The Bishop Report
Performance and Forecast of the World Connector Industry

Issue No. 346 | 3rd Quarter 2021 | September 2021

August Sales Up +19.0%
BtB At 1.15 Means Backlog Continues to Grow

Regional Performance:
Worldwide year-to-date sales increased +28.9%.

At +36.0% YTD, Europe is exhibiting the highest sales growth. Europe is followed by ROW at +35.2%. All regions have double-digit growth YTD.

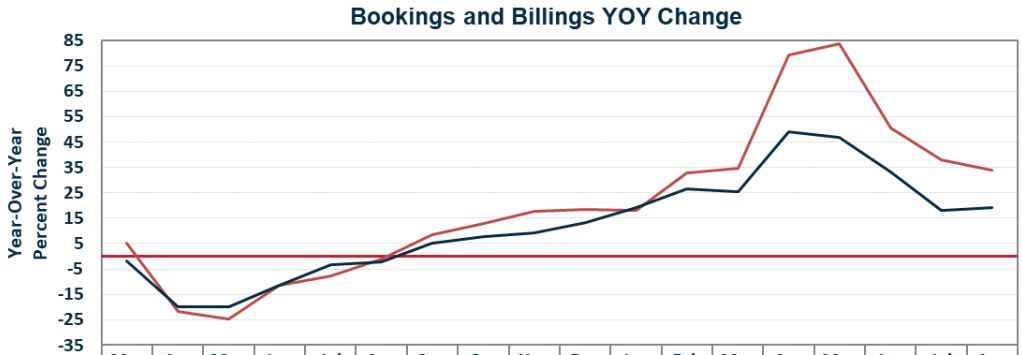
ROW's YOY increase in sales at +26.8% is the highest YOY growth in August. Europe has the highest YOY grow in bookings at +38.0%.

2021 Currency Impact:
The industry grew at +23.9% YTD in August in local currencies versus +28.9% in USD, a 5.0-point difference.

Industry Outlook:
Industry sales totaled $51,503 million through August. If we continued to grow at the historical averages, sales would total $77,353 million (up +23.3%) for the year.

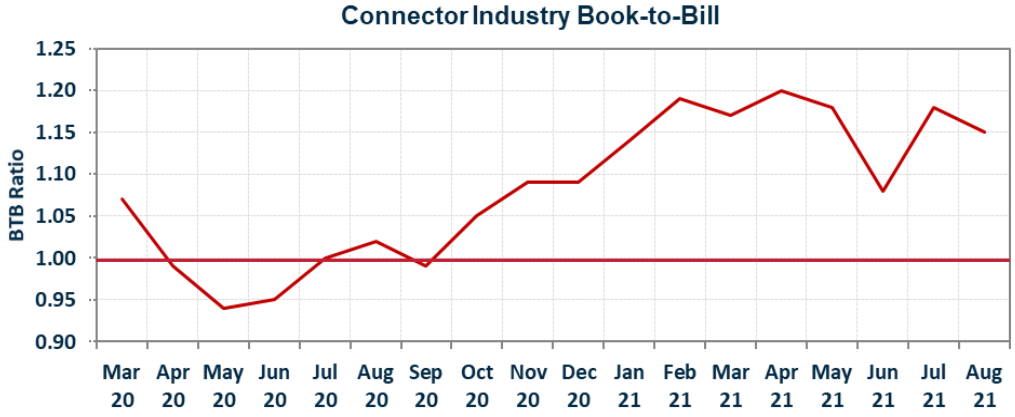
Circular Connectors:
This connector series fared better than the industry in 2020. See page 13.

August bookings were up +34.0% from 2020. Sales for the month were up +19.0% YOY. Sequentially, bookings and billings were up from July. Year-to-date sales are up +28.9%.



	Mar 20	Apr 20	May 20	Jun 20	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
Bookings	5.0	-21.8	-24.8	-11.6	-7.8	-1.2	8.4	13.0	17.5	18.3	18.0	32.8	34.5	79.2	83.8	50.6	38.1	34.0
Billings	-2.0	-19.9	-20.0	-11.6	-3.3	-2.4	5.0	7.6	9.1	13.4	19.0	26.7	25.5	48.9	46.7	33.0	17.9	19.0

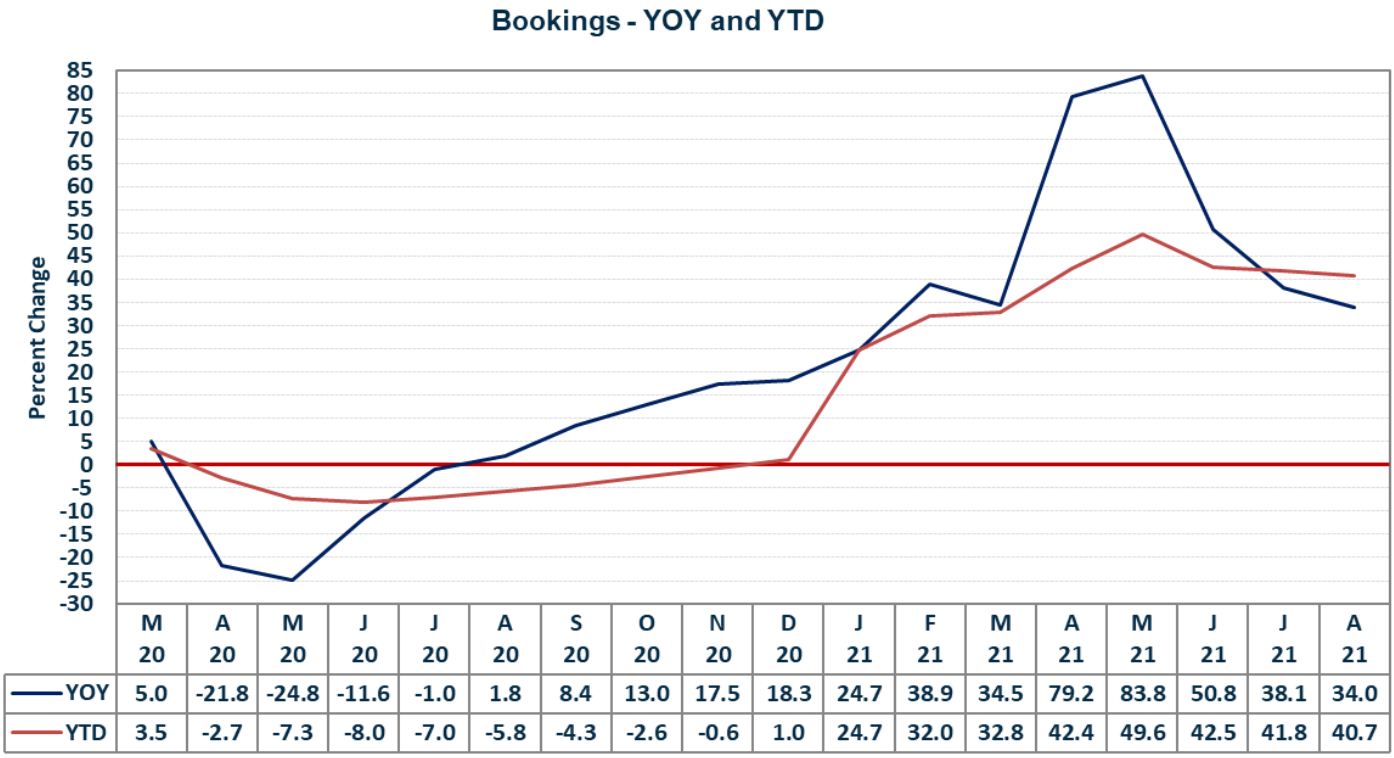
The book-to-bill ratio in August was 1.15 as orders and billings began to normalize a bit, with harder comparisons. YTD, the book-to-bill ratio is 1.12.



