

Sales in October Recorded Highest YOY Growth Since July 2018

Regional Performance:

Year-over-year sales grew in all regions led by Europe at +19.1%, followed by ROW at +16.5%, and China at +8.8%. North America grew at the slowest rate, up +1.9%. Sequential sales declined in all regions after having achieved five consecutive months of growth in September.

Currency Impact:

Year-to-date, the yuan declined in value against the US dollar. In local currencies, world connector sales were down -4.7% versus -5.1% measured in US dollars, year-to-date.

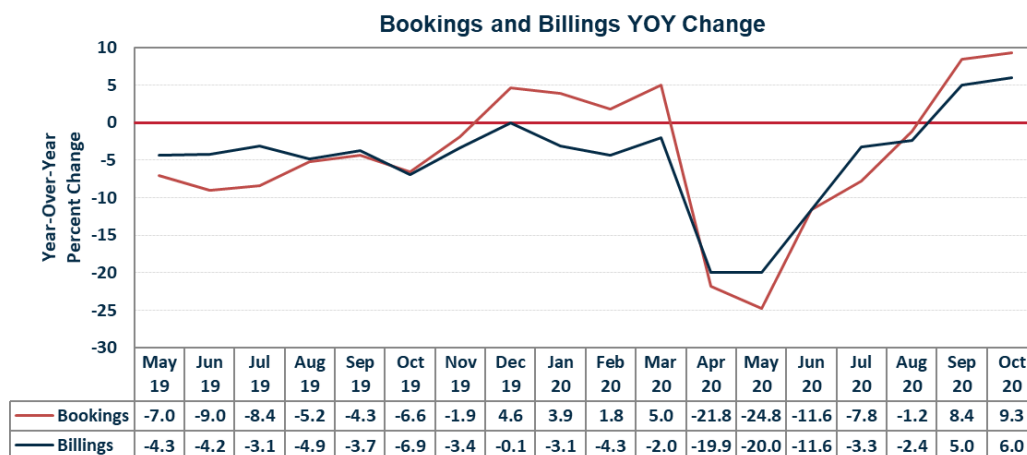
2019 Top 10 Connector Manufacturers:

Bishop takes a closer look at the top 10 connector manufacturers in the telecom/datacom market and the fiber optic product category. Amphenol ranks first in the telecom/datacom market and TE Connectivity tops the fiber optic chart. Amphenol was the only company making the top three in both studies.

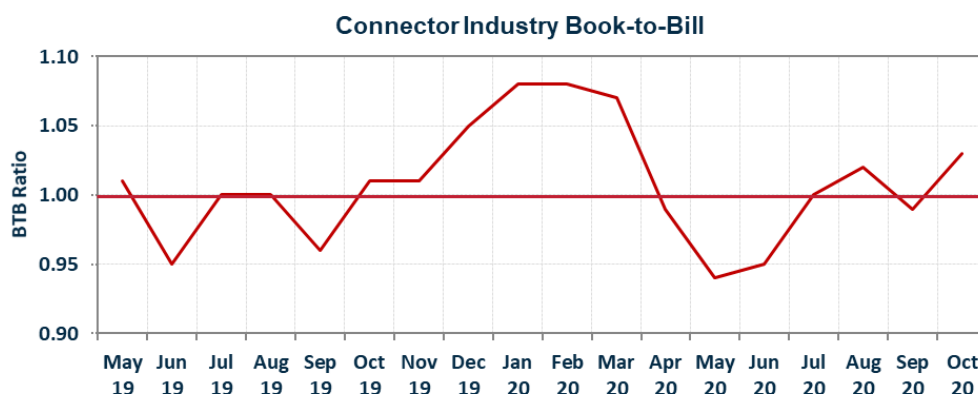
Merger and Acquisition Services Buy & Sell-Side

Contact Ron Bishop
bishop@bishoppinc.com

The connector industry proved resilient in the face of rising COVID-19 infections worldwide. Year-over-year (YOY) October sales jumped +6.0%. October orders were up +9.3% YOY. The connector industry will probably face sales pressure in the last months of 2020, as many countries introduce lockdown restrictions. But the world should be optimistic in 2021 as countries distribute COVID-19 vaccines.



The book-to-bill ratio rose to 1.02 as orders strengthened in October.

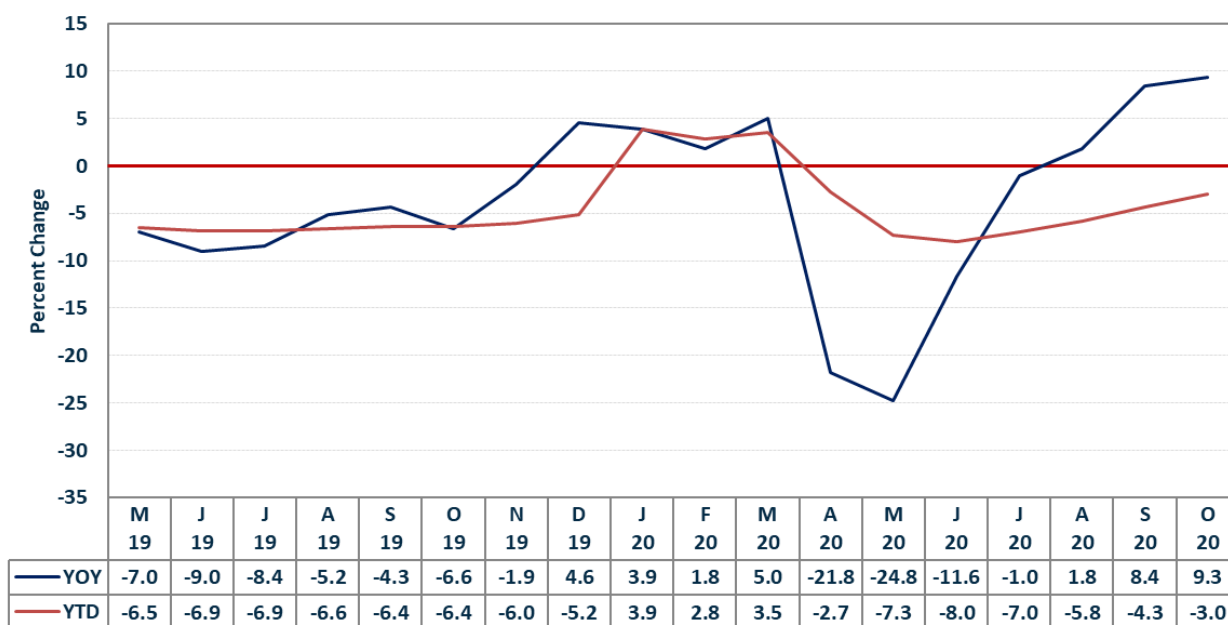


Booking Highlights and Conclusions

Sequential, Year-Over-Year, and Year-To-Date Bookings Percentage Change – 2018/2019/2020

