

UNITED STATES SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

(Mark One)

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the fiscal year ended September 28, 2019

or

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the transition period from _____ to _____

Commission File No. 0-02382



MTS SYSTEMS CORPORATION

(Exact name of registrant as specified in its charter)

Minnesota

(State or other jurisdiction
of incorporation or organization)

41-0908057

(I.R.S. Employer Identification No.)

14000 Technology Drive

Eden Prairie, Minnesota

(Address of principal executive offices)

55344

(Zip Code)

Registrant's telephone number, including area code: (952) 937-4000

Securities registered pursuant to Section 12(b) of the Act:

<u>Title of each class</u>	<u>Trading Symbol(s)</u>	<u>Name of each exchange on which registered</u>
Common Stock, \$0.25 par value	MTSC	The Nasdaq Stock Market LLC

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined by Rule 405 of the Securities Act. Yes No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes No

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes No

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes No

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer Accelerated filer Non-accelerated filer

Smaller reporting company Emerging growth company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes No

The aggregate market value of the voting and non-voting common stock held by non-affiliates of the registrant as of March 30, 2019 was approximately \$1.0 billion based on the closing price of \$54.46 as of March 29, 2019 as reported by The Nasdaq Stock Market LLC.

As of November 21, 2019, there were 19,140,444 shares of common stock outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of MTS Systems Corporation's Definitive Proxy Statement (to be filed pursuant to Regulation 14A within 120 days after the end of the fiscal year ended September 28, 2019) for its annual shareholders' meeting to be held on February 11, 2020, are incorporated by reference into Part III of this Annual Report on Form 10-K to the extent described in such Part.

MTS Systems Corporation
Annual Report on Form 10-K
For the Year Ended September 28, 2019

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PART I

ITEM 1. BUSINESS

Business Overview

MTS Systems Corporation is a leading global supplier of high-performance test, simulation and measurement systems and sensors that was incorporated under Minnesota law in 1966. Our operations are organized and managed in two reportable segments, Test & Simulation and Sensors, based on global similarities within their markets, products, operations and distribution. The Test & Simulation and Sensors segments represented 63% and 37% of our revenue, respectively, for the fiscal year ended September 28, 2019.

Terms

The terms "MTS," "we," "us," the "Company" or "our" in this Annual Report on Form 10-K, unless the context otherwise requires, refer to MTS Systems Corporation and its wholly owned subsidiaries.

Fiscal year 2019 refers to the fiscal year ended September 28, 2019, fiscal year 2018 refers to the fiscal year ended September 29, 2018, and fiscal year 2017 refers to the fiscal year ended September 30, 2017. Fiscal years 2019, 2018 and 2017 all include 52 weeks. All dollar amounts and shares are in thousands unless otherwise noted.

Products and Markets

Test & Simulation

Our Test & Simulation segment (Test & Simulation) provides testing and simulation solutions including hardware, software and services that are used by customers in product development to characterize a product's mechanical properties along with simulation systems for human response features. Our solutions simulate forces and motions that customers expect their products to encounter in use. Mechanical simulation testing in a lab setting is an accepted method to accelerate product development compared to reliance on full physical prototypes in real-world settings, proving ground testing, and virtual testing because it provides more controlled simulation and accurate measurement. The need for mechanical simulation increases in proportion to the cost of a product, the range and complexity of the physical environment in which the product will be used, expected warranty or recall risk and expense, governmental regulation and potential legal liability. A significant portion of Test & Simulation products are considered by our customers to be capital expenditures. We believe the timing of purchases of our products may be impacted by interest rates, general economic conditions, product development cycles and new product initiatives.

A typical Test & Simulation system includes a reaction frame to hold the prototype specimen; a hydraulic pump or electro-mechanical power source; actuators to create the force or motion; and a computer controller with specialized software to coordinate the actuator movement, and to measure, record, analyze and manipulate results. Lower force and less dynamic testing can usually be accomplished with electro-mechanical power sources, which are generally less expensive than hydraulic systems. In addition to these basic components, we sell a variety of accessories and spare parts.

We provide Test & Simulation customers across all sectors with a spectrum of services to maximize product performance. Our service offerings include installation, product life cycle management, professional training, calibration and metrology, technical consulting and onsite and factory repair and maintenance.

On November 21, 2018, we acquired all ownership interests of E2M Technologies B.V. (E2M), a manufacturer of high force, electrically driven actuation systems, serving primarily the human-rated entertainment and training simulation markets. The acquisition of E2M expands our technology and product offerings for human-rated simulation systems and brings key regulatory approvals and customers in the flight simulation and entertainment markets. E2M is included in our Test & Simulation structures sector.

Test & Simulation serves a diverse spectrum of customers by industry and geography. Regionally, the Americas, Europe and Asia represented 32%, 22% and 46% of revenue for fiscal year 2019, respectively, based on customer location.

Test & Simulation products, service and customers are grouped into the following three global sectors:

- *Ground Vehicles (approximately 50% of Test & Simulation revenue for fiscal year 2019)*
This sector consists of automobile, truck, motorcycle, motorsports vehicles, construction equipment, agricultural equipment, rail and off-road vehicle manufacturers and their suppliers. Customers include original equipment manufacturers (OEMs), universities, government research and development institutes, motorsports teams and contract test facilities. Our products are used to measure and simulate solutions to assess durability, vehicle dynamics and aerodynamics of vehicles, sub-systems and components. Our products include:
 - Road simulators and component test systems for durability testing;

- Vehicle performance test systems that evaluate ride handling, ride comfort and noise;
 - Vehicle dynamics simulators to test conceptual vehicle designs in advance of physical prototypes;
 - High-performance electrical motors and energy recovery systems for high-end automotive and aerospace applications;
 - Tire performance and rolling resistance measurement systems; and
 - Moving ground-plane systems and balances for vehicle aerodynamic measurements in wind tunnels.
- *Materials (approximately 30% of Test & Simulation revenue for fiscal year 2019)*
This sector covers a diverse range of applications, spanning many different industries, including power generation, aerospace, vehicles and biomedical. Our solutions deliver the reliable, innovative technologies required to satisfy every material evaluation needed from single-axle tension / compression testing to complex fracture mechanics and multi-axial fatigue testing. Our products and services support customers in the research and development of products through the physical characterization of material properties, such as metals, composites and ceramics to polymers, textiles, concrete, geomaterials and many others. Our biomedical applications include systems to test durability and performance of implants, prostheses and other medical and dental materials and devices.
 - *Structures (approximately 20% of Test & Simulation revenue for fiscal year 2019)*
This sector serves the structural testing and simulation needs and services of our customers in the fields of aerospace, structural engineering, oil and gas, wind energy, amusement parks, flight simulation and others. The aerospace structural testing market consists of manufacturers of commercial, military and private aircraft and their suppliers that use our products, systems and software to perform static and fatigue testing of aircraft. Systems for structural engineering include high force static and dynamic testing, as well as seismic simulation tables used around the world to test the design of structures, such as bridges and buildings, and to help governments establish building codes. Structural engineering customers include construction companies, government agencies, universities and building materials manufacturers. The wind energy market consists of wind turbine manufacturers and their component suppliers that use our products to reduce cost and improve reliability of blades, bearings and entire wind turbines. We provide high-quality, durable motion systems servicing human-rated entertainment and training simulation markets. Key product applications include high-technology motion simulators for the amusement park industry and flight simulators for certified pilot training.

Sensors

Our Sensors segment (Sensors) is a global leader in sensing technologies and solutions used worldwide by design engineers and predictive maintenance professionals, serving customers with a focus on total customer satisfaction, and offering regional support to provide innovative and reliable sensing solutions. Our high-performance sensors provide measurements of vibration, pressure, position, force and sound in a variety of applications. Our products and solutions are used to enable automation, enhance precision and safety, and lower our customers' production costs by improving performance and reducing downtime. Revenue is fueled by our customers' spending on research and development activities and industrial capacity utilization. Sensors products and solutions serve the automotive, aerospace, industrial, defense, and research and development markets, as well as many other markets. Sensors manufactures products utilizing piezoelectric and magnetostriction technology, both of which provide highly accurate, reliable and durable sensors ideal for use in harsh operating environments.

On August 5, 2019, we acquired the Endevco sensors business from Meggitt PLC. Endevco is a historic leader in high performance test and measurement sensors used primarily in the testing of new products. This strategic product line purchase further enhances our long-term strategy of growth and market leadership in our core businesses. Endevco is included in our Sensors test sector.

Sensors serves a diverse spectrum of customers by industry and geography. Regionally, the Americas, Europe and Asia represented 50%, 31% and 19% of revenue for fiscal year 2019, respectively, based on customer location.

Sensors products and customers are grouped into the following four global sectors:

- *Position Sensors (approximately 40% of Sensors revenue for fiscal year 2019)*
This sector consists of a wide range of industrial machinery OEMs and their end use customers with applications in all areas of manufacturing including plastics, steel, construction, agriculture, wood and mining, as well as other factory automation applications. These sensors provide positional feedback for motion control systems, improve productivity by enabling high levels of automation, reduce maintenance costs and enhance safety of machine operations.
- *Test Sensors (approximately 35% of Sensors revenue for fiscal year 2019)*
This sector covers diverse industries, including test and measurement, automotive, rail, aerospace and defense. These sensors are used in a variety of applications including research and development; structural monitoring; ground testing of aircraft and vehicles; testing for use in harsh environments; impact sensors for shock and vibration testing;

component and system performance; ride and handling; durability testing; and noise, vibration, and harshness testing. These sensors provide engineers and scientists with precise and accurate measurements to accelerate technology advancement and reduce new product development cycle time.

- *Industrial Sensors (approximately 15% of Sensors revenue for fiscal year 2019)*
This sector consists of sensors used in heavy industrial markets and energy and power generation. Sensors used in heavy industrial markets are primarily used to monitor the vibration and pressure in a wide spectrum of applications including motors, pumps, paper machines and steel rollers. These sensors provide valuable feedback on equipment performance, reducing downtime and maximizing safety and productivity. Sensors used in the energy and power generation markets are equipped to address hazardous and inaccessible locations and serve gas and wind turbines, oil and gas refineries, and nuclear power instrumentation, as well as other critical energy infrastructure providers.
- *Systems Sensors (approximately 10% of Sensors revenue for fiscal year 2019)*
This sector consists of dynamic test, measurement and sensing systems primarily used to test, model and monitor the behavior of structures and processes, as well as to ensure safety and compliance from exposure to noise and vibration. This sector also includes the calibration systems used with a variety of sensors, our comprehensive rental offering of both transactional sensor products, and consultative systems that serve a broad range of testing and industrial customers.

Financial and geographical information about our segments is included in Item 7 and Item 8 of Part II of this Annual Report on Form 10-K.

Sales and Service

Test & Simulation

Test & Simulation products are sold worldwide through a direct field sales and service organization, independent representatives and distributors and, to a much lesser extent, through other means (e.g., catalogs, internet, etc.) for standard products and accessories. Direct field sales and service personnel are compensated through salary and order incentive programs. Independent representatives and distributors are either compensated through commissions based upon orders or discounts off list prices.

In addition to direct field sales and service personnel throughout the U.S., we have sales and service subsidiaries in Toronto, Canada; Berlin, Germany; Paris, France; Amsterdam, Netherlands; Guildford, United Kingdom; Turin, Italy; Gothenburg and Gislaved, Sweden; Chinchon, Spain; Tokyo and Nagoya, Japan; Seoul, South Korea; Moscow, Russia; Bangalore, India; and Beijing, Shanghai and Shenzhen, China.

The timing and volume of large orders (valued at \$5,000 or greater on a U.S. dollar-equivalent basis) may produce volatility in backlog and quarterly operating results. Most customer orders are based on fixed-price quotations and typically have an average sales cycle of three to nine months due to the technical nature of the test systems and customer capital expenditure approval processes. The sales cycle for larger, more complex test systems may be several years.

Sensors

Sensors products are sold worldwide through a direct sales and service organization as well as through independent distributors. The direct sales and service organization is compensated through salary and commissions based upon revenue. The independent distributors purchase our products at wholesale pricing and resell the products to their customers.

In addition to direct field sales and service personnel throughout the U.S., we have sales subsidiaries in Treviolo, Italy; Stevenage, United Kingdom; Aubervilliers, France; Huckelhoven and Dresden, Germany; Beijing and Shanghai, China; Vandreuil, Canada; and Zaventem, Belgium.

The average sales cycle for Sensors products ranges from approximately one week to one month for existing customers purchasing standard products. The average sales cycle for a new account can range from approximately two weeks to two years depending on customer testing and specification requirements.

Manufacturing and Engineering

Test & Simulation

Test & Simulation systems are largely built to order and primarily engineered and assembled at our headquarters in Eden Prairie, Minnesota. We also operate manufacturing facilities in Guildford, United Kingdom for certain ground vehicles test systems and in Amsterdam, Netherlands for electrical motion platforms. We perform certain smaller system assembly at our locations in Berlin, Germany and Seoul, South Korea. Certain materials testing products are produced by a contract manufacturer in Shanghai and Hangzhou, China.

Installation of systems, training and services are primarily delivered at customer sites. The engineering and assembly cycle for a typical test system ranges from one to 12 months, depending on the complexity of the system and the availability of components. The engineering and assembly cycle for larger, more complex systems may be several years.

Sensors

Sensors are engineered and assembled regionally at facilities located in Depew, New York; Halifax and Cary, North Carolina; Sunnyvale, California; Farmington Hills, Michigan; Provo, Utah; Cincinnati, Ohio; and Lüdenscheid, Germany. Assembly cycles generally vary from several days to several weeks, depending on the degree of product customization, the size of the order and manufacturing capacity.

Sources and Availability of Raw Materials and Components

Test & Simulation

A significant portion of our test systems consist of materials and component parts purchased from independent vendors. We are dependent, in certain situations, on a limited number of vendors to provide raw materials and components. As Test & Simulation generally sells products and services based on fixed-price contracts, fluctuations in the cost of materials and components between the date of the order and the delivery date may impact the expected profitability. Material and component cost variability is considered in the estimation and customer negotiation process.

Sensors

A significant portion of Sensors products consists of materials and component parts purchased from independent vendors. We are dependent, in certain situations, on a limited number of vendors to provide raw materials and components, such as mechanical and electronic components. As Sensors generally sells products and services based on fixed-price contracts and the products are manufactured and delivered within days to months from the time of order, fluctuations in the cost of materials and components between the date of the order and the delivery date are not likely to materially impact the expected profitability.

Patents and Trademarks

We rely on a combination of patents, copyrights, trademarks and proprietary trade secrets to protect our proprietary technology, some of which are material to our segments. We have obtained numerous patents and trademarks worldwide and actively file and renew patents and trademarks on a global basis to establish and protect our proprietary technology. We are also party to exclusive and non-exclusive license and confidentiality agreements relating to our own and third-party technologies. We aggressively protect certain of our processes, products and strategies as proprietary trade secrets. Our efforts to protect intellectual property and avoid disputes over proprietary rights include ongoing review of third-party patents and patent applications.

Seasonality

There is no significant seasonality in Test & Simulation or Sensors.

Working Capital

Test & Simulation

Test & Simulation does not have significant finished product inventory, but maintains inventories of materials and components to facilitate on-time product delivery. Test & Simulation may have varying levels of work-in-process projects that are classified as inventories, net or unbilled accounts receivable, net in our Consolidated Balance Sheets, depending upon the manufacturing cycle, timing of orders, project revenue recognition and shipments to customers.

Payments are often received from Test & Simulation customers upon order or at milestones during the fulfillment of the order depending on the size and customization of the system. These payments are recorded as advance payments from customers in our Consolidated Balance Sheets and reduced as revenue is recognized. Conversely, if revenue is recognized on a project prior to customer billing, this revenue is recorded as unbilled accounts receivable, net in our Consolidated Balance Sheets until the customer has been billed. Upon billing, it is recorded as accounts receivable, net in our Consolidated Balance Sheets. Changes in the average size, payment terms and revenue recognition for orders in Test & Simulation may have a significant impact on accounts receivable, net; unbilled accounts receivable, net; advance payments from customers; and inventories, net. It has not been our practice to provide rights of return for our products. Payment terms vary and are subject to negotiation.

Sensors

Sensors has finished product inventory, as well as inventories of materials and components to facilitate rapid delivery of product to exceed customer expectations on delivery time. The type and amount of finished goods on hand are targeted based on historical and anticipated customer demands for high-volume products. Payment terms vary and are subject to negotiation. Revenue is primarily recognized when products are shipped.

Customers

We do not have a significant concentration of sales with any individual customer within Test & Simulation, Sensors or total MTS. Therefore, the loss of any one customer would not have a material impact on our results.

Backlog

Most of our products are built to order. Our backlog of orders, defined as firm orders from customers that remain unfulfilled, totaled approximately \$420,115, \$415,155 and \$360,016 at September 28, 2019, September 29, 2018 and September 30, 2017, respectively. Test & Simulation backlog was \$342,652, \$346,006 and \$311,551 at September 28, 2019, September 29, 2018 and September 30, 2017, respectively. Sensors backlog was \$77,463, \$69,149 and \$48,465 at September 28, 2019, September 29, 2018 and September 30, 2017, respectively. Based on anticipated manufacturing schedules, we expect approximately 82% of the backlog as of September 28, 2019 will be converted to revenue in fiscal year 2020. Delays may occur in the conversion of backlog into revenue as a result of export licensing compliance, technical difficulties, specification changes, manufacturing capacity, supplier issues or access to the customer site for installation. While certain contracts within backlog are subject to order cancellation, we have not historically experienced a significant number of order cancellations. Refer to Item 7 of Part II of this Annual Report on Form 10-K for further discussion of order cancellations.

Government Contracts

Revenue from U.S. government contracts varies by year. A portion of our government business is subject to renegotiation of profits or termination of contracts or subcontracts at the election of the U.S. government. In addition to contract terms, we must comply with procurement laws and regulations relating to the formation, administration and performance of U.S. government contracts. Failure to comply with these laws and regulations could lead to the termination of contracts at the election of the U.S. government or the suspension or debarment from U.S. government contracting or subcontracting. U.S. government revenue as a percentage of our total revenue was 6%, 4% and 4% for fiscal years 2019, 2018 and 2017, respectively.

Competition

Test & Simulation

For relatively simple and inexpensive mechanical testing applications, customers may satisfy their needs internally by building their own test systems or using competitors who compete on price, performance, quality and service. For larger and more complex mechanical test systems, we compete directly with several companies worldwide based upon customer value including application knowledge, engineering capabilities, technical features, price, quality and service.

Sensors

We primarily compete on factors that include technical performance, price and customer service in new applications or in situations in which other sensing technologies have been used. Sensors competitors are typically larger companies that carry multiple sensors product lines; larger diverse companies with only a small portion of business in the sensors market; or smaller, privately held companies throughout the world.

Environmental Compliance

We believe our operations are in compliance with all applicable material environmental regulations within the jurisdictions in which we operate. Capital expenditures for environmental compliance were not material in fiscal year 2019, 2018 and 2017, and we do not expect such expenditures will be material in fiscal year 2020.

Employees

We had approximately 3,500 employees as of September 28, 2019, including approximately 1,220 employees located outside the U.S.

Information about our Executive Officers

The names, ages and positions of our executive officers are presented below.

Name	Age	Position
Jeffrey A. Graves	58	Director, President and Chief Executive Officer
Steven B. Harrison	53	Executive Vice President and President, Test & Simulation
David T. Hore	54	Executive Vice President and President, Sensors
Brian T. Ross	43	Executive Vice President and Chief Financial Officer
Todd J. Klemmensen	46	Senior Vice President, General Counsel and Corporate Secretary

Dr. Jeffrey A. Graves, Ph.D. - President, Chief Executive Officer, and a Director of MTS since May 2012. Prior to joining MTS, Dr. Graves was President, Chief Executive Officer, and a Director of C&D Technologies, Inc., a leading global manufacturer of energy storage systems, from July 2005 to April 2012. From July 2001 to January 2005, Dr. Graves was employed at Kemet Electronics Corporation, a manufacturer of high performance capacitor solutions, where he last held the position of Chief Executive Officer. From 1994 to 2001, Dr. Graves held a number of key leadership positions with General Electric Company's Power Systems Division and Corporate Research & Development Center. Prior to working for GE, Dr. Graves held various positions of increasing responsibility at Rockwell International Corporation and Howmet Corporation. Dr. Graves also serves as a Director of Hexcel Corporation (NYSE: HXL) and FARO Technologies (NASDAQ: FARO). Dr. Graves holds a Bachelors Degree in Metallurgical Engineering from Purdue University, and Masters Degree and Ph.D. in Metallurgical Engineering from the University of Wisconsin-Madison.

Steven B. Harrison - Executive Vice President and President, Test & Simulation. Prior to joining MTS in 2017, Mr. Harrison served as President, AAR Airlift Group, Inc., as well as President and CEO, National Air Cargo, Inc. During a distinguished 22 year career in the United States Air Force, Mr. Harrison commanded at the wing, group, and squadron level, including three deployed commands. He also held senior staff positions at Headquarters US Air Force, the Joint Staff and US Transportation Command. Mr. Harrison is a command pilot with more than 3,400 flight hours in the C-32A, C-5B, C-17A, KC-10A, T-38A, and T-37B. A Rhodes Scholar, he holds Masters Degrees in Engineering Science as well as Politics, Philosophy, and Economics, from Oxford University, England. He also earned a Bachelor of Science in Aeronautical Engineering from the United States Air Force Academy and a Masters of National Security Strategy from the United States Air War College.

David T. Hore - Executive Vice President and President, Sensors since July 2016. Mr. Hore joined MTS through the acquisition of PCB Group, Inc. (PCB). Mr. Hore initially led PCB as its Co-President and later its President, from 2003-2016. Prior to joining PCB, Mr. Hore was Founder and Managing Partner of the CPA firm Tronconi Segarra & Hore LLP, where he served as strategic consultant and outsourced CFO for PCB from 1995-2003. Prior to that, Mr. Hore was a CPA at Price Waterhouse from 1987-1994. Mr. Hore holds a bachelor's degree in business administration with a concentration in accounting from the State University of New York at Buffalo.

Brian T. Ross - Executive Vice President and Chief Financial Officer since May 2017. Prior to joining MTS as Corporate Controller in 2014, Mr. Ross was the Director of Financial Planning and Analysis at Digi International Inc. (NASDAQ: DGII), where he gained valuable global experience ranging from strategic planning and acquisitions to operational execution and internal control. Earlier in his career, Mr. Ross served as Controller at Restore Medical, following a seven year tenure at PricewaterhouseCoopers LLP. Mr. Ross holds a BA in Accounting from the University of Northern Iowa, and is a licensed CPA (inactive) in Minnesota.

Todd J. Klemmensen - Senior Vice President, General Counsel and Secretary since July 2018. Mr. Klemmensen directs MTS's global legal affairs, including corporate governance, commercial and strategic agreements, U.S. Government contracting, litigation, and intellectual property. Previously, Mr. Klemmensen served within MTS as Acting General Counsel (April 2017 - July 2018), Associate General Counsel (November 2015 - March 2017) and Director of Contracts & Senior Counsel (January 2012 - October 2015). Mr. Klemmensen served in various roles at Alliant Techsystems, Inc. (ATK), including Sr. Manager - Contracts and providing legal counsel within its Armament Systems Group. Prior to transitioning into industry, Mr. Klemmensen practiced business and corporate law in Minneapolis, MN. He holds a Bachelor of Arts degree from Gustavus Adolphus College and a Juris Doctor degree from Hamline University School of Law. Mr. Klemmensen is a former board member of the National Contract Management Association (NCMA) Twin Cities Chapter and a graduate of the NCMA - Leadership Development Program.

Available Information

The U.S. Securities and Exchange Commission (SEC) maintains a website that contains reports, proxy and information statements and other information regarding issuers, including us, that file with the SEC. The public can obtain any documents

that we file with the SEC at <http://www.sec.gov>. We file annual reports, quarterly reports, current reports, proxy statements and other documents with the SEC under the Securities Exchange Act of 1934, as amended (the Exchange Act).

We also make available free of charge on or through the "Investor Relations" pages of our corporate website (www.mts.com) our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, and, if applicable, amendments to those reports filed or furnished pursuant to the Exchange Act as soon as reasonably practicable after we file such material with, or furnish it to, the SEC. Our Code of Conduct (the Code); any waivers from or amendments to the Code; our Corporate Governance Guidelines, Articles of Incorporation and Bylaws; and the Charters for the Audit, Compensation and Leadership Development, and Governance and Nominating Committees of our Board of Directors are also available free of charge on the "Investor Relations" pages of our corporate website (www.mts.com). We are not including the information on our corporate website as a part of or incorporating it by reference into this Annual Report on Form 10-K.

ITEM 1A. RISK FACTORS

Our business involves risks. The following summarizes what we believe to be the most important risks facing us that could adversely impact our business, financial condition or operating results. The information about these risks should be considered carefully together with the other information contained in this Annual Report on Form 10-K. Additional risks not currently known to us or that we currently deem to be immaterial may also adversely affect our business, financial condition or results of operations in future periods.

Market Risks

Our business is significantly international in scope.

We have manufacturing facilities in North America, Europe and Asia. Over the past 15 years, approximately 70% of our revenue has been derived from customers outside of the U.S. Although our financial results are reported in U.S. dollars, a large portion of our sales and operating costs are transacted in Euros, Chinese yuan, Japanese yen and other foreign currencies.

Accordingly, our business is subject to the political, economic and other risks that are inherent in operating in foreign countries. These risks include, but are not limited to:

- exposure to the risk of foreign currency fluctuations, where payment for products is denominated in a currency other than U.S. dollars;
- variability in the U.S. dollar value of foreign currency-denominated assets, earnings and cash flows;
- difficulty enforcing agreements, including patents and trademarks, and collecting receivables through foreign legal systems;
- trade protection measures and import or export licensing requirements;
- tax rates in certain foreign countries that exceed those in the U.S., the imposition of withholding requirements on foreign earnings and restrictions on repatriation of foreign earnings;
- elevated risk of terrorist activity, war or civil unrest;
- imposition of tariffs, exchange controls or other restrictions, including tariffs recently imposed by the U.S. and responsive tariffs imposed by China and the European Union;
- difficulty in staffing and managing global operations;
- required compliance with a variety of existing and emerging foreign laws and regulations and U.S. laws and regulations, such as the Foreign Corrupt Practices Act, applicable to our international operations, and significant compliance costs and penalties for failure to comply with any of these laws and regulations; and
- changes in general economic and political conditions in countries where we operate including emerging markets, continued volatility in currency exchange rates and uncertainties caused by the United Kingdom's pending exit from the European Union.

These risks could have an adverse effect on our financial position, results of operations or cash flows. In addition, foreign currency fluctuations could also make our products more expensive than competitors' products not subject to these fluctuations, which could adversely affect our revenues and profitability in international markets. As further described in Item 7 of Part II of this Annual Report on Form 10-K, revenue for fiscal year 2019 was unfavorably impacted by currency translation.

Our business is subject to competition.

Our products are sold in competitive markets throughout the world. Competition is based on application knowledge, product features and design, brand recognition, reliability, technology, breadth of product offerings, price, delivery, customer relationships and after-market support. If we are not perceived as competitive in overall value as measured by these criteria, our customers would likely choose solutions offered by our competitors or developed internally.

Our business is subject to customer demand cycles.

For many of our products, orders are subject to customers' procurement cycles and their willingness and ability to invest in capital, especially in the cyclical automotive, aircraft and machine tool industries. Any event that adversely impacts those customers' new product development activities may reduce their demand for our products.

We may experience difficulty obtaining materials or components for our products, or the cost of materials or components may increase.

We purchase materials and components from third-party suppliers, some of whom may be competitors. Other materials and components may be provided by a limited number of suppliers or by sole sources and could only be replaced with difficulty or at significant added cost. Additionally, some materials or components may become scarce or difficult to obtain in the market or they may increase in price. This could adversely affect the lead time within which we receive the materials or components, and in turn affect our commitments to our customers, or could adversely affect the cost or quality of materials. Our intention is to partner with suppliers who engage in supply chain transparency and responsible sourcing and who support human rights.

Our level and terms of indebtedness could adversely affect our business and results of operations and may require the use of our available cash resources to meet repayment obligations, which could reduce the cash available for other purposes.

We have a senior secured credit facility that provides for a revolving credit facility and a tranche B term loan facility, both of which require that we pay a variable interest rate on outstanding borrowings, as well as a \$350,000 aggregate principal amount of 5.750% senior unsecured notes due 2027. The debt under the tranche B term loan facility amortizes in equal quarterly installments in an aggregate annual amount equal to 1% of the original principal amount and matures on July 5, 2023.

As of September 28, 2019, we had \$173,695 outstanding under our senior secured credit facilities, consisting of \$173,695 on our tranche B term loan facility and no amounts drawn under our revolving credit facility, and we had \$350,000 in aggregate principal amount of senior unsecured notes outstanding. We may, at times, use debt under the revolving credit facility to continue to finance the growth of the business through acquisitions, finance working capital needs or purchase shares of our common stock.

Our substantial debt could have important consequences to us, including:

- increasing our vulnerability to general economic and industry conditions;
- requiring a substantial portion of our cash flow used in operations to be dedicated to the payment of principal and interest on our indebtedness, which would reduce our liquidity and our ability to use our cash flow to fund our operations, capital expenditures and future business opportunities;
- exposing us to the risk of increased interest rates, and corresponding increased interest expense, because future borrowings under our senior secured credit facilities would be at variable rates of interest;
- reducing funds available for working capital, capital expenditures, acquisitions and other general corporate purposes due to the costs and expenses associated with such debt;
- limiting our ability to obtain additional financing for working capital, capital expenditures, debt service requirements, acquisitions, and general corporate or other purposes;
- limiting our ability to adjust to changing marketplace conditions and placing us at a competitive disadvantage compared to our competitors who may have less debt; and
- potentially causing us to fail to comply with the financial and other restrictive covenants in our debt instruments, which, among other things, require us to maintain specified financial ratios, which failure could, if not cured or waived, have a material adverse effect on our ability to fulfill our obligations under our senior secured credit facilities and the senior unsecured notes and on our business and prospects generally.

In addition, the credit agreement that governs our senior secured credit facilities and the indenture that governs the senior unsecured notes impose significant operating and financial restrictions on us, including limitations on our ability to, among other things, incur additional indebtedness (including guarantee obligations); incur liens; engage in mergers, consolidations and certain other fundamental changes; dispose of assets; make advances, investments and loans; engage in sale and leaseback transactions; engage in certain transactions with affiliates; pay dividends, distributions and other payments in respect of capital stock; repurchase or retire capital stock, warrants or options; and engage in other actions that we may believe are advisable or necessary for our business. As a result of these restrictions, we will be limited as to how we conduct our business and we may be unable to raise additional debt or equity financing to compete effectively or to capitalize on available business opportunities. Further, our tranche B term loan facility is also subject to mandatory prepayments in certain circumstances and requires a prepayment of a certain percentage of our excess cash flow. Any future mandatory prepayments will reduce our cash available for other purposes and could impact our ability to reinvest in other areas of our business. Due to prepayments made during fiscal year 2019, we do not anticipate an excess cash flow payment will be required in the first quarter of fiscal year 2020.

There are no assurances that we will maintain a level of liquidity sufficient to permit us to pay the principal, premium and interest on our indebtedness. If our cash flows and capital resources are insufficient to fund our debt service obligations, we may be forced to reduce or delay capital expenditures, sell assets, seek additional capital, or restructure or refinance our indebtedness. These alternative measures may not be successful and may not permit us to meet our scheduled debt service obligations, which could cause us to default on our debt obligations and impair our liquidity. In the event of a default under any of our indebtedness, the holders of the defaulted debt could elect to declare all the funds borrowed to be due and payable, together with accrued and unpaid interest, which in turn could result in cross-defaults under our other indebtedness. The lenders under our senior secured credit facilities could also elect to terminate their commitments thereunder and cease making further loans, and such lenders could institute foreclosure proceedings against their collateral, and we could be forced into bankruptcy or liquidation.

For further information on our financing arrangements, see Note 8 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K.

Our variable rate indebtedness subjects us to interest rate risk, which could cause our debt service obligations to increase significantly.

Our senior secured credit facilities bear, and other indebtedness we may incur in the future may bear, interest at a variable rate. As a result, at any given time interest rates on the senior secured credit facilities and any other variable rate debt could be higher or lower than current levels. If interest rates increase, our debt service obligations on our variable rate indebtedness will increase even though the amount borrowed remains the same, and therefore net income and associated cash flows, including cash available for servicing our indebtedness, will correspondingly decrease.

Increases in interest rates may directly impact the amount of interest we are required to pay and reduce earnings accordingly. In addition, recent developments in tax policy as a part of the Tax Act, such as the disallowance of tax deductions for a portion of the interest paid on outstanding indebtedness, could have a material adverse effect on our results of operations and liquidity.

