

January Sales Up a Strong +9.0% Industry Backlog Continues to Grow

Regional Performance:

Worldwide year-to-date sales increased +9.0%.

At +13.3% YTD, North America is showing the highest regional sales growth.

North America also has the highest YTD growth in bookings at +17.4%.

Industry Outlook:

Industry sales for 2022 are forecast to be \$82,450 million, up +5.7%. Based on our historical modeling, the increase could range from as high as a +15.8% increase down to a 2.7% increase over prior year.

Industry Backlog:

January backlog increased to \$22,268 million equaling 14.8 weeks. This is an increase of \$769 million since December 2021.

2021 Currency Impact:

The industry grew at +9.0% YTD in January in USD and 6.9% in local currencies.

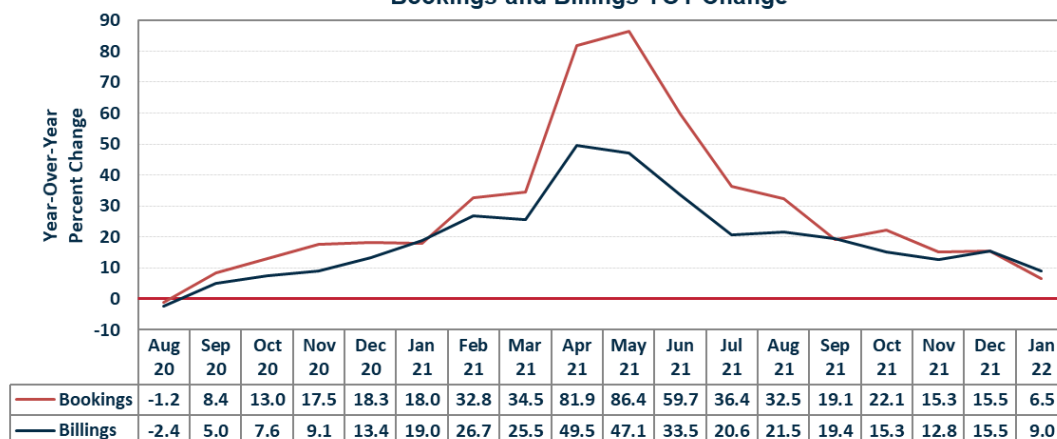
How's Business? OEM: All segments had growth in the first three quarters of 2021.

Merger and Acquisition Services Buy & Sell-Side

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January sales and bookings were up +9.0% and +6.5% YOY, respectively. This is the first time in 15 months that bookings did not record double digit growth, and the first time in 13 months that sales only exhibited single-digit growth.

Bookings and Billings YOY Change



The book-to-bill ratio in January was 1.12 as orders and billings normalize due to harder comparisons.

Connector Industry Book-to-Bill

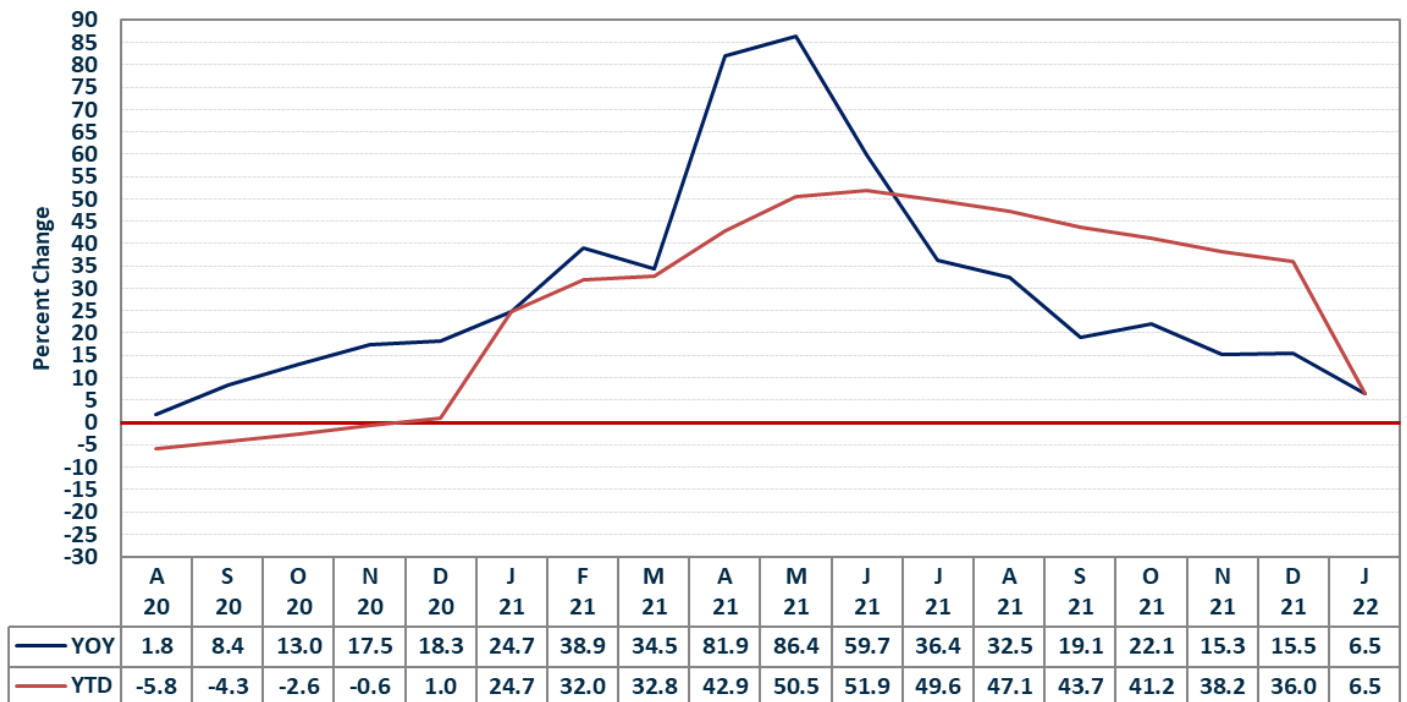


Booking Highlights and Conclusions

Sequential, Year-Over-Year, and Year-To-Date Bookings Percentage Change – 2020/2021/2022

Month	Sequential			Year-Over-Year			Year-To-Date		
	2020	2021	2022	2020	2021	2022	2019	2020	2022
Jan	0.2%	2.3%	-5.8%	3.9%	24.7%	6.5%	3.9%	24.7%	6.5%
Feb	5.5%	17.7%		1.8%	38.9%		2.8%	32.0%	
Mar	-1.4%	-3.5%		5.0%	34.5%		3.5%	32.8%	
Apr	-27.2%	3.2%		-21.8%	81.9%		-2.7%	42.9%	
May	2.9%	5.1%		-24.8%	86.4%		-7.3%	50.5%	
Jun	7.0%	-8.3%		-11.6%	59.7%		-8.0%	51.9%	
Jul	15.2%	-1.9%		-1.0%	36.4%		-7.0%	49.6%	
Aug	10.7%	6.6%		1.8%	32.5%		-5.8%	47.1%	
Sep	-0.9%	-11.9%		8.4%	19.1%		-4.3%	43.7%	
Oct	4.7%	6.8%		13.0%	22.1%		-2.6%	41.2%	
Nov	15.2%	9.3%		17.5%	15.3%		-0.6%	38.2%	
Dec	-7.2%	-7.0%		18.3%	15.5%		1.0%	36.0%	

Bookings - YOY and YTD



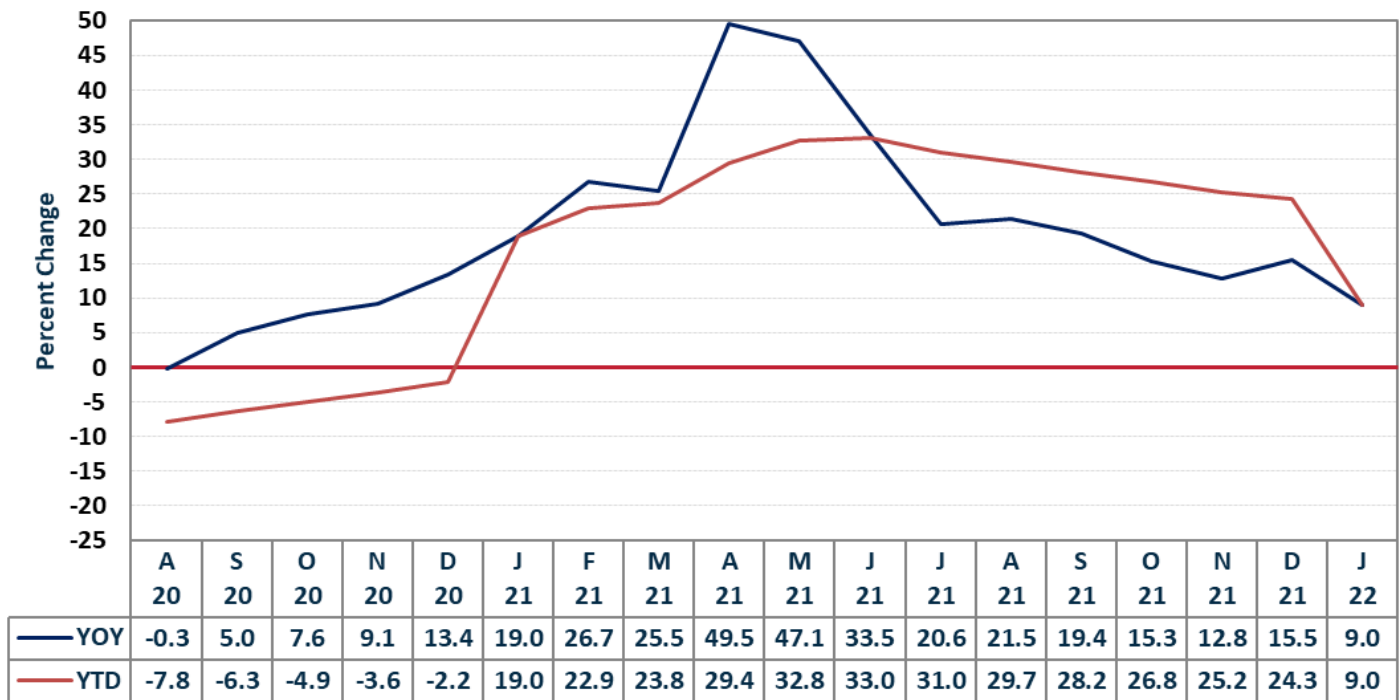
- January bookings rose +6.5% YOY.
- Orders decreased -5.8% sequentially.
- The book-to-bill ratio for January was 1.12.

