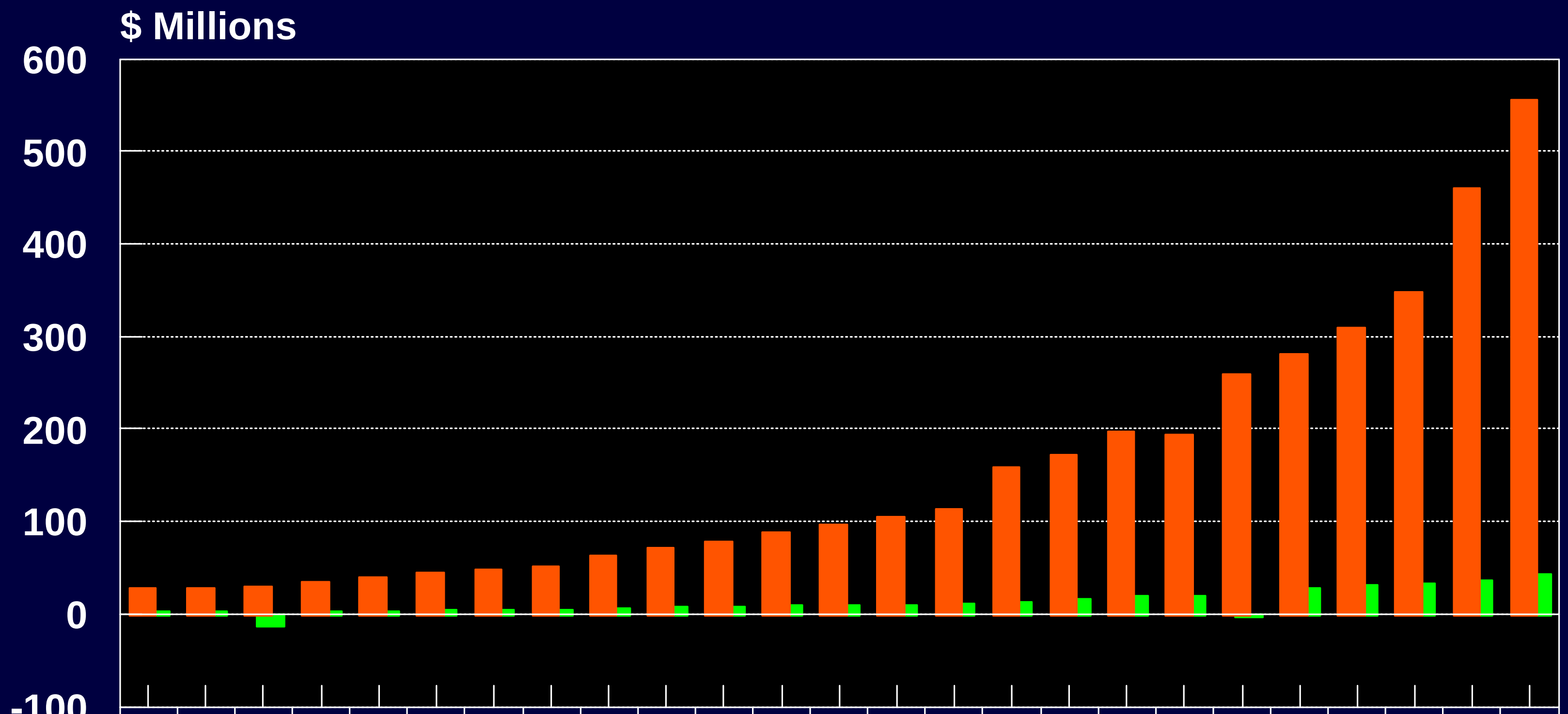


	95				96				97				98				99			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Revenue 🟥	73.7	83.4	87.3	96.0	98.5	97.8	108.2	122.7	137.1	184.1	213.0	245.6	235.0	222.0	206.0	262.0	248.0	280.0	365.0	447.0
Income 🟩	3.4	3.9	4.5	4.6	4.5	5.0	1.5	-3.1	5.1	7.5	10.0	12.7	6.8	6.1	6.5	8.8	8.9	12.3	15.0	20.9

DIIG: FY=CY

SANMINA

Revenue & Net Income



	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1
	94				95				96				97				98				99				00
Revenue 🟧	28	29	30	35	39	45	49	52	63	71	79	89	97	105	114	159	172	197	194	260	281	310	349	460	555
Income 🟩	3	3	-11	3	4	5	5	6	7	8	8	9	10	11	11	13	17	19	19	-1	29	31	34	36	44