Despite our current level of indebtedness, the terms of our existing indebtedness allow us, under certain circumstances, to incur substantially more debt, incur substantial ordinary course operating obligations, and enter into other transactions, which would increase our leverage and further exacerbate the risks to our financial condition described above.

We may be able to incur additional indebtedness in the future. Although the credit agreement that governs our senior secured credit facilities and the indenture that governs the senior unsecured notes contain restrictions on incurring additional indebtedness and entering into certain types of other transactions, these restrictions are subject to a number of qualifications and exceptions. Additional indebtedness incurred in compliance with these restrictions could be substantial. In addition, these restrictions do not prevent us from incurring obligations, such as certain trade payables, that do not constitute indebtedness as defined under our debt instruments. To the extent we incur additional indebtedness or other obligations, the risks described herein may increase.

Operational Risks

Transfer of certain Test & Simulation production operations in China to our new contract manufacturing partner may be subject to delays, increased costs or other unanticipated consequences.

On March 13, 2018, we announced workforce reductions and manufacturing facility closures in our Test & Simulation segment corresponding to the transfer of certain production operations in China to a contract manufacturing partner. These changes are designed to increase organizational effectiveness, gain efficiencies and provide cost savings that can be reinvested in growth initiatives. We can make no assurances that our current estimates of costs and timing of this restructuring action will be accurate or that additional costs will not be incurred as we continue the restructuring action. Any differences from our current estimates could be material and could adversely impact our business, financial condition and results of operations through delays in our timeline or increased costs.

While we believe our China contract manufacturing partner to be qualified to manufacture our Test & Simulation segment products, we may need to address short-term quality and delivery issues. We have not previously used contract manufacturing partners on a large scale. Significant quality or delivery schedule concerns and unforeseen costs may adversely affect our relationships with customers and our overall business, financial condition or results of operations.

Our business operations may be affected by government contracting risks.

Government business is important to us and is expected to increase in the future. Revenue from U.S. government contracts varies by year. Such revenue as a percent of our total revenue was 6%, 4% and 4% for fiscal years 2019, 2018 and 2017, respectively.

We must comply with procurement laws and regulations relating to the formation, administration and performance of U.S. government contracts. Failure to comply with these laws and regulations could lead to suspension or debarment from U.S. government contracting or subcontracting and result in administrative, civil or criminal penalties. Failure to comply could also have a material adverse effect on our reputation, our ability to secure future U.S. government contracts and export control licenses, and our results of operations or financial condition. These laws and regulations also create compliance risks and affect how we do business with federal agency clients. U.S. government contracts, as well as contracts with certain foreign governments with which we do business, are also subject to modification or termination by the government, either for the convenience of the government or for default as a result of our failure to perform under the applicable contract. Further, any investigation relating to, or suspension or debarment from, U.S. government contracting could have a material impact on our results of operations as, during the duration of any suspension or debarment, we would be prohibited or otherwise limited in our ability to enter into prime contracts or subcontracts with U.S. government agencies, certain entities that receive U.S. government funds or that are otherwise subject to the Federal Acquisition Regulations, and certain state government or commercial customers who decline to contract with suspended or debarred entities. A federal suspension could also impact our ability to obtain export control licenses which are materially important to our business.

We are subject to risks because we design and manufacture first-of-a-kind products.

We design and build systems that are unique and innovative and, in some cases, the first created to address complex and unresolved issues. The design, manufacture and support of these systems may involve higher than planned costs. If we are unable to meet our customers' expectations, our reputation and ability to further utilize our expertise will likely be damaged.

Backlog, sales, delivery and acceptance cycle for many of our products is irregular and may not develop as anticipated.

Many of our products have long sales, delivery and acceptance cycles. In addition, certain contracts within our backlog are subject to order cancellations. If an order is canceled, we typically would only be entitled to receive reimbursement from the customer for actual costs incurred under the arrangement plus a reasonable margin. Events may cause recognition of orders, backlog and results of operations to be irregular over shorter periods of time. These factors include the timing of individual large orders which may be impacted by interest rates, customer capital spending and product development cycles, design and manufacturing problems, capacity constraints, delays in product readiness, damage or delays in transit, problems in achieving technical performance requirements, and various customer-initiated delays. Any such delay or any cancellations may cause fluctuations in our reported periodic financial results and may cause our stated backlog conversion to revenue to be inaccurate.

The business could be adversely affected by product liability and commercial litigation.

Our products or services may be claimed to cause or contribute to personal injury or property damage to our customers' facilities, which could damage our reputation or necessitate a product recall. Additionally, we are, at times, involved in commercial disputes with third parties, such as customers, vendors and others. The ensuing claims may arise singularly, in groups of related claims or in class actions involving multiple claimants. Such claims, litigation and product recalls may be expensive and time consuming to resolve and may result in substantial liability to us, and any liability and related costs and expenses may not be recoverable through insurance or other forms of reimbursement.

We may experience difficulties obtaining and retaining the services of skilled employees.

We rely on knowledgeable, experienced and skilled technical personnel, particularly engineers, sales management and service personnel, to design, assemble, sell and service our products. We may be unable to attract, retain and motivate a sufficient number of such people which could adversely affect our business. The inability to transfer knowledge and transition between roles within these teams could also adversely affect our business.

We may fail to protect our intellectual property effectively or may infringe upon the intellectual property of others.

We have developed significant proprietary technology and other rights that are used in our businesses. We rely on trade secret, copyright, trademark and patent laws and contractual provisions to protect our intellectual property. While we take enforcement of these rights seriously, other companies such as competitors or others in markets in which we do not participate may attempt to copy or use our intellectual property for their own benefit.

The intellectual property of others also has an impact on our ability to offer some of our products and services for specific uses or at competitive prices. Competitors' patents or other intellectual property may limit our ability to offer products and services to our customers. Any infringement on the intellectual property rights of others could result in litigation and adversely affect our ability to continue to provide, or could increase the cost of providing, our products and services.

Intellectual property litigation can be very costly and could result in substantial expense and diversion of our resources, both of which could adversely affect our businesses, financial condition and results of operations. In addition, there may be no effective legal recourse against infringement of our intellectual property by third parties, whether due to limitations on enforcement of rights in foreign jurisdictions or as a result of other factors.

If we are unable to protect our information systems against misappropriation of data or breaches of security, our business operations and financial results could be adversely impacted. Evolving regulations and legal obligations related to data privacy, data protection and information security and our actual or perceived failure to comply with such obligations could have an adverse effect on our business.

Information security risks have generally increased in recent years because of the proliferation of new technologies and the increased sophistication and activities of cyber-attacks. Although we strive to have appropriate security controls in place, prevention of security breaches cannot be assured, particularly as cyber threats continue to evolve. We may be required to expend additional resources to continue to enhance our security measures or to investigate and remediate any security vulnerabilities. The consequences of these risks could adversely impact our business operations and financial results.

In addition, our handling of certain data is subject to a variety of existing and emerging laws and regulations, designed by various federal, state and foreign governments to regulate the collection, distribution, use and storage of personal information. Several foreign countries in which we conduct business, including the European Economic Area (EEA), currently have in place, or have recently proposed, laws or regulations concerning privacy, data protection and information security, which are more restrictive than those imposed in the U.S. Some of these laws are in the early stages and we cannot yet determine the impact these laws and regulations, if implemented, may have on our business. However, any failure or perceived failure by us to comply with these privacy laws, regulations, policies or obligations or any security incident that results in the unauthorized release or transfer of personally identifiable information or other customer data in our possession, could result in government enforcement actions, litigation, fines and penalties and/or adverse publicity, all of which could have an adverse effect on our reputation and business. For example, the EEA-wide General Data Protection Regulation (GDPR) became effective on May 25, 2018 and replaced the data protection laws of each EEA member state. If our privacy or data security measures fail to comply with applicable current or future laws and regulations, we may be subject to litigation, regulatory investigations and enforcement notices requiring us to change the way we use personal and customer data.

Government regulation and policy imposes costs and other constraints.

Our manufacturing operations and past and present ownership and operations of real property are subject to extensive and changing federal, state, local and foreign laws and regulations, including laws and regulations pertaining to regulatory compliance, such as environmental, health and safety, employee benefits, import and export compliance, intellectual property, product liability, tax matters and securities regulation. We expect to continue to incur costs to comply with these laws and may incur penalties for any failure to do so.

In particular, some of our export sales require approval from the U.S. government. Changes in political relations between the U.S. and foreign countries and/or specific potential customers for which export licenses may be required, may cause a license application to be delayed or denied, or a previously issued license withdrawn, rendering us unable to complete a sale or vulnerable to competitors who do not operate under such restrictions. In addition, the U.S. government has recently imposed tariffs on certain products imported from China as well as steel and aluminum imported from the European Union, Mexico and Canada. China and the European Union have imposed tariffs on U.S. products in response. These tariffs could force our customers or us to consider various strategic options including, but not limited to, looking for different suppliers, shifting production to facilities in different geographic regions, absorbing the additional costs or passing the cost on to customers. Moreover, any retaliatory actions by other countries where we operate could also negatively impact our financial performance.

We are required to conduct a good faith reasonable country of origin analysis on our use of conflict minerals, which has imposed and may impose additional costs on us and could raise reputational and other risks.

The SEC has promulgated final rules in connection with the Dodd-Frank Wall Street Reform and Consumer Protection Act regarding disclosure of the use of certain minerals, known as conflict minerals, mined from the Democratic Republic of the Congo and adjoining countries. While there is pending litigation challenging these rules, we have incurred and will continue to incur costs associated with complying with these disclosure requirements, including costs to determine the source of any conflict minerals used in our products. We have adopted a policy relating to conflict minerals, incorporating the standards set forth in the Organisation for Economic Co-operation and Development Due Diligence Guidance, which affects the sourcing, supply, and pricing of materials used in our products. As we continue our due diligence, we may face reputational challenges if we are unable to verify the origins for all metals used in our products through the procedures we have and may continue to implement. We may also encounter challenges in our efforts to satisfy customers that may require all of the components of products purchased to be certified as conflict-free. If we are not able to meet customer requirements, customers may choose to disqualify us as a supplier.

We may not achieve our growth plans for the expansion of the business.

In addition to market penetration, our long-term success depends on our ability to expand our business through (a) new product development and service offerings; (b) mergers and acquisitions; and/or (c) geographic expansion.

New product development and service offerings require that we maintain our ability to improve existing products, continue to bring innovative products and services to market in a timely fashion and adapt products and services to the needs and standards of current and potential customers. Our products and services may become less competitive or eclipsed by technologies to which we do not have access or which render our solutions obsolete.

Mergers and acquisitions will be accompanied by risks that may include:

- failure to achieve, or delays in achieving, the financial and strategic goals, including growth opportunities and cost synergies, for the acquired and combined businesses;
- difficulty integrating the operations and personnel of the acquired businesses, including the inability to eliminate duplicative costs or the substantial expenses that may be incurred in connection with integration;
- disruption of ongoing business and acquired business and distraction of management from the operation of both businesses;
- dilution of existing shareholders and earnings per share;
- unanticipated, undisclosed or inaccurately assessed liabilities, legal risks and costs;
- reputation risk associated with any pre-existing legal matters resulting from the acquired business;
- legal and regulatory requirements if the acquired business was not formerly a public company; and
- difficulties retaining the key vendors, customers or employees of the acquired business.

Acquisitions of businesses having a significant presence outside the U.S. will increase our exposure to the risks of international operations discussed in the operational risk factors.

Geographic expansion may be outside of the U.S., and hence will be disproportionately subject to the risks of international operations discussed in the operational risk factors.

For further information on our business acquisitions, see Note 16 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K.

We may be required to recognize impairment charges for goodwill and long-lived assets.

As of September 28, 2019, the net carrying value of goodwill and long-lived assets (property and equipment, net and intangible assets, net) totaled \$836,707. We periodically assess the value of these assets for impairment in accordance with U.S. generally accepted accounting principles (GAAP). Significant negative industry or economic trends, disruptions to our businesses, significant unexpected or planned changes in use of the assets, divestitures and market capitalization declines may result in impairments to goodwill and other long-lived assets. Future impairment charges could have an adverse effect on our results of operations.

If we fail to maintain effective processes and controls relative to adherence to our Code of Conduct and related company policies, our business, financial condition or results of operations may be adversely affected.

Our Code of Conduct and related company policies promote both a culture of ethical business practices and compliance with legal and regulatory requirements, covering topics such as human and labor rights, anti-bribery, product quality and safety, privacy, security and environmental compliance. However, there can be no assurance that all of our employees or agents will refrain from acting in violation of such policies and procedures or that our processes and controls will be sufficient to detect any such violations. The investigation into potential violations of these policies, or even allegations of such violations, and evaluation of our internal controls, could disrupt our operations, involve significant management distraction, and lead to significant costs and expenses, including legal and accounting fees, and such expenses may have a material adverse effect on our financial results. Further, if our employees or agents violate such policies and procedures, such actions could result in management override of internal controls over financial reporting. If we, or our employees or agents acting on our behalf, are found to have engaged in practices that violate these policies and/or applicable law, we could suffer severe fines and penalties, repayment of ill-gotten gains, injunctions on future conduct, securities litigation, material weaknesses in our internal control over financial reporting, delayed regulatory filings and other consequences that may have a material adverse effect on our business, financial condition or results of operations. In addition, our reputation, sales activities or stock price could be adversely affected if we become the subject of any negative publicity related to actual or potential violations of applicable laws and regulations.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

Our properties consist of owned and leased facilities for manufacturing, sales, service administration, research and warehouse space. We own our corporate headquarters, located in Eden Prairie, Minnesota, which is also the primary location for Test & Simulation manufacturing and research. We own facilities in Depew, New York and Cary, North Carolina, which are the primary manufacturing and research locations for Sensors. In addition, we own manufacturing, sales and service administration facilities in the U.S., Germany and China. We lease space in the U.S., Europe and Asia for manufacturing, sales, service administration, research and warehouse space. We consider our current facilities suitable for their purpose and adequate to support our business.

Additional information relative to lease obligations is included in Item 7 of Part II of this Annual Report on Form 10-K.

ITEM 3. LEGAL PROCEEDINGS

Discussion of legal matters is incorporated by reference from Note 17 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K and should be considered an integral part of Item 3 of Part I of this Annual Report on Form 10-K.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

PART II**ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES**

Shares of our common stock are traded on the Nasdaq Global Select Market under the trading symbol MTSC. The number of record holders of our common stock, par value \$0.25 per share, as of November 21, 2019 was 625. This number does not reflect shareholders who hold their shares in the name of broker-dealers or other nominees.

Issuer Purchases of Equity Securities

	Total Number of Shares Purchased	Average Price Paid per Share	Total Number of Shares Purchased As Part of Publicly Announced Plans or Programs	Maximum Number of Shares that May Yet be Purchased As Part of Publicly Announced Plans or Programs
June 30, 2019 – August 3, 2019	—	\$ —	—	438
August 4, 2019 – August 31, 2019	—	\$ —	—	438
September 1, 2019 – September 28, 2019	—	\$ —	—	438

We purchase common stock from time to time to mitigate dilution related to new shares issued as equity for employee compensation such as stock options, restricted stock units, performance restricted stock units and employee stock purchase plan activity, as well as to return to shareholders capital not immediately required to fund ongoing operations.

Share Purchase Plan

Our Board of Directors approved, and on February 11, 2011 announced, a purchase authorization of 2,000 shares. Authority over pricing and timing under this authorization has been delegated to management. The share purchase authorization has no expiration date. We made no purchases during the fourth quarter of fiscal year 2019. As of September 28, 2019, there were 438 shares available for purchase under the existing authorization.

Capped Calls

In connection with the pricing of the tangible equity units (TEUs) sold in our public offering in fiscal year 2016, we purchased capped calls from third party banking institutions (Capped Calls) for \$7,935. On June 13, 2018, we amended the agreements with third party banking institutions for the outstanding Capped Calls (Capped Call Agreements) to modify the timing of settlement to be only upon expiration for all outstanding Capped Calls. Per the Capped Call Agreements, the outstanding Capped Calls automatically settled upon expiration on July 1, 2019 with shares of our common stock based on the average market value of our common stock as defined in the Capped Call Agreements, resulting in us receiving and retiring 223 shares of our common stock. See Note 12 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information on our equity instruments.

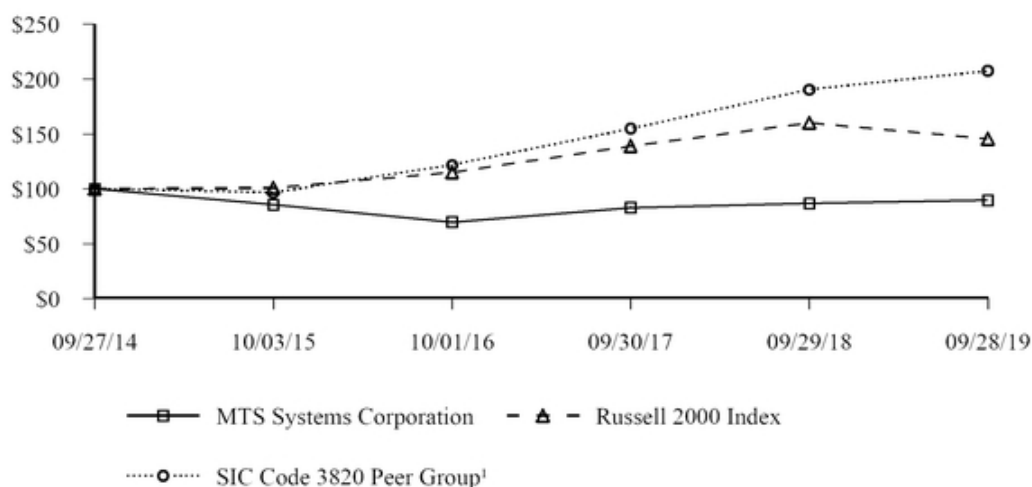
Dividends

Our dividend policy is to maintain a payout ratio that allows dividends to increase in conjunction with the long-term growth of earnings per share, while sustaining dividends through economic cycles. Our dividend practice is to target, over time, a payout ratio of approximately 25% of net earnings per share. We have historically paid dividends to holders of our common stock on a quarterly basis. The declaration and payment of future dividends will depend on many factors, including, but not limited to, our earnings, financial condition, debt repayment obligations, business development needs and regulatory considerations and are at the discretion of our Board of Directors. During fiscal years 2019 and 2018, we declared quarterly cash dividends of \$0.30 per share to holders of our common stock, resulting in a payout ratio of 54% and 38% of net earnings per share, respectively. The increase in the payout ratio in fiscal year 2019 resulted from decreased earnings per share, primarily driven by a reduction in the effective tax rate as a result of discrete tax benefits related to the U.S. tax reform in the prior year, as well as non-recurring expenses incurred in the current year.

Shareholder Performance Graph

The following graph compares the cumulative total shareholder return of our common stock over the last five fiscal years with the cumulative total shareholder return of the Russell 2000 Index and a peer group of companies in the Laboratory Apparatus and Analytical, Optical, Measuring and Controlling Instruments Standard Industrial Code (SIC Code 3820 Peer Group) that are traded on the Nasdaq, NYSE and NYSE American exchanges. The graph assumes that \$100 (in actual dollars) was invested at market close on September 27, 2014 in our common stock, the Russell 2000 Index and the SIC Code 3820 Peer Group and that all dividends were reinvested. The graph is not necessarily indicative of future investment performance.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN*
Among MTS Systems Corporation, the Russell 2000 Index, and SIC Code 3820 Peer Group



* \$100 invested on 9/27/2014 in stock or index, including reinvestment of dividends.

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(in actual dollars)	Fiscal Year					
	2014 ²	2015 ²	2016 ²	2017	2018	2019
MTS Systems Corporation	\$ 100.00	\$ 85.50	\$ 69.78	\$ 82.86	\$ 86.78	\$ 89.63
Russell 2000 Index	100.00	100.89	115.07	138.94	160.12	145.60
SIC Code 3820 Peer Group ¹	100.00	96.60	121.86	154.88	190.51	207.45

¹ Modified to remove non-exchange traded companies.

² Fiscal year 2016 refers to the fiscal year ended October 1, 2016, fiscal year 2015 refers to the fiscal year ended October 3, 2015 and fiscal year 2014 refers to the fiscal year ended September 27, 2014.

ITEM 6. SELECTED FINANCIAL DATA

The following selected financial data should be read in conjunction with Item 7 and Item 8 of Part II of this Annual Report on Form 10-K.

	Fiscal Year ¹				
	2019	2018	2017	2016	2015
Operating Results					
Revenue	\$ 892,518	\$ 778,032	\$ 787,955	\$ 650,147	\$ 563,934
Gross profit	328,930	305,529	302,278	231,404	219,613
Gross margin %	36.9%	39.3 %	38.4 %	35.6%	38.9%
Research and development expense	\$ 30,928	\$ 34,784	\$ 34,999	\$ 25,336	\$ 23,705
Research and development expense as a % of revenue	3.5%	4.5 %	4.4 %	3.9%	4.2%
Effective income tax rate	11.4%	(38.7)%	(9.0)%	18.0%	23.2%
Net income	\$ 43,067	\$ 61,328	\$ 25,084	\$ 27,494	\$ 45,462
Net income as a % of revenue	4.8%	7.9 %	3.2 %	4.2%	8.1%
Earnings per share					
Basic	\$ 2.24	\$ 3.20	\$ 1.32	\$ 1.72	\$ 3.03
Diluted	\$ 2.21	\$ 3.18	\$ 1.31	\$ 1.70	\$ 3.00
Weighted average shares outstanding ²					
Basic	19,258	19,163	19,040	16,027	14,984
Diluted	19,447	19,293	19,137	16,179	15,142
Depreciation and amortization	\$ 37,975	\$ 34,492	\$ 35,523	\$ 24,077	\$ 21,106
Financial Position					
Total assets	\$ 1,297,977	\$ 1,139,396	\$ 1,189,692	\$ 1,188,020	\$ 460,831
Interest-bearing debt ³	525,131	400,706	474,309	484,985	21,183
Total shareholders' equity	484,059	477,932	428,777	405,260	258,142
Interest-bearing debt as a % of shareholders' equity	108.5%	83.8 %	110.6 %	119.7%	8.2%
Return on equity ⁴	9.0%	14.3 %	6.2 %	10.7%	17.6%
Return on invested capital ⁵	7.6%	9.3 %	7.3 %	8.6%	15.5%
Other Statistics					
Backlog of orders at year end	\$ 420,115	\$ 415,155	\$ 360,016	\$ 370,523	\$ 353,013
Dividends declared per share	1.20	1.20	1.20	1.20	1.20
Capital Expenditures	30,525	12,321	17,798	20,806	18,445

¹ Fiscal years 2019, 2018, 2017, 2016 and 2015 include 52, 52, 52, 52 and 53 weeks, respectively.

² Assumes the conversion of potential common shares using the treasury stock method.

³ Interest-bearing debt consists of long-term debt for fiscal years 2019, 2018, 2017 and 2016 and short-term borrowings for fiscal year 2015.

⁴ Calculated by dividing net income by beginning shareholders' equity.

⁵ The measure Return on Invested Capital (ROIC) is not a measure of performance presented in accordance with GAAP. ROIC is calculated by dividing adjusted net income by average invested capital. Adjusted net income is calculated by excluding after-tax interest expense from reported net income. In addition, adjusted net income also excludes acquisition-related expense, net of tax; acquisition integration expense, net of tax; acquisition inventory fair value adjustment, net of tax; restructuring expense, net of tax; and China investigation expense, net of tax. Average invested capital is defined as the aggregate of average interest-bearing debt and average shareholders' equity and is calculated as the sum of current and prior year ending amounts divided by two. Because the ratio is not prescribed or authorized by GAAP, the ROIC percentage is a non-GAAP financial measure. We believe ROIC is useful to investors as a measure of operating performance and the effectiveness of the use of capital in our operations. We use ROIC as a measure to monitor and evaluate operating

performance relative to our invested capital. This measure should not be construed as an alternative to, or substitute for, return on equity or any other measure determined in accordance with GAAP.

Presented below is the reconciliation of ROIC to average invested capital, the nearest GAAP measure, and a reconciliation of each non-GAAP financial measure used to its nearest GAAP measure:

	Fiscal Year				
	2019	2018	2017	2016	2015
Net income	\$ 43,067	\$ 61,328	\$ 25,084	\$ 27,494	\$ 45,462
Interest expense, net of tax	24,848	19,636	23,133	6,065	767
Acquisition-related expense, net of tax	2,321	—	(814)	7,322	—
Acquisition integration expense, net of tax	—	—	2,659	2,049	—
Acquisition inventory fair value adjustment, net of tax	1,332	—	5,909	5,692	—
Restructuring expense, net of tax	635	2,033	2,980	1,465	—
China investigation expense, net of tax	—	—	6,749	—	—
Adjusted net income*	\$ 72,203	\$ 82,997	\$ 65,700	\$ 50,087	\$ 46,229
Total beginning shareholders' equity	\$ 477,932	\$ 428,777	\$ 405,260	\$ 258,142	\$ 258,127
Total ending shareholders' equity	484,059	477,932	428,777	405,260	258,142
Average shareholders' equity	480,996	453,355	417,019	331,701	258,135
Total beginning interest-bearing debt	400,706	474,309	484,985	21,183	60,000
Total ending interest-bearing debt	525,131	400,706	474,309	484,985	21,183
Average interest-bearing debt	\$ 462,919	\$ 437,508	\$ 479,647	\$ 253,084	\$ 40,592
Average invested capital*	\$ 943,914	\$ 890,862	\$ 896,666	\$ 584,785	\$ 298,726
Return on invested capital*	7.6%	9.3%	7.3%	8.6%	15.5%

* Denotes non-GAAP financial measures.

Presented below is a reconciliation of adjusted net income to net income, which reconciles the tax impact of the non-GAAP financial measure of adjusted net income presented in the table above:

	Fiscal Year								
	2019			2018			2017		
	Pre-tax	Tax	Net	Pre-tax	Tax	Net	Pre-tax	Tax	Net
Net income	\$ 48,613	\$ 5,546	\$ 43,067	\$ 44,223	\$ (17,105)	\$ 61,328	\$ 23,011	\$ (2,073)	\$ 25,084
Interest expense [†]	32,062	7,214	24,848	26,464	6,828	19,636	31,218	8,085	23,133
Acquisition-related expense ^a	2,938	617	2,321	—	—	—	—	814	(814)
Acquisition integration expense ^a	—	—	—	—	—	—	3,577	918	2,659
Acquisition inventory fair value adjustment ^a	1,601	269	1,332	—	—	—	7,975	2,066	5,909
Restructuring expense [«]	830	195	635	2,730	697	2,033	4,079	1,099	2,980
China investigation expense ^a	—	—	—	—	—	—	9,209	2,460	6,749
Adjusted net income*	\$ 86,044	\$ 13,841	\$ 72,203	\$ 73,417	\$ (9,580)	\$ 82,997	\$ 79,069	\$ 13,369	\$ 65,700

	Fiscal Year					
	2016			2015		
	Pre-tax	Tax	Net	Pre-tax	Tax	Net
Net income	\$ 33,512	\$ 6,018	\$ 27,494	\$ 59,172	\$ 13,710	\$ 45,462
Interest expense [†]	8,424	2,359	6,065	1,204	437	767
Acquisition-related expense ^a	10,170	2,848	7,322	—	—	—
Acquisition integration expense ^a	2,846	797	2,049	—	—	—
Acquisition inventory fair value adjustment ^a	7,916	2,224	5,692	—	—	—
Restructuring expense [«]	2,165	700	1,465	—	—	—
Adjusted net income [*]	\$ 65,033	\$ 14,946	\$ 50,087	\$ 60,376	\$ 14,147	\$ 46,229

[†] In determining the tax impact of interest expense, we applied a U.S. marginal income tax rate.

^a In determining the tax impact of acquisition-related expense, acquisition integration expense, acquisition inventory fair value adjustment and China investigation expense, we applied a U.S. effective income tax rate before discrete items.

[«] In determining the tax impact of restructuring expense, we applied the statutory rate in effect for each jurisdiction where restructuring expense was incurred.

* Denotes non-GAAP financial measures.

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

Management's Discussion and Analysis of Financial Condition and Results of Operations (MD&A) is designed to provide a reader of our financial statements with a narrative from the perspective of management on our financial condition, results of operations, liquidity and certain other factors that may affect our future results. Our MD&A is presented in nine sections:

- Overview
- Financial Results
- Cash Flow Comparison
- Liquidity and Capital Resources
- Off-balance Sheet Arrangements
- Critical Accounting Policies and Estimates
- Recently Issued Accounting Pronouncements
- Quarterly Financial Information
- Forward-looking Statements

Our MD&A should be read in conjunction with the Consolidated Financial Statements and related Notes included in Item 8 of Part II of this Annual Report on Form 10-K. All dollar amounts are in thousands unless otherwise noted.

The following discussion includes a comparison of our Financial Results, Cash Flow Comparisons and Liquidity and Capital Resources for fiscal year 2019 and fiscal year 2018. A discussion of changes in our financial results and cash flow comparisons from fiscal year 2017 to fiscal year 2018 has been omitted from this Form 10-K, but may be found in Item 7 of Part II of our Annual Report on Form 10-K for the fiscal year ended September 29, 2018, filed with the SEC on November 26, 2018.

Overview

MTS Systems Corporation's testing and simulation hardware, software and service solutions simulate real world environments in other than real world settings thereby enabling customers to improve design, development and manufacturing processes, determine the mechanical behavior of materials, products and structures, or create a desired human experience such as amusement rides, vehicle simulators or flight training simulators. Our high-performance sensors provide measurements of vibration, pressure, position, force and sound in a variety of applications.

Further globalization and expansion of many industries along with growth in emerging markets, such as China and India, provide a strong and vibrant market base from which we can grow revenue. We have aligned our organizational structure to be more flexible to the demands of globalized and volatile markets by adjusting our structure to be more cost effective and nimble in responding to our customers' needs. We continue to deliver distinctive business performance through our commitment to sustain the differentiated competitive advantage that comes from offering an innovative portfolio of Test & Simulation and Sensor solutions that create value for customers and are delivered with total customer satisfaction.

Fiscal Year

We have a 5-4-4 week, quarterly accounting cycle with the fiscal year ending on the Saturday closest to September 30. Fiscal years 2019 and 2018 ended September 28, 2019 and September 29, 2018, respectively, and both included 52 weeks.

Issuance of Senior Unsecured Notes

On July 16, 2019, we issued \$350,000 in aggregate principal amount of 5.750% senior unsecured notes due 2027 (the Notes). The Notes will mature on August 15, 2027. We used the net proceeds to repay all outstanding debt under the revolving credit facility, to repay a portion of the tranche B term loan facility and for general corporate purposes. See Note 8 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for further discussion of our financing activities.

Acquisitions

On November 21, 2018, we acquired E2M Technologies B.V. (E2M) for a cash purchase price of \$80,287. The acquisition of E2M expands our technology and product offerings for human-rated simulation systems and brings key regulatory approvals and customers in the flight simulation and entertainment markets. We funded the E2M acquisition through borrowings on our revolving credit facility.

On August 5, 2019, we acquired the Endevco sensors business from Meggitt PLC for a cash purchase price of \$68,330. This strategic product line purchase brings together two iconic brands in the test and measurement sensors market, in PCB and Endevco, and further enhances our long-term strategy of growth and market leadership in our core businesses. We funded the Endevco acquisition through cash on hand.

See Note 16 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for further discussion of the acquisitions of E2M and Endeveco.

Foreign Currency

Over the past 15 years, approximately 70% of our revenue has been derived from customers outside of the U.S. Our financial results are principally exposed to changes in exchange rates between the U.S. dollar and the Euro, the Japanese yen and the Chinese yuan. A change in foreign exchange rates could positively or negatively affect our reported financial results. The discussion below quantifies the impact of foreign currency translation on our financial results for the periods discussed.

Adoption of New Revenue Recognition Standard

In fiscal year 2019, we adopted Accounting Standards Update (ASU) No. 2014-09, *Revenue from Contracts with Customers (Topic 606)*, followed by related amendments (collectively, "the new revenue standard" or "ASC 606"). See Notes 2 and 3 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for the impact of this adoption on Consolidated Income Statements and Consolidated Balance Sheets.

Financial Results

Total Company

Results of Operations

The following table compares results of operations, separately identifying the estimated impact of currency translation and the acquisitions of E2M and Endeveco in the first and fourth quarter of fiscal year 2019, respectively, and restructuring expenses incurred in fiscal year 2019.