Billing Highlights and Conclusions

Sequential, Year-Over-Year, and Year-To-Date Billings Percentage Change – 2020/2021/2022

Month	Sequential			Year-Over-Year			Year-To-Date		
	2020	2021	2022	2019	2020	2022	2020	2021	2022
Jan	-2.8%	-1.6%	-7.2%	-3.1%	19.0%	9.0%	-3.1%	19.0%	9.0%
Feb	5.5%	12.6%		-4.3%	26.7%		-3.7%	22.9%	
Mar	-0.9%	-1.1%		-2.0%	25.5%		-3.1%	23.8%	
Apr	-21.2%	-1.2%		-19.9%	49.5%		-7.2%	29.4%	
May	8.8%	7.0%		-20.0%	47.1%		-9.9%	32.8%	
Jun	5.8%	-3.8%		-11.6%	33.5%		-10.2%	33.0%	
Jul	9.0%	-2.0%		-1.6%	20.6%		-9.0%	31.0%	
Aug	9.0%	8.7%		-0.3%	21.5%		-7.8%	29.7%	
Sep	1.7%	-2.3%		5.0%	19.4%		-6.3%	28.2%	
Oct	-1.0%	-3.4%		7.6%	15.3%		-4.9%	26.8%	
Nov	11.4%	9.4%		9.1%	12.8%		-3.6%	25.2%	
Dec	-7.7%	-5.6%		13.4%	15.5%		-2.2%	24.3%	

Billings - YOY and YTD

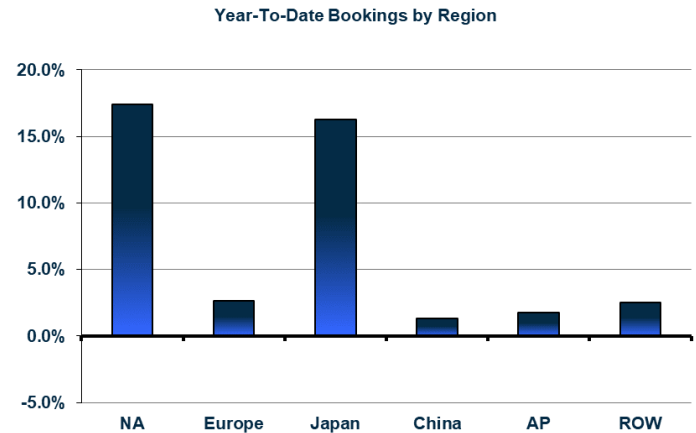


- January billings grew +9.0% YOY, making this the 17th consecutive month of increases.
- Sequentially billings decreased -7.2% in January.

Regional Performance: BOOKINGS

January 2021 Bookings

Region	Sequential	YOY	YTD
NA	-0.5%	17.4%	17.4%
Europe	-4.7%	2.6%	2.6%
Japan	-10.9%	16.2%	16.2%
China	-3.7%	1.3%	1.3%
AP	-2.0%	1.8%	1.8%
ROW	-49.6%	2.5%	2.5%
Total	-5.8%	6.5%	6.5%

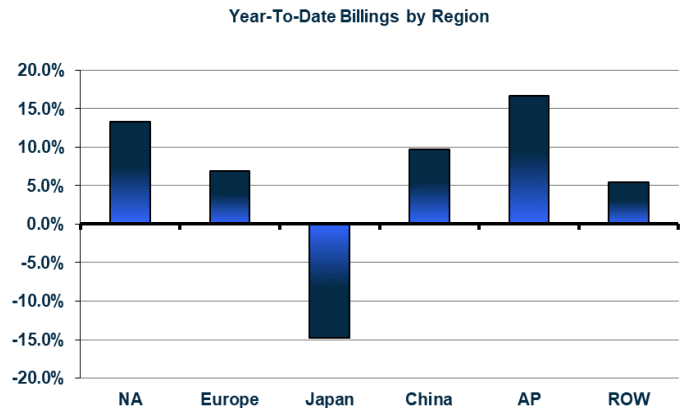


- January bookings increased +6.5% YOY, ending 15 consecutive months of double-digit growth.
- Year-over-year, all regions experienced growth.
- Bookings have increased every month since August 2020. That is 18 consecutive months of year-over-year growth of which 15 months were double-digit growth.

Regional Performance: BILLINGS

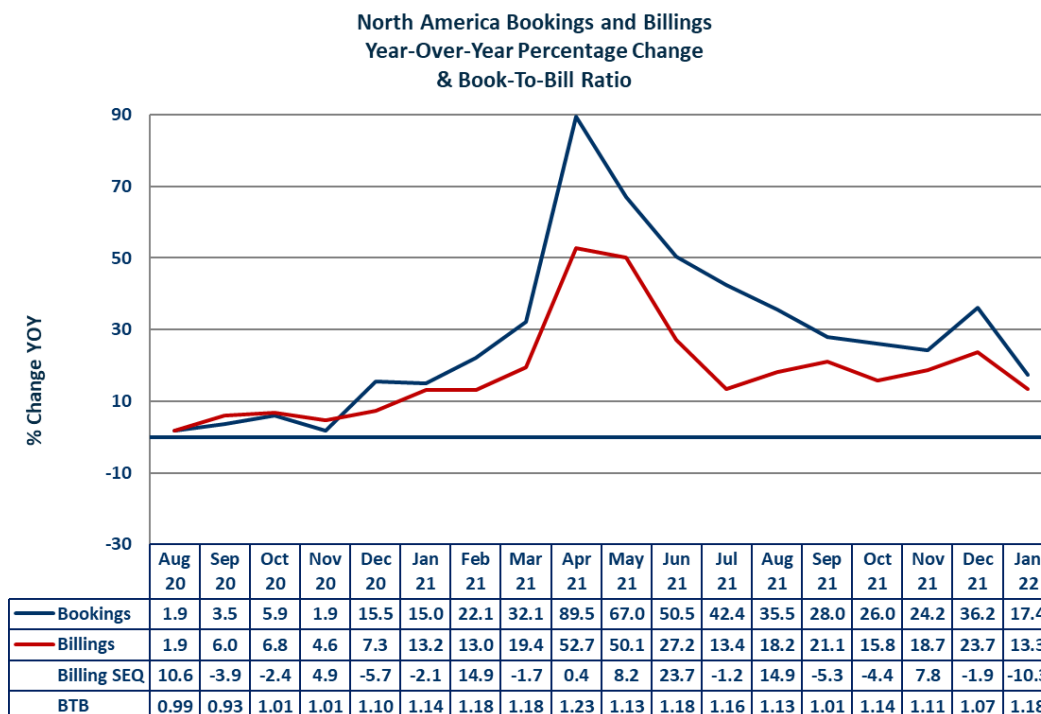
January 2021 Billings

Region	Sequential	YOY	YTD
NA	-10.3%	13.3%	13.3%
Europe	-4.8%	6.8%	6.8%
Japan	-27.8%	-14.8%	-14.8%
China	-5.8%	9.7%	9.7%
AP	2.8%	16.7%	16.7%
ROW	-10.3%	5.4%	5.4%
Total	-7.2%	9.0%	9.0%



- January connector sales growth was +9.0% YOY, ending 13 consecutive months of double-digit growth.
- Year-over-year, all regions experienced growth except Japan.
- Sequentially, sales decreased in all regions except Asia Pacific.
- The industry has now achieved 17 consecutive months of sales growth of which 13 months were double-digit growth.

North America: The following chart displays the year-over-year percentage change in bookings and billings for the last 18 months. The monthly book-to-bill (BTB) ratio is also displayed.



