

TERADYNE, INC
Form 10-K
March 01, 2019
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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549
FORM 10-K
ANNUAL REPORT
PURSUANT TO SECTIONS 13 OR 15(d)
OF THE SECURITIES EXCHANGE ACT OF 1934

(MARK ONE)

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

For the fiscal year ended December 31, 2018

OR

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

Commission file number 001-06462

TERADYNE, INC.

(Exact Name of Registrant as Specified in Its Charter)

MASSACHUSETTS
(State or Other Jurisdiction of
Incorporation or Organization)

600 RIVERPARK DRIVE

04-2272148
(I.R.S. Employer

Identification Number)

01864

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NORTH READING, MASSACHUSETTS

(Address of Principal Executive Offices)

(Zip Code)

Registrant's telephone number, including area code: (978) 370-2700

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

Title of Each Class	Name of Each Exchange on Which Registered
Common Stock, par value \$0.125 per share	Nasdaq Stock Market LLC

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in 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 Exchange 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 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 if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (229.405) is not contained herein, and will not be contained to the best of the registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or in any amendment to this Form 10-K.

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

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 stock held by non-affiliates of the registrant as of June 29, 2018 was approximately \$6.4 billion based upon the closing price of the registrant's Common Stock on the New York Stock Exchange on that date.

The number of shares outstanding of the registrant's only class of Common Stock as of February 25, 2019 was 173,629,283 shares.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's proxy statement in connection with its 2019 annual meeting of shareholders are incorporated by reference into Part III of this Form 10-K.

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TERADYNE, INC.

FORM 10-K

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, Section 27A of the Securities Act and Section 21E of the Securities Exchange Act. When used herein, the words will, would, believe, anticipate, plan, expect, estimate, project, intend, may, see, target and other words and terms of similar meaning are intended to identify forward-looking statements although not all forward looking statements contain these identifying words. Forward looking statements involve risks and uncertainties, including, but not limited to, those discussed in the section entitled Risk Factors of this annual report on Form 10-K and elsewhere, and in other reports we file with the Securities and Exchange Commission. Readers are cautioned not to place undue reliance on these forward-looking statements which reflect management's analysis only as of the date hereof and are subject to risks and uncertainties that could cause actual results to differ materially from those stated or implied. Teradyne assumes no obligation to update these forward-looking statements for any reason, except as may be required by law.

PART I

Item 1: Business

Teradyne, Inc. (Teradyne) was founded in 1960 and is a leading global supplier of automation equipment for test and industrial applications.

We design, develop, manufacture and sell automatic test systems used to test semiconductors, wireless products, data storage and complex electronics systems in the consumer electronics, wireless, automotive, industrial, computing, communications, and aerospace and defense industries. Our industrial automation products include collaborative robotic arms, autonomous mobile robots and advanced robotic control software used by global manufacturing and light industrial customers to improve quality, increase manufacturing and material handling efficiency and decrease manufacturing costs. Our automatic test equipment and industrial automation products and services include:

semiconductor test (Semiconductor Test) systems;

defense/aerospace (Defense/Aerospace) test instrumentation and systems, storage test (Storage Test) systems, and circuit-board test and inspection (Production Board Test) systems (collectively these products represent System Test);

industrial automation (Industrial Automation) products; and

wireless test (Wireless Test) systems.

We have a customer base which includes integrated device manufacturers (IDMs), outsourced semiconductor assembly and test providers (OSATs), original equipment manufacturers (OEMs), wafer foundries, fabless companies that design, but contract with others for the manufacture of integrated circuits (ICs), developers of wireless devices and consumer electronics, manufacturers of circuit boards, automotive suppliers, wireless product manufacturers, storage device manufacturers, aerospace and military contractors, and distributors that sell collaborative robots, autonomous mobile robots and wireless test systems.

The market for our test products is concentrated with a limited number of significant customers accounting for a substantial portion of the purchases of test equipment. One customer drives significant demand for our products both through direct sales and sales to the customer's supply partners. We expect that sales of our test products will continue to be concentrated with a limited number of significant customers for the foreseeable future.

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The sales of our products and services are dependent, to a large degree, on customers who are subject to cyclical trends in demand for their products. These cyclical periods have had, and will continue to have, a significant effect on our business because our customers often delay or accelerate purchases in reaction to changes in their businesses and to demand fluctuations in the semiconductor and electronics industries. Historically, these demand fluctuations have resulted in significant variations in our results of operations. During the first quarter of 2018, demand outlook for mobile device test capacity in 2018 declined sharply for our Semiconductor Test business. Demand in other segments of the Semiconductor Test business, including memory test, increased in 2018.

In 2015, we acquired Universal Robots A/S (Universal Robots), the leading supplier of collaborative robots which are low-cost, easy-to-deploy and simple-to-program robots that work side by side with production workers to improve quality, increase manufacturing efficiency and decrease manufacturing costs. The acquisition of Universal Robots provides a growth engine to our business. The total purchase price for Universal Robots was approximately \$315 million, which included cash paid of approximately \$284 million and \$32 million in fair value of contingent consideration payable upon achievement of revenue and earnings targets through 2018. Contingent consideration for 2015 was \$15 million and was paid in February 2016. Contingent consideration for the period from July 2015 to December 2017 was \$24.6 million and was paid in March 2018. Contingent consideration for the period from July 2015 to December 2018 was \$3.9 million and is expected to be paid in March 2019.

On February 26, 2018, we acquired Energid Technologies Corporation (Energid) for a total purchase price of approximately \$27.6 million. Energid s technology enables and simplifies the programming of complex robotic motions used in a wide variety of end markets, ranging from heavy industry to healthcare, utilizing both traditional robots and collaborative robots.

On April 25, 2018, we acquired Mobile Industrial Robots ApS (MiR), a Danish limited liability company. MiR is the leading maker of collaborative autonomous mobile robots for industrial applications. The total purchase price was approximately \$198 million, which included cash paid of approximately \$145 million and \$53 million in fair value of contingent consideration payable upon achievement of certain thresholds and targets for revenue and earnings before interest and taxes through 2020. At December 31, 2018, the maximum amount of contingent consideration that could be paid is \$115 million. Contingent consideration for 2018 was \$31.0 million and is expected to be paid in March 2019.

Universal Robots, MiR and Energid are included in our Industrial Automation segment.

Investor Information

We are a Massachusetts corporation incorporated on September 23, 1960. We are subject to the informational requirements of the Securities Exchange Act of 1934 (Exchange Act). We file periodic reports, proxy statements and other information with the Securities and Exchange Commission (SEC). The SEC maintains an internet site (<http://www.sec.gov>) that contains reports, proxy and information statements and other information regarding issuers that file documents electronically.

You can access financial and other information, including the charters of our Audit Committee, Compensation Committee and Nominating and Corporate Governance Committee, our Corporate Governance Guidelines and Code of Conduct, by clicking the Investors link on our web site at www.teradyne.com. We make available, free of charge, copies of our filings with the SEC, including our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act through our web site as soon as reasonably practicable after filing such material electronically or otherwise furnishing it to the SEC.

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Products

Semiconductor Test

We design, manufacture, sell and support Semiconductor Test products and services on a worldwide basis. The test systems we provide are used both for wafer level and device package testing. These chips are used in automotive, industrial, communications, consumer, and computer and electronic game applications, among others. Semiconductor devices span a broad range of functionality, from very simple low-cost devices such as appliance microcontrollers, operational amplifiers or voltage regulators to complex digital signal processors and microprocessors as well as memory devices. Semiconductor Test products and services are sold to IDMs that integrate the fabrication of silicon wafers into their business,

Fabless companies that outsource the manufacturing of silicon wafers, Foundries that cater to the processing and manufacturing of silicon wafers, and OSATs that provide test and assembly services for the final packaged devices to both Fabless companies and IDMs. Fabless companies perform the design of integrated circuits without manufacturing capabilities, and use Foundries for wafer manufacturing and OSATs for test and assembly. These customers obtain the overall benefit of comprehensively testing devices and reducing the total costs associated with testing by using our Semiconductor Test systems to:

improve and control product quality;

measure and improve product performance;

reduce time to market; and

increase production yields.

Our FLEX Test Platform architecture advances our core technologies to produce test equipment that is designed for high efficiency multi-site testing. Multi-site testing involves the simultaneous testing of many devices in parallel. Leading semiconductor manufacturers are using multi-site testing to significantly improve their Cost of Test economics. The FLEX Test Platform architecture addresses customer requirements through the following key capabilities:

A high efficiency multi-site architecture that reduces tester overhead such as instrument setup, synchronization and data movement, and signal processing;

The IG-XL software operating system which provides fast program development, including instant conversion from single to multi-site test; and

Broad technology coverage by instruments designed to cover the range of test parameters, coupled with a universal slot test head design that allows easy test system reconfiguration to address changing test needs.

FLEX Test Platform purchases are being made by IDMs, OSATs, Foundries and Fabless customers. The FLEX Test Platform has become a widely used test solution at OSATs by providing versatile testers that can handle the widest range of devices, allowing OSATs to leverage their capital investments. The broad consumer, automotive and broadband markets have historically driven most of the device volume growth in the semiconductor industry. These markets include smart phones, cell phones, tablets, set top boxes, HDTVs, game controllers, computer graphics, and automotive controllers to name a few. These end use markets continue to be drivers for the FLEX Test Platform family of products because they require a wide range of technologies and instrument coverage. The UltraFLEX-M tester extends the FLEX Test Platform into the High Speed DRAM testing market. The FLEX Test Platform has an installed base of more than 6,400 systems.

Our J750 test system shares the IG-XL software environment with the family of FLEX Test Platform systems. The J750 is designed to address the highest volume semiconductor devices, such as microcontrollers, that are central to the functionality of almost every consumer electronics

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product, from small appliances to automobiles. J750 test systems combine compact packaging, high throughput and ease of production test. We

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extended the J750 platform technology to create the IP750 Image Sensor test system. The IP750 is focused on testing image sensor devices used in smart phones and other imaging products. We have continued to invest in the J750 platform with new instrument releases that bring new capabilities to existing market segments and expand the J750 platform to new devices that include high end microcontrollers and the latest generation of cameras. The J750 platform has an installed base of over 5,600 systems.

Our Magnum platform addresses the requirements of mass production test of memory devices such as flash memory and DRAM. Flash and DRAM memory are widely used core building blocks in modern electronic products finding wide application in consumer, industrial, and computing equipment. Magnum V, the newest member of the family, is a next generation memory test solution designed for parallel memory test in the flash, DRAM and multi-chip package markets. In 2019, we plan to introduce a high-speed DRAM test version of our Magnum platform giving us full product coverage of the memory test market. The Magnum platform has an installed base of over 2,600 systems.

Our ETS platform is used by semiconductor manufacturers and assembly and test subcontractors, primarily in the analog/mixed signal markets that cover more cost sensitive applications. Our proprietary SmartPin technology enables high efficiency multi-site testing, on an individual test system, permitting greater test throughput. Semiconductors tested by ETS platform systems are incorporated into a wide range of products in historically high-growth markets, including mobile devices, video/multimedia products, automotive electronics, computer peripherals, and notebook and desktop computers. The newest products from the platform include the ETS-88, a high performance multi-site production test system designed to test a wide variety of high volume commodity and precision devices, and the ETS-800, a high performance multi-site production test system to test high complexity power devices in automotive, industrial and consumer applications. The ETS platform has an installed base of over 4,900 systems.

System Test

Our System Test segment is comprised of three business units: Defense/Aerospace, Storage Test and Production Board Test.

Defense/Aerospace

We are a leading provider of high performance test systems, subsystems, instruments and service for the defense and aerospace markets. Our test products are used to ensure the readiness of military and commercial aerospace electronics systems. New programs, such as tactical aircraft and missile systems, as well as upgrade programs, continue to fuel the demand for high performance test systems in this market. Our test products are well-suited to the demands of defense/aerospace electronics manufacturers and repair depots worldwide. Our leadership in this market is underscored by our success with major Department of Defense programs across all U.S. military service branches and many allied defense services worldwide.

Storage Test

The Storage Test business unit addresses the high throughput, automated manufacturing test requirements of hard disk drive (HDD) and solid state disk (SSD) manufacturers and semiconductor manufacturers. Our products address the client and enterprise storage markets. The client market is driven by the needs of desktop, laptop, and external HDD and SSD storage products. The enterprise market is driven by the needs of data centers and cloud storage. During 2017, we developed a system level test product for the semiconductor production market, which shipped in 2017 and 2018. The business unit's products lead in addressing customer requirements related to factory density, throughput and thermal performance.

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Production Board Test

Our test systems are used by electronics manufacturers worldwide to perform In-Circuit-Test (ICT) and device programming of printed circuit board assemblies. Fast, accurate and cost-effective test capabilities are hallmark features of our Test Station and Spectrum ICT product families. We offer the Test Station in off-line and automated in-line configurations. The automated in-line configurations address the growing requirements for automating production lines for high volume applications, such as automotive electronics.

Industrial Automation

Our Industrial Automation segment is comprised of three business units: Universal Robots, Mobile Industrial Robots and Energid.

Universal Robots

Universal Robots, which we acquired in June 2015, is the leading supplier of collaborative robots, which are low-cost, easy-to-deploy and simple-to-program robots that work side by side with production workers to improve quality, increase manufacturing efficiency and decrease manufacturing costs. Collaborative robots are designed to mimic the motion of a human arm and can be fitted with task specific grippers or fixtures to support a wide range of applications. Universal Robots offers three collaborative robot models, the UR3, UR5, and UR10, each with different weight carrying capacity and arm reach. All models are easily integrated into existing production environments. Universal Robots products are differentiated by their:

easy programming using a graphical interface which allows users to program the collaborative robot in a few hours;

flexibility and ease of use in allowing customers to change the task the collaborative robot is performing as their production demands dictate;

safe operations as collaborative robots can assist workers in side by side production environments requiring no special safety enclosures or shielding to protect workers; and

short payback period, on average less than 12 months.

In 2018, Universal Robots introduced its e-series collaborative robots which include technology advances that enable faster development of applications, greater precision and improved safety.

Cumulatively, Universal Robots has sold over 30,000 collaborative robots in diverse production environments and applications.

Mobile Industrial Robots

MiR, which was acquired in April 2018, is the leading supplier of collaborative autonomous mobile robots, which are low-cost, easy-to-deploy and simple-to-program mobile robots that increase manufacturing and warehouse efficiency and decrease costs. Collaborative autonomous mobile robots are designed to move material from point to point via autonomous navigation rather than the need for traditional mobile robot guidance infrastructure such as painted or magnetic strips, and are designed to navigate safely around obstacles and people. MiR offers three collaborative autonomous mobile robot models, the MiR100, MiR200, MiR500, each with different payload carrying capacity. All models are easily integrated into existing production environments. MiR's products are differentiated by their:

easy programming using a graphical interface which allows users to program the collaborative robot in a few hours;

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ease of use, speed of deployment and flexibility in allowing customers to change the task as their demands dictate;

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reliable autonomous navigation over large manufacturing and warehouse areas; and

short payback period, on average less than 12 months.

Cumulatively, MiR has sold over 1,800 collaborative autonomous mobile robots in diverse production and warehouse environments and applications.

Energid

Energid, which was acquired in February 2018, is a leading supplier of real-time advanced robot motion control software, which automation suppliers use to coordinate the control of multiple automation axes for performing tasks. Motion control software performs the complex mathematics and functions needed to enable robot motion for tasks such as grasping and moving an object. Energid offers developer and run time licenses of its Actin software. Actin is integrated by customers into the customers' robot and automation solutions. Actin products are differentiated by their:

highly flexible, adaptive, robot motion control; and

task optimized robotic path planning.

Cumulatively, Energid has sold over 500 Actin developer and run time licenses deployed in diverse automation applications.

Wireless Test

Our acquisition of LitePoint in 2011 and ZTEC Instruments Inc. (ZTEC) in 2013 expanded our product offerings in the wireless test market. Under the LitePoint brand name, these products provide test solutions utilized in the development and manufacturing of wireless devices. The world's leading makers of smart phones, tablets, notebooks, laptops, peripherals, and Internet-of-Things (IoT) devices rely on LitePoint technology to ensure their products get into consumer hands with high quality and high efficiency.

LitePoint hardware and software wireless test solutions are used in test insertions that span design verification to high volume manufacturing and are deployed across the entire production eco-system from the wireless chipset suppliers to the consumer brands. Wireless devices are often tested at multiple points along the manufacturing process that include insertions at component, system-in-package (SiP), module, PCB, SMT and finished product stages.

Design verification is an important step in the development process for evaluating product performance prior to starting production. As end market unit volumes have increased, the quantity of units and the amount of data that must be analyzed for a successful product launch continues to grow. LitePoint products provide easy to use, domain specific tools for rapid analysis of product performance. This helps to speed time to market.

In high volume manufacturing, before products are packaged and shipped, wireless test enables the calibration of each individual product's wireless performance to improve range, data throughput and battery life. Testing also verifies product specifications for product quality control. As markets become increasingly competitive, product performance and quality provide brand differentiation.

Wireless standards can be thought of in two categories, connectivity and cellular. Connectivity covers many standards such as Wi-Fi, Bluetooth, and GPS. LitePoint's IQxel products cover emerging Wi-Fi standards such as 802.11ax and 802.11ad as well as the existing standards 802.11a/b/g/n and 11ac, and includes a variety of other standards such as Bluetooth Classic, Bluetooth 5.0 and Bluetooth low energy, Zigbee, Z-Wave, NFC, LoRa, GPS, GLONASS and others.

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The IQxel product family's high-performance wireless and multi-device testing economics is aligned with the needs of networking equipment, Internet gateways, IoT products and embedded modules used in smartphones, tablets, and PCs. Another connectivity product, the IQnfc, addresses the growing use of NFC technology for payments with mobile devices.

Cellular standards include 2G, 3G, 4G and emerging 5G mobile phone technologies. LitePoint's IQxstream is a multi-device production test optimized solution for high-speed testing of GSM, EDGE, CDMA2000, TD-SCDMA, WCDMA, HSPA+, LTE-FDD, TD-LTE, and LTE-A, and 5G technologies. It is used for calibration and verification of smartphones, tablets, small cell wireless gateways and embedded cellular modules. The IQcell, is a multi-device cellular signaling test solution which enables user experience testing of LTE cellular devices via over-the-air connections. The IQgig family provides test solution at the intermediary and millimeter wave frequencies for 5G and 802.11ad.

An important component in all wireless systems is the analog RF front end. The performance of these components is continually pushed higher as device makers add more bands, channels, antennas and higher data rates. We offer the LitePoint zSeries of modular wireless test instruments for design verification test and production testing of these wireless components. The lab-in-a-box zSeries solution provides simple and fast design verification of RF power amplifier and smart device RF front end modules. It is capable of rapid analysis of the latest digital pre-distortion and envelope tracking technologies for both LTE and Wi-Fi standards. A ruggedized version of the product is designed for high volume testing of these same devices.

To complement the test systems, LitePoint offers turnkey test software for over 350 of the most popular wireless chipsets. These optimized solutions provide rapid development of high volume manufacturing solutions with a minimum of engineering effort by customers.

Sales and Distribution

In 2018, no single customer accounted for more than 10% of our consolidated revenues. In 2017 and 2016, revenues from Taiwan Semiconductor Manufacturing Company Ltd. accounted for 13% and 12%, respectively, of our consolidated revenues. In 2016, revenues from JA Mitsui Leasing, Ltd. accounted for 12% of our consolidated revenues. Taiwan Semiconductor Manufacturing Company Ltd. and JA Mitsui Leasing, Ltd. are customers of our Semiconductor Test segment. In each of the years, 2018, 2017, and 2016, our five largest customers in aggregate accounted for 27%, 32% and 36% of our consolidated revenues, respectively.

OSAT customers, such as Taiwan Semiconductor Manufacturing Company Ltd., often purchase our test systems based upon recommendations from OEMs, IDMs and Fabless companies. In all cases when an OSAT customer purchases a test system from us, we consider the OSAT as the customer since credit risk, title and risk of loss, among other things, are between Teradyne and the OSAT. We estimate consolidated revenues driven by a single OEM customer, combining direct sales to that customer with sales to the customer's OSATs (which include Taiwan Semiconductor Manufacturing Company Ltd. and its leasing company, JA Mitsui Leasing, Ltd.), accounted for approximately 13%, 22%, and 26% of our consolidated revenues in 2018, 2017, and 2016, respectively. The loss of, or significant decrease in demand from, this OEM customer, or any of our five largest direct customers, could have a material adverse effect on our business, results of operations and financial condition.

We have sales and service offices located throughout North America, Asia and Europe. We sell in these areas predominantly through a direct sales force, except for Industrial Automation products which are sold through distributors. Our manufacturing activities are primarily conducted through subcontractors and outsourced contract manufacturers with significant operations in China and Malaysia.

