The Bishop Report
Performance and Forecast of the World Connector Industry

Issue No. 350 | 1st Quarter 2022 | January 2022

2021 Sales Up +24.3% to $78.0 Billion
Industry Backlog at $21.4 Billion!

Regional Performance:
Worldwide year-to-date sales increased +24.3%.

At +31.2% YTD, ROW is showing the highest sales growth.

ROW also has the highest YTD growth in bookings at +44.0% in December.

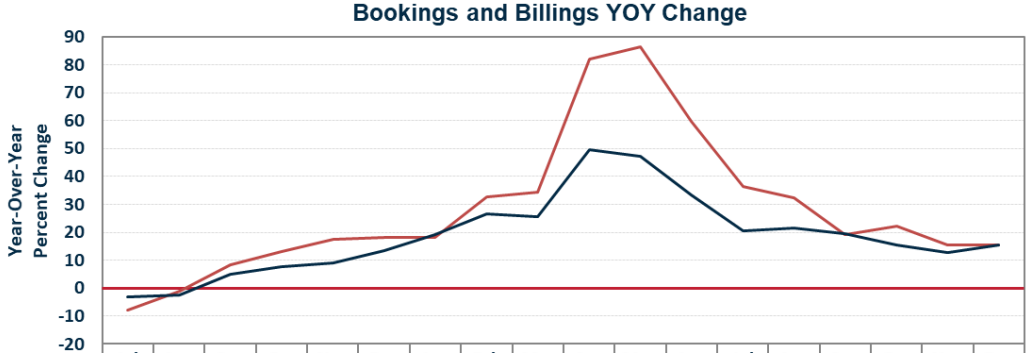
Industry Results:
Industry sales totaled $77,991 million through December, a growth of +24.3% over 2020. Bookings totaled $88,910 million, up +36.0% over 2020.

Industry Backlog:
December backlog increased to $21,449 million equaling 14.3 weeks. This is an increase of 167% since January 2020. This is unprecedented in industry history.

2021 Currency Impact:
The industry grew at +21.8% YTD in December in local currencies versus +24.3% in USD.

December sales and bookings were both up +15.5% YOY. 4Q21 sales were up +14.3%. Orders have achieved 15 consecutive months of double-digit increases and sales have achieved 16 consecutive months of growth.

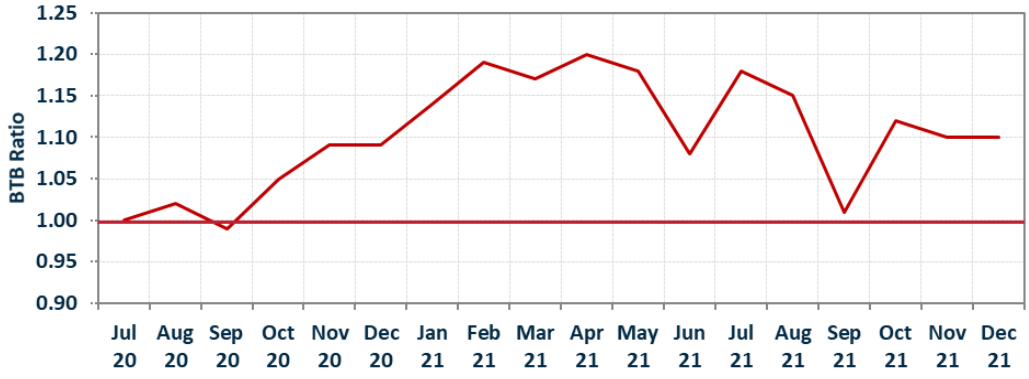
Bookings and Billings YOY Change



	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21
Bookings	-7.8	-1.2	8.4	13.0	17.5	18.3	18.0	32.8	34.5	81.9	86.4	59.7	36.4	32.5	19.1	22.1	15.3	15.5
Billings	-3.3	-2.4	5.0	7.6	9.1	13.4	19.0	26.7	25.5	49.5	47.1	33.5	20.6	21.5	19.4	15.3	12.8	15.5

The book-to-bill ratio in December was 1.10 as orders and billings continue normalizing with harder comparisons. YTD, the book-to-bill ratio is 1.14.

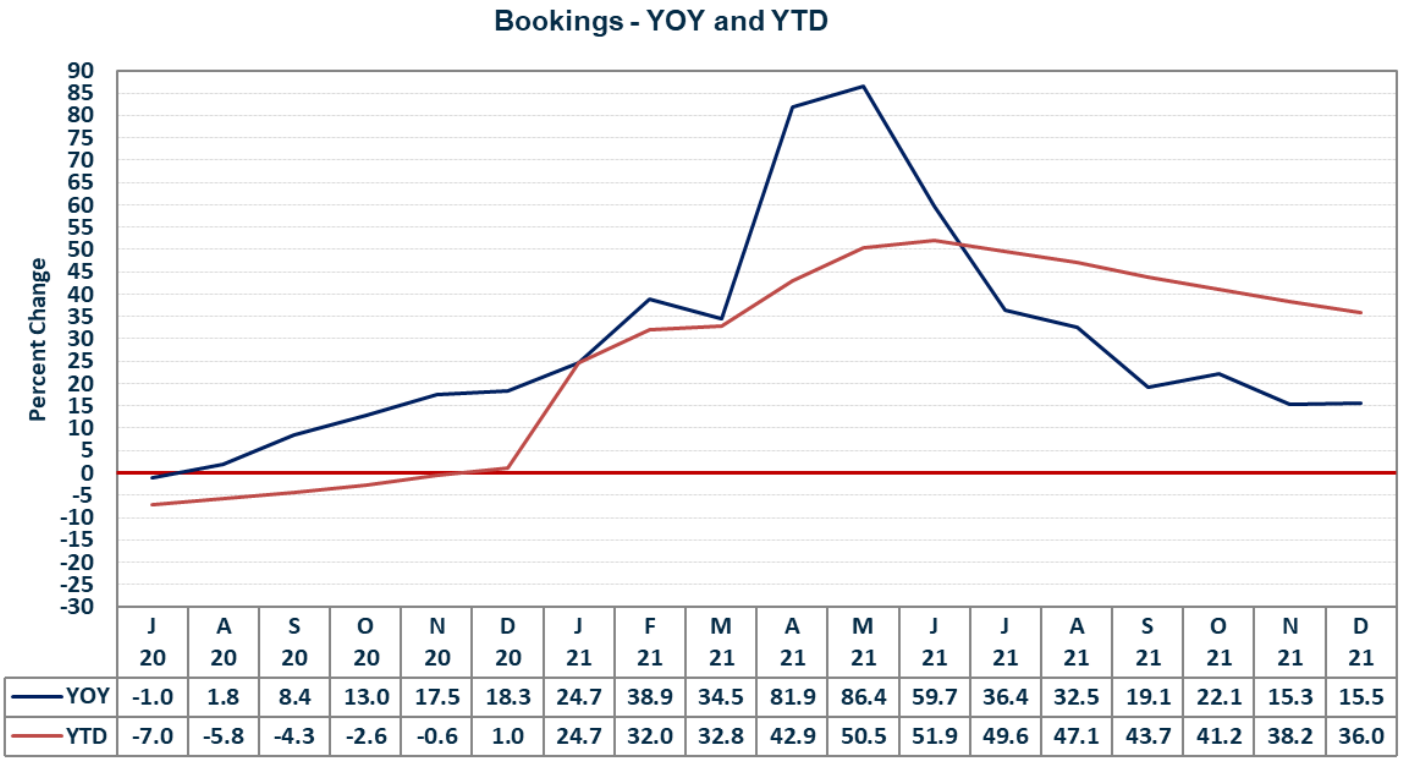
Connector Industry Book-to-Bill



Booking Highlights and Conclusions

Sequential, Year-Over-Year, and Year-To-Date Bookings Percentage Change – 2019/2020/2021

	Sequential			Year-Over-Year			Year-To-Date		
Month	2019	2020	2021	2019	2020	2021	2019	2020	2021
Jan	1.0%	0.2%	2.3%	-3.7%	3.9%	24.7%	-3.7%	3.9%	24.7%
Feb	7.7%	5.5%	17.7%	-6.2%	1.8%	38.9%	-5.0%	2.8%	32.0%
Mar	-4.5%	-1.4%	-3.5%	-6.8%	5.0%	34.5%	-5.6%	3.5%	32.8%
Apr	-2.2%	-27.2%	3.2%	-8.8%	-21.8%	81.9%	-6.4%	-2.7%	42.9%
May	6.9%	2.9%	5.1%	-7.0%	-24.8%	86.4%	-6.5%	-7.3%	50.5%
Jun	-8.9%	7.0%	-8.3%	-8.3%	-11.6%	59.7%	-6.9%	-8.0%	51.9%
Jul	2.8%	15.2%	-1.9%	-8.4%	-1.0%	36.4%	-6.9%	-7.0%	49.6%
Aug	7.8%	10.7%	6.6%	-5.2%	1.8%	32.5%	-6.6%	-5.8%	47.1%
Sep	-7.1%	-0.9%	-11.9%	-4.3%	8.4%	19.1%	-6.4%	-4.3%	43.7%
Oct	0.6%	4.7%	6.8%	-6.6%	13.0%	22.1%	-6.4%	-2.6%	41.2%
Nov	10.8%	15.2%	9.3%	-1.9%	17.5%	15.3%	-6.0%	-0.6%	38.2%
Dec	-7.8%	-7.2%	-7.0%	4.6%	18.3%	15.5%	-5.2%	1.0%	36.0%