Month	Sequential			Year-Over-Year			Year-To-Date		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
Jan	2.8%	1.0%	0.2%	15.5%	-3.7%	3.9%	15.5%	-3.7%	3.9%
Feb	10.6%	7.7%	5.5%	17.5%	-6.2%	1.8%	16.5%	-5.0%	2.8%
Mar	-3.8%	-4.5%	-1.4%	17.7%	-6.8%	5.0%	16.9%	-5.6%	3.5%
Apr	-0.2%	-2.2%	-27.2%	17.7%	-8.8%	-21.8%	17.1%	-6.4%	-2.7%
May	4.9%	6.9%	2.9%	15.7%	-7.0%	-24.8%	16.8%	-6.5%	-7.3%
Jun	-7.0%	-8.9%	7.0%	10.6%	-9.0%	-11.6%	15.8%	-6.9%	-8.0%
Jul	-0.1%	2.8%	15.2%	11.8%	-8.4%	-1.0%	15.2%	-6.9%	-7.0%
Aug	6.4%	7.8%	10.7%	7.1%	-5.2%	1.8%	14.1%	-6.6%	-5.8%
Sep	-7.9%	-7.1%	-0.9%	0.7%	-4.3%	8.4%	12.5%	-6.4%	-4.3%
Oct	3.0%	0.6%	1.3%	6.8%	-6.6%	9.3%	11.9%	-6.4%	-3.0%
Nov	5.5%	10.8%		-0.3%	-1.9%		10.5%	-6.0%	
Dec	-13.6%	-7.8%		-2.0%	4.6%		9.6%	-5.2%	

Bookings - YOY and YTD



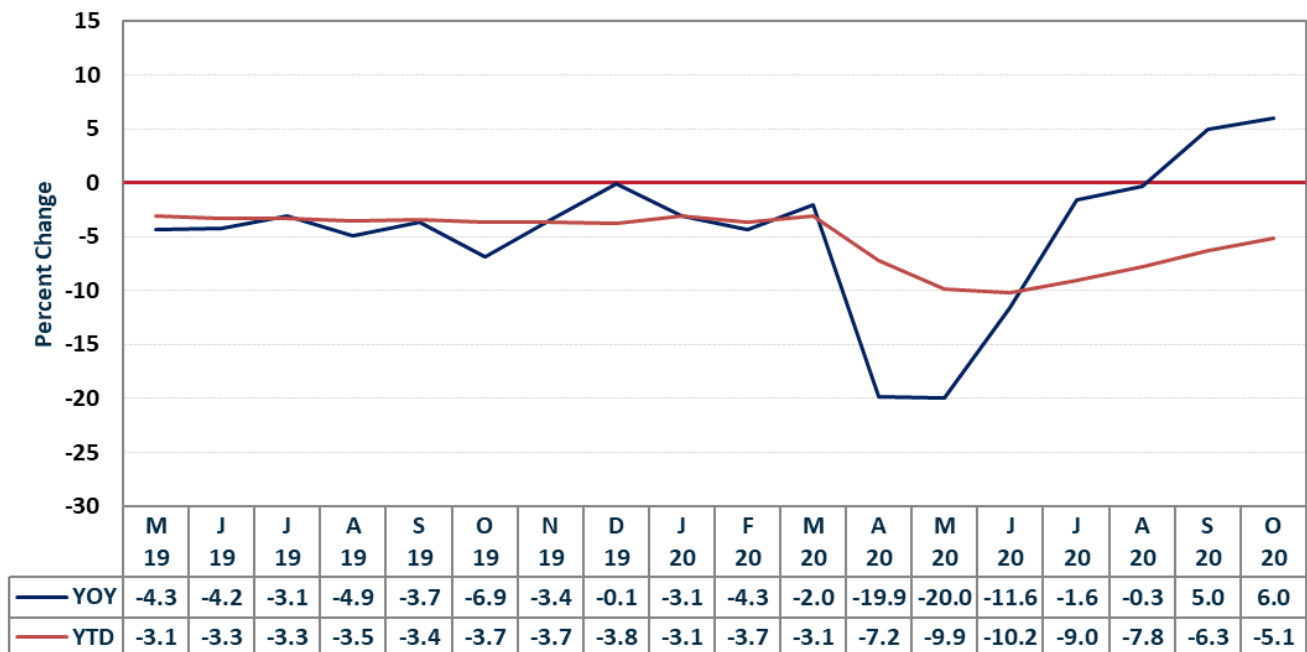
- October bookings rose 9.3% year-over-year (YOY). This is the largest increase since July 2018.
- Orders contracted -3.0% year-to-date (YTD).
- Sequentially, orders grew +1.3% over the prior month.
- The book-to-bill ratio for October grew to 1.03 from 0.99 in September.
- Year-to-date, the book-to-bill ratio recorded 1.02.

Billing Highlights and Conclusions

Sequential, Year-Over-Year, and Year-To-Date Billings Percentage Change – 2018/2019/2020

Month	Sequential			Year-Over-Year			Year-To-Date		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
Jan	2.9%	0.3%	-2.8%	17.2%	-1.0%	-3.1%	17.2%	-1.0%	-3.1%
Feb	8.4%	6.8%	5.5%	15.6%	-2.5%	-4.3%	16.2%	-1.8%	-3.7%
Mar	-3.2%	-3.2%	-0.9%	14.8%	-2.4%	-2.0%	15.8%	-2.0%	-3.1%
Apr	-2.3%	-3.7%	-21.2%	15.7%	-5.4%	-19.9%	15.7%	-2.8%	-7.2%
May	7.8%	9.0%	8.8%	13.2%	-4.3%	-20.0%	15.1%	-3.1%	-9.9%
Jun	-4.4%	-4.2%	5.8%	14.9%	-4.2%	-11.6%	15.1%	-3.3%	-10.2%
Jul	-3.1%	-2.0%	9.0%	10.5%	-3.1%	-1.6%	14.4%	-3.3%	-9.0%
Aug	9.0%	7.0%	9.0%	9.4%	-4.9%	-0.3%	13.7%	-3.5%	-7.8%
Sep	-4.1%	-2.9%	1.7%	9.0%	-3.7%	5.0%	13.2%	-3.4%	-6.3%
Oct	-0.8%	-4.1%	-2.5%	7.6%	-6.9%	6.0%	12.6%	-3.7%	-5.1%
Nov	6.7%	9.8%		4.1%	-3.4%		11.7%	-3.7%	
Dec	-14.2%	-11.2%		1.6%	-0.1%		11.0%	-3.8%	

Billings - YOY and YTD

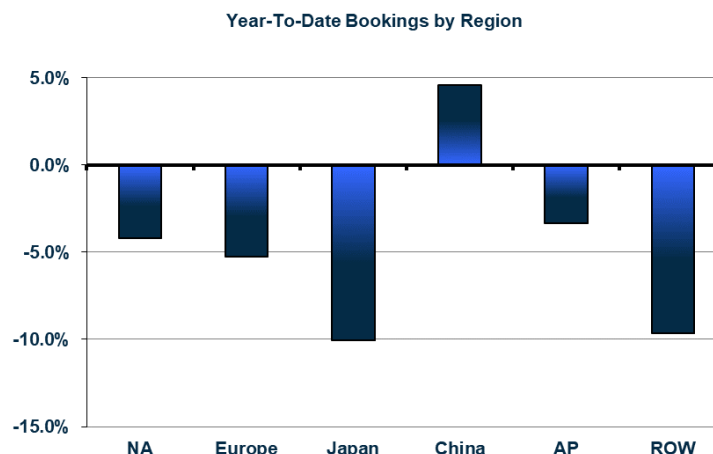


- Up +6.0% YOY, October billings jumped to their highest recording since October 2018.
- Year-to-date, sales were down -5.1%.
- Sequentially, billings fell -2.5%.