CY

FY ends September 30

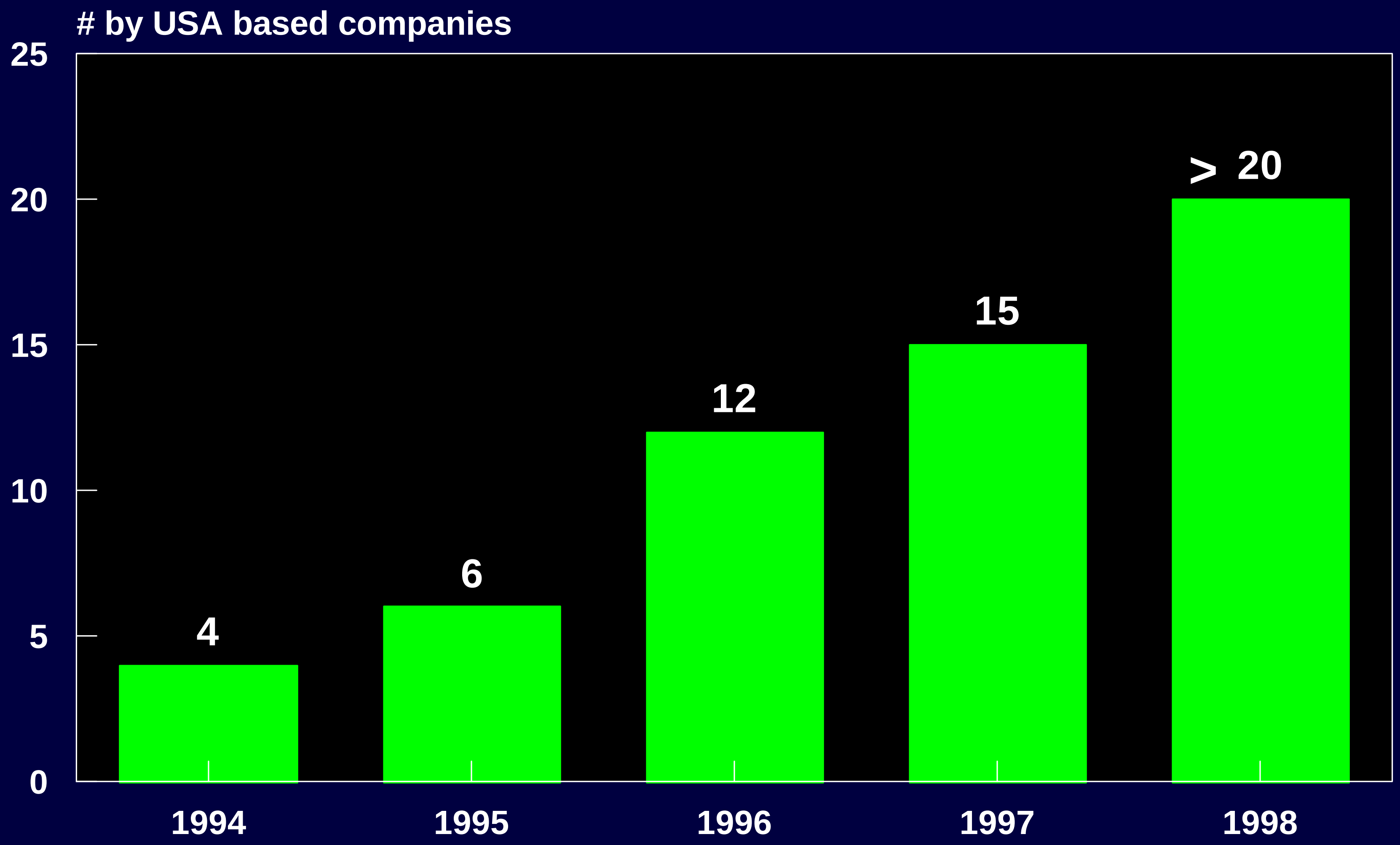
TOP N AMERICAN PCB MANUFACTURERS

PCB FAB & TOTAL - 1999 ESTIMATE ($M)

	PCB	TOTAL
VIASYSTEMS	1,130	1,230
HADCO	885	1,015
TYCO	515	590
HONEYWELL	405	Large
PHOTOCIRCUITS	385	385
SANMINA	330	1,375
DII GROUP (Flextronics)	315	1,100
DYNAMIC/DETAILS	280	280
IBM	220	430
3M	150	Large
MERIX	138	138
TTM TECHNOLOGIES	125	125
AUTOMATA INTERNATIONAL	110	110
SHELDAHL	105	127
VIKTRON	93	133
CIRCUIT SYSTEMS	89	89
TOPPAN WEST	80	80
CIRCUIT-WISE	75	75
BUREAU ELECTRONICS	74	74

ACCELERATING PACE OF ACQUISITIONS

NUMBER OF ACQUISITIONS IN PCB INDUSTRY



EBN:ROBERTSON STEPHENS 12/98

INDUSTRY CONSOLIDATIONS

<u>VIASYSTEMS GROUP (HICKS, MUSE, TATE & FURST)</u>

LUCENT TECHNOLOGIES (ex AT&T, RICHMOND)
CIRCO CRAFT
FORWARD GROUP
ISL
ERICCSON
MOMMERS PRINT SERVICE
ZINCOCELERE
PAGG CORP
TERMBRAY
MARCONI COMMUNICATIONS' NETWORK COMPONENTS & SERVICES
INTERNATIONAL WIRE's WIRE HARNESS UNIT

<u>HADCO (bought by Sanmina 4/2000)</u>

- ZYCON
  - ACT
- CONTINENTAL
  - DYNAFLEX
  - RADIAN
  - PCA DESIGN

INDUSTRY CONSOLIDATIONS

SANMINA
COMPTRONIX
ASSEMBLY SOLUTIONS
GOLDEN EAGLE SYSTEMS
LUCENT CUSTOM MANUFACTURING
ELEXSYS
PRAGMATEC
ALTRON
HADCO

PRAEGITZER - sold to TYCO 10/99
TREND CIRCUITS
3 DESIGN FACILITIES - sold 1/2000
INTERGRAPH PCB FACILITY - closed 7/99
LIKOM PCB, MALAYSIA (51%) - for sale
INTRACOM DESIGN, EDINBURGH, SCOTLAND

JOHNSON MATTHEY - sold to AlliedSignal 7/99 (now Honeywell)
ACI
CRAY
UNIVERSAL CIRCUITS, BUFFALO, MN

INDUSTRY CONSOLIDATIONS

DII GROUP (sold to Flextronics 11/99)

MULTEK
UNISYS, ROSEVILLE
IBM, AUSTIN
HP, BOEBLINGEN
GREATSINO ELECTRONIC TECHNOLOGY, CHINA
ERICCSON ASSEMBLY, KINDBERG, AUSTRIA
MICRO ELECTRONICA, BRAZIL

CORNERSTONE CAPITAL

AUTOMATA
KODE (KAM CIRCUITS) - receivership 2/99
PAM CIRCUITS
MICRON TECHNOLOGY ASSEMBLY FACILITIES

TYCO

ELECTROSTAR
SIGMA CIRCUITS
AMP (QLP) - SOLD TO NELCO
SOLADYNE (from MERIX)
ADVANCED QUICK CIRCUITS
PRAEGITZER

INDUSTRY CONSOLIDATIONS

MERIX
HEWLETT-PACKARD, LOVELAND - closed
SOLADYNE/ROGERS - sold to TYCO 2/99
AMKOR CHIP CARRIER FACILITY

PENTEX-SCHWEITZER
DEGUSSA ELECTRONICS

BAIN CAPITAL
DYNAMIC CIRCUITS
DETAILS INC
CUPLEX
NTI - shut down 1Q'2000

C-MAC INDUSTRIES
CAROLINA CIRCUITS (former DEC)

ADFLEX - sold to INNOVEX 8/99
XYRATEX FLEX OPERATIONS
THAILAND JV

INDUSTRY CONSOLIDATIONS

CIRCUIT SYSTEMS
PHILIPS (ex MAGNAVOX)
SILICON VALLEY PRINTED CIRCUITS

WU's
MOTOROLA, SINGAPORE (2)

THAYER
COSMOTRONICS
PACIFIC CIRCUITS
POWER CIRCUITS

TTM Technologies

M&I CAPITAL
ELECTROTEQ

EL MAN
ERICSSON, ITALY PCB FACILITY

INDUSTRY CONSOLIDATIONS

PARLEX
DYNAFLEX (from HADCO)
POLY-FLEX (from COOKSON)