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%	1.7%	-8.8%	-21.8%	79.2%	-6.4%	-2.7%	42.4%
May	6.9%	2.9%	5.2%	-7.0%	-24.8%	83.8%	-6.5%	-7.3%	49.6%
Jun	-8.9%	7.0%	-12.3%	-9.0%	-11.6%	50.8%	-6.9%	-8.0%	42.5%
Jul	2.8%	15.2%	-0.7%	-8.4%	-1.0%	38.1%	-6.9%	-7.0%	41.8%
Aug	7.8%	10.7%	6.5%	-5.2%	1.8%	34.0%	-6.6%	-5.8%	40.7%
Sep	-7.1%	-0.9%		-4.3%	8.4%		-6.4%	-4.3%	
Oct	0.6%	4.7%		-6.6%	13.0%		-6.4%	-2.6%	
Nov	10.8%	15.2%		-1.9%	17.5%		-6.0%	-0.6%	
Dec	-7.8%	-7.2%		4.6%	18.3%		-5.2%	1.0%	

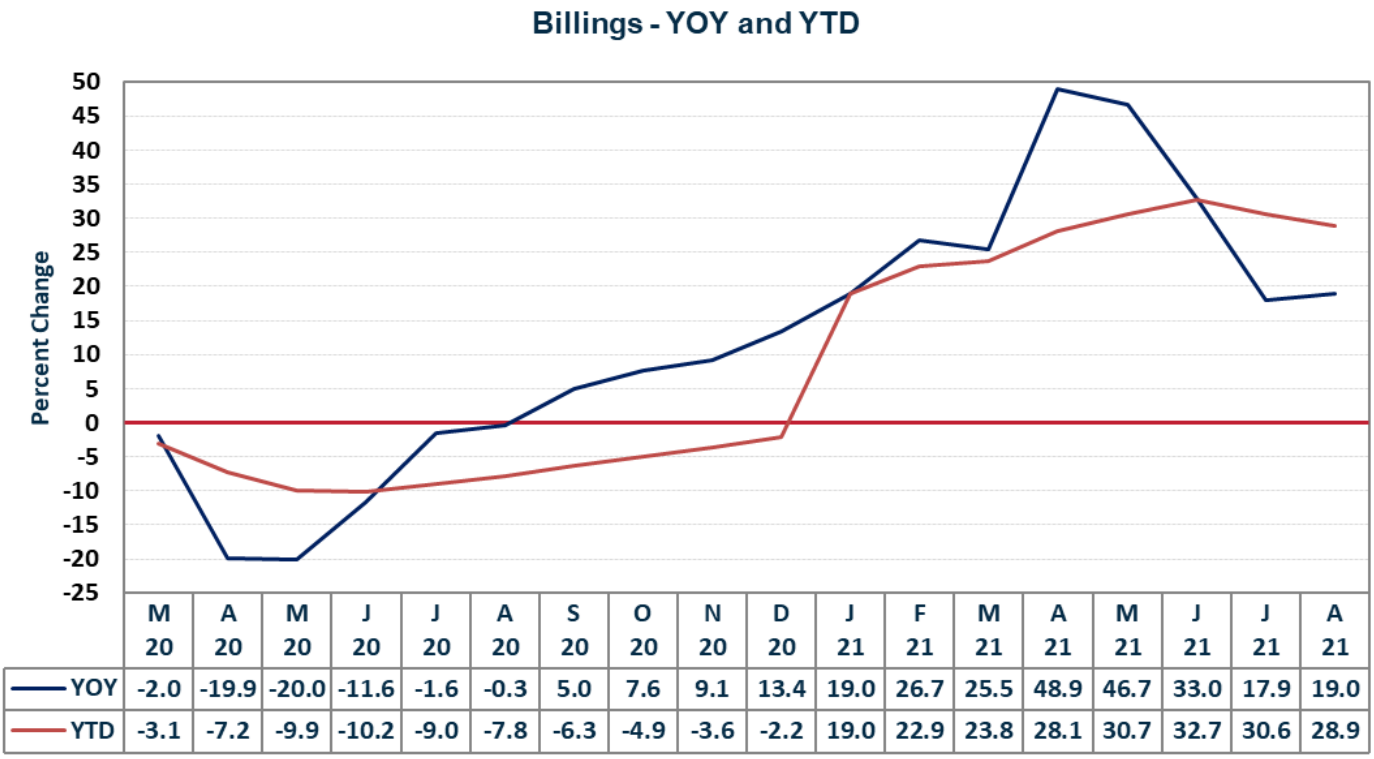


- August bookings rose +34.0% year-over-year.
- Orders increased +6.2% sequentially.
- The book-to-bill ratio for August was 1.15 and 1.12 YTD.

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%	-1.5%	-5.4%	-19.9%	48.9%	-2.8%	-7.2%	29.3%
May	9.0%	8.8%	7.1%	-4.3%	-20.0%	46.7%	-3.1%	-9.9%	32.7%
Jun	-4.2%	5.8%	-3.8%	-4.2%	-11.6%	33.0%	-3.3%	-10.2%	32.7%
Jul	-2.0%	9.0%	-4.2%	-3.1%	-1.6%	17.9%	-3.3%	-9.0%	30.6%
Aug	7.0%	9.0%	8.9%	-4.9%	-0.3%	19.0%	-3.5%	-7.8%	28.9%
Sep	-2.9%	1.7%		-3.7%	5.0%		-3.4%	-6.3%	
Oct	-4.1%	-1.0%		-6.9%	7.6%		-3.7%	-4.9%	
Nov	9.8%	11.4%		-3.4%	9.1%		-3.7%	-3.6%	
Dec	-11.2%	-7.7%		-0.1%	13.4%		-3.8%	-2.2%	



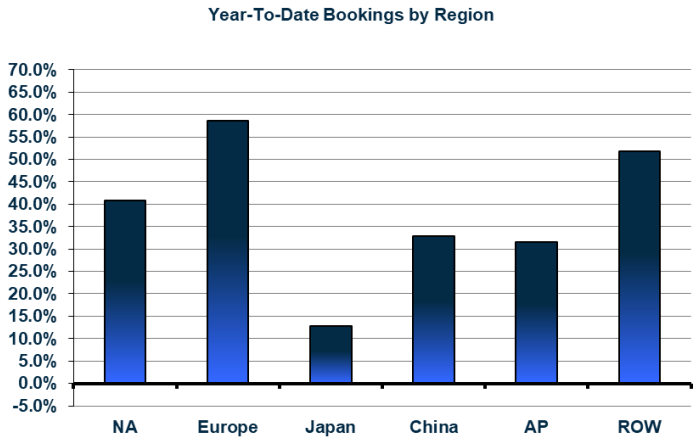
	M 20	A 20	M 20	J 20	J 20	A 20	S 20	O 20	N 20	D 20	J 21	F 21	M 21	A 21	M 21	J 21	J 21	A 21
YOY	-2.0	-19.9	-20.0	-11.6	-1.6	-0.3	5.0	7.6	9.1	13.4	19.0	26.7	25.5	48.9	46.7	33.0	17.9	19.0
YTD	-3.1	-7.2	-9.9	-10.2	-9.0	-7.8	-6.3	-4.9	-3.6	-2.2	19.0	22.9	23.8	28.1	30.7	32.7	30.6	28.9

- August billings grew +19.0% YOY.
- Billings are up +28.9% for the year.
- Sequentially billings increased +8.9%.

Regional Performance

August 2021 Bookings

Region	Sequential	YOY	YTD
NA	11.4%	37.2%	40.9%
Europe	6.4%	38.0%	58.7%
Japan	-1.1%	26.7%	12.9%
China	10.8%	32.8%	32.9%
AP	3.6%	33.0%	31.6%
ROW	-36.1%	1.9%	51.8%
Total	6.5%	34.0%	40.7%

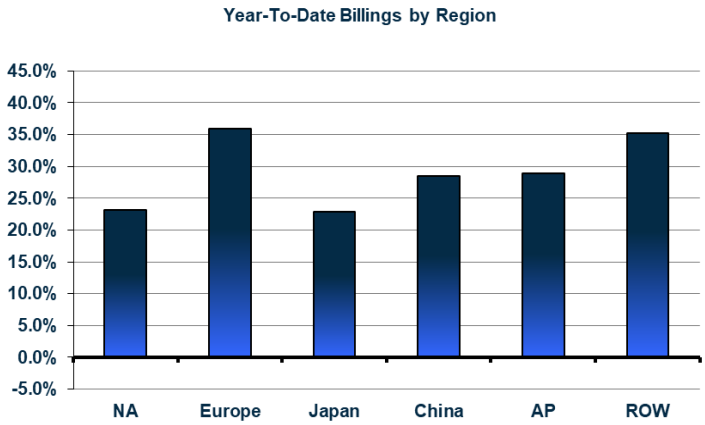


- August bookings increased +34.0% YOY and +40.7% YTD.
- Year-over-year, all regions experienced double-digit growth except ROW.
- Year-over-year comparisons through August have been relatively easy because COVID-19 was still impacting orders at this time last year. Bookings will continue to grow, but the rate of growth will slow significantly in the fourth quarter.