	2019 ¹	Estimated			2018
		Business Change	Acquisition /Restructuring ²	Currency Translation	
Revenue	\$ 892,518	\$ 96,699	\$ 33,963	\$ (16,176)	\$ 778,032
Cost of sales	563,588	77,051	25,825	(11,791)	472,503
Gross profit	328,930	19,648	8,138	(4,385)	305,529
Gross margin	36.9%				39.3%
Operating expenses					
Selling and marketing	131,639	6,004	1,128	(1,826)	126,333
General and administrative	86,658	(533)	8,790	(839)	79,240
Research and development	30,928	(4,979)	1,303	(180)	34,784
Total operating expenses	249,225	492	11,221	(2,845)	240,357
Income from operations	\$ 79,705	\$ 19,156	\$ (3,083)	\$ (1,540)	\$ 65,172

¹ Financial results for fiscal year 2019 are presented in accordance with the new revenue standard adopted in the first quarter of fiscal year 2019. Prior period results have not been restated to reflect this change. Fiscal year 2019 includes a favorable impact on income from operations of \$12,584 related to the ASC 606 adoption. See Note 3 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information on the new revenue standard.

² The Acquisition / Restructuring column includes operating results and costs incurred as part of the acquisitions of E2M and Endeveco and restructuring expenses. See Note 16 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information on the E2M and Endeveco acquisitions.

Revenue			Increased / (Decreased)	
	2019	2018	\$	%
Revenue	\$ 892,518	\$ 778,032	\$ 114,486	14.7%

The increase in revenue of 14.7% was primarily driven by growth in both the Test & Simulation and Sensors businesses, partially offset by the unfavorable impact of currency translation. Test & Simulation revenue increased \$93,984 or 20.2%, primarily driven by volume growth from the conversion of robust beginning-of-year backlog across all sectors and geographies and contributions from the acquisition of E2M, partially offset by the unfavorable impact of currency translation. Sensors revenue increased \$20,707, or 6.6%, primarily driven by growth in the Sensors test sector from a multi-year contract with the U.S. Department of Defense, growth in the Sensors position sector in the first half of fiscal year 2019, contributions from the acquisition of Endeveco and growth in the Sensors industrial sector from a continued rebound in the energy market, partially offset by the unfavorable impact of currency translation. Excluding the impact of currency translation and the E2M and Endeveco acquisitions, revenue increased 12.4%.

Revenue by geography is as follows:

			Increased / (Decreased)	
	2019	2018	\$	%
Americas	\$ 346,538	\$ 275,422	\$ 71,116	25.8%
Europe	224,982	223,236	1,746	0.8%
Asia	320,998	279,374	41,624	14.9%
Total Revenue	\$ 892,518	\$ 778,032	\$ 114,486	14.7%

Gross Profit			Increased / (Decreased)	
	2019	2018	\$	%
Gross profit	\$ 328,930	\$ 305,529	\$ 23,401	7.7%
Gross margin	36.9%	39.3%	(2.4)	ppts

Gross profit increased 7.7% primarily driven by higher revenue volume in both segments and contributions from the E2M acquisition, partially offset by higher compensation expense in both segments, the unfavorable impact of currency translation and the E2M and Endeveco inventory acquisition adjustments of \$1,601. Gross margin decreased 2.4 percentage points primarily due to higher compensation expense, the impact from the acquisition of E2M and Endeveco and the E2M and Endeveco inventory acquisition adjustments, partially offset by leverage on currency translation. Excluding the impact of currency translation, the E2M and Endeveco acquisitions and restructuring costs incurred in both fiscal years, gross profit increased 5.9% and the gross margin declined 2.3 percentage points.

Selling and Marketing Expense			Increased / (Decreased)	
	2019	2018	\$	%
Selling and marketing	\$ 131,639	\$ 126,333	\$ 5,306	4.2%
% of Revenue	14.7%	16.2%		

Selling and marketing expenses increased 4.2% primarily due to higher compensation and commissions expense to support sales growth and the addition of E2M and Endeveco expenses, partially offset by the favorable impact of currency translation. Excluding the impact of currency translation, the E2M and Endeveco expenses and restructuring costs incurred in both fiscal years, selling and marketing expense increased 4.9%.

General and Administrative Expense			Increased / (Decreased)	
	2019	2018	\$	%
General and administrative	\$ 86,658	\$ 79,240	\$ 7,418	9.4%
% of Revenue	9.7%	10.2%		

General and administrative expense increased 9.4% primarily due to the addition of E2M expenses, acquisition-related expenses of \$2,697 and higher professional fees. Excluding the impact of currency translation, E2M and Endeveco expenses and restructuring costs incurred in both fiscal years, general and administrative expense decreased 0.3%.

Research and Development Expense

	2019		2018		Increased / (Decreased)		
	\$		\$		\$	%	
Research and development	\$	30,928	\$	34,784	\$	(3,856)	(11.1)%
% of Revenue		3.5%		4.5%			

Research and development (R&D) expense decreased 11.1% primarily due to the shift of internal resources to larger, capitalizable, Test & Simulation projects as we continue to invest in our technology to support current and future customer needs and overall lower Test & Simulation compensation expense. This decline was partially offset by the addition of E2M expenses and continued investment in new product development in Sensors. Excluding the impact of currency translation, E2M and Endeveco expenses and restructuring costs incurred in the prior fiscal year, R&D expense decreased 13.0%.

Income from Operations

	2019		2018		Increased / (Decreased)		
	\$		\$		\$	%	
Income from operations	\$	79,705	\$	65,172	\$	14,533	22.3%
% of Revenue		8.9%		8.4%			

Income from operations increased 22.3% primarily due to increased gross profit from higher revenue volume and contributions from the E2M acquisition, partially offset by higher compensation expense in both segments, acquisition-related expenses of \$2,938 and the unfavorable impact of foreign currency translation. Excluding the impact of currency translation, E2M and Endeveco expenses and restructuring costs incurred in both fiscal years, income from operations increased 24.2%.

Interest Expense, Net

	2019		2018		Increased / (Decreased)		
	\$		\$		\$	%	
Interest expense, net	\$	31,558	\$	25,882	\$	5,676	21.9%

Interest expense increased primarily due to additional interest expense recognized on the revolving credit facility drawn on in the first quarter of fiscal year 2019 to fund the acquisition of E2M, which was paid down in the fourth quarter of fiscal year 2019, the acceleration of non-cash debt issuance costs related to the pre-payment on the tranche B term loan facility and incurring interest expense on an increased debt position related to the issuance of the Notes in the fourth quarter of fiscal year 2019.

Other Income (Expense), Net

	2019		2018		Increased / (Decreased)		
	\$		\$		\$	%	
Other income (expense), net	\$	466	\$	4,933	\$	(4,467)	(90.6)%

The decrease in other income (expense), net was primarily driven by the gain on the sale of one of our China manufacturing facilities recognized in the prior year.

Income Tax Provision (Benefit)

	2019		2018		Increased / (Decreased)		
	\$		\$		\$	%	
Income tax provision (benefit)	\$	5,546	\$	(17,105)	\$	22,651	132.4%
Effective rate		11.4%		(38.7)%		50.1	ppts

The effective tax rate increased primarily due to certain discrete benefits of \$25,008 in the prior year for the estimated impact of the Tax Act. The current year also included \$3,547 for the favorable true-up of our previously recorded transition tax estimate, successful closure of prior year audit activity and a reduction in the Netherlands income tax rate resulting in remeasurement of the deferred tax liability associated with certain intangible assets acquired in the E2M acquisition. Excluding the impact of these discrete benefits, the effective tax rate for fiscal years 2019 and 2018 would have been 18.7% and 17.9%, respectively. Factors that increased the effective tax rate for fiscal year 2019 included impacts of the Tax Act, such as elimination of the domestic manufacturing deduction and the implementation of the global intangible low-taxed income (GILTI) provision. These increases were partially offset by favorable aspects of the Tax Act, such as the decrease in the U.S. income tax rate and provisions for incentivizing foreign-derived intangible income (FDII).

<i>Net Income</i>			Increased / (Decreased)	
	2019	2018	\$	%
Net income	\$ 43,067	\$ 61,328	\$ (18,261)	(29.8)%
Diluted earnings per share	\$ 2.21	\$ 3.18	\$ (0.97)	(30.5)%

Net income declined primarily due to an increase in the effective tax rate and lower income from operations in Sensors, partially offset by higher income from operations in Test & Simulation.

Backlog

Backlog of undelivered orders as of September 28, 2019 was \$420,115, an increase of \$4,960, or 1.2%, compared to backlog of \$415,155 as of September 29, 2018. Based on anticipated manufacturing schedules, we expect to convert approximately 82% of the backlog as of September 28, 2019 into revenue during fiscal year 2020. The expected conversion rate is slightly lower than the prior year rate of 87% primarily due to timing of long-term contracts in Test & Simulation.

We believe backlog is not an absolute indicator of future revenue because a portion of the orders in backlog could be canceled at the customer's discretion. While certain contracts within backlog are subject to order cancellation, we have not historically experienced a significant number of order cancellations. During fiscal year 2019, order cancellations did not have a material effect on backlog.

Test & Simulation Segment

Results of Operations

The following table compares results of operations for Test & Simulation, separately identifying the estimated impact of currency translation and the acquisition of E2M in the first quarter of fiscal year 2019 and restructuring expenses incurred in fiscal year 2019. See Note 15 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information on our reportable segments.

	2019 ¹	Estimated			2018
		Business Change	Acquisition / Restructuring ²	Currency Translation	
Revenue	\$ 558,908	\$ 74,380	\$ 29,554	\$ (9,950)	\$ 464,924
Cost of sales	391,493	63,342	21,668	(8,252)	314,735
Gross profit	167,415	11,038	7,886	(1,698)	150,189
Gross margin	30.0%				32.3%
Operating expenses					
Selling and marketing	72,804	3,830	913	(838)	68,899
General and administrative	47,721	(3,254)	7,002	(686)	44,659
Research and development	12,810	(5,810)	1,224	(10)	17,406
Total operating expenses	133,335	(5,234)	9,139	(1,534)	130,964
Income from operations	\$ 34,080	\$ 16,272	\$ (1,253)	\$ (164)	\$ 19,225

¹ Financial results for fiscal year 2019 are presented in accordance with the new revenue standard adopted in the first quarter of fiscal year 2019. Prior period results have not been restated to reflect this change. Fiscal year 2019 includes a favorable impact on income from operations of \$12,584 related to the ASC 606 adoption. See Note 3 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information on the new revenue standard.

² The Acquisition / Restructuring column includes operating results and costs incurred as part of the acquisition of E2M and restructuring costs. See Note 16 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information on the E2M acquisition.

Revenue			Increased / (Decreased)	
	2019	2018	\$	%
Revenue	\$ 558,908	\$ 464,924	\$ 93,984	20.2%

Revenue increased 20.2% primarily driven by volume growth across all sectors and geographies from the conversion of robust beginning-of-year backlog and contributions from the acquisition of E2M, partially offset by the unfavorable impact of currency translation. Excluding the impact of currency translation and the E2M acquisition, revenue increased 16.0%.

Revenue by geography is as follows:

			Increased / (Decreased)	
	2019	2018	\$	%
Americas	\$ 179,421	\$ 132,201	\$ 47,220	35.7%
Europe	120,164	112,092	8,072	7.2%
Asia	259,323	220,631	38,692	17.5%
Total Revenue	\$ 558,908	\$ 464,924	\$ 93,984	20.2%

Gross Profit			Increased / (Decreased)	
	2019	2018	\$	%
Gross profit	\$ 167,415	\$ 150,189	\$ 17,226	11.5%
Gross margin	30.0%	32.3%	(2.3) ppts	

Gross profit increased 11.5% primarily due to higher revenue volume and contributions from the E2M acquisition, partially offset by increased compensation expense. The gross margin decreased by 2.3 percentage points primarily driven by higher compensation expense and the \$1,141 E2M inventory acquisition adjustment. This decrease was partially offset by favorable operating leverage on higher revenue volume and favorable currency translation. Excluding the impact of currency translation, the E2M acquisition and restructuring costs incurred in both fiscal years, gross profit increased 6.2% and gross margin declined 2.8 percentage points.

Selling and Marketing Expense			Increased / (Decreased)	
	2019	2018	\$	%
Selling and marketing	\$ 72,804	\$ 68,899	\$ 3,905	5.7%
% of Revenue	13.0%	14.8%		

Selling and marketing expense increased 5.7% primarily due to higher commissions and compensation expense, as well as the addition of E2M expenses, partially offset by the favorable impact of currency translation. Excluding the impact of currency translation, E2M expenses and restructuring costs incurred in both fiscal years, selling and marketing expense increased 5.9%.

General and Administrative Expense			Increased / (Decreased)	
	2019	2018	\$	%
General and administrative	\$ 47,721	\$ 44,659	\$ 3,062	6.9%
% of Revenue	8.5%	9.6%		

General and administrative expense increased 6.9% primarily driven by the addition of E2M expenses and \$1,046 of acquisition-related expenses, partially offset by lower compensation costs and favorable currency translation. Excluding the impact of currency translation, E2M expenses and restructuring costs incurred in both fiscal years, general and administrative expense decreased 6.6%.

Research and Development Expense

	2019		2018		Increased / (Decreased)	
	\$	%	\$	%	\$	%
Research and development	\$ 12,810		\$ 17,406		\$ (4,596)	(26.4)%
% of Revenue		2.3%		3.7%		

R&D expense decreased 26.4% primarily due to the shift of internal resources to larger, capitalizable projects as we continue to invest in our technology to support current and future customer needs and lower compensation expense, partially offset by the addition of E2M expenses. Excluding the impact of currency translation, E2M expenses and restructuring costs incurred in the prior fiscal year, R&D expense decreased 31.3%.

Income from Operations

	2019		2018		Increased / (Decreased)	
	\$	%	\$	%	\$	%
Income from operations	\$ 34,080		\$ 19,225		\$ 14,855	77.3%
% of Revenue		6.1%		4.1%		

Income from operations increased 77.3% primarily due to increased gross profit on higher revenue volume, the shift of internal resources to capital projects and contributions from the E2M acquisition, partially offset by higher compensation and commissions expense, acquisition-related expenses of \$1,287 and the E2M inventory acquisition adjustment of \$1,141. Excluding the impact of currency translation, the E2M acquisition and restructuring costs incurred in both fiscal years, income from operations increased 61.9%.

Backlog

Backlog of undelivered orders at September 28, 2019 was \$342,652, a decrease of 1.0% from backlog of \$346,006 at September 29, 2018. Based on anticipated manufacturing schedules, we expect to convert approximately 79% of the backlog as of September 28, 2019 into revenue during fiscal year 2020. The expected conversion rate is lower than the prior year rate of 85% primarily due to timing of long-term contracts. Order cancellations in fiscal year 2019 did not have a material effect on backlog.

Sensors Segment
Results of Operations

The following table compares results of operations for Sensors, separately identifying the estimated impact of currency translation and the acquisition of Endeveco in the fourth quarter of fiscal year 2019. See Note 15 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information on our reportable segments.

	2019	Estimated			2018
		Business Change	Acquisition ¹	Currency Translation	
Revenue	\$ 334,976	\$ 22,524	\$ 4,409	\$ (6,226)	\$ 314,269
Cost of sales	173,466	13,952	4,157	(3,539)	158,896
Gross profit	161,510	8,572	252	(2,687)	155,373
Gross margin	48.2%				49.4%
Operating expenses					
Selling and marketing	58,835	2,174	215	(988)	57,434
General and administrative	38,937	2,721	1,788	(153)	34,581
Research and development	18,118	831	79	(170)	17,378
Total operating expenses	115,890	5,726	2,082	(1,311)	109,393
Income from operations	\$ 45,620	\$ 2,846	\$ (1,830)	\$ (1,376)	\$ 45,980

¹ The Acquisition column includes operating results and costs incurred as part of the acquisition of Endeveco. See Note 16 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information on the Endeveco acquisition.

Revenue			Increased / (Decreased)	
	2019	2018	\$	%
Revenue	\$ 334,976	\$ 314,269	\$ 20,707	6.6%

Revenue increased 6.6% primarily driven by growth in the Sensors test sector from a multi-year contract with the U.S. Department of Defense, growth in the Sensors position sector in the first half of the fiscal year, contributions from the acquisition of Endeveco and growth in the Sensors industrial sector from a continued rebound in the energy market, partially offset by the unfavorable impact of currency translation. Excluding the impact of currency translation and the Endeveco acquisition, revenue growth was 7.2%.

Revenue by geography is as follows:

			Increased / (Decreased)	
	2019	2018	\$	%
Americas	\$ 168,483	\$ 144,382	\$ 24,101	16.7 %
Europe	104,818	111,144	(6,326)	(5.7)%
Asia	61,675	58,743	2,932	5.0 %
Total Revenue	\$ 334,976	\$ 314,269	\$ 20,707	6.6 %

Gross Profit			Increased / (Decreased)	
	2019	2018	\$	%
Gross profit	\$ 161,510	\$ 155,373	\$ 6,137	3.9%
Gross margin	48.2%	49.4%	(1.2) ppts	

Gross profit increased 3.9% primarily due to increased revenue volume and contributions from the Endeveco acquisition, partially offset by higher compensation expenses, unfavorable impact of currency translation and the Endeveco inventory acquisition adjustment of \$460. The gross margin declined 1.2 percentage points primarily driven by higher compensation expense during the ramp-up of manufacturing capacity to support both new products and growth in order volume in a tight labor market and impact from the acquisition of Endeveco. Excluding the impact of currency translation and the Endeveco acquisition, gross profit increased 5.5% and the gross margin declined 0.7 percentage points.

Selling and Marketing Expense			Increased / (Decreased)	
	2019	2018	\$	%
Selling and marketing	\$ 58,835	\$ 57,434	\$ 1,401	2.4%
% of Revenue	17.6%	18.3%		

Selling and marketing expense increased 2.4% primarily driven by higher compensation expense from headcount additions to support sales growth, the addition of Endeveco expenses and higher marketing expenses, partially offset by the favorable impact of currency translation. Excluding the impact of currency translation and Endeveco expenses, selling and marketing expense increased 3.8%.

General and Administrative Expense			Increased / (Decreased)	
	2019	2018	\$	%
General and administrative	\$ 38,937	\$ 34,581	\$ 4,356	12.6%
% of Revenue	11.6%	11.0%		

General and administrative expense increased 12.6% primarily driven by higher compensation expense, acquisition-related expenses of \$1,651 and higher professional fees. Excluding the impact of currency translation and Endeveco expenses, general and administrative expense increased 7.9%.

Research and Development Expense

			Increased / (Decreased)	
	2019	2018	\$	%
Research and development	\$ 18,118	\$ 17,378	\$ 740	4.3%
% of Revenue	5.4%	5.5%		

R&D expense increased 4.3% primarily driven by continued investment in new product development and the impact of the Endeveco acquisition. Excluding the impact of currency translation and Endeveco expenses, R&D expense increased 4.8%.

Income from Operations

			Increased / (Decreased)	
	2019	2018	\$	%
Income from operations	\$ 45,620	\$ 45,980	\$ (360)	(0.8)%
% of Revenue	13.6%	14.6%		

Income from operations declined 0.8% primarily due to increased compensation expense, acquisition-related expenses of \$1,651, the unfavorable impact of currency translation, higher professional fees and the Endeveco inventory acquisition adjustment of \$460, partially offset by increased gross profit on higher revenue volume. Excluding the impact of currency translation and the Endeveco acquisition, income from operations increased 6.2%.

Backlog

Backlog of undelivered orders at September 28, 2019 was \$77,463, an increase of 12.0% compared to backlog of \$69,149 at September 29, 2018. We expect to convert approximately 97% of Sensors backlog to revenue in fiscal year 2020.

Cash Flow Comparison

The following table summarizes our cash flows from total operations:

	Fiscal Year	
	2019	2018
Total cash provided by (used in):		
Operating activities	\$ 73,463	\$ 63,247
Investing activities	(182,756)	(4,705)
Financing activities	97,403	(94,566)
Effect of exchange rate changes on cash	(1,977)	(905)
Increase (decrease) during the period	(13,867)	(36,929)
Cash and cash equivalents balance, beginning of period	71,804	108,733
Cash and cash equivalents balance, end of period	\$ 57,937	\$ 71,804

Operating Activities

The increase in cash provided by operating activities was primarily due to a reduction in cash used by deferred income taxes due to the Tax Act in fiscal year 2018, an increase in cash provided by other assets and liabilities primarily related to accrued project costs, and an increase in cash provided by payroll-related accruals. This increase was partially offset by an increase in cash used by working capital associated with timing fluctuations from advanced payments received from customers, accounts receivable payments received and unbilled accounts receivable accruals, accounts payable payments, and inventory purchases, as well as a decrease in net income due to the remeasurement of our estimated deferred tax liabilities as a result of the Tax Act in fiscal year 2018.

Investing Activities

The increase in cash used in investing activities was primarily due to the acquisition of E2M in the first quarter of fiscal year 2019 and Endeveco in the fourth quarter of fiscal year 2019 as well as an increase in cash used to purchase property and equipment for continued strategic investments in the business.

Financing Activities

The increase in cash provided by financing activities was primarily due to the issuance of the Notes. This was partially offset by the use of the proceeds to repay all outstanding debt under the revolving credit facility and to repay a portion of the tranche B term loan facility.

Liquidity and Capital Resources

We had cash and cash equivalents of \$57,937 as of September 28, 2019. Of this amount, \$13,197 was located in North America, \$24,365 in Europe and \$20,375 in Asia. Repatriation of certain foreign earnings is restricted by local law. The North American cash balance was primarily invested in bank deposits. The cash balances in Europe and Asia were primarily invested in money market funds and bank deposits. In accordance with our investment policy, we place cash equivalent investments with issuers who have high-quality investment credit ratings. In addition, we limit the amount of investment exposure we have with any particular issuer. Our investment objectives are to preserve principal, maintain liquidity and achieve the best available return consistent with our primary objectives of safety and liquidity. As of September 28, 2019, we held no short-term investments.

As a result of the transition tax related to the enactment of the Tax Act, we are able to repatriate cash held in our foreign subsidiaries without such funds being subject to additional federal income tax liability. We plan to continue to repatriate certain amounts of our existing offshore cash and future earnings back to the U.S.

As of September 28, 2019, our capital structure was comprised of \$30,170 in short-term debt, \$494,961 in long-term debt and \$484,059 in shareholders' equity. The Consolidated Balance Sheets also included \$12,514 of unamortized debt issuance costs as of September 28, 2019. Total interest-bearing debt as of September 28, 2019 was \$525,131.

We have a credit agreement with a consortium of financial institutions (the Credit Agreement) that provides for senior secured credit facilities consisting of a revolving credit facility and a tranche B term loan facility. The maturity date of the revolving credit facility is July 5, 2022 and the maturity date of the loans under the tranche B term facility is July 5, 2023, unless a term loan lender agrees to extend the maturity date pursuant to a loan modification agreement made in accordance with the terms of the Credit Agreement. The Credit Agreement also requires mandatory prepayments on our tranche B term loan facility in certain circumstances, including the potential for an annual required prepayment of a certain percentage of our excess cash flow.

Under the Credit Agreement, we are subject to customary affirmative and negative covenants, including, among others, restrictions on our ability to incur debt; create liens; dispose of assets; make investments, loans, advances, guarantees and acquisitions; enter into transactions with affiliates; and enter into any restrictive agreements and customary events of default (including payment defaults, covenant defaults, change of control defaults and bankruptcy defaults). The Credit Agreement also contains financial covenants, including the ratio of consolidated total indebtedness to adjusted consolidated earnings before income, taxes, depreciation and amortization (Adjusted EBITDA), as defined in the Credit Agreement, as well as the ratio of Adjusted EBITDA to consolidated interest expense. These covenants restrict our ability to pay dividends and purchase outstanding shares of common stock. As of September 28, 2019 and September 29, 2018, we were in compliance with these financial covenants.

On July 16, 2019, we issued \$350,000 in aggregate principal amount of 5.750% senior unsecured notes due in 2027 (the Notes). The Notes were issued pursuant to an Indenture dated as of July 16, 2019 among us, the Guarantors (as defined therein) and Wells Fargo Bank, National Association, as trustee (the Indenture). The Notes will mature on August 15, 2027.

The Indenture governing the Notes contains covenants that limit, among other things, our ability and the ability of our restricted subsidiaries to incur additional indebtedness or issue certain preferred shares; create liens; pay dividends, redeem stock or make other distributions; make investments; for our restricted subsidiaries to pay dividends to us or make other intercompany transfers; transfer or sell assets; merge or consolidate; enter into certain transactions with our affiliates; and designate subsidiaries as unrestricted subsidiaries. As of September 28, 2019 and September 29, 2018, we were in compliance with these financial covenants.

See Notes 8 and 18 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information on our financing arrangements and changes to our capital structure, respectively, subsequent to the end of fiscal year 2019.

Shareholders' equity increased by \$6,127 during fiscal year 2019 primarily due to \$43,067 net income and \$9,430 stock-based compensation. This increase was partially offset by \$22,096 dividends declared and other comprehensive loss of \$19,949. Also contributing to the decrease was a cumulative effect of accounting change reduction to our opening retained earnings balance of \$6,227 related to the adoption of the new revenue recognition standard, ASU No. 2014-09, *Revenue from Contracts with Customers (Topic 606)*.

As of September 28, 2019, we believe our current capital resources will be sufficient to fund working capital requirements, capital expenditures and operations for the foreseeable future, including at least the next twelve months.

Contractual Obligations

As of September 28, 2019, our contractual obligations are as follows:

	Total	Less than 1 year	1 - 3 years	3 - 5 years	More than 5 years
Long-term debt ¹	\$ 523,695	\$ 4,600	\$ 9,200	\$ 159,895	\$ 350,000
Interest payable on long-term debt ²	191,959	29,390	58,002	46,708	57,859
Capital lease obligations ³	1,436	570	866	—	—
Operating lease obligations ⁴	20,040	7,149	8,415	2,687	1,789
Other long-term obligations ⁵	14,728	1,067	2,239	2,332	9,090
Total contractual obligations ⁶	\$ 751,858	\$ 42,776	\$ 78,722	\$ 211,622	\$ 418,738

¹ Long-term debt includes the tranche B term loan facility (Term Facility) and the Notes. For the above period of less than one year, no excess cash flow prepayment is required under the provisions of the Term Facility based on fiscal year 2019 results due to the prepayments made during fiscal year 2019. The Term Facility amounts for periods subsequent to less than one year exclude excess cash flow prepayments, which may be required under the provisions of the Term Facility based on fiscal year 2020 and subsequent fiscal year results as future prepayment amounts, if any, are not reasonably estimable as of September 28, 2019. Refer to Note 8 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information regarding our financing arrangements.

² Interest payable on long-term debt includes interest on the Term Facility, the Notes and capital lease obligations.

³ Capital lease obligations represent contractual vehicle leases. Refer to Note 1 and Note 8 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information regarding our capital lease obligations.

⁴ Operating leases are primarily for office space, as well as vehicles and equipment. Refer to Note 17 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional lease information.

⁵ Other long-term obligations include liabilities under pension and other retirement plans.

⁶ Long-term income tax liabilities for uncertain tax positions have been excluded from the contractual obligations table as we are unable to make a reasonably reliable estimate of the amount and period of related future payments. As of September 28, 2019, our long-term liability for uncertain tax positions was \$4,414. Refer to Note 11 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional income tax information.

As of September 28, 2019, we had letters of credit and guarantees outstanding totaling \$23,121 and \$26,665, respectively, primarily to bond advance payments and performance guarantees related to customer contracts in Test & Simulation.

Off-balance Sheet Arrangements

As of September 28, 2019, we did not have any off-balance sheet arrangements that have, or are reasonably likely to have, a current or future material effect on our financial condition, changes in financial condition, revenues or expenses, results of operations, liquidity, capital expenditures or capital resources that are material to investors.

Critical Accounting Policies and Estimates

The Consolidated Financial Statements have been prepared in accordance with GAAP, which require us to make estimates and assumptions in certain circumstances that affect amounts reported, giving due consideration to materiality, that affect the reported amounts of assets and liabilities, revenues and expenses and related disclosures of any contingent assets and liabilities at the date of the financial statements. We regularly review our estimates and assumptions, which are based on historical experience and on various other factors that are believed to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions.

We believe that of our significant accounting policies, the following is particularly important to the portrayal of our results of operations and financial position and is subject to an inherent degree of uncertainty as it may require the application of a higher level of judgment by us. Our significant accounting policies are fully described in Note 1 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K.

Revenue Recognition (Over Time)

Revenue is recognized either over time as work progresses or at a point-in-time, dependent upon contract-specific terms and the pattern of transfer of control of the product or service to the customer. Contracts with equipment revenue recognized over time

use costs incurred to date relative to total estimated costs at completion to measure progress toward satisfying the performance obligation. Incurred cost represents work performed, which corresponds with, and thereby best depicts, the transfer of control to the customer. Equipment contract costs include materials, component parts, labor and overhead costs. For contracts recognized over time, we estimate the profit on a contract as the difference between the total estimated revenue and expected costs to complete a contract and recognize that profit over the life of the contract. Contract estimates are based on various assumptions to determine the outcome of future events that may span several years. These assumptions include labor productivity and availability, the complexity of the work to be performed, the cost and availability of materials, and internal and subcontractor performance.

As a significant change in one or more of these estimates could affect the profitability of our contracts, we review and update our contract-related estimates regularly. We recognize adjustments in estimated profit on contracts under the cumulative catch-up method. Under this method, the impact of the adjustment on profit recorded to date is recognized in the period the adjustment is identified. Revenue and profit in future periods of contract performance is recognized using the adjusted estimate. If at any time the estimate of contract profitability indicates an anticipated loss on the contract, we recognize the total loss in the period it is identified. Our review of contract-related estimates has not resulted in adjustments that are significant to our results of operations.

See Note 3 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K.

Business Acquisitions

We account for acquired businesses using the acquisition method of accounting which requires that the assets acquired and liabilities assumed be recorded at the date of acquisition at their respective fair values. The judgments made in determining the estimated fair value assigned to each class of assets acquired and liabilities assumed, as well as asset lives, can materially impact net income. Accordingly, for significant items, we typically engage a third-party valuation firm. There are several methods that can be used to determine the fair value of assets acquired and liabilities assumed in a business combination. For intangible assets, we historically have utilized the "income method." This method starts with a forecast of all of the expected future net cash flows attributable to the subject intangible asset. These cash flows are then adjusted to present value by applying an appropriate discount rate that reflects the risk factors associated with the cash flow streams. Some of the more significant estimates and assumptions inherent in the income method (or other methods) include the projected future cash flows (including timing) and the discount rate reflecting the risks inherent in the future cash flows. Estimating the useful life of an intangible asset also requires judgment. For example, different types of intangible assets will have different useful lives, influenced by the nature of the asset, competitive environment and rate of change in the industry. All of these judgments and estimates can significantly impact the determination of the amortization period of the intangible asset, and thus net income. In connection with the acquisition of E2M, the final valuation of assets acquired and liabilities assumed was completed during the fourth quarter of fiscal year 2019. The valuation of assets acquired and purchase price allocation related to the Endeveco acquisition which closed in the fourth quarter of fiscal year 2019 are considered preliminary and expected to be finalized as soon as possible, but no later than one year from the acquisition date.

See Note 16 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K.

Recently Issued Accounting Pronouncements

Information regarding new accounting pronouncements is included in Note 2 and Note 3 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K.

Quarterly Financial Information

Revenue and operating results reported on a quarterly basis do not necessarily reflect trends in demand for our products or our operating efficiency. Revenue and operating results in any quarter may be significantly affected by the timing of revenue recognition for the various performance obligations included in a contract based on transfer of control resulting in revenue being recognized at a point in time rather than over time. Recognition of revenue over time for large, long-term projects generally has the effect of minimizing significant fluctuations quarter-over-quarter. See Note 3 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information on our revenue recognition policy. Quarterly earnings also vary as a result of the use of estimates including, but not limited to, the rates used in recording federal, state and foreign income tax expense. See Note 1 and Note 11 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information on our use of estimates and income tax related matters, respectively.

Selected quarterly financial information is as follows:

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Full Year ¹
	(unaudited)	(unaudited)	(unaudited)	(unaudited)	
Fiscal Year 2019					
Revenue	\$ 203,181	\$ 233,046	\$ 232,209	\$ 224,082	\$ 892,518
Gross profit	78,305	87,350	85,103	78,172	328,930
Income before income taxes	11,197	17,076	16,190	4,150	48,613
Net income	\$ 10,501	\$ 14,160	\$ 13,585	\$ 4,821	\$ 43,067
Earnings per share					
Basic	\$ 0.55	\$ 0.74	\$ 0.70	\$ 0.25	\$ 2.24
Diluted	\$ 0.54	\$ 0.73	\$ 0.70	\$ 0.25	\$ 2.21
Fiscal Year 2018					
Revenue	\$ 194,162	\$ 191,323	\$ 194,668	\$ 197,879	\$ 778,032
Gross profit	77,928	74,825	76,284	76,492	305,529
Income before income taxes	9,470	10,176	10,045	14,532	44,223
Net income	\$ 33,151	\$ 8,438	\$ 8,979	\$ 10,760	\$ 61,328
Earnings per share					
Basic	\$ 1.73	\$ 0.44	\$ 0.47	\$ 0.56	\$ 3.20
Diluted	\$ 1.72	\$ 0.44	\$ 0.47	\$ 0.56	\$ 3.18

¹ The earnings per share amounts for each quarter may not sum to the fiscal year amounts due to rounding and the effect of weighting.