Regional Performance

October 2020 Bookings

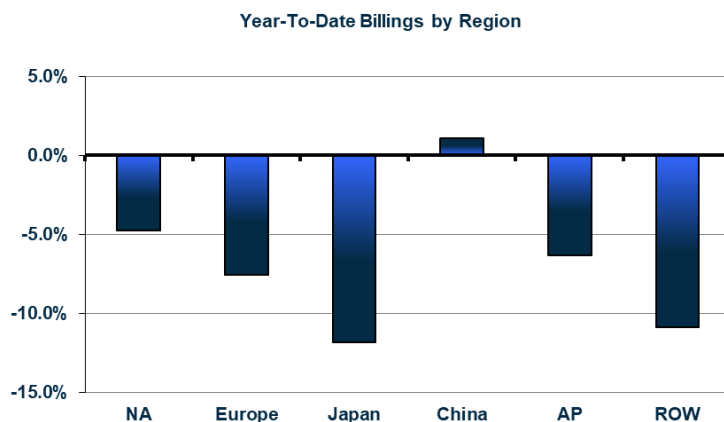
Region	Sequential	YOY	YTD
NA	0.4%	1.9%	-4.2%
Europe	4.5%	19.1%	-5.3%
Japan	2.8%	5.0%	-10.0%
China	-1.0%	8.8%	4.6%
AP	-1.5%	5.7%	-3.3%
ROW	5.5%	16.5%	-9.6%
Total	1.3%	9.3%	-3.0%



- October bookings increased +9.3% YOY. October orders rose +1.3% compared to September.
- Year-over-year orders increased in all regions. Year-over-year orders in Europe were up +19.1% and orders in ROW were up +16.5% due partially too easier comparisons.
- Highlights for the month include sequential growth in four of the six regions, with single-digit growth in Europe (+4.5%), Japan (+2.8%), and ROW (+5.5%). China's and Asia Pacific's bookings contracted month-over-month, down -1.0% and -1.5%, respectively.
- Year-to-date, industry bookings were down -3.0% and five of the six regions recorded negative growth YTD. China is likely to be the only region to experience full-year bookings growth in 2020 which was up +4.6% YTD.
- Japan and ROW were the weakest regions YTD, down -10.0% and -9.6%, respectively.

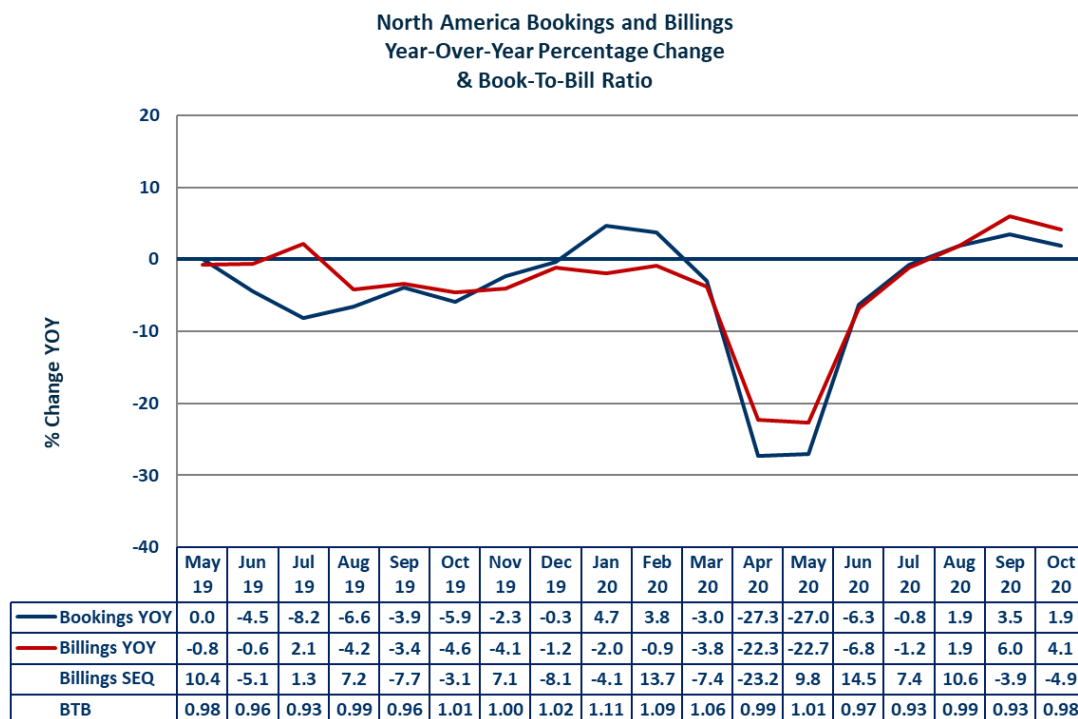
October 2020 Billings

Region	Sequential	YOY	YTD
NA	-4.9%	4.1%	-4.7%
Europe	-0.6%	8.9%	-7.6%
Japan	-5.5%	-4.9%	-11.8%
China	-1.7%	9.0%	1.1%
AP	-1.3%	4.2%	-6.3%
ROW	-2.9%	4.5%	-10.9%
Total	-2.5%	6.0%	-5.1%



- Worldwide connector sales decreased sequentially -2.5%, with all regions posting negative month-over-month sales declines. Sequentially, sales in North America have now dropped for the past two consecutive months.
- Year-over-year, all regions grew except Japan (-4.9%). China (+9.0%) and Europe (+8.9%) led the regions with near double-digit growth.
- Year-to-date, billings were down -5.1%. All regions declined with the exception of China which was up +1.1%, YTD. Japan and ROW suffered the largest declines in YTD sales, down -11.8% and -10.9%, respectively.

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.