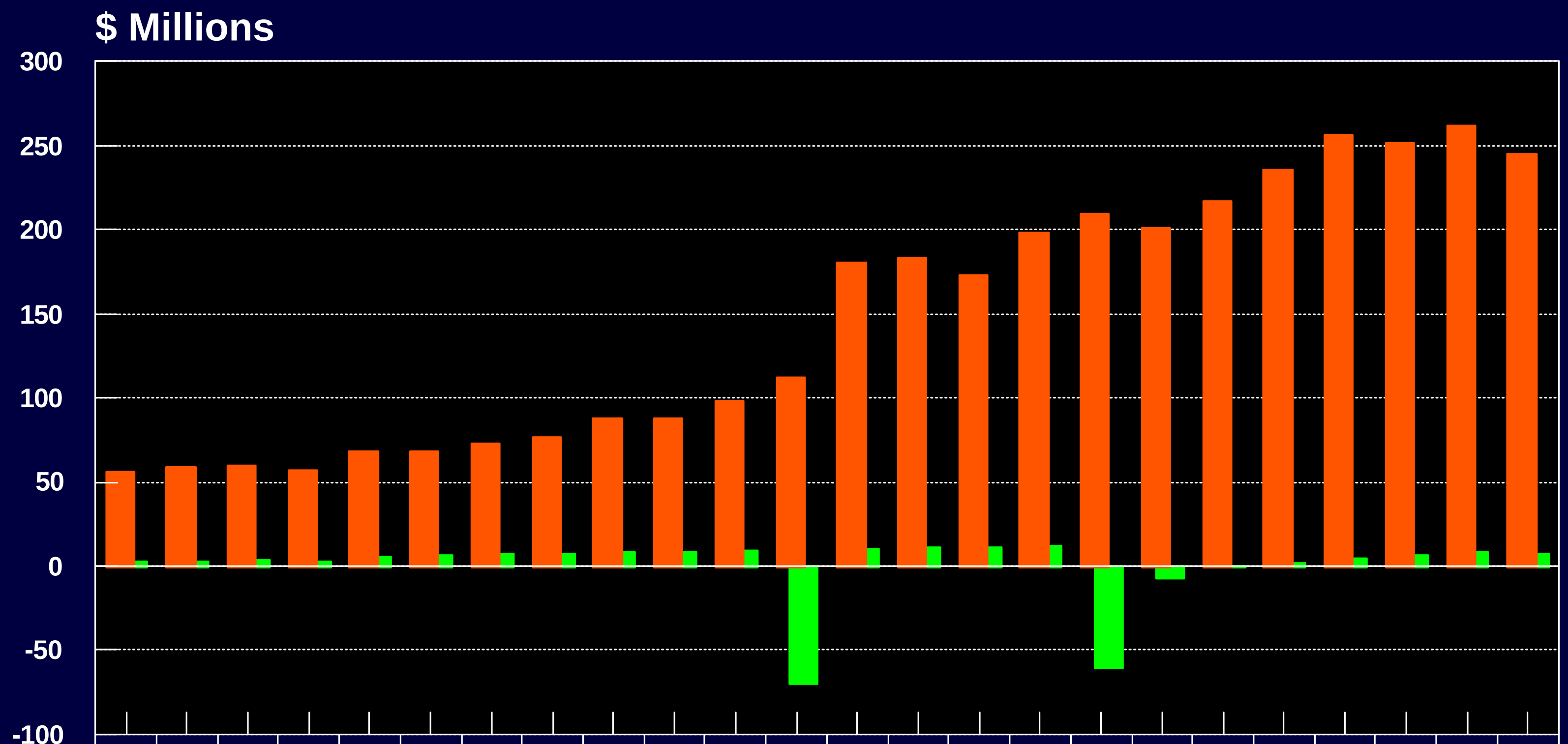
PROTOTRON CIRCUITS
SOUTHWEST CIRCUITS

ALLIEDSIGNAL (now HONEYWELL)
LITRONICS CHIP CARRIER FACILITY
JOHNSON MATTHEY ELECTRONICS

GUL TECHNOLOGIES, SINGAPORE
ACCUDYNE
ELLIOT TECHNOLOGIES

HADCO

Revenue & Net Income



	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
		94				95				96				97				98				99		
Revenue 🟧	56	59	60	57	68	68	73	77	88	88	98	112	181	183	173	198	210	201	217	236	256	252	262	245
Income 🟩	2	3	4	3	5	6	7	7	8	8	9	-69	10	11	11	12	-60	-7	0	2	5	7	9	7