Regional Performance

August 2021 Billings

Region	Sequential	YOY	YTD
NA	15.3%	15.5%	23.2%
Europe	8.8%	20.5%	36.0%
Japan	5.5%	20.2%	22.8%
China	5.7%	18.9%	28.4%
AP	4.5%	21.4%	28.9%
ROW	11.3%	26.8%	35.2%
Total	8.9%	19.0%	28.9%



- August connector sales growth increased +19.0% YOY as demand for electronic products and automobiles continued to accelerate.
- Year-over-year, all regions experienced double-digit growth, with ROW growing at the quickest pace of any region at +26.8%, followed by Asia Pacific.
- Sequentially, sales increased in all regions.
- The third and fourth quarters sales will face the challenge of harder comparisons as the connector industry rebounded strongly in the second half of 2020. We are already seeing this impact.

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.

	Mar 20	Apr 20	May 20	Jun 20	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 22
Bookings	-3.0	-27.3	-27.0	-6.3	-0.8	1.9	3.5	5.9	1.9	15.5	15.0	22.1	32.1	88.9	66.5	48.9	44.5	37.2
Billings	-3.8	-22.3	-22.7	-6.8	-1.2	1.9	6.0	6.8	4.6	7.3	13.2	13.0	19.4	52.6	50.0	23.6	10.4	15.5
Billing SEQ	-7.4	-23.2	9.8	14.5	7.4	10.6	-3.9	-2.4	4.9	-5.7	-2.1	14.9	-1.7	0.3	8.2	-4.9	-3.8	15.3
BTB	1.06	0.99	1.01	0.97	0.93	0.99	0.93	1.01	1.01	1.10	1.14	1.18	1.18	1.23	1.13	1.17	1.21	1.17

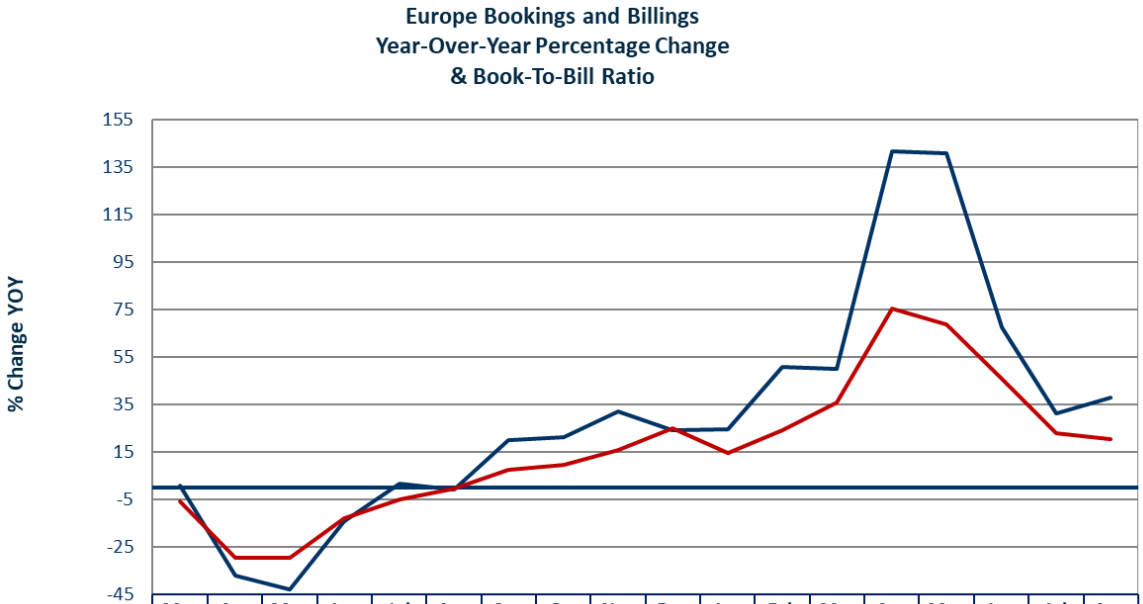
North America Performance

- Sales grew +15.5% and orders were up +37.2% YOY in August. North American billings were up sequentially +15.3%. The book-to-bill remained strong at 1.17.
- Industrial production increased 5.9% YOY in August.
- Manufacturing PMI fell to 61.1 in August from 63.4 in July.
- US unemployment fell to 5.2% in August, the lowest rate since March 2020. The number of unemployed fell 318,000 to 8.38 million.
- Retail sales were up 15.1% in August YOY.
- The annual inflation rate in the US in July fell slightly to 5.3%. According to the CPI data, price increases slowed for used cars and truck, transportation services, and shelter. Prices increases sped up for new vehicles, energy, and medical care services.
- US automotive sales in August were down 10.7% from July and up 33.0% YOY.

Conclusions

The US economy is running strong, but the annual inflation rate is still running high. The higher prices are causing the Federal Reserve Board to plan on raising rates earlier in 2022. This will cool off the economy which could have a negative impact on business, the stock market, and the connector industry in 2022. The market for new vehicles slowed due to the lack of semiconductors required to manufacture them.

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.



	Mar 20	Apr 20	May 20	Jun 20	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 22
Bookings	0.7	-37.0	-43.0	-14.3	1.7	-1.0	19.7	21.0	32.1	24.1	24.5	50.8	49.9	141.4	140.5	67.2	31.2	38.0
Billings	-5.8	-29.5	-29.7	-13.0	-5.0	-0.4	7.5	9.3	15.7	24.8	14.6	24.1	35.6	75.2	68.6	45.6	22.8	20.5
Billing SEQ	-11.5	-29.2	14.3	8.0	11.2	11.2	3.4	-0.2	16.4	-15.8	1.6	24.7	-3.6	-5.3	10.4	-6.4	-7.1	8.8
BTB	1.07	0.88	0.85	0.97	1.09	1.00	1.00	1.06	1.13	1.13	1.18	1.28	1.20	1.22	1.21	1.12	1.17	1.14

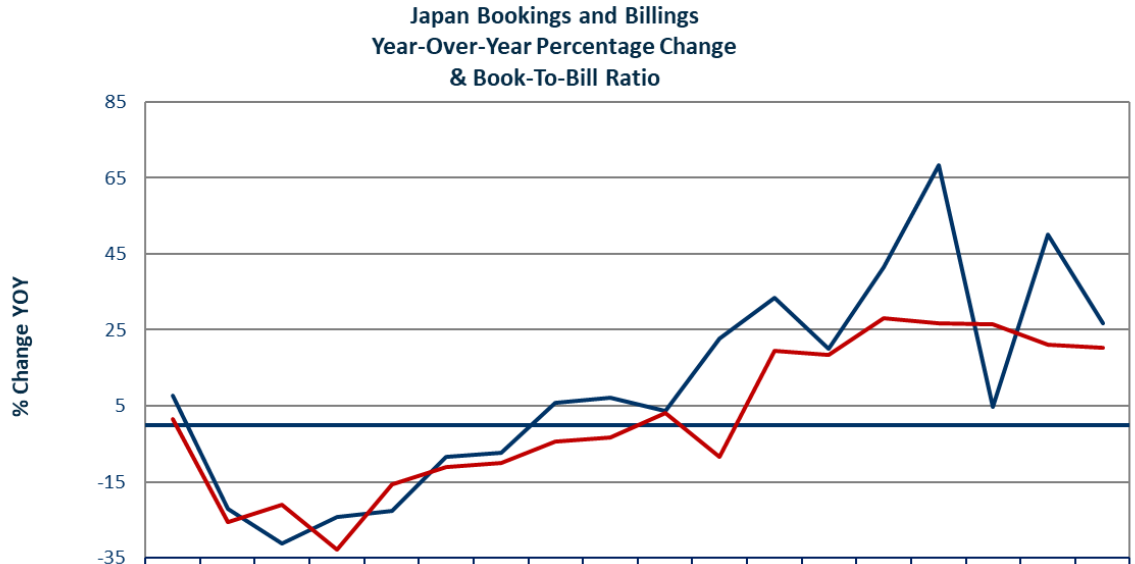
Europe Performance

- YOY billings grew +20.5%, the 12th consecutive positive reading. Orders were up +38.0%, and the book-to-bill ratio was to 1.14. Sequentially, sales were up +8.8%.
- Euro area industrial production increased 7.7% in July YOY.
- The August manufacturing PMI decreased to 61.4 from 62.8 in July.
- July retail sales increased 3.1% YOY and decreased 2.3% sequentially.
- Euro area new car registrations were down 23.6% in July and down 18.1% in August.
- Business confidence fell to 1.75 in August from 1.88 in July.