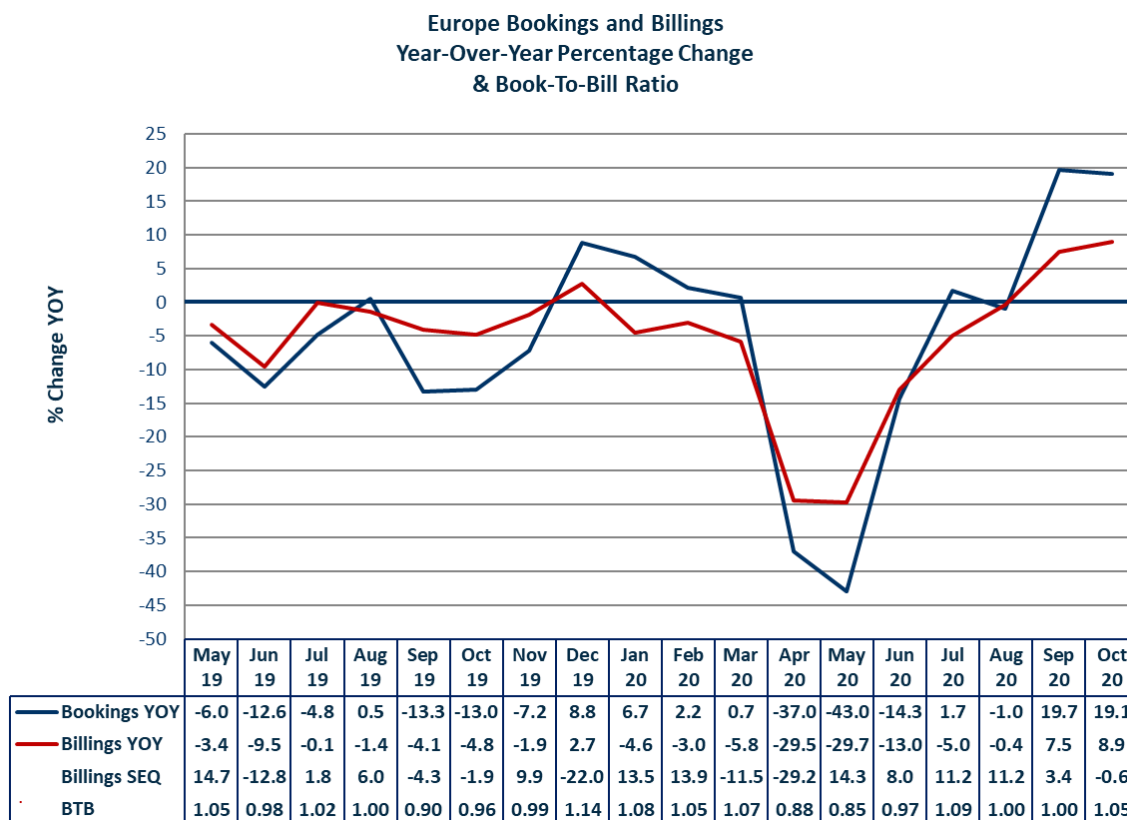
North America Performance

- Sales grew +4.1% and orders were up +1.9% YOY in October. North American billings continued to weaken sequentially, down -4.9%. The book-to-bill ratio was 0.98.
- Industrial production rose 1.1% sequentially in October, but it was still 5.6% lower than its pre-pandemic February level.
- Unemployment in the US decreased to 6.9% in October. At the end of October, there were 20.3 million Americans receiving unemployment benefits with almost 12 million losing them at the end of December.
- Retail sales in the United States increased 5.7% in October YOY. Retail sales rose 0.3% month-over-month.
- October telecom/datacom sales were up 1.7% versus a year ago. The telecom/datacom industry grew 36% in 3Q20 compared to the previous quarter.
- Core inflation in October (excludes food and energy) fell to 1.6% YOY (Fed target: slightly above 2.0%).
- The two-week US average in COVID-19 cases was up 68.8% and deaths increased 49.8%. (World average cases increased 13.1%, deaths increased 28.2%.) Data as of November 23, 2020. Source: <https://www.statnews.com/feature/coronavirus/covid-19-tracker/>

Conclusions

North American sequential connector sales have declined for two consecutive months. We are anticipating due to rising hospitalizations and states implementing partial lockdowns, that this trend will continue through the balance of the year. Year-to-date sales are down -4.2% and are on track to meet our forecasted expectations of -5.1% for full year 2020.

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.



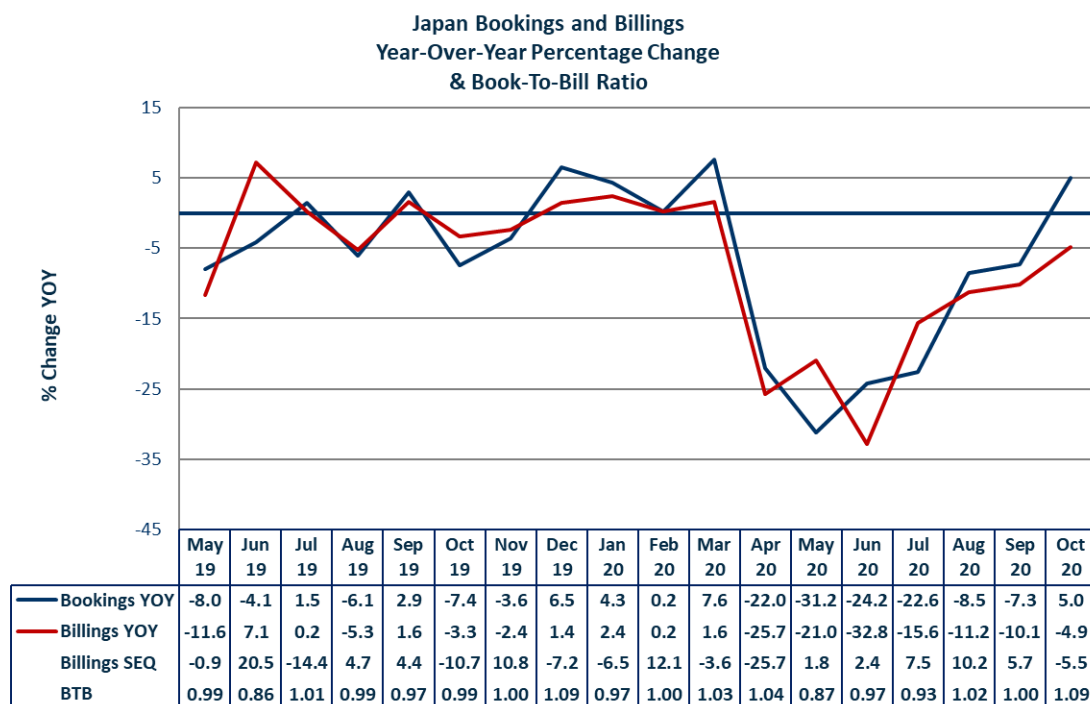
Europe Performance

- YOY billings grew +8.9%, its second consecutive positive reading since December 2019. Orders increased +19.1% and the book-to-bill ratio strengthened to 1.05. Sequentially, sales declined slightly -0.6%, the lowest decline among the six defined regions.
- The United Kingdom's GDP rose 15.5% in 3Q20 compared to the previous quarter.
- Retail sales in September slowed to 2.2% YOY and 2.0% month-over-month.
- Euro area car registrations slipped back into negative territory, down 7.8% in October YOY (-26.8% YTD).
- Manufacturing production in September for the Euro Area decreased 7.2% YOY.
- COVID-19 cases in Germany increased 11.1% and deaths increased 116.8% (two-week average change). France: Cases down 43.8% and deaths up 12.2%. United Kingdom: Cases up 1.5% and deaths up 38.6%. Source: <https://www.statnews.com/feature/coronavirus/covid-19-tracker/> as of November 23, 2020.