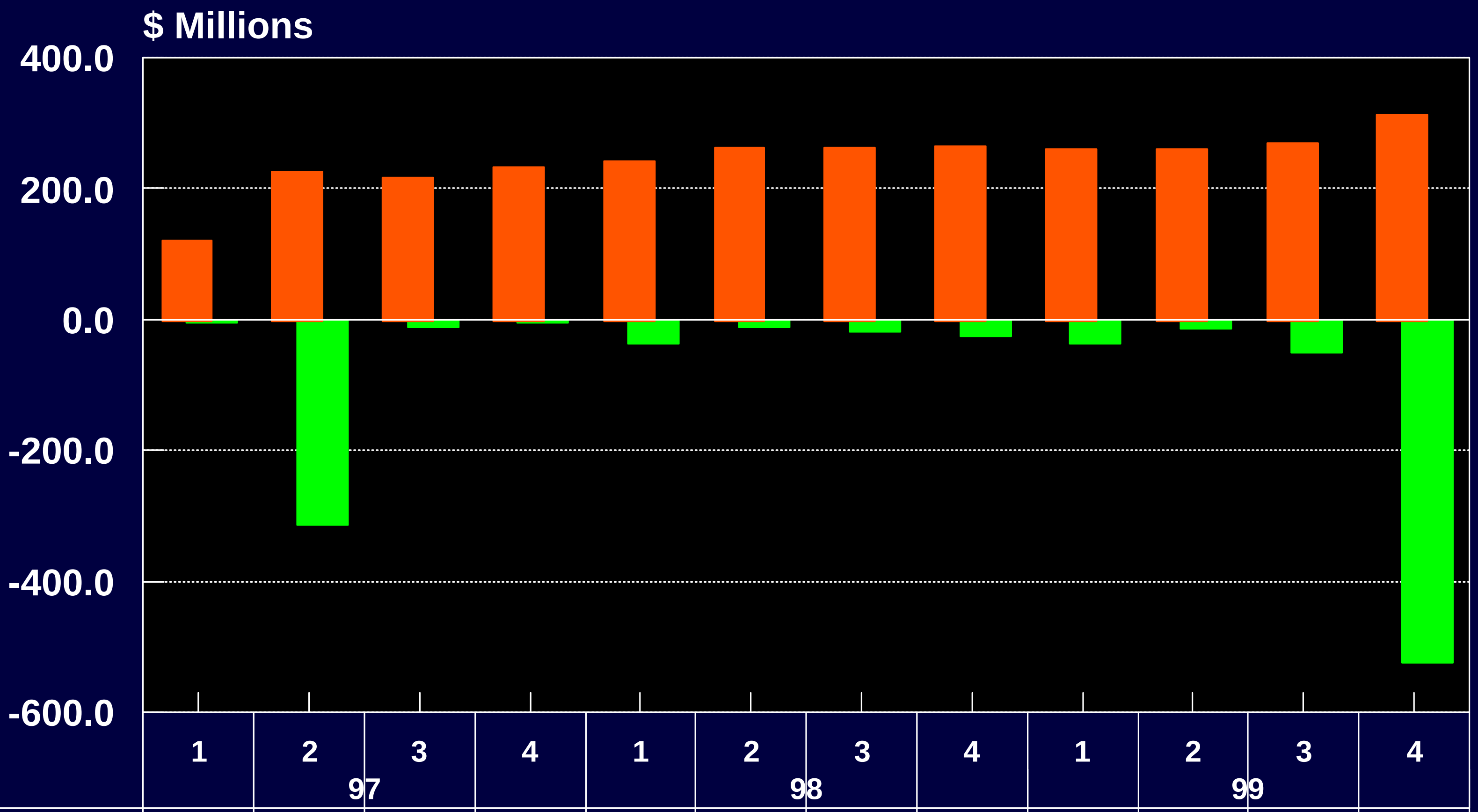
CY

HDC

FY ends October 31

VIASYSTEMS

Revenue & Income



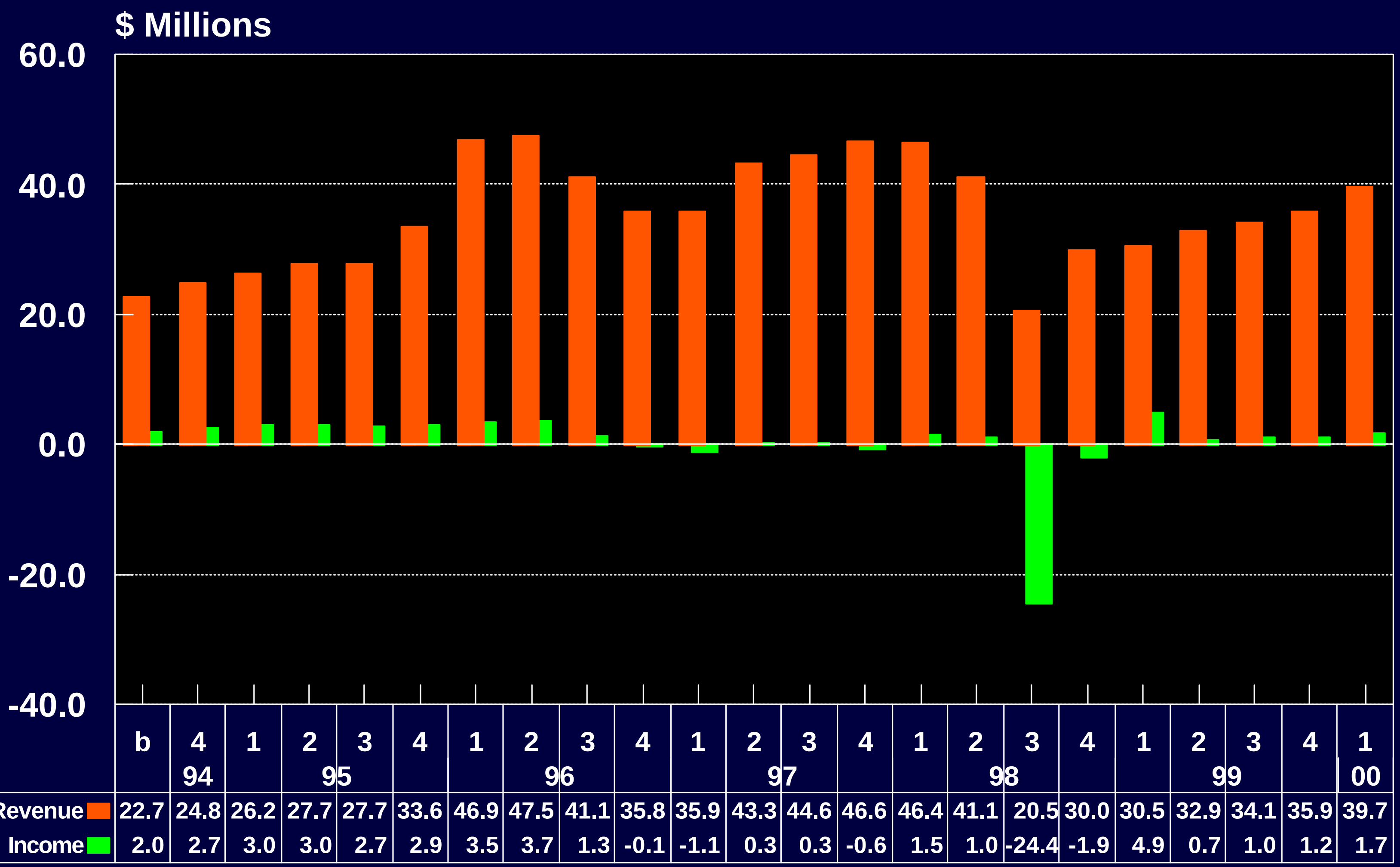
	1	2	3	4	1	2	3	4	1	2	3	4
		97				98				99		
Revenue 🟥	119.9	226.8	216.8	232.0	242.4	261.9	263.0	265.0	260.0	260.0	270.0	312.0
Net Income 🟩	-2.3	-311.9	-9.4	-3.9	-35.6	-9.3	-15.7	-24.1	-34.2	-10.9	-48.2	-523.0