Conclusions

European new car registrations were down significantly in July and August as a result of the semiconductor shortages. Automotive is the largest connector market in Europe. The connector industry appears to be running stronger than their economies. Europe has also had strong connector bookings and billings for the last six months due to easier comparisons.

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.



	Mar 20	Apr 20	May 20	Jun 20	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 22
Bookings	7.6	-22.0	-31.2	-24.2	-22.6	-8.5	-7.3	5.9	7.1	3.6	22.6	33.5	20.1	41.4	68.4	4.8	50.2	26.7
Billings	1.6	-25.7	-21.0	-32.8	-15.6	-11.2	-10.1	-4.5	-3.2	3.1	-8.5	19.6	18.5	28.2	26.7	26.6	21.1	20.2
Billing SEQ	-3.6	-25.7	1.8	2.4	7.5	10.2	5.7	-5.1	12.4	-1.2	16.9	17.9	-4.3	-5.5	0.3	2.0	0.4	5.5
BTB	1.03	1.04	0.87	0.97	0.93	1.02	1.00	1.10	1.11	1.10	1.03	1.13	1.06	1.16	1.17	0.81	1.18	1.11

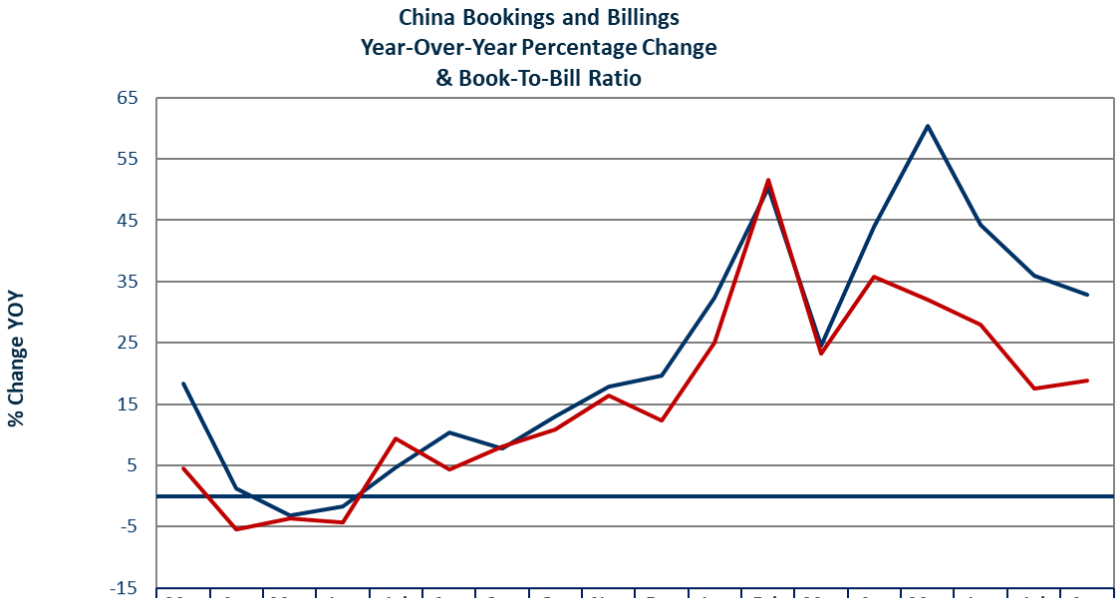
Japan Performance

- Bookings were up +26.7% in August. Sales increased +20.2%. Sequentially, sales were up +5.5%. Japan's book-to-bill ratio was down to 1.11.
- Industrial production increased 11.6% YOY in July.
- July retail sales were up 2.4% YOY.
- The unemployment rate decreased to 2.8% in July.
- Exports increased 26.2% YOY in August. Exports to the US rose 22.8%. Exports of semiconductor machinery was up 34.3%.
- The August manufacturing PMI decreased to 52.7 (revised) from 53.0 in July.

Conclusions

Japan's economy grew in Q2 after six consecutive quarters of contraction on a YOY basis. Sequentially, their economy grew a meager 0.3%. This ongoing weak performance 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 seven 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.



	Mar 20	Apr 20	May 20	Jun 20	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 22
Bookings	18.4	1.3	-3.2	-1.7	4.7	10.3	7.7	13.0	17.8	19.6	32.3	50.2	24.5	44.0	60.3	44.3	36.0	32.8
Billings	4.5	-5.5	-3.6	-4.3	9.4	4.3	8.1	10.9	16.4	12.3	25.0	51.6	23.3	35.8	32.1	28.0	17.5	18.9
Billing SEQ	25.8	-12.2	7.6	0.3	5.2	5.6	4.8	0.0	12.0	-4.2	-3.2	3.1	2.0	-0.9	4.2	-2.8	-2.2	5.7
BTB	1.09	1.10	0.97	0.92	0.99	1.09	1.02	1.05	1.10	1.05	1.14	1.12	1.11	1.17	1.19	1.04	1.16	1.22

China Performance

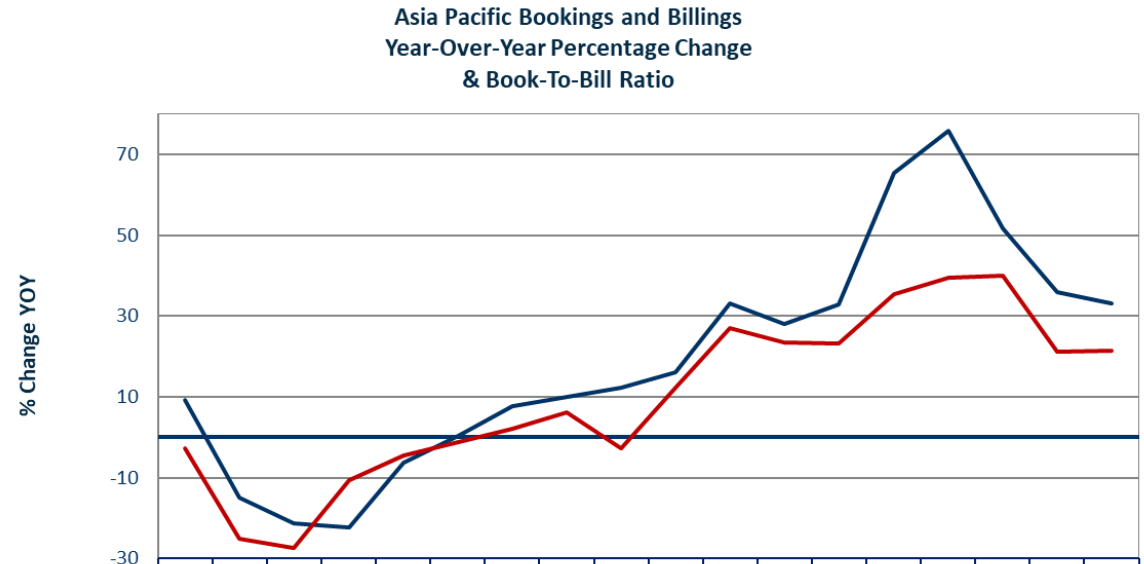
- Sales and orders, year-over-year, increased +18.9% and +32.8%, respectively. The BTB was 1.22. Sequentially, sales increased +5.7%.
- Industrial production increased 5.3% YOY in August, the sixth consecutive month of slowing down.
- China's manufacturing PMI fell to 49.2 in August from 50.3 in July. This is the first contraction since April 2020.
- Retail sales slowed to 2.0% YOY in August, the weakest performance in a year.
- China's auto sales were down 13.7% YOY in August and down 3.3% sequentially for the fourth consecutive month of declines.
- Exports from China were up 25.6%% YOY in August to a record $294.3 billion.

Conclusions

China's industrial production and retail sales continue to slow. Their PMI has reached 49.2 indicating a contraction. Their economy, though still growing YOY, is starting to slow on a quarter-to-quarter basis.