Sales to customers outside the United States were 87%, 88%, and 87%, respectively, of our consolidated revenues in 2018, 2017 and 2016. Sales are attributed to geographic areas based on the location of the customer site.

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See also Item 1A: Risk Factors and Note R: Operating Segment, Geographic and Significant Customer Information in Notes to Consolidated Financial Statements.

Competition

We face significant competition throughout the world in each of our reportable segments. Competitors in the Semiconductor Test segment include, among others, Advantest Corporation and Cohu, Inc.

Competitors in the System Test segment include, among others, Keysight Technologies, Inc., Advantest Corporation, Test Research, Inc. and SPEA S.p.A.

Competitors in our Industrial Automation segment include manufacturers of traditional industrial robots such as KUKA Robotics Corporation, ABB, FANUC and Yaskawa Electric Corporation, companies with emerging collaborative robot offerings such as Techman, Doosan, and AUBO Robotics, and manufacturers of autonomous mobile robots such as Omron, Fetch, and OTTO Motors.

Competitors in our Wireless Test segment include, among others, Rohde & Schwarz GmbH & Co. KG, Anritsu Company, Keysight Technologies, Inc. and National Instruments Corporation.

Some of our competitors have substantially greater financial and other resources to pursue engineering, manufacturing, marketing and distribution of their products. We also face competition from emerging Asian companies and from internal suppliers at several of our customers. Some of our competitors have introduced or announced new products with certain performance characteristics which may be considered equal or superior to those we currently offer. We expect our competitors to continue to improve the performance of their current products and to introduce new products or new technologies that provide improved cost of ownership and performance characteristics. See also Item 1A: Risk Factors.

Backlog

At December 31, 2018 and 2017, our backlog of unfilled orders in our four reportable segments was as follows:

	2018	2017 (1)
	(in millions)	
Semiconductor Test	\$ 367.5	\$ 464.2
System Test	149.5	111.9
Wireless Test	32.0	35.5
Industrial Automation	19.7	14.8
	\$ 568.7	\$ 626.4

(1) December 31, 2017 backlog has not been adjusted for the new revenue standard adopted January 1, 2018. If the Wireless Test backlog was calculated based on the new revenue standard, the backlog balance would have been \$21.3 million. Backlog for each of the other reportable segments was not materially affected by the adoption of the new revenue standard.

Of the backlog at December 31, 2018, approximately 98% of the Semiconductor Test backlog, 89% of the System Test backlog, and 35% of the Industrial Automation backlog is expected to be delivered in 2019.

Customers may delay delivery of products or cancel orders suddenly and without advanced notice, subject to possible cancellation penalties. Due to possible customer changes in delivery schedules and cancellation of orders, our backlog at any particular date is not necessarily indicative of the actual sales for any succeeding period. Delays in delivery schedules or cancellations of backlog during any particular period could have a material adverse effect on our business, financial condition or results of operations.

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Raw Materials

Our products contain electronic and mechanical components that are provided by a wide range of suppliers. Some of these components are standard products, while others are manufactured to our specifications. We can experience occasional delays in obtaining timely delivery of certain items. While the majority of our components are available from multiple suppliers, certain items are obtained from sole sources. We may experience a temporary adverse impact if any of our sole source suppliers delay or cease to deliver products.

Intellectual Property and Licenses

The development of our products, both hardware and software, is based in significant part on proprietary information, our brands and technology. We protect our rights in proprietary information, brands and technology through various methods, such as:

patents;

copyrights;

trademarks;

trade secrets;

standards of business conduct and related business practices; and

technology license agreements, software license agreements, non-disclosure agreements, employment agreements, and other agreements.

However, these protections might not be effective in all circumstances. Competitors might independently develop similar technology or exploit our proprietary information and our brands in countries where we lack enforceable intellectual property rights or where enforcement of such rights through the legal system provides an insufficient deterrent. Also, intellectual property protections can lapse or be invalidated through appropriate legal processes. We do not believe that any single piece of intellectual property or proprietary rights is essential to our business.

Employees

As of December 31, 2018, we employed approximately 4,900 people. Since the inception of our business, we have experienced no work stoppages or other labor disturbances.

Environmental Affairs

We are subject to various federal, state, and local government laws and regulations relating to the protection of employee health and safety and the environment. We accrue for all known environmental liabilities when it becomes probable that we will incur cleanup costs and those costs can reasonably be estimated. Estimated environmental costs are not expected to materially affect the financial position or results of our operations in future periods. However, estimates of future costs are subject to change due to protracted cleanup periods and changing environmental remediation laws and regulations.

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Pursuant to General Instruction G(3) of Form 10-K, the following table is included in Part I of this Annual Report on Form 10-K in lieu of being included in the Proxy Statement for the Annual Meeting of Shareholders. The table sets forth the names of all of our executive officers and certain other information relating to their positions held with Teradyne and other business experience. Our executive officers do not have a specific term of office but rather serve at the discretion of the Board of Directors.

Executive Officer	Age	Position	Business Experience For The Past 5 Years
Mark E. Jagiela	58	Chief Executive Officer and President	Chief Executive Officer since February 2014; President of Teradyne since January 2013; President of Semiconductor Test from 2003 to February 2016; Vice President of Teradyne from 2001 to 2013.
Gregory R. Beecher	61	Vice President, Chief Financial Officer and Treasurer	Vice President and Chief Financial Officer of Teradyne since 2001; Treasurer of Teradyne from 2003 to 2005 and since 2006.
Charles J. Gray	57	Vice President, General Counsel and Secretary	Vice President, General Counsel and Secretary of Teradyne since April 2009.
Bradford B. Robbins	60	President of Wireless Test	President of Wireless Test since August 2014; Chief Operating Officer of LitePoint Corporation from 2012 to 2014; Vice President of Teradyne since 2001.
Gregory S. Smith	55	President of Semiconductor Test	President of Semiconductor Test since February 2016; Vice President, SOC Business Group and Marketing Manager for Semiconductor Test Group from January 2014 to February 2016; Business Unit Manager, Complex SOC Business Unit from 2009 to January 2014.
Walter G. Vahey	54	Executive Vice President, Business Development	Executive Vice President, Business Development since December 2017; President of System Test from July 2012 to December 2017; Vice President of Teradyne since 2008; General Manager of Storage Test from 2008 to December 2017; General Manager of Production Board Test from April 2013 to December 2017.

Item 1A: Risk Factors
Risks Associated with Our Business

The risks described below are not the only risks that we face. Additional risks and uncertainties not currently known to us or that we currently deem to be immaterial also may materially adversely affect our business, financial condition and/or operating results.

Our business is impacted by global and industry-specific economic cycles, which are difficult to predict, and actions we have taken or may take to offset these cycles may not be sufficient.

Capital equipment providers in the electronics and semiconductor industries, such as Teradyne, have, in the past, been negatively impacted by both sudden slowdowns in the global economies and recurring cyclicality

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within those industries. These cycles have resulted in periods of over-supply; a trend we believe will continue to occur for newer generations of electronic products. Our business and results of operations depend, in significant part, upon capital expenditures of manufacturers of semiconductors and other electronics, which in turn depend upon the current and anticipated market demand for those products. Disruption or deterioration in economic conditions may reduce customer purchases of our products, thereby reducing our revenues and earnings. In addition, such adverse changes in economic conditions, and resulting slowdowns in the market for our products, may, among other things, result in increased price competition for our products, increased risk of excess and obsolete inventories, increased risk in the collectability of our accounts receivable from our customers, potential reserves for doubtful accounts and write-offs of accounts receivable, increased risk of restructuring charges, and higher operating costs as a percentage of revenues, which, in each case and together, adversely affect our operating results. We are unable to predict the likely duration, frequency and severity of disruptions in financial markets, credit availability, and adverse economic conditions throughout the world, and we cannot ensure that the level of revenues or new orders for a fiscal quarter will be sustained in subsequent quarters. We have taken actions to address the effects of general economic variability and recurring industry cyclicality, including implementing cost control and reduction measures. We cannot predict whether these measures will be sufficient to offset global or market-specific disruptions that might affect our test businesses and we may need to take additional or different measures in the future.

We are subject to intense competition.

We face significant competition throughout the world in each of our reportable segments. Some of our competitors have substantial financial and other resources to pursue engineering, manufacturing, marketing and distribution of their products. We also face competition from emerging Asian equipment companies and internal development at several of our customers. Some of our competitors have introduced or announced new products with certain performance characteristics that may be considered equal or superior to those we currently offer. We expect our competitors to continue to improve the performance of their current products and to introduce new products or new technologies that provide improved cost of ownership and performance characteristics. New product introductions by competitors could cause a decline in revenues or loss of market acceptance of our products.

The market for our products is concentrated, and our business depends, in part, on obtaining orders from a few significant customers.

The market for our products is concentrated with a limited number of significant customers accounting for a substantial portion of the purchases of test equipment. In each of the years 2018, 2017, and 2016, our five largest customers in aggregate accounted for 27%, 32%, and 36% of consolidated revenues, respectively. We estimate consolidated revenues driven by a single OEM customer, combining direct sales to that customer with sales to the customer's OSATs (which include Taiwan Semiconductor Manufacturing Company Ltd. and its leasing company, JA Mitsui Leasing, Ltd.), accounted for approximately 13%, 22%, and 26% of our consolidated revenues in 2018, 2017, and 2016, respectively. In any one reporting period, a single customer or several customers may contribute even a larger percentage of our consolidated revenues. In addition, our ability to increase sales will depend, in part, on our ability to obtain orders from current or new significant customers. The opportunities to obtain orders from these customers may be limited, which may impair our ability to grow revenues. We expect that sales of our products will continue to be concentrated with a limited number of significant customers for the foreseeable future. The loss of a significant customer or any reduction in orders by these customers, including reductions due to market or competitive conditions, such as we experienced in our Wireless Test segment, would likely have a material adverse effect on our business, financial condition or results of operations.

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Our operating results are likely to fluctuate significantly.

Our operating results are affected by a wide variety of factors that could materially adversely affect revenues or profitability. The following factors could impact future operations:

a worldwide economic slowdown or disruption in the global financial markets;

competitive pressures on selling prices;

our ability to introduce, and the market acceptance of, new products;

changes in product revenues mix resulting from changes in customer demand;

the level of orders received which can be shipped in a quarter because of the tendency of customers to wait until late in a quarter to commit to purchase due to capital expenditure approvals and constraints occurring at the end of a quarter, or the hope of obtaining more favorable pricing from a competitor seeking the business;

engineering and development investments relating to new product introductions, and the expansion of manufacturing, outsourcing and engineering operations in Asia;

provisions for excess and obsolete inventory relating to the lack of demand for and the discontinuance of products;

impairment charges for certain long-lived and intangible assets, and goodwill;

an increase in the leasing of our products to customers;

our ability to expand our global distribution channel for our collaborative robots;

parallel or multi-site testing could lead to a decrease in the ultimate size of the market for our products; and

the ability of our suppliers and subcontractors to meet product quality or delivery requirements needed to satisfy customer orders for our products, especially if consolidated revenues increase.

As a result of the foregoing and other factors, we have experienced and may continue to experience material fluctuations in future operating results on a quarterly or annual basis which could materially and adversely affect our business, financial condition, operating results or stock price.

We are subject to risks of operating internationally.

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A significant portion of our total revenues is derived from customers outside the United States. Our international sales and operations are subject to significant risks and difficulties, including:

unexpected changes in legal and regulatory requirements affecting international markets;

changes in tariffs and exchange rates;

social, political and economic instability, acts of terrorism and international conflicts;

difficulties in protecting intellectual property;

difficulties in accounts receivable collection;

cultural differences in the conduct of business;

difficulties in staffing and managing international operations;

compliance with customs regulations; and

compliance with international tax laws and regulations.

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In addition, an increasing portion of our products and the products we purchase from our suppliers are sourced or manufactured in foreign locations, including China and Malaysia, and a large portion of the devices our products test are fabricated and tested by foundries and subcontractors in Taiwan, China, Singapore and other parts of Asia. As a result, we are subject to a number of economic and other risks, particularly during times of political or financial instability in these regions. Disruption of manufacturing or supply sources in these international locations could materially adversely impact our ability to fill customer orders and potentially result in lost business.

The implementation of tariffs and export controls on our products may have a material impact on our business.

Our business operations and supply chain are global and may be disrupted by the implementation of tariffs and export controls on our products.

On July 6, 2018 and August 23, 2018, the United States Trade Representative imposed a 25% tariff on two lists of products, including certain Teradyne products that are made in China and imported into the United States. We have submitted requests for exclusion of our products from the tariff, but there is no assurance that our requests will be approved. We have implemented operational changes that will mitigate the impact of the 25% tariff on the import of our impacted products into the United States. As a result, we do not expect that the tariff will have a material adverse effect on our business, financial condition or results of operations.

On September 24, 2018, the United States Trade Representative imposed a 10% tariff on many additional products made in China and imported into the United States. The tariff rate may increase to 25% in 2019. At this time, we do not expect that this tariff will significantly impact any Teradyne products and thus the tariff should not have a material adverse effect on our business, financial condition or results of operations.

On June 29, 2018, the United States Department of Commerce announced that it has commenced a review of new export controls focusing on emerging and foundational technologies. While there is uncertainty as to the technologies that will be covered, the new export controls could cover technologies used in one or more Teradyne products and, therefore, could impact the sale of certain Teradyne products and have a material adverse effect on our business, financial condition or results of operations.

The United States Department of Commerce from time to time has taken action to restrict the access of U.S.-origin technologies to Chinese companies by adding them to the Entity List under U.S. Export Administration Regulations. The addition to the Entity List of Chinese companies who are customers or potential customers could impact the sale and/or support of certain Teradyne products to those customers or potential customers and, therefore, have a material adverse effect on our business, financial condition or results of operations.

In addition to the actions taken by the United States, China has implemented retaliatory tariffs on products made in the United States and imported into China, including certain Teradyne products. We plan to assess and implement, if appropriate, operational changes that would mitigate the impact of the retaliatory tariffs. However, notwithstanding our efforts, the retaliatory tariffs or other trade restrictions implemented by China could disrupt our business operations, sales and supply chain and, therefore, have a material adverse effect on our business, financial condition or results of operations.

If we fail to develop new technologies to adapt to our customers' needs and if our customers fail to accept our new products, our revenues will be adversely affected.

We believe that our technological position depends primarily on the technical competence and creative ability of our engineers. In a rapidly evolving market, such as ours, the development or acquisition of new technologies, commercialization of those technologies into products and market acceptance and customer

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demand for those products are critical to our success. Successful product development or acquisition, introduction and acceptance depend upon a number of factors, including:

new product selection;

ability to meet customer requirements;

development of competitive products by competitors;

timely and efficient completion of product design;

timely and efficient implementation of manufacturing and manufacturing processes;

timely remediation of product performance issues, if any, identified during testing;

assembly processes and product performance at customer locations;

differentiation of our products from our competitors' products;

management of customer expectations concerning product capabilities and product life cycles;

transition of customers to new product platforms;

ability to attract and retain technical talent; and

innovation that does not infringe on the intellectual property rights of third parties.

We may be subject to product recalls and warranty and product liability claims.

We invest significant resources in the design, manufacture and testing of our products. However, we may discover design or manufacturing defects in our products after they have been shipped and, as a result, we may incur development and remediation costs and be required to settle warranty and product liability claims. In addition, if any of our products contain defects or have reliability, quality or safety issues, we may need to conduct a product recall which could result in significant repair or replacement costs and substantial delays in product shipments and may damage our reputation which could make it more difficult to sell our products. Any of these results could have a material adverse effect on our business, results of operations or financial condition.

If our suppliers do not meet product or delivery requirements, we could have reduced revenues and earnings.

Certain components, including semiconductor chips, may be in short supply from time to time because of high industry demand or the inability of some vendors to consistently meet our quality or delivery requirements. If any of our suppliers were to cancel contracts or commitments or

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fail to meet the quality or delivery requirements needed to satisfy customer orders for our products, we could lose time-sensitive customer orders, have significantly decreased revenues and earnings and be subject to contractual penalties, which would have a material adverse effect on our business, results of operations and financial condition. In addition, we rely on contract manufacturers for certain subsystems used in our products, and our ability to meet customer orders for those products depends upon the timeliness and quality of the work performed by these subcontractors, over whom we do not exercise any control.

To a certain extent, we are dependent upon the ability of our suppliers and contractors to help meet increased product or delivery requirements. It may be difficult for certain suppliers to meet delivery requirements in a period of rapid growth, therefore impacting our ability to meet our customers' demands.

We rely on the financial strength of our suppliers. There can be no assurance that the loss of suppliers either as a result of financial viability, bankruptcy or otherwise will not have a material adverse effect on our business, results of operations or financial condition.

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Our operations may be adversely impacted if our outsourced contract manufacturers or service providers fail to perform.

We depend on Flex Ltd. (Flex) to manufacture and test our FLEX and J750 family of products from its facility in China and on other contract manufacturers to manufacture other products. If for any reason these contract manufacturers cannot provide us with these products in a timely fashion, or at all, we may not be able to sell these products to our customers until we enter a similar arrangement with an alternative contract manufacturer. If we experience a problem with our supply of products from Flex or our other contract manufacturers, it may take us significant time to either manufacture the product or find an alternate contract manufacturer, which could result in substantial expense and disruption to our business.

We have also outsourced certain general and administrative functions to reputable service providers, many of which are in foreign countries, sometimes impacting communication with them because of language and time differences. Their presence in foreign countries also increases the risk they could be exposed to political risk. Additionally, there may be difficulties encountered in coordinating the outsourced operations with existing functions and operations. If we fail in successfully coordinating and managing the outsourced service providers, it may cause an adverse effect on our operations which could have a material adverse effect on our business, results of operations or financial condition.

We may not fully realize the benefits of our acquisitions or strategic alliances.

In June 2015, we acquired Universal Robots, and, in 2018, we acquired Energid and MiR. We may not be able to realize the benefit of acquiring or successfully growing these businesses. We may continue to acquire additional businesses, form strategic alliances or create joint ventures with third parties that we believe will complement or augment our existing businesses. We may not be able to realize the expected synergies and cost savings from the integration with our existing operations of other businesses or technologies that we may acquire. In addition, the integration process for our acquisitions may be complex, costly and time consuming and include unanticipated issues, expenses and liabilities. We may have difficulty in developing, manufacturing and marketing the products of a newly acquired company in a manner that enhances the performance of our combined businesses or product lines and allows us to realize value from expected synergies. Following an acquisition, we may not achieve the revenue or net income levels that justify the acquisition. Acquisitions may also result in one-time charges (such as acquisition-related expenses, write-offs or restructuring charges) or in the future, impairment of goodwill or acquired intangible assets that adversely affect our operating results. Additionally, we may fund acquisitions of new businesses, strategic alliances or joint ventures by utilizing our cash, incurring debt, issuing shares of our common stock, or by other means.

We may incur significant liabilities if we fail to comply with environmental regulations.

We are subject to both domestic and international environmental regulations and statutory strict liability relating to the use, storage, discharge, site cleanup and disposal of hazardous chemicals used in our manufacturing processes. If we fail to comply with present and future regulations, or are required to perform site remediation, we could be subject to future liabilities or cost, including penalties or the suspension of production. Present and future regulations may also:

restrict our ability to expand facilities;

restrict our ability to ship certain products;

require us to modify our operations logistics;

require us to acquire costly equipment; or

require us to incur other significant costs and expenses.

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Pursuant to present regulations and agreements, we are conducting groundwater and subsurface assessment and monitoring and are implementing remediation and corrective action plans for facilities located in Massachusetts and New Hampshire which are no longer conducting manufacturing operations. As of December 31, 2018, we have not incurred material costs as a result of the monitoring and remediation steps taken at the Massachusetts and New Hampshire sites.

On January 27, 2003, the European Union adopted the following directives: (i) the directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (the RoHS Directive); and (ii) the directive on Waste Electrical and Electronic Equipment (the WEEE Directive). The WEEE Directive became effective August 13, 2005 and the RoHS Directive became effective on July 6, 2006. Both the RoHS Directive and the WEEE Directive alter the form and manner in which electronic equipment is imported, sold and handled in the European Union. Other jurisdictions, such as China, have followed the European Union's lead in enacting legislation with respect to hazardous substances and waste removal. Ensuring compliance with the RoHS Directive, the WEEE Directive and similar legislation in other jurisdictions, and integrating compliance activities with our suppliers and customers could result in additional costs and disruption to operations and logistics and thus, could have a negative impact on our business, operations or financial condition.

We currently are, and in the future may be, subject to litigation or regulatory proceedings that could have an adverse effect on our business.