Conclusions

Europe experienced significant YOY connector growth in September and October. This trend will reverse over the course of the next few months as COVID-19 cases spike and countries within the region lockdown. Further complicating the region will be the possibility of a no-deal Brexit scheduled to occur on December 31, 2020. These and other obstacles are anticipated to put downward pressure on connector demand.

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.



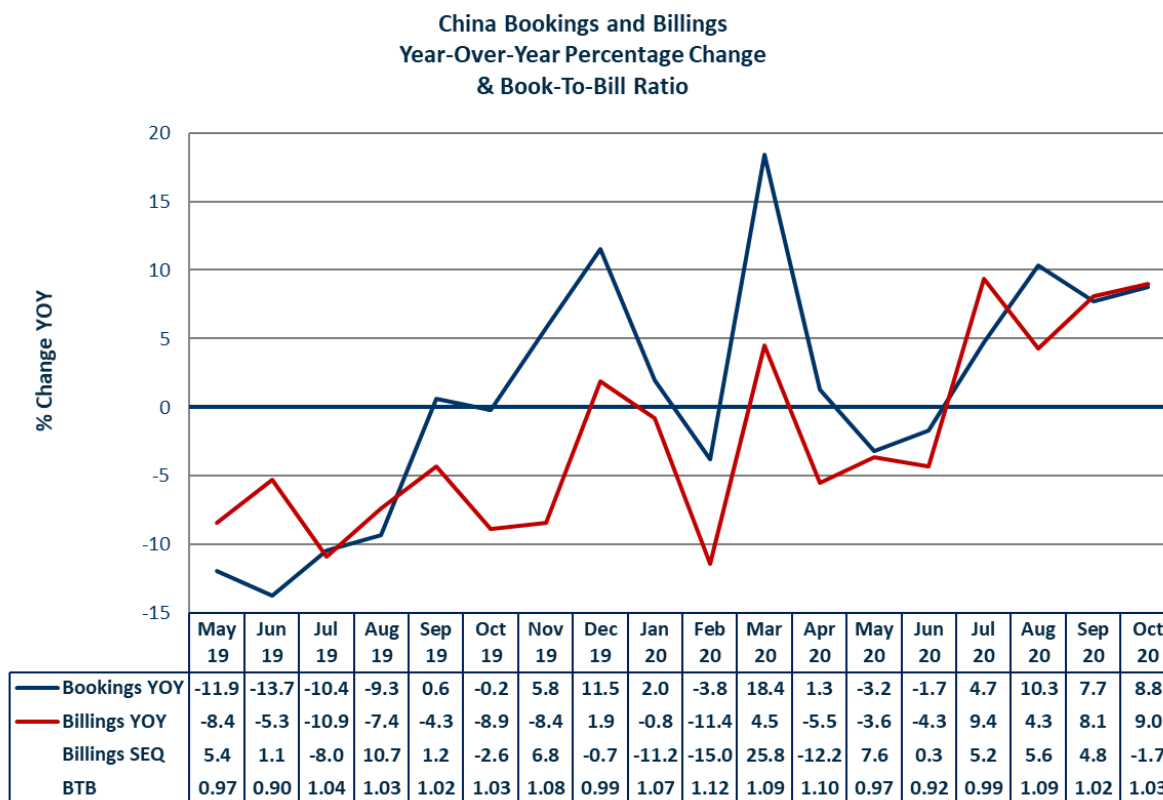
Japan Performance

- Japan's book-to-bill ratio rose to 1.09 in October. Bookings were up for the first time since March, up +5.0%. Billings, down -4.9%, declined YOY for the seventh consecutive month. Sequentially, billings, reversing the positive five-month trend, dropped -5.5%.
- Japan's economy grew 5.0% (21.4% annualized) in the third quarter.
- Industrial production increased 3.9% from last month but declined 9.0% year-over-year in September.
- September 2020 telecom/datacom sales fell 14.4% YOY and were down 19.9% YTD.
- September retail sales fell 8.7% YOY and were down 0.1% over the previous month
- The unemployment rate remained at 3.0% in September 2020.
- Exports declined 0.2% YOY in September, the 23rd straight month of decline in exports. Exports to the US rose 2.5%, and sales to China climbed 10.2%. Year-over-year, manufacturing production decreased 9.0% in September.
- COVID-19 cases in Japan rose 116.2% and deaths increased 11.4% (two-week average change). Source: <https://www.statnews.com/feature/coronavirus/covid-19-tracker/> as of November 23, 2020.

Conclusions

Japan's economy has suffered disproportionately from the affects of the COVID-19 pandemic. Despite encouraging growth in the third quarter, with service sector sentiment at a six-year high and the Nikkei hitting a 29-year high last week, Japan is only halfway to a full pre-COVID-19 recovery. Japan's sales YTD are down -11.8% - the worst performing region by this metric.

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.