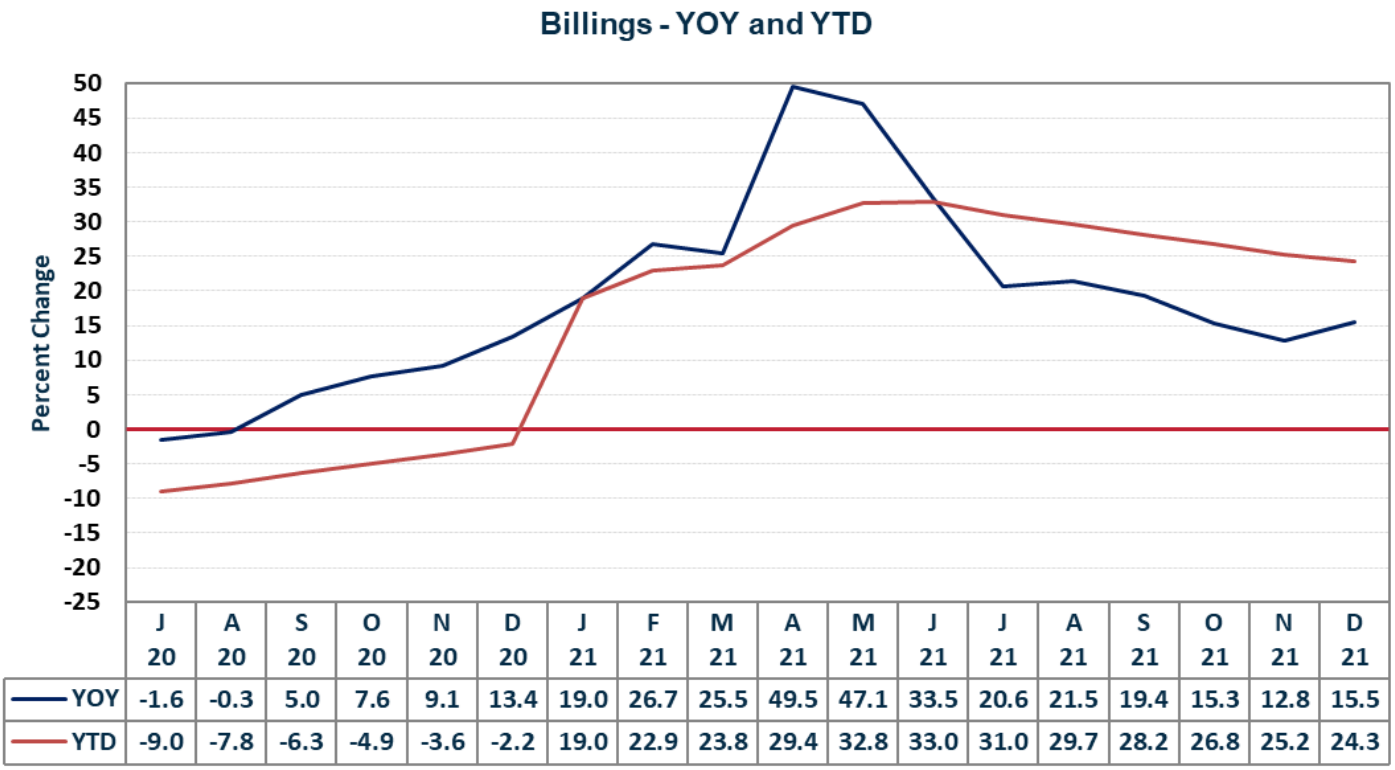
	J 20	A 20	S 20	O 20	N 20	D 20	J 21	F 21	M 21	A 21	M 21	J 21	J 21	A 21	S 21	O 21	N 21	D 21
YOY	-1.0	1.8	8.4	13.0	17.5	18.3	24.7	38.9	34.5	81.9	86.4	59.7	36.4	32.5	19.1	22.1	15.3	15.5
YTD	-7.0	-5.8	-4.3	-2.6	-0.6	1.0	24.7	32.0	32.8	42.9	50.5	51.9	49.6	47.1	43.7	41.2	38.2	36.0

- December bookings rose +15.5% YOY and +36.0% YTD.
- Orders decreased -7.0% sequentially.
- The book-to-bill ratio for December was 1.10 and remained at 1.14 YTD.

Billing Highlights and Conclusions

Sequential, Year-Over-Year, and Year-To-Date Billings Percentage Change – 2019/2020/2021

	Sequential			Year-Over-Year			Year-To-Date		
Month	2019	2020	2021	2019	2020	2021	2019	2020	2021
Jan	0.3%	-2.8%	-1.6%	-1.0%	-3.1%	19.0%	-1.0%	-3.1%	19.0%
Feb	6.8%	5.5%	12.6%	-2.5%	-4.3%	26.7%	-1.8%	-3.7%	22.9%
Mar	-3.2%	-0.9%	-1.1%	-2.4%	-2.0%	25.5%	-2.0%	-3.1%	23.8%
Apr	-3.7%	-21.2%	-1.2%	-5.4%	-19.9%	49.5%	-2.8%	-7.2%	29.4%
May	9.0%	8.8%	7.0%	-4.3%	-20.0%	47.1%	-3.1%	-9.9%	32.8%
Jun	-4.2%	5.8%	-3.8%	-4.2%	-11.6%	33.5%	-3.3%	-10.2%	33.0%
Jul	-2.0%	9.0%	-2.0%	-3.1%	-1.6%	20.6%	-3.3%	-9.0%	31.0%
Aug	7.0%	9.0%	8.7%	-4.9%	-0.3%	21.5%	-3.5%	-7.8%	29.7%
Sep	-2.9%	1.7%	-2.3%	-3.7%	5.0%	19.4%	-3.4%	-6.3%	28.2%
Oct	-4.1%	-1.0%	-3.4%	-6.9%	7.6%	15.3%	-3.7%	-4.9%	26.8%
Nov	9.8%	11.4%	9.4%	-3.4%	9.1%	12.8%	-3.7%	-3.6%	25.2%
Dec	-11.2%	-7.7%	-5.6%	-0.1%	13.4%	15.5%	-3.8%	-2.2%	24.3%

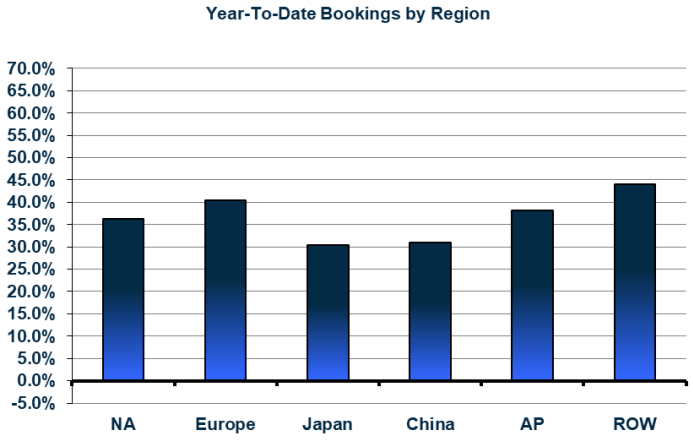


- December billings grew +15.5% YOY, making this the 16th consecutive month of increases.
- Billings are up +24.3% for the year and up +14.3% for 4Q21.
- Sequentially billings decreased -5.6% in December.

Regional Performance: BOOKINGS

December 2021 Bookings

Region	Sequential	YOY	YTD
NA	-4.7%	18.9%	36.2%
Europe	-9.0%	13.5%	40.4%
Japan	-5.1%	11.1%	30.5%
China	-8.1%	10.5%	30.9%
AP	-21.6%	8.5%	38.1%
ROW	74.6%	86.5%	44.0%
Total	-7.0%	15.5%	36.0%

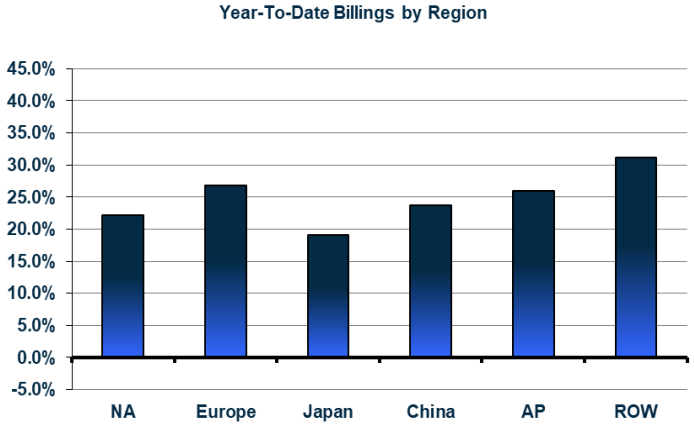


- December bookings increased +15.5% YOY and increased +36.0% YTD.
- Year-over-year, all regions experienced growth.
- Year-over-year comparisons through September had been relatively easy because COVID-19 was still impacting orders at that time last year. The growth rate slowed in the fourth quarter.
- Bookings have increased every month since August 2020. That is 17 consecutive months of year-over-year growth in which 15 months were in double-digits.
- The industry achieved +86.4% order growth in May 2021, making May the largest intake of new orders in industry history.