CY

Sources: 10Q & 10K reports and company press releases

MERIX

Revenue & Net Income

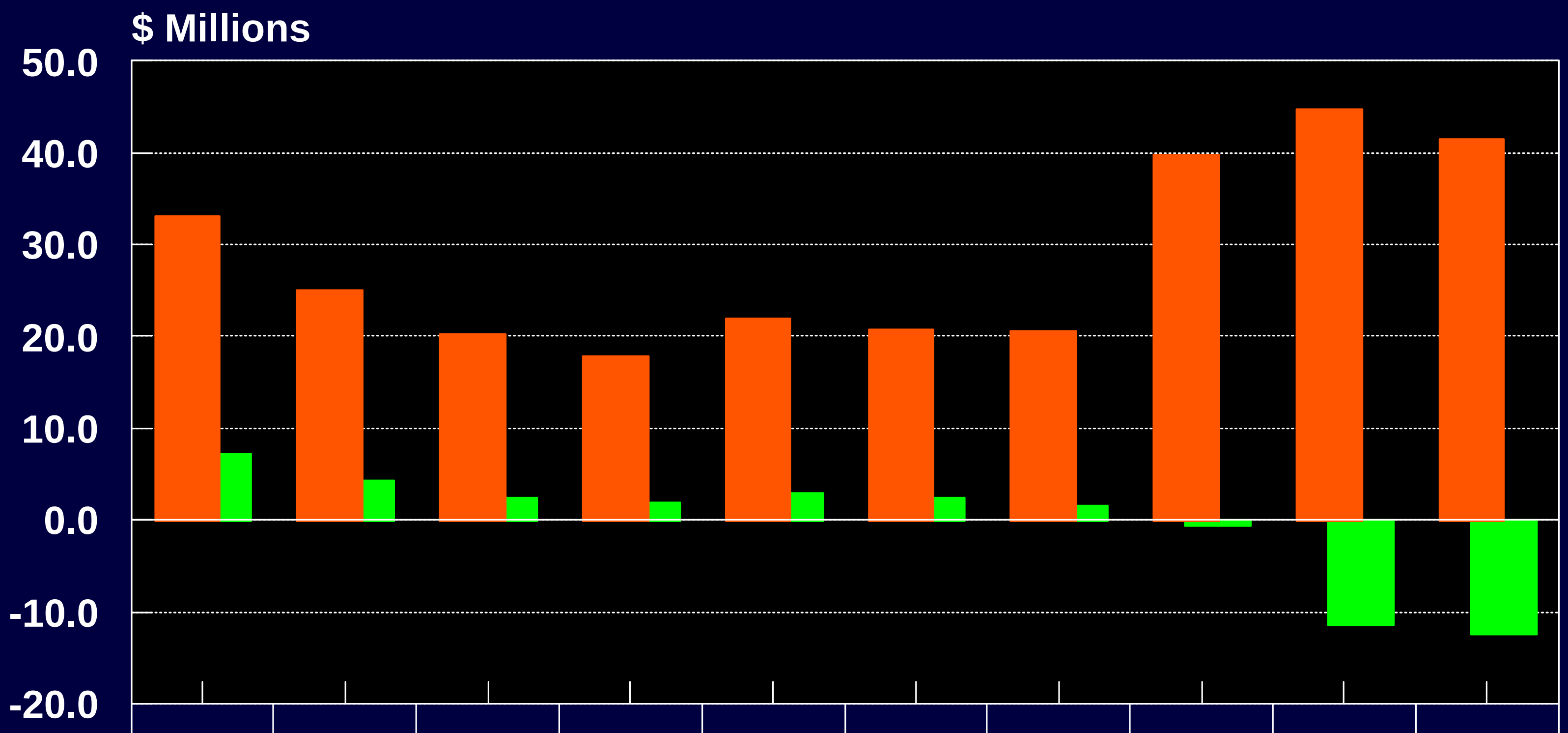


	b	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1
		94	95				96				97				98				99				00
Revenue 🟧	22.7	24.8	26.2	27.7	27.7	33.6	46.9	47.5	41.1	35.8	35.9	43.3	44.6	46.6	46.4	41.1	20.5	30.0	30.5	32.9	34.1	35.9	39.7
Income 🟩	2.0	2.7	3.0	3.0	2.7	2.9	3.5	3.7	1.3	-0.1	-1.1	0.3	0.3	-0.6	1.5	1.0	-24.4	-1.9	4.9	0.7	1.0	1.2	1.7

FY ends May

INNOVEX

Revenue & Net Income



	4	1	2	3	4	1	2	3	4	1
	97	98				99				00
Revenue 🟧	33.0	25.1	20.3	17.9	22.0	20.7	20.6	39.8	44.7	41.4
Income 🟩	7.3	4.3	2.4	2.0	3.0	2.5	1.5	-0.5	-11.2	-12.3