From time to time, we may be subject to litigation or other administrative, regulatory or governmental proceedings, including tax audits and resulting claims that could require significant management time and resources and cause us to incur expenses and, in the event of an adverse decision, pay damages or incur costs in an amount that could have a material adverse effect on our financial position or results of operations.

Third parties may claim we are infringing their intellectual property and we could suffer significant litigation costs, licensing expenses or be prevented from selling our products.

We have been sued for patent infringement in the past and receive notifications from time to time that we may be in violation of patents held by others. An assertion of patent infringement against us, if successful, could have a material adverse effect on our ability to sell our products or it could force us to seek a license to the intellectual property rights of others or alter such products so that they no longer infringe the intellectual property rights of others. A license could be very expensive to obtain or may not be available at all. Similarly, changing our products or processes to avoid infringing the rights of others may be costly or impractical. Additionally, patent litigation could require a significant use of management resources and involve a lengthy and expensive defense, even if we eventually prevail. If we do not prevail, we might be forced to pay significant damages, obtain licenses, modify our products, or stop making our products; each of which could have a material adverse effect on our financial condition, operating results or cash flows.

If we are unable to protect our intellectual property (IP), we may lose a valuable asset or may incur costly litigation to protect our rights.

We protect the technology that is incorporated in our products in several ways, including through patent, copyright, trademark and trade secret protection and by contractual agreement. However, even with these protections, our IP may still be challenged, invalidated or subject to other infringement actions. While we believe that our IP has value in the aggregate, no single element of our IP is in itself essential. If a significant portion of our IP is invalidated or ineffective, our business could be materially adversely affected.

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We may incur higher tax rates than we expect and may have exposure to additional international tax liabilities and costs.

We are subject to paying income taxes in the United States and various other countries where we operate. Our effective tax rate is dependent on where our earnings are generated and the tax regulations and the interpretation and judgment of administrative tax or revenue entities in the United States and other countries. We have pursued a global tax strategy which could be adversely affected by the mix of earnings and tax rates in the countries where we operate, changes to tax laws, tax regulations or an adverse tax ruling by administrative entities. We are also subject to tax audits in the countries where we operate. Any material change in our tax liability resulting from changes in tax laws, tax regulations, administrative ruling or from an audit from an administrative tax or revenue entity could negatively affect our financial results.

As a multinational corporation, we are subject to income taxes as well as non-income based taxes, in both the United States and various foreign jurisdictions. In certain foreign jurisdictions, we qualify for tax incentives and tax holidays based on our ability to meet, on a continuing basis, various tests relating to our employment levels, research and development expenditures and other qualification requirements in a particular foreign jurisdiction. While we intend to operate in such a manner to maintain and maximize our tax incentives, no assurance can be given that we have so qualified or that we will so qualify for any particular year or jurisdiction. If we fail to qualify and to remain qualified for certain foreign tax incentives and tax holidays, we may be subject to further taxation or an increase in our effective tax rate which would adversely impact our financial results. In December 2015, we entered into an agreement with the Singapore Economic Development Board which extended our Singapore tax holiday under substantially similar terms to the agreement which expired on December 31, 2015. The new tax holiday is scheduled to expire on December 31, 2020. The tax savings attributable to the Singapore tax holiday for the years ended December 31, 2018, 2017 and 2016 were \$11.9 million or \$0.06 per diluted share, \$24.8 million or \$0.12 per diluted share and \$17.0 million or \$0.08 per diluted share, respectively. These tax savings may not be achievable in subsequent years due to changes in Singapore's tax laws or the expiration of the tax holiday.

In addition, we may incur additional costs, including headcount expenses, in order to maintain or obtain a foreign tax incentive in a particular foreign jurisdiction.

We have significant guarantees, indemnification and customer confidentiality obligations.

From time to time, we make guarantees to customers regarding the delivery, price and performance of our products and guarantee certain indebtedness, performance obligations or lease commitments of our subsidiary and affiliate companies. We also have agreed to provide indemnification to our officers, directors, employees and agents, to the extent permitted by law, arising from certain events or occurrences while the officer, director, employee or agent, is or was serving at our request in such capacity. Additionally, we have confidentiality obligations to certain customers and if breached would require the payment of significant penalties. If we become liable under any of these obligations, it could materially and adversely affect our business, financial condition or operating results. For additional information see Note K: Commitments and Contingencies Guarantees and Indemnification Obligations in Notes to Consolidated Financial Statements.

We may discontinue or reduce our quarterly cash dividend or share repurchase program.

In January 2014, our Board of Directors initiated a quarterly cash dividend of \$0.06 per share. In January 2017, our Board of Directors increased our quarterly cash dividend to \$0.07 per share and in January 2018, our Board of Directors increased our quarterly cash dividend to \$0.09 per share. In January 2018, our Board of Directors approved a new \$1.5 billion share repurchase authorization. In 2018 and 2017, we repurchased \$823 million and \$200 million of common stock, respectively. We intend to repurchase \$500 million in 2019. Holders of our common stock are only entitled to receive dividends when and if they are declared by our Board of Directors. Future cash dividends and share repurchases are subject to the discretion of our Board of Directors

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and will depend, among other things, upon our earnings, capital requirements and financial condition. While we have declared a quarterly cash dividend on our common stock and authorized a share repurchase program, we are not required to do either and may reduce or eliminate our cash dividend or share repurchase program in the future. The reduction or elimination of our cash dividend or our share repurchase program could adversely affect the market price of our common stock.

We have incurred indebtedness and may incur additional indebtedness.

On December 12, 2016, we completed a private offering of \$460.0 million aggregate principal amount of 1.25% convertible senior unsecured notes (the Notes) due December 15, 2023 and received net proceeds, after issuance costs, of approximately \$450.8 million, \$33.0 million of which was used to pay the net cost, after being partially offset by proceeds from the sale of the warrants, of the convertible note hedge transactions and \$50.1 million of which was used to repurchase 2 million shares of our common stock. Holders of the Notes may require us to repurchase the Notes upon the occurrence of certain fundamental changes involving us or the holders may elect to convert into shares of our common stock.

On April 27, 2015, we entered into a five-year, senior secured revolving credit facility of up to \$350.0 million. Subject to customary conditions, we may seek to obtain from existing or new lenders incremental commitments under the credit facility in an aggregate principal amount not to exceed \$150.0 million. We have not borrowed any funds under this credit facility. We could borrow funds under this credit facility at any time for general corporate purposes and working capital.

The issuance of the Notes and any additional indebtedness, among other things, could:

make it difficult to make payments on this indebtedness and our other obligations;

make it difficult to obtain any necessary future financing for working capital, capital expenditures, debt service requirements or other purposes;

require the dedication of a substantial portion of any cash flow from operations to service for indebtedness, thereby reducing the amount of cash flow available for other purposes, including capital expenditures; and

limit our flexibility in planning for, or reacting to, changes in our business and the industries in which we compete.

Our convertible note hedge and warrant transactions could impact the value of our stock.

Concurrent with the offering of the Notes, we entered into convertible note hedge transactions (the Note Hedge Transactions) with the initial purchasers or their affiliates (the Option Counterparties). The Note Hedge Transactions cover, subject to customary anti-dilution adjustments, the number of shares of our common stock that underlie the Notes, with a strike price equal to the conversion price of the Notes of \$31.70. The Note Hedge Transactions cover, subject to customary anti-dilution adjustments, approximately 14.5 million shares of our common stock.

Separately and concurrent with the pricing of the Notes, we entered into warrant transactions with the Option Counterparties (the Warrant Transactions) in which we sold net-share-settled (or, at our election subject to certain conditions, cash-settled) warrants to the Option Counterparties. The Warrant Transactions cover, subject to customary anti-dilution adjustments, approximately 14.5 million shares of our common stock. The strike price of the warrants is \$39.78 per share. The Warrant Transactions could have a dilutive effect to our common stock to the extent that the market price per share of our common stock, as measured under the terms of the Warrant Transactions, exceeds the applicable strike price of the warrants.

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The Note Hedge Transactions are expected to reduce the potential dilution to our common stock upon any conversion of the Notes. However, the Warrant Transactions could separately have a dilutive effect to the extent that the market value per share of our common stock exceeds the applicable strike price of the warrants. The net cost of the Note Hedge Transactions, after being partially offset by the proceeds from the sale of the warrants, was approximately \$33.0 million.

In connection with establishing their initial hedge of these convertible note hedge and warrant transactions, the Option Counterparties have entered into various derivative transactions with respect to our common stock and/or purchase shares of our common stock or other securities, including the Notes, concurrent with, or shortly after, the pricing of the Notes. In addition, the Option Counterparties may modify their hedge positions by entering into or unwinding various derivative transactions with respect to our common stock or by selling our common stock or other securities, including the Notes, in secondary market transactions (and may do so during any observation period related to the conversion of the Notes). These activities could adversely impact the value of our common stock and the Notes.

We may not be able to pay our debt and other obligations.

If our cash flow is inadequate to meet our obligations, we could face substantial liquidity problems. If we are unable to generate sufficient cash flow or otherwise obtain funds necessary to make required payments on the Notes or certain of our other obligations, we would be in default under the terms thereof, which would permit the holders of those obligations to accelerate their maturity and also could cause defaults under future indebtedness we may incur. Any such default could have a material adverse effect on our business, prospects, financial position and operating results. In addition, we cannot be certain that we would be able to repay amounts due on the Notes if those obligations were to be accelerated following the occurrence of any other event of default as defined in the instruments creating those obligations, or if the holders of the Notes require us to repurchase the Notes upon the occurrence of a fundamental change involving us. Moreover, we cannot be certain that we will have sufficient funds or will be able to arrange for financing to pay the principal amount due on the Notes at maturity.

Restrictive covenants in the agreement governing our senior secured revolving credit facility may restrict our ability to pursue business strategies.

The agreement governing our senior secured revolving credit facility limits our ability, among other things, to: incur additional secured indebtedness; sell, transfer, license or dispose of assets; consolidate or merge; enter into transactions with our affiliates; and incur liens. In addition, our senior secured revolving credit facility contains financial and other restrictive covenants that limit our ability to engage in activities that may be in our long term best interest, such as, subject to permitted exceptions, making capital expenditures in excess of certain thresholds, making investments, loans and other advances, and prepaying any additional indebtedness while our indebtedness under our senior secured revolving credit facility is outstanding. Our failure to comply with financial and other restrictive covenants could result in an event of default, which if not cured or waived, could result in the lenders requiring immediate payment of all outstanding borrowings or foreclosing on collateral pledged to them to secure the indebtedness.

Our business may suffer if we are unable to attract and retain key employees.

Competition for employees with skills we require is intense in the high technology industry. Our success will depend on our ability to attract and retain key technical employees. The loss of one or more key or other employees, a decrease in our ability to attract additional qualified employees, or the delay in hiring key personnel could each have a material adverse effect on our business, results of operations or financial condition.

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Our operations, and the operations of our customers and suppliers, are subject to risks of natural catastrophic events, widespread health epidemics, acts of war, terrorist attacks and the threat of domestic and international terrorist attacks, any one of which could result in cancellation of orders, delays in deliveries or other business activities, or loss of customers and could negatively affect our business and results of operations.

Our business is international in nature, with our sales, service and administrative personnel and our customers and suppliers located in numerous countries throughout the world. Our operations, and those of our customers and suppliers, are subject to disruption for a variety of reasons, including work stoppages, acts of war, terrorism, health epidemics, fires, earthquakes, hurricanes, volcanic eruptions, energy shortages, telecommunication failures, tsunamis, flooding or other natural disasters. Such disruption could materially increase our costs and expenses as well as cause delays in, among other things, shipments of products to our customers, our ability to perform services requested by our customers, or the installation and acceptance of our products at customer sites. Any of these conditions could have a material adverse effect on our business, financial condition or results of operations.

A breach of our operational or security systems could negatively affect our business and results of operations.

We rely on various information technology networks and systems, some of which are managed by third parties, to process, transmit and store electronic information, including confidential data, and to carry out and support a variety of business activities, including manufacturing, research and development, supply chain management, sales and accounting. A failure in or a breach of our operational or security systems or infrastructure, or those of our suppliers and other service providers, including as a result of cyber attacks, could disrupt our business, result in the disclosure or misuse of proprietary or confidential information, damage our reputation, cause losses and increase our costs.

We may face risks associated with shareholder activism.

Publicly traded companies have increasingly become subject to campaigns by shareholders advocating corporate actions such as financial restructuring, increased borrowing, special dividends, stock repurchases or divestitures. We may become subject in the future to such shareholder activity and demands. Such activities could interfere with our ability to execute our business plans, be costly and time-consuming, disrupt our operations, divert the attention of management or result in our initiating borrowing or increasing our share repurchase plan or dividend, any of which could have an adverse effect on our business or stock price.

Provisions of our charter and by-laws and Massachusetts law may make a takeover of Teradyne more difficult.

There are provisions in our basic corporate documents and under Massachusetts law that could discourage, delay or prevent a change in control, even if a change in control may be regarded as beneficial to some or all of our stockholders.

Item 1B: *Unresolved Staff Comments*

None.

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The following table provides information as to our principal facilities:

Location	Operating Segment	Major Activity (1)	Approximate Square Feet of Floor Space
Properties owned:			
North Reading, Massachusetts	Semiconductor Test & System Test	1-2-3-4-5	422,000
Agoura Hills, California	Semiconductor Test	3-4	120,000
Kumamoto, Japan	Semiconductor Test	2-3-4-5	60,300
			602,300
Properties leased:			
Odense, Denmark	Industrial Automation	2-3-4-5	247,000
Cebu, Philippines	Semiconductor Test	1-2-5	209,000
San Jose, California	Semiconductor Test & Wireless Test	2-3-4-5	185,700
Shanghai, China	Semiconductor Test, System Test, Wireless		
	Test & Industrial Automation	3-4-5	103,000
Buffalo Grove, Illinois	Semiconductor Test	2-3-4-5	95,000
Sunnyvale, California	Wireless Test & Semiconductor Test	2-3-4-5	71,300
Heredia, Costa Rica	Semiconductor Test	1-5	63,000
Hsinchu, Taiwan	Semiconductor Test & System Test	4	43,000
Seoul, Korea	Semiconductor Test & Industrial Automation	4	34,000
Singapore, Singapore	Semiconductor Test & Industrial Automation	1-3-4	32,700
			1,083,700

- (1) Major activities have been separated into the following categories: 1. Corporate Administration, 2. Manufacturing, 3. Engineering, 4. Sales and Marketing, 5. Storage and Distribution.

Item 3: Legal Proceedings

We are subject to legal proceedings, claims and investigations that arise in the ordinary course of business such as, but not limited to, patent, employment, commercial and environmental matters. We believe that we have meritorious defenses against all pending claims and intend to vigorously contest them. While it is not possible to predict or determine the outcomes of any pending claims or to provide possible ranges of losses that may arise, we believe the potential losses associated with all of these actions are unlikely to have a material adverse effect on our results of operations, financial condition or cash flows.

Item 4: Mine Safety Disclosure

Not Applicable.

Table of Contents**PART II****Item 5: Market for Registrant's Common Equity, Related Shareholder Matters and Issuer Purchases of Equity Securities**

Our common stock is traded on the Nasdaq Global Select Market under the trading symbol TER. Before November 27, 2018, our common stock traded on the New York Stock Exchange.

See Item 7: Management's Discussion and Analysis of Financial Condition and Results of Operations, for information on the frequency and amounts of our quarterly cash dividends, equity compensation plans and performance graph.

The following table includes information with respect to repurchases we made of our common stock during the three months ended December 31, 2018 (in thousands except per share price):

Period	(a) Total Number of Shares (or Units) Purchased	(b) Average Price Paid per Share (or Unit)	(d) Maximum Number (or Approximate Dollar Value) of Shares (or Units) that may Yet Be	
			(c) Total Number of Shares (or Units) Purchased as Part of Publicly Announced Plans or Programs	Purchased Under the Plans or Programs
October 1, 2018 – October 28, 2018	3,115	\$ 33.87	3,113	\$ 832,309
October 29, 2018 – November 25, 2018	2,386	\$ 34.54	2,383	\$ 750,000
November 26, 2018 – December 31, 2018	2,300	\$ 31.95	2,300	\$ 676,522
	7,801(1)	\$ 33.51(1)	7,796	

(1) Includes approximately five thousand shares at an average price of \$36.24 withheld from employees for the payment of taxes. We satisfy U.S. federal and state minimum withholding tax obligations due upon the vesting and the conversion of restricted stock units into shares of our common stock, by automatically withholding from the shares being issued, a number of shares with an aggregate fair market value on the date of such vesting and conversion that would satisfy the minimum withholding amount due.

Item 6: Selected Financial Data

	2018	Years Ended December 31,			2014
		2017	2016	2015	
(dollars in thousands, except per share amounts)					
Consolidated Statement of Operations Data (1)(2)(3)(4)(5):					
Revenues	\$ 2,100,802	\$ 2,136,606	\$ 1,753,250	\$ 1,639,578	\$ 1,647,824
Net income (loss)	\$ 451,779	\$ 257,692	\$ (43,421)	\$ 206,477	\$ 81,272
Net income (loss) per common share-basic	\$ 2.41	\$ 1.30	\$ (0.21)	\$ 0.98	\$ 0.40
Net income (loss) per common share-diluted	\$ 2.35	\$ 1.28	\$ (0.21)	\$ 0.97	\$ 0.37

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Cash dividend declared per common share	\$	0.36	\$	0.28	\$	0.24	\$	0.24	\$	0.18
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Consolidated Balance Sheet Data:

Total assets	\$	2,706,606	\$	3,109,545	\$	2,762,493	\$	2,548,674	\$	2,538,520
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Long-term debt obligations	\$	379,981	\$	365,987	\$	352,669	\$		\$	
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- (1) The year ended December 31, 2018 includes \$49.5 million of tax benefit related to the finalization of the U.S. transition tax liability, \$3.3 million of pension actuarial gains, and the results of operations of Mobile Industrial Robots and Energid from April 25, 2018 and February 26, 2018, respectively.

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- (2) The year ended December 31, 2017 includes \$186.0 million of provisional tax expense related to the Tax Reform Act and \$6.6 million of pension actuarial gains.
- (3) The year ended December 31, 2016 includes a \$254.9 million goodwill impairment charge and an \$83.3 million acquired intangible assets impairment charge related to the Wireless Test segment, and \$3.2 million of pension actuarial gains.
- (4) The year ended December 31, 2015 includes \$17.7 million of pension actuarial losses, a \$5.4 million gain from the sale of an equity investment and the results of operations of Universal Robots from June 12, 2015.
- (5) The year ended December 31, 2014 includes a \$98.9 million goodwill impairment charge related to the Wireless Test segment and \$46.6 million of pension actuarial losses.

Item 7: *Management's Discussion and Analysis of Financial Condition and Results of Operations*

Overview

We are a leading global supplier of automation equipment for test and industrial applications. We design, develop, manufacture and sell automatic test systems used to test semiconductors, wireless products, data storage and complex electronics systems in the consumer electronics, wireless, automotive, industrial, computing, communications, and aerospace and defense industries. Our industrial automation products include collaborative robotic arms, autonomous mobile robots and advanced robotic control software used by global manufacturing and light industrial customers to improve quality, increase manufacturing and material handling efficiency and decrease manufacturing costs. Our automatic test equipment and industrial automation products and services include:

semiconductor test (Semiconductor Test) systems;

defense/aerospace (Defense/Aerospace) test instrumentation and systems, storage test (Storage Test) systems, and circuit-board test and inspection (Production Board Test) systems (collectively these products represent System Test);

industrial automation (Industrial Automation) products; and

wireless test (Wireless Test) systems.

We have a customer base which includes integrated device manufacturers (IDMs), outsourced semiconductor assembly and test providers (OSATs), original equipment manufacturers (OEMs), wafer foundries, fabless companies that design, but contract with others for the manufacture of integrated circuits (ICs), developers of wireless devices and consumer electronics, manufacturers of circuit boards, automotive suppliers, wireless product manufacturers, storage device manufacturers, aerospace and military contractors, and distributors that sell collaborative robots, autonomous mobile robots and wireless test systems.

The market for our test products is concentrated with a limited number of significant customers accounting for a substantial portion of the purchases of test equipment. One customer drives significant demand for our products both through direct sales and sales to the customer's supply partners. We expect that sales of our test products will continue to be concentrated with a limited number of significant customers for the foreseeable future.

The sales of our products and services are dependent, to a large degree, on customers who are subject to cyclical trends in the demand for their products. These cyclical periods have had, and will continue to have, a significant effect on our business because our customers often delay or accelerate purchases in reaction to changes in their businesses and to demand fluctuations in the semiconductor and electronics industries. Historically, these demand fluctuations have resulted in significant variations in our results of operations. During the first quarter of 2018, demand outlook for mobile device test capacity in 2018 declined sharply for our Semiconductor Test business. Demand in other segments of the Semiconductor Test business, including memory test, increased in 2018.