Forward-looking Statements

Statements contained in this Annual Report on Form 10-K including, but not limited to, the discussion under Item 7 of Part II, that are not statements of historical fact are forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. In addition, certain statements in our future filings with the SEC, in press releases and in oral and written statements made by us or with our approval that are not statements of historical fact also constitute forward-looking statements. Examples of forward-looking statements include, but are not limited to: (i) projections of revenue, ROIC, Adjusted EBITDA, net income or loss, earnings or loss per share, the payment or nonpayment of dividends, our capital structure, the adequacy of our liquidity and reserves, the anticipated level of expenditures required and other statements concerning future financial performance; (ii) statements of our plans and objectives by our management or Board of Directors, including those relating to products or services, our restructuring initiatives, merger or acquisition activity and the potential impact of newly acquired businesses; (iii) statements of assumptions underlying such statements; (iv) statements regarding business relationships with vendors, customers or collaborators or statements relating to our order cancellation history, our ability to convert our backlog of undelivered orders into revenue, the timing of purchases, competitive advantages and growth in end markets; and (v) statements regarding our products and their characteristics, fluctuations in the costs of raw materials for products, our geographic footprint, performance, sales potential or effect in the hands of customers. Words such as "believes," "anticipates," "expects," "intends," "targeted," "should," "potential," "goals," "strategy" and similar expressions are intended to identify forward-looking statements, but are not the exclusive means of identifying such statements.

Forward-looking statements involve risks and uncertainties that may cause actual results to differ materially from those in such statements. Factors that could cause actual results to differ from those discussed in the forward-looking statements include, but are not limited to, those described in Item 1A of Part I of this Annual Report on Form 10-K. The performance of our business and our securities may be adversely affected by these factors and by other factors common to other businesses and investments, or to the general economy. Forward-looking statements are qualified by some or all of these risk factors. Therefore, you should consider these forward-looking statements with caution and form your own critical and independent conclusions about the likely effect of these risk factors on our future performance. Forward-looking statements speak only as of the date on which such statements are made, and we undertake no obligation to update any forward-looking statement to reflect events or circumstances after the date on which such statement is made to reflect the occurrence of unanticipated events or circumstances. You should carefully review the disclosures and the risk factors described in this Annual Report on Form 10-K and in other documents we file from time to time with the SEC, including our Quarterly Reports on Form 10-Q and Current Reports on Form 8-K.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK**Foreign Currency Exchange Risk**

Over the past 15 years, approximately 70% of our revenue has been derived from customers outside of the U.S. Our international subsidiaries have functional currencies other than our U.S. dollar reporting currency and, occasionally, transact business in currencies other than their functional currencies. These non-functional currency transactions expose us to market risk on assets, liabilities and cash flows recognized on these transactions.

The strengthening of the U.S. dollar relative to foreign currencies decreases the value of foreign currency-denominated revenue and earnings when translated into U.S. dollars resulting in an unfavorable currency translation impact on revenue and earnings. Conversely, a weakening of the U.S. dollar increases the value of foreign currency-denominated revenue and earnings resulting in a favorable currency translation impact on revenue and earnings. The following table illustrates financial results utilizing currency exchange rates from the applicable prior years to estimate the impact of currency on the following financial items.

Foreign Currency Exchange Rates

	2019	2018	2017
(Unfavorable) favorable impact from currency translation on			
Revenue	\$ (16,176)	\$ 17,070	\$ (3,315)
Net income	\$ (1,122)	\$ 933	\$ 187

The estimated net effect of currency translation on revenue was unfavorable in fiscal year 2019, primarily driven by the unfavorable translation impact associated with the relative strengthening in the value of the U.S. dollar against the Euro, Chinese yuan, British pound and Korean won during fiscal year 2019.

A hypothetical 10% appreciation or depreciation in foreign currencies against the U.S. dollar, assuming all other variables are held constant, would result in an increase or decrease in revenue of approximately \$33,900 in fiscal year 2019.

We have operational procedures to mitigate these non-functional currency exposures. We also utilize foreign currency exchange contracts to exchange currencies at set exchange rates on future dates to offset expected gains or losses on specifically identified exposures.

Mark-to-market gains and losses on derivatives designated as cash flow hedges in our currency hedging program are recorded within accumulated other comprehensive income (loss) (AOCI) in the Consolidated Balance Sheets. Mark-to-market gains and losses are reclassified from AOCI to earnings in the same line item in the Consolidated Statements of Income and in the same period as the recognition of the underlying hedged transaction. Net gains and losses on foreign currency transactions included in the accompanying Consolidated Statements of Income were a net loss of \$200 in fiscal year 2019, a net gain of \$104 in fiscal year 2018, and a net loss of \$2,499 in fiscal year 2017. See Note 7 to the Consolidated Financial Statements included in Item 8 of Part II of this Annual Report on Form 10-K for additional information on our cash flow hedge currency exchange contracts.

Interest Rates

We are directly exposed to changes in market interest rates on cash, cash equivalents, short-term investments and long-term debt, and are indirectly exposed to the impact of market interest rates on overall business activity.

On floating-rate investments, increases and decreases in market interest rates will increase or decrease future interest income, respectively. On floating-rate debt, increases or decreases in market interest rates will increase or decrease future interest expense, respectively. On fixed-rate investments, increases or decreases in market interest rates do not impact future interest income but may decrease or increase the fair market value of the investments, respectively. On fixed-rate debt, increases or decreases in market interest rates do not impact future interest expense but may decrease or increase the fair market value of the debt, respectively.

As of September 28, 2019, we had cash and cash equivalents of \$57,937, some of which was invested in interest-bearing bank deposits or money market funds. The interest-bearing bank deposits and money market funds have interest rates that reset every 1 to 89 days and generate interest income that will vary based on changes in short-term interest rates. A hypothetical decrease of 100 basis points in market interest rates, assuming all other variables were held constant, would decrease interest income by approximately \$90 for fiscal year 2019.

As of September 28, 2019, we had floating interest rate debt of \$173,695. Secured floating rate credit facilities require interest payments to be calculated at a floating rate and are therefore impacted by increases or decreases in market interest rates. A hypothetical increase of 100 basis points in floating interest rates, assuming all other variables were held constant, would result in a \$1,768 increase in future annual interest expense.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

Our audited financial statements and notes thereto included in Item 15 of Part IV of this Annual Report on Form 10-K, and appearing on pages F-1 through F-46 of this Annual Report on Form 10-K, are incorporated by reference herein. See also "Quarterly Financial Data" in Item 7 of Part II of this Annual Report on Form 10-K, which is incorporated by reference herein.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

Our management, including our Chief Executive Officer and Chief Financial Officer, has conducted an evaluation of the effectiveness of the design and operation of our disclosure controls and procedures (as defined in Rule 13a-15(e) under the Securities Exchange Act of 1934, as amended (the Exchange Act)), as of September 28, 2019. Based on that evaluation, our Chief Executive Officer and Chief Financial Officer concluded that, as of September 28, 2019, our disclosure controls and procedures were effective.

For purposes of Rule 13a-15(e) under the Exchange Act, the term disclosure controls and procedures means controls and other procedures of an issuer that are designed to ensure that information required to be disclosed by the issuer in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by an issuer in the reports that it files or submits under the Exchange Act is accumulated and communicated to the issuer's management, including its Chief Executive Officer and Chief Financial Officer, or persons performing similar functions, as appropriate to allow timely decisions regarding required disclosure.

Management's Annual Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Rule 13a-15(f) under the Exchange Act.

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting also includes those policies and procedures that:

- (a) Pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company;
- (b) Provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and
- (c) Provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Under the supervision of the Audit Committee of the Board of Directors and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting using the criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Based on our assessment and those criteria, our Chief Executive Officer and Chief Financial Officer concluded that our internal control over financial reporting was effective as of September 28, 2019.

The Company acquired E2M and Endevo on November 21, 2018 and August 5, 2019, respectively, and management excluded E2M and Endevo from its assessment of internal control over financial reporting as of September 28, 2019. E2M and Endevo represented \$159 million of our consolidated total assets at September 28, 2019 and \$34 million of our consolidated total revenue for the year ended September 28, 2019.

KPMG, LLP, an independent registered public accounting firm, has audited the effectiveness of our internal control over financial reporting as of September 28, 2019, and has issued a report that appears on page 34 of this Annual Report on Form 10-K.

Changes in Internal Control Over Financial Reporting

There were no changes in our internal control over financial reporting during the fourth quarter of fiscal year 2019 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Report of Independent Registered Public Accounting Firm

To the Shareholders and Board of Directors
MTS Systems Corporation:

Opinion on Internal Control Over Financial Reporting

We have audited MTS Systems Corporation and subsidiaries' (the Company) internal control over financial reporting as of September 28, 2019, based on criteria established in *Internal Control – Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission. In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of September 28, 2019, based on criteria established in *Internal Control – Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of the Company as of September 28, 2019 and September 29, 2018, the related consolidated statements of income, comprehensive income, shareholders' equity, and cash flows for each of the fiscal years in the three-year period ended September 28, 2019, and the related notes and financial statement schedule II (collectively, the consolidated financial statements), and our report dated November 25, 2019 expressed an unqualified opinion on those consolidated financial statements.

The Company acquired E2M and Endevo on November 21, 2018 and August 5, 2019, respectively, and management excluded E2M and Endevo from its assessment of internal control over financial reporting as of September 28, 2019. E2M and Endevo represented \$159 million of consolidated total assets at September 28, 2019 and \$34 million of consolidated total revenue for the year ended September 28, 2019. Our audit of internal control over financial reporting of the Company also excluded an evaluation of the internal control over financial reporting of E2M and Endevo.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Annual Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audit also included performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ KPMG LLP

Minneapolis, Minnesota
November 25, 2019

ITEM 9B. OTHER INFORMATION

None.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The required information by this Item 10 with respect to our directors, our Code of Conduct, compliance with Section 16(a) of the Exchange Act and our Audit Committee, including our Audit Committee financial experts, is incorporated by reference to the information set forth under the headings "Election of Directors" and "Other Information – Delinquent Section 16(a) Reports" in our Definitive Proxy Statement for the Annual Meeting of Shareholders scheduled to be held on February 11, 2020.

Information regarding our executive officers is included in Item I of Part I of this Annual Report on Form 10-K.

ITEM 11. EXECUTIVE COMPENSATION

The information required by this Item 11 is incorporated by reference to the information set forth under the headings "Executive Compensation," "Election of Directors – Non-Employee Director Compensation," and "Other Information – Compensation Committee Interlocks and Insider Participation" in our Definitive Proxy Statement for the Annual Meeting of Shareholders scheduled to be held on February 11, 2020.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

The information required by this Item 12 is incorporated by reference to the information set forth under the headings "Other Information – Security Ownership of Principal Shareholders and Management" and "Other Information – Information Regarding Equity Compensation Plans" in our Definitive Proxy Statement for the Annual Meeting of Shareholders scheduled to be held on February 11, 2020.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

The information required by this Item 13 is incorporated by reference to the information set forth under the headings "Election of Directors – Other Information Regarding the Board" and "Other Information – Related Party Transactions" in our Definitive Proxy Statement for the Annual Meeting of Shareholders scheduled to be held February 11, 2020.

ITEM 14. PRINCIPAL ACCOUNTANT FEES AND SERVICES

The information required by this Item 14 is incorporated by reference to the information set forth under the heading "Ratification of Appointment of Independent Registered Public Accounting Firm" in our Definitive Proxy Statement for the Annual Meeting of Shareholders scheduled to be held on February 11, 2020.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

(a) The following documents are filed as part of this Annual Report on Form 10-K:

(1) Consolidated Financial Statements

Report of Independent Registered Public Accounting Firm

Consolidated Balance Sheets as of September 28, 2019 and September 29, 2018

Consolidated Statements of Income for the Fiscal Years Ended September 28, 2019, September 29, 2018 and September 30, 2017

Consolidated Statements of Comprehensive Income for the Fiscal Years Ended September 28, 2019, September 29, 2018 and September 30, 2017

Consolidated Statements of Shareholders' Equity for the Fiscal Years Ended September 28, 2019, September 29, 2018 and September 30, 2017

Consolidated Statements of Cash Flows for the Fiscal Years Ended September 28, 2019, September 29, 2018 and

September 30, 2017

Notes to Consolidated Financial Statements

Financial Statement Schedules

See accompanying Index to Financial Statements on page F-1

(2) Exhibits

Exhibit Number	Description
2.1	Agreement and Plan of Merger, dated April 5, 2016, by and among the Company, Nickel Merger Sub Inc., PCB Group, Inc., and David T. Hore, John A. Lally and David M. Lally as the Shareholder Representative Group thereto (excluding schedules and exhibits, which the registrant agrees to furnish supplementally to the Securities and Exchange Commission upon request), incorporated by reference to Exhibit 2.1 of the Company's Current Report on Form 8-K filed April 6, 2016.
3.1	Restated and Amended Articles of Incorporation, incorporated by reference to Exhibit 3.a of the Company's Form 10-K for the fiscal year ended September 29, 2012.
3.2	Amended and Restated Bylaws, incorporated by reference to Exhibit 3.b of the Company's Current Report on Form 8-K filed November 28, 2011.
4.1	Indenture, dated as of June 15, 2016, by and between the Company and U.S. Bank National Association, as trustee, incorporated by reference to Exhibit 4.1 to the Company's Current Report on Form 8-K filed June 15, 2016.
4.2	First Supplemental Indenture, dated as of June 15, 2016, by and between the Company and U.S. Bank National Association, as trustee, incorporated by reference to Exhibit 4.2 to the Company's Current Report on Form 8-K filed June 15, 2016.
4.3	Purchase Contract Agreement, dated as of June 15, 2016, by and among the Company, U.S. Bank National Association, as purchase contract agent and as attorney-in-fact for the holders of the purchase contracts from time to time, and U.S. Bank National Association, as trustee under the Indenture, incorporated by reference to Exhibit 4.3 to the Company's Current Report on Form 8-K filed June 15, 2016.
4.4	Form of Tangible Equity Unit (included in Exhibit 4.3 above).
4.5	Form of Purchase Contract (included in Exhibit 4.3 above).
4.6	Form of Amortizing Note (included in Exhibit 4.2 above).
4.7	Form of Common Stock Certificate, incorporated by reference to Exhibit 4.1 to the Company's Registration Statement on Form S-3 filed June 7, 2016.
4.8	Indenture, dated as of July 16, 2019, by and among the Company, the Guarantors (as defined therein), and Wells Fargo Bank, National Association, as trustee, incorporated by reference to Exhibit 4.1 to the Company's Current Report on Form 8-K filed July 16, 2019.
4.9	Description of Securities Registered Under Section 12 of the Exchange Act (filed herewith).
10.1 *	Executive Variable Compensation Plan, incorporated by reference to Appendix A of the Company's Proxy Statement filed December 30, 2014.

- 10.2 * [Amended and Restated 2012 Employee Stock Purchase Plan, incorporated by reference to Exhibit 10.2 of the Company's Form 10-K for the fiscal year ended October 1, 2016.](#)
- 10.3 * [Restated Executive Deferred Compensation Plan \(2005\), incorporated by reference to Exhibit 10.3 of the Company's Current Report on Form 8-K filed October 28, 2008.](#)
- 10.4 * [MTS Systems Corporation 2011 Stock Incentive Plan, conformed copy including all amendments through February 9, 2016, incorporated by reference to Annex B of the Company's Definitive Proxy Statement on Schedule 14A filed December 30, 2015.](#)
- 10.5 * [Form of Notice of Grant and Terms and Conditions of Employee Options under 2011 Stock Incentive Plan, incorporated by reference to Exhibit 99.1 of the Company's Registration Statement on Form S-8 filed February 9, 2011.](#)
- 10.6 * [Form of Notice of Grant and Terms and Conditions of Employee Restricted Stock Units under 2011 Stock Incentive Plan, incorporated by reference to Exhibit 99.2 of the Company's Registration Statement on Form S-8 filed February 9, 2011.](#)
- 10.7 * [Form of Notice of Grant and Terms and Conditions of Employee Restricted Stock under 2011 Stock Incentive Plan, incorporated by reference to Exhibit 99.3 of the Company's Registration Statement on Form S-8 filed February 9, 2011.](#)
- 10.8 * [Form of Notice of Grant and Terms and Conditions of Restricted Stock for Directors under 2011 Stock Incentive Plan, incorporated by reference to Exhibit 99.4 of the Company's Registration Statement on Form S-8 filed February 9, 2011.](#)
- 10.9 * [Form of Notice of Grant of Restricted Stock and Restricted Stock Agreement – Director under the 2011 Stock Incentive Plan, incorporated by reference to Exhibit 10.1 of the Company's Form 10-Q for the fiscal quarter ended December 28, 2013.](#)
- 10.10 * [Form of Notice of Grant of Restricted Stock Units and Restricted Stock Agreement – Non-Employee Director under the 2011 Stock Incentive Plan, incorporated by reference to Exhibit 10.2 of the Company's Form 10-Q for the fiscal quarter ended December 28, 2013.](#)
- 10.11 * [Uniform Terms and Conditions Applicable to Non-Employee Director Restricted Stock Unit Grants under the 2011 Stock Incentive Plan, incorporated by reference to Exhibit 10.3 of the Company's Form 10-Q for the fiscal quarter ended December 28, 2013.](#)
- 10.12 * [Form of Notice of Grant of Restricted Stock Units and Restricted Stock Unit Agreement – Employee under the 2011 Stock Incentive Plan, incorporated by reference to Exhibit 10.4 of the Company's Form 10-Q for the fiscal quarter ended December 28, 2013.](#)
- 10.13 * [Uniform Terms and Conditions Applicable to Employee Restricted Stock Unit Grants under the 2011 Stock Incentive Plan, incorporated by reference to Exhibit 10.5 of the Company's Form 10-Q for the fiscal quarter ended December 28, 2013.](#)
- 10.14 * [Form of Notice of Grant of Non-Qualified Stock Options and Option Agreement – Employee under the 2011 Stock Incentive Plan, incorporated by reference to Exhibit 10.6 of the Company's Form 10-Q for the fiscal quarter ended December 28, 2013.](#)
- 10.15 * [Uniform Terms and Conditions Applicable to Employee Option Grants under the 2011 Stock Incentive Plan, incorporated by reference to Exhibit 10.7 of the Company's Form 10-Q for the fiscal quarter ended December 28, 2013.](#)

- 10.16 * [Uniform Terms and Conditions Applicable to Employee Performance Restricted Stock Unit Agreements under the 2011 Stock Incentive Plan, incorporated by reference to Exhibit 10.16 of the Company's Form 10-K for the fiscal year ended October 3, 2015.](#)
- 10.17 * [Form of Notice of Grant Performance Restricted Stock Units and Performance Restricted Stock Unit Agreement - Employee under the 2011 Stock Incentive Plan, incorporated by reference to Exhibit 10.17 of the Company's Form 10-K for the fiscal year ended October 3, 2015.](#)
- 10.18 * [MTS Systems Corporation 2017 Stock Incentive Plan, incorporated by reference to Annex A of the Company's Definitive Proxy Statement on Schedule 14A filed April 25, 2017.](#)
- 10.19 * [Form of Restricted Stock Unit Agreement - Employee under 2017 Stock Incentive Plan, incorporated by reference to Exhibit 99.2 of the Company's Registration Statement on Form S-8 filed June 7, 2017.](#)
- 10.20 * [Form of Non-Qualified Stock Option Agreement - Employee under 2017 Stock Incentive Plan, incorporated by reference to Exhibit 99.3 of the Company's Registration Statement on Form S-8 filed June 7, 2017.](#)
- 10.21 * [Form of Performance Restricted Stock Agreement - Employee under 2017 Stock Incentive Plan, incorporated by reference to Exhibit 99.4 of the Company's Registration Statement on Form S-8 filed June 7, 2017.](#)
- 10.22 * [Form of Restricted Stock Unit Agreement - Non-employee Director under 2017 Stock Incentive Plan, incorporated by reference to Exhibit 99.5 of the Company's Registration Statement on Form S-8 filed June 7, 2017.](#)
- 10.23 * [Letter Agreement, dated as of March 31, 2012, by and between the Company and Jeffrey A. Graves, incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed April 9, 2012.](#)
- 10.24 * [Employment Agreement, dated as of April 1, 2016, by and between PCB Group, Inc. and David T. Hore, incorporated by reference to Exhibit 10.2 to the Company's Current Report on Form 8-K filed July 7, 2016.](#)
- 10.25 * [First Amendment to Employment Agreement, dated as of November 8, 2016, by and between PCB Group, Inc. and David T. Hore, incorporated by reference to Exhibit 10.22 of the Company's Form 10-K for the fiscal year ended October 1, 2016.](#)
- 10.26 * [Letter Agreement, dated December 30, 2016, by and between the Company and Steven B. Harrison, incorporated by reference to Exhibit 10.2 of the Company's Current Report on Form 8-K filed January 5, 2017.](#)
- 10.27 * [Form of Indemnification Agreement between the Company and each of its directors and executive officers, incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed September 1, 2006.](#)
- 10.28 * [Amended and Restated Executive Severance Plan, incorporated by reference to Exhibit 10.26 of the Company's Form 10-K for the fiscal year ended October 1, 2016.](#)
- 10.29 * [Amended and Restated Executive Change in Control Severance Plan, incorporated by reference to Exhibit 10.27 of the Company's Form 10-K for the fiscal year ended October 1, 2016.](#)

10.30	Credit Agreement, dated as of July 5, 2016, among the Company; the foreign subsidiaries of the Company party thereto, the lenders party thereto and JPMorgan Chase Bank N.A., as administrative agent, incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed July 7, 2016.
10.31	Amendment No. 1 to Credit Agreement, dated as of July 29, 2016, by and among the Company, JPMorgan Chase Bank, N.A., as Administrative Agent and Swingline Lender, JPMorgan Chase Bank, N.A. and U.S. Bank National Association, as Issuing Banks, the Revolving Lenders party thereto and Bank of America, N.A., as an Additional Lender, incorporated by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K filed August 1, 2016.
10.32	Form of Consent Memorandum, effective as of January 24, 2017, executed by the lenders party thereto and JPMorgan Chase Bank, N.A. as administrative agent, and acknowledged and agreed to by the Company, incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed January 24, 2017.
10.33	Amendment No. 2 to Credit Agreement, dated as of July 6, 2017, by and among the Company, JPMorgan Chase Bank, N.A., as Administrative Agent and Swingline Lender, JPMorgan Chase Bank, N.A. and U.S. Bank National Association, as Issuing Banks, the Revolving Lenders party thereto and Bank of America, N.A., as an Additional Lender, incorporated by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K filed July 6, 2017.
10.34	Amendment No. 3 to Credit Agreement, dated as of November 21, 2018, by and among the Company, JPMorgan Chase Bank, N.A., as Administrative Agent and Swingline Lender, JPMorgan Chase Bank, N.A. and U.S. Bank National Association, as Issuing Banks and the Revolving Lenders party thereto, incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q filed on February 4, 2019.
10.35 *	Retirement Agreement, dated October 17, 2019, by and between the Company and William C. Becker, incorporated by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K filed October 21, 2019.
10.36	Amendment No. 4 to Credit Agreement, dated as of November 1, 2019, among MTS Systems Corporation, JP Morgan Chase Bank, N.A., as Administrative Agent and Swingline Lender, JP Morgan Chas Bank, N.A., U.S. Bank National Association and Wells Fargo Bank, National Association as Issuing Banks, and the Revolving Lenders party thereto, incorporated by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K filed November 7, 2019.
21.1	Subsidiaries of the Registrant (filed herewith).
23.1	Consent of Independent Registered Public Accounting Firm (filed herewith).
31.1	Certification of the Chief Executive Officer Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 (filed herewith).
31.2	Certification of the Chief Financial Officer Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 (filed herewith).
32.1	Certification of the Chief Executive Officer Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (furnished herewith).
32.2	Certification of the Chief Financial Officer Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (furnished herewith).
101.INS	XBRL Instance Document - the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document (filed herewith).

101.SCH	XBRL Taxonomy Extension Schema Document (filed herewith).
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document (filed herewith).
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document (filed herewith).
101.LAB	XBRL Taxonomy Extension Label Linkbase Document (filed herewith).
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document (filed herewith).

104	Cover Page Interactive Data File (embedded within the Inline XBRL document) (filed herewith).
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* Denotes a management contract or compensatory plan or arrangement required to be filed as an exhibit pursuant to Item 15 of Form 10-K.

ITEM 16. FORM 10-K SUMMARY

Not applicable.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

MTS SYSTEMS CORPORATION

Date: November 25, 2019

/s/ JEFFREY A. GRAVES

Jeffrey A. Graves
President and Chief Executive Officer
(Principal Executive Officer)

Date: November 25, 2019

/s/ BRIAN T. ROSS

Brian T. Ross
Executive Vice President and Chief Financial Officer
(Principal Financial Officer and Principal Accounting Officer)

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Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

<u>/s/ JEFFREY A. GRAVES</u> Jeffrey A. Graves	President and Chief Executive Officer and Director (Principal Executive Officer)	November 25, 2019
<u>/s/ BRIAN T. ROSS</u> Brian T. Ross	Executive Vice President and Chief Financial Officer (Principal Financial Officer and Principal Accounting Officer)	November 25, 2019
<u>/s/ DAVID J. ANDERSON</u> David J. Anderson	Non-Executive Chairman of the Board	November 25, 2019
<u>/s/ NANCY A. ALTOBELLO</u> Nancy A. Altobello	Director	November 25, 2019
<u>/s/ DAVID D. JOHNSON</u> David D. Johnson	Director	November 25, 2019
<u>/s/ RANDY J. MARTINEZ</u> Randy J. Martinez	Director	November 25, 2019
<u>/s/ MICHAEL V. SCHROCK</u> Michael V. Schrock	Director	November 25, 2019
<u>/s/ GAIL P. STEINEL</u> Gail P. Steinel	Director	November 25, 2019
<u>/s/ CHUN HUNG (KENNETH) YU</u> Chun Hung (Kenneth) Yu	Director	November 25, 2019
<u>/s/ LINDA K. ZUKAUCKAS</u> Linda K. Zukauckas	Director	November 25, 2019

MTS Systems Corporation and Subsidiaries

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<u>Schedule</u>	<u>Description</u>
II	Summary of Consolidated Allowances for Doubtful Accounts

Report of Independent Registered Public Accounting Firm

To the Shareholders and Board of Directors
MTS Systems Corporation:

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of MTS Systems Corporation and subsidiaries (the Company) as of September 28, 2019 and September 29, 2018, the related consolidated statements of income, comprehensive income, shareholders' equity, and cash flows for each of the fiscal years in the three-year period ended September 28, 2019, and the related notes and financial statement Schedule II (collectively, the consolidated financial statements). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of September 28, 2019 and September 29, 2018, and the results of its operations and its cash flows for each of the fiscal years in the three-year period ended September 28, 2019, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of September 28, 2019 based on criteria established in *Internal Control – Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission, and our report dated November 25, 2019 expressed an unqualified opinion on the effectiveness of the Company's internal control over financial reporting.

Change in Accounting Principle

As discussed in Note 2 to the consolidated financial statements, the Company has changed its method of accounting for revenue recognition as of September 30, 2018 due to the adoption of FASB Accounting Standards Codification Topic 606, *Revenue from Contracts with Customers*.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current period audit of the consolidated financial statements that were communicated or required to be communicated to the audit committee and that: (1) relate to accounts or disclosures that are material to the consolidated financial statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Assessment of total estimated cost at completion for equipment revenue recognized over time

As discussed in Notes 2 and 3 to the consolidated financial statements, the Company recognizes revenue on certain performance obligations in the Test & Simulation segment over time. For equipment performance obligations satisfied over time, the Company uses an input method based on the costs incurred to date relative to the estimated cost at completion to determine the revenue to be recognized. The Company's Test & Simulation solutions includes standard, configurable testing products; engineered products, which combine standard product configurations with a moderate degree of customization per customer specifications; and highly customized, highly engineered testing solutions built to address the customer's unique business need.

We identified the assessment of total estimated cost at completion for equipment revenue recognized over time as a critical audit matter. Given that Test & Simulation equipment performance obligations satisfied over time are customized per customer specifications, complex auditor judgment was required in evaluating the estimated cost at completion.

The primary procedures we performed to address this critical audit matter included the following. We tested certain internal controls over the Company's revenue recognition process. This included controls related to 1) the development of the initial estimated cost at completion for equipment performance obligations recognized over time and 2) the evaluation of subsequent changes to the estimated cost at completion. We tested the development of the initial estimated cost at completion and subsequent changes to those estimates by selecting a sample of cost estimates and subsequent changes and comparing them to customer contract specifications, and correspondence between the Company and the customer. We evaluated the Company's ability to accurately develop the estimated cost at completion by inspecting the Company's analysis of subsequent changes to the estimated cost at completion and inquiring with the project managers for a sample of projects as to the reason for the change.

Assessment of the initial fair value measurement of the customer list, technology, and trademark and trade name intangible assets acquired in certain business combinations

As discussed in Note 16 to the consolidated financial statements, the Company acquired E2M Technologies B.V. and Endevco for an aggregated total purchase price of \$146.9 million, net of cash acquired. This resulted in the recording of customer list, technology, and trademark and trade name intangible assets of \$34.9 million, \$17.1 million, and \$13.8 million, respectively. The determination of the acquisition date fair value of the customer list, technology, and trademark and trade name intangible assets required the Company to make significant estimates and assumptions regarding future revenue growth rates and discount rates.

We identified the assessment of the initial fair value measurement of the customer list, technology, and trademark and trade name intangible assets acquired in these business combinations as a critical audit matter. Testing the assumptions regarding future revenue growth rates and discount rates, which were used to estimate the fair values, involved a high degree of subjectivity.

The primary procedures we performed to address this critical audit matter included the following. We tested certain internal controls over the Company's acquisition-date valuation process, including controls related to the development of the future revenue growth rates and discount rates. We performed sensitivity analyses over the future revenue growth rates to assess the impact of changes to that assumption on the Company's determination of the fair value of the intangible assets. We evaluated the future revenue growth rates used by the Company to determine forecasted revenues by comparing them to industry benchmarks and publicly available data. In addition, we evaluated the relevance and reliability of third-party market data points used to develop the future revenue growth rates. We compared the Company's historical revenue forecasts to actual results to assess the Company's ability to accurately forecast. We involved a valuation professional with specialized skills and knowledge, who assisted in:

- evaluating each of the discount rates by comparing it against a discount rate range that was independently developed using publicly available market data for comparable entities, and
- developing an estimate of the fair value of the intangible assets acquired using the Company's cash flow forecasts and an independently developed discount rate, and comparing it to the Company's fair value estimate.

/s/ KPMG LLP

We have served as the Company's auditor since 2002.

Minneapolis, Minnesota
November 25, 2019

Consolidated Balance Sheets

(in thousands, except per share data)

	September 28, 2019	September 29, 2018
Assets		
Current assets		
Cash and cash equivalents	\$ 57,937	\$ 71,804
Accounts receivable, net of allowance for doubtful accounts of \$5,963 and \$5,004, respectively	121,260	122,243
Unbilled accounts receivable, net	80,331	70,474
Inventories, net	167,199	139,109
Prepaid expenses and other current assets	23,761	24,572
Total current assets	450,488	428,202
Property and equipment, net	101,083	90,269
Goodwill	429,039	369,275
Intangible assets, net	306,585	246,138
Other long-term assets	3,553	2,263
Deferred income taxes	7,229	3,249
Total assets	\$ 1,297,977	\$ 1,139,396
Liabilities and Shareholders' Equity		
Current liabilities		
Current maturities of long-term debt, net	\$ 27,969	\$ 32,738
Accounts payable	46,849	47,886
Accrued payroll and related costs	46,760	43,554
Advance payments from customers	70,520	80,131
Accrued warranty costs	3,541	5,418
Accrued income taxes	7,077	4,928
Accrued dividends	5,695	5,312
Other accrued liabilities	43,165	19,146
Total current liabilities	251,576	239,113
Long-term debt, less current maturities, net	484,648	355,640
Deferred income taxes	41,531	46,482
Non-current accrued income taxes	4,414	6,158
Defined benefit pension plan obligation	16,585	9,177
Other long-term liabilities	15,164	4,894
Total liabilities	813,918	661,464
Shareholders' Equity		
Common stock, \$0.25 par value; 64,000 shares authorized: 19,124 and 17,856 shares issued and outstanding as of September 28, 2019 and September 29, 2018, respectively	4,781	4,464
Additional paid-in capital	182,422	171,407
Retained earnings	315,329	300,585
Accumulated other comprehensive income (loss)	(18,473)	1,476
Total shareholders' equity	484,059	477,932
Total liabilities and shareholders' equity	\$ 1,297,977	\$ 1,139,396

The accompanying Notes to Consolidated Financial Statements are an integral part of these consolidated financial statements.