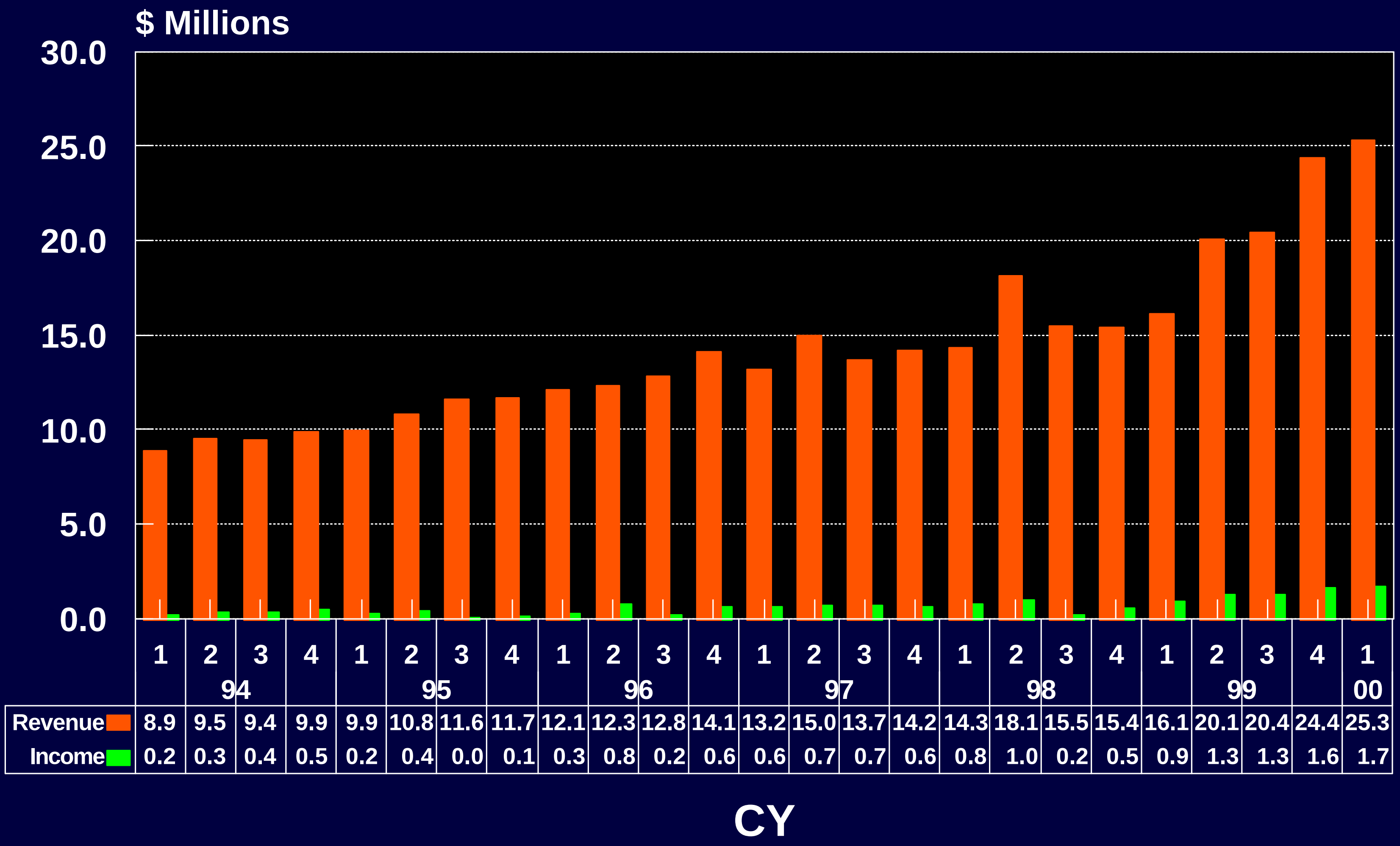
CY

FY ends September

INVX

PARLEX

Revenue & Net Income



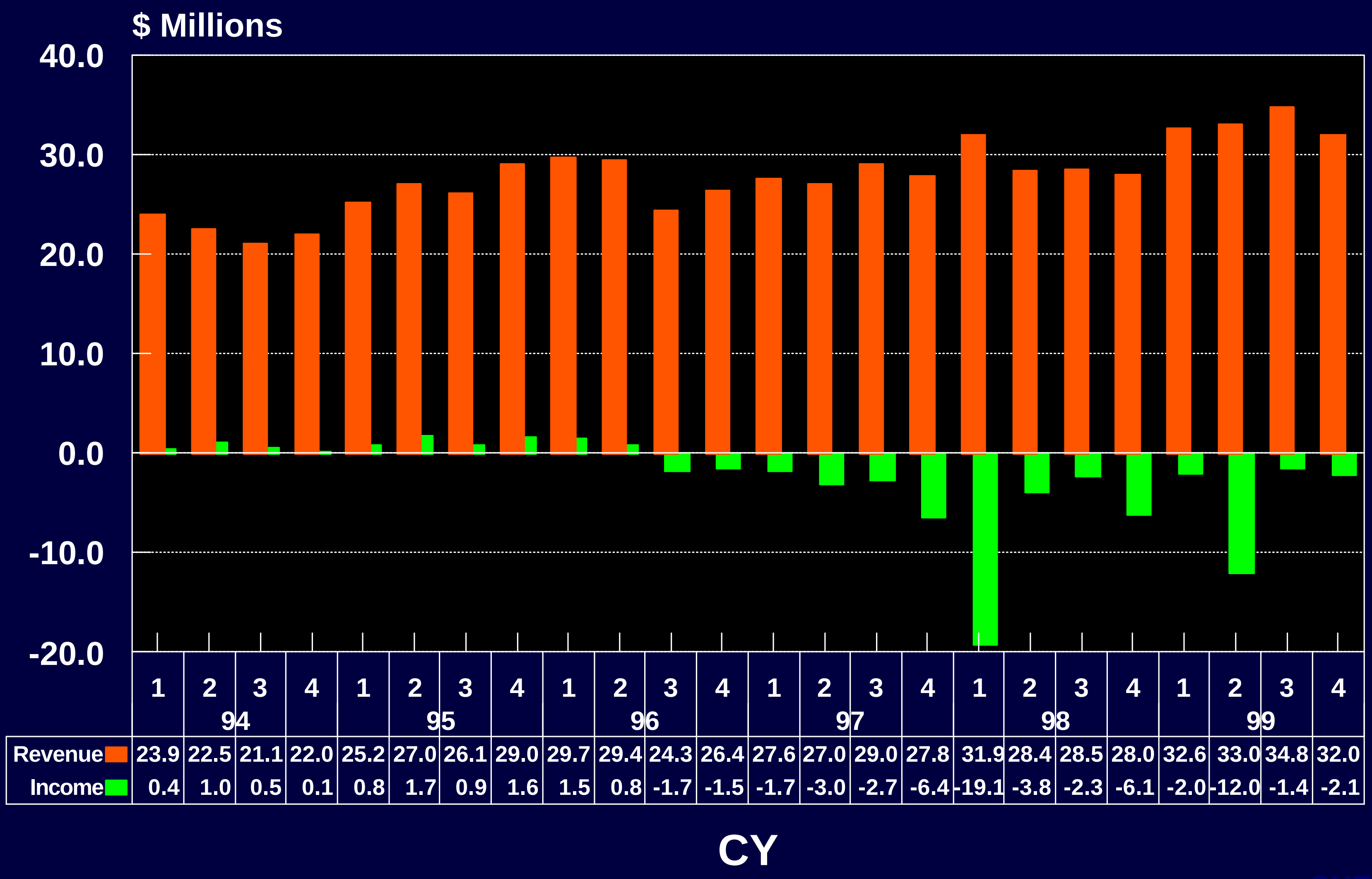
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1
	94				95				96				97				98				99				00
Revenue 🟧	8.9	9.5	9.4	9.9	9.9	10.8	11.6	11.7	12.1	12.3	12.8	14.1	13.2	15.0	13.7	14.2	14.3	18.1	15.5	15.4	16.1	20.1	20.4	24.4	25.3
Income 🟩	0.2	0.3	0.4	0.5	0.2	0.4	0.0	0.1	0.3	0.8	0.2	0.6	0.6	0.7	0.7	0.6	0.8	1.0	0.2	0.5	0.9	1.3	1.3	1.6	1.7

FY ends June 30

PRLX

SHELDAHL

Revenue & Net Income



	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	94				95				96				97				98				99			
Revenue 🟥	23.9	22.5	21.1	22.0	25.2	27.0	26.1	29.0	29.7	29.4	24.3	26.4	27.6	27.0	29.0	27.8	31.9	28.4	28.5	28.0	32.6	33.0	34.8	32.0
Income 🟩	0.4	1.0	0.5	0.1	0.8	1.7	0.9	1.6	1.5	0.8	-1.7	-1.5	-1.7	-3.0	-2.7	-6.4	-19.1	-3.8	-2.3	-6.1	-2.0	-12.0	-1.4	-2.1

SHEL

N. AMERICAN PCB MANUFACTURERS - PUBLIC DATA

QUARTERLY SALES & NET INCOME ($M)

		LAST YEAR		THIS YEAR		QUARTER
		SALES	INC	SALES	INC	ENDING
CIRCUIT SYS	CSYI	20.7	-0.3	23.0	-1.1	1/00
CIRCUIT WORLD	TSE:CWW	4.5	0.5	4.2	0.2	12/99
HADCO	HDCO	236.0	2.0	244.7	7.1	1/00
INNOVEX	INVX	20.7	5.5	41.4	-12.3	3/00
MERIX	MERX	30.5	4.9	39.7	1.7	2/00
M-WAV	MWAV	3.5	0.1	3.6	0.0	12/99
PARLEX	PRLX	16.1	0.9	25.3	1.7	3/00
SHELDAHL	SHEL	28.0	-6.1	32.0	-2.1	2/00
VIASYSTEMS	VG	265.0	-24.1	312.0	-523.0	12/99
TOTAL		625.0	-16.6	725.9	-527.8	
INCOME %			-2.7%		-72.7%	

Includes foreign sales

N. AMERICAN CEMs WITH PCB FABS - PUBLIC DATA
QUARTERLY SALES & NET INCOME ($M)

		LAST YEAR		THIS YEAR		QUARTER
		SALES	INC	SALES	INC	ENDING
C-MAC	TSE:CMS	153.1	15.4	267.3	12.0	12/99
Dii GROUP	DIIG	262.0	2.3	447.0	20.9	12/99
FLEXTRONICS	FLEX	580.4	15.8	1179.5	34.3	12/99
SANMINA	SANM	281.0	28.8	555.0	43.9	3/00
TOTAL		1276.0	52.3	2448.8	111.1	
INCOME %			4.1%		4.5%	