Regional Performance: BILLINGS

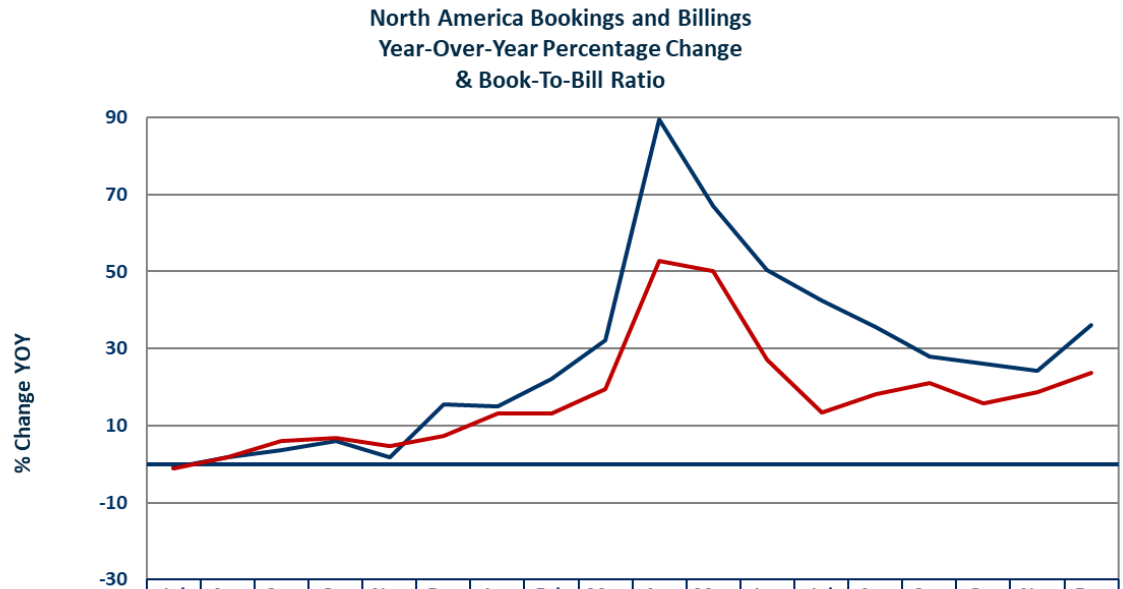
December 2021 Billings

Region	Sequential	YOY	YTD
NA	-1.9%	23.7%	22.2%
Europe	-9.0%	13.9%	26.8%
Japan	-4.5%	8.0%	19.1%
China	-5.2%	12.8%	23.8%
AP	-7.1%	12.9%	25.9%
ROW	-7.1%	17.6%	31.2%
Total	-5.6%	15.5%	24.3%



- December connector sales growth was +15.5% YOY and +24.3% YTD.
- Year-over-year and year-to-date, all regions experienced growth.
- Sequentially, sales decreased in all regions in December.
- 4Q21 sales growth was strong at +14.3%. Actual sales were comparable to Q1, Q2 and Q3. The growth rate was less because Q4 2020 was the beginning of improved demand resulting from pent-up demand from the COVID-19 lockdowns.
- The industry has now achieved 16 consecutive months of sales growth of which 13 months were in the double-digits.
- April 2022 sales increased +49.5%, a new single month industry record.

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.



	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21
Bookings	-0.8	1.9	3.5	5.9	1.9	15.5	15.0	22.1	32.1	89.5	67.0	50.5	42.4	35.5	28.0	26.0	24.2	36.2
Billings	-1.2	1.9	6.0	6.8	4.6	7.3	13.2	13.0	19.4	52.7	50.1	27.2	13.4	18.2	21.1	15.8	18.7	23.7
Billing SEQ	7.4	10.6	-3.9	-2.4	4.9	-5.7	-2.1	14.9	-1.7	0.4	8.2	23.7	-1.2	14.9	-5.3	-4.4	7.8	-1.9
BTB	0.93	0.99	0.93	1.01	1.01	1.10	1.14	1.18	1.18	1.23	1.13	1.18	1.16	1.13	1.01	1.14	1.11	1.07

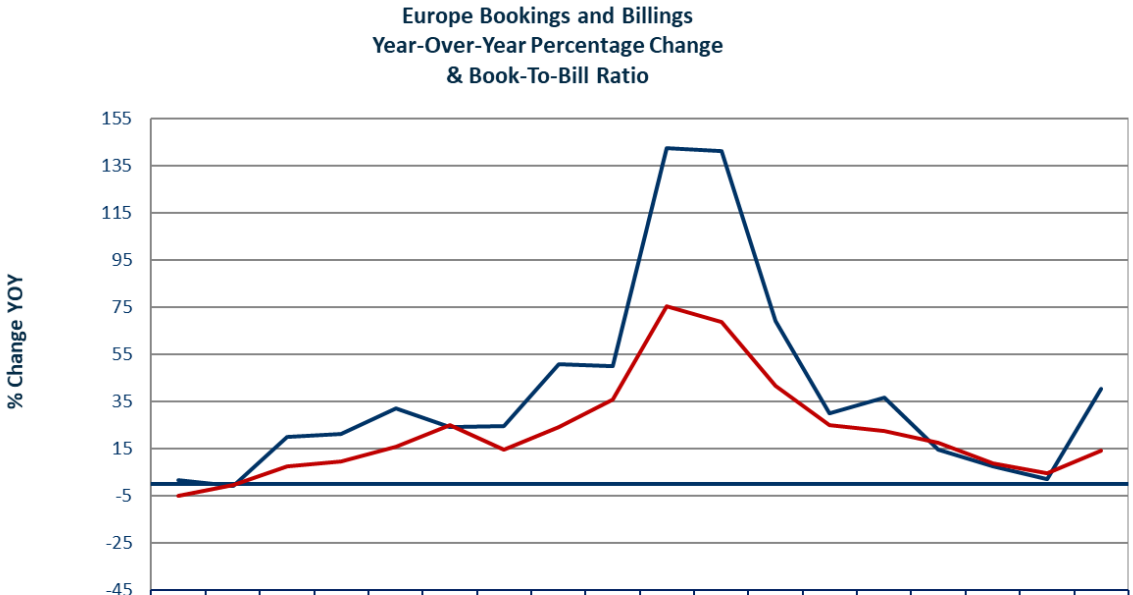
North America Performance

- Sales grew +23.7% and orders were up +36.2% YOY in December. North American billings were down sequentially -1.9%. The book-to-bill remained strong at 1.07.
- The US GDP grew 6.9% YOY in 4Q21, the largest gain since 1984. For 2021, GDP was up 5.7%.
- US inflation hit 7.0% in December, the fastest pace since 1982.
- Industrial production increased to 5.0% YOY in November and 3.7% in December.
- Manufacturing PMI was to 58.3 in November and 57.7 in December.
- US unemployment fell to 4.6% in October, the lowest rate since March 2020.
- US housing starts unexpectedly increased 8.1% MOM in November and 1.4% in December.
- Retail sales were up 16.9% YOY in December and 18.2% in November.
- US automotive sales in December decreased 27% YOY in December finishing 2021 up 3.3%.

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, supply chain issues, and resurging COVID-19 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 will 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.



	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21
Bookings	1.7	-1.0	19.7	21.0	32.1	24.1	24.5	50.8	49.9	142.2	141.2	69.2	29.9	36.8	14.5	7.6	2.1	40.4
Billings	-5.0	-0.4	7.5	9.3	15.7	24.8	14.6	24.1	35.6	75.4	68.7	41.4	25.0	22.5	17.6	8.8	4.6	13.9
Billing SEQ	11.2	11.2	3.4	-0.2	16.4	-15.8	1.6	24.7	-3.6	-5.3	10.3	45.7	-5.5	8.6	-1.8	-7.4	12.5	-9.0
BTB	1.09	1.00	1.00	1.06	1.13	1.13	1.18	1.28	1.20	1.23	1.22	1.13	1.14	1.12	0.98	1.08	1.06	1.13