Consolidated Statements of Income

(in thousands, except per share data)

For the fiscal year ended	September 28, 2019	September 29, 2018	September 30, 2017
Revenue			
Product	\$ 782,012	\$ 674,391	\$ 691,471
Service	110,506	103,641	96,484
Total revenue	892,518	778,032	787,955
Cost of sales			
Product	494,725	409,525	427,405
Service	68,863	62,978	58,272
Total cost of sales	563,588	472,503	485,677
Gross profit	328,930	305,529	302,278
Operating expenses			
Selling and marketing	131,639	126,333	124,912
General and administrative	86,658	79,240	87,539
Research and development	30,928	34,784	34,999
Total operating expenses	249,225	240,357	247,450
Income from operations	79,705	65,172	54,828
Interest expense, net	(31,558)	(25,882)	(30,821)
Other income (expense), net	466	4,933	(996)
Income before income taxes	48,613	44,223	23,011
Income tax provision (benefit)	5,546	(17,105)	(2,073)
Net income	\$ 43,067	\$ 61,328	\$ 25,084
Earnings per share			
Basic			
Earnings per share	\$ 2.24	\$ 3.20	\$ 1.32
Weighted average common shares outstanding	19,258	19,163	19,040
Diluted			
Earnings per share	\$ 2.21	\$ 3.18	\$ 1.31
Weighted average common shares outstanding	19,447	19,293	19,137
Dividends declared per share	\$ 1.20	\$ 1.20	\$ 1.20

The accompanying Notes to Consolidated Financial Statements are an integral part of these consolidated financial statements.

Consolidated Statements of Comprehensive Income

(in thousands, except per share data)

For the fiscal year ended	September 28, 2019	September 29, 2018	September 30, 2017
Net income	\$ 43,067	\$ 61,328	\$ 25,084
Other comprehensive income (loss), net of tax			
Foreign currency translation gain (loss) adjustments	(9,980)	(2,174)	3,273
Derivative instruments			
Unrealized net gain (loss)	(2,141)	4,325	2,110
Net (gain) loss reclassified to earnings	(2,905)	(598)	98
Defined benefit pension plan			
Unrealized net gain (loss)	(5,758)	(621)	4,132
Net (gain) loss reclassified to earnings	379	367	696
Currency exchange rate gain (loss)	456	90	(489)
Other comprehensive income (loss)	(19,949)	1,389	9,820
Comprehensive income	\$ 23,118	\$ 62,717	\$ 34,904

The accompanying Notes to Consolidated Financial Statements are an integral part of these consolidated financial statements.

Consolidated Statements of Shareholders' Equity

(in thousands, except per share data)

	Common Stock		Additional Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive Income (Loss)	Total Shareholders' Equity
	Shares Issued	Amount				
Balance, October 1, 2016	16,660	\$ 4,165	\$ 154,879	\$ 256,589	\$ (10,373)	\$ 405,260
Total comprehensive income	—	—	—	25,084	9,820	34,904
Conversion of tangible equity units	939	235	(235)	—	—	—
Settlement of capped calls	(12)	(3)	3	—	—	—
Exercise of stock options	112	28	4,531	—	—	4,559
Stock-based compensation	69	17	5,603	—	—	5,620
Tax shortfall from equity compensation	—	—	(386)	—	—	(386)
Issuance for employee stock purchase plan	25	6	1,014	—	—	1,020
Common stock purchased and retired	(33)	(8)	(1,777)	—	—	(1,785)
Dividends, \$1.20 per share	—	—	—	(20,415)	—	(20,415)
Balance, September 30, 2017	17,760	\$ 4,440	\$ 163,632	\$ 261,258	\$ (553)	\$ 428,777
Total comprehensive income	—	—	—	61,328	1,389	62,717
Exercise of stock options	19	5	916	—	—	921
Stock-based compensation	79	19	7,224	—	—	7,243
Issuance for employee stock purchase plan	24	6	1,065	—	—	1,071
Cumulative effect of accounting change	—	—	(33)	(607)	640	—
Common stock purchased and retired	(26)	(6)	(1,397)	—	—	(1,403)
Dividends, \$1.20 per share	—	—	—	(21,394)	—	(21,394)
Balance, September 29, 2018	17,856	\$ 4,464	\$ 171,407	\$ 300,585	\$ 1,476	\$ 477,932
Total comprehensive income	—	—	—	43,067	(19,949)	23,118
Conversion of tangible equity units	1,342	336	(336)	—	—	—
Settlement of capped calls	(223)	(57)	57	—	—	—
Exercise of stock options	47	12	2,267	—	—	2,279
Stock-based compensation	97	24	9,406	—	—	9,430
Issuance for employee stock purchase plan	34	8	1,148	—	—	1,156
Cumulative effect of accounting change	—	—	—	(6,227)	—	(6,227)
Common stock purchased and retired	(29)	(6)	(1,527)	—	—	(1,533)
Dividends, \$1.20 per share	—	—	—	(22,096)	—	(22,096)
Balance, September 28, 2019	19,124	\$ 4,781	\$ 182,422	\$ 315,329	\$ (18,473)	\$ 484,059

The accompanying Notes to Consolidated Financial Statements are an integral part of these consolidated financial statements.

Consolidated Statements of Cash Flows

(in thousands)

For the fiscal year ended	September 28, 2019	September 29, 2018	September 30, 2017
Cash Flows from Operating Activities			
Net income	\$ 43,067	\$ 61,328	\$ 25,084
Adjustments to reconcile net income to net cash provided by (used in) operating activities			
Stock-based compensation	9,397	7,283	5,600
Fair value adjustment to acquired inventory	1,601	—	7,975
Net periodic pension benefit cost	1,154	1,178	1,768
Depreciation and amortization	37,975	34,492	35,523
(Gain) loss on sale or disposal of property and equipment	1,442	(4,162)	733
Amortization of debt issuance costs	6,765	4,644	3,863
Loss on debt extinguishment	—	—	503
Deferred income taxes	(11,060)	(28,252)	(9,127)
Bad debt provision (recovery), net	1,744	2,271	1,930
Other	(671)	(111)	—
Changes in operating assets and liabilities			
Accounts receivable and unbilled accounts receivable	(21,340)	4,763	7,652
Inventories, net	8,702	(12,343)	(2,253)
Prepaid expenses	(3,194)	(375)	(1,486)
Accounts payable	(4,624)	(846)	1,751
Accrued payroll and related costs	2,917	(5,338)	4,781
Advance payments from customers	(23,041)	3,531	3,635
Accrued warranty costs	(1,861)	(594)	278
Other assets and liabilities	24,490	(4,222)	(16,350)
Net Cash Provided by (Used in) Operating Activities	73,463	63,247	71,860
Cash Flows from Investing Activities			
Purchases of property and equipment	(30,525)	(12,321)	(17,798)
Proceeds from sale of property and equipment	10	6,793	45
Purchases of business, net of acquired cash	(151,956)	—	(853)
Other	(285)	823	—
Net Cash Provided by (Used in) Investing Activities	(182,756)	(4,705)	(18,606)
Cash Flows from Financing Activities			
Proceeds from issuance of long-term debt	430,391	—	—
Payment of long-term debt	(298,659)	(64,517)	(4,881)
Payment of debt component of tangible equity units	(7,290)	(9,153)	(8,541)
Payment of debt issuance costs for long-term debt	(6,561)	—	(782)
Payment of debt issuance costs for revolving credit facility	(667)	(125)	(200)
Receipts under short-term borrowings	70,000	38,750	—
Payments under short-term borrowings	(70,000)	(38,750)	—
Cash dividends	(21,713)	(21,360)	(20,079)
Proceeds from exercise of stock options and employee stock purchase plan	3,435	1,992	5,579
Payments to purchase and retire common stock	(1,533)	(1,403)	(1,785)
Net Cash Provided by (Used in) Financing Activities	97,403	(94,566)	(30,689)
Effect of Exchange Rate Changes on Cash and Cash Equivalents	(1,977)	(905)	1,388
Cash and Cash Equivalents			
Increase (decrease) during the period	(13,867)	(36,929)	23,953
Balance, beginning of period	71,804	108,733	84,780
Balance, End of Period	\$ 57,937	\$ 71,804	\$ 108,733
Supplemental Disclosures			
Cash paid during the year for			
Interest	\$ 22,136	\$ 22,224	\$ 29,881
Income taxes	11,406	11,380	11,478
Non-cash investing and financing activities			
Property and equipment acquired under capital lease	—	67	2,747
Dividends declared not yet paid	5,695	5,312	5,278

The accompanying Notes to Consolidated Financial Statements are an integral part of these consolidated financial statements.

Notes to Consolidated Financial Statements

(Dollars and shares in thousands, unless otherwise noted)

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Nature of Operations

MTS Systems Corporation is a leading global supplier of high-performance test systems, motion simulators and sensors. Our testing and simulation hardware, software and service solutions help customers accelerate and improve their design, development and manufacturing processes and are used for determining the mechanical behavior of materials, products and structures. Our high-performance sensors provide measurements of vibration, pressure, position, force and sound in a variety of applications to enable automation, enhance precision and safety, and lower our customers' production costs by improving performance and reducing downtime.

Fiscal Year

We have a 5-4-4 week, quarterly accounting cycle with our fiscal year ending on the Saturday closest to September 30. Fiscal years 2019, 2018 and 2017 ended September 28, 2019, September 29, 2018 and September 30, 2017, respectively. Fiscal years 2019, 2018 and 2017 all included 52 weeks.

Consolidation

The Consolidated Financial Statements include the accounts of MTS Systems Corporation and its wholly owned subsidiaries. Significant intercompany account balances and transactions have been eliminated.

Revenue Recognition

As described in Note 2, we adopted Accounting Standards Update (ASU) No. 2014-09, *Revenue from Contracts with Customers (Topic 606)*, followed by related amendments, on September 30, 2018 under the modified retrospective transition method. Our new revenue recognition accounting policy and disclosures relative to this guidance are included in Note 3.

Research and Development

Research and development (R&D) costs associated with new products are charged to operations as incurred. We have also allocated certain resources to capitalized software development activities. Total internal software development costs capitalized during fiscal years 2019 and 2018 were \$5,883 and \$1,803, respectively.

Foreign Currency

The financial position and results of operations of our foreign subsidiaries are measured using local currency as the functional currency. Assets and liabilities are translated using fiscal period-end exchange rates, and monthly statements of income are translated using average exchange rates applicable to each month, with the resulting adjustments recorded in foreign currency translation gain (loss) adjustments in the Consolidated Statements of Comprehensive Income. Net gains and losses from foreign currency transactions are recognized in the Consolidated Statements of Income. We recorded a net foreign currency transaction loss of \$200 in fiscal year 2019, a net foreign currency transaction gain of \$104 in fiscal year 2018 and a net foreign currency transaction loss of \$2,499 in fiscal year 2017.

Cash and Cash Equivalents

Cash and cash equivalents represent cash, demand deposits and highly liquid investments with original maturities of three months or less. Cash equivalents are recorded at cost, which approximates fair value. Cash equivalents, both within and outside the U.S., are invested in bank deposits or money market funds and are held in local currency.

Accounts Receivable and Long-term Contracts

We grant credit to customers and generally do not require collateral or other security from domestic customers. When deemed appropriate, receivables from customers located outside the U.S. are supported by letters of credit from financial institutions. The allowance for doubtful accounts is based on our assessment of the collectability of specific customer accounts and includes consideration of the credit worthiness and financial condition of those specific customers. We record an allowance to reduce receivables to the amount reasonably believed to be collectible and consider factors such as the financial condition of the customer and the aging of the receivables. If there is a deterioration of a customer's financial condition, if we become aware of additional information related to the credit worthiness of a customer or if future actual default rates on trade receivables differ from those currently anticipated, we may adjust the allowance for doubtful accounts, which would affect earnings in the period the adjustments were made.

We enter into long-term contracts for customized equipment sold to our customers. Under the terms of such contracts, revenue recognized over time may be invoiced upon completion of contractual milestones, shipment to the customer or installation and customer acceptance. Unbilled amounts relating to these contracts are included in unbilled accounts receivable, net in the Consolidated Balance Sheets. Amounts unbilled as of September 28, 2019 are expected to be invoiced during fiscal year 2020.

Inventories

Inventories consist of material, labor and overhead costs and are stated at the lower of cost or net realizable value determined under the first-in, first-out accounting method. Certain inventories are measured using the weighted average cost method. Inventories, net are as follows:

	2019	2018
Components, assemblies and parts	\$ 112,886	\$ 93,020
Customer projects in various stages of completion	39,534	35,675
Finished goods	14,779	10,414
Total inventories, net	\$ 167,199	\$ 139,109

Software Development Costs

We capitalize certain software development costs related to software to be sold or otherwise marketed. Capitalized software development costs include purchased materials and services, salary and benefits of our development and technical support staff and other costs associated with the development of new products and services. Software development costs are expensed as incurred until technological feasibility has been established, at which time future costs incurred are capitalized until the product is available for general release to the public. Based on our product development process, technological feasibility is generally established once product and detailed program designs have been completed, uncertainties related to high-risk development issues have been resolved through coding and testing, and we have the capability to manufacture the end product. Once a software product is available for general release to the public, capitalized development costs associated with that product will begin to be amortized to cost of sales in the Consolidated Statements of Income over the product's estimated economic life, using the greater of straight-line or a method that results in cost recognition in future periods that is consistent with the anticipated timing of product revenue recognition.

Our capitalized software development costs are subject to an ongoing assessment of recoverability, which is impacted by estimates and assumptions of future revenues and expenses for these software products, as well as other factors such as changes in product technologies. Any portion of unamortized capitalized software development costs that is determined to be in excess of net realizable value is expensed in the period such a determination is made. We capitalized \$8,295, \$5,167 and \$2,900 of software development costs during fiscal years 2019, 2018 and 2017, respectively. Amortization expense for software development costs was \$176, \$30 and \$892 for fiscal years 2019, 2018 and 2017, respectively. See Note 5 for additional information on capitalized software development costs.

Impairment of Long-lived Assets

We review the carrying value of long-lived assets or asset groups, such as property and equipment and intangible assets subject to amortization, when events or changes in circumstances such as asset utilization, physical change, legal factors or other matters indicate that the carrying value may not be recoverable. When this review indicates the carrying value of an asset or asset group exceeds the sum of the undiscounted cash flows expected to result from the use and eventual disposition of the asset or asset group, we recognize an asset impairment charge in earnings in the period such a determination is made. The amount of the impairment loss recorded is the amount by which the carrying value of the impaired asset or asset group exceeds its fair value.

Property and Equipment

Property and equipment are capitalized at cost, including additions, replacements and improvements. Repairs and maintenance are expensed as incurred. Depreciation is recorded over the following estimated useful lives of the asset:

Asset Type	Useful Life
Buildings and improvements	10 to 40 years
Machinery and equipment	3 to 10 years

Building and equipment additions are generally depreciated on a straight-line basis for financial reporting purposes and on an accelerated basis for income tax purposes. Property and equipment includes assets held under capital leases, consisting of machinery and equipment, which are recorded at the present value of minimum lease payments and amortized on a straight-line basis over the estimated life of the asset or the lease term. Amortization of assets held under capital leases is included in depreciation expense in the Consolidated Statements of Income. See Note 5 for additional information on property and equipment.

Goodwill and Indefinite-lived Intangible Assets

Goodwill represents the excess of cost over the fair value of the identifiable net assets of businesses acquired and allocated to our reporting units at the time of acquisition. We test goodwill for impairment annually in the fourth quarter and when an event occurs or circumstances change that indicate the carrying value of the reporting unit may not be recoverable. As of both September 28, 2019 and September 29, 2018, we determined there was no impairment of our goodwill or indefinite-lived intangible assets.

Evaluating goodwill for impairment involves the determination of the fair value of each reporting unit in which goodwill is recorded using a qualitative or quantitative analysis. A reporting unit is an operating segment or a component of an operating segment for which discrete financial information is available and reviewed by management on a regular basis. For fiscal year 2019, we identified four reporting units: Test & Simulation excluding E2M Technologies B.V. (E2M), E2M, Temposonics and PCB Group, Inc. (PCB).

Prior to completing the quantitative analysis described below, we have the option to perform a qualitative assessment of goodwill for impairment to determine whether it is more likely than not (a likelihood of more than 50%) that the fair value of a reporting unit is less than its carrying amount, including goodwill and other intangible assets. If we conclude the fair value is more likely than not less than the carrying value, we perform the quantitative analysis. Otherwise, no further testing is needed.

If the quantitative analysis is required, the impairment test is used to compare the calculated fair value of each reporting unit to its carrying value, including goodwill. We estimate the fair value of a reporting unit using both the income approach and the market approach. The income approach uses a discounted cash flow model that requires input of certain estimates and assumptions requiring judgment, including projections of revenue, profit margins, operating costs, capital expenditures, changes in working capital, discount rates and perpetual growth rates based on economic conditions, customer demand, changes in competition and new product introductions. The market approach uses a multiple of earnings and revenue based on guidelines for publicly traded companies. Fair value calculations contain significant judgments and estimates. If the fair value exceeds the carrying value, no further work is required and no impairment loss is recognized. If the carrying value exceeds the fair value, an impairment loss shall be recognized in an amount equal to that excess, limited to the total amount of goodwill allocated to that reporting unit.

In fiscal years 2019 and 2018, we performed a qualitative analysis of goodwill for each of our reporting units as described above. Based on the analysis, we determined that it was more likely than not that the fair value exceeds the carrying amount for all of our reporting units. Therefore, a quantitative analysis was not necessary for any of our reporting units. As of September 28, 2019, our Test & Simulation excluding E2M, E2M, Temposonics and PCB reporting units had goodwill balances of \$25,993, \$35,160, \$1,416 and \$366,470, respectively.

Indefinite-lived Intangible Assets

Intangible assets with indefinite lives are not amortized. These assets are tested annually for impairment and when an event occurs or circumstances change that indicate the carrying value of the asset may not be recoverable. Fair value of indefinite-lived intangible assets is primarily determined using a relief from royalty method if a quantitative analysis is deemed necessary. See Note 5 for additional information on goodwill and intangible assets.

Other Long-term Assets

Other assets primarily consist of the cash value of security deposits paid on leased property, life insurance policies and debt issuance costs.

Derivative Financial Instruments

Our results of operations could be materially impacted by changes in foreign currency exchange rates, as well as interest rates on our floating-rate indebtedness. In an effort to manage exposure to these risks, we periodically enter into forward and option currency exchange contracts, interest rate swaps and forward interest rate swaps. Since the market value of these hedging contracts is derived from current market rates, they are classified as derivative financial instruments. We do not use derivatives for speculative or trading purposes. The derivative contracts contain credit risk to the extent that our bank counterparties may be unable to meet the terms of the agreements. The amount of such credit risk is generally limited to the unrealized gains, if any, in such contracts. Such risk is minimized by limiting those counterparties to major financial institutions of high credit quality. For derivative instruments executed under master netting arrangements, we have the contractual right to offset fair value amounts recognized for the right to reclaim cash collateral against obligations to return cash collateral. We do not offset fair value amounts recognized on these derivative instruments. As of both September 28, 2019 and September 29, 2018, we did not have any foreign exchange contracts with credit risk related contingent features. See Note 7 for additional information on derivatives and hedging activities.

Income Taxes

We record a tax provision for the anticipated tax consequences of the reported results of operations. Deferred tax assets and liabilities are measured using the currently enacted tax rates that apply to taxable income in effect for the years in which those deferred tax assets and liabilities are expected to be realized or settled. We record a valuation allowance to reduce deferred tax assets to the amount that is believed more likely than not to be realized. We believe it is more likely than not that forecasted income, including income that may be generated as a result of certain tax planning strategies, together with the tax effects of the deferred tax liabilities, will be sufficient to fully recover the remaining net realizable value of our deferred tax assets. In the event that all or part of the net deferred tax assets are determined not to be realizable in the future, an adjustment to the valuation allowance would be charged to earnings in the period such determination is made. In addition, the calculation of tax liabilities involves significant judgment in estimating the impact of uncertainties in the application of complex tax laws. Resolution of these uncertainties in a manner inconsistent with our expectations could have a material impact on our financial condition and operating results. See Note 11 for additional information on income taxes.

Stock-based Compensation

We measure the cost of employee services received in exchange for the award of equity instruments based on the fair value of the award at the date of grant. We recognize the cost over the period during which an employee is required to provide services in exchange for the award. Forfeitures of stock-based awards are recognized as they occur.

For purposes of determining estimated fair value of stock-based payment awards, we utilize the Black-Scholes option pricing model, which requires the input of certain assumptions requiring management judgment. Because our employee stock option awards have characteristics significantly different from those of traded options and because changes in the input assumptions can materially affect fair value estimates, existing models may not provide a reliable single measure of the fair value of employee stock options. We continue to assess the assumptions and methodologies used to calculate estimated fair value of stock-based compensation. Circumstances may change and additional data may become available over time that could result in changes to these assumptions and methodologies and thereby materially impact the fair value determination of future grants of stock-based payment awards. If factors change and we employ different assumptions in future periods, the compensation expense recorded may differ significantly from the stock-based compensation expense recorded in the current period. See Note 9 for additional information on stock-based compensation.

Loss Contingencies

We establish an accrual for loss contingencies when it is both probable that an asset has been impaired or a liability has been incurred and the amount of the loss can be reasonably estimated. When both of these criteria are not met, we do not establish an accrual. However, when there is at least a reasonable possibility that a loss has been incurred, but it is not probable or reasonably estimable, we disclose the nature of the loss contingency and an estimate of the possible loss or range of loss, as applicable. Any adjustment made to a loss contingency accrual during an accounting period affects the earnings of the period.

Business Acquisitions

Our acquisition accounting policy and disclosures are included in Note 16.

Use of Estimates

The preparation of financial statements in accordance with U.S. generally accepted accounting principles (GAAP) requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities, disclosure of contingent assets and liabilities as of the date of the financial statements, and reported amounts of revenue and expense during the reporting period. Additionally, we frequently undertake significant technological innovation on certain of our long-term contracts, involving performance risk that may result in delayed delivery of product and/or revenue and gross profit variation due to changes in the ultimate costs of these contracts versus estimates. On an ongoing basis, we evaluate our estimates including those related to receivables, inventory, property and equipment, intangible assets, warranties, accrued expenses, stock-based compensation, income taxes and capitalized software, among others. Actual results could differ from those estimates.

NOTE 2 RECENTLY ISSUED ACCOUNTING PRONOUNCEMENTS

Leases

In February 2016, the Financial Accounting Standards Board (FASB) issued ASU No. 2016-02, *Leases (Topic 842)*, followed by related amendments (collectively, "the new lease standard"), which requires lessees to recognize most leases on the balance sheet for the rights and obligations created by those leases. Under the new lease standard, a company recognizes a right-of-use asset, representing the right to use the underlying asset for the lease term, and a corresponding lease liability for all leases with terms greater than 12 months. The new lease standard requires enhanced disclosures regarding the amount, timing and uncertainty of cash flows arising from a company's leases. Adoption of the new lease standard is required for annual periods beginning after December 15, 2018, including interim periods within that annual period, which is our fiscal year 2020. The new

guidance is required to be adopted using a modified retrospective transition method, and an optional transition method may be elected to use the effective date as the date of initial application on transition.

We will adopt the new lease standard for our fiscal year 2020 under the optional transition method with an effective date of September 29, 2019. As a result, we will not adjust our comparative period financial information or make the new required lease disclosures for periods before the effective date. We will elect the package of practical expedients to not reassess prior conclusions related to contracts containing leases, lease classification and initial direct costs. We will elect the practical expedient to not separate non-lease components from the lease components to which they relate and instead account for each separate lease and non-lease component associated with that lease component as a single lease component for all underlying asset classes. Accordingly, all costs associated with a lease contract are accounted for as lease cost. We will also make an accounting policy election to keep leases with an initial lease term of 12 months or less off the balance sheet. We continue to make progress with preparation for the adoption and implementation of the new lease standard, including assessing the completeness of our lease arrangements, assessing impacts to controls and implementing a lease software solution. The adoption of the new lease standard will result in an increase in assets and liabilities on our Consolidated Balance Sheet. The impact on our Consolidated Statement of Income and Consolidated Statement of Cash Flows is being evaluated but is not expected to be significant. Expanded disclosures will be provided beginning in the first quarter of fiscal year 2020.

Other

In June 2016, the FASB issued ASU No. 2016-13, *Financial Instruments—Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments*, followed by related amendments, which changes the accounting for credit losses on instruments measured at amortized cost by adding an impairment model that is based on expected losses rather than incurred losses. An entity will recognize as an allowance its estimate of expected credit losses, which is believed to result in more timely recognition of such losses as the standard eliminates the probable initial recognition threshold. Adoption of the standard is required for annual periods beginning after December 15, 2019, including interim periods within that annual period, which is our fiscal year 2021. The new guidance is required to be adopted using a modified retrospective approach with a cumulative-effect adjustment to retained earnings as of the beginning of the first reporting period of adoption. Early adoption is permitted for annual periods beginning after December 15, 2018, including interim periods within that annual period, which is our fiscal year 2020. We have not yet evaluated the impact the adoption of this guidance may have on our financial condition, results of operations or disclosures.

In August 2018, the FASB issued ASU No. 2018-13, *Fair Value Measurements (Topic 820): Disclosure Framework—Changes to the Disclosure Requirements for Fair Value Measurement*, which eliminates, amends and adds disclosure requirements for fair value measurements. The standard is required to be adopted for annual periods beginning after December 15, 2019, including interim periods within that annual period, which is our fiscal year 2021. Certain disclosures in the new guidance are to be applied using a retrospective approach while other disclosures are to be applied using a prospective approach. Early adoption is permitted. We have not yet evaluated the impact the adoption of this guidance may have on our financial condition, results of operations or disclosures.

In August 2018, the FASB issued ASU No. 2018-14, *Compensation—Retirement Benefits—Defined Benefit Plans—General (Subtopic 715-20): Disclosure Framework—Changes to the Disclosure Requirements for Defined Benefit Plans*, which eliminates, amends and adds disclosure requirements for defined benefit pension and other postretirement plans. The standard is required to be adopted for annual periods ending after December 15, 2020, which is our fiscal year 2021. The new guidance is to be applied using a retrospective approach with early adoption permitted. We have not yet evaluated the impact the adoption of this guidance may have on our financial condition, results of operations or disclosures.

Adopted

In May 2014, the FASB issued ASU No. 2014-09, *Revenue from Contracts with Customers (Topic 606)*, followed by related amendments (collectively, "the new revenue standard" or "ASC 606"), to provide a single, comprehensive revenue recognition model for all contracts with customers. Under the new revenue standard, a company recognizes revenue to depict the transfer of promised goods or services to a customer in an amount that reflects the consideration a company expects to receive in exchange for those goods or services. Determination of when and how revenue is recognized is based on a five-step analysis. Enhanced disclosures regarding the nature, amount, timing and uncertainty of revenue and cash flows arising from a company's contracts with customers are required.

We adopted the new revenue standard on September 30, 2018 for our fiscal year 2019 under the modified retrospective transition method. As of September 30, 2018, we recorded a cumulative-effect reduction to the opening balance of our fiscal year 2019 retained earnings of \$6,227, net of tax, for the net deferral of previously recognized revenue and related cost of sales, partially offset by the capitalization and deferral of pre-contract costs. The comparative information has not been restated and continues to be reported under the accounting standards in effect for those periods. See Note 3 for our new revenue recognition accounting policy and disclosures relative to this guidance.

In March 2016, the FASB issued ASU No. 2016-04, *Liabilities—Extinguishments of Liabilities (Subtopic 405-20): Recognition of Breakage for Certain Prepaid Stored-Value Products*, which amends existing guidance on extinguishing financial liabilities for certain prepaid stored-value products. The standard requires recognition of the expected breakage amount or the value that is ultimately not redeemed either proportionally in earnings as redemption occurs or when redemption is remote, if issuers are not entitled to breakage. We adopted the standard on a modified retrospective basis for the annual period ending September 28, 2019, including interim periods within that annual period. The adoption of this guidance had no impact on our financial condition, results of operations or disclosures.

In October 2016, the FASB issued ASU No. 2016-16, *Income Taxes (Topic 740), Intra-Entity Transfers of Assets Other Than Inventory*, which requires companies to account for the income tax effects of intercompany sales and transfers of assets other than inventory when the transfer occurs. Existing guidance required companies to defer the income tax effects of intercompany transfers of assets until the asset has been sold to an outside party or otherwise recognized. We adopted the standard on a modified retrospective basis for the annual period ending September 28, 2019, including interim periods within that annual period. The adoption of this guidance had no impact on our financial condition, results of operations or disclosures.

In March 2017, the FASB issued ASU No. 2017-07, *Compensation - Retirement Benefits (Topic 715): Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost*, which changes how employers that sponsor defined benefit pension or other postretirement benefit plans present the net periodic benefit cost in the income statement. The standard requires the service cost component of net periodic benefit cost to be presented in the same income statement line items as other employee compensation costs arising from services rendered during the period, with only the service cost component eligible for capitalization in assets. Other components of the net periodic benefit cost are to be stated separately from the line items that include the service cost and outside of operating income. These components are not eligible for capitalization in assets. We adopted the standard for the annual period ending September 28, 2019, including interim periods within that annual period, retrospectively for the presentation in the income statement of the service cost component and the other components of net periodic pension cost and prospectively for the capitalization in assets of the service cost component of net periodic pension cost. The adoption of this guidance did not have a material impact on our current or prior year financial condition, results of operations or disclosures. Therefore, the comparative information has not been restated and continues to be reported under the accounting standards in effect for those periods.

In August 2017, the FASB issued ASU No. 2017-12, *Derivatives and Hedging (Topic 815): Targeted Improvements to Accounting for Hedging Activities*, which amends the hedge accounting model in Accounting Standards Codification (ASC) 815 to enable entities to better portray the economics of their risk management activities in the financial statements and enhance the transparency and understandability of hedge results. We early adopted the standard on a modified retrospective basis for the annual period ending September 28, 2019, including interim periods within that annual period. The adoption of this guidance had no impact on our current or prior year financial condition, results of operations or disclosures.

NOTE 3 REVENUE

Adoption

We adopted the new revenue standard on September 30, 2018 for our fiscal year 2019 under the modified retrospective transition method. We applied the new revenue standard to all contracts which were not completed as of the effective date and elected not to apply contract modification guidance retrospectively. As a result of the adoption, we recorded a cumulative-effect reduction to the opening balance of our fiscal year 2019 retained earnings of \$6,227, net of tax, for the net deferral of previously recognized revenue and related cost of sales, partially offset by the capitalization and deferral of pre-contract costs.

The timing of revenue recognition for the majority of our products and contracts remains substantially unchanged under the new revenue standard, with the exception of certain contracts in our Test & Simulation segment (Test & Simulation). Dependent on contract-specific terms that evidence customer control of the work in process or an enforceable right to payment with no alternative use, certain contracts have a delay in revenue recognition until the customer takes control of the product, while certain contracts accelerate the recognition of revenue over the life of the contract. Under the new revenue standard, certain costs to obtain contracts (i.e., pre-contract costs) are capitalized at contract inception and recognized as revenue is earned.