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In 2015, we acquired Universal Robots A/S (Universal Robots), the leading supplier of collaborative robots which are low-cost, easy-to-deploy and simple-to-program robots that work side by side with production workers to improve quality, increase manufacturing efficiency and decrease manufacturing costs. The acquisition of Universal Robots provides a growth engine to our business. The total purchase price for Universal Robots was approximately \$315 million, which included cash paid of approximately \$284 million and \$32 million in fair value of contingent consideration payable upon achievement of revenue and earnings targets through 2018. Contingent consideration for 2015 was \$15 million and was paid in February 2016. Contingent consideration for the period from July 2015 to December 2017 was \$24.6 million and was paid March 2018. Contingent consideration for the period from July 2015 to December 2018 was \$3.9 million and it is expected to be paid in March 2019.

On February 26, 2018, we acquired Energid Technologies Corporation (Energid) for a total purchase price of approximately \$27.6 million. Energid s technology enables and simplifies the programming of complex robotic motions used in a wide variety of end markets, ranging from heavy industry to healthcare, utilizing both traditional robots and collaborative robots.

On April 25, 2018, we acquired Mobile Industrial Robots ApS (MiR), a Danish limited liability company. MiR is the leading maker of collaborative autonomous mobile robots for industrial applications. The total purchase price was approximately \$198 million, which included cash paid of approximately \$145 million and \$53 million in fair value of contingent consideration payable upon achievement of certain thresholds and targets for revenue and earnings before interest and taxes through 2020. At December 31, 2018, the maximum amount of contingent consideration that could be paid is \$115 million. Contingent consideration for 2018 was \$31.0 million and is expected to be paid in March 2019.

Universal Robots, MiR and Energid are included in our Industrial Automation segment.

We believe our recent acquisitions have enhanced our opportunities for growth. We intend to continue to invest in our business, grow market share in our markets and expand further our addressable markets while tightly managing our costs.

Critical Accounting Policies and Estimates

We have identified the policies discussed below as critical to understanding our business and our results of operations and financial condition. The impact and any associated risks related to these policies on our business operations is discussed throughout Management s Discussion and Analysis of Financial Condition and Results of Operations where such policies affect our reported and expected financial results.

Revenue from Contracts with Customers

We adopted Accounting Standards Codification (ASC) 606, *Revenue from Contracts with Customers* on January 1, 2018 using the modified retrospective method for all contracts not completed as of the date of adoption. The reported results for 2018 reflect the application of ASC 606 while the reported results for 2017 were prepared under the guidance of ASC 605, *Revenue Recognition*, which is also referred to herein as Legacy GAAP or the previous guidance. We recorded a net increase to retained earnings of \$12.7 million as of January 1, 2018 due to the cumulative impact of adopting ASC 606. The adoption of ASC 606 represents a change in accounting principle that will more closely align revenue recognition with the delivery of Teradyne s hardware and services and will provide financial statement readers with enhanced disclosures. In accordance with ASC 606, revenue is recognized when or as a customer obtains control of promised goods or services. The amount of revenue recognized reflects the consideration to which Teradyne expects to be entitled to receive in exchange for fulfillment of the performance obligation. Teradyne s primary source of revenue will continue to be from the sale of systems, instruments, robots, and the delivery of services.

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In accordance with ASC 606, we recognize revenues, when or as control is transferred to a customer. Our determination of revenue is dependent upon a five step process outlined below.

Step 1: Identify the contract with the customer

We account for a contract with a customer when there is written approval, the contract is committed, the rights of the parties, including payment terms, are identified, the contract has commercial substance and consideration is probable of collection.

Step 2: Identify the performance obligations in the contract

We periodically enter into contracts with customers in which a customer may purchase a combination of goods and services, such as products with extended warranty obligations. We determine performance obligations by assessing whether the products or services are distinct from the other elements of the contract. In order to be distinct, the product or service must perform either on its own or with readily available resources and must be separate within the context of the contract.

Step 3: Determine the transaction price

We consider the amount stated on the face of the purchase order to be the transaction price. We do not have variable consideration which could impact the stated purchase price agreed to by us and the customer.

Step 4: Allocate the transaction price to the performance obligations in the contract

Transaction price is allocated to each individual performance obligation based on the standalone selling price of that performance obligation. We use standalone transactions when available to value each performance obligation. If standalone transactions are not available, we will estimate the standalone selling price through market assessments or cost plus a reasonable margin analysis. Any discounts from standalone selling price are spread proportionally to each performance obligation.

Step 5: Recognize revenue when (or as) the entity satisfies a performance obligation

In order to determine the appropriate timing for revenue recognition, we first determine if the transaction meets any of three criteria for over time recognition. If the transaction meets the criteria for over time recognition, we recognize revenue as the good or service is delivered. We use input variables such as hours or months utilized or costs incurred to determine the amount of revenue to recognize in a given period. Input variables are used as they best align consumption with benefit to the customer. For transactions that do not meet the criteria for over time recognition, we will recognize revenue at a point in time based on an assessment of the five criteria for transfer of control. We have concluded that revenue should be recognized when shipped or delivered based on contractual terms. Typically acceptance of our products and services is a formality as we deliver similar systems, instruments and robots to standard specifications. In cases where acceptance is not deemed a formality, we will defer revenue recognition until customer acceptance.

Translation of Non-U.S. Currencies

The functional currency for all non-U.S. subsidiaries is the U.S. dollar, except for the Industrial Automation segment for which the local currency is its functional currency. All foreign currency denominated monetary assets and liabilities are remeasured on a monthly basis into the functional currency using exchange rates in effect at the end of the period. All foreign currency denominated non-monetary assets and liabilities are remeasured into the functional currency using historical exchange rates. Net foreign exchange gains and losses resulting from remeasurement are included in other (income) expense, net. For Industrial Automation, assets and liabilities are translated into U.S. dollars using exchange rates in effect at the end of the period. Revenues and expense amounts are translated using an average of exchange rates in effect during the period. Translation adjustments are recorded within accumulated other comprehensive income (loss).

Table of Contents***Retirement and Postretirement Plans***

We recognize net actuarial gains and losses and the change in the fair value of the plan assets in our operating results in the year in which they occur or upon any interim remeasurement of the plans. We calculate the expected return on plan assets using the fair value of the plan assets. Actuarial gains and losses are generally measured annually as of December 31 and, accordingly, recorded during the fourth quarter of each year or upon any interim remeasurement of the plans.

In March 2017, the Financial Accounting Standards Board (FASB) issued ASU 2017-07, *Compensation Retirement Benefits (Topic 715): Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost*. We retrospectively adopted the new accounting guidance on presentation of net periodic pension costs and net periodic postretirement benefit costs in the first quarter of 2018. This guidance requires the service cost component of net benefit costs to be reported in the same line item in the consolidated statement of operations as other employee compensation costs. The non-service components of net benefit costs such as interest cost, expected return on assets, amortization of prior service cost, and actuarial gains or losses, are required to be reported separately outside of income or loss from operations. Following the adoption of this guidance, we continue to record the service cost component in the same line item as other employee compensation costs and the non-service components of net benefit costs such as interest cost, expected return on assets, amortization of prior service cost, and actuarial gains or losses are reported within other (income) expense, net. In 2017 and 2016, the retrospective adoption of this standard decreased income from operations by \$5.0 million and \$3.0 million, respectively, due to the reclass of net actuarial pension gains and increased non-operating (income) expense by the same amount with no impact to net income (loss).

Inventories

Inventories are stated at the lower of cost (first-in, first-out basis) or net realizable value. On a quarterly basis, we use consistent methodologies to evaluate all inventories for net realizable value. We record a provision for both excess and obsolete inventory when such write-downs or write-offs are identified through the quarterly review process. The inventory valuation is based upon assumptions about future demand, product mix, and possible alternative uses.

Equity Incentive and Stock Purchase Plans

Stock-based compensation expense is based on the grant-date fair value estimated in accordance with the provisions of ASC 718, *Compensation Stock Compensation*. Upon adoption of ASU 2016-09, *Compensation-Stock Compensation (Topic 718): Improvements to Employee Share-Based Payment Accounting*, in the first quarter of 2017, we made an accounting policy election to continue accounting for forfeitures by applying an estimated forfeiture rate and recognizing compensation costs only for those stock-based compensation awards expected to vest. In accordance with ASU 2016-09, starting in the first quarter of 2017, excess tax benefits or tax deficiencies are recognized as a discrete tax benefit or discrete tax expense to the current income tax provision in our consolidated statements of operations and are reported as cash flows from operating activities. On January 1, 2017, a cumulative effect adjustment of \$39.1 million for any prior year excess tax benefits or tax deficiencies not previously recorded was recorded as an increase to retained earnings and deferred tax assets. All cash payments made to taxing authorities on the employees' behalf for withheld shares are presented as financing activities on the statement of cash flows. In 2018 and 2017, we recognized a discrete tax benefit of \$7.6 million and \$6.3 million, respectively, related to net excess tax benefit.

Income Taxes

Deferred tax assets and liabilities are determined based on differences between financial reporting and tax basis of assets and liabilities and are measured using the enacted tax rates and laws that will be in effect when the differences are expected to reverse. The measurement of deferred tax assets is reduced by a valuation allowance

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if it is more likely than not that some or all of the deferred tax assets will not be realized. We performed the required assessment of positive and negative evidence regarding the realization of the net deferred tax assets in accordance with ASC 740, *Accounting for Income Taxes*. This assessment included the evaluation of scheduled reversals of deferred tax liabilities, estimates of projected future taxable income and tax-planning strategies. Although realization is not assured, based on our assessment, we concluded that it is more likely than not that such assets, net of the existing valuation allowance, will be realized.

Investments

We account for our investments in debt and equity securities in accordance with the provisions of ASC 320-10, *Investments Debt and Equity Securities*. On a quarterly basis, we review our investments to identify and evaluate those that have an indication of a potential other-than-temporary impairment. Factors considered in determining whether a loss is other-than-temporary include:

The length of time and the extent to which the market value has been less than cost;

The financial condition and near-term prospects of the issuer; and

The intent and ability to retain the investment in the issuer for a period of time sufficient to allow for any anticipated recovery in market value.

Financial Assets and Financial Liabilities

In January 2016, the FASB issued ASU 2016-01, *Financial Instruments Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities*. We adopted the new accounting guidance in the first quarter of 2018 using the modified retrospective approach. This guidance requires that changes in fair value of equity marketable securities be accounted for directly in earnings. Previously, the changes in fair value of equity marketable securities were recorded in accumulated other comprehensive income on the balance sheet. We continue to record realized gains in interest income and realized losses in interest expense. The adoption of this new accounting guidance increased the January 1, 2018 retained earnings balance by \$3.1 million and decreased the accumulated other comprehensive income balance by the same amount.

Goodwill, Intangible and Long-Lived Assets

We assess goodwill for impairment at least annually in the fourth quarter, as of December 31, on a reporting unit basis, or more frequently, when events and circumstances occur indicating that the recorded goodwill may be impaired. If the book value of a reporting unit exceeds its fair value, the implied fair value of goodwill is compared with the carrying amount of goodwill. If the carrying amount of goodwill exceeds the implied fair value, an impairment charge is recorded in an amount equal to that excess.

In the second quarter of 2016, the Wireless Test reporting unit (which is our Wireless Test operating and reportable segment) reduced headcount by 11% as a result of a sharp decline in projected demand attributable to an estimated smaller future wireless test market. The decrease in projected demand was due to lower forecasted buying from our largest Wireless Test segment customer (who had previously contributed between 51% and 73% of annual Wireless Test sales since the LitePoint acquisition in 2011) as a result of the customer's numerous operational efficiencies; slower smartphone growth rates; and a slowdown of new wireless technology adoption. We considered the headcount reduction and sharp decline in projected demand to be a triggering event for an interim goodwill impairment test. Following the interim goodwill impairment test, we recorded a goodwill impairment charge of \$254.9 million, with approximately \$8.0 million of goodwill remaining.

No goodwill impairment was identified in the fourth quarter of 2018, 2017, and 2016, as part of the annual goodwill impairment test.

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We assess the impairment of intangible and long-lived assets whenever events or changes in circumstances indicate that the carrying value may not be recoverable. Factors we consider important in the determination of an impairment include significant underperformance relative to historical or projected future operating results, significant changes in the manner that we use the acquired asset and significant negative industry or economic trends.

As a result of the interim goodwill impairment test in the second quarter of 2016 described above, we performed an impairment test of the Wireless Test segment's intangible and long-lived assets based on the comparison of the estimated undiscounted cash flows to the recorded value of the assets and recorded an \$83.3 million acquired intangible assets impairment charge, with approximately \$2.2 million of intangible assets remaining at December 31, 2018. There were no events or circumstances indicating that the carrying value of acquired intangible and long-lived assets may not be recoverable in 2018 and 2017; as such no impairment test was performed. When we determine that the carrying value of intangible and long-lived assets may not be recoverable based upon the existence of one or more of the above indicators of impairment, we measure any impairment based on a projected discounted cash flow method using a discount rate commensurate with the associated risks.

Results of Operations

The following table sets forth the percentage of total net revenues included in our consolidated statements of operations:

	Years Ended December 31,		
	2018	2017	2016
Percentage of revenues:			
Revenues:			
Products	82.3%	83.5%	82.9%
Services	17.7	16.5	17.1
Total revenues	100.0	100.0	100.0
Cost of revenues:			
Cost of products	34.6	35.6	37.6
Cost of services	7.3	7.2	7.7
Total cost of revenues (exclusive of acquired intangible assets amortization shown separately below)	41.9	42.8	45.3
Gross profit	58.1	57.2	54.7
Operating expenses:			
Selling and administrative	18.6	16.3	18.1
Engineering and development	14.4	14.4	16.7
Acquired intangible assets amortization	1.9	1.4	3.0
Restructuring and other	0.7	0.4	1.3
Goodwill impairment			14.5
Acquired intangible assets impairment			4.8
Total operating expenses	35.5	32.6	58.3
Income (loss) from operations	22.6	24.6	(3.6)
Non-operating (income) expenses:			
Interest income	(1.3)	(0.8)	(0.5)
Interest expense	1.5	1.0	0.2
Other (income) expense, net	0.1	(0.1)	(0.1)
Income (loss) before income taxes	22.3	24.5	(3.1)
Income tax provision (benefit)	0.8	12.5	(0.7)
Net income (loss)	21.5%	12.1%	(2.5)%

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Revenues for our reportable segments were as follows:

				2017-2018	2016-2017
	2018	2017	2016 (in millions)	Dollar Change	Dollar Change
Semiconductor Test	\$ 1,492.4	\$ 1,662.5	\$ 1,368.2	\$ (170.1)	\$ 294.3
Industrial Automation	261.5	170.1	99.0	91.4	71.1
System Test	216.1	192.1	189.8	24.0	2.3
Wireless Test	132.0	111.9	96.2	20.1	15.7
Corporate and Other	(1.2)			(1.2)	
	\$ 2,100.8	\$ 2,136.6	\$ 1,753.3	\$ (35.8)	\$ 383.3

The decrease in Semiconductor Test revenues of \$170.1 million, or 10%, from 2017 to 2018 was driven primarily by a decrease in sales in the mobility and microcontroller test segments, partially offset by increased sales in memory and analog test segments and an increase in service revenues. The increase in Semiconductor Test revenues of \$294.3 million, or 22%, from 2016 to 2017 was driven primarily by increased sales in the microcontroller, power management, flash memory, and automotive safety test segments and an increase in service revenues.

The increase in Industrial Automation revenues of \$91.4 million, or 54%, from 2017 to 2018 was due to higher demand for collaborative robotic arms and the acquisition of MiR, completed in April 2018. MiR added revenues of \$24.1 million in 2018. The increase in Industrial Automation revenues of \$71.1 million, or 72%, from 2016 to 2017 was due to higher demand for collaborative robotic arms.

The increase in System Test revenues of \$24.0 million, or 12%, from 2017 to 2018 was primarily due to higher system sales in Production Board Test and higher sales of 3.5 hard disk drive and system level testers in Storage Test. The increase in System Test revenues of \$2.3 million, or 1%, from 2016 to 2017 was primarily due to higher service revenue in Defense/Aerospace test instrumentation and systems.

The increase in Wireless Test revenues of \$20.1 million, or 18%, from 2017 to 2018 was primarily due to higher demand for next generation wireless products. The increase in Wireless Test revenues of \$15.7 million, or 16%, from 2016 to 2017 was primarily due to higher demand for connectivity test systems and higher service revenue.

Our reportable segments accounted for the following percentages of consolidated revenues:

	2018	2017	2016
Semiconductor Test	71%	78%	78%
Industrial Automation	12	8	6
System Test	10	9	11
Wireless Test	6	5	5
	100%	100%	100%

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Revenues by country as a percentage of total revenues were as follows (1):

	2018	2017	2016
Taiwan	25%	32%	37%
China	17	12	10
United States	13	12	13
Europe	11	8	7
Korea	8	10	8
Japan	8	8	8
Malaysia	6	6	6
Singapore	5	5	4
Philippines	4	5	3
Thailand	3	1	3
Rest of the World		1	1
	100%	100%	100%

(1) Revenues attributable to a country are based on the location of the customer site. The breakout of product and service revenues was as follows:

	2018	2017	2016	2017-2018	2016-2017
			(in millions)	Dollar Change	Dollar Change
Product revenues	\$ 1,729.6	\$ 1,784.7	\$ 1,453.2	\$ (55.1)	\$ 331.5
Service revenues	371.2	351.9	300.0	19.3	51.9
	\$ 2,100.8	\$ 2,136.6	\$ 1,753.3	\$ (35.8)	\$ 383.3

Our product revenues decreased \$55.1 million, or 3%, in 2018 from 2017 primarily due to lower sales in Semiconductor Test mobility test segment, partially offset by higher sales in Industrial Automation, System Test and Wireless Test. Service revenues increased \$19.3 million, or 5%.

Our product revenues increased \$331.5 million, or 23%, in 2017 from 2016 primarily due to higher sales across all Semiconductor Test products and higher sales in Industrial Automation. Service revenues, which are derived from the servicing of our installed base of products and include equipment maintenance contracts, repairs, extended warranties, parts sales, and applications support increased \$51.9 million, or 17%.

In 2018, no single customer accounted for more than 10% of our consolidated revenues. In 2017 and 2016, revenues from one customer accounted for 13% and 12%, respectively, of our consolidated revenues. In 2016, a different customer accounted for 12% of our consolidated revenues. In each of the years, 2018, 2017, and 2016, our five largest customers in aggregate accounted for 27%, 32%, and 36%, respectively, of our consolidated revenues. We estimate consolidated revenues driven by a single OEM customer, combining direct sales to that customer with sales to the customer's OSATs, accounted for approximately 13%, 22%, and 26% of our consolidated revenues in 2018, 2017, and 2016, respectively.

Gross Profit

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	2018	2017	2016	2017-2018	2016-2017
			(dollars in millions)	Dollar /	Dollar /
				Point	Point
				Change	Change
Gross profit	\$ 1,220.4	\$ 1,221.5	\$ 958.6	\$ (1.1)	\$ 262.9
Percent of total revenues	58.1%	57.2%	54.7%	0.9	2.5

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Gross profit as a percent of total revenues increased from 2017 to 2018 by 0.9 points, primarily due to favorable product mix in System Test, Semiconductor Test, and lower product costs in Industrial Automation.

Gross profit as a percent of total revenues increased from 2016 to 2017 by 2.5 points, as a result of a 1.5 point increase related to favorable product mix in Semiconductor Test and a 1.0 point increase due to higher sales primarily in Semiconductor Test and Industrial Automation.

The breakout of product and service gross profit was as follows:

	2018	2017	2016	2017-2018 Dollar / Point Change	2016-2017 Dollar / Point Change
	(dollars in millions)				
Product gross profit	\$ 1,002.5	\$ 1,023.7	\$ 793.2	\$ (21.2)	\$ 230.5
Percent of product revenues	58.0%	57.4%	54.6%	0.6	2.8
Service gross profit	\$ 217.9	\$ 197.7	\$ 165.4	\$ 20.2	\$ 32.3
Percent of service revenues	58.7%	56.2%	55.1%	2.5	1.1

We assess the carrying value of our inventory on a quarterly basis by estimating future demand and comparing that demand against on-hand and on-order inventory positions. Forecasted revenues information is obtained from the sales and marketing groups and incorporates factors such as backlog and future consolidated revenues. This quarterly process identifies obsolete and excess inventory. Obsolete inventory, which represents items for which there is no demand, is fully reserved. Excess inventory, which represents inventory items that are not expected to be consumed during the next twelve quarters for our Semiconductor Test, Industrial Automation and System Test segments and next four quarters for our Wireless Test segment, is written-down to estimated net realizable value.