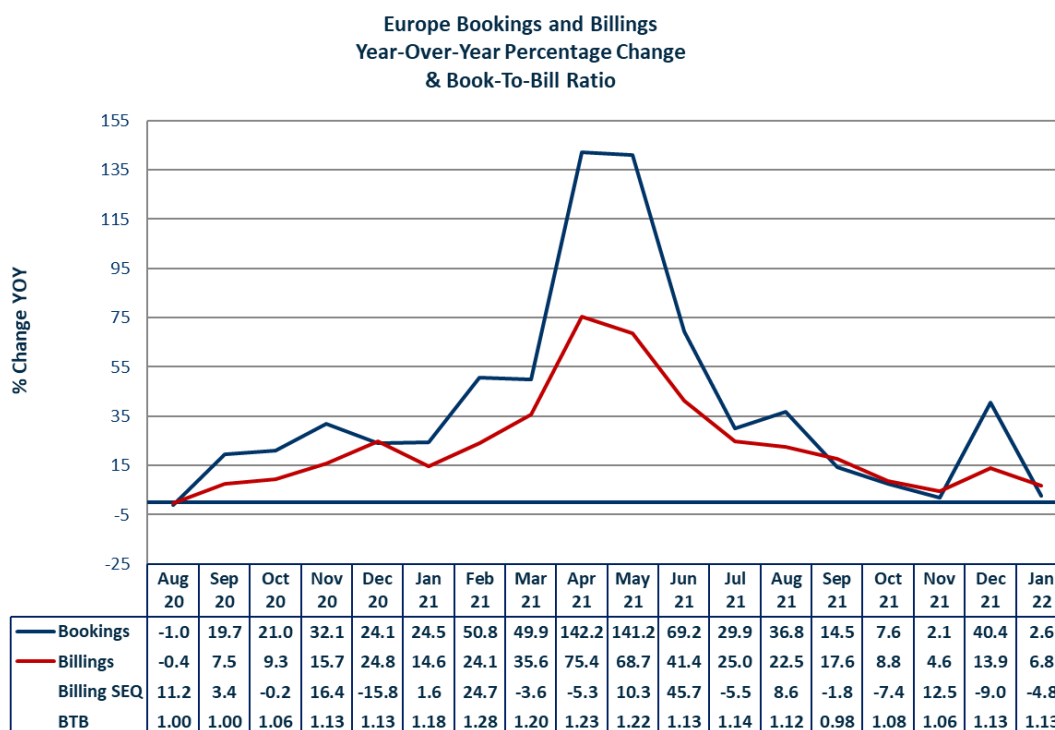
North America Performance

- Sales grew +13.3% and orders were up +17.4% YOY in January. North American billings were down sequentially -10.3%. The book-to-bill was strong at 1.18.
- US inflation hit 7.5% in January, the highest level since 1982. The rate has been above 5% for eight months now.
- Industrial production increased 4.1% YOY in January.
- Manufacturing PMI was down to 55.5 in January.
- US unemployment was 4.0% in January.
- US home sales were up 6.7% in January in the midst of record-low inventory.
- Retail sales were up 13.0% YOY in January.
- US automotive sales in January decreased 16.5% YOY.

Conclusions

The US economy accelerated in 4Q21 but may have tailed off a bit toward the end of the quarter due to the Omicron variant. Higher prices/inflation, supply chain issues, unstable financial markets, and the situation in the Ukraine are a few of the headwinds. The production of new vehicles is still slow due to the lack of semiconductors. The ports on the West Coast (and East Coast and Gulf) are still backed up. These issues may negatively impact the connector industry in 1Q22.

Europe: The following chart displays the year-over-year percentage change in bookings and billings for the last 18 months. The monthly book-to-bill ratio is also displayed.



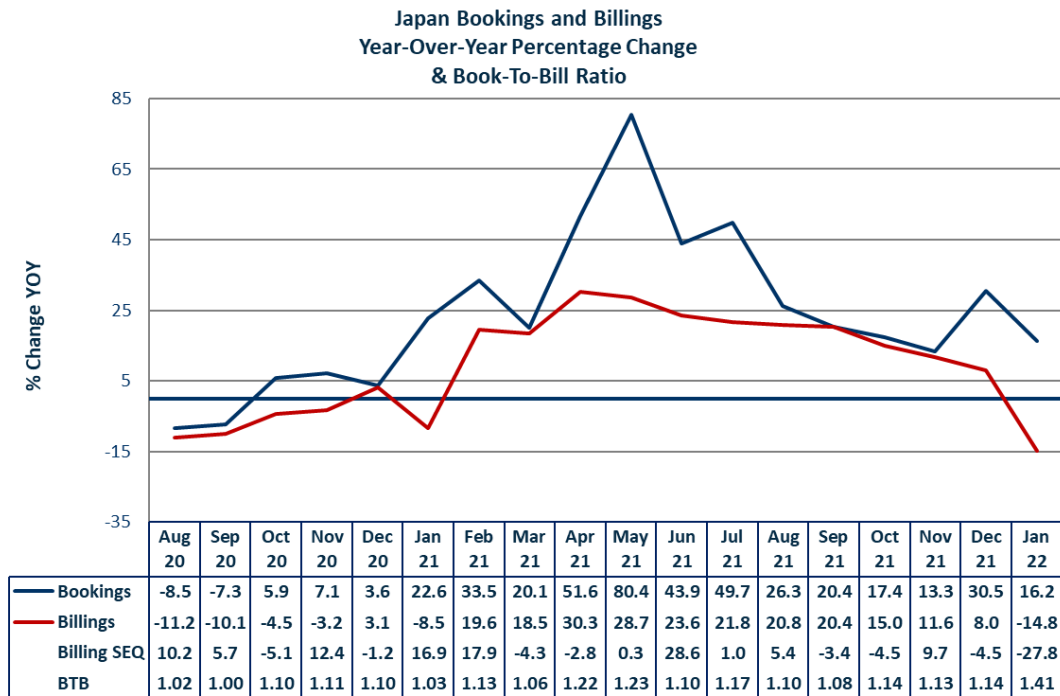
Europe Performance

- YOY billings grew +6.8% and orders were up +2.6%. The book-to-bill ratio was 1.13. Sequentially, sales were down -4.8%.
- 4Q21 GDP grew 4.6% YOY and 0.3% from the prior quarter. For 2021, GDP grew 5.2% over 2020.
- Euro area industrial production increased 1.6% YOY in January.
- The February manufacturing PMI was 58.4 down from 58.7 in January.
- December retail sales increased 2.0% YOY.
- The inflation rate was 5.1% in January, up from 5.0% in December.
- Year-over-year, Euro area new car registrations were down 2.4% due to the semiconductor shortages.
- The unemployment rate dropped to 7.0% in December from 7.1% in November.

Conclusions

European new car registrations were down again in January because of the semiconductor shortages. Automotive is the largest connector market in Europe. The connector industry appears to be performing better than the overall economies, but the ongoing shortages, high inflation, the situation in the Ukraine and supply chain issues will likely dampen results in 1Q22.

Japan: The following chart displays the year-over-year percentage change in bookings and billings for the last 18 months. The monthly book-to-bill ratio is also displayed.



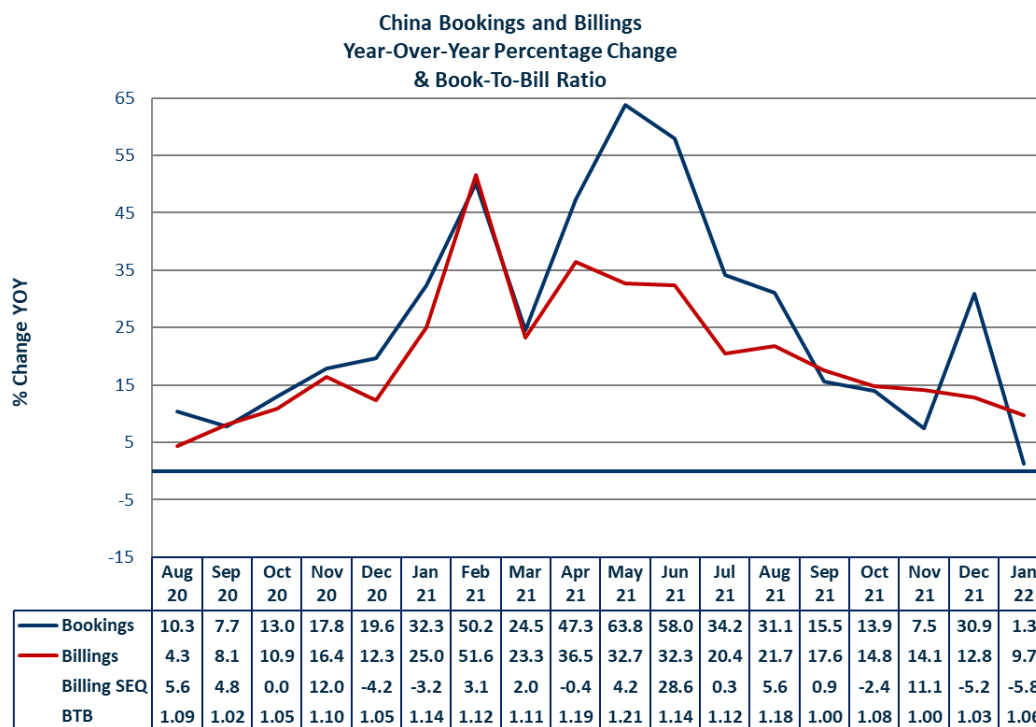
Japan Performance

- Bookings were up +16.2% in January. Sales decreased -14.8%. Sequentially, sales decreased -27.8%. Japan's book-to-bill ratio was 1.41 primarily due to their low January sales results.
- 4Q21 GDP grew 0.7% YOY and 1.3% sequentially.
- Industrial production grew 2.7% YOY in December.
- December retail sales grew 1.4% YOY.
- The unemployment rate was 2.7% in December, down from 2.8% in November.
- Exports decreased 19.7% in January.
- The February manufacturing PMI decreased to 52.9 from 55.4 in January.