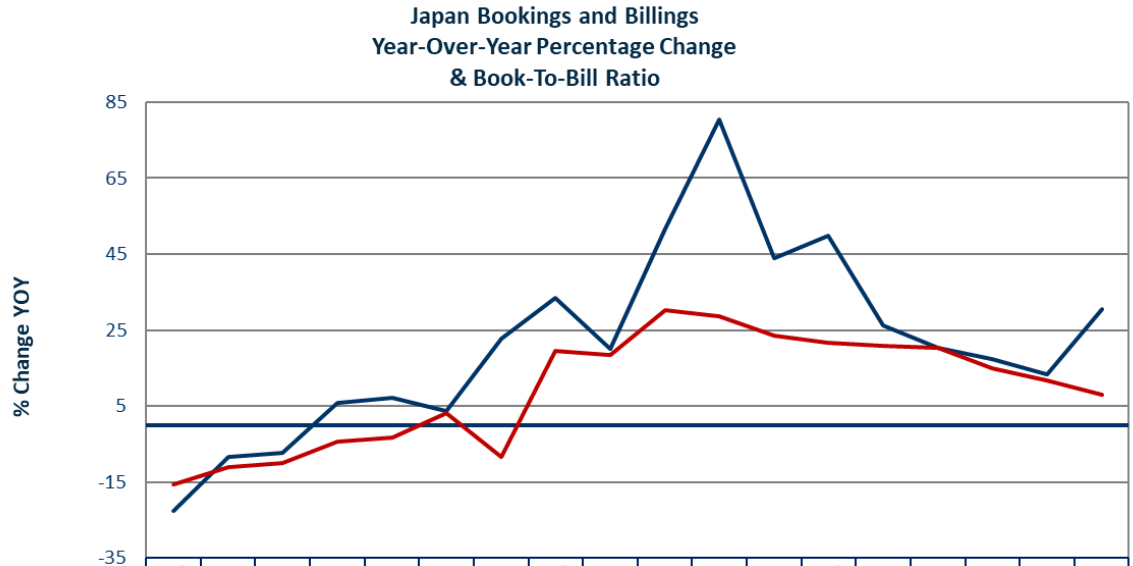
Europe Performance

- YOY billings grew +13.9% and orders were up +40.4%. The book-to-bill ratio was 1.13. Sequentially, sales were down -9.0%.
- Euro area industrial production decreased 1.5% YOY in November ending an eight-month growth run.
- The December manufacturing PMI was 58.0 down from 58.4 in November.
- November retail sales increased 7.8%% YOY and increased 1.0% sequentially.
- The inflation rate was 5.0% in December, up from 4.9% in November.
- Year-over-year, Euro area new car registrations were down 22.0% due to the semiconductor shortages. For 2021, sales dropped 1.5%.
- The unemployment rate dropped to 7.2% in November from 7.3% in October.

Conclusions

European new car registrations were down significantly again in December 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, and supply chain shortages will likely mute 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.



	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21
Bookings	-22.6	-8.5	-7.3	5.9	7.1	3.6	22.6	33.5	20.1	51.6	80.4	43.9	49.7	26.3	20.4	17.4	13.3	30.5
Billings	-15.6	-11.2	-10.1	-4.5	-3.2	3.1	-8.5	19.6	18.5	30.3	28.7	23.6	21.8	20.8	20.4	15.0	11.6	8.0
Billing SEQ	7.5	10.2	5.7	-5.1	12.4	-1.2	16.9	17.9	-4.3	-2.8	0.3	28.6	1.0	5.4	-3.4	-4.5	9.7	-4.5
BTB	0.93	1.02	1.00	1.10	1.11	1.10	1.03	1.13	1.06	1.22	1.23	1.10	1.17	1.10	1.08	1.14	1.13	1.14

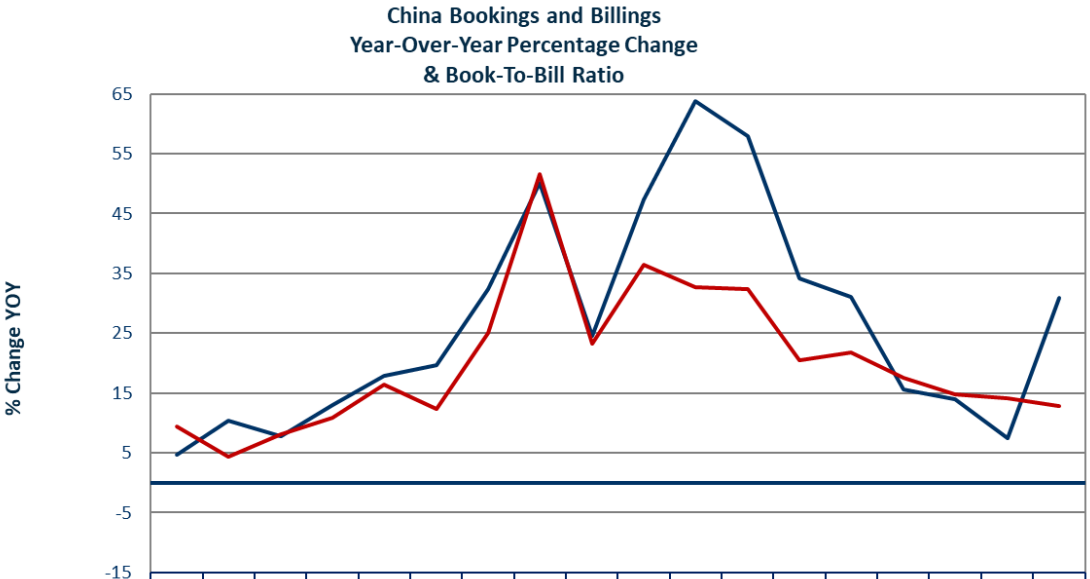
Japan Performance

- Bookings were up +30.5% in December. Sales increased +8.0%. Sequentially, sales decreased -4.5%. Japan's book-to-bill ratio was 1.14.
- Industrial production was -4.1% YOY in October and 5.1% in November.
- October retail sales was 0.9% YOY and November increased 1.9%.
- The unemployment rate was at 2.8% in November.
- Exports increased 9.4% YOY in October. Exports to the US rose shrank 0.4%. Exports of semiconductor machinery was up 45.1%. Export of cars shrank 40.9%.
- The December manufacturing PMI decreased to 54.3 (revised) from 54.5 in November.

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 booking and sales performance, in the last 11 months, primarily reflects easy comparisons to the poor results in 2020.

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.



	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21
Bookings	4.7	10.3	7.7	13.0	17.8	19.6	32.3	50.2	24.5	47.3	63.8	58.0	34.2	31.1	15.5	13.9	7.5	30.9
Billings	9.4	4.3	8.1	10.9	16.4	12.3	25.0	51.6	23.3	36.5	32.7	32.3	20.4	21.7	17.6	14.8	14.1	12.8
Billing SEQ	5.2	5.6	4.8	0.0	12.0	-4.2	-3.2	3.1	2.0	-0.4	4.2	28.6	0.3	5.6	0.9	-2.4	11.1	-5.2
BTB	0.99	1.09	1.02	1.05	1.10	1.05	1.14	1.12	1.11	1.19	1.21	1.14	1.12	1.18	1.00	1.08	1.00	1.03

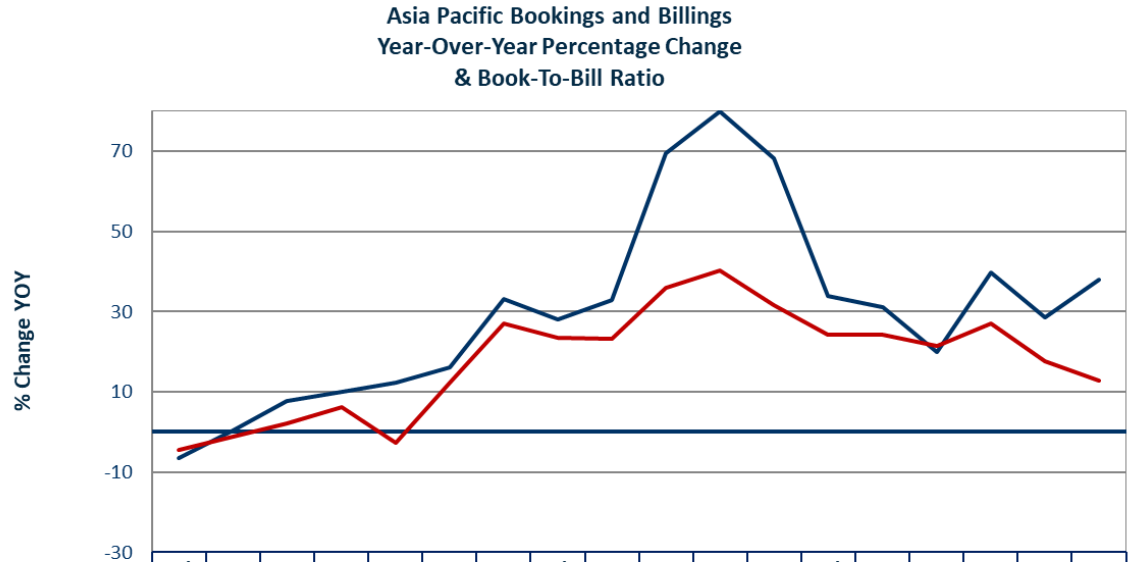
China Performance

- Sales and orders, year-over-year, increased +12.8% and +30.9%, respectively. The BTB was 1.03. Sequentially, sales decreased -5.2% in December.
- 4Q21 GDP grew 4.0% YOY, the slowest growth since 2Q20. Sequentially, GDP grew 1.6%, the highest quarterly growth in 2021.
- Industrial production increased 3.8% YOY in November and 4.3% in December, in-spite curbs to slow COVID-19 and control supply chain shortages.
- China’s manufacturing PMI rose to 50.9 in December from 49.9 in November.
- Retail sales declined to 1.7% YOY in December from 3.9% in November.
- Exports from China were up 29.9% YOY in 2021 to $3.3 trillion.
- China's auto sales were up 5.4% YOY in December. Sales for 2021 declined 1.9%.