The impact of adopting the new revenue standard on our Consolidated Statements of Income and Consolidated Balance Sheets is as follows:

Consolidated Statements of Income

	September 28, 2019		
	As Reported	Balances without Adoption of ASC 606	Effect of Change
Revenue	\$ 892,518	\$ 849,805	\$ 42,713
Cost of sales	563,588	535,204	28,384
Gross profit	328,930	314,601	14,329
Selling and marketing	131,639	129,894	1,745
Income tax provision (benefit)	5,546	3,399	2,147
Net income	43,067	32,630	10,437

Consolidated Balance Sheets

	September 28, 2019		
	As Reported	Balances without Adoption of ASC 606	Effect of Change
Assets			
Accounts receivable, net	\$ 121,260	\$ 120,496	\$ 764
Unbilled accounts receivable, net	80,331	70,949	9,382
Inventories, net	167,199	166,668	531
Prepaid expenses and other current assets	23,761	20,328	3,433
Other long-term assets	3,553	2,690	863
Deferred income taxes	7,229	7,538	(309)
Liabilities and Shareholders' Equity			
Advance payments from customers	70,520	74,209	(3,689)
Other accrued liabilities	43,165	28,506	14,659
Deferred income taxes	41,531	41,548	(17)
Other long-term liabilities	15,164	15,715	(551)
Accumulated other comprehensive income (loss)	(18,473)	(18,525)	52
Retained earnings	315,329	311,119	4,210

The cumulative effect of the changes made to our September 29, 2018 Consolidated Balance Sheet from the modified retrospective adoption of the new revenue standard is as follows:

Consolidated Balance Sheets

	Balance at September 29, 2018	Adjustments due to ASC 606 Adoption	Balance at September 30, 2018
Assets			
Accounts receivable, net	\$ 122,243	\$ (4,481)	\$ 117,762
Unbilled accounts receivable, net	70,474	(8,002)	62,472
Inventories, net	139,109	16,727	155,836
Prepaid expenses and other current assets	24,572	4,651	29,223
Other long-term assets	2,263	1,060	3,323
Deferred income taxes	3,249	643	3,892
Liabilities and Shareholders' Equity			
Advance payments from customers	80,131	13,568	93,699
Other accrued liabilities	19,146	(2,504)	16,642
Deferred income taxes	46,482	(1,228)	45,254
Other long-term liabilities	4,894	6,989	11,883
Retained earnings	300,585	(6,227)	294,358

Revenue Recognition

Revenue is recognized when control of the promised goods or services is transferred to our customers in an amount that reflects the consideration we expect to be entitled to in exchange for transferring those goods or providing those services. We account for a contract when it has approval and commitment from both parties, the rights of the parties are identified, payment terms are known, the contract has commercial substance and collectability of consideration is probable.

A performance obligation is a promise in a contract to transfer a distinct good or service to the customer and is the unit of account under the new revenue standard. A contract's transaction price is allocated to each distinct performance obligation and recognized as revenue when, or as, the performance obligation is satisfied. Many of our contracts have a single performance obligation as the promise to transfer the individual goods or services is not separately identifiable from other promises in the contracts and, therefore, not distinct. In situations when our contract includes distinct goods or services that are substantially the same and have the same pattern of transfer to the customer over time, they are recognized as a series of distinct goods or services. For contracts with multiple performance obligations, we allocate the contract's transaction price to each performance obligation using our best estimate of the standalone selling price of each distinct good or service in the contract.

We do not adjust the promised amount of consideration for the effects of a significant financing component if we expect, at contract inception, that the period between when we transfer a promised good or service to a customer and when the customer pays for that good or service will be one year or less.

Revenue is recorded net of taxes collected from customers, and taxes collected are recorded as current liabilities until remitted to the relevant government authority. Shipping and handling costs associated with outbound freight after control of a product has transferred are accounted for as a fulfillment cost and are included in cost of sales in the Consolidated Statements of Income.

The following is a description of the product offerings, end markets, typical revenue transactions and payment terms for each of our two reportable segments. See Note 15 for further information on reportable segments.

Test & Simulation

Test & Simulation manufactures and sells equipment and related software and services which are used by customers to characterize a product's mechanical properties or performance. Our solutions simulate forces and motions that customers expect their products to encounter in use or are necessary to properly characterize the product's performance. Primary Test & Simulation markets include transportation, infrastructure, energy, aerospace, materials science, medical, flight training and amusement parks. A typical system is a comprehensive solution which includes a reaction frame to hold the prototype specimen; a hydraulic or electro-mechanical power source; actuators to create the force or motion; and a computer controller with specialized software to coordinate the actuator movement and to measure, record, analyze and manipulate results. Our portfolio of Test & Simulation solutions includes standard, configurable testing products; engineered products which combine standard product configurations with a moderate degree of customization per customer specifications; and highly customized, highly engineered testing solutions built to address the customer's unique business need, which can include development of first-of-a-kind technology. To complement our Test & Simulation products, we provide our customers with a spectrum of services to maximize product performance including installation, product life cycle management, professional training, calibration and metrology, technical consulting and onsite and factory repair and maintenance. In addition, we sell a variety of accessories and spare parts. The manufacturing cycle for a typical system ranges from weeks to 12 months, depending on the complexity of the system and the availability of components, and can be several years for larger, more complex systems. For certain contracts, the order to revenue cycle may extend beyond the manufacturing cycle, such as when the manufacturing start date is driven by the customer's project timeline or when the contract terms require equipment installation and commissioning and customer acceptance prior to point-in-time revenue recognition.

Test & Simulation contracts often have multiple performance obligations, most commonly due to the contract covering multiple phases of the product life cycle (i.e., equipment design and production, installation and commissioning, extended warranty and software maintenance). The primary method used to estimate standalone selling price is the expected cost plus a margin approach under which we forecast our expected costs of satisfying a performance obligation and then add an appropriate margin for that distinct good or service.

Test & Simulation revenue is recognized either over time as work progresses or point-in-time, depending on contract-specific terms and the pattern of transfer of control of the product or service to the customer. Revenue from services is recognized in the period the service is performed or ratably over the period of the related service contract. Equipment revenue is recognized over time when: (i) control is transferred to the customer over time as work progresses; or (ii) contract terms evidence customer control of the work in process or an enforceable right to payment with no alternative use. Equipment revenue is recognized over time using costs incurred to date relative to total estimated costs at completion to measure progress toward satisfying the

performance obligation. Incurred cost represents work performed, which corresponds with, and thereby best depicts, the transfer of control to the customer. Equipment contract costs include materials, component parts, labor and overhead costs.

Equipment revenue is recognized point-in-time when either: (i) control is transferred to the customer at a point-in-time when obligations under the terms of the contract are satisfied; or (ii) contract terms do not evidence customer control of the work in process or an enforceable right to payment with no alternative use, and consequently revenue is deferred as work progresses. Satisfaction of performance obligations under the terms of the contract occurs either upon product shipment (as evidenced by delivery or shipment terms), completion of equipment installation and commissioning, or customer acceptance.

For our Test & Simulation contracts with customers, payment terms vary and are subject to negotiation. Typical payment terms include progress payments based on specified events or milestones. For some contracts, we are entitled to receive an advance payment.

Sensors

Our Sensors segment (Sensors) manufactures and sells high-performance sensors which provide measurements of vibration, pressure, position, force and sound in a variety of applications. Our Sensors products are used to enable automation, enhance precision and safety, and lower our customers' production costs by improving performance and reducing downtime. Primary Sensors markets include automotive, aerospace and defense, industrial, and research and development. Our Sensors products are sold as configurable, standard units; utilize piezoelectric or magnetostriction technology; and are ideal for use in harsh operating environments to provide accurate and reliable sensor information. To complement our Sensors products, we also provide spare parts and services. The cycle from contract inception to shipment of equipment is typically one to three months, with the exception of certain high-volume contracts which are fulfilled in a series of shipments over an extended period.

Our Sensors contracts generally have a single performance obligation which is satisfied at a point in time. The performance obligation is a stand-alone sensor product, accessory, service or software license. Sensors contracts are generally fixed-price purchase order fulfillment contracts, and the transaction price is equal to the observable consideration in the contract. Revenue is recognized when obligations under the terms of the contract with our customer are satisfied; generally this occurs with the transfer of control upon product shipment (as evidenced by shipment or delivery terms) or with the performance of the service. Certain contracts are measured using the as invoiced practical expedient as we have a right to consideration from a customer in an amount that corresponds directly with the value to the customer of our performance completed to date.

For our Sensors contracts with customers, payment terms are generally within 90 days. The timing of satisfying our Sensors performance obligations does not vary significantly from the typical timing of payment. For certain high-volume contracts, we are entitled to receive an advance payment.

Disaggregation of Revenue

We disaggregate our revenue by reportable segment, sales type (product or service), the timing of recognition of revenue for transfer of goods or services to customers (point-in-time or over time), and geographic market based on the billing location of the customer. See Note 15 for further information on our reportable segments and intersegment revenue.

	2019						
	Test & Simulation		Sensors		Intersegment		Total
Sales type							
Product	\$	455,715	\$	327,663	\$	(1,366)	\$ 782,012
Service		103,193		7,313		—	110,506
Total revenue	\$	558,908	\$	334,976	\$	(1,366)	\$ 892,518
Timing of recognition							
Point-in-time	\$	356,907	\$	313,355	\$	(1,366)	\$ 668,896
Over time		202,001		21,621		—	223,622
Total revenue	\$	558,908	\$	334,976	\$	(1,366)	\$ 892,518
Geographic market							
Americas	\$	179,421	\$	168,483	\$	(1,366)	\$ 346,538
Europe		120,164		104,818		—	224,982
Asia		259,323		61,675		—	320,998
Total revenue	\$	558,908	\$	334,976	\$	(1,366)	\$ 892,518

Contract Assets and Liabilities

Contract assets and contract liabilities are as follows:

	2019		2018	
Contract assets	\$	80,331	\$	70,474
Contract liabilities		81,045		80,131

The timing of revenue recognition, billings and cash collections results in billed accounts receivable, unbilled accounts receivable (contract assets) and advance payments from customers (contract liabilities). Contract balances are classified as assets or liabilities on a contract-by-contract basis at the end of each reporting period. Contract liabilities represent payments received from customers at contract inception and at milestones per contract provisions. These payments are recorded in advance payments from customers and other long-term liabilities in our Consolidated Balance Sheets (current and non-current portions, respectively) and are liquidated as revenue is recognized. Conversely, when billing occurs subsequent to revenue recognition for contracts recognized over time, balances are recorded in unbilled accounts receivable, net in our Consolidated Balance Sheets. As customers are billed, unbilled accounts receivable balances are transferred to accounts receivable, net in the Consolidated Balance Sheets.

Significant changes in contract assets and contract liabilities are as follows:

	Contract Assets	
Balance, September 29, 2018	\$	70,474
Cumulative transition adjustment upon adoption		(8,002)
Changes in estimated stage of completion		121,770
Transfers to accounts receivable, net		(108,171)
Acquisitions ¹		1,518
Other		2,742
Balance, September 28, 2019	\$	80,331

	Contract Liabilities	
Balance, September 29, 2018	\$	80,131
Cumulative transition adjustment upon adoption		20,557
Revenue recognized included in balance at beginning of period		(80,414)
Increases due to payments received, excluding amounts recognized as revenue during period		55,208
Acquisitions ¹		4,853
Other		710
Balance, September 28, 2019	\$	81,045

¹ See Note 16 for additional information regarding acquisitions.

Remaining Performance Obligations

As of September 28, 2019, we had approximately \$188,500 of remaining performance obligations on contracts with an original expected duration of one year or more which are primarily related to Test & Simulation. As of September 28, 2019, we expect to recognize approximately 74% of these remaining performance obligations as revenue within one year, an additional 23% within two years and the balance thereafter. We do not disclose the value of remaining performance obligations for contracts with an original expected duration of one year or less.

Contract Estimates

For contracts recognized over time, we estimate the profit on a contract as the difference between the total estimated revenue and expected costs to complete a contract and recognize that profit over the life of the contract. Contract estimates are based on various assumptions to project the outcome of future events that may span several years. These assumptions include labor productivity and availability, the complexity of the work to be performed, the cost and availability of materials, and internal and subcontractor performance.

Pricing is established at or prior to the time of sale with our customers, and we record sales at the agreed-upon selling price. The terms of a contract or the historical business practice can give rise to variable consideration due to but not limited to volume discounts, penalties and early payment discounts. We estimate variable consideration at the most likely amount we will receive from customers. We include estimated amounts in the transaction price to the extent it is probable that a significant reversal of cumulative revenue recognized for such transaction will not occur, or when the uncertainty associated with the variable consideration is resolved. In general, variable consideration in our contracts relates to the entire contract. As a result, the variable consideration is allocated proportionately to all performance obligations. Our estimates of variable consideration and determination of whether to include estimated amounts in the transaction price are based largely on an assessment of our anticipated performance and all information (historical, current and forecasted) that is reasonably available to us at contract inception. There are no significant instances where variable consideration is constrained and not recorded at the initial time of sale.

As a significant change in one or more of these estimates could affect the profitability of our contracts, we review and update our contract-related estimates regularly. We recognize adjustments in estimated profit on contracts under the cumulative catch-up method. Under this method, the impact of the adjustment on profit recorded to date is recognized in the period the adjustment is identified. Revenue and profit in future periods of contract performance is recognized using the adjusted estimate. If at any time the estimate of contract profitability indicates an anticipated loss on the contract, we recognize the total loss in the period it is identified. Our review of contract-related estimates has not resulted in adjustments that are significant to our results of operations.

Contract Modifications

When contracts are modified to account for changes in contract specifications and requirements, we consider whether the modification either creates new, or changes existing, enforceable rights and obligations. Contract modifications that are for goods or services that are not distinct from the existing contract, due to the significant integration with the original product or service provided, are accounted for as if they were part of that existing contract. The effect of a contract modification on the transaction price, and our measure of progress for the performance obligation to which it relates, is recognized as an adjustment to revenue (either as an increase in or a reduction of revenue) under the cumulative catch-up method. When the modifications include additional performance obligations that are distinct and at a relative stand-alone selling price, they are accounted for as a new contract and performance obligation and recognized prospectively.

Warranties and Returns

For both Test & Simulation and Sensors, we provide a manufacturer's warranty on our products and systems which is included in customer contracts. At the time a sale is recognized, we record estimated future warranty costs. See Note 4 for further discussion of our product warranty liabilities. We also offer separately-priced extended warranties or service-type contracts on certain products for which revenue is recognized over the contractual period or as services are rendered.

Our sales terms generally do not allow for a right of return except for situations where the product fails. When the right of return exists, we recognize revenue for the transferred products at the expected amount of consideration for which we will be entitled.

Shipping and Handling

Freight revenue billed to customers is reported within revenue in the Consolidated Statements of Income. Expenses incurred for shipping products to customers are reported within cost of sales in the Consolidated Statements of Income.

Pre-contract Costs

We recognize an asset for the incremental costs of obtaining a contract with a customer (i.e., pre-contract costs) when costs are considered recoverable. Capitalized pre-contract costs, consisting primarily of Test & Simulation sales commissions, are amortized as the related revenue is recognized. We recognized total capitalized pre-contract costs of \$4,297 in prepaid expenses and other current assets and other long-term assets in the Consolidated Balance Sheets as of September 28, 2019 and related expense of \$9,003 in the Consolidated Statements of Income during fiscal year 2019.

NOTE 4 WARRANTY OBLIGATIONS

Sales of our products and systems are subject to limited warranty obligations that are included in customer contracts. For sales that include installation services, warranty obligations generally extend for a period of 12 to 24 months from the date of either shipment or acceptance based on the contract terms. Product obligations generally extend for a period of 12 to 24 months from the date of purchase. Certain products offered in our Sensors segment include a lifetime warranty.

Under the terms of these warranties, we are obligated to repair or replace any components or assemblies deemed defective due to workmanship or materials. We reserve the right to reject warranty claims where it is determined that failure is due to normal wear, customer modifications, improper maintenance or misuse. We record general warranty provisions based on an estimated warranty expense percentage applied to current period revenue. The percentage applied reflects our historical warranty claims experience over the preceding 12-month period. Both the experience percentage and the warranty liability are evaluated on an ongoing basis for adequacy. Warranty provisions are also recognized for certain unanticipated product claims that are individually significant.

Changes to accrued warranty costs are as follows:

	2019	2018
Beginning accrued warranty costs	\$ 5,418	\$ 6,018
Warranty claims	(4,331)	(5,443)
Warranty provisions	2,485	5,109
Adjustments to preexisting warranties	(15)	(260)
Currency translation	(16)	(6)
Ending accrued warranty costs	\$ 3,541	\$ 5,418

NOTE 5 CAPITAL ASSETS
Property and Equipment

Property and equipment, net are as follows:

	2019	2018
Land and improvements	\$ 3,949	\$ 2,881
Buildings and improvements	64,140	58,880
Machinery and equipment	224,684	203,647
Assets held under capital leases	2,796	2,815
Total property and equipment	295,569	268,223
Less: Accumulated depreciation	(194,486)	(177,954)
Total property and equipment, net	\$ 101,083	\$ 90,269

Goodwill

Changes to the carrying amount of goodwill are as follows:

	Test & Simulation	Sensors	Total
Balance, September 30, 2017	\$ 25,109	\$ 344,653	\$ 369,762
Currency translation gain (loss)	(478)	(9)	(487)
Balance, September 29, 2018	\$ 24,631	\$ 344,644	\$ 369,275
Acquisitions ¹	39,181	23,292	62,473
Currency translation gain (loss)	(2,659)	(50)	(2,709)
Balance, September 28, 2019	\$ 61,153	\$ 367,886	\$ 429,039

¹ See Note 16 for additional information regarding acquisitions.

See Note 1 for additional information on our goodwill impairment analysis.

Intangible Assets

Intangible assets are as follows:

	September 28, 2019			
	Gross Carrying Amount	Accumulated Amortization	Net Carrying Value	Weighted Average Useful Life (in Years)
Software development costs ²	\$ 39,546	\$ (16,035)	\$ 23,511	6.2
Technology and patents	63,015	(15,739)	47,276	14.9
Trademarks and trade names	20,186	(3,808)	16,378	18.4
Customer lists	192,488	(34,735)	157,753	15.6
Land-use rights	2,303	(968)	1,335	25.7
Other	3,606	(774)	2,832	4.0
Trade names	57,500	—	57,500	Indefinite
Total intangible assets	\$ 378,644	\$ (72,059)	\$ 306,585	14.4

September 29, 2018

	Gross Carrying Amount	Accumulated Amortization	Net Carrying Value	Weighted Average Useful Life (in Years)
Software development costs ²	\$ 31,251	\$ (15,860)	\$ 15,391	6.5
Technology and patents	46,405	(12,188)	34,217	14.9
Trademarks and trade names	6,754	(2,987)	3,767	25.4
Customer lists	156,971	(23,314)	133,657	15.8
Land-use rights	2,336	(730)	1,606	26.0
Trade names	57,500	—	57,500	Indefinite
Total intangible assets	\$ 301,217	\$ (55,079)	\$ 246,138	14.8

² The gross carrying amount of software development costs as of September 28, 2019 and September 29, 2018 includes \$21,840 and \$15,391, respectively, of software not yet available for general release to the public.

Amortization expense recognized related to finite-lived intangible assets is as follows:

	2019	2018	2017
Amortization expense	\$ 17,361	\$ 13,831	\$ 14,665

See Note 1 for additional information on our intangible asset impairment analysis.

Estimated future amortization expense related to finite-lived intangible assets is as follows:

Fiscal Year	Amortization Expense
2020	\$ 19,395
2021	20,558
2022	21,537
2023	20,662
2024	20,296
Thereafter	146,637

Future amortization amounts presented above are estimates. Actual future amortization expense may be different due to fluctuations in foreign currency exchange rates, future acquisitions, impairments, changes in amortization periods or other factors.

NOTE 6 FAIR VALUE MEASUREMENTS

In determining the fair value of financial assets and liabilities, we currently utilize market data or other assumptions that we believe market participants would use in pricing the asset or liability in the principal or most advantageous market and adjust for non-performance and/or other risk associated with the company as well as counterparties, as appropriate. When considering market participant assumptions in fair value measurements, the following fair value hierarchy distinguishes between observable and unobservable inputs, which are categorized in one of the following levels:

- **Level 1:** Unadjusted quoted prices which are available in active markets for identical assets or liabilities accessible to us at the measurement date.
- **Level 2:** Inputs other than quoted prices included in Level 1 inputs that are observable for the asset or liability, either directly or indirectly, for substantially the full term of the asset or liability.
- **Level 3:** Unobservable inputs for the asset or liability used to measure fair value to the extent that observable inputs are not available, thereby allowing for situations in which there is little, if any, market activity for the asset or liability at the measurement date.

The hierarchy gives the highest priority to Level 1, as this level provides the most reliable measure of fair value, while giving the lowest priority to Level 3.

Assets and Liabilities Measured at Fair Value on a Recurring Basis

Financial assets and liabilities subject to fair value measurements on a recurring basis are as follows:

	September 28, 2019			
	Level 1	Level 2	Level 3	Total
Assets				
Currency contracts ¹	\$ —	\$ 907	\$ —	\$ 907
Total assets	—	907	—	907
Liabilities				
Currency contracts ¹	—	251	—	251
Total liabilities	\$ —	\$ 251	\$ —	\$ 251

	September 29, 2018			
	Level 1	Level 2	Level 3	Total
Assets				
Currency contracts ¹	\$ —	\$ 1,080	\$ —	\$ 1,080
Interest rate swaps ²	—	7,411	—	7,411
Total assets	—	8,491	—	8,491
Liabilities				
Currency contracts ¹	—	173	—	173
Total liabilities	\$ —	\$ 173	\$ —	\$ 173

¹ Based on observable market transactions of spot currency rates and forward currency rates on equivalently-termed instruments. Carrying amounts of the financial assets and liabilities are equal to the fair value. See Note 7 for additional information on derivative financial instruments.

² Based on London Interbank Offered Rate (LIBOR) and spot rates. Carrying amount of the financial asset is equal to the fair value. In the fourth quarter of fiscal year 2019, we terminated the interest rate swap agreement. See Note 7 for additional information on derivative financial instruments.

Assets and Liabilities Measured at Fair Value on a Nonrecurring Basis

We measure certain financial instruments at fair value on a nonrecurring basis. These assets primarily include goodwill, intangible assets and other long-lived assets acquired either as part of a business acquisition, individually or with a group of other assets, as well as property and equipment. These assets were initially measured and recognized at amounts equal to the fair value determined as of the date of acquisition or purchase subject to changes in value only for foreign currency translation. Periodically, these assets are tested for impairment, by comparing their respective carrying values to the estimated fair value of the reporting unit or asset group in which they reside. In the event any of these assets were to become impaired, we would recognize an impairment loss equal to the amount by which the carrying value of the reporting unit, impaired asset or asset group exceeds its estimated fair value. Fair value measurements of reporting units are estimated using an income approach involving discounted or undiscounted cash flow models that contain certain Level 3 inputs requiring management judgment, including projections of economic conditions and customer demand, revenue and margins, changes in competition, operating costs, working capital requirements and new product introductions. Fair value measurements of the reporting units associated with our goodwill balances and our indefinite-lived intangible assets are estimated at least annually in the fourth quarter of each fiscal year for purposes of impairment testing if a quantitative analysis is performed. Fair value measurements associated with our intangible assets, other long-lived assets and property and equipment are estimated when events or changes in circumstances such as market value, asset utilization, physical change, legal factors or other matters indicate that the carrying value may not be recoverable. See Note 1 and Note 5 for additional information on goodwill, indefinite-lived intangible assets, other long-lived assets, property and equipment and impairment testing.

Assets and Liabilities Not Measured at Fair Value

Certain financial instruments are not measured at fair value but are recorded at carrying amounts approximating fair value based on their short-term nature or variable interest rate. These financial instruments include cash and cash equivalents, accounts receivable, unbilled accounts receivable, accounts payable and short-term borrowings.

Other Financial Instruments

Other financial instruments subject to fair value measurements include debt, which is recorded at carrying value in the Consolidated Balance Sheets. The carrying amount and estimated fair values of our debt are as follows:

	September 28, 2019				
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
Tranche B term loan ³	\$ 173,695	\$ 174,563	\$ —	\$ 174,563	\$ —
Senior unsecured notes ³	350,000	366,625	—	366,625	—
Total debt	\$ 523,695	\$ 541,188	\$ —	\$ 541,188	\$ —

	September 29, 2018				
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
Debt component of tangible equity units ⁴	\$ 7,290	\$ 8,626	\$ —	\$ 8,626	\$ —
Tranche B term loan ³	391,416	395,330	—	395,330	—
Total debt	\$ 398,706	\$ 403,956	\$ —	\$ 403,956	\$ —

³ The fair value of the tranche B term loan and senior unsecured notes is based on the most recently quoted market price for the outstanding debt instrument, adjusted for any known significant deviations in value. The estimated fair value of the debt obligation is not necessarily indicative of the amount that would be realized in a current market exchange. See Note 8 for additional information on financing arrangements.

⁴ The fair value of the 8.75% tangible equity units (TEUs) was based on the most recently quoted price for the outstanding securities, adjusted for any known significant deviations in value. The final TEU installment payment was made during the fourth quarter of fiscal year 2019. See Note 12 for additional information on the TEUs.

NOTE 7 DERIVATIVE INSTRUMENTS AND HEDGING ACTIVITIES

Our currency exchange contracts and interest rate swaps are designated as cash flow hedges and qualify as hedging instruments. We also have derivatives that are not designated as cash flow hedges and, therefore, are accounted for and reported under foreign currency guidance. Regardless of designation for accounting purposes, we believe all of our derivative instruments are hedges of transactional risk exposures. The fair value of our outstanding designated and undesignated derivative assets and liabilities are reported in the Consolidated Balance Sheets as follows:

	September 28, 2019	
	Prepaid Expenses and Other Current Assets	Other Accrued Liabilities
Designated hedge derivatives		
Cash flow derivatives	\$ 907	\$ 133
Total designated hedge derivatives	907	133
Undesignated hedge derivatives		
Balance sheet derivatives	—	118
Total hedge derivatives	\$ 907	\$ 251

	September 29, 2018	
	Prepaid Expenses and Other Current Assets	Other Accrued Liabilities
Designated hedge derivatives		
Cash flow derivatives	\$ 989	\$ 173
Interest rate swaps	7,411	—
Total designated hedge derivatives	8,400	173
Undesignated hedge derivatives		
Balance sheet derivatives	91	—
Total hedge derivatives	\$ 8,491	\$ 173

A reconciliation of the net fair value of designated hedge derivatives subject to master netting arrangements that are recorded in the Consolidated Balance Sheets to the net fair value that could have been reported in the Consolidated Balance Sheets are as follows:

	Gross Recognized Amount	Gross Offset Amount	Net Amount Presented	Derivatives Subject to Offset	Cash Collateral Received	Net Amount
September 28, 2019						
Assets	\$ 907	\$ —	\$ 907	\$ (133)	\$ —	\$ 774
Liabilities	133	—	133	(133)	—	—
September 29, 2018						
Assets	\$ 8,400	\$ —	\$ 8,400	\$ (173)	\$ —	\$ 8,227
Liabilities	173	—	173	(173)	—	—

Cash Flow Hedging – Currency Risks

Currency exchange contracts utilized to maintain the functional currency value of expected financial transactions denominated in foreign currencies are designated as cash flow hedges. Gains and losses related to changes in the market value of these contracts are reported as a component of accumulated other comprehensive income (AOCI) within shareholders' equity in the Consolidated Balance Sheets and reclassified to earnings in the same line item in the Consolidated Statements of Income and in the same period as the recognition of the underlying hedged transaction. The effective portion of the cash flow hedges represents the change in fair value of the hedge that offsets the change in the functional currency value of the hedged item. We periodically assess whether our currency exchange contracts are effective and, when a contract is determined to be no longer effective as a hedge, we discontinue hedge accounting prospectively. Subsequent changes in the market value of ineffective currency exchange contracts are recognized as an increase or decrease in revenue in the Consolidated Statements of Income as that is the same line item in which the underlying hedged transaction is reported.

As of September 28, 2019 and September 29, 2018, we had outstanding cash flow hedge currency exchange contracts with gross notional U.S. dollar equivalent amounts of \$43,033 and \$39,856, respectively. Upon netting offsetting contracts to sell foreign currencies against contracts to purchase foreign currencies, irrespective of contract maturity dates, the net notional U.S. dollar equivalent amount of contracts outstanding was \$38,177 and \$29,315 at September 28, 2019 and September 29, 2018, respectively. As of September 28, 2019, the net market value of the foreign currency exchange contracts was a net asset of \$774, consisting of \$907 in assets and \$133 in liabilities. As of September 29, 2018, the net market value of the foreign currency exchange contracts was a net asset of \$816, consisting of \$989 in assets and \$173 in liabilities.

The pretax amounts recognized in AOCI on currency exchange contracts, including (gains) losses reclassified into earnings in the Consolidated Statements of Income and gains (losses) recognized in other comprehensive income (loss) (OCI), are as follows:

	2019	2018
Beginning unrealized net gain (loss) in AOCI	\$ 672	\$ (443)
Net (gain) loss reclassified into revenue	(1,026)	399
Net gain (loss) recognized in OCI	920	716
Ending unrealized net gain (loss) in AOCI	\$ 566	\$ 672

As of September 28, 2019, the amount projected to be reclassified from AOCI into earnings in the next 12 months was a net gain of \$609. The maximum remaining maturity of any forward or optional contracts as of September 28, 2019 was 1.1 years.

Interest Rate Swaps

On October 20, 2016, we entered into a floating to fixed interest rate swap agreement to mitigate our exposure to interest rate increases related to a portion of our tranche B term loan facility. In connection with the repayment of a portion of the tranche B term loan facility during the fourth quarter of fiscal year 2019, we terminated the interest rate swap agreement. Prior to termination, every month we paid a fixed interest of 1.256% in exchange for interest received at one month U.S. LIBOR. The interest rate swap was designated as a cash flow hedge. As a result, changes in the fair value of the interest rate swap were recorded in AOCI within shareholders' equity in the Consolidated Balance Sheets. The unrealized gains on the interest rate swap associated with the interest payments on our tranche B term loan facility that are still forecasted to occur are included in AOCI. These gains will be reclassified into interest expense over the life of the original swap agreement as the hedged interest payments occur.

The pretax amounts recognized in AOCI on interest rate swaps, including (gains) losses reclassified into earnings in the Consolidated Statements of Income and gains (losses) recognized in OCI, are as follows:

	2019	2018
Beginning unrealized net gain (loss) in AOCI	\$ 7,411	\$ 3,499
Net (gain) loss reclassified into interest expense	(2,689)	(1,204)
Net gain (loss) recognized in OCI	(3,643)	5,116
Ending unrealized net gain (loss) in AOCI	\$ 1,079	\$ 7,411

As of September 28, 2019, the amount projected to be reclassified from AOCI into earnings in the next 12 months was a net gain of \$886.

Foreign Currency Balance Sheet Derivatives

We also use foreign currency derivative contracts to maintain the functional currency value of monetary assets and liabilities denominated in non-functional foreign currencies. The gains and losses related to the changes in the market value of these derivative contracts are included in other income (expense), net in the Consolidated Statements of Income.

As of September 28, 2019 and September 29, 2018, we had outstanding foreign currency balance sheet derivative contracts with gross notional U.S. dollar equivalent amounts of \$60,827 and \$90,816, respectively. Upon netting offsetting contracts by counterparty banks to sell foreign currencies against contracts to purchase foreign currencies, irrespective of contract maturity dates, the net notional U.S. dollar equivalent amount of contracts outstanding at September 28, 2019 and September 29, 2018 was \$118 and \$28,271, respectively. As of September 28, 2019 and September 29, 2018, the net market value of the foreign exchange balance sheet derivative contracts was a net liability of \$118 and a net asset of \$91, respectively.

The net gain (loss) recognized in the Consolidated Statements of Income on foreign exchange balance sheet derivative contracts is as follows:

	2019	2018	2017
Net gain (loss) recognized in other income (expense), net	\$ 365	\$ 316	\$ (876)

NOTE 8 FINANCING

Long-term debt consists of the following:

	2019	2018
Long-term debt		
Tranche B term loan, 1.00% amortizing per year, maturing July 5, 2023	\$ 173,695	\$ 391,416
Senior unsecured notes, 5.75% coupon, maturing August 15, 2027	350,000	—
Tangible equity units, 8.75% coupon, maturing July 1, 2019 ¹	—	7,290
Capital lease obligations	1,436	2,000
Total long-term debt	\$ 525,131	\$ 400,706
Less: Unamortized underwriting discounts, commissions and other expenses	(10,313)	(8,623)
Less: Current maturities of tranche B term loan debt ^{2,3}	(29,600)	(28,600)
Less: Current maturities of TEU debt ²	—	(7,290)
Less: Current maturities of capital lease obligations ²	(570)	(553)
Total long-term debt, less current maturities, net	\$ 484,648	\$ 355,640

¹ See Note 12 for more information on our TEUs.

² In addition to the current maturities above, current maturities of long-term debt, net on the Consolidated Balance Sheets includes the current portion of unamortized underwriting discounts, commissions and other expenses of \$2,201 and \$3,705 as of September 28, 2019 and September 29, 2018, respectively.

³ As of September 28, 2019 and September 29, 2018, current maturities of tranche B term loan consist of the 1% annual payment and calculated required annual Excess Cash Flow payment as defined below, as well as planned prepayments.