Conclusions

The ongoing weakness of Japan's economy will weigh down their connector industry results. The lack of semiconductors is holding back growth in their automotive industry sales. Their bookings performance, in the last 13 months, primarily reflects easy comparisons to the poor results in 2020. Billings were negative for the first time since February of last year.

China: The following chart displays the year-over-year percentage change in bookings and billings for the last 18 months. The monthly book-to-bill ratio is also displayed.



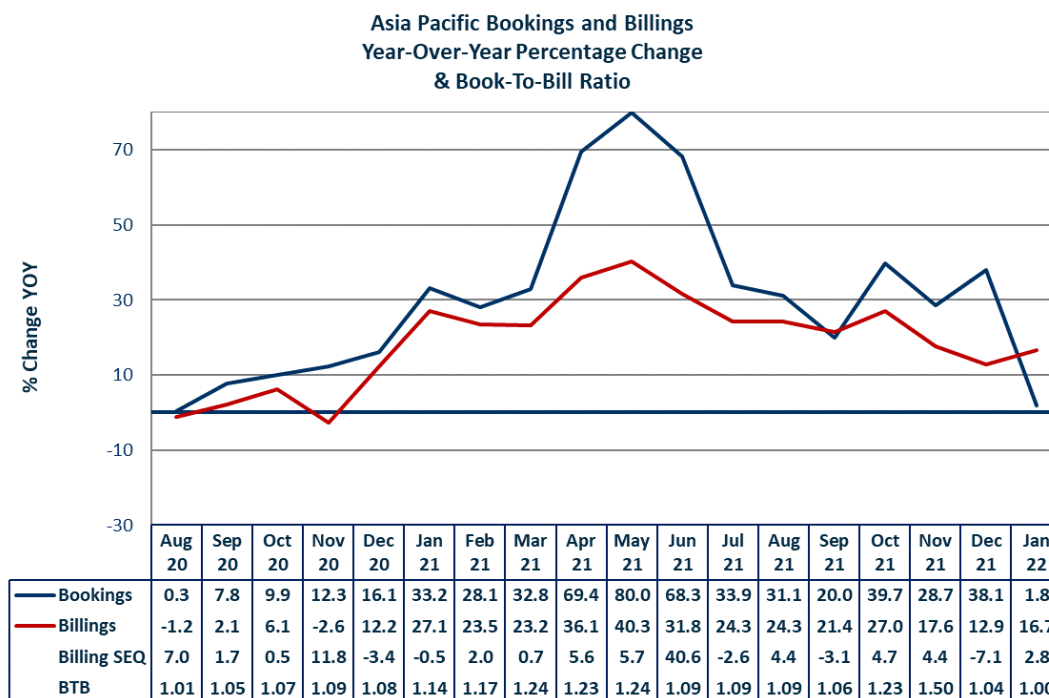
China Performance

- Sales and orders, year-over-year, increased +9.7% and +1.3%, respectively. The BTB was 1.06. Sequentially, sales decreased -5.8% in January.
- Industrial production increased 4.3% YOY in December.
- China's manufacturing PMI dropped to 49.1 in January, a 23-month low.
- Retail sales increased 1.7% YOY in December.
- Exports from China were up 20.9% YOY in December. In 2021, exports were up 29.9% YOY.
- China's auto sales were up 0.9% YOY in January after eight months of declines.

Conclusions

China's output picked up in 4Q21. Their economy, however, faces some significant headwinds in 2022. For most of 2021, China had posted double-digit year-over-year growth in both connector sales and orders. This growth has allowed China to continue to take connector market share from other regions of the world. In 2022, the comparisons to 2021 will make it harder to show growth.

Asia Pacific: The following chart displays the year-over-year percentage change in bookings and billings for the last 18 months. The monthly book-to-bill ratio is also displayed.



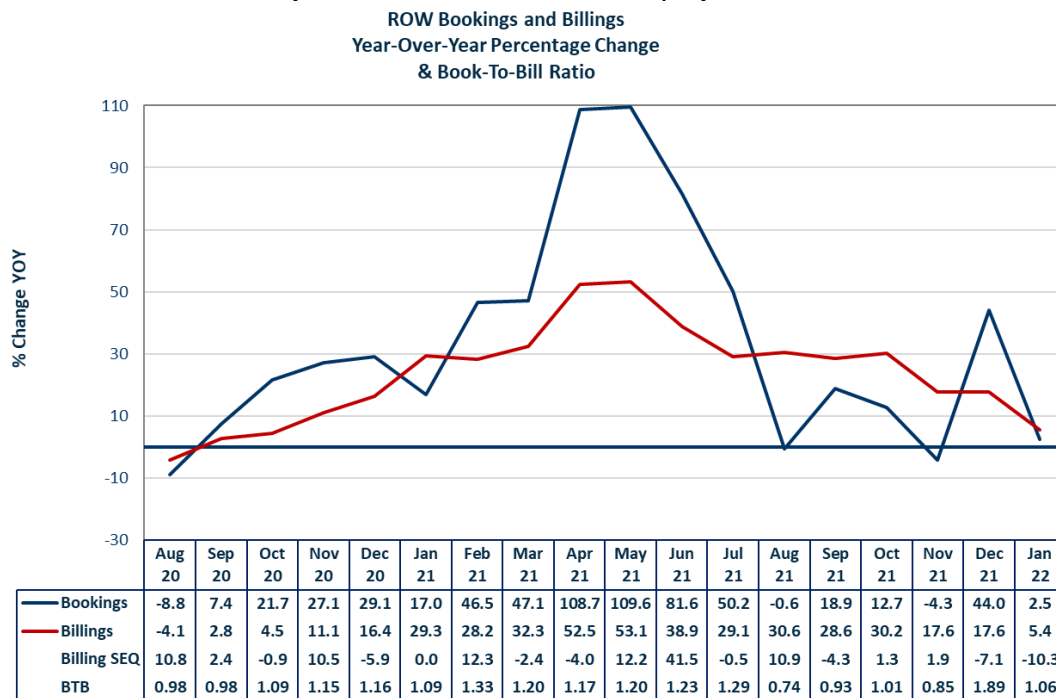
Asia Pacific Performance

- Orders were up +1.8% in January and sales rose +16.7% YOY. The book-to-bill ratio was 1.00. Sequentially, sales increased +2.8%.
- India's industrial production grew 0.4% YOY in December. Exports were down 8.7% sequentially in January. The manufacturing PMI declined to 54.0 in January from 55.5 in December. Inflation in December was 6.01%.
- South Korea's 4Q21 GDP grew 4.1% YOY and 1.1% sequentially. Industrial production rose 6.2% YOY in December. Exports decreased 8.9% sequentially in January. The manufacturing PMI rose to 52.8 in January from 51.9 in December.

Conclusions

South Korea's GDP continues to grow YOY and sequentially. Their connector sales also have a positive outlook with a strong economy.

Rest of World: The following chart displays the year-over-year percentage change in bookings and billings for the last 18 months. The monthly book-to-bill ratio is also displayed.



Rest of World Performance

- Orders increased +2.5% and sales increased +5.4% YOY in January. Sequentially, sales in the region decreased -10.3%. The book-to-bill ratio was 1.06.
- Brazil's industrial production decreased 5.0% YOY in December, the fifth consecutive month of declines. The inflation rate decreased to 10.38% in January. The manufacturing PMI declined to 47.8 in January.
- Russia's industrial production increased 6.1% YOY in December. Exports increased 60.0% YOY in December. The inflation rate increased to 8.73% in January. The unemployment rate remained at 4.3% in December.

Conclusions

Both Brazil and Russia continue to have growth in their connector industries, which are outperforming their national economies. In 2021, the ROW region showed the greatest growth in billings, increasing 31.2%.

Sales have experienced growth since September 2020.

Industry Backlog Continues to Grow

January orders were \$7,179 million, up +6.5%. Sales were \$6,410 million, up +9.0%. The resulting book-to-bill ratio was 1.12 making January the 16th consecutive month in which orders exceeded sales.

The industry backlog is now \$22,268 million, an increase of \$769 million from December 2021. We now have 14.8 weeks in order backlog. See the following table.

Industry Backlog

	2021	YTD Jan 2022
BtB Ratio	1.14	1.12
Beginning Backlog	\$10,530	\$21,499
Bookings	\$88,910	\$7,179
Billings	\$77,991	\$6,410
Ending Backlog	\$21,499	\$22,268
Backlog in Weeks	14.3	14.8

\$ Millions

We will continue to update this analysis in each monthly Bishop Report.