Conclusions

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

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.



	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21
Bookings	-6.4	0.3	7.8	9.9	12.3	16.1	33.2	28.1	32.8	69.4	80.0	68.3	33.9	31.1	20.0	39.7	28.7	38.1
Billings	-4.5	-1.2	2.1	6.1	-2.6	12.2	27.1	23.5	23.2	36.1	40.3	31.8	24.3	24.3	21.4	27.0	17.6	12.9
Billing SEQ	14.8	7.0	1.7	0.5	11.8	-3.4	-0.5	2.0	0.7	5.6	5.7	40.6	-2.6	4.4	-3.1	4.7	4.4	-7.1
BTB	1.01	1.01	1.05	1.07	1.09	1.08	1.14	1.17	1.24	1.23	1.24	1.09	1.09	1.09	1.06	1.23	1.50	1.04

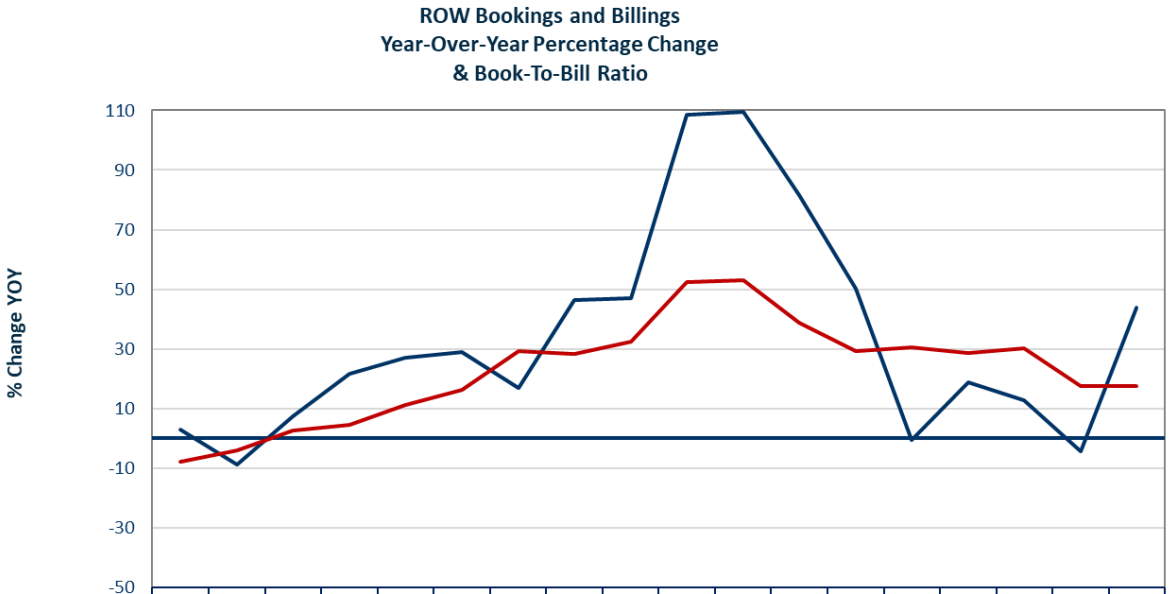
Asia Pacific Performance

- Orders were up +38.1% in December and sales rose +12.9% YOY. The book-to-bill ratio was 1.04. Sequentially, sales decreased -7.1%.
- India's industrial production grew 1.4% YOY in November. Exports were up 38.9% YOY in December to a record $37.8 billion driven by oil products and coffee. The manufacturing PMI declined to 55.5 in December from 57.6 in November. Inflation in December was 5.59%.
- South Korea's industrial production rose 5.9% YOY in November. Exports increased 0.5% sequentially in December. The manufacturing PMI rose to 51.9 in December from 50.9 in November.

Conclusions

In spite of a recent surge in COVID-19 cases, exports in India continue to increase. South Korea's GDP continues to grow 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.



	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21
Bookings	3.0	-8.8	7.4	21.7	27.1	29.1	17.0	46.5	47.1	108.7	109.6	81.6	50.2	-0.6	18.9	12.7	-4.3	44.0
Billings	-7.8	-4.1	2.8	4.5	11.1	16.4	29.3	28.2	32.3	52.5	53.1	38.9	29.1	30.6	28.6	30.2	17.6	17.6
Billing SEQ	19.1	10.8	2.4	-0.9	10.5	-5.9	0.0	12.3	-2.4	-4.0	12.2	41.5	-0.5	10.9	-4.3	1.3	1.9	-7.1
BTB	1.10	0.98	0.98	1.09	1.15	1.16	1.09	1.33	1.20	1.17	1.20	1.23	1.29	0.74	0.93	1.01	0.85	1.89

Rest of World Performance

- Orders increased +44.0% and sales increased +17.6% YOY in November. Sequentially, sales in the region decreased -7.1%. The book-to-bill ratio was 1.89.
- Brazil's industrial production decreased 4.4% YOY in November, the fourth consecutive month of declines. The inflation rate decreased to 10.06% in December. The manufacturing PMI remained at 49.8 in December.
- Russia's industrial production increased 7.0% YOY in November. Exports increased 5.1% sequentially in November. The inflation rate came in at 8.39% YOY in December. The unemployment rate remained at 4.3% in November.

Conclusions

Both Brazil and Russia continue to have growth in their connector industries, which are outperforming their national economies. Both countries will achieve connector industry growth in 2021.

Sales have experienced double-digit growth since November 2020.

4Q21 Connector Industry Results

Industry sales increased +14.3% YOY in 4Q21 to $19,780 million.

The following table shows industry sales by quarter for 2019, 2020, and 2021. Our full year 2021 results is $77,991 million, up +24.3% from prior year. This is amazing results considering the continuing impact of COVID-19 on the worldwide economy.

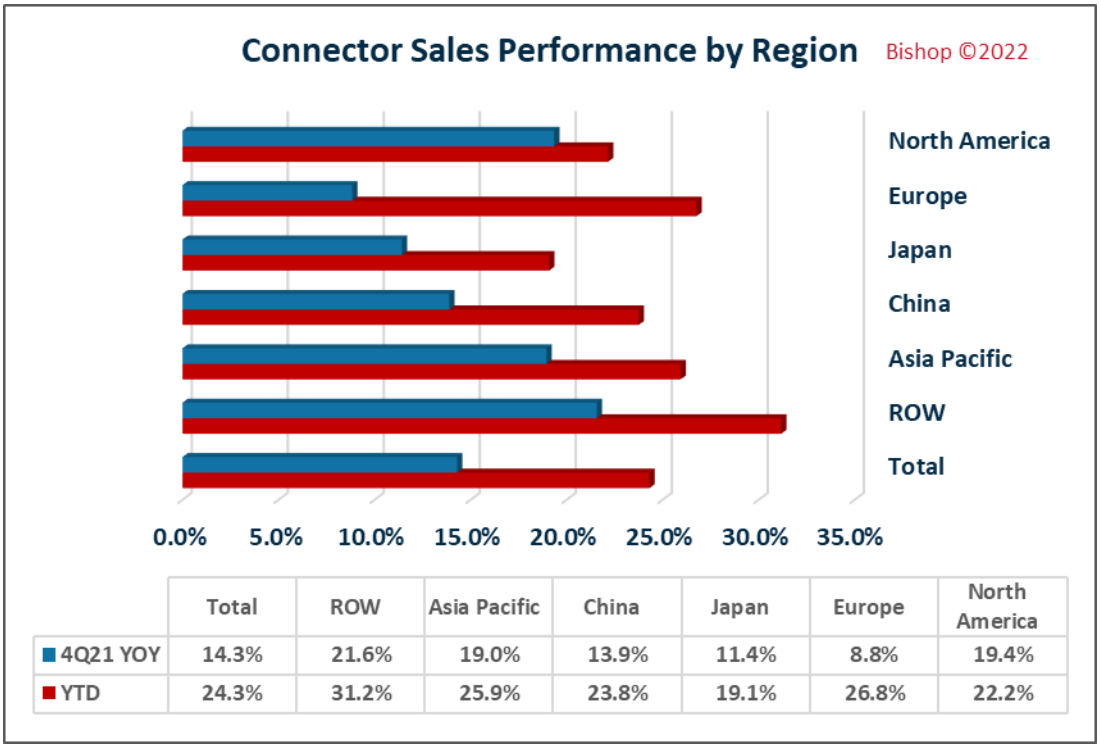
Connector Industry Quarterly Sales Results

2019, 2020, and 2021

Quarter	2019 Actual	2020 Actual	YOY Change	2021 Results	YOY Change
1Q	$15,890	$15,397	-3.1%	$19,061	23.8%
2Q	$16,097	$13,333	-17.2%	$19,000	42.5%
3Q	$16,475	$16,689	1.3%	$20,150	20.7%
4Q	$15,707	$17,308	10.2%	$19,780	14.3%
Total	$64,169	$62,727	-2.2%	$77,991	24.3%