Includes foreign sales

FEBRUARY U.S. PCB GROWTH INDICATORS

% GROWTH - Feb 2000 vs Feb 1999

RIGID PCB $ SHIPMENTS

UP 6.4%

RIGID PCB $ BOOKINGS

UP 21.8%

RIGID PCB BOOK/BILL RATIO

3-MONTH AVG	1.15
1-MONTH	1.18

LAMINATE+PREPREG SQ FT SHIPMENTS

UP 4.8%

LAMINATE+PREPREG SQ FT BOOKINGS

UP 24.6%

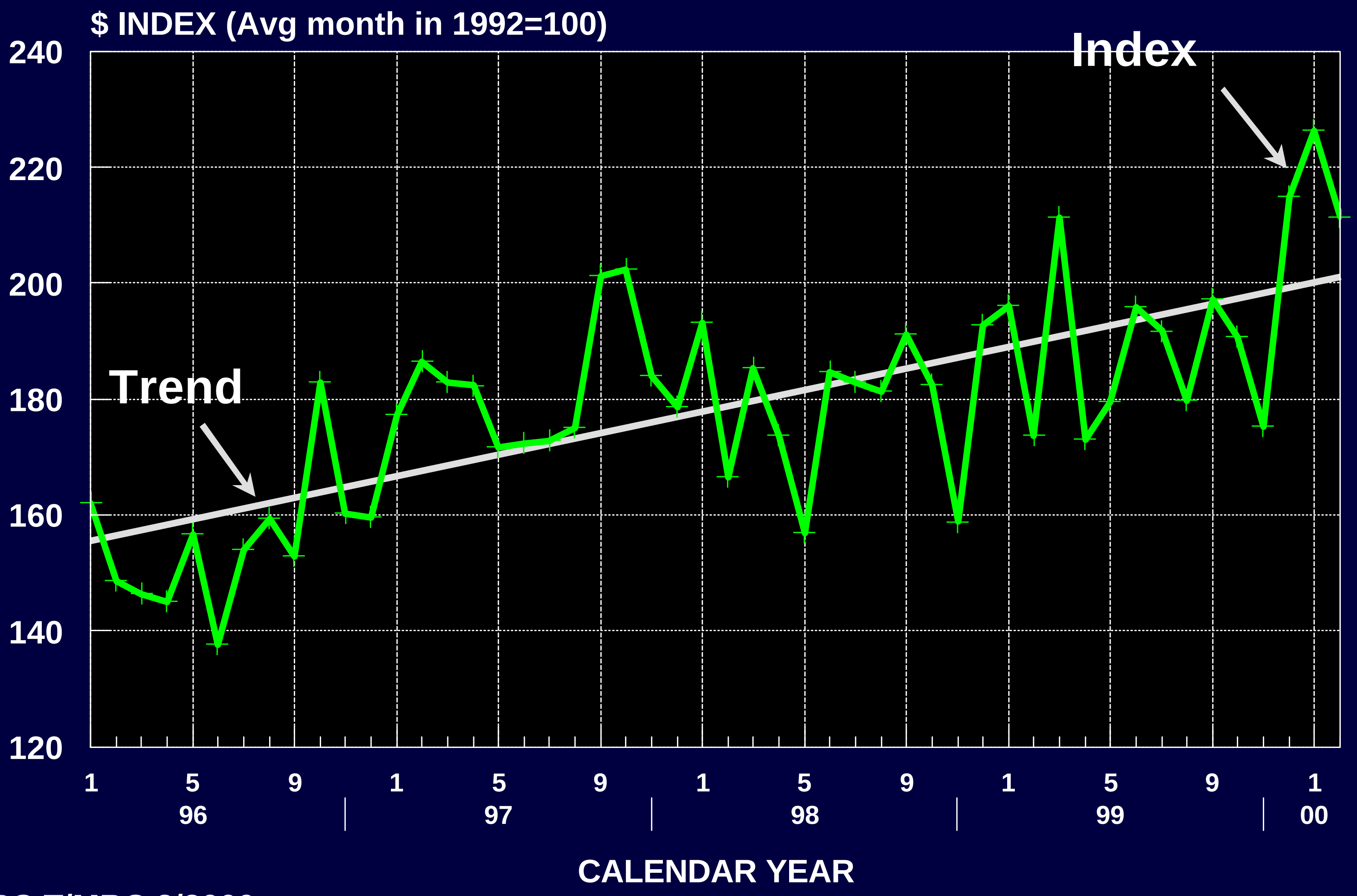
FLEX CIRCUIT $ SHIPMENTS

UP 42.2%

FLEX CIRCUIT $ BOOKINGS

UP 78.7%

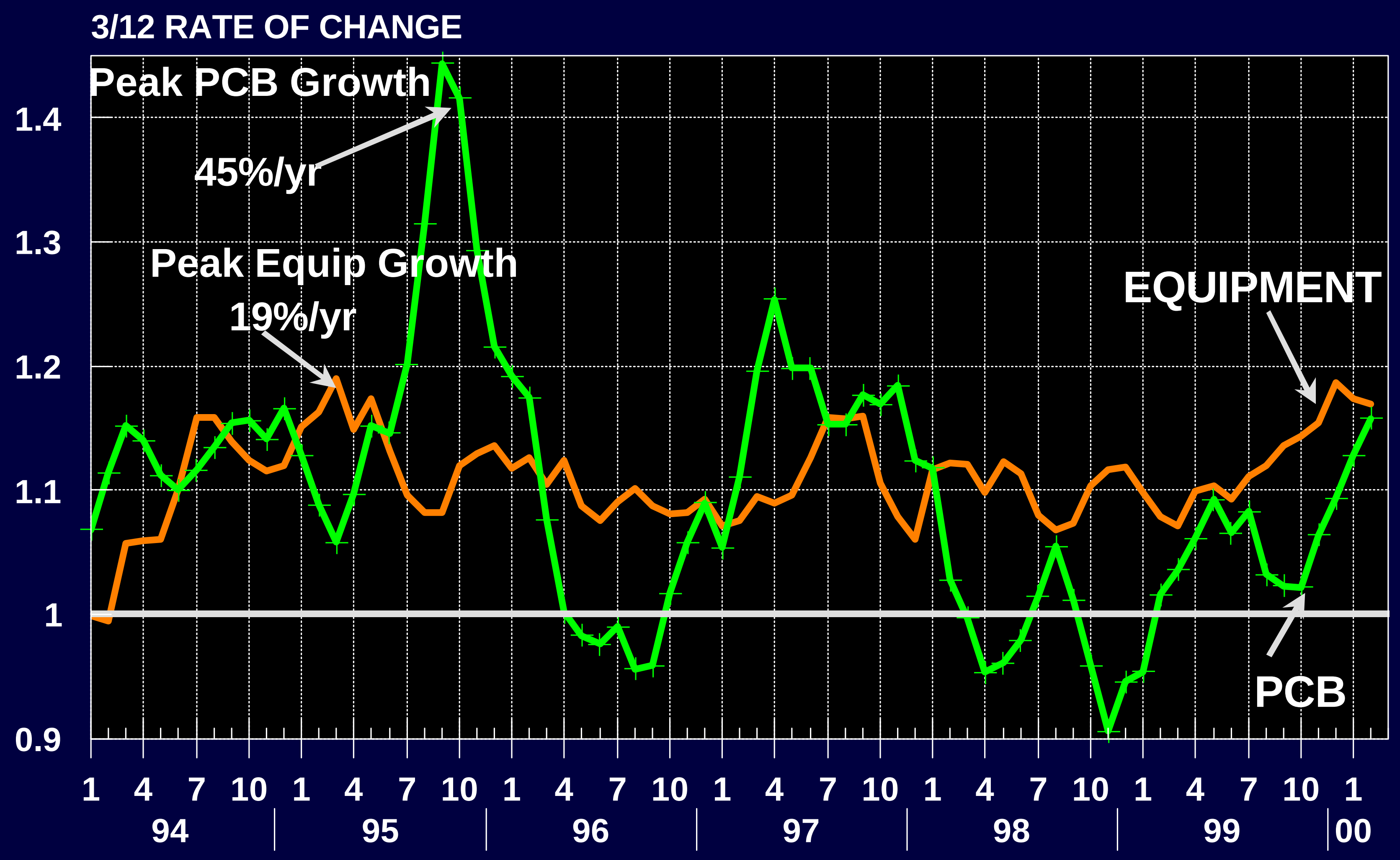
U.S. RIGID PCB BOOKINGS



IPC T/MRC 3/2000

U.S. ELECTRONIC EQUIPMENT vs PCBs

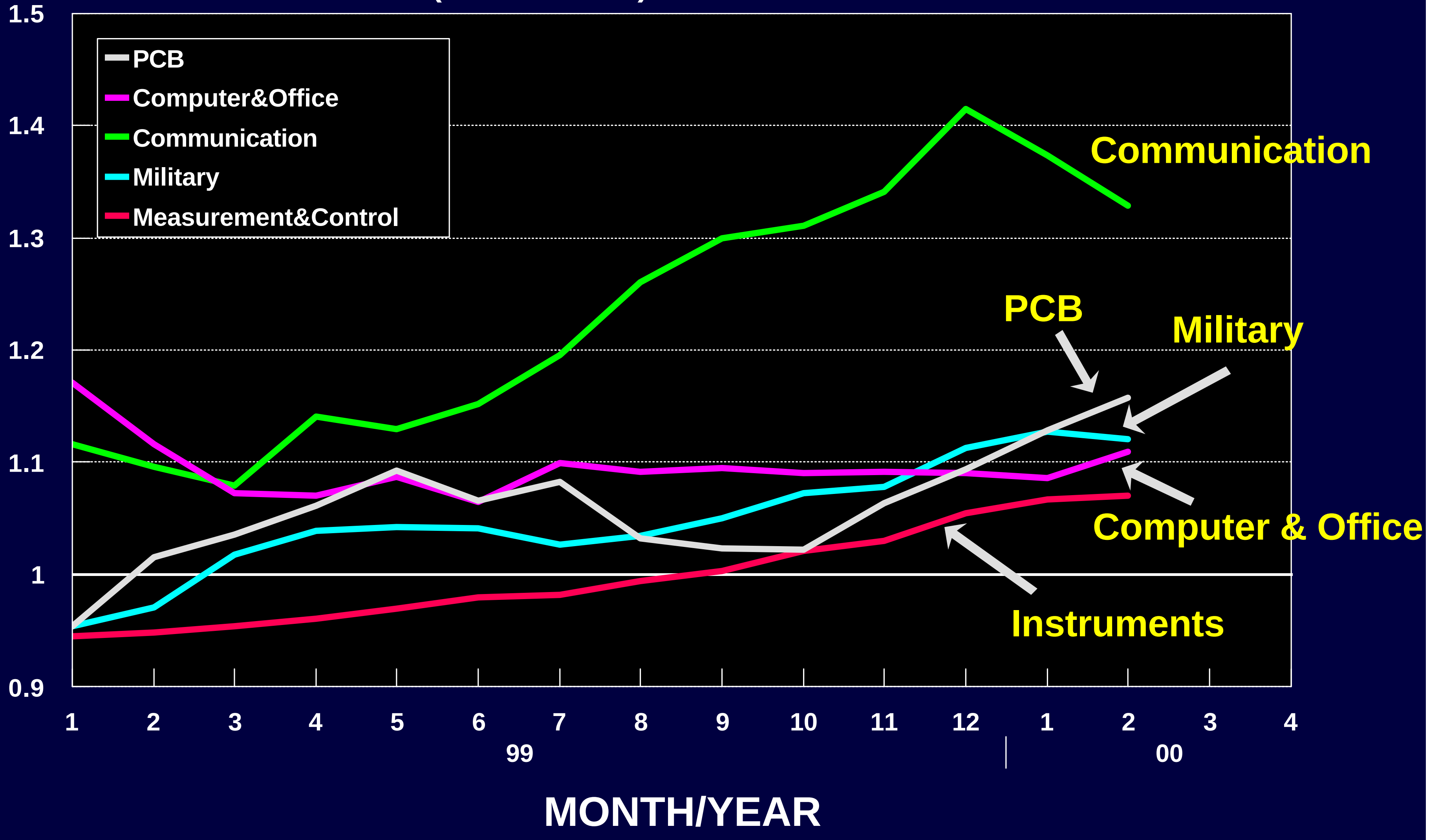
$ BOOKINGS GROWTH



4/2000

US RIGID PCB vs ELECTRONIC EQUIPMENT BOOKINGS

3/12 RATE OF CHANGE ($ BOOKINGS)



US COMMERCE DEPT & IPC T/MRC 4/2000

PRESENT GROWTH RATES (%)

U.S. ECONOMY & ELECTRONICS INDUSTRY

	LATEST MONTH	ANNUAL GROWTH RATE	3-MONTH GROWTH RATE
RIGID PCB BOOKING $	2/00	108.6	115.8
RIGID PCB SHIPMENT $	2/00	107.7	106.8
LAMINATE+PREPREG SHIPMENTS SF	2/00	110.4	112.5
ELECTRONIC COMPONENTS BOOK $	2/00	116.8	114.8
ELECTRONIC EQUIPMENT BOOKINGS $			
COMPUTER & OFFICE	2/00	109.5	110.9
COMMUNICATIONS	2/00	126.7	132.8
MEASURE/CONTROL INSTRUMENTS	2/00	107.0	112.1
MILITARY (SEARCH & NAVIG)	2/00	105.9	104.1
TOTAL ELECTRONIC EQUIPMENT	2/00	113.7	116.9
INDUSTRIAL PRODUCTION	2/00	104.0	105.4

NOTE: 3 month growth rates compare most recent
3 months to same 3 months one year earlier

Summary

- 1999 was a better year both in the USA & globally. An Asia recovery and outstanding growth in communication equipment were key factors.
- N. American PCB, semiconductor & electronic equipment orders are all currently strong.
- All key industrial countries' economies are growing. Interest rates are being raised to limit future inflation.
- Passive component shortages are serious problem. Massive cel phone growth has impacted global component availability. Microprocessors are tight and laminate supply may be an issue.
- Personal computer induced seasonality continues.
- 7-10% domestic PCB growth is likely for 2000. Longer term, sporadic "double digit" cyclical peaks in PCB demand will continue.

Getting More Data

CUSTER CONSULTING GROUP
http://www.custerconsulting.com

IPC
http://www.ipc.org
Look under Marketing Articles in Market Information

Special Thanks to the Shipley Company