2022 Industry Outlook

January has averaged 7.5% of the full year sales over the past 14 years (2008 – 2021). Assuming the historical average repeats, 2022 world connector sales will be \$85,467 million. This would be an increase of +9.6% (January sales of \$6,410 million divided by 7.5%).

The lowest historical January was 8.0% of full year sales. The highest historical January was 7.1%. Using the historical January performance, we can develop a range of possible outcomes for sales in 2022.

2022 Forecast Range

	Historical Range		
	High	Avg	Low
January Sales %	7.1%	7.5%	8.0%
Actual Sales	\$6,410	\$6,410	\$6,410
Full Year Forecast	\$90,282	\$85,467	\$80,125
2021 Actual Sales	\$77,991	\$77,991	\$77,991
% Increase	15.8%	9.6%	2.7%

\$ Millions

Based on historical January results, 2022 should result in full year sales growth. That is encouraging and useful. However, a range of possible outcomes from a low of +2.7% to +15.8% is less useful.

Bishop & Associates forecasts 2022 growth of +5.7%. We base our forecast on the following:

- The industry backlog is \$22,268 million. This guarantees a good 1Q22.
- World GDPs are slowing making the second half of 2022 economic results less certain.
- The industry achieved outstanding growth of +24.3% in 2021 creating tough comparisons.
- Inflation is high and the world banks will start to raise interest rates. This will further dampen demand for products and reduce economic growth.
- There are a number of black swans that could have a negative impact on the global business conditions including: Russia/Ukraine, China/Taiwan, Iran's build-up of nuclear capabilities, and North Korean missile tests.

The following table identifies the Bishop 2022 forecast by quarter.

2022 Forecast by Quarter

Quarter	2020 Actual	2021 Actual	YOY Change	2022 Forecast	YOY Change
1Q	\$15,397	\$19,061	23.8%	\$20,950	9.9%
2Q	\$13,333	\$19,000	42.5%	\$20,400	7.4%
3Q	\$16,689	\$20,150	20.7%	\$20,800	3.2%
4Q	\$17,308	\$19,780	14.3%	\$20,300	2.6%
Total	\$62,727	\$77,991	24.3%	\$82,450	5.7%

\$ Million, Bishop ©2022

You will note that we project connector demand to slow in the second half of 2022.

The following table identifies the Bishop 2022 forecast by region.

2022 Forecast by Region

	2021 Results	2022 Forecast	Change
North America	\$16,484	\$17,439	5.8%
Europe	\$16,278	\$17,209	5.7%
Japan	\$5,276	\$5,435	3.0%
China	\$24,978	\$26,714	7.0%
Asia Pacific	\$11,384	\$11,881	4.4%
ROW	\$3,590	\$3,758	4.7%
Total	\$77,991	\$82,435	5.7%

\$ Million, Bishop ©2022

We will continue to closely monitor industry results and update our forecast as business conditions dictate.

Inflation Impact on Connector Prices

Inflation is at a 40 year high. The Consumer Price Index (CPI) has increased 7.5%. The Producer Price Index (PPI) has increased 9.7%. Prices are also increasing on some of the products that have the largest impact on connector prices.

- Oil is nearing \$100 per barrel
- Gold up 0.1%
- Copper/Brass up 19.6%
- Thermoplastics up 14.7%

The three major cost categories related to manufacturing a connector are: materials, overhead, and direct labor.

Bishop news brief # 05-22 identified that material costs increased 36.5% in 2021. Overhead is related to the PPI and direct labor is most closely associated with the CPI.

Based on high-level analysis and broad assumptions, Bishop calculates that connector prices will have to increase 19.7% in 2022 to break even with rising costs.

- Materials account for 40% of the cost to build a connector. Overhead accounts for 40%. Direct labor accounts for 20%. (Note each connector company's cost structure will vary.)
- Material cost increased 36.5% based on our analysis in news brief # 05-22.
- Overhead cost increased 9.7% (based on the increase in PPI).
- Direct labor will increase by 6% which is slightly below the CPI increase of 7.5%.

Using these assumptions, we prepared the following analysis.

Increase in Connector Prices

	% of Total Cost	% Price Increase	Weighted Increase
Materials	40.0%	36.5%	54.6%
Overhead	40.0%	9.7%	43.9%
Direct Labor	20.0%	6.0%	21.2%
Total	100.0%		119.7%

The cost to build a connector is projected to be up 19.7% over 2021.

2022 YTD Currency Impact on Regional Industry Growth

The dollar has been weakening against the euro, the yen, and the yuan. The following table measures the impact for January 2021 versus January 2022 and shows results for these three currencies.

**Local Currency to One USD
January 2021 versus January 2022**

Currency	2021	2022	% Change
Euro	0.8217	0.8830	7.5%
Yuan	6.4779	6.3557	-1.9%
Yen	103.7430	114.8422	10.7%

Europe, China, and Japan account for approximately 60% of world connector sales. Currency fluctuation to the US dollar can have a significant impact on our reporting of sales performance in US dollars.

The following table shows January YTD sales performance by region in US dollars and local currencies.

**Industry Sales Performance
January 2022
USD-vs-Local Currencies**

Region	U.S.\$	Local Currency
North America	13.3%	13.3%
Europe	6.8%	-1.2%
Japan	-14.8%	-23.9%
China	9.7%	11.8%
Asia Pacific	16.7%	16.7%
ROW	5.4%	5.4%
World	9.0%	6.9%

Connector sales are 2.1 percentage points lower when stated in local currencies rather than in US dollars, putting industry performance at +6.9% in January (versus +9.0% in US dollars). This is the result of a stronger US dollar, on average, compared to these currencies as the yuan partially offsets the yen and the euro.

How's Business? OEM

Bishop & Associates tracks sales and profits of 13 market sectors and more than 120 companies. The objectives are to determine how selected electronic markets have performed, identify sales and profit trends for forecasting purposes, and monitor company performance within market sectors.

The following tables provides the 2019/2020 percent change in revenues, and the first nine months 2021 versus the first nine-months 2020 sales and percent change in sales by market sector.

Sales Performance - Percent Change

Market Sector	2019/2020 % Change	Nine months 2020	Nine months 2021	Percent Change
Telecom/Datacom	1.9%	\$166,758.3	\$215,048.1	29.0%
Automotive	-10.1%	\$997,981.9	\$1,286,522.1	28.9%
Industrial	-19.3%	\$233,122.3	\$254,654.9	9.2%
Mil/Aero	-5.4%	\$236,277.7	\$241,427.0	2.2%
Computers	2.9%	\$278,099.2	\$333,456.8	19.9%
Peripherals	-4.1%	\$48,373.6	\$55,526.7	14.8%
Consumer	0.5%	\$248,410.8	\$288,839.6	16.3%
Transportation	-6.2%	\$180,979.5	\$217,283.0	20.1%
Medical	2.3%	\$73,686.6	\$90,222.0	22.4%
Instrumentation	17.2%	\$37,774.8	\$46,361.3	22.7%
Semiconductors	10.4%	\$217,108.4	\$329,691.9	51.9%
CEMs	-3.8%	\$51,725.6	\$55,830.8	7.9%
Distribution	5.1%	\$48,570.7	\$61,911.4	27.5%
Total Market Sectors	-2.7%	\$2,818,869.4	\$3,476,775.7	23.3%

\$ Millions

All 13 market sectors Bishop tracks had year-over-year growth in first nine months of 2021. Semiconductors experienced the highest growth at 51.9% followed by Telecom/Datacom, up 29.0% and Automotive, up 28.9%.

As a note: This database is not static. Companies are acquired or go into bankruptcy; thus, their financial data is no longer available, and they are removed from the database. These types of activities occurred frequently in 2009 and 2010, and because of this, as well as additions we have made to the database, it is not possible to directly compare current numbers to numbers referenced in past Bishop "How's Business? OEMs." These analyses are meant to be used as a relative measure of market sector performance. If you have any questions about this database or specific market sectors, please feel free to contact us.

Significant Events

HEICO Corporation to Acquire Pioneer Industries

HEICO Corporation (NYSE: HEI.A and HEI) announced its Flight Support Group entered into an agreement to acquire 74% of Pioneer Industries, LLC for cash at closing, plus potential additional cash consideration to be paid if certain post-closing earnings levels are attained. HEICO stated that it expects the acquisition to be accretive to its earnings within the year following closing. Farmingdale, NY-based Pioneer Industries is a leading specialty distributor of spares for military aviation, marine and ground platforms. Its customers include the US Department of Defense and companies that support the defense sector.

HEICO

Pioneer's owners and leaders, Robert and David Yormack, brothers whose family founded Pioneer in 1945, will retain 26% of Pioneer's equity and continue in their current roles with the company. HEICO stated that it does not expect any staff turnover to result from the acquisition.

Pioneer adds new products and capabilities to HEICO's rapidly growing and highly-successful Defense Sustainment and Distribution operations which are dedicated to supporting the defense aftermarket's specialized and niche needs, along with sales to new defense equipment production.