During the year ended December 31, 2018, we recorded an inventory provision of \$11.2 million included in cost of revenues, primarily due to downward revisions to previously forecasted demand levels for certain products. Of the \$11.2 million of total excess and obsolete provisions, \$6.8 million was related to Semiconductor Test, \$2.5 million was related to Wireless Test, \$1.2 million was related to System Test, and \$0.7 million was related to Industrial Automation.

During the year ended December 31, 2017, we recorded an inventory provision of \$8.8 million included in cost of revenues, primarily due to downward revisions to previously forecasted demand levels for certain products. Of the \$8.8 million of total excess and obsolete provisions, \$4.6 million was related to Semiconductor Test, \$2.2 million was related to Wireless Test, and \$1.9 million was related to System Test.

During the year ended December 31, 2016, we recorded an inventory provision of \$17.5 million included in cost of revenues, primarily due to downward revisions to previously forecasted demand levels. Of the \$17.5 million of total excess and obsolete provisions, \$9.7 million was related to Semiconductor Test, \$7.2 million was related to Wireless Test, and \$0.6 million was related to System Test.

During the years ended December 31, 2018, 2017 and 2016, we scrapped \$7.0 million, \$14.4 million and \$15.2 million of inventory, respectively, and sold \$6.7 million, \$7.5 million and \$10.0 million of previously written-down or written-off inventory, respectively. As of December 31, 2018, we had inventory related reserves for amounts which had been written-down or written-off totaling \$100.8 million. We have no pre-determined timeline to scrap the remaining inventory.

Table of Contents**Selling and Administrative**

Selling and administrative expenses were as follows:

	2018	2017	2016	2017-2018	2016-2017
	(dollars in millions)			Change	Change
Selling and administrative	\$ 390.7	\$ 348.9	\$ 316.5	\$ 41.8	\$ 32.4
Percent of total revenues	18.6%	16.3%	18.1%		

The increase of \$41.8 million in selling and administrative expenses from 2017 to 2018 was due primarily to higher spending in Industrial Automation related to higher sales and marketing spending in Universal Robots and due to the acquisitions of MiR and Energid in 2018, partially offset by lower variable compensation across all segments.

The increase of \$32.4 million in selling and administrative expenses from 2016 to 2017 was due primarily to higher variable compensation across all segments and higher spending in Universal Robots, partially offset by lower spending in Wireless Test.

Engineering and Development

Engineering and development expenses were as follows:

	2018	2017	2016	2017-2018	2016-2017
	(dollars in millions)			Change	Change
Engineering and development	\$ 301.5	\$ 307.3	\$ 292.2	\$ (5.8)	\$ 15.1
Percent of total revenues	14.4%	14.4%	16.7%		

The decrease of \$5.8 million in engineering and development expenses from 2017 to 2018 was due primarily to lower spending in System Test and Semiconductor Test, and lower variable compensation, partially offset by higher spending in Industrial Automation.

The increase of \$15.1 million in engineering and development expenses from 2016 to 2017 was due primarily to higher variable compensation across all segments and higher spending in System Test and Industrial Automation, partially offset by lower spending in Wireless Test and Semiconductor Test.

Acquired Intangible Assets Amortization

Acquired intangible assets amortization expense was as follows:

	2018	2017	2016	2017-2018	2016-2017
	(dollars in millions)			Change	Change
Acquired intangible assets amortization	\$ 39.2	\$ 30.5	\$ 52.6	\$ 8.7	\$ (22.1)
Percent of total revenues	1.9%	1.4%	3.0%		

Acquired intangible assets amortization expense increased from 2017 to 2018 primarily due to Industrial Automation segment acquisitions of MiR and Energid in 2018.

Acquired intangible assets amortization expense decreased from 2016 to 2017 primarily in the Wireless Test segment due to the impairment of acquired intangible assets in the second quarter of 2016 and in the Industrial Automation segment due to intangible assets that became fully amortized in June 2017.

Table of Contents**Goodwill Impairment**

We assess goodwill for impairment at least annually, in the fourth quarter, as of December 31, or on an interim basis between annual tests when events or circumstances indicate that it is more likely than not that the fair value of a reporting unit is less than its carrying value. In the second quarter of 2016, the Wireless Test reporting unit (which is our Wireless Test operating and reportable segment) reduced headcount by 11% as a result of a sharp decline in projected demand attributable to an estimated smaller future wireless test market. The decrease in projected demand was due to lower forecasted buying from our largest Wireless Test segment customer (which had contributed between 51% and 73% of annual Wireless Test sales since the LitePoint acquisition in 2011 through 2015) as a result of the customer's numerous operational efficiencies; slower smartphone growth rates; and a slowdown of new wireless technology adoption. We considered the headcount reduction and sharp decline in projected demand to be a triggering event for an interim goodwill impairment test. Following the interim goodwill impairment test, we recorded a goodwill impairment charge of \$254.9 million in the second quarter of 2016. The fourth quarter 2018, 2017 and 2016 goodwill impairment tests did not identify any goodwill impairments.

Acquired Intangible Assets Impairment

We review long-lived assets for impairment whenever events or changes in business circumstances indicate that the carrying amount of the assets may not be fully recoverable or that the useful lives of these assets are no longer appropriate. If undiscounted cash flows for the asset are less than the carrying amount, the asset is written down to its estimated fair value based on a discounted cash flow analysis. The cash flow estimates used to determine the impairment contain management's best estimates using appropriate assumptions and projections at that time. As a result of the Wireless Test segment goodwill impairment charge in the second quarter of 2016, we performed an impairment test of the Wireless Test segment's intangible and long-lived assets based on a comparison of the estimated undiscounted cash flows to the recorded value of the assets. As a result of the analysis, we recorded an \$83.3 million impairment charge in the second quarter of 2016 in acquired intangible assets impairment on the statements of operations.

Restructuring and Other

During the year ended December 31, 2018, we recorded an expense of \$17.7 million for the increase in the fair value of the MiR contingent consideration liability, \$8.7 million of severance charges related to headcount reductions primarily in Semiconductor Test, and \$4.5 million for acquisition related expenses and compensation, partially offset by a gain of \$16.7 million from the decrease in the fair value of the Universal Robots contingent consideration liability.

During the year ended December 31, 2017, we recorded an expense of \$7.8 million for the increase in the fair value of the Universal Robots contingent consideration liability, \$3.8 million of severance charges related to headcount reductions primarily in Semiconductor Test, \$1.1 million for an impairment of fixed assets in Semiconductor Test, \$1.0 million for a lease impairment of a Wireless Test facility in Sunnyvale, CA, which was terminated in September 2017, and \$0.8 million of expenses related to an earthquake in Kumamoto, Japan, partially offset by \$5.1 million of property insurance recovery related to the Japan earthquake.

During the year ended December 31, 2016, we recorded an expense of \$15.9 million for the increase in the fair value of the contingent consideration liability, of which \$15.3 million was related to Universal Robots and \$0.6 million was related to Avionics Interface Technologies, LLC (AIT), \$6.0 million of severance charges related to headcount reductions primarily in Wireless Test, \$4.2 million for an impairment of fixed assets, and \$0.9 million for expenses related to an earthquake in Kumamoto, Japan, partially offset by \$5.1 million of property insurance recovery related to the Japan earthquake.

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The remaining accrual for severance of \$1.0 million is reflected in the accrued employees' compensation and withholdings on the balance sheet and is expected to be paid by April 2019.

Interest and Other

	2018	2017	2016 (in millions)	2017-2018 Change	2016-2017 Change
Interest income	\$ (26.7)	\$ (17.8)	\$ (9.3)	\$ (8.9)	\$ (8.5)
Interest expense	31.3	21.7	3.6	9.6	18.1
Other (income) expense, net	1.4	(2.9)	(2.3)	4.3	(0.6)

Interest income increased by \$8.9 million from 2017 to 2018 due primarily to higher interest rates and realized gains on sales of marketable securities. Interest income increased by \$8.5 million from 2016 to 2017 due primarily to higher cash and marketable securities balances and higher interest rates.

Interest expense increased by \$9.6 million from 2017 to 2018 due primarily to recognizing unrealized losses on equity marketable securities, and by \$18.1 million from 2016 to 2017 due primarily to interest expense related to our convertible senior notes.

Other (income) expense, net changed by \$4.3 million, from \$2.9 million income in 2017 to \$1.4 million expense in 2018 due primarily to lower pension actuarial gains in 2018, and higher foreign exchange losses, partially offset by lower non service pension costs. Other (income) expense, net decreased by \$0.6 million from 2016 to 2017 due primarily to pension actuarial gains.

Income (Loss) Before Income Taxes

	2018	2017	2016 (in millions)	2017-2018 Change	2016-2017 Change
Semiconductor Test	\$ 397.6	\$ 491.4	\$ 311.9	\$ (93.8)	\$ 179.5
System Test	48.9	10.3	28.9	38.6	(18.6)
Wireless Test	29.1	17.4	(371.4)	11.7	388.8
Industrial Automation	7.7	8.8	(16.8)	(1.1)	25.6
Corporate and Other (1)	(15.4)	(3.4)	(7.7)	(12.1)	4.4
	\$ 467.8	\$ 524.4	\$ (55.1)	\$ (56.6)	\$ 579.5

(1) Included in Corporate and Other are the following: contingent consideration adjustments, pension and postretirement plans actuarial (gains) and losses, impairment of fixed assets and expenses related to the Japan earthquake, property insurance recovery and proceeds, interest (income) and expense, net foreign exchange (gains) and losses, intercompany eliminations and acquisition related charges. The decrease in income before income taxes in Semiconductor Test from 2017 to 2018 was driven primarily by a decrease in sales in the mobility and microcontroller test segments, partially offset by an increase in memory and analog test segments sales and an increase in service revenues. The increase in income before income taxes in System Test from 2017 to 2018 was primarily due to higher system sales in Production Board Test, and higher sales of 3.5" hard disk drive and system level testers in Storage Test. The increase in income before income taxes in Wireless Test from 2017 to 2018 was primarily due to higher demand for next generation wireless products. The decrease in income before income taxes in Industrial Automation from 2017 to 2018 was due primarily to increased intangible assets amortization expense from the acquisitions of MiR and Energid in 2018.

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The increase in income before income taxes in Semiconductor Test from 2016 to 2017 was driven primarily by increased sales and higher gross margin due to favorable product mix. The increase in income before income taxes in Wireless Test from 2016 to 2017 was primarily due to goodwill and intangible assets impairment charges in 2016, lower intangible assets amortization, lower operating expenses, higher demand for connectivity test systems and higher service revenue in 2017. The decrease in income before income taxes in System Test from 2016 to 2017 was primarily due to lower sales in Storage Test of 3.5 hard disk drive testers for cloud storage and increased spending for new product development. The increase in income before income taxes in Industrial Automation was due primarily to higher demand for collaborative robots.

Income Taxes

Income tax expense for 2018 and 2017 totaled \$16.0 and \$266.7 million, respectively. Income tax benefit for 2016 totaled \$11.6 million. The effective tax rate for 2018, 2017 and 2016 was 3.4%, 50.9%, and 21.1%, respectively.

The increase in the effective tax rate from 2016 to 2017 and the decrease in the effective tax rate from 2017 to 2018 are primarily attributable to the effect of changes in U.S. Federal tax law. On December 22, 2017, the U.S. enacted the Tax Cuts and Jobs Act of 2017 (the Tax Reform Act), making significant changes to the Internal Revenue Code. Among other changes, the Tax Reform Act permanently reduces the corporate tax rate from 35% to 21% effective for tax years beginning after December 31, 2017, shifts the U.S. tax regime from a worldwide system to a modified territorial tax system and requires companies to pay a transition tax on earnings of certain foreign subsidiaries that were previously tax deferred.

We recorded a provisional amount of \$186.0 million of additional income tax expense in the fourth quarter of 2017 which represented our best estimate of the impact of the Tax Reform Act in accordance with our understanding of the Tax Reform Act and available guidance as of that date. The \$186.0 million is primarily composed of expense of \$161.0 million related to the one-time transition tax on the mandatory deemed repatriation of foreign earnings, \$33.6 million of expense related to the remeasurement of certain deferred tax assets and liabilities based on the rates at which they are expected to reverse in the future, and benefit of \$10.3 million associated with the impact of correlative adjustments on uncertain tax positions. In accordance with the requirements of SEC Staff Accounting Bulletin (SAB) No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act, in the fourth quarter of 2018, we completed our analysis of the effect of the Tax Reform Act based on the application of the most recently available guidance as of December 31, 2018 and recorded \$49.5 million of net income tax benefit. The net benefit consisted of \$51.7 million of benefit resulting from a reduction in the estimate of the one-time transition tax on the mandatory deemed repatriation of foreign earnings and an expense of \$2.2 million associated with the impact of correlative adjustments on uncertain tax positions.

The change in the effective tax rate from 2017 to 2018 was also impacted by a shift in the geographic distribution of income which increased income subject to taxation in the U.S. relative to lower tax rate jurisdictions, the benefit of the U.S. foreign derived intangible income deduction and increases in discrete benefit from non-taxable foreign exchange gains and losses.

The change in the effective rate from 2016 to 2017 was also impacted by the U.S. non-deductible goodwill impairment charge recorded in 2016, a shift in the geographic distribution of income which increased income subject to taxation in the U.S. relative to lower tax rate jurisdictions, decreases in the discrete benefits from tax reserve releases, increases in discrete expense from non-taxable foreign exchange gains and losses and an increase in the discrete benefit from stock-based compensation.

We qualify for a tax holiday in Singapore by fulfilling the requirements of an agreement with the Singapore Economic Development Board under which certain headcount and spending requirements must be met. The tax savings attributable to the Singapore tax holiday for the years ended December 31, 2018, 2017 and 2016 were \$11.9 million or \$0.06 per diluted share, \$24.8 million or \$0.12 per diluted share and \$17.0 million or \$0.08 per diluted share, respectively. The tax holiday is scheduled to expire on December 31, 2020.

Table of Contents**Contractual Obligations**

The following table reflects our contractual obligations as of December 31, 2018:

	Total	Payments Due by Period				Other
		Less than 1 year	1-3 years (in thousands)	3-5 years	More than 5 years	
Convertible debt	\$ 460,000	\$	\$	\$ 460,000	\$	\$
Purchase obligations	242,052	232,533	9,519			
Retirement plans contributions	122,294	4,919	10,455	10,136	96,784	
Transition tax payable (1)	91,186	7,295	14,590	14,590	54,711	
Operating lease obligations	76,055	19,570	31,871	15,142	9,472	
Interest on long term debt	28,750	5,750	11,500	11,500		
Fair value of contingent consideration	70,543	34,865	35,678			
Other long-term liabilities reflected on the balance sheet under GAAP (2)	90,959		27,631	5,119		58,209
Total	\$ 1,181,839	\$ 304,932	\$ 141,244	\$ 516,487	\$ 160,967	\$ 58,209

- (1) Represents the transition tax liability associated with our accumulated foreign earnings as a result of enactment of the Tax Reform Act on December 22, 2017.
- (2) Included in other long-term liabilities are liabilities for customer advances, extended warranty, uncertain tax positions, deferred tax liabilities and other obligations. For certain long-term obligations, we are unable to provide a reasonably reliable estimate of the timing of future payments relating to these obligations and therefore we included these amounts in the column marked Other.

Liquidity and Capital Resources

Our cash, cash equivalents and marketable securities balance decreased by \$699 million from 2017 to 2018 to \$1,205 million.

Operating activities during 2018 provided cash of \$476.9 million. Changes in operating assets and liabilities used cash of \$163.5 million. This was due to a \$105.8 million increase in operating assets and a \$57.7 million decrease in operating liabilities.

The increase in operating assets was due to a \$58.4 million increase in prepayments and other assets due primarily to payments to our contract manufacturers, a \$29.5 million increase in inventories, and a \$17.9 million increase in accounts receivable due to higher sales in the fourth quarter of 2018 comparing to 2017.

The decrease in operating liabilities was due to a \$80.4 million decrease in income taxes, primarily related to a decrease in our transitional tax liability associated with our accumulated foreign earnings under the U.S. Tax Reform Act, a \$5.5 million decrease in other accrued liabilities and \$4.3 million of retirement plans contributions, partially offset by a \$13.4 million increase in customer advance payments and deferred revenue, a \$12.9 million increase in accounts payable, and a \$6.3 million increase in accrued employee compensation due primarily to variable compensation.

Investing activities during 2018 provided cash of \$923.0 million, due to \$1,270.4 million and \$846.1 million in proceeds from maturities and sales of marketable securities, respectively, proceeds from a government subsidy of \$7.9 million for property, plant and equipment, and proceeds from life insurance of \$1.1 million related to the cash surrender value from the cancellation of a Teradyne owned life insurance policy, partially offset by \$918.7 million used for purchase of marketable securities, \$169.5 million used for acquisition of MiR and Energid, and \$114.4 million used for purchases of property, plant and equipment.

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Financing activities during 2018 used cash of \$903.4 million, due to \$823.5 million used for the repurchase of 21.6 million shares of common stock at an average price of \$38.06 per share, \$67.3 million used for dividend payments, \$20.0 million used for payments related to net settlement of employee stock compensation awards, and \$13.6 million used for a payment related to Universal Robots acquisition contingent consideration, partially offset by \$21.0 million from the issuance of common stock under employee stock purchase and stock option plans.

Operating activities during 2017 provided cash of \$626.5 million. Changes in operating assets and liabilities provided cash of \$183.1 million. This was due to a \$33.4 million increase in operating assets and a \$216.5 million increase in operating liabilities.

The increase in operating assets was due to an \$80.6 million increase in accounts receivable due to higher sales, partially offset by a \$45.0 million decrease in inventories and a \$2.3 million decrease in prepayments and other assets.

The increase in operating liabilities was due to a \$173.8 million increase in income taxes, primarily related to the estimated impact of U.S. Tax Reform Act, a \$30.9 million increase in accrued employee compensation due primarily to variable compensation, a \$24.0 million increase in other accrued liabilities, and a \$5.0 million increase in customer advance payments and deferred revenue, partially offset by an \$11.3 million decrease in accounts payable and \$5.9 million of retirement plans contributions.

Investing activities during 2017 used cash of \$262.8 million, due to \$1,391.9 million used for purchases of marketable securities and \$105.4 million used for purchases of property, plant and equipment, partially offset by proceeds from maturities and sales of marketable securities of \$701.7 million and \$527.7 million, respectively, and proceeds from property insurance of \$5.1 million related to the Japan earthquake.

Financing activities during 2017 used cash of \$245.2 million, due to \$200.3 million used for repurchase of 5.8 million shares of common stock at an average price of \$34.30 per share, \$55.4 million used for dividend payments, \$12.9 million used for payments related to net settlement of employee stock compensation awards, and \$1.1 million used for a payment related to AIT acquisition contingent consideration, partially offset by \$24.5 million from the issuance of common stock under employee stock purchase and stock option plans.

Operating activities during 2016, provided cash of \$455.2. Changes in operating assets and liabilities provided cash of \$49.0 million. This was due to a \$33.4 million decrease in operating assets and a \$15.6 million increase in operating liabilities.

The decrease in operating assets was due to an \$18.3 million decrease in accounts receivable due to increased collections and a \$34.3 million decrease in inventories, partially offset by a \$19.2 million increase in prepayments and other assets.

The increase in operating liabilities was due to an \$18.4 million increase in income taxes, a \$3.9 million increase in accounts payable, and a \$6.7 million increase in other accrued liabilities, partially offset by a \$3.8 million decrease in accrued employee compensation due primarily to variable compensation, \$6.0 million of retirement plans contributions and a \$3.6 million decrease in customer advance payments and deferred revenue.

Investing activities during 2016 used cash of \$640.5 million, due to \$1,656.3 million used for purchases of marketable securities and \$85.3 million used for purchases of property, plant and equipment, partially offset by proceeds from maturities and sales of marketable securities of \$243.2 million and \$852.8 million, respectively, and proceeds from property insurance of \$5.1 million related to the Japan earthquake.

Financing activities during 2016 provided cash of \$228.4 million, due to \$450.8 million of proceeds from the issuance of senior convertible notes, net of issuance costs, \$67.9 million of proceeds from the issuance of

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warrants, \$20.5 million from the issuance of common stock under employee stock purchase and stock option plans, and \$6.2 million from the tax benefit related to employee stock compensation awards, partially offset by \$146.3 million used for the repurchase of 6.8 million shares of common stock at an average price of \$21.39 per share, \$100.8 million used for the purchase of convertible note hedges, \$48.6 million used for dividend payments, \$11.7 million used for a payment related to the Universal Robots acquisition contingent consideration and \$9.4 million used for payments related to net settlement of employee stock compensation awards.