Tranche B Term Loan and Revolving Credit Facility

We have a credit agreement with U.S. Bank National Association and HSBC Bank USA, National Association as Co-Documentation Agents, Wells Fargo Bank, National Association as Syndication Agent, JPMorgan Chase Bank, N.A. as Administrative Agent and JP Morgan Chase Bank, N.A. and Wells Fargo Securities, LLC as Joint Bookrunners and Joint Lead Arrangers (the Credit Agreement). The Credit Agreement as amended provides for senior secured credit facilities consisting of a \$150,000 revolving credit facility (the Revolving Credit Facility) which expires on July 5, 2022, and a \$460,000 tranche B term loan facility (the Term Facility) which expires on July 5, 2023. The proceeds of the Revolving Credit Facility can be drawn upon to refinance existing indebtedness, for working capital and for other general corporate purposes, up to a maximum of \$150,000. The Term Facility amortizes in equal quarterly installments equal to 1% of the original principal amount. The proceeds of the Term Facility were used for financing the acquisition of PCB Group, Inc. (PCB) in fiscal year 2016. Borrowings on the Revolving Credit Facility were used for financing the acquisition of E2M Technologies B.V. (E2M) in the first quarter of fiscal year 2019.

In the first quarter of fiscal year 2019, in conjunction with the acquisition of E2M, we entered into a third amendment to the Credit Agreement to increase the borrowing capacity on the Revolving Credit Facility from \$120,000 to \$150,000 and extend the expiration date of the Revolving Credit Facility from July 5, 2021 to July 5, 2022. Additionally, the required performance levels under certain financial covenants were modified. During fiscal year 2019, we incurred debt financing costs of \$541 as a result of this amendment which were capitalized in current maturities of long-term debt, net and long-term debt, less current maturities, net in the Consolidated Balance Sheets.

The primary categories of borrowing include Alternate Base Rate (ABR) Borrowings (ABR Term Loans and ABR Revolving Loans), Swingline Loans and Eurocurrency Borrowings (Eurocurrency Term Loans and Eurocurrency Revolving Loans), each as defined in the Credit Agreement. ABR Borrowings and Swingline Loans made in U.S. dollars under the Credit Agreement bear interest at a rate per annum equal to the ABR plus the Applicable Rate (as defined in the Credit Agreement). The ABR is defined as the greater of (a) the Prime Rate (as defined in the Credit Agreement) in effect on such day, (b) the New York Federal Reserve Bank (NYFRB) rate (as defined in the Credit Agreement) in effect on such day plus ½ of 1.00%, or (c) the Adjusted LIBOR (as defined in the Credit Agreement) for a one-month interest period in dollars on such day plus 1.00%. The ABR for ABR Term Loans shall not be less than 1.75% per annum. The Applicable Rate for any ABR Revolving Loans is based upon the leverage ratio applicable on such date. As of September 28, 2019, the Applicable Rate for ABR Term Loans was 2.25% per annum.

Eurocurrency Borrowings made under the Credit Agreement bear interest at a rate per annum equal to the Adjusted LIBOR Rate plus the Applicable Rate. The Adjusted LIBOR Rate is defined as an interest rate per annum equal to (a) the LIBOR Rate for such interest period multiplied by (b) the Statutory Reserve Rate (as defined in the Credit Agreement). The Applicable Rate for any Eurocurrency Revolving Loans is based upon the leverage ratio applicable on such date. The Adjusted LIBOR Rate for Eurocurrency Term Loans shall not be less than 0.75% per annum. Based on our leverage ratio as of September 28, 2019, the Applicable Rate for Eurocurrency Revolving Loans was 3.00%. As of September 28, 2019, the Applicable Rate for Eurocurrency Term Loans was 3.25% per annum, plus the applicable Adjusted LIBOR rate of 2.06%. The weighted average interest rate on the Term Facility debt during fiscal year 2019 was 5.65%.

As of September 28, 2019 and September 29, 2018, there were no outstanding borrowings under the Revolving Credit Facility. We had outstanding letters of credit drawn from the Revolving Credit Facility totaling \$21,173 and \$20,448 as of September 28, 2019 and September 29, 2018, respectively, leaving approximately \$128,827 and \$99,552, respectively, of unused borrowing capacity. Commitment fees are payable on the unused portion of the Revolving Credit Facility at rates between 0.25% and 0.40% based on our leverage ratio. For fiscal years 2019 and 2018, commitment fees incurred totaled \$281 and \$342, respectively.

The Credit Agreement governing the Term Facility requires us to prepay outstanding term loans, subject to certain exceptions, depending on the leverage ratio with (a) up to 50% of our annual Excess Cash Flow (as defined in the Credit Agreement) and (b) 100% of the net cash proceeds of (i) certain asset sales and casualty and condemnation events, subject to reinvestment rights and certain other exceptions; and (ii) any incurrence or issuance of certain debt, other than debt permitted under the Credit Agreement. We may voluntarily prepay outstanding loans under the Term Facility at any time without premium or penalty. All obligations under the Term Facility are unconditionally guaranteed by certain of our existing wholly-owned domestic subsidiaries, and are secured, subject to certain exceptions, by substantially all of our assets and the assets of our subsidiary guarantors.

Under the Credit Agreement, we are subject to customary affirmative and negative covenants, including, among others, restrictions on our ability to incur debt; create liens; dispose of assets; make investments, loans, advances, guarantees and acquisitions; enter into transactions with affiliates; and enter into any restrictive agreements and customary events of default (including payment defaults, covenant defaults, change of control defaults and bankruptcy defaults). The Credit Agreement also contains financial covenants, including the ratio of consolidated total indebtedness to adjusted consolidated earnings before income, taxes, depreciation and amortization (Adjusted EBITDA), as defined in the Credit Agreement, as well as the ratio of Adjusted EBITDA to consolidated interest expense. These covenants restrict our ability to purchase outstanding shares of our common stock. As of September 28, 2019 and September 29, 2018, we were in compliance with these financial covenants. See Note 18 for changes to our capital structure subsequent to the end of fiscal year 2019.

Senior Unsecured Notes

On July 16, 2019, we issued \$350,000 in aggregate principal amount of 5.750% senior unsecured notes due in 2027 (the Notes). The Notes were issued pursuant to an Indenture dated as of July 16, 2019 among us, the Guarantors (as defined therein) and Wells Fargo Bank, National Association, as trustee (the Indenture). The Notes will mature on August 15, 2027. Interest accrues at the rate of 5.750% per annum and is payable semi-annually on each February 15 and August 15, with the first interest payment due on February 15, 2020. We used the net proceeds after discounts and expenses of \$343,439 from the offering to repay all outstanding debt under the Revolving Credit Facility, to repay a portion of the Term Facility and for general corporate purposes.

The Notes and the guarantees constitute senior unsecured obligations of the company and the Guarantors, respectively. The Notes are: (a) equal in right of payment with all existing or future unsecured indebtedness that is not subordinated to the Notes; (b) senior in right of payment to any existing or future indebtedness that is subordinated to the Notes; (c) unconditionally guaranteed by the Guarantors; (d) effectively subordinated to all existing or future indebtedness this is secured, including borrowings under the Credit Agreement, to the extent of the value of assets securing such indebtedness; and (e) structurally subordinated to all indebtedness, other liabilities and preferred stock, of any of our subsidiaries that are not Guarantors.

The Indenture governing the Notes contains covenants that limit, among other things, our ability and the ability of our restricted subsidiaries to incur additional indebtedness or issue certain preferred shares, create liens; pay dividends, redeem stock or make other distributions; make investments; for our restricted subsidiaries to pay dividends to us or make other intercompany transfers; transfer or sell assets; merge or consolidate; enter into certain transactions with our affiliates; and designate subsidiaries as unrestricted subsidiaries. If we experience a change of control, we must offer to repurchase all of the Notes (unless otherwise redeemed) at a price equal to 101% of the aggregate principal amount of the Notes, plus accrued and unpaid interest, if any, on such Notes to the repurchase date. If we sell assets under certain circumstances, we must use the proceeds to make an offer to repurchase all of the Notes at a price equal to 100% of their principal amount, plus accrued and unpaid interest, if any, to the date of purchase.

See Note 6 for additional information on the fair value of the Term Facility, the TEU debt and the Notes.

Future Maturities of Long-term Debt

Future maturities of long-term debt, excluding unamortized original issue discounts and deferred financing costs, for the next five fiscal years and thereafter are as follows:

Fiscal Year	Future Maturities ⁴
2020	\$ 5,170
2021	5,188
2022	4,878
2023	159,895
2024	—
Thereafter	350,000

⁴ Fiscal year 2020 includes the 1% annual payment on the Term Facility and current maturities of capital lease obligations. No Excess Cash Flow prepayment is required under the provisions of the Credit Agreement for the Term Facility. Fiscal years 2021 and thereafter exclude any Excess Cash Flow prepayments which may be required under the provisions of the Credit Agreement for the Term Facility based on fiscal year 2020 and subsequent fiscal year results because the amount of future prepayments, if any, is not reasonably estimable as of September 28, 2019. Capital lease obligations expire on various dates through fiscal year 2022.

Letters of Credit and Guarantees

As of September 28, 2019, we had outstanding letters of credit and guarantees totaling \$23,121 and \$26,665, respectively, primarily to advance payments and performance guarantees related to customer contracts in Test & Simulation.

NOTE 9 STOCK-BASED COMPENSATION

We compensate our officers, directors and employees with stock-based compensation under the 2017 Stock Incentive Plan (the 2017 Plan) approved by our shareholders and administered under the supervision of our Board of Directors. The 2017 Plan provides stock incentive awards in the form of stock options (incentive and non-qualified), stock appreciation rights, restricted stock, restricted stock units, performance stock, performance stock units and other awards. In fiscal year 2017, our shareholders approved the 2017 Plan and authorized 1,500 shares for issuance. As of September 28, 2019, a total of 967 shares were available for issuance under the 2017 Plan. Shares will be available for issuance under the 2017 Plan until June 6, 2027.

We make an annual stock grant under the 2017 Plan of stock options, restricted stock units and performance restricted stock units, as well as stock grants throughout the fiscal year. For fiscal years 2019, 2018 and 2017, the annual stock grant occurred in December 2018, April 2018 and April 2017, respectively.

Stock-based Compensation Expense

Stock-based compensation expense recognized in the Consolidated Statements of Income is as follows:

	2019	2018	2017
Stock-based compensation expense by type of award			
Employee stock options	\$ 2,415	\$ 1,849	\$ 1,588
Employee stock purchase plan	321	283	298
Restricted stock units and performance restricted stock units	6,694	5,112	3,737
Amounts capitalized as inventory	(2,875)	(1,799)	(1,444)
Amounts recognized in income for amounts previously capitalized as inventory	2,842	1,838	1,421
Total stock-based compensation included in income from operations	9,397	7,283	5,600
Income tax benefit on stock-based compensation	(1,978)	(1,763)	(1,893)
Net stock-based compensation expense included in net income	\$ 7,419	\$ 5,520	\$ 3,707

As of September 28, 2019, there was \$1,837 of total unrecognized expense related to non-vested awards of stock options which is expected to be recognized over a weighted average period of approximately 1.0 years. As of September 28, 2019, there was \$7,244 of total unrecognized expense related to non-vested awards of restricted stock units and performance restricted stock units which is expected to be recognized over a weighted average period of approximately 1.1 years.

Stock Options

Stock options are granted at an exercise price equal to the closing market price of our stock on the date of grant. Generally, stock options vest proportionally on the first three anniversaries of the grant date and expire, depending on the date of grant, five or seven years from the grant date.

The fair value of stock options granted is estimated as of the date of each grant using the multiple option form of the Black-Scholes valuation model based on the exercise price and assumptions regarding the expected grant life, stock price volatility, dividends and risk-free interest rates. Each vesting period of an option award is valued separately and recognized evenly over the respective vesting period. The weighted average per share fair value of stock options granted during fiscal years 2019, 2018 and 2017 was \$9.91, \$11.10 and \$8.91, respectively.

The weighted average assumptions used to determine fair value of stock options granted are as follows:

	2019	2018	2017
Expected life (in years)	3.7	4.0	4.0
Risk-free interest rate	2.8%	2.6%	1.6%
Expected volatility	29.2%	29.4%	29.2%
Dividend yield	2.5%	2.3%	2.6%

The expected life represents the period that the stock option awards are expected to be outstanding and was determined based on historical and anticipated future exercise and expiration patterns. The risk-free interest rate used is based on the yield of constant maturity U.S. Treasury bonds on the grant date with a remaining term equal to the expected life of the grant. Stock price volatility is estimated based on a historical weekly price observation. The dividend yield assumption is based on the annualized current dividend divided by the share price on the grant date.

Stock option activity is as follows:

	2019		2018		2017	
	Shares	WAEP ¹	Shares	WAEP ¹	Shares	WAEP ¹
Options outstanding at beginning of year	881	\$ 56.57	766	\$ 57.86	784	\$ 60.34
Granted	231	\$ 48.58	245	\$ 52.30	288	\$ 46.35
Exercised	(47)	\$ 48.04	(19)	\$ 47.26	(112)	\$ 40.68
Forfeited or expired	(85)	\$ 56.47	(111)	\$ 57.64	(194)	\$ 60.74
Options outstanding at end of year	980	\$ 55.11	881	\$ 56.57	766	\$ 57.86
Options eligible for exercise at year end	565	\$ 59.37	443	\$ 61.61	329	\$ 64.52

¹ Weighted Average Exercise Price

Options outstanding as of September 28, 2019 had a weighted average remaining contractual term of 4.1 years and an aggregate intrinsic value of \$3,594. Options eligible for exercise as of September 28, 2019 had a weighted average remaining contractual term of 3.0 years and an aggregate intrinsic value of \$1,165.

The total intrinsic value of stock options exercised during fiscal years 2019, 2018 and 2017 was \$459, \$121 and \$1,467, respectively.

Restricted Stock Units and Performance Restricted Stock Units

We award restricted stock units to directors. The restricted stock units vest one year from the date of the grant, provided the director continues to serve on the Board of Directors. The directors are entitled to cash dividend equivalents on restricted stock units, but they do not have voting rights on the unvested shares until they become owners of the shares, unless otherwise approved by the Compensation and Leadership Development Committee of the Board of Directors. Restricted stock units are valued based on the market value of the shares as of the date of grant with the value allocated to expense evenly over the restricted period.

We award restricted stock units to key employees. Employees awarded restricted stock units are not entitled to cash dividends or voting rights on unvested units. Awards are valued based on the market value of our stock as of the date of grant with the value recognized as expense evenly over the restricted period. Restricted stock units vest proportionally on the first three anniversaries of the grant date.

We award performance restricted stock units to key employees. Performance restricted stock units vest based on attainment of average return on invested capital performance targets over a one or three year performance period. Participants awarded performance restricted stock units are not entitled to cash dividends or voting rights on unvested units. Performance restricted stock units are valued based on the market value of our shares as of the date of grant with the value recognized as an expense over the performance period. Once the performance criteria has been met, the value of the performance restricted stock units is finalized at the end of the performance period.

Restricted stock unit and performance restricted stock unit activity are as follows:

	2019		2018		2017	
	Shares	WAGDFV ²	Shares	WAGDFV ²	Shares	WAGDFV ²
Outstanding at beginning of year	267	\$ 48.99	223	\$ 49.95	165	\$ 58.98
Granted	189	\$ 47.41	140	\$ 49.67	157	\$ 45.05
Vested and released	(97)	\$ 50.12	(75)	\$ 52.45	(68)	\$ 59.07
Forfeited	(33)	\$ 47.44	(21)	\$ 48.96	(31)	\$ 53.08
Outstanding at end of year	326	\$ 47.88	267	\$ 48.99	223	\$ 49.95

² Weighted Average Grant Date Fair Value per share

Employee Stock Purchase Plan

Our U.S. employees are eligible to participate in the 2012 Employee Stock Purchase Plan (2012 ESPP). Employee purchases of our stock are funded through payroll deductions over calendar six-month periods. The purchase price is 85% of the lower of the market price at the beginning or end of the six-month period. The shares are required to be held by the employee for at least 18 months subsequent to the purchase. Employee stock purchase plan share awards are valued based on the value of the discount feature plus the fair value of the optional features as of the date of grant using the Black-Scholes valuation model. The value of these share awards is allocated to expense evenly over each purchase period.

In fiscal year 2011, our shareholders approved the 2012 ESPP that was effective beginning January 1, 2012. As of September 28, 2019, a total of 581 shares were available for issuance under the 2012 ESPP. Shares will be available for issuance under the 2012 ESPP until December 31, 2021.

In fiscal years 2019, 2018 and 2017, purchases under the 2012 ESPP were 34, 24 and 25 shares, respectively, with weighted average prices per share of \$34.11, \$44.39 and \$40.49, respectively.

NOTE 10 EMPLOYEE BENEFIT PLANS

Retirement Savings Plan

We sponsor a defined contribution retirement savings plan for certain U.S. employees subject to the provisions of the Employee Retirement Income Security Act. These employees may contribute a portion of their eligible compensation to the plan on a pre-tax or after-tax basis. We match a portion of certain eligible employee contributions by contributing cash into the investment options selected by the employees. The total amount contributed by MTS is determined by plan provisions for matching contributions, as well as at our discretion. Matching contributions were 75% of eligible compensation for fiscal years 2019, 2018 and 2017, up to a maximum of 6% of compensation subject to Internal Revenue Service (IRS) limitations. Employer matching and discretionary contributions were \$5,370, \$5,394 and \$5,483 for fiscal years 2019, 2018 and 2017, respectively.

Defined Benefit Pension Plan

We sponsor a non-contributory, defined benefit pension plan for eligible employees of one of our German subsidiaries. This plan provides benefits based on the employee's years of service and compensation during the years immediately preceding retirement, termination, disability or death, as defined in the plan. We use a September 30 measurement date for this defined benefit pension plan.

We recognize the funded status of the defined benefit pension plan in our Consolidated Balance Sheets, recognize changes in the funded status in the year in which the changes occur through comprehensive income and measure the plan's assets and obligations that determine the plan's funded status as of the end of our fiscal year.

The portion of the pre-tax amount in AOCI as of September 29, 2018 that was recognized in earnings during fiscal year 2019 was \$542. The portion of the pretax amount in AOCI as of September 28, 2019 that is expected to be recognized as a component of net periodic retirement cost during fiscal year 2020 is \$1,201. The actuarial loss in fiscal year 2019 of \$8,304 was primarily a result of the change in the discount rate from 1.89% in fiscal year 2018 to 0.72% in fiscal year 2019.

Changes in benefit obligations and plan assets are as follows:

	2019		2018	
Change in benefit obligation				
Projected benefit obligation, beginning of year	\$	33,909	\$	32,280
Service cost		1,271		1,282
Interest cost		612		640
Actuarial (gain) loss		8,304		871
Currency translation		(2,419)		(405)
Benefits paid		(759)		(759)
Projected benefit obligation, end of year	\$	40,918	\$	33,909
Change in plan assets				
Fair value of plan assets, beginning of year	\$	23,871	\$	22,886
Actual return on plan assets		1,144		1,269
Employer contributions		759		759
Currency translation		(1,534)		(284)
Benefits paid		(759)		(759)
Fair value of plan assets, end of year	\$	23,481	\$	23,871

The funded status of the defined benefit pension plan and amounts included in our Consolidated Balance Sheets are as follows:

	2019		2018	
Funded status				
Funded status, end of year	\$	(17,437)	\$	(10,038)
Actuarial net loss in AOCI, pre-tax		16,546		9,496
Net amount recognized	\$	(891)	\$	(542)
Included in Consolidated Balance Sheets				
Accrued payroll and related costs	\$	(853)	\$	(861)
Defined benefit pension plan obligation		(16,585)		(9,177)
Deferred income taxes		5,008		2,880
AOCI, net of tax		11,539		6,616
Net amount recognized	\$	(891)	\$	(542)

The weighted average assumptions used to determine the defined benefit pension plan obligation as of September 28, 2019 and September 29, 2018 in the Consolidated Balance Sheets and the net periodic benefit cost for fiscal year 2020 are as follows:

	2019	2018
Discount rate	0.72%	1.89%
Expected rate of return on plan assets	5.50%	5.50%
Expected rate of increase in future compensation levels	3.00%	3.00%

The discount rate is calculated based on zero-coupon bond yields published by the Deutsche Bundesbank for maturities that match the weighted average duration of the pension liability, adjusted for the average credit spread of corporate bond rates above the government bond yields.

The expected rate of return on plan assets represents the weighted average of the expected returns on individual asset categories in the portfolio. We use investment advisors to assist with determining the overall expected rate of return on plan assets. Factors considered in our determination include historical long-term investment performance and estimates of future long-term returns by asset class.

The overall objective of our investment policy and strategy for the defined benefit pension plan is to maintain sufficient liquidity to pay benefits and minimize the volatility of returns while earning the highest possible rate of return over time to satisfy the benefit obligations. The plan fiduciaries assist us with setting our long-term strategic investment objectives for the defined benefit pension plan assets. The objectives include preserving the funded status of the trust and balancing risk and return. Investment performance and plan asset mix are reviewed periodically.

As of both September 28, 2019 and September 29, 2018, plan assets were invested in a single mutual fund, the underlying assets of which were allocated to fixed income and cash and cash equivalents categories as shown in the table below. Any decisions to change the asset allocation are made by the plan fiduciaries. The investment in equity and fixed income securities has a long-term targeted allocation of assets of 50% equity and 50% fixed income.

The actual defined benefit pension plan asset allocations within the balanced mutual fund are as follows:

	Percentage of Plan Assets	
	2019	2018
Fixed income securities ¹	77.8%	77.2%
Cash and cash equivalents ²	22.2%	22.8%
Total	100.0%	100.0%

¹ Fixed income securities are comprised primarily of international government agency and international corporate bonds with investment grade ratings.

² Cash and cash equivalents include deposit accounts holding cash in Euros and other currencies and term deposits primarily held as collateral for equity futures. The market values of the equity and futures are linked to the values of equity indices of developed country markets, including the U.S., Great Britain, Europe, Canada, Switzerland and Japan.

The fair value of the defined benefit pension plan assets, which are subject to fair value measurement as described in Note 6, are as follows:

	September 28, 2019			
	Level 1	Level 2	Level 3	Total
Mutual fund ³	\$ —	\$ 23,481	\$ —	\$ 23,481

	September 29, 2018			
	Level 1	Level 2	Level 3	Total
Mutual fund ³	\$ —	\$ 23,871	\$ —	\$ 23,871

³ The fair value of the mutual fund is valued based on closing prices from national exchanges, if the underlying securities are traded on an active market, or fixed income pricing models that use observable market inputs.

Net periodic benefit cost for the defined benefit pension plan includes the following components:

	2019	2018	2017
Service cost	\$ 1,271	\$ 1,282	\$ 1,426
Interest cost	612	640	431
Expected return on plan assets	(1,271)	(1,270)	(1,085)
Net amortization and deferral	542	526	996
Net periodic benefit cost	\$ 1,154	\$ 1,178	\$ 1,768

The accumulated benefit obligation of our defined benefit pension plan as of September 28, 2019 and September 29, 2018 was \$37,182 and \$31,077, respectively.

Future pension benefit payments, which reflect expected future service for the next five fiscal years and the combined five fiscal years thereafter, are as follows:

Fiscal Year	Pension Benefit Payments
2020	\$ 852
2021	965
2022	1,031
2023	1,058
2024	1,081
2025 through 2028	6,336
Total	\$ 11,323

Other Retirement Plans

Certain of our international subsidiaries have non-contributory, unfunded post-retirement benefit plans that provide retirement benefits for eligible employees and managing directors. Generally, these post-retirement plans provide benefits that accumulate based on years of service and compensation levels. As of September 28, 2019 and September 29, 2018, the aggregate liabilities associated with these post-retirement benefit plans were \$3,412 and \$3,924, respectively.

NOTE 11 INCOME TAXES

The components of income (loss) before income taxes are as follows:

	2019	2018	2017
Domestic	\$ 17,474	\$ 6,139	\$ (9,658)
Foreign	31,139	38,084	32,669
Total income (loss) before income taxes	\$ 48,613	\$ 44,223	\$ 23,011

The income tax provision (benefit) is as follows:

	2019	2018	2017
Current			
Federal	\$ 2,392	\$ 1,613	\$ (1,493)
State	1,171	565	156
Foreign	11,638	10,331	11,980
Deferred	(9,655)	(29,614)	(12,716)
Income tax provision (benefit)	\$ 5,546	\$ (17,105)	\$ (2,073)

A reconciliation from the U.S. federal statutory income tax rate to our effective income tax rate is as follows:

	2019	2018	2017
U.S. federal statutory income tax rate	21 %	25 %	35 %
Impact from foreign operations	10	3	(10)
State income taxes, net of federal benefit	1	—	(1)
R&D tax credits	(15)	(10)	(22)
Domestic production activities deduction / foreign derived intangible income	(5)	(2)	(10)
Impact of U.S. Tax Act	(2)	(57)	—
Acquisition costs	—	—	(3)
Nondeductible stock option expense and other permanent items	1	2	2
Effective income tax rate	11 %	(39)%	(9)%

The Tax Cuts and Jobs Act (the Tax Act) was enacted into law on December 22, 2017 and made significant changes to U.S. federal corporate tax law. Effective January 1, 2018, the Tax Act lowered the U.S. corporate tax rate from 35% to 21% and prompted various other changes to U.S. federal corporate tax law, including the establishment of a territorial-style system for

taxing foreign-source income of domestic multinational corporations and a one-time deemed repatriation tax on untaxed foreign earnings. The Tax Act resulted in a U.S. federal blended statutory rates of 21.0% and 24.5% for fiscal years 2019 and 2018, respectively.

Generally, the impacts of new tax legislation would be required to be recorded in the period of enactment, which was our first quarter of fiscal year 2018. However, in March 2018, the FASB issued ASU No. 2018-05, *Income Taxes (Topic 740): Amendments to SEC Paragraphs Pursuant to SEC Staff Accounting Bulletin No. 118*, which incorporated various SEC paragraphs from Staff Accounting Bulletin No. 118 into income tax accounting guidance effective immediately, allowing registrants to record provisional amounts during a one-year measurement period.

As of December 29, 2018, we completed our accounting for the tax effects of the Tax Act at the conclusion of the one-year measurement period. As a result, the income tax provision for the three months ended December 29, 2018 included certain discrete benefits of \$1,293 for Tax Act measurement period adjustments. The discrete benefits relate to \$1,297 of additional dividends received deduction for certain foreign tax credits included in the mandatory deemed repatriation tax calculation, partially offset by \$4 of expense for other Tax Act measurement period adjustments. The additional dividends received deduction is based on our assessment of the treatment under the applicable provisions of the Tax Act as written and enacted during the first quarter of fiscal year 2019. The Department of the Treasury provided regulatory updates during the three months ended June 29, 2019, causing us to change our assessment of the benefit associated with the dividends received deduction, and in the third quarter of fiscal year 2019 to reverse the entire benefit of \$1,297 that was recorded in the first quarter of fiscal year 2019.

The fiscal year 2019 effective tax rate was 11.4% primarily due to certain discrete benefits of \$3,547 for the favorable true-up of our previously recorded transition tax estimate, successful closure of prior year audit activity and the reduction in the Netherlands income tax rate resulting in remeasurement of the deferred tax liability associated with their intangible assets. Excluding the impact of these discrete items, the effective tax rate for fiscal year 2019 was 18.7%. Factors that increased the effective tax rate for fiscal year 2019 included impacts of the Tax Act, such as elimination of the domestic manufacturing deduction and the implementation of the global intangible low-taxed income (GILTI) provision. These increases were offset by favorable aspects of the Tax Act, such as the decrease in the U.S. income tax rate and provisions for incentivizing foreign-derived intangible income (FDII). In the first quarter of fiscal year 2019, we made an accounting policy election to treat the future tax impacts of the GILTI provisions of the Tax Act as a period cost to the extent applicable.

The fiscal year 2018 effective tax rate was a benefit of 38.7% primarily due to certain discrete benefits of \$25,008 for the estimated impact of the Tax Act. The discrete benefits primarily related to \$31,647 of estimated benefit from the remeasurement of our estimated net deferred tax liabilities, partially offset by \$6,639 of estimated expense associated with the mandatory deemed repatriation tax. Excluding the impact of these discrete benefits, the effective tax rate for fiscal year 2018 was 17.9% and increased compared to the prior year rate excluding the impact of certain discrete benefits primarily due to higher current year earnings before taxes, partially offset by the lower U.S. corporate tax rate under the Tax Act.

The fiscal year 2017 effective tax rate was a benefit of 9.0% primarily due to certain discrete benefits of \$2,801 recognized during the third quarter of fiscal year 2017, which consisted of additional U.S. tax benefits for prior fiscal years associated with domestic manufacturing, deductible PCB acquisition-related expenses, and the U.S. R&D tax credit. Excluding the impact of these discrete benefits, the effective tax rate for fiscal year 2017 was 3.2%.

A summary of the deferred tax assets and liabilities are as follows:

	2019	2018
Deferred tax assets		
Accrued compensation and benefits	\$ 15,014	\$ 10,660
Inventory reserves	4,510	4,787
163(j) interest disallowance	4,253	—
Other assets	4,565	4,255
Allowance for doubtful accounts	1,408	1,196
Net operating loss carryovers	2,103	516
State and foreign tax credit carryovers	1,224	1,252
Research and development tax credit carryovers	3,774	3,337
Unrealized derivative instrument gains	311	—
Total deferred tax asset before valuation allowance	37,162	26,003
Less valuation allowance	(5,279)	(4,792)
Total deferred tax assets	31,883	21,211
Deferred tax liabilities		
Property and equipment	13,158	10,210
Foreign deferred revenue and other	5,779	4,649
Intangible assets	47,248	48,019
Unrealized derivative instrument gains	—	1,566
Total deferred tax liabilities	66,185	64,444
Net deferred tax assets (liabilities)	\$ (34,302)	\$ (43,233)

As of September 28, 2019, we had a Minnesota R&D tax credit carryover of \$3,768, which may be carried forward fifteen years. We also had New York and North Carolina tax credit carryovers of \$1,224. We have determined that the benefit of these tax credits are not likely to be realized before they expire and have recorded a full valuation allowance against these deferred tax assets.

During fiscal year 2019, we repatriated \$5,943 of current earnings from various foreign subsidiaries and recorded \$437 of corresponding tax expense. During fiscal year 2018, we repatriated \$54,778 of earnings from various foreign subsidiaries and recorded \$1,249 of corresponding tax expense. During fiscal year 2017, we repatriated \$15,272 of earnings from our German and Japanese subsidiaries and recorded \$11 of corresponding tax expense.

We have not recognized a deferred tax liability for the undistributed earnings of certain foreign operations because those subsidiaries have invested or will invest the undistributed earnings indefinitely. As of September 28, 2019 and September 29, 2018, undistributed earnings were \$68,784 and \$73,819, respectively. Because of the availability of U.S. dividends received deductions, it is impracticable for us to determine the amount of U.S. federal tax liability that would be payable if these earnings were not indefinitely reinvested. Deferred taxes are recorded for earnings of foreign operations when we determine that such earnings are no longer indefinitely reinvested.

A summary of changes to our liability for unrecognized tax benefits is as follows:

	2019	2018
Beginning liability for unrecognized tax benefits	\$ 6,158	\$ 5,849
Increase due to tax positions related to the current year	663	742
Increase (decrease) due to tax positions related to prior years	960	277
Decrease due to settlements with tax authorities	(2,635)	—
Decrease due to lapse of statute of limitations	(732)	(710)
Ending liability for unrecognized tax benefits	\$ 4,414	\$ 6,158

Included in the liability of unrecognized tax benefits as of September 28, 2019 and September 29, 2018 are potential benefits of \$2,761 and \$3,740, respectively, that, if recognized, would impact the effective tax rate.

As of September 28, 2019 and September 29, 2018, we have accrued interest related to uncertain income tax positions of approximately \$332 and \$542, respectively. As of September 28, 2019 and September 29, 2018, no accrual for penalties related

to uncertain tax positions existed. Interest and penalties related to uncertain tax positions are included in interest expense, net and general and administrative expense, respectively, in the Consolidated Statements of Income.

We are subject to U.S. federal income tax as well as income tax of numerous state and foreign jurisdictions. We are no longer subject to U.S. federal tax examinations for fiscal years ending before fiscal year 2018 and with limited exceptions, state and foreign income tax examinations for fiscal years ending before fiscal year 2015. As of September 28, 2019, we do not expect significant changes in the amount of unrecognized tax benefits for our U.S. or foreign subsidiaries during the next 12 months.

As of September 28, 2019 and September 29, 2018, we expected to receive income tax refunds within the next fiscal year. As a result, we recognized a current income tax receivable of \$4,282 and \$5,155 as of September 28, 2019 and September 29, 2018, respectively, which is included in prepaid expenses and other current assets in the Consolidated Balance Sheets.