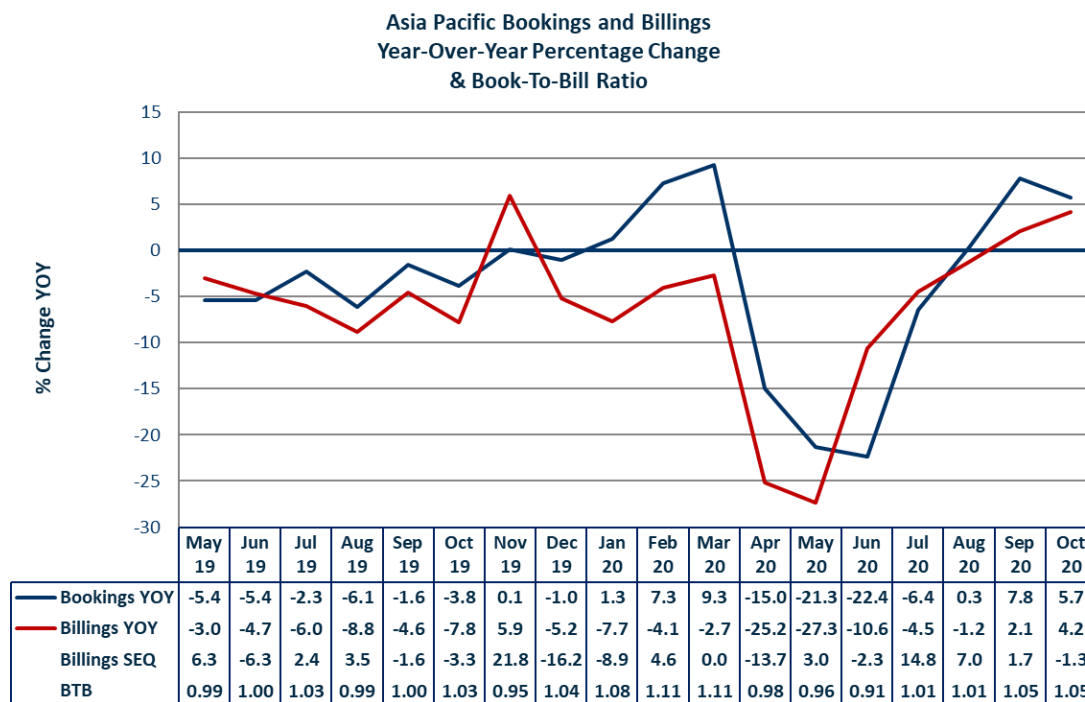
China Performance

- Sales and orders, year-over-year, increased +9.0% and +8.8% respectively. The BTB was 1.03. Sequentially sales slid -1.7%.
- Industrial production increased 6.9% YOY in October. Sale in electrical machinery climbed 17.6% and computer, communications, and electronic equipment rose 5.0% YOY.
- Retail sales grew 4.3% YOY in October and were up 0.68% versus the prior month. China's October auto sales grew for the seventh consecutive month, up 12.5% YOY to 2.6 million units.
- Exports in October jumped the fastest in 19 months, up 11.4% YOY. October imports rose 4.7% YOY to USD 178.74 billion. Purchases of unwrought copper and copper products jumped 43.4% YOY. Imports from the US fell 14.3% and exports to the US shrank 16.2%.
- In China, the two-week change in COVID-19 cases declined 11.0% with no deaths reported. Source: <https://www.statnews.com/feature/coronavirus/covid-19-tracker/> as of November 23, 2020.

Conclusions

China's trade surplus with the United States widened in October to \$31.37 billion due to increased demand for medical supplies and reduced manufacturing capacity in other regions caused by the ongoing pandemic. Some analysts have predicted Chinese exports will come under pressure as major economies in Europe and North America lockdown in response to the rise of COVID-19 cases. October connector billings sequentially declined for the first time in five months. This is likely to become a new trend in the next few months.

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.



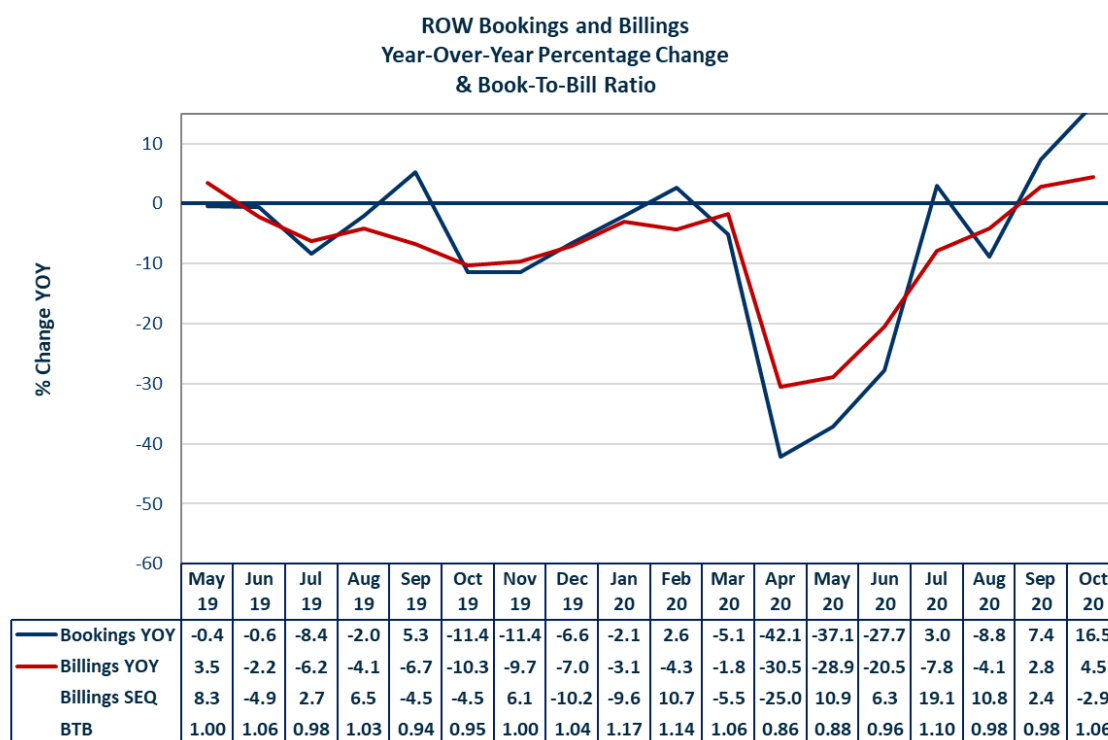
Asia Pacific Performance

- Orders climbed 5.7% in October and sales were up 4.2% YOY. The book-to-bill ratio was 1.05. Sequentially, sales in October dipped -1.3% after three consecutive months of increases.
- India: In September, industrial production was up slightly 0.2% YOY, and on a month-on-month basis, it grew 5.4%. Manufacturing production in September decreased 0.6% YOY. Year-over-year in October, imports and exports declined 19.6% and 5.4%, respectively.
- South Korea: Industrial production jumped 8.0% YOY following a revised 2.6% drop over the previous month in September. Exports from South Korea declined 3.6% in October, and imports fell 5.8% from a year earlier. The industrial production increased 8.0% YOY in September.
- India's two-week change in COVID-19 cases fell 8.3%, while deaths rose slightly 0.4%.
- South Korea's two-week change in COVID-19 cases jumped 107.8%, and deaths rose 28.6%. Source: <https://www.statnews.com/feature/coronavirus/covid-19-tracker/> as of November 23, 2020.

Conclusions

On November 14, an Asia Pacific trade agreement, eight years in the making, was signed by 15 countries called the Regional Comprehensive Economic Partnership (RCEP). Despite being billed as the largest trade deal in the region, its overall impact will be relatively insignificant. Notably absent from the deal is India, the region's second largest economy after China. The Peterson Institute for International Economics forecasted Japan and South Korea to accrue the most benefits, with it affecting their GDP by 1.0% in the next decade. The three Asian Pacific countries of Malaysia, Vietnam, and Thailand will see around a 0.5% increase in GDP growth over the same period. The trade agreement is unlikely to have a significant impact on overall connector sales in the region. The five-year (2020-2025) CAGR forecast for the region is for +6.2% growth.

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 and sales increased +16.5% and +4.5% YOY in October, respectively. Sequentially, sales in the region declined -2.9% after five months of positive sequential increases. The book-to-bill ratio rose to 1.06.
- Brazil's industrial production grew 3.4% YOY in September, and it increased 2.6% over the prior month. Retail sales increased 7.3% in September YOY and increased 0.6% over the previous month. The inflation rate rose to 3.92% in October, the highest rate since February. The manufacturing PMI rose up in October, increasing to 66.6 from 64.9 from the prior month. This reading points to the fifth consecutive expansion in factory activity.
- Russia's industrial production dropped 5.9% YOY in October. This is the seventh consecutive decline in industrial activity. Exports fell 14.1% and imports declined 2.7% in September. The inflation rate increased to 4.0% YOY in September. (Bank of Russia inflation target is 4.0%). The unemployment rate was unchanged at 6.3% in October.
- Brazil's two-week change in COVID-19 cases and deaths increased 55.3% and 29.1%, respectively. Source: <https://www.statnews.com/feature/coronavirus/covid-19-tracker/> as of November 23, 2020.
- Russia's two-week change in COVID-19 cases and deaths rose 21.5% and 24.5%, respectively.