In January 2018, May 2018, August 2018 and November 2018, our Board of Directors declared a quarterly cash dividend of \$0.09 per share. Total dividend payments in 2018 were \$67.3 million.

In January 2017, May 2017, August 2017 and November 2017, our Board of Directors declared a quarterly cash dividend of \$0.07 per share. Total dividend payments in 2017 were \$55.4 million.

In January 2016, May 2016, August 2016 and November 2016, our Board of Directors declared a quarterly cash dividend of \$0.06 per share. Total dividend payments in 2016 were \$48.6 million.

In January 2019, our Board of Directors declared a quarterly cash dividend of \$0.09 per share to be paid on March 22, 2019 to shareholders of record as of February 22, 2019. Payment of future cash dividends are subject to the discretion of our Board of Directors and will depend, among other things, upon our earnings, capital requirements and financial condition.

In January 2015, our Board of Directors cancelled the November 2010 stock repurchase program and authorized a new stock repurchase program for up to \$500 million of common stock. In 2016, we repurchased 6.8 million shares of common stock at an average price of \$21.39, for a total cost of \$146.3 million. The cumulative repurchases as of December 31, 2016 totaled 22.5 million shares of common stock for \$446 million at an average price per share of \$19.87.

In December 2016, our Board of Directors cancelled the January 2015 stock repurchase program and approved a new \$500 million share repurchase authorization which commenced on January 1, 2017. The cumulative repurchases as of December 31, 2017 totaled 5.8 million shares of common stock for \$200.3 million at an average price per share of \$34.30.

In January 2018, our Board of Directors cancelled the December 2016 stock repurchase program and authorized a new stock repurchase program for up to \$1.5 billion of common stock. The cumulative repurchases as of December 31, 2018 totaled 21.6 million shares of common stock for \$823.5 million at an average price per share of \$38.06. We intend to repurchase \$500 million in 2019.

We believe our cash, cash equivalents and marketable securities balance will be sufficient to pay our quarterly dividend, execute our authorized share repurchase program and meet our working capital and expenditure needs for at least the next twelve months. We also have a \$350 million revolving credit facility. As of March 1, 2019 we have not borrowed any funds under this credit facility. Inflation has not had a significant long-term impact on earnings.

Retirement Plans

ASC 715-20, *Compensation Retirement Benefits Defined Benefit Plans*, requires an employer with defined benefit plans or other postretirement benefit plans to recognize an asset or a liability on its balance sheet for the overfunded or underfunded status of the plans as defined by ASC 715-20. The pension asset or liability represents the difference between the fair value of the pension plan's assets and the projected benefit obligation as of December 31. For other postretirement benefit plans, the liability is the difference between the fair value of the plan's assets and the accumulated postretirement benefit obligation as of December 31.

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For the year ended December 31, 2018, our pension expense, which includes the U.S. Qualified Pension Plan (U.S. Plan), certain qualified plans for non-U.S. subsidiaries, and a U.S. Supplemental Executive Defined Benefit Plan, was approximately \$0.3 million. Pension expense or income is calculated based upon a number of actuarial assumptions. Discount rate and expected return on assets are two assumptions which are important elements of pension plan expense (income) and asset/liability measurement. We evaluate our discount rate and expected rate of return on assets assumptions annually on a plan and country specific basis. We evaluate other assumptions related to demographic factors, such as retirement age, mortality and turnover periodically, and update them to reflect our experience and expectations for the future.

In developing the expected return on U.S. Plan assets assumption, we evaluated input from our investment manager and pension consultants, including their forecast of asset class return expectations. We believe that 4.25% was an appropriate rate of return on assets to use for 2018. The December 31, 2018 asset allocation for our U.S. Plan was 94% invested in fixed income securities, 5% invested in equity securities, and 1% invested in other securities. Our investment manager regularly reviews the actual asset allocation and periodically rebalances the portfolio to ensure alignment with our target allocations.

We recognize net actuarial gains and losses and the change in the fair value of plans assets in our operating results in the year in which they occur or upon any interim remeasurement of the plans. We calculate the expected return on plan assets using the fair value of the plan assets. Actuarial gains and losses are generally measured annually as of December 31 and, accordingly, recorded during the fourth quarter of each year or upon any interim remeasurement of the plans.

The discount rate that we utilized for determining future pension obligations for the U.S. Plan is based on the FTSE Pension Index adjusted for the U.S. Plan's expected cash flows and was 4.15% at December 31, 2018, up from 3.40% at December 31, 2017. We estimate that in 2019 we will recognize approximately \$0.4 million of pension expense for the U.S. Plan. The U.S. Plan pension expense estimate for 2019 is based on a 4.15% discount rate and a 4.25% return on assets. Future pension expense or income will depend on future investment performance, changes in future discount rates and various other factors related to the employee population participating in our pension plans.

As of December 31, 2018, our pension plans had unrecognized pension prior service cost of \$0.1 million.

We performed a sensitivity analysis, which expresses the potential U.S. Plan (income) expense for the year ending December 31, 2019, which would result from changes to either the discount rate or the expected return on plan assets. The below estimates exclude the impact of any potential actuarial gains or losses. It is difficult to reliably forecast or predict whether there will be any actuarial gains or losses in 2019 as they are primarily driven by events and circumstances beyond our control, such as changes in interest rates and the performance of the financial markets.

Return on Plan Assets	Discount Rate		
	3.65%	4.15%	4.65%
	(in millions)		
3.75%	\$ 0.9	\$ 1.1	\$ 1.2
4.25%	0.2	0.4	0.5
4.75%	(0.5)	(0.3)	(0.2)

The assets of the U.S. Plan consist substantially of fixed income securities. U.S. Plan assets have decreased from \$324.5 million at December 31, 2017 to \$144.3 million at December 31, 2018 while the U.S. Plan's liability decreased from \$307.0 million at December 31, 2017 to \$127.4 million at December 31, 2018. The decrease in assets and liabilities for the U.S. Plan is due primarily to the purchase of a group annuity insurance contract in 2018. Under the group annuity, the accrued pension obligations for approximately 1,700 retiree participants were transferred to an insurance company. The reduction in the pension benefit obligation and pension assets was \$151.3 million. We recorded a settlement loss of \$0.3 million related to the retiree group annuity transaction.

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Our funding policy is to make contributions to our pension plans in accordance with local laws and to the extent that such contributions are tax deductible. During 2018, we made contributions of \$2.6 million to the U.S. supplemental executive defined benefit pension plan, and \$0.8 million to certain qualified plans for non-U.S. subsidiaries. In 2019, we expect to contribute approximately \$2.7 million to the U.S. supplemental executive defined benefit pension plan. Contributions to be made in 2019 to certain qualified plans for non-U.S. subsidiaries are based on local statutory requirements and are estimated at approximately \$0.9 million.

Equity Compensation Plans

In addition to our 1996 Employee Stock Purchase Plan discussed in Note O: *Stock-Based Compensation* in Notes to Consolidated Financial Statements, we have a 2006 Equity and Cash Compensation Incentive Plan (the 2006 Equity Plan) under which equity securities are authorized for issuance. The 2006 Equity Plan was initially approved by stockholders on May 25, 2006.

At our annual meeting of stockholders held May 21, 2013, our stockholders approved an amendment to the 2006 Equity Plan to increase the number of shares issuable thereunder by 10.0 million, for an aggregate of 32.0 million shares issuable thereunder, and our stockholders also approved an amendment to our 1996 Employee Stock Purchase Plan to increase the number of shares issuable thereunder by 5.0 million, for an aggregate of 30.4 million shares issuable thereunder. At our annual meeting of stockholders held May 12, 2015, our stockholders approved an amendment to the 2006 Equity Plan to extend its term until May 12, 2025.

The following table presents information about these plans as of December 31, 2018 (share numbers in thousands):

Plan category	Number of securities to be issued upon exercise of outstanding options, warrants and rights	Weighted-average exercise price of outstanding options, warrants and rights	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in column one)
Equity plans approved by shareholders	2,785(1)	\$ 27.82	10,377(2)
Equity plans not approved by shareholders (3)	175	2.49	
Total	2,960	19.06	10,377

- (1) Includes 2,454,259 shares of restricted stock units that are not included in the calculation of the weighted average exercise price.
- (2) Consists of 7,873,477 securities available for issuance under the 2006 Equity Plan and 2,504,492 of securities available for issuance under the Employee Stock Purchase Plan.
- (3) In connection with the 2011 acquisition of LitePoint Corporation (the LitePoint Acquisition), we assumed the options granted under the LitePoint Corporation 2002 Stock Plan (the LitePoint Plan). Upon the consummation of the LitePoint Acquisition, these options were converted automatically into options to purchase an aggregate of 2,828,344 shares of our common stock. No additional awards were granted under the LitePoint Plan. As of December 31, 2018, there were outstanding options exercisable for an aggregate of 175,168 shares of our common stock pursuant to the LitePoint Plan, with a weighted average exercise price of \$2.49 per share.

The purpose of the 2006 Equity Plan is to motivate employees, officers and directors by providing equity ownership and compensation opportunities in Teradyne. The aggregate number of shares available under the 2006 Equity Plan as of December 31, 2018 was 7,873,477 shares of our common stock. The 2006 Equity Plan authorizes the grant of stock-based awards in the form of (1) non-qualified and incentive stock options, (2) stock appreciation rights, (3) restricted stock awards and restricted stock unit awards, (4) phantom stock, and (5) other stock-based awards. Awards may be tied to time-based vesting schedules and/or performance-based vesting

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measured by reference to performance criteria chosen by the Compensation Committee of the Board of Directors, which administers the 2006 Equity Plan. Awards may be made to any employee, officer, consultant and advisor of Teradyne and our subsidiaries, as well as, to our directors. The maximum number of shares of stock-based awards that may be granted to one participant during any one fiscal year is 2,000,000 shares of common stock.

As of December 31, 2018, total unrecognized compensation expense related to non-vested restricted stock units and options was \$44 million, and is expected to be recognized over a weighted average period of 2.4 years.

Performance Graph

The following graph compares the change in our cumulative total shareholder return in our common stock with (i) the NYSE Composite Index and (ii) the Morningstar Semiconductor Equipment & Materials Industry Group (compiled by Morningstar, Inc.). The comparison assumes \$100.00 was invested on December 31, 2013 in our common stock and in each of the foregoing indices and assumes reinvestment of dividends, if any. Historic stock price performance is not necessarily indicative of future price performance.

Recently Issued Accounting Pronouncements

On January 26, 2017, the FASB issued ASU 2017-04, *Intangibles Goodwill and Other (Topic 350): Simplifying the Accounting for Goodwill Impairment*. The new guidance removes Step 2 of the goodwill impairment test, which requires a hypothetical purchase price allocation. Goodwill impairment will now be the amount by which a reporting unit's carrying value exceeds its fair value, not to exceed the carrying amount of goodwill. All other goodwill impairment guidance will remain largely unchanged. Entities will continue to have the option to perform a qualitative assessment to determine if a quantitative impairment test is necessary. The same one-step impairment test will be applied to goodwill at all reporting units, even those with zero or negative carrying amounts. Entities will be required to disclose the amount of goodwill at reporting units with zero or negative carrying amounts. The revised guidance will be applied prospectively, and is effective in 2020. Early adoption is permitted for any impairment tests performed after January 1, 2017. We are currently evaluating the impact of this ASU on our financial position, results of operations and statements of cash flows.

In February 2016, the FASB issued ASU 2016-02, *Leases (Topic 842)*. The guidance in this ASU supersedes the lease recognition requirements in ASC Topic 840, *Leases*. The new standard establishes a right-of-use (ROU) model that requires a lessee to record an ROU asset and a lease liability on the balance sheet for all

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leases with terms longer than twelve months. Leases will be classified as either finance or operating, with classification affecting the pattern of expense recognition in the statements of operations. The new standard is effective for annual periods beginning after December 15, 2018 with early adoption permitted. A modified retrospective transition approach is required for lessees for capital and operating leases existing at, or entered into after, the beginning of the earliest comparative period presented in the financial statements. In July 2018, the FASB issued ASU 2018-11, Leases (Topic 842): Targeted Improvements, which amends ASU 2016-02. The new ASU offers an additional transition method by which entities may elect not to recast the comparative periods presented in financial statements in the period of adoption and allows lessors to elect a practical expedient to not separate lease and non-lease components when certain conditions are met. This ASU has the same transition requirements and effective date as ASU 2016-02. We elected not to recast the comparative periods presented in financial statements in the period of adoption. We adopted this guidance in January 2019; as a result we recorded between \$50 and \$60 million of operating lease right-of-use assets and operating lease liabilities. Adoption had an immaterial impact on our results of operations.

Item 7A: *Quantitative and Qualitative Disclosures about Market Risks*
Concentration of Credit Risk

Financial instruments which potentially subject us to concentrations of credit risk consist principally of cash equivalents, marketable securities, forward currency contracts and accounts receivable. Our cash equivalents consist primarily of money market funds invested in U.S. Treasuries and government agencies. Our fixed income available-for-sale marketable securities have a minimum rating of AA by one or more of the major credit rating agencies. We place forward currency contracts with high credit-quality financial institutions in order to minimize credit risk exposure. Concentrations of credit risk with respect to accounts receivable are limited due to the large number of geographically dispersed customers. We perform ongoing credit evaluations of our customers' financial condition and from time to time may require customers to provide a letter of credit from a bank to secure accounts receivable. There were no customers who accounted for more than 10% of our accounts receivable balance as of December 31, 2018 and December 31, 2017.

In addition to market risks, we have an equity price risk related to the fair value of our convertible senior unsecured notes issued in December 2016. In December 2016, Teradyne issued \$460 million aggregate principal amount of 1.25% convertible senior unsecured notes (the "Notes") due December 15, 2023. As of December 31, 2018, the Notes had a fair value of \$547.1 million. The table below provides a sensitivity analysis of hypothetical 10% changes of Teradyne's stock price as of the end of 2018 and the estimated impact on the fair value of the Notes. The selected scenarios are not predictions of future events, but rather are intended to illustrate the effect such event may have on the fair value of the Notes. The fair value of the Notes is subject to equity price risk due to the convertible feature. The fair value of the Notes will generally increase as Teradyne's common stock price increases and will generally decrease as the common stock price declines in value. The change in stock price affects the fair value of the convertible senior notes, but does not impact Teradyne's financial position, cash flows or results of operations due to the fixed nature of the debt obligation. Additionally, we carry the Notes at face value less unamortized discount on our balance sheet, and we present the fair value for required disclosure purposes only. In connection with the offering of the Notes we also sold warrants to the option counterparties. These transactions have been accounted for as an adjustment to our shareholders' equity. The convertible note hedge transactions are expected to reduce the potential equity dilution upon conversion of the Notes. The warrants along with any shares issuable upon conversion of the Notes will have a dilutive effect on our earnings per share to the extent that the average market price of our common stock for a given reporting period exceeds the applicable strike price or conversion price of the warrants or Notes, respectively.

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Hypothetical Change in Teradyne Stock Price	Fair Value	Estimated change in fair value	Hypothetical percentage increase (decrease) in fair value
10% Increase	\$ 581,716	\$ 34,603	6.3%
No Change	547,113		
10% Decrease	514,703	(32,410)	(5.9)

See Note H: Debt for further information.

Exchange Rate Risk Management

We regularly enter into foreign currency forward contracts to hedge the value of our monetary assets and liabilities in Japanese Yen, British Pound, Korean Won, Taiwan Dollar, Singapore Dollar, Euro, Philippine Peso and Chinese Yuan. These foreign currency forward contracts have maturities of approximately one month. These contracts are used to minimize the effect of exchange rate fluctuations associated with the remeasurement of monetary assets and liabilities. We do not engage in currency speculation.

We performed a sensitivity analysis assuming a hypothetical 10% fluctuation in foreign exchange rates to the hedging contracts and the underlying exposures described above. As of December 31, 2018, 2017, and 2016, the analysis indicated that these hypothetical market movements would not have a material effect on our consolidated financial position, results of operations or cash flows.

Interest Rate Risk Management

We are exposed to potential losses due to changes in interest rates. Our interest rate exposure is primarily in the Netherlands, United States and Singapore related to short-term and long-term marketable securities.

In order to estimate the potential loss due to interest rate risk, a fluctuation in interest rates of 25 basis points was assumed. Market risk for the short and long-term marketable securities was estimated as the potential change in the fair value resulting from a hypothetical change in interest rates for securities contained in the investment portfolio. The potential change in the fair value from changes in interest rates is immaterial as of December 31, 2018 and 2017.

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**Item 8: *Financial Statements and Supplementary Data*
Report of Independent Registered Public Accounting Firm**

To the Board of Directors and Shareholders of Teradyne, Inc.:

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Teradyne, Inc. and its subsidiaries (the Company) as of December 31, 2018 and 2017, and the related consolidated statements of operations, comprehensive income (loss), shareholders' equity and cash flows for each of the three years in the period ended December 31, 2018, including the related notes and schedule of valuation and qualified accounts for each of the three years in the period ended December 31, 2018 appearing under Item 15(c) (collectively referred to as the consolidated financial statements). We also have audited the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Change in Accounting Principle

As discussed in Note B to the consolidated financial statements, the Company changed the manner in which it accounts for revenue from contracts with customers in 2018.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in Management's Annual Report on Internal Control over Financial Reporting appearing under Item 9A. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (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 audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements 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. 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 audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

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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 (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) 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 (iii) 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/ PricewaterhouseCoopers LLP

Boston, Massachusetts

March 1, 2019

We have served as the Company's auditor since 1968.

Table of Contents**TERADYNE, INC.****CONSOLIDATED BALANCE SHEETS**

	December 31, 2018 2017 (in thousands, except per share information)	
ASSETS		
Current assets:		
Cash and cash equivalents	\$ 926,752	\$ 429,843
Marketable securities	190,096	1,347,979
Accounts receivable, less allowance for doubtful accounts of \$1,673 and \$2,219 in 2018 and 2017, respectively	291,267	272,783
Inventories, net	153,541	107,525
Prepayments and other current assets	170,826	112,151
Total current assets	1,732,482	2,270,281
Property, plant and equipment, net	279,821	268,447
Marketable securities	87,731	125,926
Deferred tax assets	70,848	84,026
Retirement plans assets	16,883	17,491
Other assets	11,509	12,275
Acquired intangible assets, net	125,482	79,088
Goodwill	381,850	252,011
Total assets	\$ 2,706,606	\$ 3,109,545
LIABILITIES		
Current liabilities:		
Accounts payable	\$ 100,688	\$ 86,393
Accrued employees' compensation and withholdings	148,566	141,694
Deferred revenue and customer advances	77,711	83,614
Other accrued liabilities	78,272	59,083
Contingent consideration	34,865	24,497
Income taxes payable	36,185	59,055
Total current liabilities	476,287	454,336
Retirement plans liabilities	117,456	119,776
Long-term deferred revenue and customer advances	32,750	30,127
Long-term contingent consideration	35,678	20,605
Deferred tax liabilities	20,662	6,720
Long-term other accrued liabilities	37,547	10,273
Long-term income taxes payable	83,891	148,075
Long-term debt	379,981	365,987
Total liabilities	1,184,252	1,155,899
Commitments and contingencies (Note K)		
SHAREHOLDERS' EQUITY		
Common stock, \$0.125 par value, 1,000,000 shares authorized, 175,522 and 195,548 shares issued and outstanding at December 31, 2018 and 2017, respectively	21,940	24,444
Additional paid-in capital	1,671,645	1,638,413

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Accumulated other comprehensive (loss) income	(13,040)	18,776
(Accumulated deficit) Retained earnings	(158,191)	272,013
Total shareholders' equity	1,522,354	1,953,646
Total liabilities and shareholders' equity	\$ 2,706,606	\$ 3,109,545

The accompanying notes are an integral part of the consolidated financial statements.