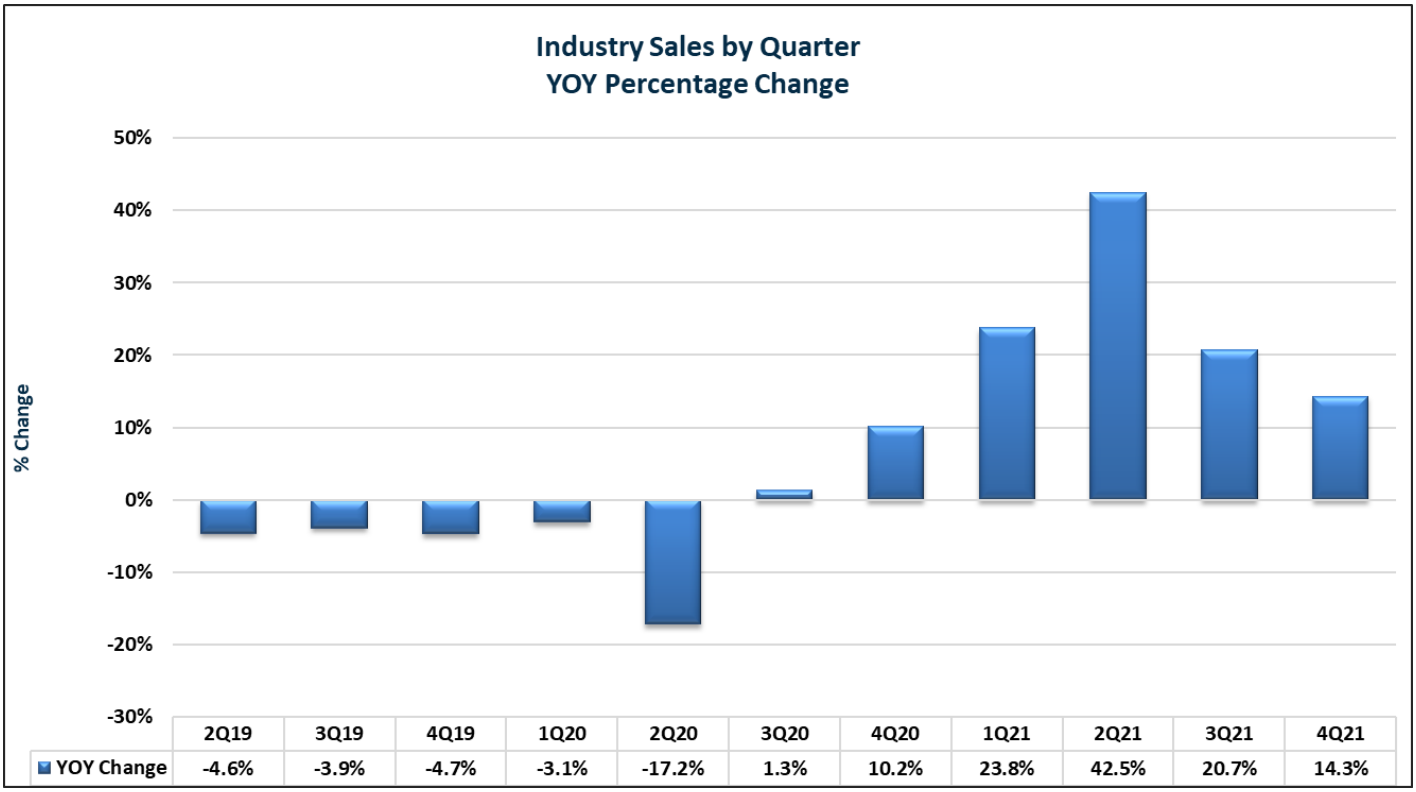
$ Million, Bishop ©2021

Sales growth by region in the fourth quarter and for the full year 2021 can be seen in the following chart.



	Total	ROW	Asia Pacific	China	Japan	Europe	North America
4Q21 YOY	14.3%	21.6%	19.0%	13.9%	11.4%	8.8%	19.4%
YTD	24.3%	31.2%	25.9%	23.8%	19.1%	26.8%	22.2%

Connector industry sales growth can be seen in the following chart by quarter. In this last contraction, the industry contracted for seven consecutive quarters. Prior to that, the industry achieved eleven consecutive quarters of growth. We have now achieved six consequtive quarters of growth.



Backlog Increases to $21.4 Billion

Full year 2021 orders were $88,910 million and sales were $77,991 million, making the book-to-bill ratio1.14. Both orders and sales set new industry records.

The backlog is now $21,499 million, also a new industry record.

Industry Backlog

	2020	YTD Dec 2021
BtB Ratio	1.04	1.14
Beginning Backlog	$8,021	$10,530
Bookings	$65,236	$88,910
Billings	$62,727	$77,991
Ending Backlog	$10,530	$21,499
Backlog in Weeks	8.7	14.3

$ Millions

We have now experienced 17 consecutive months of a book-to-bill ratio above 1.0. Industry backlog has increased from $8,021 million in January 2020 to $21,499 million at the end of 2021. This is an increase of $13,428 million, up +167%. This is unprecedented in industry history.

In 2021, we averaged $1.5 billion sales per week. Our backlog is now 14.3 weeks which exceeds one quarter of sales. Barring a major black swan event (war, pandemic, etc.), the industry will do well in the first quarter of 2022.

Some of the current backlog could be a hedge against product shortages and future price increases.

Industry Outlook – 2022

We are projecting modest growth of +5.7% in 2022. World GDPs are slowing, inflation is very high, and the world's banks will begin to raise interest rates and slow the global economies.

2021 and 2022F by Region
With Percent Change

	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%

$ Millions

- The annualized GDP in 2022 is forecast to be approximately: 2.2% for the US, 3.3% for Europe, 1.2% for Japan, 4.0% for China, 3.5% for Asia Pacific, and 2.1% for ROW (looking at average concensus projections). This assumes no invasion of the Ukraine and the resulting sanctions.
- The backlog coming into 2022 is very large. At $21.5 billion, it is larger than the average historical sales for an individual quarter.
- It appears that inflation will be with us for all of 2022. Growth of sales through price increases alone could concievably result in 5% growth.
- Single-digit growth historically follows double-digit growth as we had in 2021.

2021 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 December 2020 versus December 2021 and shows results for these three currencies.

Local Currency to One USD
December 2020 versus December 2021

Currency	2020	2021	% Change
Euro	0.8222	0.8846	7.6%
Yuan	6.5422	6.3703	-2.6%
Yen	103.7859	113.7857	9.6%

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 December YTD sales performance by region in US dollars and local currencies.

Industry Sales Performance
December 2021
USD-vs-Local Currencies

Region	U.S.$	Local Currency
North America	22.2%	22.2%
Europe	26.8%	17.1%
Japan	19.1%	7.7%
China	23.8%	27.0%
Asia Pacific	25.9%	25.9%
ROW	31.2%	31.2%
World	**24.3%**	**21.8%**

Connector sales are 2.5 percentage points lower when stated in local currencies rather than in US dollars, putting industry performance at +21.8% in December (versus +24.3% in US dollars). This is the result of a stronger US dollar, on average, compared to these currencies as the yaun partially offsets the yen and the euro.

Significant Events

Amphenol Creates Three New Divisions

Effective January 1, 2022, Amphenol aligned its business units into three newly formed Divisions: Harsh Environment Solutions (HES), Communications Solutions (CS), and Interconnect and Sensor Systems (ISS). This new alignment reinforces the Company's entrepreneurial culture and the clear accountability of each of our business unit general managers, while enhancing the scalability of Amphenol's business for the future. Beginning with the first quarter of 2022, the Company will report the financial results of these three new Divisions as separate reportable segments, replacing the Company's previous two reportable segments. We will provide the results of these new reportable segments, as well as comparable historical financial data, with our first quarter 2022 results

Samtec Acquires Ultra Communications

Samtec Inc. acquired Ultra Communications Inc., a Vista, California-based manufacturer of high-speed digital and RF fiber optic components. Ultra Communications' core competencies include circuit design, optoelectronic package design, and manufacturing of fiber optic components. Founded in 2005, the company holds substantial IP and technology, with active programs in the mil-avionic, space/satellite, ground vehicles, radar, and shipboard connectivity arenas. Samtec has an established customer base in the industrial and mil-aero markets with its optical FireFly™ product line. Ultra Communications' products, which feature a Surface-Mount-Technology (SMT) reflowable attach process, complement the FireFly family. The acquisition provides aerospace and mil-aero customers with another option to achieve small size, low weight, and power (SWaP) in extreme environments. Samtec plans to maintain operations and staff at the Vista facility.