Rosenberger Group Creates New Entity: PROSE

The Rosenberger Group announced the spin-off of its antenna and wireless coverage product portfolio with a new brand entity: PROSE. The goal is to accelerate the company's growth and create a stronger local Rosenberger footprint by focusing on RF, fiber-optic, high-speed data, and high-voltage interconnect solutions. Rosenberger has already released investments to further expand the manufacturing footprint in India and China. The transaction is planned to be completed by the first half of 2022.



After closing, Olaf Scale will become president for Rosenberger Asia Pacific, and Ashok Vasudevan will become president for Rosenberger India.

TE Named One of Fortune's Most Admired Companies for the Fifth Year in a Row

Amid the challenges faced by businesses around the world in 2021, TE Connectivity maintained its positive reputation among the global business community, earning for the fifth year in a row a place among FORTUNE magazine's [World's Most Admired Companies](#).

The annual survey, conducted by FORTUNE and Korn Ferry, is given to top executives, directors, and financial analysts to identify the companies that enjoy the strongest reputations among their peers and across industries. TE was ranked sixth in the electronics industry.

VITA Announced Dean Holman as New President and Executive Director

VITA, the trade association for standard computing architectures serving critical embedded systems industries, announced that Dean Holman has accepted the position as VITA's president and executive director effective February 1, 2022. Jerry Gipper, the previous executive director, will continue as VITA's marketing director. Holman began participating in VITA as technical editor of the VITA 46 VPX working group in 2004 while at Mercury Systems. In 2011, the membership elected Holman as chairman of the VITA Standards Organization (VSO) where he leads the bi-



monthly standards meetings and guides the working groups through the standards development process. Holman joined VITA as VP and assistant executive director in March 2021. This new role will allow him to leverage over three decades of leadership in the aerospace and defense industry to advance the development, publication, and adoption of next-generation standards.

Ford Will Spend Up to \$20 billion More in Shift to Electric Vehicles

Ford will spend as much as \$20 billion to reorganize its business for the electric future, according to Bloomberg. The automaker is also mulling whether to spin off some of its EV business as a special acquisition company (SPAC) in order to attract more investment. Ford has previously stated that it would spend \$30 billion on electric and autonomous vehicle development by 2025. Ford is reportedly putting former Apple and Tesla executive Doug Field in charge of the reorganization, which will include converting its factories from gas-powered to electric vehicle production and hiring more engineers. Ford is enmeshed in a high-stakes race against its rivals as the auto industry struggles to catch up to Tesla, the most valuable automaker in the world and the top seller of EVs. While Ford sells more F-series trucks every year than Tesla's entire output, investors have rewarded Elon Musk's vision of an all-electric future with a significantly higher share price and more confidence about his company's prospects. Ford CEO Jim Farley is trying to change that narrative with an effort to show that his company can compete. Ford recently announced that it was doubling production of its upcoming electric pickup truck, the F-150 Lightning, and tripling production for the Mustang Mach-E, with the expectation that it will reach over 200,000 units per year by 2023. Ford's electric delivery van, the E-Transit, also goes on sale early this year.

GM Declares Chip Crisis Over—and Says It's Time to Let the Cheap Cars Roll

General Motors expects to boost global volumes by 25% to 30% this year as it bulks up production of smaller, more affordable crossovers and sedans that could not be built previously due to missing chips. Despite consensus among analysts that the semiconductor pipeline remains fragile, executives from the Detroit manufacturer say the crisis appears to be over. Supply remains constrained, yet it continues to steadily improve since the third quarter. A better supply of microchips during the fourth quarter allowed the company to complete and sell over 80,000 vehicles from its inventory of semi-built vehicles lacking parts. The company is predicting only a modest volume gain in China, production rates in the U.S. are expected to be disproportionately higher than the overall global number, GM executives confirmed. The automaker is targeting around 800,000 cars built quarterly for North America starting July, returning to levels seen before the shortage became especially acute. GM was hit hard in the third quarter of last year by COVID lockdowns in Malaysia, home to labor-intensive downstream chip packaging facilities. This ultimately caused GM to lose the crown as the largest U.S. automaker by sales to Toyota.

Gartner Forecasts 6 million Electric Cars Will Be Shipped in 2022

Six million electric cars (battery electric and plug-in hybrid) will be shipped in 2022, up from 4 million in 2021, according to a new forecast by Gartner, Inc. With China imposing a mandate on automakers requiring that EVs make up 40% of all sales by 2030 and automakers establishing new factories for manufacturing electric cars, Gartner estimates that Greater China will account for 46% of global EV shipments in 2022. Greater China will take the No. 1 position in shipments globally, shipping 2.9 million EVs in 2022. Western Europe is on pace to ship 1.9 million units in 2022, ranking No. 2 in EV shipments. North America is expected to be the third highest region in shipments at 855.3 thousand EVs in 2022. As governments across the world introduce new regulations and incentives to fuel EV sales, the automotive industry is also increasing investment in companies that provide charging infrastructure and vehicle battery technology to support and bolster the

transition to EVs by consumers and businesses. Gartner forecasts that the number of global public EV chargers will rise from 2.1 million units in 2022, up from 1.6 million units in 2021.

Private 5G Networks are Rolling Out Slowly Too

Private 5G networks are already one of the most hyped tech phrases of 2022. But how many production 5G private networks are actually out there? EE Times examined the progress of 5G private networks in January 2021 and found that the vast majority of networks deployed were in the trial phase. This is still largely the case in 2022, according to analyst Dean Bubley, founder of Disruptive Analysis. Europe, rather than America, may be the major focus for 5G private networking in 2022. For instance, France and Germany have just announced that they are pledging €17.7 million (\$20 million) for four collaborative projects using 5G. Volkswagen is working with Nokia to deploy a standalone 5G network at its massive HQ in Wolfsburg, Germany. Vodafone is deploying a similar private 5G network for Porsche at its Weissach Development Center in Deutschland. Japanese operator NTT has released a survey that interviewed 216 technology executives about their plans for private 5G networks going forward. It found that half plan to implement a private 5G network within 6 to 24 months. Clearly with the widespread arrival of standalone 5G, as well as CBRS, 5G private networking is gathering speed the world over. 2022 will be a year when several large enterprise players deploy the technology, and many more test it out. Amazon, Comcast, and Dish will be interesting new entrants into what is still, despite all hype, a very new market.

Apple Returns to Top Spot in China

Apple Inc was China's top-selling smartphone brand in the final quarter of last year, industry research showed, taking top spot in the world's largest mobile market for the first time since 2015. The newly released iPhone 13 helped Apple outsell Chinese rivals Vivo Communication Technology Co and Oppo Mobile Telecommunications Corp after Huawei Technologies Co plummeted down the rankings, Counterpoint Research said in a report. Apple's sales in the country surged 32 percent even while the overall domestic market shrank 9 percent, hurt by chip shortages and an economic slowdown that have constrained production and consumer demand. The shuffle marks a shift in market dynamics after US curbs on technology exports crippled Huawei's smartphone business, briefly the world's largest. Apple's Chinese market share hit a record 23 percent in the final three months of last year, Counterpoint estimated.

Strong Recovery for India's Smartphone Market in 2021 With a Record 162 million Shipments

India's smartphone market made a strong recovery in 2021 and grew 12% from the previous year, according to research firm Canalys. Smartphone makers shipped a record 162 million devices in last year, despite a difficult start to the year as the country battled a second wave of Covid-19 and navigated supply chain disruptions, according to firm.

"Following a strong comeback in Q3, smartphone vendors shipped 44.5 million devices in Q4 for 2% growth, despite a challenging supply chain," the research firm said in a report on Monday.

Chinese smartphone makers dominated the top five spots in 2021, with Xiaomi leading the way. South Korean phone maker Samsung took second place, while Chinese manufacturer vivo took third position. Shenzhen-based Realme came a close fourth, but for the first time in India, managed to clinch third place in the fourth quarter.

US PCB Sales Up 16.9% in December

IPC announced the December 2021 findings from its North American Printed Circuit Board (PCB) Statistical Program. The book-to-bill ratio stands at 1.17. Total North American PCB shipments in December 2021 were up 16.9 percent compared to the same month last year. Compared to the preceding month, December shipments grew 21.5 percent. PCB year-to-date bookings in December were up 33.6 percent compared to last year. Bookings in December grew 47.1 percent from the previous month.

Manufacturing Loses Steam in China

China's manufacturing sector avoided contraction to expand at a slower pace this month as businesses struggled with a seasonal slowdown, COVID-19 outbreaks and a housing market drop. The official manufacturing purchasing managers' index (PMI) dropped to 50.1, the Chinese National Bureau of Statistics said yesterday, just above the median estimate of 50. The non-manufacturing gauge, which measures activity in the construction and services sectors, fell to 51.1, also marginally above the consensus forecast. The 50-mark separates expansion from contraction. Chinese factories often see a production lull in January and February as workers head home for the Lunar New Year holidays. Activity has also been affected this year by the government's orders for steel plants to trim output to reduce air pollution ahead of the Winter Olympics in Beijing, which begin on Friday. The disruptions add to the woes facing the Chinese economy, with home sales falling and consumption sluggish due to tightened restrictions to contain the spread of the highly contagious Omicron variant of SARS-CoV-2. Residents in places where there have been recent COVID-19 outbreaks — including Beijing, Shanghai, and the northern port city of Tianjin — have been urged to not leave the cities unless necessary.