Table of Contents**TERADYNE, INC.****CONSOLIDATED STATEMENTS OF OPERATIONS**

	Years Ended December 31,		
	2018	2017	2016
	(in thousands, except per share amounts)		
Revenues:			
Products	\$ 1,729,621	\$ 1,784,695	\$ 1,453,248
Services	371,181	351,911	300,002
Total revenues	2,100,802	2,136,606	1,753,250
Cost of revenues:			
Cost of products	727,138	760,967	660,056
Cost of services	153,270	154,186	134,586
Total cost of revenues (exclusive of acquired intangible assets amortization shown separately below)	880,408	915,153	794,642
Gross profit	1,220,394	1,221,453	958,608
Operating expenses:			
Selling and administrative	390,669	348,913	316,544
Engineering and development	301,505	307,305	292,159
Acquired intangible assets amortization	39,191	30,530	52,648
Restructuring and other	15,232	9,362	21,942
Goodwill impairment			254,946
Acquired intangible assets impairment			83,339
Total operating expenses	746,597	696,110	1,021,578
Income (loss) from operations	473,797	525,343	(62,970)
Non-operating (income) expenses:			
Interest income	(26,704)	(17,805)	(9,296)
Interest expense	31,269	21,663	3,637
Other (income) expense, net	1,431	(2,927)	(2,251)
Income (loss) before income taxes	467,801	524,412	(55,060)
Income tax provision (benefit)	16,022	266,720	(11,639)
Net income (loss)	\$ 451,779	\$ 257,692	\$ (43,421)
Net income (loss) per common share:			
Basic	\$ 2.41	\$ 1.30	\$ (0.21)
Diluted	\$ 2.35	\$ 1.28	\$ (0.21)
Weighted average common shares basic	187,672	198,069	202,578
Weighted average common shares diluted	192,605	201,641	202,578
Cash dividend declared per common share	\$ 0.36	\$ 0.28	\$ 0.24

The accompanying notes are an integral part of the consolidated financial statements.

Table of Contents**TERADYNE, INC.****CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS)**

	Years Ended December 31,		
	2018	2017	2016
	(in thousands)		
Net income (loss)	\$ 451,779	\$ 257,692	\$ (43,421)
Other comprehensive (loss) income, net of tax:			
Foreign currency translation adjustment, net of tax of \$0, \$0, \$0	(28,442)	37,840	(13,162)
Available-for-sale marketable securities:			
Unrealized (losses) gains on marketable securities arising during period, net of tax of \$(722), \$1,903, \$923, respectively	(2,110)	1,863	2,037
Less: Reclassification adjustment for losses (gains) included in net income, net of tax of \$(21), \$(297), \$(255), respectively	1,337	(441)	(683)
	(773)	1,422	1,354
Defined benefit pension and post-retirement plans:			
Amortization of prior service benefit included in net periodic pension and post-retirement benefit, net of tax \$(71), \$(154), \$(190), respectively	(245)	(272)	(321)
Prior service benefit arising during period, net of tax of \$0, \$0, \$34, respectively			59
	(245)	(272)	(262)
Other comprehensive (loss) income	(29,460)	38,990	(12,070)
Comprehensive income (loss)	\$ 422,319	\$ 296,682	\$ (55,491)

The accompanying notes are an integral part of the consolidated financial statements.

Table of Contents**TERADYNE, INC.****CONSOLIDATED STATEMENTS OF SHAREHOLDERS EQUITY****Years Ended December 31, 2018, 2017 and 2016**

	Common Stock Shares Issued	Common Stock Par Value	Additional Paid-in Capital	Accumulated Other Comprehensive (Loss) Income (in thousands)	Retained Earnings (Accumulated Deficit)	Total Shareholders Equity
Balance, December 31, 2015	203,641	\$ 25,455	\$ 1,480,647	\$ (8,144)	\$ 467,828	\$ 1,965,786
Issuance of stock to employees under benefit plans, net of shares withheld for payroll tax of \$9,398	2,377	297	10,368			10,665
Equity component of convertible debt			100,836			100,836
Equity component of convertible notes issuance cost			(2,017)			(2,017)
Purchase of convertible notes hedges			(100,834)			(100,834)
Proceeds from issuance of warrants			67,852			67,852
Stock-based compensation expense			30,745			30,745
Repurchase of common stock	(6,841)	(855)			(145,476)	(146,331)
Tax benefit related to stock options and restricted stock units			6,087			6,087
Cash dividends					(48,639)	(48,639)
Net loss					(43,421)	(43,421)
Foreign currency translation adjustment				(13,162)		(13,162)
Unrealized gains on marketable securities:						
Unrealized gains on marketable securities, net of tax of \$923				2,037		2,037
Less: reclassification adjustment for gains included in net income, net of tax \$(255)				(683)		(683)
Amortization of prior service (credit) cost, net of tax of \$(190)				(321)		(321)
Prior service income arising during period, net of tax of \$34				59		59
Balance, December 31, 2016	199,177	24,897	1,593,684	(20,214)	230,292	1,828,659
Issuance of stock to employees under benefit plans, net of shares withheld for payroll tax of \$12,881	2,211	277	10,747			11,024
Stock-based compensation expense			33,982			33,982
Repurchase of common stock	(5,840)	(730)			(199,574)	(200,304)
Cumulative effect adjustment for prior year tax benefits related to stock options and restricted stock units					39,081	39,081
Cash dividends					(55,478)	(55,478)
Net income					257,692	257,692
Foreign currency translation adjustment				37,840		37,840
Unrealized gains on marketable securities:						
Unrealized gains on marketable securities, net of tax of \$1,903				1,863		1,863
Less: reclassification adjustment for gains included in net income, net of tax of \$(297)				(441)		(441)
Amortization of prior service benefit, net of tax of \$(154)				(272)		(272)
Balance, December 31, 2017	195,548	24,444	1,638,413	18,776	272,013	1,953,646
Issuance of stock to employees under benefit plans, net of shares withheld for payroll tax of \$20,025	1,613	201	(72)			129
Stock-based compensation expense			33,304			33,304
Repurchase of common stock	(21,639)	(2,705)			(829,651)	(832,356)
Cash dividends					(67,367)	(67,367)
Net income					451,779	451,779
Foreign currency translation adjustment				(28,442)		(28,442)
Unrealized losses on marketable securities:						
Unrealized losses on marketable securities, net of tax of \$(722)				(2,110)		(2,110)
Less: reclassification adjustment for losses included in net income, net of tax \$(21)				1,337		1,337
Reclassification of unrealized gains on equity securities, net of tax of \$(902)				(3,125)	3,125	

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Amortization of prior service benefit, net of tax of \$(71)					(245)		(245)
Reclassification of tax effects resulting from the Tax Reform Act, net of tax of \$769					769	(769)	
Cumulative effect of changes in accounting principle related to revenue recognition						12,679	12,679
Balance, December 31, 2018	175,522	\$ 21,940	\$ 1,671,645	\$ (13,040)	\$ (158,191)		\$ 1,522,354

The accompanying notes are an integral part of the consolidated financial statements.

Table of Contents**TERADYNE, INC.****CONSOLIDATED STATEMENTS OF CASH FLOWS**

	Years Ended December 31,		
	2018	2017	2016
	(in thousands)		
Cash flows from operating activities:			
Net income (loss)	\$ 451,779	\$ 257,692	\$ (43,421)
Adjustments to reconcile net income (loss) from operations to net cash provided by operating activities:			
Depreciation	67,415	66,122	64,782
Amortization	45,809	41,953	55,227
Stock-based compensation	33,577	34,097	30,750
Deferred taxes	28,340	37,105	(62,936)
Provision for excess and obsolete inventory	11,242	8,844	17,493
Contingent consideration fair value adjustment	987	7,820	15,896
Losses (gains) on investments	3,494	(878)	(1,050)
Retirement plans actuarial gains	(3,316)	(6,624)	(3,203)
Property insurance recovery, net		(4,309)	
Goodwill impairment			254,946
Acquired intangible assets impairment			83,339
Tax benefit related to employee stock compensation awards			(6,198)
Other	1,083	1,585	602
Changes in operating assets and liabilities, net of businesses acquired:			
Accounts receivable	(17,938)	(80,584)	18,325
Inventories	(29,498)	44,960	34,263
Prepayments and other assets	(58,402)	2,254	(19,194)
Accounts payable and other accrued expenses	13,693	43,574	6,820
Deferred revenue and customer advances	13,379	4,984	(3,634)
Retirement plan contributions	(4,334)	(5,902)	(6,044)
Income taxes	(80,429)	173,802	18,434
Net cash provided by operating activities	476,881	626,495	455,197
Cash flows from investing activities:			
Purchases of property, plant and equipment	(114,379)	(105,375)	(85,272)
Proceeds from government subsidy for property, plant and equipment	7,920		
Purchases of marketable securities	(918,744)	(1,391,917)	(1,656,267)
Proceeds from maturities of marketable securities	1,270,439	701,681	243,232
Proceeds from sales of marketable securities	846,122	527,746	852,794
Proceeds from insurance	1,126	5,064	5,051
Acquisition of businesses, net of cash acquired	(169,474)		
Net cash provided by (used for) investing activities	923,010	(262,801)	(640,462)
Cash flows from financing activities:			
Issuance of common stock under stock purchase and stock option plans	20,973	24,493	20,473
Repurchase of common stock	(823,478)	(200,304)	(146,331)
Dividend payments	(67,322)	(55,447)	(48,619)
Payments related to net settlement of employee stock compensation awards	(20,023)	(12,881)	(9,398)
Payments of contingent consideration	(13,571)	(1,050)	(11,697)
Proceeds from issuance of convertible notes, net of issuance costs			450,800
Purchase of convertible note hedges			(100,834)
Proceeds from issuance of warrants			67,852
Tax benefit related to employee stock compensation awards			6,198
Net cash (used for) provided by financing activities	(903,421)	(245,189)	228,444
Effects of exchange rate changes on cash and cash equivalents	439	3,454	

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Increase in cash and cash equivalents	496,909	121,959	43,179
Cash and cash equivalents at beginning of year	429,843	307,884	264,705
Cash and cash equivalents at end of year	\$ 926,752	\$ 429,843	\$ 307,884
Supplementary disclosure of cash flow information:			
Cash paid for:			
Interest	\$ 6,205	\$ 6,446	\$ 446
Income taxes	\$ 72,811	\$ 53,775	\$ 40,424

The accompanying notes are an integral part of the consolidated financial statements.

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TERADYNE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

A. THE COMPANY

Teradyne, Inc. (Teradyne) is a leading global supplier of automation equipment for test and industrial applications. Teradyne designs, develops, manufactures and sells automatic test systems used to test semiconductors, wireless products, data storage and complex electronics systems in the consumer electronics, wireless, automotive, industrial, computing, communications, and aerospace and defense industries. Teradyne s industrial automation products include collaborative robotic arms, autonomous mobile robots and advanced robotic control software used by global manufacturing and light industrial customers to improve quality, increase manufacturing and material handling efficiency and decrease manufacturing costs. Teradyne s automatic test equipment and industrial automation products and services include:

semiconductor test (Semiconductor Test) systems;

defense/aerospace (Defense/Aerospace) test instrumentation and systems, storage test (Storage Test) systems, and circuit-board test and inspection (Production Board Test) systems (collectively these products represent System Test);

industrial automation (Industrial Automation) products; and

wireless test (Wireless Test) systems.

On June 11, 2015, Teradyne acquired Universal Robots A/S (Universal Robots) for approximately \$284 million of cash plus up to an additional \$65 million of cash if certain performance targets are met extending through 2018. Universal Robots is the leading supplier of collaborative robots which are low-cost, easy-to-deploy and simple-to-program robots that work side by side with production workers. Universal Robots is a separate operating and reportable segment, Industrial Automation.

On February 26, 2018, Teradyne acquired Energid Technologies Corporation (Energid) for a total purchase price of approximately \$28 million. Energid s technology enables and simplifies the programming of complex robotic motions used in a wide variety of end markets, ranging from heavy industry to healthcare, utilizing both traditional robots and collaborative robots.

On April 25, 2018, Teradyne acquired Mobile Industrial Robots ApS (MiR), a Danish limited liability company, for a total purchase price of approximately \$198 million, which included \$145 million of cash paid and \$53 million of contingent consideration measured at fair value. The contingent consideration is payable upon achievement of certain thresholds and targets for revenue and earnings before interest and taxes through 2020. At December 31, 2018, the maximum amount of contingent consideration that could be paid is \$115 million. MiR is the leading maker of collaborative autonomous mobile robots for industrial applications.

Universal Robots, MiR and Energid are included in Teradyne s Industrial Automation segment.

B. ACCOUNTING POLICIES

The consolidated financial statements include the accounts of Teradyne and its wholly-owned subsidiaries. All significant intercompany balances and transactions are eliminated. Certain prior years amounts were reclassified to conform to the current year presentation.

Preparation of Financial Statements and Use of Estimates

The preparation of consolidated financial statements requires management to make estimates and judgments that affect the reported amounts of assets, liabilities, revenues and expenses, and related disclosure of contingent liabilities. On an on-going basis, management evaluates its estimates, including those related to inventories, investments, goodwill, intangible and other long-lived assets, accounts receivable, income taxes, deferred tax

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assets and liabilities, pensions, warranties, and loss contingencies. Management bases its estimates on historical experience and on appropriate and customary assumptions 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 significantly from these estimates.

Revenue Recognition

Revenue from Contracts with Customers

Teradyne adopted Accounting Standards Codification (ASC) 606, *Revenue from Contracts with Customers* on January 1, 2018 using the modified retrospective method for all contracts not completed as of the date of adoption. The reported results for 2018 reflect the application of ASC 606 while the reported results for 2017 were prepared under the guidance of ASC 605, *Revenue Recognition*, which is also referred to herein as Legacy GAAP or the previous guidance. Teradyne recorded a net increase to retained earnings of \$12.7 million as of January 1, 2018 due to the cumulative impact of adopting ASC 606. The adoption of ASC 606 represents a change in accounting principle that will more closely align the timing of revenue recognition with the delivery of Teradyne's hardware and services and will provide financial statement readers with enhanced disclosures. In accordance with ASC 606, revenue is recognized when or as a customer obtains control of promised goods or services. The amount of revenue recognized reflects the consideration to which Teradyne expects to be entitled to receive in exchange for fulfillment of the performance obligation. Teradyne's primary source of revenue will continue to be from the sale of systems, instruments, robots, and the delivery of services.

In accordance with ASC 606, Teradyne recognizes revenues, when or as control is transferred to a customer. Teradyne's determination of revenue is dependent upon a five step process outlined below.

Step 1: Identify the contract with the customer

Teradyne accounts for a contract with a customer when there is written approval, the contract is committed, the rights of the parties, including payment terms, are identified, the contract has commercial substance and consideration is probable of collection.

Step 2: Identify the performance obligations in the contract

Teradyne periodically enters into contracts with customers in which a customer may purchase a combination of goods and services, such as products with extended warranty obligations. Teradyne determines performance obligations by assessing whether the products or services are distinct from the other elements of the contract. In order to be distinct, the product or service must perform either on its own or with readily available resources and must be separate within the context of the contract.

Step 3: Determine the transaction price

Teradyne considers the amount stated on the face of the purchase order to be the transaction price. Teradyne does not have material variable consideration which could impact the stated purchase price agreed to by Teradyne and the customer.

Step 4: Allocate the transaction price to the performance obligations in the contract

Transaction price is allocated to each individual performance obligation based on the standalone selling price of that performance obligation. Teradyne uses standalone transactions when available to value each performance obligation. If standalone transactions are not available, Teradyne will estimate the standalone selling price through market assessments or cost plus a reasonable margin analysis. Any discounts from standalone selling price are spread proportionally to each performance obligation.

Table of Contents*Step 5: Recognize revenue when (or as) the entity satisfies a performance obligation*

In order to determine the appropriate timing for revenue recognition, Teradyne first determines if the transaction meets any of three criteria for over time recognition. If the transaction meets the criteria for over time recognition, Teradyne recognizes revenue as the good or service is delivered. Teradyne uses input variables such as hours or months utilized or costs incurred to determine the amount of revenue to recognize in a given period. Input variables are used as they best align consumption with benefit to the customer. For transactions that do not meet the criteria for over time recognition, Teradyne will recognize revenue at a point in time based on an assessment of the five criteria for transfer of control. Teradyne has concluded that revenue should be recognized when shipped or delivered based on contractual terms. Typically, acceptance of Teradyne's products and services is a formality as Teradyne delivers similar systems, instruments and robots to standard specifications. In cases where acceptance is not deemed a formality, Teradyne will defer revenue recognition until customer acceptance.

Revenue recognized in accordance with ASC 606 was \$2,088.8 million for the twelve months ended December 31, 2018. For the twelve months ended December 31, 2018, Teradyne also recognized \$12.0 million in revenue on leases of Teradyne systems, which are accounted for outside of ASC 606.

Disaggregation of Revenue

The following table provides information about disaggregated revenue by primary geographical market, major product line and timing of revenue recognition.

For the Year Ended December 31, 2018											
	Semiconductor Test		System Test			Industrial Automation			Wireless Test	Corporate and Other	Consolidated
	System on a Chip	Memory	Defense/Aerospace	Storage Test	Production Board Test	Universal Robots	Industrial Mobile Robots	Energid			
	(in thousands)										
Americas											
Point in time	\$ 43,398	\$ 14,579	\$ 59,246	\$ 767	\$ 9,082	\$ 68,289	\$ 7,326	\$ 543	\$ 17,730	\$ (1,205)	\$ 219,755
Over time	35,100	2,774	24,577		3,091	649		997	1,436		68,624
Europe, Middle East and Africa											
Point in time	50,988	9,726	3,056		16,733	105,776	10,839		3,821		200,939
Over time	21,584	1,125	2,124		6,467	1,000		1,591	1,147		35,038
Asia Pacific											
Point in time	916,107	235,061	2,769	58,004	17,761	57,830	5,950	10	100,985		1,394,477
Over time	140,887	10,203	965	7,877	3,221	551		101	6,127		169,932
Lease revenue	10,885				392				760		12,037
Total	\$ 1,218,949	\$ 273,468	\$ 92,737	\$ 66,648	\$ 56,747	\$ 234,095	\$ 24,115	\$ 3,242	\$ 132,006	\$ (1,205)	\$ 2,100,802

*Performance Obligations**Hardware*

Teradyne hardware consists primarily of semiconductor test systems and instruments, defense/aerospace test instrumentation and systems, storage test systems and instruments, circuit-board test and inspection systems and instruments, collaborative robots, autonomous mobile robots and wireless test systems. The hardware includes a standard 12-month warranty. This warranty is not considered a distinct performance obligation because it does not obligate Teradyne to provide a separate service to the customer and it cannot be purchased separately. Teradyne's hardware is recognized at a point in time upon transfer of control to the customer.

Table of Contents*Extended Warranty*

Customers have the option to purchase an extended warranty, which extends the warranty period for systems and robots beyond the one-year standard warranty. The extended warranty is purchased in the same transaction as the system or robot purchase and is classified as a separate performance obligation, which meets the criteria for over time recognition. The relative standalone selling price of the extended warranty is recognized ratably over the course of the extended warranty based on months completed.

Training and Applications Support

Teradyne sells training and applications support to customers either in standalone transactions or included with system purchases. The training and support allow the customer to use Teradyne's systems efficiently and effectively. Training and applications support included in system orders are valued based on their standalone selling price and all training and applications support is recognized over time as the customer receives and consumes the benefit associated with each. Both are recognized using an input method of hours consumed as this best depicts the transfer of services to the customer.

Service Agreements

Service agreements are recognized ratably over the period of agreement based on months completed.

Post-Contract Customer Support (PCS)

Teradyne provides support services for certain systems and robots outside of warranty. These services include telephone support, bug fixes, and when-and-if available upgrades. Standalone selling price for PCS is not directly observable as Teradyne does not sell these services separately. Teradyne has estimated the standalone selling price for these services based on adjusted market assessments. Revenue for PCS is recognized ratably over the performance period.

Teradyne does not allow customer returns or provide refunds to customers for any products or services.

Contract Balances

The following table provides information about contract liabilities. Teradyne does not have material contract assets on the balance sheet.

	December 31, 2018	January 1, 2018 (as adjusted) (in thousands)	Increase
Deferred revenue and customer advances	\$ 77,711	\$ 76,638	\$ 1,073
Long-term deferred revenue and customer advances	32,750	20,848	11,902

The amount of revenue recognized during the twelve months ended December 31, 2018 that was previously included within the deferred revenue and customer advances balance was \$69.9 million and primarily relates to extended warranties, training, application support and PCS. Each of these represents a distinct performance obligation. Customers typically pay for these services net 30 to 60 days from the date that transfer of control of the associated system or product occurs. Teradyne expects to recognize 70% of the remaining performance obligation in the next 12 months, 25% in 1-3 years, and the remainder thereafter.

Practical Expedients

Teradyne has adopted the practical expedients available within ASC 340 *Other Assets and Deferred Costs* for contract assets, specifically in relation to incremental costs of obtaining a contract. Teradyne generally expenses sales commissions when incurred because the amortization period would be less than one year. Teradyne records these costs within selling and administrative expenses.

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Teradyne has adopted the practical expedient, which states an entity need not adjust the promised amount of consideration for the effects of a significant financing component if the entity expects, at contract inception, that the period between when the entity transfers a promised good or service to the customer and when the customer pays for that good or service will be one year or less. Teradyne does not have material payments associated with performance obligations outside this one-year time frame.