TE Connectivity Acquires Relay Technology from Phoenix Contact Group

TE Connectivity has acquired the force-guided narrow safety relay (NSR) elementary relay technology from the Phoenix Contact Group (Phoenix Contact), as part of a long-term partnership agreement. The acquisition adds a single-pole, force-guided offering to TE's broad relay portfolio for the factory automation, elevator, and rail markets. As a part of the agreement, TE will assume responsibility for manufacturing and marketing the NSR element relays, supporting TE's focus on bringing miniaturized solutions and advanced safety technology to market, particularly in robotic control, programmable logic control, elevator, and servo drive applications. "As the industry continues to shift toward more advanced automation technologies, operator safety has easily become one of the most critical issues facing our customers today," said Vish Ananthan, senior vice president and general manager of TE's Industrial business. "When humans are involved, equipment must work every time, without restrictions to functional safety. The addition of the NSR product line underscores our commitment to this vital need and to providing much needed space savings as our customers manage the dramatic increase of signal, power and data in the modern production environment."

RF Industries Agreement to Purchase Microlab LLC

RF Industries has entered into an agreement to purchase Microlab LLC radio frequency components business from Wireless Telecom Group. The boards of directors of the two companies unanimously approved the transaction, which is subject to various terms and conditions, including approval by Wireless Telecom Group's shareholders. After the transaction, Wireless Telecom Group will be comprised of Boonton, Holzworth, and Noisecom brands within its test and measurement product group, and the CommAgility brand within its radio, baseband, and software product group. The transaction will allow Wireless Telecom Group to prepare for the next stage of transformation with a stronger concentration of revenues and the ability to focus its investments on satellite communications, 5G small cell, and private

network deployments, and growth in applications related to semiconductor testing, military and defense spending and quantum computing.

TPC Wire & Cable Forms Trexon Brand

TPC Wire & Cable announced the formation of the Trexon brand, which encompasses the brand portfolio of TPC, Pittsburgh Wire and Cable, and MilRail in its Industrial Products division, and EZ Form Cable, CiCoil, Hydro Group, Integrated Cable Systems (ICS), and The First Electronics Corporation (FEC) in its Engineered Products division. Industrial Products are manufactured to provide top performance in the most demanding environments, and Engineered Products are designed into exacting and mission-critical applications. Trexon, a leading provider of unique connectivity solutions built to withstand the toughest environments and the most exacting applications, is headquartered in Macedonia, Ohio. The existing TPC leadership will take the helm at Trexon, with Jeff Crane as president and CEO, Todd Spaulding managing the Industrial Products business, and Nildeep Patel leading the Engineered Products business.

Trexon Acquired Power Connector Inc.

Trexon announced that it has completed the acquisition of Power Connector Inc. (PCI), a leading supplier of tactical communications interconnect for military applications. Founded in 1987 and based in Suffolk County, New York, PCI is a defense logistics agency QPL manufacturer of MIL-DTL-55181 and MIL-DTL-55116 connectors. Designed into hand-held and mounted radio systems, PCI's power connectors, audio connectors, and other interconnect components complement Trexon's existing specialty connectivity offerings for mission critical applications. PCI's commitment to excellence and innovation is demonstrated by its high-performance equipment, stringent quality standards, and skillful employees. Todd West, PCI General Manager, said, "We believe the new coupling of Trexon's Engineered Products Group with PCI's advancement into lighter weight, small form factor connectors paves the way for a quicker time to market in support of the dynamic needs of the defense communication industry."

TTI Agreement to Acquire SMD Inc.

TTI Inc. has entered into a purchase agreement to acquire SMD Inc., a privately held electronic component distributor headquartered in Irvine, California. Upon completion of the transaction, SMD President/Owner Rich Unruh will continue to lead the company, reporting to Don Akery, President, TTI Americas. SMD Inc. is a specialty, authorized distributor of electronic and electrical components, services, and logistic solutions in North America. The acquisition is subject to the applicable waiting period and customary closing conditions, including regulatory approvals. The transaction is expected to close by January 1, 2022.

Hirose Helps Create Multi-Mode Waveguide Interconnect System (MWIS) Working Group

Hirose, an associate member of the Consortium for On-Board Optics (COBO), helped create the Multi-Mode Waveguide Interconnect System (MWIS) Working Group to increase bandwidth and reduce power consumption for printed circuit board interconnect systems. The Consortium for On-Board Optics is a member-driven standards-setting organization developing specifications for interchangeable and interoperable optical modules that can be mounted onto printed circuit boards. Led by Joshua Kihong Kim, principal engineer at Hirose Electric, COBO's new MWIS Working Group focuses specifically on the replacement of copper traces with multi-mode waveguides and adding an extra thin interface for Electrical/Optical and Optical/Electrical conversion within proximity to the electrical component. "Although embedded optical waveguides in printed circuit boards have been researched for decades, now is the time for the industry to work together to address the imminent bandwidth and power issues associated with copper interfaces," said Kihong Kim. "In the development of on-board optical systems, this is one of the missing pieces of the puzzle, and COBO is stepping up to develop specifications to enable an industry eco-system."

New Yorker Electronics Co Acquires Omni Pro Elextronics

New Yorker Electronics Co. Inc. announced the acquisition of Omni Pro Electronics Inc., a leading electronic component distributor, located in Addison, Texas. Omni Pro maintains a deep inventory of industrial control and board-level components used in a broad array of industrial, commercial, and aerospace/defense applications.

Yamaichi Opens Sales Office in Middle East

Yamaichi Electronics opened its first sales office in the Middle East, located in Palmachim, south of Tel Aviv. Manager Amit Lampert is available to customers and interested parties of Yamaichi Electronics as a direct local contact. Yamaichi Electronics Germany now also distributes its product portfolio in the Middle East. In addition to the sales headquarters in Aschheim-Dornach near Munich, Yamaichi Electronics has sales offices in Great Britain and Italy. Lampert has more than 20 years of industry knowledge and has already gained many years of expertise in sales.

How the Global Chip Shortage Helps US Manufacturing

A pandemic problem led to a $52 billion proposal to help US chipmakers like Intel, which plans a new $100 billion Ohio "megafab." But Taiwan and Korea are also spending massively.

Congress authorized $52 billion in subsidies for chipmakers in the CHIPS for America Act, but Congress has yet to actually appropriate the funds. The Senate in June passed the United States Innovation and Competition Act, or USICA, to allocate funds, but it wasn't until November that House Speaker Nancy Pelosi nudged the chip funding forward in the House of Representatives. On Nov. 29, US Commerce Secretary Gina Raimondo pushed for the funding, saying the US is "vulnerable" without more semiconductor manufacturing since "chips are the building blocks of our entire modern economy."

It takes years to build a fab. Intel just started building two new facilities, Fab 52 and 62 in Arizona, at a cost of $20 billion. But they won't begin mass manufacturing until the second half of 2024. Chipmakers' coming capital investments are extraordinary. Intel trumpeted $23.5 billion in spending this year in the US, followed by plans for two "megafabs" in coming years totaling $200 billion. "These are big sites -- something like over 1,000 acres. TSMC's investments include a new fab in Arizona and a new fab partnership in Japan with Sony. Samsung expects to spend $145 billion through 2030.

In November, Samsung announced that one of its investments is a $17 billion fab in Taylor, Texas.

The shortage also gave new power to lesser-known chipmakers still building chips with earlier-generation "legacy node" manufacturing technology. That includes ST Microelectronics, Onsemi, Microchip, NXP Semiconductors and Infineon. GlobalFoundries, the manufacturing division AMD spun off in 2018, held its initial public offering despite a lack of profitability and bowing out of the race to keep up with the three leading-edge chipmakers: Intel, Samsung and TSMC. GlobalFoundries is investing $1 billion to increase its current fab capacity in New York and add another fab there. It's also building a fab in Singapore and expanding one in Germany.

Companies that build semiconductor manufacturing tools are raking in the money. Globally, spending on chip equipment will rise 10% in 2022 to a record high of $98 billion, the third year of growth in a row, the trade group Semi said in January. South Korea is the biggest spender, followed by Taiwan and China, collectively accounting for an expected 73% of spending this year. Korean spending should increase 14% in 2022 but spending in the US and China likely will decrease.

Semiconductor Revenue Reached New Heights in 2021

Despite demand continuing to outpace supply, or perhaps because of it, industry revenue grew by 25% in 2021 to top $500 billion for the first time. The chip shortage carries on, but Gartner says that hasn't stopped the semiconductor industry from growing by 25.1% in 2021 to top $500 billion in revenue for the first time. The automotive industry isn't the only place where average selling prices rose: Gartner said that 5G smartphone manufacturing was a major driver, with unit production doubling in 2021 to reach 555 million units. Gartner also reports that Samsung regained the top spot in the semiconductor industry (based on revenue) from Intel for the first time since 2018, with a 31.6% revenue growth between 2020 and 2021. Intel, on the other hand, only saw 0.5% growth over the same period. Gartner did not explicitly state that Samsung's jump was due to increased smartphone production, but Samsung itself announced a more than 50% increase in its profits that has been attributed to increased chip and device sales.