The Caixin Manufacturing PMI, also released yesterday, fell to 49.1, the worst in almost two years. The private survey focuses on smaller, export-oriented firms compared with the official manufacturing PMI. To spur growth, the People's Bank of China has cut key interest rates, lowered reserve requirements for lenders and vowed to open its toolbox wider in response to top leaders' calls for prioritizing stability. Still, the earliest available indicators tracked by Bloomberg sent mixed signals about the state of the economy this month, with the housing market and consumer spending remaining weak, and business confidence and stocks tumbling.

Construction activity continued to cool this month, with the sub-index falling to 55.4, statistics bureau figures show, suggesting sentiment remained subdued given the property downturn and the limited effect that government spending on infrastructure is having so far.

Meta Aims to Build the World's Fastest AI Supercomputer

Meta, parent company of Facebook, says it has built a research supercomputer that is among the fastest on the planet. By the middle of this year, when an expansion of the system is complete, it will be the fastest, Meta researchers Kevin Lee and Shubho Sengupta write in a blog post today. The AI Research SuperCluster (RSC) will one day work with neural networks with trillions of parameters, they write. The number of parameters in neural network models have been rapidly growing. The natural language processor GPT-3, for example, has 175 billion parameters, and such sophisticated AIs are only expected to grow.

RSC is meant to address a critical limit to this growth, the time it takes to train a neural network. Generally, training involves testing a neural network against a large data set, measuring how far it is from doing its job accurately, using that error signal to tweak the network's parameters, and repeating the cycle until the neural network reaches the needed level of accuracy. It can take weeks of computing for large networks, limiting

how many new networks can be trialed in a given year. Several well-funded startups, such as Cerebras and SambaNova, were launched in part to address training times.

Among other things, Meta hopes RSC will help it build new neural networks that can do real-time voice translations to large groups of people, each speaking a different language, the researchers write.

Tablet and Chromebook Shipments Slowed in the Fourth Quarter but Saw Solid Growth for 2021, According to IDC

Worldwide tablet shipments reached 46 million units during the fourth quarter of 2021 (4Q21), posting a decline for the second time since the pandemic began in 2020. Shipments declined 11.9% year over year in 4Q21 as demand slowed, according to preliminary data from the International Data Corporation (IDC) Worldwide Quarterly Personal Computing Device Tracker. For the full year 2021, total tablet shipments were up 3.2% year over year and reached 168.8 million units, the market's highest level since 2016. Meanwhile, Chromebook shipments declined 63.6% year over year in 4Q21, but managed to grow 13.5% for the full year.

"Though 2021 was a great year for the tablet market, shipments have begun to decelerate as the market has moved past peak demand across many geographies," said Anuroopa Nataraj, senior research analyst with IDC's Mobility and Consumer Device Trackers. "However, shipments in the near future will remain above pre-pandemic levels as virtual learning, remote work, and media consumption remain priorities for users."

"Much of the initial demand for Chromebooks has been satiated in primary markets like the U.S. and Europe and this has led to a slowdown in overall shipments. However, Chromebook demand in emerging markets has seen continued growth in the past year," said Jitesh Ubrani, research manager with IDC's Mobility and Consumer Device Trackers. "Supply has also been unusually tight for Chromebooks as component shortages have led vendors to prioritize Windows machines due to their higher price tags, further suppressing Chromebook shipments on a global scale."

Apple CEO Tim Cook Says Everybody's Seeing Inflationary Pressure

Apple CEO Tim Cook said the company is seeing inflationary pressure in an interview with CNBC's Julia Boorstin on Thursday as the company reported nearly \$124 billion in sales in its December quarter.

"We try to price our products for the value that we deliver, and we are seeing inflationary pressure," Cook said. "I think everybody's seeing inflationary pressure. There's no two ways about that."

The observation from the head of the country's most valuable company comes as the Biden administration and Federal Reserve grapple with questions about how to tame elevated inflation and whether to raise interest rates. The consumer price index, an metric measuring price increases across a basket of consumer goods, rose 7% in December from a year earlier, its fastest annual pace in nearly 40 years. Inflation hasn't hurt Apple's business, which reported rising gross margins in the December quarter, and Apple hasn't raised prices in response to inflation in the United States. Cook didn't rule out the possibility of price increases in his interview with CNBC nor on Apple's earnings call. Cook also said he expects supply chain constraints, which are contributing to inflation, to ease for Apple in the coming months.

Alice, the First All-electric Passenger Airplane, Prepares to Fly

The world's first all-electric passenger aircraft is preparing to take flight. The Alice, a plane developed by Israeli company Eviation, went through engine testing last week at Arlington Municipal Airport north of Seattle. According to Eviation CEO Omer Bar-Yohay, the Alice is just weeks away from its first flight. With battery technology similar to that of an electric car or a cell phone and 30 minutes of charging, the nine-passenger Alice will be able to fly for one hour, and about 440 nautical miles. The plane has a max cruise speed of 250 kts, or 287 miles per hour. For reference, a Boeing 737 has a max cruise speed of 588 miles per hour. The company, focused exclusively on electric air travel, hopes that electric planes that can fit 20 to 40 passengers will be a reality in seven to 10 years.

Japan Factory Production Declines After Record Jump

Production of machinery and chip-making devices pushed factory output down last month, while retail sales and consumer confidence dwindled. Japan's industrial production fell last month following record gains a month earlier, but an overall solid quarter for manufacturing likely helped restore economic growth at the end of last year.

Declines in production of general machinery and chip-making devices pushed overall factory output down 1 percent from the level in November, when it surged a record 7 percent, the economy ministry reported yesterday.

A separate report showed retail sales also dropped 1 percent last month, slipping on a month-on-month basis for the first time since August even before the Omicron variant of SARS-CoV-2 began its rapid spread.

Tech Companies Thrive Despite Shortages

Tech giants Apple, Samsung and Intel reported record revenues this past week. Other companies, such as Lam Research, weren't so fortunate, reporting lower-than-expected numbers and dwindling sales. But if there's one thing these companies can agree on, it's that supply chain disruptions are here to stay. Samsung reported an all-time quarterly high with a Q4 revenue of 76.6 trillion won (\$63.4 billion), which the company says is due in part to its expanded sales in premium smartphones, smart TVs and home appliances. Gross margins did decrease because of a decline in memory prices, according to the company. During its earnings call, executives provided Samsung's business outlook for 2022, expecting growth in several areas, including memory, component business and finished product business, based on expected recovery of the global IT demand. Executives did acknowledge, however, that component shortages are likely to persist well into 2022. Apple also reported record highs with a Q1 revenue of \$123.9 billion, an all-time high for the company and an 11 percent increase YoY. Analyst estimates originally forecasted Apple's Q1 earnings to reach \$118.5 billion and expected mid-single-digit growth in both its iPhone and Mac revenues, which Apple beat with a 9 and 25 percent increase in those areas, respectively.

Apple Reportedly Preparing Low-cost iPhone, iPad for March Launch

Apple could launch new products as soon as March 8, according to a report from Bloomberg. The report says that Apple is preparing to announce a new low-cost 5G iPhone and iPad at the event and potentially a new Mac. The launch would be Apple's first since October 2021, when it revealed new MacBook Pro laptops. It's expected to be a virtual livestream launch, according to Bloomberg. Apple has held virtual events since the start of the Covid-19 pandemic in March 2020. Apple currently offers a low-cost iPhone called the iPhone SE, which was introduced in the spring of 2020, and retails for \$399. It's the most recent iPhone model with

Apple's Touch ID fingerprint sensor. The updated model could have the same design but a faster processor and 5G support, according to the report. The new iPad is expected to be an updated version of the iPad Air, according to the report. That device was last updated in October 2020 and currently retails for \$599. Apple iPad business was the only major product line to report declining sales during the December quarter. Apple said that slowing sales of a \$329 iPad targeted at schools and volume purchasers was the primary reason for the business's decline. Apple's low-cost device launches are less important to the company than its traditional fall launches, which reveal pricier and more profitable high-end iPhone models ahead of the holiday shopping season.

Worldwide Market for Foldable Phones Forecast to Reach 27.6 million Units with a Market Value of \$29 Billion in 2025, According to IDC

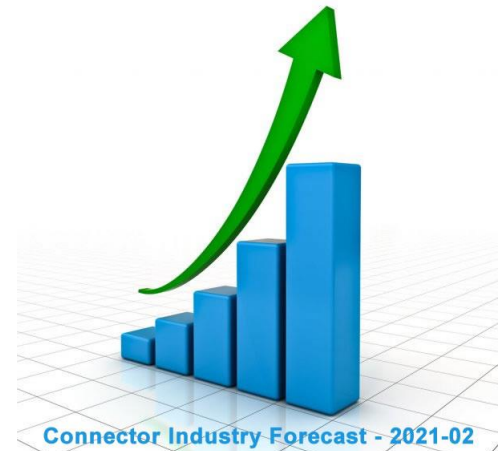
International Data Corporation (IDC) reports worldwide shipments of foldable phones, inclusive of both flip and fold form factors, reach a total of 7.1 million units in 2021. This represents an increase of 264.3% over the 1.9 million units shipped in 2020. A new forecast from IDC projects foldable phone shipments will reach 27.6 million units in 2025 with a compound annual growth rate (CAGR) of 69.9% from 2020 to 2025. The growth in 2021 can largely be attributed to Samsung's recent success, as the Korean giant made waves in the market thanks to its newest foldable flagships. The new design of the Flip3 was a winner for consumers thanks to its compact folding size (pocketable), larger second display, and most importantly its \$999 price tag. The new Fold3 also saw vast improvements but remains much higher in price and more of a niche product overall.