For the last 11 months, 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.



	Mar 20	Apr 20	May 20	Jun 20	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 22
Bookings	9.3	-15.0	-21.3	-22.4	-6.4	0.3	7.8	9.9	12.3	16.1	33.2	28.1	32.8	65.3	75.8	51.6	35.8	33.0
Billings	-2.7	-25.2	-27.3	-10.6	-4.5	-1.2	2.1	6.1	-2.6	12.2	27.1	23.5	23.2	35.3	39.5	39.9	21.2	21.4
Billing SEQ	0.0	-13.7	3.0	-2.3	14.8	7.0	1.7	0.5	11.8	-3.4	-0.5	2.0	0.7	5.0	5.7	-1.1	-5.0	4.5
BTB	1.11	0.98	0.96	0.91	1.01	1.01	1.05	1.07	1.09	1.08	1.14	1.17	1.24	1.21	1.22	0.99	1.14	1.13

Asia Pacific Performance

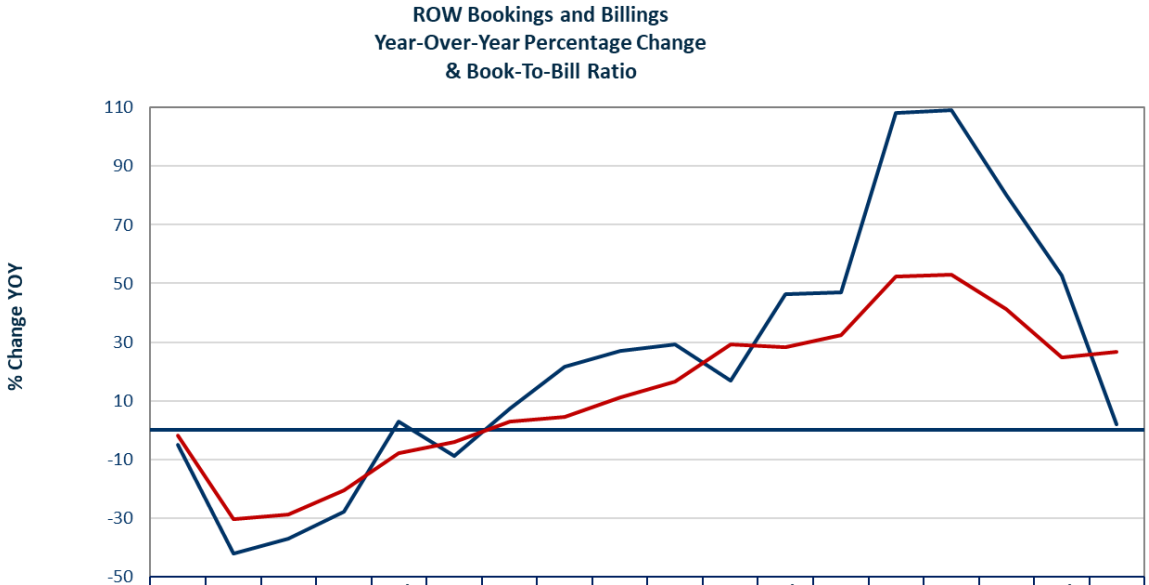
- Orders were up +33.0% in August and sales rose +21.4% YOY. The book-to-bill ratio was 1.13. Sequentially, sales increased +4.5%.
- India's industrial production grew 11.5% YOY in July. Exports were down 6.1% sequentially in August. The June manufacturing PMI fell to 52.3 in August from 55.3 in July. Inflation in August was 5.3%.
- South Korea's industrial production grew 7.9% YOY in July. Exports increased 34.9% YOY in August. Exports to the US and the EU were up 38% and 41.6%, respectively. Exports to China were up 26.8. Exports of chips rose 43.0% and cars rose 16.9%.

Conclusions

India is doing better than expected with industrial production and exports given their current surge of COVID-19, which should help their connector sales. South Korea's GDP continues to grow sequentially. Their connector sales also have a positive outlook with a strong economy.

From the Wall Street Journal, "The recent surge in Covid-19 cases in Southeast Asia has throttled ports and locked down plantations and processors, sparking extended disruptions of raw materials such as palm oil, coffee, and tin."

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.



	Mar 20	Apr 20	May 20	Jun 20	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 22
Bookings	-5.1	-42.1	-37.1	-27.7	3.0	-8.8	7.4	21.7	27.1	29.1	17.0	46.5	47.1	108.2	109.2	80.4	52.6	1.9
Billings	-1.8	-30.5	-28.9	-20.5	-7.8	-4.1	2.8	4.5	11.1	16.4	29.3	28.2	32.3	52.4	53.1	41.4	24.9	26.8
Billing SEQ	-5.5	-25.0	10.9	6.3	19.1	10.8	2.4	-0.9	10.5	-5.9	0.0	12.3	-2.4	-4.1	12.2	-1.4	-3.8	11.3
BTB	1.06	0.86	0.88	0.96	1.10	0.98	0.98	1.09	1.15	1.16	1.09	1.33	1.20	1.17	1.20	1.22	1.36	0.78

Rest of World Performance

- Orders and sales increased +1.9% and +26.8% YOY, respectively, in August. Sequentially, sales in the region increased +11.3%. The book-to-bill ratio declined to 0.78.
- Brazil's 2Q21 GDP grew 12.4% YOY and contracted 0.1% sequentially. Industrial production increased 1.2% YOY in July. The inflation rate rose to 9.68% in August accelerating for the 15th consecutive month. The manufacturing PMI increased to 53.6 in August from 56.7 the prior month.
- Russia's 2Q21 GDP grew 10.5% YOY. Industrial production increased 6.8% YOY in July. Exports increased 100.7% YOY in July. The inflation rate remained at 6.8% YOY in August. The unemployment rate declined to 4.5% in July from 4.8% in June.

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.

ROW connector industry sales have grown in double digits for the last 10 months primarily from easy comparison to 2020.

Industry Outlook – 2021

World connector sales in August were $6,772 million. Through August, we have now shipped $51,053 million for a growth rate of +28.9%.

Historically, 2008 – 2020, August has averaged 66.0% of full year sales. In 2021, should the industry achieve the average, world connector sales will be $77,353 million for a full year growth rate of +23.3%.

YTD August Sales	$51,503
Historical % of Sales	66.0%
2021 Sales Forecast	$77,353
2020 Actual Sales	$62,727
Sales Increase	$14,626
% Change	23.3%

$ Millions

We will probably not achieve the +23.3% growth rate because the industry had an excellent 4Q20 when sales were up a healthy +10.2%. In effect, tougher comparisons will reduce the growth rate in the fourth quarter. We also expect there will be softening of demand as the world economies begin to return to normalcy. We do not expect that governments will once again lockdown their economies.

In 2021, we do expect the industry to achieve double digit growth in the range of +18% to +22%.

A lot of unusual things are happening in the market:

- The semiconductor shortage is reducing car production which is the largest connector market.
- Raw materials used in connectors are up +52.3% in 2021 (gold, copper, steel, and thermoplastics). See Bishop News Brief #31.
- Connector companies are raising prices. We expect companies will increase prices more than once per year.
- Customers are hedging against product shortages and price increases by over ordering. The connector industry has booked $7.5 billion more orders in 2021 than shipments. The industry now has the largest order backlog in history.

The outcome is that lead time are increasing, connector prices are increasing, and order backlogs are increasing. We will continue to monitor these trends and report. We certainly are living in an interesting and unpredictable period of time.

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

Local Currency to One USD
August 2020 versus August 2021

Currency	2020	2021	% Change
Euro	0.8955	0.8342	-6.8%
Yuan	7.0183	6.4734	-7.8%
Yen	107.8025	108.3460	0.5%

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 August year-over-year sales performance by region in US dollars and local currencies.

Industry Sales Performance
August 2021
USD-vs-Local Currencies

Region	U.S.$	Local Currency
North America	23.2%	23.2%
Europe	36.0%	26.7%
Japan	22.8%	23.4%
China	28.4%	18.4%
Asia Pacific	28.9%	28.9%
ROW	35.2%	35.2%
World	**28.9%**	**23.9%**

World connector sales are 5.0 percentage points lower when stated in local currencies rather than in US dollars, putting industry performance at +23.9% in August. (versus +28.9% in US dollars). This is the result of the continued weakness of the US dollar compared to these currencies.