Chip Shortage and Covid Weigh on China's Smartphone Market

Chinese domestic smartphone shipments recovered from the hit they took during the pandemic but have still not recovered to pre-Covid levels, according to government data. The smartphone industry has been constrained by various factors, from the global semiconductor shortage to disruption from Covid outbreaks in China. Domestic smartphone shipments totaled 342.8 million in 2021, up 15.9% year-on-year, according to data released Tuesday by the China Academy of Information and Communications Technology (CAICT). That was strong growth compared to 2020 which saw the market take a hit due to the coronavirus outbreak in China. Various parts of the country were locked down, effectively shutting down large parts of the economy.

Still, 2021′s smartphone shipment figure is below the 371.7 million units shipped in 2019, before the pandemic began. However, separate data released by market research firm Canalys on Tuesday showed worldwide smartphone shipments grew just 1% year-on-year in the fourth quarter of 2021, constrained by supply chain shortages and a resurgence in Covid cases around the globe. Canalys said Apple retook the top spot as the world's largest smartphone player with 22% market share, thanks to strong demand for the iPhone 13. South Korea's Samsung followed with 20% market share.

PC Sales are Back to 2012 Levels, up 34% From 2017

- The PC market grew 14.8% in 2021, shipping the largest number of desktops, laptops, and workstations in a single year since 2012.
- It's a noteworthy recovery for a sector that had been written off by tech investors as a sleepy field in decline as recently as a few years ago.
- The six largest PC companies by number of units shipped in 2021 were Lenovo, HP, Dell, Apple, Asus, and Acer, according to IDC.

The PC market grew 14.8% in 2021, shipping the largest number of desktops, laptops, and workstations in a single year since 2012, according to IDC. Shipments were up over 34% from the industry's low point in 2017, to 349 million units, according to preliminary data provided by IDC. It's a noteworthy recovery for a sector that had been written off by tech investors and operators as a sleepy field in decline as recently as a few years ago as smartphones became the most important and highest-volume product in the electronics business. The recovery has been driven by lockdowns and the rise in remote work and learning during the Covid-19 pandemic, as households purchased new laptops and PCs for schoolchildren in virtual classes and businesses bought equipment for employees working from home.

"We're going from one PC per household to one PC per person per household, which is the smartphone model," said Tikoo, senior vice president for Dell's Client Product Group. "I think PCs are in the middle of transitioning to that now."

The six largest PC companies by number of units shipped in 2021 were Lenovo, HP, Dell, Apple, Asus, and Acer, according to IDC.

Microsoft, which sells the Windows operating system used on the vast majority of PCs, is another major beneficiary of the PC boom. Although the software giant has shifted its focus to cloud services like Azure in recent years, Windows is still a sizable business, generating $5.68 billion in sales in the third quarter, an increase of 10% from the year-earlier period.

Supply Chain Challenges Continue to Hamper Electronics Production

IPC's January 2022 Economic Outlook report finds that supply chain challenges remain acute and have improved little from the previous month. Shortages continue to hamper production levels and lead-times remain long. Supply chain challenges will linger well into 2022, and in some instances, into 2023.

Among other data, IPC's economic outlook report shows:

- Economic growth will be severely muted at the start of the year as Omicron slows economic activity – gross domestic product (GDP) growth in the United States could drop to as low as 2.5 percent in the first quarter of the year.
- Inflation in Europe shot-up to 4.9 percent in November, the highest level since records began in 1997, two years before the euro was launched.
- Consumer sentiment improved marginally in December, but the gains might be short-lived thanks to rising cases of COVID. Consumer sentiment reached lows in November not seen since 2011.
- The reemergence of COVID had stymied Europe's recovery early in the year, but Europe is quickly getting growth back on track. Growth in the third quarter was 3.7 percent higher than a year ago.
- The number of employed persons increased by 0.9 percent in both the Euro area and in the European Union during the third quarter, but the unemployment rate has declined slowly during the recovery.

Huawei Enters China's Electric Car Race in Competition with Tesla

Less than a week after Chinese electric car start-up Nio announced its latest competitor to Tesla, Huawei released details on a vehicle with specs it claims beat the Model Y. Chinese tech giant Huawei is best known for its telecommunications products and smartphones and says it will not make cars on its own. But it has been working with automakers on car technology such as autonomous driving. The first car with Huawei's HarmonyOS operating system will be the Aito M5, a car that runs on both electricity and fuel, Richard Yu, executive director, and CEO of Huawei's consumer business group, said Thursday at the company's winter product launch event. Deliveries are set to begin around Feb. 20 after the Lunar New Year, said Yu, who is also CEO of Huawei's intelligent automotive business solution unit.

China's Luxshare Builds iPhone Mega-plant to Challenge Foxconn

Luxshare Precision Industry is building a massive manufacturing complex in eastern China as it aims -- with Apple's blessing -- to break the decadelong hold that Taiwanese rivals Foxconn and Pegatron have on iPhone assembly. Luxshare, China's most prominent player in the Apple supply chain, is building a 285,000 sq. meter manufacturing park in Kunshan, Jiangsu Province, with a total investment of 11 billion yuan ($1.72 billion). The sprawling site -- covering an area the size of 40 football fields -- will churn out millions of iPhones as early as next year. The sheer scale of the project is a sign not only of Luxshare's ambitions, but also of Apple's growing reliance on Chinese suppliers, a trend that could reshape the global tech supply chain in the long run. Wingtech, another rising Chinese tech manufacturing powerhouse, recently entered Apple's supply chain, and won orders to make the Mac mini and Apple TV, multiple sources familiar with the matter said. Apple also added BOE Technology to its list of premium display suppliers for new iPhones this year. In addition to the new complex, Luxshare has also leased and remodeled an adjacent facility that was previously owned by iPad assembler Compal Electronics, according to company filings and government environmental assessment papers seen by Nikkei Asia. Luxshare is set to complete the first phase of its new complex around the middle of 2022, according to the construction floor plan and government documents obtained by Nikkei Asia. Armed with the new facility, the Chinese supplier aims to significantly increase its share of iPhone assembly, from about 6.5 million units in 2021 to between 12 million and 15 million units by as early as next year, people briefed on the matter told Nikkei Asia. Luxshare currently builds iPhones in another facility in Kunshan that it bought from Taiwan's Wistron in the summer of 2020. Apple ships around 200 million iPhones a year, with Foxconn assembling nearly 60% of those and Pegatron around 30%.

This new report from Bishop & Associates provides a detailed analysis of the I/O rectangular connectors market. The report furnishes detailed statistics by region and by I/O rectangular connector type for the years 2019, 2020, 2021F, and 2026F.

Total World I/O Rectangular Connector Sales by Region
2020-2021F with Percent Change

	North America			Europe		
	2020	2021	% Chg.	2020	2021	% Chg.
D-Subminiature Connectors						
PC Board Mounted Types						
Includes Plastic and Shielded Standard and High Density Types	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Crimp Contact Types						
Includes Standard and High Density Types	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
IDC Contact Types						
Includes Plastic and Shielded Types	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Mil-DTL-24308 Types						
Includes Standard and High Density Layouts, Fixed and Crimp Contact Types	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Fixed Contact						
Includes 2-Piece Nylon and Mono-Block Insulator Types	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Filtered D-Subs	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Accessories	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Combination Layouts	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Contacts and Custom Layouts						
Includes Power, Coax, and Fiber Optic Contacts.	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Total D-Subminiature	**$XX.X**	**$XX.X**	**Y.Y%**	**$XX.X**	**$XX.X**	**Y.Y%**

$ Millions

The world I/O rectangular connector market is complex and diverse. While products developed several years ago (D-subs, ribbon connectors) are experiencing steady or rapid decline several more recently developed products are growing extremely fast. The third largest product family, connector types falling under the I/O rectangular connector banner include D-subminiatures, SFP (small form-factor pluggable) connectors, blade and tab contact connectors, rectangular power connectors including RAST type and rack and panel connectors. I/O rectangular product types also includes one of the fastest growing connectors presently offered on the market, a product type now used in every single market sector, the USB connector.

Total World Circular Connector Sales by Region and Key Product Type 2021F and 2026F with 5-Year CAGR

	Asia/Pac			ROW			TOTAL		
	2021F	2026F	5-Year CAGR	2021F	2026F	5-Year CAGR	2021F	2026F	5-Year CAGR
D-Subminiature Connectors	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Ribbon I/O, SCSI, and VHDCI Connectors	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Personal Computer and Peripheral I/O's	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Small Form-Factor Pluggable (SFP) Connectors	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
I/O Connectors With Blade or Tab Contacts	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Rectangular Industrial (Valve Connectors, ect)	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Power Connectors	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Micro and Nano Connectors	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
LIF/ZIF Rectangular I/O Connectors	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Rack & Panel	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
All Other I/O Connectors	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Total Rectangular I/O	**$X,XXX,X**	**$X,XXX,X**	**Y.Y%**	**$X,XXX,X**	**$X,XXX,X**	**Y.Y%**	**$X,XXX,X**	**$X,XXX,X**	**Y.Y%**

$ Millions

Providing a brief description of each product type, future trends, and key manufacturers, this report provides a look at the I/O rectangular connector market from a detailed product perspective. Be prepared for future growth in this key product area, order your copy of the I/O Rectangular Connector Market.

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Bishop & Associates has recently completed several new research reports about the worldwide connector industry. A table of contents for each report can be found at **https://store.bishopinc.com**.

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