Despite their small market share, foldables represent a major opportunity for vendors. From the consumer point of view, foldables represent the most innovative visual change to happen to smartphones and therefore it is a segment that cannot be ignored by vendors. The commercial segment has also seen foldables being marketed as a replacement for both a phone and a tablet. Although IDC believes adoption of this use case remains low, vendors have made some enticing offers on the latest lineup of foldables that are explicitly targeting business users.

Connector Industry Forecast

Bishop & Associates has just released the **Connector Industry Forecast**. This eight-chapter report provides an in-depth, and detailed forecast of the worldwide connector industry. In addition to the detailed forecasts for each region of the world (North America, Europe, Japan, China, Asia Pacific, and ROW), an industry overview is included which provides current market trends, including connector confidence level, currency fluctuation effects, and industry sales performance, as well as an outlook narrative.

Worldwide and each regional forecast includes:



Computers & Peripherals

- Mobile Computers
- Desktops
- Servers
- Storage Equipment
- Input/Output Equipment
- Communication LAN Devices
- Other Computer Equipment

Business/Office Equipment

- Retail/POS Equipment
- Imaging Systems
- Other Business/Office Equipment

Instrumentation

- Automatic Test Equipment
- Analytical/Scientific Instruments
- Other Instrumentation

Medical Equipment

- Diagnostic & Imaging Equipment
- Therapeutic Equipment
- Other Medical Equipment

Industrial

- Factory Automation and Machinery
- Construction and Civil Engineering
- Energy Markets
- Other Industrial Equipment

Automotive

- Body Wiring & Power Distribution
- Powertrain
- Comfort, Convenience & Entertainment
- Navigation & Instrumentation
- Safety & Security

Transportation (non-auto)

- Commercial Vehicles
- RVs & Power Sports
- Commercial Air
- Marine
- Rail
- Construction
- Farm & Garden

Military/Aerospace

Telecom/Datacom

- Carrier Network
- Enterprise Network
- Wireless Infrastructure
- Subscriber Equipment
- Other Telecommunications

Consumer

- Personal/Portable Consumer
- Home Video Equipment
- Home Audio Equipment
- Consumer White Goods
- Other Consumer

Other Equipment

2021 – Proving to be a Year Even More Surprising Than 2020!

After what we thought would be one of the most challenging years ever, 2021 is showing to be even more surprising than 2020. Declining a mere -2.2%, 2020 started off with sales anticipated to grow 3.5%. As the pandemic exploded, affecting key economies like China and the US, we revisited our original forecast and sent the forecast spiraling downward \$20 billion, reflecting a decrease of -30.8%.

By third quarter once again things had changed directions and sales moved from declining double-digits to positive year-over-year growth. This would allow 2020 to close with connector sales only declining -2.2%.

As we moved into 2021, we anticipated growth due to easy comparisons to 2020, but no one anticipated 11 straight months of double-digit growth and a year-to-date book-to-bill ratio of 1.14!

Industry Sales Performance by Region

As the following charts indicate, growth and decline were not equal across all regions in 2020 or will they be in 2021. China, who came out of lockdown the earliest was the only region to see connector sales grow in 2020, increasing 3.6%. North America, who proved to the world that they could rapidly divert manufacturing capacity from one industry to another, saw connector sales drop 2.8%. The greatest decline was seen in Japan, where connector industry sales dropped 9.4% or over \$460 million dollars.

**2019 and 2020 Connector Sales by Region
With Percent Change**

Region	2019	2020	Percent Change
North America	\$13,887.0	\$13,491.5	-2.8%
Europe	\$13,544.2	\$12,837.5	-5.2%
Japan	\$4,891.4	\$4,430.9	-9.4%
China	\$19,477.4	\$20,184.3	3.6%
Asia-Pacific	\$9,435.4	\$9,045.0	-4.1%
ROW	\$2,933.7	\$2,737.5	-6.7%
Total World	\$64,169.1	\$62,726.7	-2.2%

\$ Millions

Growth in 2021 is also going to vary drastically based on region. Although the ROW region is anticipated to show the greatest year-over-year growth from a percentage standpoint, from a US dollar standpoint, the greatest growth is anticipated to be seen in China, where sales dollars will increase by over \$X.7 billion.

Connector Industry Forecast

In addition to connector sales results varying by region, sales also varied remarkably by market sector in 2020. As the table below shows, the telecom/datacom market grew 1.5%, spurred by increased Internet activity and the drive towards 5G. In line with this growth, was the very slight decline in computers & peripherals. This market sector, which saw sales decline 7.2% from 2018 to 2019, showed a strong rebound linked directly to telecommuting of both business professionals and students.

The market sector showing the greatest decline was the automotive sector, where sales dropped a steep 7.0%. This was primarily due to auto plants being shuttered and most dealers being forced to close showrooms. In fact, in the US, 2020 was the fourth-largest annual decline in automotive sales since 1980. What is surprising is that the industrial market, tied heavily to automotive production, saw connector sales decline only 2.3% due to the repurposing of many off these factories. Also showing a steep decline was the transportation sector, where sales dropped 3.0%. What is unique about this decline is that not only was it spurred by travel restrictions placed worldwide, but also due to the unique problems facing the commercial aerospace industry in 2019 that rolled over into 2020.

**2019 and 2020 Connector Sales by Market Sector
With Percent Change**

Equipment Sector	2019	2020	YOY Change
Computers & Peripherals	\$8,380.2	\$8,355.0	-0.3%
Business/Office Equipment	\$754.0	\$724.2	-4.0%
Instrumentation	\$1,836.1	\$1,811.7	-1.3%
Medical	\$1,985.8	\$1,966.6	-1.0%
Industrial	\$7,901.6	\$7,721.8	-2.3%
Automotive	\$15,209.7	\$14,145.8	-7.0%
Transportation	\$4,479.2	\$4,344.6	-3.0%
Military/Aerospace	\$3,796.6	\$3,770.6	-0.7%
Telecom/Datacom	\$14,269.2	\$14,479.4	1.5%
Consumer	\$3,108.8	\$3,038.4	-2.3%
Other Equipment	\$2,447.8	\$2,368.6	-3.2%
Total World	\$64,169.1	\$62,726.7	-2.2%

\$ Millions

2021 Outlook

Due to outstanding performance through the first nine months of 2021, Bishop is forecasting 2021 sales to grow by Y.Y% to \$7X,XXX million. We anticipate the greatest percentage increase will occur in ROW, where sales will increase Y.Y%, followed by Europe where sales will increase Y.Y%. In US dollars, the smallest growth will be seen in the Japanese region, where connector sales will increase by \$X11.8 million or Y.Y%. The Japanese region will be followed by ROW, where sales will only grow \$8XX.3 million or Y.Y%.

Connector Industry Forecast

2021F Connector Forecast by Geographic Region With Percent Change

Region	2020	2021F	YOY Change
North America	\$13,491.5	\$XX,XXX.X	X.X%
Europe	\$12,837.5	\$XX,XXX.X	X.X%
Japan	\$4,430.9	\$X,XXX.X	X.X%
China	\$20,184.3	\$XX,XXX.X	X.X%
Asia-Pacific	\$9,045.0	\$X,XXX.X	X.X%
ROW	\$2,737.5	\$X,XXX.X	X.X%
Total World	\$62,726.7	\$7X,XXX.X	X.X%

\$ Millions

Forecast Assumptions

Forecasting is always difficult. Projecting future business conditions in this environment is almost impossible. The following are the assumptions we are using to develop the connector industry forecast.

- We are in the middle of a global pandemic, with efforts continuing to vaccinate much of the population in hope of achieving herd immunity in key societies.
- Inflation is increasing, as are interest rates, causing consumers to hold off on large purchases such as recreational vehicles, second homes, and personal watercraft.
- World GDPs are slowing, particularly in the two largest economies (China and the US).
- We have a semiconductor shortage that is predicted to last through most of 2022. This has already affected the automotive and consumer electronics/appliances industry extensively.
- We have a global supply chain backlog, with shipping containers gridlocked, a global shortage of truck and crane operators, and rising transportation costs (fuel and maintenance)
- There is a shortage of oil and gas in the US.
- China has launched a supersonic missile and is threatening Taiwan.
- North Korea is once again launching missiles.
- Iran is ramping up its nuclear program.
- Afghanistan is being led by the Taliban, an organization that is notorious for cruelty and aggression.

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Connector Industry Forecast

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Connector Industry Forecast

Chapter 2 – World Connector Forecast (continued)

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Chapters 4 Thru 8 Provide the Same Detail Level as Chapter 3

- Chapter 4 – European Connector Forecast
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