New Products Bolster Sales of Circular Connectors

Military/Aerospace and Commercial/Industrial Markets Expand

Commercial/Industrial Circulars Outsell Mil/Aero by over 30%

While some industries suffered huge declines last year due to the COVID-19 pandemic, the connector industry briefly slowed and then recovered with unexpected strength, declining only -2.2%, resulting in 2020 worldwide sales of $62.7 billion. Circular connectors, representing $4.3 billion or approximately 6.9% of total connector sales in 2020, declined a mere 1.4%. Although sales of cable assemblies using circular connectors did decline in 2020, anticipated growth in 2021 means this product will represent over 9% of the worldwide cable assembly market, ranking behind application-specific and I/O rectangular assemblies.

2020 and 2021 Circular Connector Sales by Region
With Percent Change

	2020	2021F	Percent Change
North America	$1,354.5	$1,426.3	5.3%
Europe	$1,073.3	$1,127.7	5.1%
Japan	$265.0	$269.1	1.5%
China	$925.8	$1,021.0	10.3%
Asia Pacific	$421.5	$442.2	4.9%
ROW	$227.8	$238.6	4.7%
Total World	**$4,267.9**	**$4,524.9**	**6.0%**

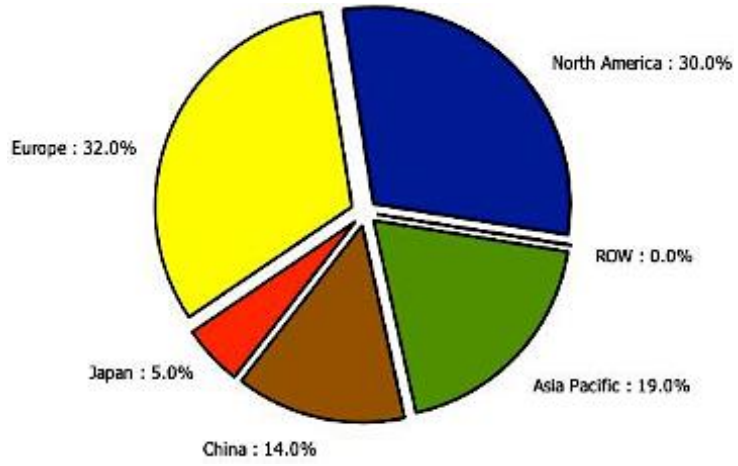
$ Millions

Examining the circular connector market from a commercial/industrial perspective versus MIL-spec/COTS type, in 2020 sales of commercial/industrial circular type connectors exceeded military/COTS-equivalent types by over 30%. This was primarily driven by the transportation and telecom/datacom markets, which experienced higher than normal connector demand. It is important to note that there is considerable cross-over between mil/aero and commercial/industrial for end-use applications. In fact, many standard MIL-spec circulars are used in industrial applications such as commercial lighting and machine controls, while commercial circulars such as push-pull types and breakaways are used in military wearables involving sensors and communications. MIL-spec circulars are even used to power many of the mini-UAV applications used in the commercial sector. MIL-DTL-55116 connectors are popular for portable commercial radio and intercom systems.

Close to 300 connector companies participate in the manufacturing of circular connectors, and close to 200 of these have annual sales greater or equal to $5 million. Because all types of circular connectors are used worldwide, manufacturing locations are widespread, allowing for both local and export sales. For clarification, MIL-spec/COTS and commercial/industrial circular connectors do not include electric vehicle charging connectors or heavy-duty circular connectors such as those used in nuclear, high-pressure (hydrospace and MIL-C-24271, 22249, or 24231 types), or connectors used in energy exploration applications. These connectors fall under application-specific or heavy-duty/harsh-environment types.

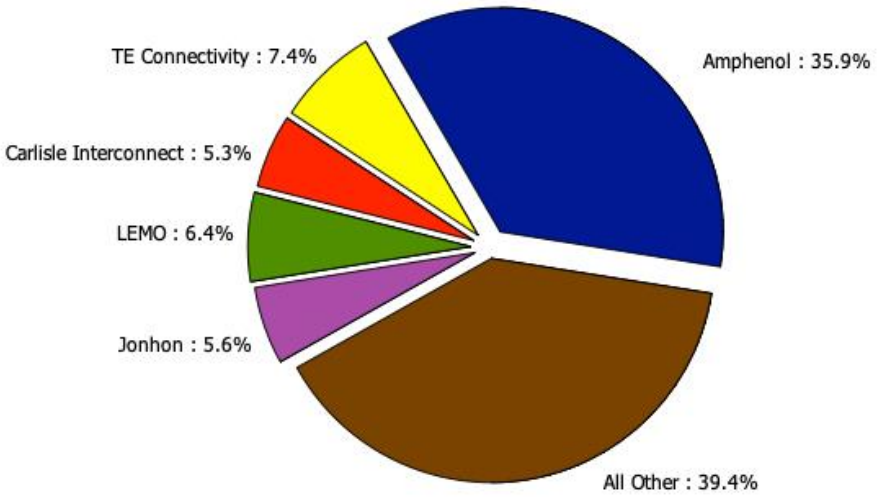
It is not surprising to see that when you examine the company based on base of origin, Europe accounts for the most manufacturers of circular connectors, followed by North America. It is also not surprising to note that of those with base of origin in Europe, the largest percentage are headquartered in Germany.

Distribution of Circular Connector Manufacturers
With Annual Sales ≥$5 Million by Geographic Region



Examining the top 10 manufacturers of circular connectors, we see that Amphenol is the largest manufacturer of standard MIL-spec/COTS equivalent and commercial/industrial circular connectors, with a market share of close to 35%. This market share is almost five times that of the next largest manufacturer, TE Connectivity, which has over 7% of the circular connector market. Although Amphenol excels in both the MIL-spec/COTS equivalent and commercial/industrial categories, they do hold more MIL-spec qualifications than any other connector company. Amphenol and TE Connectivity are followed by LEMO, which has over 6% of the circular connector market. It is interesting to note that TE Connectivity, although always a participant in the commercial/industrial circular connector market, did not truly participate in the MIL-spec/COTS-equivalent circular connector market until the company's 2012 acquisition of Deutsch Group SAS. In 2011, Deutsch had connector sales of approximately $670 million, of which over 35% were in the military/aerospace market sector, and was ranked the 13th connector supplier in the world. In 2020, LEMO was the 36th largest connector maker although the company only manufactures circular connectors. Although 15% of the company's business is with the military/aerospace sector, LEMO holds no formal military specifications.

Market Share Top 5 Circular Connector Manufacturers
2020



Popular Product Types Among Circular Connector Families

Analyzing individual product types within each of the two key circular connector product families, it is obvious that among MIL-spec/COTS-equivalent connectors, the family of MIL-DTL-38999 connectors has the highest sales worldwide. Within this family, Series III — including composites, BACC (Boeing approved), and EN3645 configurations — are the most popular. Creative combinations include Amphenol's KVTV series, which assembles inserts from MIL-DTL-5015 into shells from Series III MIL-DTL-38999. Spacecraft Components puts inserts from MIL-DTL-38999 into reverse bayonet VG95234 housings for their DuraLock SCPB39 series. Multiple suppliers offer versions with low-pass EMI filters, PC termination, non-outgassing inserts for deep space needs, and multi-port assemblies with RF coaxes instead of standard size 12 through 20 contacts, plus inline adapters as "gender changers" or "connector savers."

Special PC Termination (Amphenol Aerospace)

Switching to commercial/industrial type circular connectors, plastic and metal shell push-pull types not only account for the largest percentage, but also represent the single largest circular connector type. In 2020, plastic and metal shell push-pull connectors accounted for slightly more than 45% of the total industrial/commercial connector market and almost 27% of all circular connector types. Push-pull connectors are offered by almost all the key circular connector manufacturers, with some actually developing their product offering around the push-pull concept.