NOTE 12 SHAREHOLDERS' EQUITY

Tangible Equity Units

During the third quarter of fiscal year 2016, we issued 1,150 TEUs in a registered public offering primarily to finance the acquisition of PCB, to repay amounts outstanding under our existing revolving credit facility and to pay related costs, fees and expenses. Total proceeds, net of underwriting discounts, commissions and other expenses were \$110,926. Each TEU had a stated amount of \$100 per TEU and was comprised of a prepaid stock purchase contract and a senior amortizing note having a final installment payment date of July 1, 2019. We allocated the proceeds from the issuance of the TEUs between equity and debt based on the relative fair values of the respective components of each TEU. The fair value of the prepaid stock purchase contracts, net of underwriting discounts, commissions and other expenses, was recorded in additional paid-in capital in the Consolidated Balance Sheets. The fair value of the senior amortizing notes, net of underwriting discounts, commissions and other expenses, was split between current maturities of long-term debt, net and long-term debt, less current maturities, net in the Consolidated Balance Sheets. Underwriting discounts, commissions and other costs directly associated with the TEU-related debt were amortized using the effective interest rate method over the three-year term of the instrument.

The aggregate values assigned upon issuance to each component of the TEUs, based on the relative fair value of the respective components, were as follows:

	Equity Component		Debt Component		Total
Fair value price per TEU ¹	\$	76.19	\$	23.81	\$ 100.00
Gross proceeds	\$	87,614	\$	27,386	\$ 115,000
Less: Underwriting discounts and commissions		(2,628)		(822)	(3,450)
Less: Other expenses ²		(475)		(149)	(624)
Issuance of TEUs, net	\$	84,511	\$	26,415	\$ 110,926

¹ The fair value price allocation between equity and debt for each TEU was determined using a discounted cash flow model.

² Other expenses include direct and incremental costs related to the issuance of the TEUs.

Equity Component

During the fourth quarter of fiscal year 2017, certain holders of our TEUs elected to early convert the equity component on 473 of our outstanding TEUs at the minimum conversion rate of 1.9841 which resulted in the issuance of 939 shares of our common stock. During fiscal year 2018, no holders of our TEUs elected to early convert the equity component of our TEUs. During the third quarter of fiscal year 2019, certain holders of our TEUs elected to early convert the equity component on 394 of our outstanding TEUs at the minimum conversion rate of 1.9841 which resulted in the issuance of 781 shares of our common stock. During the fourth quarter of fiscal year 2019, the remaining 283 outstanding TEUs were converted at the minimum conversion rate of 1.9841 which resulted in the issuance of 561 shares of our common stock. As of September 28, 2019, no TEUs were outstanding.

Debt Component

During the fourth quarter of fiscal year 2019, we made the final quarterly cash installment payment of \$2.1875 per amortizing note.

Capped Calls

In connection with the pricing of the TEUs sold in our public offering in fiscal year 2016, we purchased capped calls from third party banking institutions (Capped Calls) for \$7,935. The initial Capped Calls were for 2,282 equivalent shares of our common stock with a strike price of \$50.40, a cap price of \$58.80 and an expiration date of July 1, 2019. The value of the Capped Calls

is settled with shares of our common stock, based on the approximate market value of our common stock at such time, and could be settled as the TEUs were early converted or settled upon expiration on July 1, 2019 (Capped Call Expiration).

During the fourth quarter of fiscal year 2017, we settled approximately 10% of the Capped Calls, which resulted in us receiving and retiring 12 shares of our common stock. During fiscal year 2018, no Capped Calls were settled.

On June 13, 2018, we amended the agreements with third party banking institutions for the outstanding Capped Calls (Capped Call Agreements) to modify the timing of settlement to be only upon expiration for all outstanding Capped Calls. Per the Capped Call Agreements, the outstanding Capped Calls were for 2,054 equivalent shares of our common stock with a strike price of \$50.40 and a cap price of \$57.97. The Capped Calls automatically settled upon Capped Call Expiration with shares of our common stock based on the average market value of our common stock as defined in the Capped Call Agreements, resulting in us receiving and retiring 223 shares of our common stock in the fourth quarter of fiscal year 2019.

NOTE 13 EARNINGS PER SHARE

Basic earnings per share is computed by dividing net income by the daily weighted average number of common shares outstanding during the applicable period. In fiscal years 2018 and 2017, the TEUs were assumed to be settled at the minimum settlement amount of 1.9841 shares per TEU when calculating weighted average common shares outstanding for purposes of basic earnings per share.

Under the treasury stock method, shares associated with certain stock options have been excluded from the diluted weighted average shares outstanding calculation because the exercise of those options would lead to a net reduction in common shares outstanding or anti-dilution. As a result, stock options to acquire 805, 584 and 726 weighted common shares have been excluded from the diluted weighted shares outstanding calculation for fiscal years 2019, 2018 and 2017, respectively.

In connection with the pricing of the TEUs, we purchased capped calls. The capped calls were settled in the fourth quarter of fiscal year 2019 and have been reflected in the calculation of diluted earnings in fiscal year 2019. See Note 12 for additional information on our equity instruments.

Basic and diluted earnings per share were calculated as follows:

	2019	2018	2017
Net income	\$ 43,067	\$ 61,328	\$ 25,084
Weighted average common shares outstanding	19,258	19,163	19,040
Effect of dilutive securities			
Stock-based compensation	189	130	97
Weighted average dilutive common shares outstanding	19,447	19,293	19,137
Earnings per share			
Basic	\$ 2.24	\$ 3.20	\$ 1.32
Diluted	\$ 2.21	\$ 3.18	\$ 1.31

NOTE 14 OTHER COMPREHENSIVE INCOME (LOSS)

Other comprehensive income (loss), a component of shareholders' equity, consists of foreign currency translation adjustments, gains or losses on derivative instruments and defined benefit pension plan adjustments.

Income tax expense or benefit allocated to each component of other comprehensive income (loss) is as follows:

	2019			2018			2017		
	Pretax	Tax	Net	Pretax	Tax	Net	Pretax	Tax	Net
Foreign currency translation gain (loss) adjustments	\$ (9,980)	\$ —	\$ (9,980)	\$ (2,174)	\$ —	\$ (2,174)	\$ 3,273	\$ —	\$ 3,273
Derivative instruments									
Unrealized net gain (loss)	(2,723)	582	(2,141)	5,832	(1,507)	4,325	3,301	(1,191)	2,110
Net (gain) loss reclassified to earnings	(3,715)	810	(2,905)	(805)	207	(598)	155	(57)	98
Defined benefit pension plan									
Unrealized net gain (loss)	(8,247)	2,489	(5,758)	(890)	269	(621)	5,918	(1,786)	4,132
Net (gain) loss reclassified to earnings	542	(163)	379	526	(159)	367	996	(300)	696
Currency exchange rate gain (loss)	456	—	456	90	—	90	(489)	—	(489)
Other comprehensive income (loss)	\$ (23,667)	\$ 3,718	\$ (19,949)	\$ 2,579	\$ (1,190)	\$ 1,389	\$ 13,154	\$ (3,334)	\$ 9,820

The changes in the net-of-tax balances of each component of AOCI are as follows:

	Foreign Currency Translation Adjustments	Unrealized Derivative Instrument Adjustments	Defined Benefit Pension Plan Adjustments	Total
Balance, October 1, 2016	\$ 673	\$ (255)	\$ (10,791)	\$ (10,373)
Other comprehensive net gain (loss) reclassifications	3,273	2,110	3,643	9,026
Net (gain) loss reclassified to earnings	—	98	696	794
Other comprehensive income (loss)	3,273	2,208	4,339	9,820
Balance, September 30, 2017	\$ 3,946	\$ 1,953	\$ (6,452)	\$ (553)
Other comprehensive net gain (loss) reclassifications	(2,174)	4,325	(531)	1,620
Net (gain) loss reclassified to earnings	—	(598)	367	(231)
Other comprehensive income (loss)	(2,174)	3,727	(164)	1,389
Reclassification to retained earnings ¹	—	640	—	640
Balance, September 29, 2018	\$ 1,772	\$ 6,320	\$ (6,616)	\$ 1,476
Other comprehensive net gain (loss) reclassifications	(9,980)	(2,141)	(5,302)	(17,423)
Net (gain) loss reclassified to earnings	—	(2,905)	379	(2,526)
Other comprehensive income (loss)	(9,980)	(5,046)	(4,923)	(19,949)
Balance, September 28, 2019	\$ (8,208)	\$ 1,274	\$ (11,539)	\$ (18,473)

¹ Deferred taxes stranded in AOCI as a result of the Tax Act that were reclassified to retained earnings upon adoption of ASU 2018-02.

The effect on certain line items in the Consolidated Statements of Income of amounts reclassified out of AOCI are as follows:

	2019	2018	2017	Affected Line Item in the Consolidated Statements of Income
Derivative instruments				
Currency exchange contracts gain (loss)	\$ 1,026	\$ (399)	\$ 459	Revenue
Interest rate swap contracts gain (loss)	2,689	1,204	(614)	Interest expense, net
Income tax benefit (expense)	(810)	(207)	57	Income tax provision (benefit)
Total net gain (loss) on derivative instruments	2,905	598	(98)	Net income
Defined benefit pension plan²				
Actuarial loss	—	(288)	(543)	Cost of sales
Actuarial loss	—	(148)	(282)	Selling and marketing
Actuarial loss	—	(90)	(171)	General and administrative
Actuarial loss	(542)	—	—	Other income (expense), net
Total actuarial loss	(542)	(526)	(996)	Income before income taxes
Income tax benefit	163	159	300	Income tax provision (benefit)
Total net loss on pension plan	(379)	(367)	(696)	Net income
Total net of tax reclassifications out of AOCI included in net income	\$ 2,526	\$ 231	\$ (794)	

² Change in classification of actuarial loss on defined benefit pension plan related to the adoption of ASU No. 2017-07 in fiscal year 2019. See Note 2 for additional information on the impact of adoption.

NOTE 15 BUSINESS SEGMENT INFORMATION

Our Chief Executive Officer (the Chief Operating Decision Maker) regularly reviews financial information for our two operating segments, Test & Simulation and Sensors. Test & Simulation manufactures and sells equipment and related software and services which are used by customers to characterize a product's mechanical properties or performance. Sensors manufactures and sells high-performance sensors which provide measurements of vibration, pressure, position, force and sound in a variety of applications.

In evaluating each segment's performance, our Chief Executive Officer focuses on income from operations. This measure excludes interest income and expense, income taxes and other non-operating items. Corporate expenses, including costs associated with various support functions such as human resources, information technology, legal, finance and accounting, and general and administrative costs are allocated to the reportable segments on the basis of revenue. The accounting policies of the reportable segments are the same as those described in Note 1 and Note 3 of this Annual Report on Form 10-K.

Intersegment revenue is based on standard costs with reasonable mark-ups established between the reportable segments. All significant intersegment amounts are eliminated to arrive at consolidated financial results.

Financial information by reportable segment is as follows:

	2019	2018	2017
Revenue			
Test & Simulation	\$ 558,908	\$ 464,924	\$ 504,087
Sensors	334,976	314,269	283,868
Intersegment eliminations	(1,366)	(1,161)	—
Total revenue	\$ 892,518	\$ 778,032	\$ 787,955
Income from Operations			
Test & Simulation	\$ 34,080	\$ 19,225	\$ 28,622
Sensors	45,620	45,980	26,206
Intersegment eliminations	5	(33)	—
Total income from operations	\$ 79,705	\$ 65,172	\$ 54,828
Identifiable Assets			
Test & Simulation	\$ 419,403	\$ 299,242	\$ 374,698
Sensors	878,602	840,187	814,994
Intersegment eliminations	(28)	(33)	—
Total identifiable assets	\$ 1,297,977	\$ 1,139,396	\$ 1,189,692
Goodwill			
Test & Simulation	\$ 61,153	\$ 24,631	\$ 25,109
Sensors	367,886	344,644	344,653
Total goodwill	\$ 429,039	\$ 369,275	\$ 369,762
Capital Expenditures			
Test & Simulation	\$ 18,792	\$ 8,111	\$ 13,281
Sensors	11,733	4,210	4,517
Total capital expenditures	\$ 30,525	\$ 12,321	\$ 17,798
Depreciation and Amortization			
Test & Simulation	\$ 19,529	\$ 16,353	\$ 17,275
Sensors	18,446	18,139	18,248
Total depreciation and amortization	\$ 37,975	\$ 34,492	\$ 35,523

Geographic information is as follows:

	2019	2018	2017
Revenue			
U.S.	\$ 306,574	\$ 245,909	\$ 246,679
Europe	224,982	223,236	192,491
China	189,227	165,421	174,044
Asia, excluding China	131,771	113,953	142,644
Americas, excluding U.S.	39,964	29,513	32,097
Total revenue	\$ 892,518	\$ 778,032	\$ 787,955
Property and Equipment, Net			
U.S.	\$ 81,119	\$ 69,782	\$ 78,080
Europe	13,927	15,130	15,296
China	5,424	4,858	5,542
Asia, excluding China	613	499	1,012
Total property and equipment, net	\$ 101,083	\$ 90,269	\$ 99,930

Revenue by geographic area is presented based on customer location. The U.S. and China were the only countries with revenue in excess of 10% of total revenue during fiscal years 2019, 2018 and 2017. No single customer accounted for 10% or more of consolidated revenue for fiscal years 2019, 2018 and 2017. Revenue is not reported for each of our products and services because it is impracticable to do so.

NOTE 16 BUSINESS ACQUISITIONS

E2M Technologies B.V. Acquisition

On November 21, 2018, we acquired all ownership interests of E2M for a cash purchase price of \$80,287. Based in Amsterdam, Netherlands, E2M is a leading manufacturer of high force, electrically driven actuation systems, serving primarily the human-rated entertainment and training simulation markets. The acquisition of E2M expands our technology and product offerings for human-rated simulation systems and brings key regulatory approvals and customers in the flight simulation and entertainment markets. The transaction was accounted for under the acquisition method of accounting. The acquired assets, liabilities and operating results have been included in our financial statements within Test & Simulation from the date of acquisition. During fiscal year 2019, we included \$29,554 of revenue from E2M in our Consolidated Statements of Income. We funded the acquisition of E2M primarily with borrowings on our Revolving Credit Facility. Costs of \$1,287 associated with the acquisition of E2M were expensed as incurred. Pro forma information related to the acquisition of E2M has not been included as the impact on our consolidated results of operations was not considered material.

The following table summarizes the final fair value measurement of the assets acquired and liabilities assumed, net of cash acquired, as of the date of acquisition:

Asset (Liability)	Fair Value	Finite-Lived Intangible Asset Lives (Years)
Accounts receivable	\$ 4,651	
Unbilled accounts receivable	1,518	
Inventories	11,063	
Prepaid expenses and other current assets	123	
Property and equipment	672	
Intangible assets		
Customer lists	21,652	15
Trademarks and trade names	5,926	15
Technology	12,650	15
Other intangible assets	3,761	4
Other long-term assets	60	
Purchased goodwill	36,665	
Accounts payable	(3,657)	
Accrued payroll and related costs	(1,328)	
Advance payments from customers	(4,315)	
Accrued income taxes	(290)	
Other accrued liabilities	(127)	
Deferred income taxes	(10,477)	
Net assets acquired	\$ 78,547	
Supplemental information		
Consideration paid at closing	\$ 79,772	
Post-closing purchase price adjustment	515	
Less: Cash acquired	(1,740)	
Purchase price, net of cash acquired	\$ 78,547	

The fair value measurement was completed as of September 28, 2019. Measurement period adjustments were recorded in fiscal year 2019 and have been reflected in the table above.

Goodwill was calculated as the difference between the acquisition date fair value of the total purchase price consideration and the fair value of the net assets acquired and represents the future economic benefits that we expect to achieve as a result of the acquisition. This resulted in a purchase price in excess of the fair value of identifiable net assets acquired. The purchase price also included the fair value of other assets that were not identifiable, not separately recognizable under accounting rules (e.g., assembled workforce) or of immaterial value. All of the goodwill was assigned to Test & Simulation. None of the goodwill is deductible for income tax purposes.

The fair value of the acquired intangible assets was \$43,989. The acquired intangible assets are being amortized on a straight-line basis over the useful lives identified in the table above.

Endevco Acquisition

On August 5, 2019, we acquired the Endevco sensors business from Meggitt PLC for a cash purchase price of \$68,330. Endevco is a historic leader in high performance test and measurement sensors used primarily in the testing of new products. This strategic product line purchase brings together two iconic brands in the test and measurement sensors market, in PCB and Endevco, and further enhances our long-term strategy of growth and market leadership in our core businesses. The transaction was accounted for under the acquisition method of accounting. The acquired assets and operating results have been included in our financial statements within Sensors from the date of acquisition. During fiscal year 2019, we included \$4,409 of revenue

from Endevo in our Consolidated Statements of Income. We funded the acquisition of Endevo through cash on hand. Costs of \$1,388 associated with the acquisition of Endevo were expensed as incurred. Pro forma information related to the acquisition of Endevo has not been included as the impact on our consolidated results of operations was not considered material.

The following table summarizes the preliminary fair value measurement of the assets acquired as of the date of acquisition:

Asset	Fair Value	Finite-Lived Intangible Asset Lives (Years)
Inventories	\$ 11,890	
Property and equipment	1,078	
Intangible assets		
Customer lists	13,200	15
Trademarks and trade names	7,900	15
Technology	4,400	15
Purchased goodwill	23,292	
Deferred income taxes	6,570	
Net assets acquired	\$ 68,330	
Supplemental information		
Consideration paid at closing	\$ 70,000	
Post-closing purchase price adjustment	(1,670)	
Purchase price	\$ 68,330	

The allocation of purchase price consideration is considered preliminary as of September 28, 2019 with provisional amounts related to inventory, property and equipment, intangible assets, deferred income taxes and purchase price adjustments included as our allocation process has not been finalized. We expect to finalize the allocation of purchase price as soon as possible, but no later than one year from the acquisition date.

Goodwill was calculated as the difference between the acquisition date fair value of the total purchase price consideration and the fair value of the net assets acquired and represents the future economic benefits that we expect to achieve as a result of the acquisition. This resulted in a purchase price in excess of the fair value of identifiable assets acquired. The purchase price also included the fair value of other assets that were not identifiable, not separately recognizable under accounting rules (e.g., assembled workforce) or of immaterial value. All of the goodwill was assigned to Sensors. All of the goodwill is deductible for income tax purposes.

The fair value of the acquired intangible assets was \$25,500. The acquired intangible assets are being amortized on a straight-line basis over the useful lives identified in the table above.

NOTE 17 COMMITMENTS AND CONTINGENCIES***Litigation***

We are subject to various claims, legal actions and complaints arising in the ordinary course of business. We believe the final resolution of legal matters outstanding as of September 28, 2019 will not have a material adverse effect on our consolidated financial position or results of operations. We expense legal costs as incurred.

Operating Leases

We have operating lease commitments for equipment, automobiles, land and facilities that expire on various dates through 2052. Total lease expense was \$9,055, \$7,924 and \$7,506 for fiscal years 2019, 2018 and 2017, respectively.

Minimum annual rents payable under operating leases for the next five fiscal years and thereafter are as follows:

Fiscal Year	Operating Lease Payments
2020	\$ 7,149
2021	5,291
2022	3,124
2023	1,602
2024	1,085
Thereafter	1,789
Total	\$ 20,040

NOTE 18 SUBSEQUENT EVENTS***Amendment to the Credit Agreement***

On November 1, 2019, we entered into a fourth amendment to the Credit Agreement, which governs the Term Facility and Revolving Credit Facility, to increase the borrowing capacity on the Revolving Credit Facility to \$200,000 and extend the expiration date to July 5, 2023. Additionally, the required performance levels under certain financial covenants were modified. See Note 8 for additional information on financing arrangements.

Business Acquisition

On November 22, 2019, we signed a definitive agreement to acquire 100% of the stock of R&D Test Systems, R&D Engineering, R&D Steel, R&D Prague, RGDK Engineering Private Limited and R&D Tools and Structures (collectively, "R&D") for approximately \$80,000, subject to working capital and other adjustments. We expect the deal to close by December 31, 2019, subject to customary closing provisions. Based out of Denmark, R&D is a leader in high-quality, durable, rotating test systems, serving primarily the wind energy markets. As a strategic addition to Test & Simulation, the acquisition is structured with an upfront payment of approximately \$55,000 to be funded primarily through our existing Revolving Credit Facility, with expected earn-out payments of up to an additional \$25,000 based on financial performance through June 2021.

MTS Systems Corporation
Schedule II – Summary of Consolidated Allowances for Doubtful Accounts

Changes to the allowance for doubtful accounts receivable are as follows:

	2019		2018		2017
Beginning balance	\$	5,004	\$	5,371	\$ 3,923
Provisions / (recoveries)		1,864		2,142	1,930
Amounts written-off / payments		(734)		(2,378)	(551)
Currency translation		(171)		(131)	69
Ending balance	\$	5,963	\$	5,004	\$ 5,371

DESCRIPTION OF COMMON STOCK

The following summary of the common stock, par value \$0.25 per share (the "Common Stock"), of MTS Systems Corporation (the "Company," "we," or "our") is based on and qualified by our amended and restated articles of incorporation (the "Articles of Incorporation") and our amended and restated bylaws (the "Bylaws"). For a complete description of the terms and provisions of our common stock, refer to the full text of the Articles of Incorporation and the Bylaws, both of which are filed as exhibits to our Annual Report on Form 10-K to which this description is also an exhibit.

General

Shares Authorized and Outstanding. Our authorized common stock consists of 64,000,000 shares. We do not have any preferred stock authorized under our Articles of Incorporation.

Dividends. Holders of common stock are entitled to receive dividends when and as declared by our board of directors out of funds legally available for dividends. We have historically paid dividends to holders of our common stock on a quarterly basis. The declaration and payment of future dividends will depend on many factors, including, but not limited to, our earnings, financial condition, business development needs and regulatory considerations and are at the discretion of our board of directors.

Voting Rights. Holders of common stock are entitled to one vote per share on all matters to be voted upon by our shareholders. All shares of common stock rank equally as to voting and all other matters. Holders of common stock are also entitled to cumulative voting rights in the election of directors. Upon proper written notice, holders of common stock may cumulate their votes for the election of directors by multiplying the number of votes to which the shareholder is entitled by the number of directors to be elected and casting all such votes for one nominee or distributing them among any two or more nominees.

Other Rights. If we voluntarily or involuntarily liquidate, dissolve or wind up our business, holders of common stock will receive pro rata, according to shares held by them, any remaining assets able to be distributed to our common shareholders. Holders of common stock have no preemptive rights. This means that the holders of common stock have no right to buy any portion of securities we may issue in the future.

Listing. Our outstanding shares of common stock are listed on the Nasdaq Global Select Market under the symbol "MTSC." EQ Shareowner Services serves as the transfer agent and registrar for the common stock.

Fully Paid. The outstanding shares of common stock are fully paid and nonassessable. This means the full purchase price for the outstanding shares of common stock has been paid and the holders of such shares will not be assessed any additional amounts for such shares.

Anti-Takeover Provisions Contained in the Minnesota Business Corporation Act

Certain provisions of the Minnesota Business Corporation Act (the "MBCA"), as described below, could have an anti-takeover effect. These provisions are intended to provide management flexibility to enhance the likelihood of continuity and stability in the composition of our board of directors and in the policies formulated by our board and to discourage an unsolicited takeover of our company if our board determines that such a takeover is not in the best interests of our company and our shareholders. However, these provisions could have the effect of discouraging attempts to acquire us which could deprive our shareholders of opportunities to sell their shares of common stock at prices higher than prevailing market prices.

Section 302A.671 of the MBCA applies, with certain exceptions, to any acquisitions of our voting stock from a person other than us, and other than in connection with certain mergers and exchanges to which we are a party and certain tender offers or exchange offers approved in advance by a disinterested board committee, resulting in the beneficial ownership of 20% or more of the voting power of our then outstanding stock.

Section 302A.671 requires approval of the granting of voting rights for the shares received pursuant to any such acquisitions by a vote of our shareholders holding a majority of the voting power of our outstanding shares and a majority of the voting power of our outstanding shares that are not held by the acquiring person, our officers or those non-officer employees, if any, who are also our directors. Similar voting requirements are imposed for acquisitions resulting in beneficial ownership of 33-1/3% or more or a majority of the voting power of our then outstanding stock. In general, shares acquired without this approval are denied voting rights in excess of the 20%, 33-1/3% or 50% thresholds and, to that extent, can be called for redemption at their

then fair market value by us within 30 days after the acquiring person has failed to deliver a timely information statement to us or the date our shareholders voted not to grant voting rights to the acquiring person's shares.

Section 302A.673 of the MBCA generally prohibits any business combination by us, or any subsidiary of ours, with any shareholder that beneficially owns 10% or more of the voting power of our outstanding shares (an "interested shareholder") within four years following the time the interested shareholder crosses the 10% stock ownership threshold, unless the business combination is approved by a committee of disinterested members of our board of directors before the time the interested shareholder crosses the 10% stock ownership threshold.

Section 302A.675 of the MBCA generally prohibits an offeror from acquiring our shares within two years following the offeror's last purchase of our shares pursuant to a takeover offer with respect to that class, unless our shareholders are able to sell their shares to the offeror upon substantially equivalent terms as those provided in the earlier takeover offer. This statute will not apply if the acquisition of shares is approved by a committee of disinterested members of our board of directors before the purchase of any shares by the offeror pursuant to the earlier takeover offer.

Authorized but Unissued Common Stock

Minnesota law does not require shareholder approval for any issuance of authorized shares of common stock. However, the listing requirements of the Nasdaq Global Select Market, which would apply so long as our common stock remains listed on the Nasdaq Global Select Market, require shareholder approval of certain issuances equal to or exceeding 20% of the then-outstanding voting power or then outstanding number of shares of common stock.

One of the effects of the existence of unissued and unreserved common stock may be to enable our board of directors to issue shares to persons friendly to current management, which issuance could render more difficult or discourage an attempt to obtain control of our company by means of a merger, tender offer, proxy contest or otherwise, and thereby protect the continuity of our management and possibly deprive the shareholders of opportunities to sell their shares of common stock at prices higher than prevailing market prices.

Advance Notice Requirements for Director Nominations and Shareholder Proposals

Our Bylaws provide that shareholders seeking to nominate candidates for election as directors or to bring business before an annual meeting of shareholders must provide timely notice of their proposal in writing to our corporate secretary.

Generally, to be timely, a shareholder's notice must be received at our principal executive offices not less than 90 days nor more than 120 days prior to the first anniversary of the previous year's annual meeting. Our Bylaws also specify requirements as to the form and content of a shareholder's notice.

These provisions may impede shareholders' ability to bring matters before an annual meeting of shareholders or make nominations for directors at an annual meeting of shareholders and may delay, deter or prevent tender offers or takeover attempts that shareholders may believe are in their best interests, including tender offers or attempts that might allow shareholders to receive premiums over the market price of their common stock.

Amendment of our Articles of Incorporation and Bylaws

The holders of a majority of the outstanding voting shares of our common stock have the power to amend our Articles of Incorporation. Our board of directors may alter or amend, make or adopt, or repeal our Bylaws, subject to the limitations set forth in our Bylaws and the MBCA. Our shareholders also have the power to alter or amend, make or adopt, or repeal our Bylaws.

**Subsidiaries of MTS Systems Corporation
As of September 28, 2019**

Subsidiaries

Instruments & Calibration Sweden AB
 MTS 1, LLC
 MTS 2, LLC
 MTS 3, LLC
 MTS Systems (Hong Kong), Inc.
 MTS Holdings France, SARL
 MTS Japan Ltd.
 MTS Korea, Inc.
 MTS Sensor Technologie GmbH and Co. KG
 MTS Sensor Technologie und Verwaltungs-GmbH
 MTS Sensor Technology KK
 MTS Systems Holding B.V.
 E2M Technologies B.V.
 E2M Production B.V.
 E2M Technologies Inc.
 MTS Systems (China) Co., Ltd.
 MTS Systems Finance C.V.
 MTS Systems GmbH
 MTS Systems Ltd.
 Denison Mayes Group Ltd.
 MTS Systems Norden AB
 MTS Systems SAS
 MTS Systems Srl
 MTS Testing Solutions India Private Limited
 MTS Testing Systems (Canada) Ltd.
 MTS Systems do Brazil (inactive)
 PCB Piezotronics, Inc.
 PCB Piezotronics Srl
 PCB Piezotronics Europe GmbH
 PCB Piezotronics Limited
 The Modal Shop, Inc.
 PCB Group Sales Company, Inc.
 3395 Walden Avenue Acquisition Corp
 DI U.S. Holdings, Inc.
 Dalimar Instruments ULC
 PCB Piezotronics S.A.
 PCB Piezotronics Sensor Technology (Beijing) Co., Ltd.
 PCB Synotech GmbH
 PCB Piezotronics of North Carolina, Inc.
 Accumetrics, Inc.
 PCB Piezotronics BVBA
 MMD RE Acquisition Corp
 Modern Microstructures, Inc.

Jurisdiction

Sweden
 Minnesota
 Minnesota
 Minnesota
 Minnesota
 France
 Japan
 Republic of Korea
 Germany
 Germany
 Japan
 Netherlands
 Netherlands
 Netherlands
 California
 People's Republic of China
 Netherlands
 Germany
 United Kingdom
 United Kingdom
 Sweden
 France
 Italy
 India
 Ontario, Canada
 Brazil
 New York
 Italy
 Germany
 United Kingdom
 Ohio
 Delaware
 New York
 New York
 Alberta, Canada
 France
 People's Republic of China
 Germany
 Delaware
 New York
 Belgium
 Ohio
 Ohio

Consent of Independent Registered Public Accounting Firm

The Board of Directors
MTS Systems Corporation:

We consent to the incorporation by reference in the registration statements (Nos. 333-172136, 333-172137, 333-187287, 333-211902, and 333-218556) on Form S-8 and the registration statement (No. 333-231244) on Form S-3 of MTS Systems Corporation of our reports dated November 25, 2019, with respect to the consolidated balance sheets of MTS Systems Corporation as of September 28, 2019 and September 29, 2018, and the related consolidated statements of income, comprehensive income, shareholders' equity, and cash flows for each of the fiscal years in the three-year period ended September 28, 2019, and the related notes and financial statement Schedule II, and the effectiveness of internal control over financial reporting as of September 28, 2019, which reports appear in the September 28, 2019 annual report on Form 10-K of MTS Systems Corporation.

Our report dated November 25, 2019, on the effectiveness of internal control over financial reporting as of September 28, 2019, contains an explanatory paragraph that states management excluded from its assessment of the Company's internal control over financial reporting as of September 28, 2019, E2M and Endevo's internal control over financial reporting associated with total assets of \$159 million and total revenues of \$34 million included in the consolidated financial statements of the Company as of and for the fiscal year ended September 28, 2019. Our audit of internal control over financial reporting of the Company also excluded an evaluation of the internal control over financial reporting of E2M and Endevo.

Our report refers to a change in the method of accounting for revenue.

/s/ KPMG LLP

Minneapolis, Minnesota
November 25, 2019

SARBANES-OXLEY SECTION 302 CERTIFICATION

I, Jeffrey A. Graves, certify that:

1. I have reviewed this annual report on Form 10-K of MTS Systems Corporation;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
 - (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: November 25, 2019

/s/ JEFFREY A. GRAVES

Jeffrey A. Graves

President and Chief Executive Officer

SARBANES-OXLEY SECTION 302 CERTIFICATION

I, Brian T. Ross, certify that:

1. I have reviewed this annual report on Form 10-K of MTS Systems Corporation;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
 - (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: November 25, 2019

/s/ BRIAN T. ROSS

Brian T. Ross

Executive Vice President and Chief Financial Officer

MTS SYSTEMS CORPORATION
CERTIFICATION OF CHIEF EXECUTIVE OFFICER
PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002 (18 U.S.C. 1350)

The undersigned, Jeffrey A. Graves, the Chief Executive Officer of MTS Systems Corporation (the "Company"), has executed this Certification in connection with the filing with the Securities and Exchange Commission of the Company's Annual Report on Form 10-K for the fiscal year ended September 28, 2019 (the "Report").

The undersigned hereby certifies that:

1. The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: November 25, 2019

/s/ JEFFREY A. GRAVES

Jeffrey A. Graves

President and Chief Executive Officer

This certification accompanies the Report pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 and shall not be deemed "filed" by the Company for purposes of Section 18 of the Securities and Exchange Act of 1934, as amended.

**MTS SYSTEMS CORPORATION
CERTIFICATION OF CHIEF FINANCIAL OFFICER
PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002 (18 U.S.C. 1350)**

The undersigned, Brian T. Ross, the Chief Financial Officer of MTS Systems Corporation (the "Company"), has executed this Certification in connection with the filing with the Securities and Exchange Commission of the Company's Annual Report on Form 10-K for the fiscal year ended September 28, 2019 (the "Report").

The undersigned hereby certifies that:

1. The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: November 25, 2019

/s/ BRIAN T. ROSS

Brian T. Ross

Executive Vice President and Chief Financial Officer

This certification accompanies the Report pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 and shall not be deemed "filed" by the Company for purposes of Section 18 of the Securities and Exchange Act of 1934, as amended.