Conclusions

The two largest representative countries in this region, Brazil and Russia, produced opposite results when comparing economic indicators in September and October. With year-to-date connector sales growth down -9.6%, this is the second most challenged region behind Japan.

October 2020 YTD Currency Impact on Regional Industry Growth

The yuan continued its decline in value against the US dollar. The yen rose slightly, up 1.6% YTD against the US dollar in October, while the euro rose 0.5%. The following table measures the impact for October 2019 versus October 2020 and shows the YTD results for these three currencies.

**Local Currency to One USD
YTD October 2019 versus October 2020**

Currency	2019	2020	% Change
Euro	0.8908	0.8860	0.5%
Yuan	6.8854	6.9690	-1.2%
Yen	109.0216	107.2728	1.6%

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 year-to-date sales performance by region in US dollars and local currencies.

**Industry Sales Performance
October YTD 2020
USD-vs-Local Currencies**

Region	U.S.\$	Local Currency
North America	-4.7%	-4.7%
Europe	-7.6%	-7.1%
Japan	-11.8%	-12.9%
China	1.1%	2.7%
Asia Pacific	-6.3%	-6.3%
ROW	-10.9%	-10.9%
World	-5.1%	-4.7%

Connector sales are 0.4 percentage points higher when stated in local currencies rather than in US dollars, putting industry performance at -4.7% YTD in September (versus -5.1% YTD in US dollars).

In some regions, there is a larger discrepancy in the value of the US dollar to the local currency, e.g. Korean won. These regions are listed in the following table.

**Local Currency to One USD
October YTD 2019 versus October 2020**

Currency	2019	2020	% Change
Swiss Franc	0.9947	0.9469	5.1%
S. K. Won	1163.4931	1194.4835	-2.6%
Russian Ruble	65.0214	71.6009	-9.2%
Taiwan Dollar	30.9986	29.6707	4.5%
Indian Rupee	70.2510	74.2096	-5.3%
Singapore Dollar	1.3654	1.3871	-1.6%

Top 10 Connector Manufacturers – Telecom/Datacom and Fiber Optics

This month, Bishop & Associates published the [High-Speed Fiber Optic & Copper Connectors](#) research report. The following article focuses on the entirety of the Telecom/Datacom market and the Fiber Optic product category as it relates to the largest 10 connector manufacturers producing interconnects within these categories for the full year ending December 31, 2019.

The world's top 10 connector manufacturers (ranked by sales) that serve the telecom/datacom market recorded total world sales of \$33.9 billion in 2019. Within these top 10 companies, the telecom/datacom connector market comprised 27.1% of total 2019 sales, or \$9.2 billion. Together, the top-ranking companies command a telecom/datacom market share of 64.4%. In 2019, the telecom/datacom market was the second largest Bishop-defined market, representing 22.2% of total 2019 world connector sales or \$14.3 billion.

The table below ranks the top 10 largest connector manufacturers by telecom/datacom market sales.

**Top 10 2019 Connector Manufacturers
by Telecom/Datacom Market Sales***

2019 Rank	Manufacturer	2019 Sales	2019 Telecom	% Company Sales Telecom	% Market Share Telecom
1	Amphenol	\$7,339.7	\$3,559.8	48.5%	24.9%
2	Molex	\$5,301.0	\$1,537.3	29.0%	10.8%
3	Luxshare Precision	\$2,974.5	\$1,207.7	40.6%	8.5%
4	JAE	\$1,628.0	\$700.0	43.0%	4.9%
5	Rosenberger	\$1,213.4	\$473.2	39.0%	3.3%
6	FIT	\$3,092.3	\$439.1	14.2%	3.1%
7	TE Connectivity	\$9,916.1	\$396.6	4.0%	2.8%
8	Hirose	\$1,070.5	\$310.4	29.0%	2.2%
9	CommScope	\$411.1	\$300.1	73.0%	2.1%
10	JONHON	\$980.3	\$264.7	27.0%	1.9%
Total Top 10		\$33,926.9	\$9,188.9	27.1%	64.4%
Total All Other		\$30,242.2	\$5,080.3	16.8%	35.6%
Total World		\$64,169.1	\$14,269.2	22.2%	100.0%

\$ Millions

**The above table includes company-provided data, information collected from public sources, and Bishop estimates.*

The leading worldwide telecom/data market connector manufacturer was Amphenol, with 2019 telecom/datacom related shipments of \$3,559.8 million. Amphenol accounted for 24.9% of total 2019 worldwide telecom/datacom connector shipments. Nearly half of Amphenol's 2019 total connector sales were attributed to telecom/datacom connectors.

The second-highest ranking telecom/datacom connector manufacturer was Molex, with 2019 shipments of \$1,537.3 million, representing 10.8% of total worldwide telecom/datacom connector shipments. Molex's 2019 telecom/datacom connector sales represent 29.0% of the company's total sales for the year.

The third-highest ranking telecom/datacom connector manufacturer was Luxshare Precision, with 2019 shipments of \$1,207.7 million, accounting for 8.5% of total 2019 worldwide telecom/datacom connector shipments. Luxshare Precision's 2019 telecom/datacom connector sales represent 40.6% of the company's total sales for the year.

Examining the 2019 top 10 connector manufacturers as defined by fiber optic related interconnect product sales, it is interesting to note that fiber optic connectors represent 54.9% of the telecom/datacom market.

The world's top 10 connector manufacturers (ranked by sales) that produce fiber optic interconnects recorded total world sales of \$32.3 billion in 2019. Within these top 10 fiber optic connector manufacturers, 2019 fiber optic connector sales represented 6.8% of their total 2019 sales, or \$2.2 billion. Together, the top-ranking companies' fiber optic connector products make up a market share of 59.8%. In 2019, the fiber optic product category was fifth largest connector product among the 12 Bishop-defined product categories. Fiber optic connector products represented 5.7% of total 2019 world connector sales or \$3.6 billion.

The table below ranks the top 10 largest connector manufacturers by fiber optic product category sales.