Future Developments in the Circular Connector Market

Several suppliers offer micro-38999 connectors and target their sales to compete with Glenair's Mighty Mouse connectors. While many indicate they offer an equivalent to, or can mate with Mighty Mouse, Glenair does not accept interchangeability with others. The Engineering and Technical Support Directorate within DLA Land and Maritime has undertaken the task of creating a MIL-specification that will establish test and performance criteria for connectors to be equivalent to *Mighty Mouse* based upon application needs and equivalencies to MIL-DTL-38999. For several years, they have had an industry group involving other U.S. agencies and system integrators, such as Raytheon Space and Missiles, along with established D38999 manufacturers, including Amphenol, ITT Cannon, Souriau (Eaton), and TE Connectivity (plus other companies that are new to these products, including Omnetics Connector Corporation), working to create this specification. Bishop & Associates has attended these meetings from time to time to maintain current knowledge regarding specification status. As of this writing, the specification draft is well underway but still incomplete. If/when finished, Qualified Parts List (QPL) approval will be based upon dimensional inspection to applicable new drawings and testing per the new specification's requirements, but intermateability testing between suppliers is not part of the QPL process.

Micro-38999 (left) vs. Standard MIL-DTL-38999.
Micro-versions are 71% lower in weight and 52% smaller.
(ITT Cannon)

In addition to push-pull connectors, many commercial and industrial applications involve Metric "M" series connectors, which are defined by their metric coupling thread. They are used worldwide for industrial processing, measurement, control, and sensor applications. They have different coding to differentiate power ratings, data interface configurations, termination means, and special characteristics. Sizes currently range from M5 to M50. The most popular are the M8 and M12 sizes, covered by IEC standard 61076-2-10. Each metric connector size may have different manufacturers with varying options. Recent standards have defined M8 and M12 for SPE (single-pair Ethernet) supporting 10 Mb/s transmission over balanced single pair cabling to deliver power and data to devices. These products support a wide range of building control applications and transportation applications. M-style circular connectors are anticipated to achieve a five-year compound annual growth rate (CAGR) of close to 6%, with growth in not only traditional markets like industrial, but also in the transportation market.

High Power Configurations, from M58 to M17, with Various "Boot" Options (Phoenix Contact)

Overall circular connector growth through 2026 is forecast to achieve varying five-year CAGR results, based on product type. High growth is expected for the micro-circular MIL-type grouping that involves new micro-D38999 types along with circular versions of ultra-small connectors that reference MIL-DTL-83513 and MIL-DTL-32139 (specifications define rectangular connectors, but they are used to reference circular connectors that meet applicable test procedures). Above average growth will also be seen in push-pull connectors and industrial/commercial power circular connectors.

Much of the information provided in this article is from the just-released market research report ***World Circular Connector Market 2021*** from Bishop & Associates. This new six-chapter research report provides an inclusive analysis of the MIL-spec/COTS equivalent and commercial/industrial circular connector market, with detailed statistics by region, and by circular connector types, for the years 2019, 2020, 2021F, and 2026F. In addition to circular connector families, product and marketplace information also is separated for MIL-spec/COTS equivalents and commercial/industrial types**,** plus information on primary suppliers and a quantitative review of cable assemblies using circular connectors. To see a detailed summary and ordering information for ***World Circular Connector Market 2021,*** click here.

Significant Events

Sales Outlook Moderates for Components

Long-term demand for electronic components remains robust although sales expectations for the third and fourth quarters have moderated, according to the ECIA. Concerns and uncertainty related to the economy, inflationary pressure and the resurgence of Covid-19 with potential shutdowns could account for the continuing shift of sentiment, said Chief Economist Dale Ford. Yet there are no indications long-term demand for electronics will decrease. Chip makers – currently struggling with a shortage of supply – plan to bring more than 20 fabs online over the next few years. The Institute for Supply Management's manufacturing index grew in August – led by tech companies -- as the sector struggles with supply chain issues. The ability to deliver products to factories and end-users continues to dog the industry. Within individual market segments avionics/military/space and medical equipment have the brightest outlook for September followed by telecom networks and industrial electronics. Expectations for consumer electronics and telecom mobile phones are essentially flat. Automotive electronics saw the biggest drop in expectations for September compared to August.

Major Automakers Fear the Global Chip Shortage Could Persist for Some Time

Car manufacturers including Ford, Volkswagen and Daimler are still struggling to deal with the impact of the global chip shortage, with executives from each of the companies warning a lack of silicon is likely to remain a problem. Volkswagen CEO Herbert Diess, Daimler CEO Ola Kallenius and Ford Europe chairman of the management board Gunnar Herrmann told CNBC's Annette Weisbach at the Munich Motor Show on Monday that it's hard to tell when the complex issue will be resolved. The shortage is thought to have been exacerbated by the move to electric vehicles. For example, a Ford Focus typically uses roughly 300 chips, whereas one of Ford's new electric vehicles can have up to 3,000 chips. The chip shortage has affected the automotive industry more than any other. Assembly lines have been shut down and some cars are now being shipped without features that rely on semiconductors.

Ford Increases Production of Electric F-150 on Increase in Pre-Orders

Ford is increasing production capacity for its upcoming F-150 Lightning pickup as it begins building prototypes of the electric vehicle. The Detroit automaker said that it plans to invest an additional $250 million and add 450 jobs across three Michigan facilities — including the Rouge Electric Vehicle Center, which is building the truck — to double annual production capacity for the vehicle to 80,000 units. That's up from 40,000 vehicles a year ago. Ford has now invested about $950 million in production of a hybrid version of the truck and the electric F-150, which is scheduled to go on sale next spring starting at about $40,000. Kumar Galhotra, Ford's president of the Americas and international markets, said the company expects to hit the 80,000 annual production rate during the second year of production, in 2023. He said Ford has gradually been "pulling levers" to increase production capacity of the F-150 Lightning throughout its supply chain.

Component Shortages to 'Last Well Into 2022

The challenges related to semiconductor and other component shortages will be with us for a considerable time, according to more than a dozen manufacturing executives. The common consensus is this will be a long haul with problems into 2022 or even longer.

Downward Pressure on Pricing Drives Momentum in Wearables

Global wearables shipments grew 32.3% year-over-year as volumes reached 114.2 million during the second quarter of 2021 (2Q21), according to new data from the International Data Corporation. Despite early signs

of slower consumer tech spending, purchases of wearable devices remained strong during the quarter as consumers once again ventured outdoors with the urge to track their health and activity. Among the various device types, hearables and watches each grew 39% during the quarter as demand continued to soar for these categories. Meanwhile, the market for wristbands remained flat as consumer continue to transition to watches and the category lacked notable product launches during recent quarters. According to IDC, watches priced between $200 and $300 have gained 10 percentage points since last year thanks to devices like the Watch SE, Series 3, Versa 3, and the Galaxy Watch Active 2. Meanwhile, hearables in the sub-$100 space have enjoyed a similar trend largely thanks to brands such as Xiaomi, BoAt, Huawei, JBL, and JLAB as they have succeeded at making premium features such as active noise control (ANC) more affordable.

Hyundai Tops Global Hydrogen Auto Sales

South Korea's Hyundai Motor Co. topped global hydrogen fuel-cell electric vehicle sales in the January-July period. Hyundai sold a total of 5,300 units of hydrogen-powered vehicles in the first seven months, beating Toyota Motor Corp. and Honda Motor Co., which sold 4,100 and 200 units, respectively, during the same period, according to SNE Research. Hyundai's hydrogen car sales jumped 44 percent in the seven-month period from 3,600 units a year earlier, while Toyota's jumped eight times from 500 units, it said. Hyundai's Nexo hydrogen car mainly competes with Toyota's Mirai in the global market. yundai, Toyota, Honda and others sold a combined 10,300 hydrogen cars from January to July, more than doubling the 4,900 units sold during the same period of last year.

Gartner Says Worldwide Smartphone Sales Grew 10.8% in Second Quarter of 2021

Global smartphone sales to end users totaled 328.8 million in the second quarter of 2021, an increase of 10.8% year over year, according to Gartner, Inc. Overall global mobile phone sales grew 10.2% despite supply constraints due to COVID-19 related production disruption and component shortages. Xiaomi’s worldwide smartphone sales overtook Apple in the second quarter, placing Xiaomi at the No. 2 position for the first time. Xiaomi registered 80.5% growth in its smartphone sales owing to a stronger online presence and fast expansion in the global markets beyond Asia/Pacific led by investments in retail channels and partnerships with communication service providers (CSPs). Apple sales grew 28.3% and its market share increased 2.1% year over year.

Semiconductor Market to Grow By 17.3% in 2021 and Reach Potential Overcapacity by 2023

IDC expects the semiconductor market to grow by 17.3% in 2021 versus 10.8% in 2020. According to IDC, the industry will see normalization and balance by the middle of 2022, with a potential for overcapacity in 2023 as larger scale capacity expansions begin to come online towards the end of 2022. Growth is driven by mobile phones, notebooks, servers, automotive, smart home, gaming, wearables, and Wi-Fi access points, with increased memory pricing. IC shortages are also expected to continue easing through 4Q21 as capacity additions accelerate. According to IDC, 5G semiconductor revenues will increase by 128%, with total mobile phone semiconductors expected to grow by 28.5%. Game consoles, smart home, and wearables will grow +34%, 20%, 21% respectively. Automotive semiconductor revenues will also increase by 22.8% as shortages are mitigated by year end. Notebook semiconductor revenues will grow by 11.8%, while X86 Server semi revenues will increase by 24.6%.

World Circular Connector Market 2021

Bishop & Associates has just released a new six-chapter research report providing an inclusive analysis of the mil-spec/COTS equivalent and commercial/industrial circular connector market. This new report furnishes detailed statistics by region, by circular connector type for the years 2019, 2020, 2021F and 2026F. In addition to circular connector type, products are also broken into mil-spec/COTS equivalent and commercial/industrial types**,** plus a quantitative review of cable assemblies using circular connectors.

Total World Circular Connector Sales by Region
Mil-Spec & COTS Equivalent
2019-2020

	North America			Europe		
MIL-Spec Circular Connectors	**2019**	**2020**	**% Chg.**	**2019**	**2020**	**% Chg.**
Standard Circular Connectors (MIL & COTS)						
MIL-DTL-5015 A/B, E/F/R (MS is Inactive for New Design)						
CA/CT-, F-80, 97-, etc.	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
MIL-DTL-5015-340X (Front Release) & -350X (Rear Release)	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
MIL-DTL-83723 Series III (Crimp, Rear Release)						
EN2997/BACC, SBAC ESC10 & ESC11, GE M50TF3564	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Standard Reverse Bayonet VG 95234 Types						
CA-B, CB, GCA/B	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Others	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Total Standard Circular	**$XXX.X**	**$XXX.X**	**Y.Y%**	**$XXX.X**	**$XXX.X**	**Y.Y%**
Miniature Circular Connectors (MIL & COTS)						
MIL-DTL-26482 Series I Solder, PT, SE, KPT	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
MIL-DTL-26482 Series I Crimp	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
MIL-DTL-26482 Series II & M83723 Series I	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
MIL-DTL-83723 Series III	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
MIL-DTL-26500, BACC45-BACC63BV/BP/BN or CC/CP, C48	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Other Types: MIL-C-81582 (SAE-AS81582), MIL-DTL-83538, MIL-C-81703 (SAE-AS81703), etc.	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Total Miniature Circular	**$XXX.X**	**$XXX.X**	**Y.Y%**	**$XXX.X**	**$XXX.X**	**Y.Y%**
Subminiature Circular Connectors (MIL & COTS)						
Mil-DTL-38999 Series I	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Mil-DTL-38999 Series II, Incl. Composites	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Mil-DTL-38999 Series III, incl. NATO Types & Composites: BACC63CT/CU or BACC63DB/DC, EN3645, CECC	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Mil-DTL-38999 Series IV	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Others: Mil-C-27599, Push-Pull, MIL-DTL-81511 SS as SAE-AS81511, 348	$XX.X	$XX.X	Y.Y%	$XX.X	$XX.X	Y.Y%
Total Subminiature Circular	**$XXX.X**	**$XXX.X**	**Y.Y%**	**$XXX.X**	**$XXX.X**	**Y.Y%**

$ Millions

Connectors are an essential part of electrical and electronic connections. In an increasingly electronic and digital world, connectors are the key to creating products for networking and connectivity. They are used in all areas of electrical engineering and electronics. Depending on the application and transmission quality required, connectors are designed to satisfy the intended purpose in the best way possible, which is why there are so many variations, types, and sizes. This report focuses on circular connectors, which range in size from micro-miniature to huge, heavy-duty models.

This report is intended for use by those interested in forecasting circular connectors by product and industry trends, or benchmarking comparative sales by product type or overall and regional markets, plus providing a general understanding of various circular connectors including new types, industry standards, and primary suppliers. While an in-depth technical presentation is not intended (books are written just on the materials involved), comparative specifications are included for most major circular connector series. Forecasts reference industry specifications and generic series terminology.

Total World Circular Connector Sales by Region
Commercial and Industrial
2021F and 2026F with 5-Year CAGR

Commercial / Industrial Circular Connectors	2021	Total 2026	5-Yr CAGR
DIN 41524, DIN 43563 Types (non-RF) Connectors			
Standard Circular	$XX.X	$XX.X	Y.Y%
Mini DIN Circular (Keyboard type, etc.)	$XX.X	$XX.X	Y.Y%
Subtotal DIN Connectors	**$XX.X**	**$XX.X**	**Y.Y%**
Audio/Microphone/Speaker Connectors			
Microphone (QG, XLR type)	$XX.X	$XX.X	Y.Y%
Large Types: MASScon, K/LK, SYNTAX SSX	$XX.X	$XX.X	Y.Y%
Speaker and Other Audio-type Connectors	$XX.X	$XX.X	Y.Y%
Subtotal Audio/Microphone Type Connectors	**$XX.X**	**$XX.X**	**Y.Y%**
Miscellaneous Circular			
Industrial Types: VEAM, HUBBELL, Eaton AMC, Amphenol DM, Socapex, ABB/Russellstoll , IEC 60309 connectors (IP69K), etc.	$XX.X	$XX.X	Y.Y%
Plastic Shell: ISO 15170, CPC types, HR30, etc.	$XX.X	$XX.X	Y.Y%
Soft Shell Types: Sure Seal, 164, Molded Remke, etc.	$XX.X	$XX.X	Y.Y%
Metal Shell: Amphenol 67, WPI 165, Japanese JIS C 5432, etc.	$XX.X	$XX.X	Y.Y%
Subtotal Misc. Circular	**$XX.X**	**$XX.X**	**Y.Y%**
Push Pull (Lemo, ODU, Fischer, YC8, types)			
Metal & Plastic Shell, Push Pull	$XX.X	$XX.X	Y.Y%
Subtotal Push Pull Connectors	**$XX.X**	**$XX.X**	**Y.Y%**

$ Millions

The following table of contents shows the detail provided in this new report.

Table of Contents

Chapter 6 – Circular Connector Manufacturers

To Order World Circular Connector Market 2021

Research Report P-430-21, ***World Circular Connector Market 2021*** 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 form, and email or mail it to Bishop & Associates, Inc. To place your order on our website: **https://store.bishopinc.com/**.

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World Circular Connector Market 2021

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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-430-21**	**World Circular Connector Market 2021 (September 2021) NEW**
☐ **Report M-121-21**	**2021 Top 100 Connector Manufacturers (August 2021) NEW**
☐ **Report C-122-21**	**2021 Connector Industry Yearbook (July 2021) NEW**
☐ **Report M-310-21**	**Instrumentation Market for Connectors (June 2021) NEW**
☐ **Report P-799-21**	**World Cable Assembly Market (May 2021) NEW**
☐ **Report P-410-21**	**Computer Server Market Trends and Connector Use 2020 – 2030 (May 2021) NEW**
☐ **Report M-607-21**	**World Industrial Market for Connectors (April 2021) NEW**
☐ **Report M-700-21**	**World Connector Market Handbook (April 2021) NEW**
☐ **Report F-2021-01**	**Connector Industry Forecast (March 2021) NEW**
☐ **Report M-510-21**	**World Telecom Connector Market 2020-2025 (January 2021)**
☐ **Report M-1601-20**	**Top 50 Medical Interconnect Solutions Companies (December 2020)**
☐ **Report P-675-20**	**High-Speed Copper & Fiber Optic Connectors (November 2020)**
☐ **Report M-980-20**	**5G Infrastructure – How 5G is Impacting Infrastructure Hardware and Connector Buying Trends (September 2020)**
☐ **Report M-1501-20**	**Medical Electronics Market for Interconnect Solutions (July 2020)**
☐ **Report P-780-20**	**World RF Coax Connector Market 2020 (June 2020)**
☐ **Report M-4100-20**	**Non-Automotive Transportation Market for Connectors (February 2020)**

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