**Top 10 2019 Connector Manufacturers
by Fiber Optic Product Sales***

2019 Rank	Manufacturer	2019 Sales	2019 Fiber Optic	% Company Sales Fiber Optic	% Market Share Fiber Optic
1	TE Connectivity	\$9,916.1	\$376.8	3.8%	10.3%
2	Foxconn (FIT)	\$3,092.3	\$358.7	11.6%	9.8%
3	Amphenol	\$7,339.9	\$308.3	4.2%	8.5%
4	Molex	\$5,300.7	\$212.0	4.0%	5.8%
5	Corning	\$313.6	\$208.5	66.5%	5.7%
6	CommScope	\$411.1	\$205.6	50.0%	5.6%
7	JONHON	\$980.1	\$182.7	18.6%	5.0%
8	Aptiv	\$3,373.3	\$128.2	3.8%	3.5%
9	Rosenberger	\$1,213.3	\$109.2	9.0%	3.0%
10	HUBER+SUHNER	\$370.1	\$92.9	25.1%	2.5%
Total Top 10		\$32,310.5	\$2,182.9	6.8%	59.8%
Total All Other		\$31,858.6	\$1,465.2	4.6%	40.2%
Total World		\$64,169.1	\$3,648.1	5.7%	100.0%

\$ Millions

**The above table includes company-provided data, information collected from public sources, and Bishop estimates.*

The leading worldwide fiber optic product connector manufacturer was TE Connectivity, with 2019 fiber optic related shipments of \$376.8 million. TE Connectivity accounted for 10.3% of total 2019 worldwide fiber optic connector shipments. TE Connectivity's 2019 fiber optic connector sales make up just 3.8% of the company's total sales.

The second-highest ranking fiber optic connector manufacturer was FIT, with 2019 shipments of \$3,092.3 million, representing 10.3% of total worldwide fiber optic connector shipments. FIT's 2019 fiber optic connector sales represent 11.6% of the company's total sales for the year.

The Bishop Report

The third-highest ranking fiber optic connector manufacturer was Amphenol, with 2019 shipments of \$308.3 million, accounting for 8.5% of total 2019 worldwide fiber optic connector shipments. Amphenol's 2019 fiber optic connector sales represent a modest 4.2% of the company's total sales for the year. Amphenol is the only company to rank in the top three in both the telecom/datacom market and the fiber optic product category.

For detailed information on the world telecom/datacom connector market and the fiber optic products as it relates to high-speed connectors, please refer to Bishop & Associates' research report P-675-20, [High-Speed Copper & Fiber Optic Connectors](#).

Information in this article was obtained from Bishop & Associates' 2020 edition of the [Top 100 Connector Manufacturers](#) research report. This report includes in-depth information about the companies that provide connectors to the telecom/datacom market, as well as the other key markets that drive the connector industry. This valuable resource helps the industry learn more about connector companies' sales, products, and their ranking among the top 100 connector manufacturers, as well as the trends that will continue to shape critical markets.

High-Speed Copper & Fiber Optic Connectors

Bishop & Associates has just released a 15-chapter, 234-page research report that examines high-speed copper & fiber optic connectors. **High-Speed Copper & Fiber Optic Connectors**,

reviews how high-speed copper and fiber optic connectors are continuing to evolve to support the ever-increasing demand for higher bandwidth, signal integrity, increased panel density, and reduced power. Current, state of the art copper printed circuit board interfaces continue to exceed perceived performance limitations through a combination of fine tuning of the internal signal path, optimized PCB launch, advanced signal conditioning, and adoption of PAM4 modulation. High-performance shielded differential pair cables can significantly increase the reach of high-speed signals.

High-Speed Copper & Fiber Optic Connectors



Design engineers are beginning to find applications that require performance beyond the practical limits of copper. In addition to inherent bandwidth size and weight advantages, newer fiber optic connectors are becoming smaller, easier to terminate, less susceptible to contamination and capable of terminating many single mode fibers simultaneously. In the past, fiber was limited to long-reach applications that were measured in kilometers. Advanced optical signaling technology including coherent signaling can greatly increase the data capacity of a single fiber. Today, fiber links are being considered for rack-to-rack, server to top of rack, and even select inside the box applications. Attenuation and signal degradation attributed to PCB laminates is stimulating the growth of both copper and fiber optic links that lift high-speed signals out of the board entirely.

This report focuses primarily on telecom and computing applications with some additional discussion in related consumer and military/aerospace applications. The basic characteristics of high-speed copper and fiber optic connectors are reviewed, as well as advanced silicon photonic transceiver technology. Also discussed are high-speed copper cable assemblies both passive and those with active equalization features, which enable greater bandwidth and length.

Additional chapters discuss the evolution of small form factor pluggable interfaces that provide options for both copper and fiber links. The advantages and typical applications of active optical cables are also reviewed.

One chapter is focused on the role of formal and industry sponsored standards that facilitate the implementation and certification of both copper and fiber optic links.

Another chapter identifies a series of applications that are driving the development of high-speed communications and represent long-term growth for both copper and fiber optic connectors.

The report also reviews the many alternative wireless technologies that are available to address high-speed link applications. Emerging millimeter band communication including 5G are reviewed.

Mid-board optical transceivers and co-packaged optics are emerging technologies that provide packaging solutions for high-performance circuits. Both topics are discussed along with their potential long-term impact on system design.

High-Speed Copper & Fiber Optic Connectors

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To Order *High-Speed Copper & Fiber Optic Connectors*



Research Report P-675-20, *High-Speed Copper & Fiber Optic Connectors* is available for \$5,135. If you would like additional information about this report, or would like to place an order, please complete the following information and e-mail, or mail it to Bishop & Associates, Inc. To place your order on our website, please visit: <http://store.bishopinc.com/>.

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1209 Fox Glen Drive - St. Charles, IL 60174

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For Questions in **Europe:**

Mr. Arthur Visser

Bishop & Associates, Inc.

Phone: (32) 2.660.3696

[Email Arthur Visser](mailto:Arthur.Visser@bishopinc.com)

What's New ?

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>.

- ☐ **Report P-675-20** **High-Speed Copper & Fiber Optic Connectors (November 2020) NEW**
- ☐ **Report F-2020-02** **Connector Industry Forecast (October 2020) NEW**
- ☐ **Report M-980-20** **5G Infrastructure – How 5G is Impacting Infrastructure Hardware and Connector Buying Trends (September 2020) NEW**
- ☐ **Report M-121-20** **2020 Top 100 Connector Manufacturers (August 2020) NEW**
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- ☐ **Report C-122-20** **2020 Connector Industry Yearbook (June 2020)**
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- ☐ **Report P-606-19** **Connector Types and Technologies Poised for Growth (October 2019)**
- ☐ **Report M-1010-19** **World Automotive Connector Market (August 2019)**
- ☐ **Report M-970-19** **World Consumer Market for Connectors - 2019 (June 2019)**
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THE BISHOP REPORT - CONNECTOR INDUSTRY YEARBOOK

An annual subscription to **THE BISHOP REPORT** (12 issues) is available for \$1,750. *The Bishop Report* subscription includes access, through Bishopinc.com, to prior issues of The Bishop Report, 30-40 yearly News Briefs, Industry Financial Benchmarks, and various connector industry indices. In addition, your subscription will include the **Connector Industry Yearbook** report (normally \$1,500).

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[Click here](#) to view an expanded report description, and a complete table of contents, for all Bishop & Associates' research reports.



1209 Fox Glen Drive • St. Charles, IL 60174
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