Impacts

The following tables summarize the impact of ASC 606 to Teradyne's consolidated financial statements. Differences are the result of timing differences between the recognition of revenue under ASC 606 and ASC 605 primarily with respect to software transactions deferred due to lack of vendor specific objective evidence of price under ASC 605 and Teradyne's assessment of acceptance under ASC 606. Under Legacy GAAP, Teradyne did not recognize revenue prior to acceptance if payment, title, or risk of loss was tied to acceptance. Under ASC 606, Teradyne recognizes revenue prior to receipt of acceptance if acceptance is deemed a formality.

Condensed Consolidated Balance Sheet:

	As Reported	December 31, 2018 Adjustments to Recognize under Legacy GAAP	Legacy GAAP
	(in thousands, except per share amount)		
Assets			
Accounts receivable, less allowance for doubtful accounts	\$ 291,267	\$ (37,348)	\$ 253,919
Inventories, net	153,541	10,759	164,300
Deferred tax assets	70,848	(3,874)	66,974
Liabilities			
Deferred revenue and customer advances	\$ 77,711	\$ (4,118)	\$ 73,593
Income taxes payable	36,185	(4,495)	31,690
Long-term deferred revenue and customer advances	32,750	(10,303)	22,447
Shareholders' equity			
Accumulated deficit	\$ (158,191)	\$ (11,547)	\$ (169,738)

Condensed Consolidated Statement of Operation:

	As Reported	For the Year Ended December 31, 2018 Adjustments to Recognize under Legacy GAAP	Legacy GAAP
	(in thousands, except per share amount)		
Total revenues	\$ 2,100,802	\$ (39,184)	\$ 2,061,618
Total cost of revenues	880,408	(10,760)	869,648
Income tax provision	16,022	(4,197)	11,825
Net income	451,779	(24,227)	427,552
Net income per common share:			
Basic	\$ 2.41	\$ (0.13)	\$ 2.28
Diluted	\$ 2.35	\$ (0.13)	\$ 2.22

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As of December 31, 2018 and 2017, deferred revenue and customer advances consisted of the following and are included in the short and long-term deferred revenue and customer advances:

	2018 (in thousands)	2017 (in thousands)
Maintenance and training	\$ 58,362	\$ 57,256
Extended warranty	27,422	24,438
Customer advances, undelivered elements and other	24,677	32,047
Total deferred revenue and customer advances	\$ 110,461	\$ 113,741

Product Warranty

Teradyne generally provides a one-year warranty on its products, commencing upon installation, acceptance or shipment. A provision is recorded upon revenue recognition to cost of revenues for estimated warranty expense based on historical experience. Related costs are charged to the warranty accrual as incurred. The balance below is included in other accrued liabilities:

	Amount (in thousands)
Balance at December 31, 2015	\$ 6,925
Accruals for warranties issued during the period	14,291
Accruals related to pre-existing warranties	(1,354)
Settlements made during the period	(12,659)
Balance at December 31, 2016	7,203
Accruals for warranties issued during the period	14,223
Accruals related to pre-existing warranties	(379)
Settlements made during the period	(12,847)
Balance at December 31, 2017	8,200
Acquisition	41
Accruals for warranties issued during the period	13,045
Accruals related to pre-existing warranties	921
Settlements made during the period	(14,298)
Balance at December 31, 2018	\$ 7,909

When Teradyne receives revenue for extended warranties, beyond one year, it is deferred and recognized on a straight-line basis over the contract period. Related costs are expensed as incurred. The balance below is included in short and long-term deferred revenue and customer advances:

	Amount (in thousands)
Balance at December 31, 2015	\$ 30,024
Deferral of new extended warranty revenue	19,909
Recognition of extended warranty deferred revenue	(21,733)
Balance at December 31, 2016	28,200
Deferral of new extended warranty revenue	20,513

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Recognition of extended warranty deferred revenue	(24,275)
Balance at December 31, 2017	24,438
Deferral of new extended warranty revenue	23,753
Recognition of extended warranty deferred revenue	(20,769)
Balance at December 31, 2018	\$ 27,422

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Accounts Receivable and Allowance for Doubtful Accounts

Trade accounts receivable are recorded at the invoiced amount and do not bear interest. The volatility of the industries that Teradyne serves can cause certain of its customers to experience shortages of cash flows, which can impact their ability to make required payments. Teradyne maintains allowances for doubtful accounts for estimated losses resulting from the inability of its customers to make required payments. Estimated allowances for doubtful accounts are reviewed periodically taking into account the customer's recent payment history, the customer's current financial statements and other information regarding the customer's credit worthiness. Account balances are written off against the allowance when it is determined the receivable will not be recovered.

Teradyne sells certain trade accounts receivables on a non-recourse basis to third-party financial institutions pursuant to factoring agreements. Teradyne accounts for these transactions as sales of receivables and presents cash proceeds as a cash provided by operating activities in the consolidated statements of cash flows. Total trade accounts receivable sold under the factoring agreements were \$52.2 million and \$5.4 million during 2018 and 2017, respectively. Factoring fees for the sales of receivables were recorded in interest expense and were not material.

Inventories

Inventories are stated at the lower of cost (first-in, first-out basis) or net realizable value. On a quarterly basis, Teradyne uses consistent methodologies to evaluate all inventories for net realizable value. Teradyne records a provision for both excess and obsolete inventory when such write-downs or write-offs are identified through the quarterly review process. The inventory valuation is based upon assumptions about future demand, product mix and possible alternative uses.

Investments

Teradyne accounts for its investments in debt and equity securities in accordance with the provisions of ASC 320-10, *Investments Debt and Equity Securities*. ASC 320-10 requires that certain debt and equity securities be classified into one of three categories; trading, available-for-sale or held-to-maturity securities. On a quarterly basis, Teradyne reviews its investments to identify and evaluate those that have an indication of a potential other-than-temporary impairment. Factors considered in determining whether a loss is other-than-temporary include:

The length of time and the extent to which the market value has been less than cost;

The financial condition and near-term prospects of the issuer; and

The intent and ability to retain the investment in the issuer for a period of time sufficient to allow for any anticipated recovery in market value.

Teradyne uses the market and income approach techniques to value its financial instruments and there were no changes in valuation techniques during the twelve months ended December 31, 2018 and 2017. As defined in ASC 820-10, *Fair Value Measurements and Disclosures*, fair value is the price that would be received from the sale of an asset or paid to transfer a liability in an orderly transaction between market participants. ASC 820-10 requires that assets and liabilities carried at fair value be classified and disclosed in one of the following three categories:

Level 1: Quoted prices in active markets for identical assets as of the reporting date;

Level 2: Inputs other than Level 1, that are observable either directly or indirectly as of the reporting date. For example, a common approach for valuing fixed income securities is the use of matrix pricing. Matrix pricing is a mathematical technique used to value securities by relying on the securities' relationship to other benchmark quoted prices, and is considered a Level 2 input; or

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Level 3: Unobservable inputs that are not supported by market data. Unobservable inputs are developed based on the best information available, which might include Teradyne's own data.

In accordance with ASC 820-10, Teradyne measures its debt and equity investments at fair value. Teradyne's debt investments are classified as Level 2, and equity investments are classified as Level 1. Acquisition-related contingent consideration is classified as Level 3. Teradyne determines the fair value of acquisition-related contingent consideration using a Monte Carlo simulation model. Assumptions utilized in the model include forecasted revenues, revenue volatility, earnings before interest and taxes, and discount rate.

Financial Assets and Financial Liabilities

In January 2016, the Financial Accounting Standards Board (FASB) issued ASU 2016-01, *Financial Instruments Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities*. Teradyne adopted the new accounting guidance in the first quarter of 2018 using the modified retrospective approach. This guidance requires that changes in fair value of equity securities be accounted for directly in earnings. Previously, the changes in fair value were recorded in accumulated other comprehensive income on the balance sheet. Teradyne continues to record realized gains in interest income and realized losses in interest expense. The adoption of this new accounting guidance increased the January 1, 2018 retained earnings balance by \$3.1 million and decreased the accumulated other comprehensive income balance by the same amount.

Prepayments

Prepayments consist of the following and are included in prepayments and other current assets on the balance sheet:

	2018	2017
	(in thousands)	
Contract manufacturer and supplier prepayments	\$ 131,642	\$ 82,503
Prepaid taxes	9,646	5,039
Prepaid maintenance and other services	8,487	8,189
Other prepayments	12,744	12,386
Total prepayments	\$ 162,519	\$ 108,117

Retirement and Postretirement Plans

Teradyne recognizes net actuarial gains and losses and the change in the fair value of the plan assets in its operating results in the year in which they occur or upon any interim remeasurement of the plans. Teradyne calculates the expected return on plan assets using the fair value of the plan assets. Actuarial gains and losses are generally measured annually as of December 31 and, accordingly, recorded during the fourth quarter of each year or upon any interim remeasurement of the plans.

Retirement Benefits

In March 2017, the FASB issued ASU 2017-07, *Compensation Retirement Benefits (Topic 715): Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost*. Teradyne retrospectively adopted the new accounting guidance on presentation of net periodic pension costs and net periodic postretirement benefit costs in the first quarter of 2018. This guidance requires the service cost component of net benefit costs to be reported in the same line item in the consolidated statement of operations as other employee compensation costs. The non-service components of net benefit costs such as interest cost, expected return on assets, amortization of prior service cost, and actuarial gains or losses, are required to be reported separately outside of income or loss from operations. Following the adoption of this

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guidance, Teradyne continues to record the service cost component in the same line item as other employee compensation costs and the non-service components of net benefit costs such as interest cost, expected return on assets, amortization of prior service cost, and actuarial gains or losses are reported within other (income) expense, net. In the twelve months ended December 31, 2017 and 2016, the retrospective adoption of this standard decreased income from operations by \$5.0 million and \$3.0 million, respectively, due to the removal of net actuarial pension gains and increased non-operating (income) expense by the same amount with no impact to net income.

Goodwill, Intangible and Long-Lived Assets

Teradyne accounts for goodwill and intangible assets in accordance with ASC 350-10, *Intangibles-Goodwill and Other*. Intangible assets are amortized over their estimated useful economic life and are carried at cost less accumulated amortization. Goodwill is assessed for impairment at least annually in the fourth quarter, as of December 31, on a reporting unit basis, or more frequently when events and circumstances occur indicating that the recorded goodwill may be impaired. In accordance with ASC 350-10, Teradyne has the option to perform a qualitative assessment to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying amount. If Teradyne determines this is the case, Teradyne is required to perform the two-step goodwill impairment test to identify potential goodwill impairment and measure the amount of goodwill impairment loss to be recognized. If Teradyne determines that it is more likely than not that the fair value of the reporting unit is greater than its carrying amounts, the two-step goodwill impairment test is not required.

In accordance with ASC 360-10, *Impairment or Disposal of Long-Lived Assets*, Teradyne reviews long-lived assets for impairment whenever events or changes in business circumstances indicate that the carrying amount of the assets may not be fully recoverable or that the useful lives of these assets are no longer appropriate. Each impairment test is based on a comparison of the estimated undiscounted cash flows to the recorded value of the asset. If impairment is indicated, the asset is written down to its estimated fair value based on a discounted cash flow analysis. The cash flow estimates used to determine the impairment, if any, contain management's best estimates using appropriate assumptions and projections at that time.

Property, Plant and Equipment

Property, plant and equipment are stated at cost and depreciated over the estimated useful lives of the assets. Leasehold improvements and major renewals are capitalized and included in property, plant and equipment accounts while expenditures for maintenance and repairs and minor renewals are charged to expense. When assets are retired, the assets and related accumulated depreciation are removed from the accounts and any resulting gain or loss is reflected in the consolidated statements of operations.

Teradyne provides for depreciation of its assets principally on the straight-line method with the cost of the assets being charged to expense over their useful lives as follows:

Buildings	40 years
Building improvements	5 to 10 years
Leasehold improvements	Lesser of lease term or 10 years
Furniture and fixtures	10 years
Test systems manufactured internally	6 years
Machinery and equipment	3 to 5 years
Software	3 to 5 years

Test systems manufactured internally are used by Teradyne for customer evaluations and manufacturing and support of its customers. Teradyne depreciates the test systems manufactured internally over a six-year life to cost of revenues, engineering and development, and selling and administrative expenses. Teradyne often sells internally manufactured test equipment to customers. Upon the sale of an internally manufactured test system,

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the net book value of the system is transferred to inventory and expensed as cost of revenues. The net book value of internally manufactured test systems sold in the years ended December 31, 2018, 2017, and 2016 was \$3.8 million, \$3.6 million, and \$11.4 million, respectively.

Engineering and Development Costs

Teradyne's products are highly technical in nature and require a large and continuing engineering and development effort. Software development costs incurred prior to the establishment of technological feasibility are charged to expense. Software development costs incurred subsequent to the establishment of technological feasibility are capitalized until the product is available for release to customers. To date, the period between achieving technological feasibility and general availability of the product has been short and software development costs eligible for capitalization have not been material. Engineering and development costs are expensed as incurred and consist primarily of salaries, contractor fees including non-recurring engineering charges related to product design, allocated facility costs, depreciation, and tooling costs.

Stock Compensation Plans and Employee Stock Purchase Plan

Stock-based compensation expense is based on the grant-date fair value estimated in accordance with the provisions of ASC 718-10, *Compensation-Stock Compensation*.

In March 2016, the FASB issued ASU 2016-09, *Compensation-Stock Compensation (Topic 718): Improvements to Employee Share-Based Payment Accounting*. Teradyne adopted this ASU in the first quarter of 2017. This ASU changes how Teradyne accounts for certain aspects of share-based payment awards to employees, including the accounting for income taxes, forfeitures, and statutory tax withholding requirements, as well as classification in the statements of cash flows.

Adoption of this ASU required recognition of a cumulative effect adjustment to retained earnings for any prior year excess tax benefits or tax deficiencies not previously recorded. The cumulative effect adjustment of \$39 million was recorded in the first quarter of 2017 as an increase to retained earnings and deferred tax assets.

This ASU also required a change in how Teradyne recognizes the excess tax benefits or tax deficiencies related to stock-based compensation. Prior to adopting ASU 2016-09, these excess tax benefits or tax deficiencies were credited or charged to additional paid-in capital in Teradyne's consolidated balance sheets. In accordance with ASU 2016-09, starting in the first quarter of 2017, these excess tax benefits or tax deficiencies are recognized as a discrete tax benefit or discrete tax expense to the current income tax provision in Teradyne's consolidated statements of operations.

ASU 2016-09 requires companies to adopt the amendment related to accounting for excess tax benefits or tax deficiencies on a prospective basis. In 2017, Teradyne recognized a discrete tax benefit of \$6.3 million related to net excess tax benefit.

In addition, under ASU 2016-09, all excess tax benefits related to share-based payments are reported as cash flows from operating activities. Previously, excess tax benefits from share-based payment arrangements were reported as cash flows from financing activities. The classification amendment was applied prospectively. This ASU also clarifies that all cash payments made to taxing authorities on the employees' behalf for withheld shares should be presented as financing activities on the statement of cash flows. Previously, Teradyne reported cash payments made to taxing authorities as operating activities on the statement of cash flows. This change was applied retrospectively.

Upon adoption of ASU 2016-09, Teradyne made an accounting policy election to continue accounting for forfeitures by applying an estimated forfeiture rate and to continue to recognize compensation costs only for those stock-based compensation awards expected to vest.

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Under its stock compensation plans, Teradyne has granted stock options, restricted stock units and performance-based restricted stock units, and employees are eligible to purchase Teradyne's common stock through its Employee Stock Purchase Plan (ESPP).

Income Taxes

Deferred tax assets and liabilities are determined based on differences between financial reporting and tax basis of assets and liabilities and are measured using the enacted tax rates and laws that will be in effect when the differences are expected to reverse. The measurement of deferred tax assets is reduced by a valuation allowance if it is more likely than not that some or all of the deferred tax assets will not be realized. Teradyne performed the required assessment of positive and negative evidence regarding the realization of the net deferred tax assets in accordance with ASC 740, *Accounting for Income Taxes*. This assessment included the evaluation of scheduled reversals of deferred tax liabilities, estimates of projected future taxable income and tax-planning strategies. Although realization is not assured, based on its assessment, Teradyne concluded that it is more likely than not that such assets, net of the existing valuation allowance, will be realized.

Advertising Costs

Teradyne expenses all advertising costs as incurred. Advertising costs were \$15.4 million, \$9.1 million, and \$6.4 million in 2018, 2017, and 2016, respectively.

Translation of Non-U.S. Currencies

The functional currency for all subsidiaries is the U.S. dollar, except for the Universal Robots and MiR reporting units for which the local currency is its functional currency. All foreign currency denominated monetary assets and liabilities are remeasured on a monthly basis into the functional currency using exchange rates in effect at the end of the period. All foreign currency denominated non-monetary assets and liabilities are remeasured into the functional currency using historical exchange rates. Net foreign exchange gains and losses resulting from remeasurement are included in other (income) expense, net. For Industrial Automation, assets and liabilities are translated into U.S. dollars using exchange rates in effect at the end of the period. Revenue and expense amounts are translated using an average of exchange rates in effect during the period. Translation adjustments are recorded within accumulated other comprehensive income (loss).

Net foreign exchange gains and losses resulting from remeasurement are included in other (income) expense, net. For the years ended December 31, 2018, 2017, and 2016, (gains) losses from the remeasurement of the monetary assets and liabilities denominated in foreign currencies were \$(2.4) million, \$2.9 million, and \$(8.0) million, respectively.

These amounts do not reflect the corresponding (gains) losses from foreign exchange contracts. See Note G: Financial Instruments regarding foreign exchange contracts.

Net Income (Loss) per Common Share

Basic net income (loss) per common share is calculated by dividing net income (loss) by the weighted average number of common shares outstanding during the period. Except where the result would be anti-dilutive, diluted net income (loss) per common share is calculated by dividing net income (loss) by the sum of the weighted average number of common shares plus common stock equivalents, if applicable.

With respect to its convertible debt issued in 2016, Teradyne has determined that it has the ability and intent to settle the principal of the convertible debt in cash; accordingly, the principal amount is excluded from the determination of diluted earnings per share. As a result, Teradyne is accounting for the conversion spread using the treasury stock method.

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Comprehensive income (loss) includes net income, unrealized pension and postretirement prior service costs and benefits, unrealized gains and losses on investments in debt marketable securities and foreign currency translation adjustment. Prior to 2018, comprehensive income (loss) included unrealized gains and losses on investments in equity marketable securities.

C. RECENTLY ISSUED ACCOUNTING PRONOUNCEMENTS

On January 26, 2017, the FASB issued ASU 2017-04, *Intangibles Goodwill and Other (Topic 350): Simplifying the Accounting for Goodwill Impairment*. The new guidance removes Step 2 of the goodwill impairment test, which requires a hypothetical purchase price allocation. Goodwill impairment will now be the amount by which a reporting unit's carrying value exceeds its fair value, not to exceed the carrying amount of goodwill. All other goodwill impairment guidance will remain largely unchanged. Entities will continue to have the option to perform a qualitative assessment to determine if a quantitative impairment test is necessary. The same one-step impairment test will be applied to goodwill at all reporting units, even those with zero or negative carrying amounts. Entities will be required to disclose the amount of goodwill at reporting units with zero or negative carrying amounts. The revised guidance will be applied prospectively, and is effective in 2020. Early adoption is permitted for any impairment tests performed after January 1, 2017. Teradyne is currently evaluating the impact of this ASU on its financial position, results of operations and statements of cash flows.

In February 2016, the FASB issued ASU 2016-02, *Leases (Topic 842)*. The guidance in this ASU supersedes the lease recognition requirements in ASC Topic 840, *Leases*. The new standard establishes a right-of-use (ROU) model that requires a lessee to record an ROU asset and a lease liability on the balance sheet for all leases with terms longer than twelve months. Leases will be classified as either finance or operating, with classification affecting the pattern of expense recognition in the statements of operations. The new standard is effective for annual periods beginning after December 15, 2018 with early adoption permitted. A modified retrospective transition approach is required for lessees for capital and operating leases existing at, or entered into after, the beginning of the earliest comparative period presented in the financial statements. In July 2018, the FASB issued ASU 2018-11, *Leases (Topic 842): Targeted Improvements*, which amends ASU 2016-02. The new ASU offers an additional transition method by which entities may elect not to recast the comparative periods presented in financial statements in the period of adoption and allows lessors to elect a practical expedient to not separate lease and non-lease components when certain conditions are met. This ASU has the same transition requirements and effective date as ASU 2016-02. Teradyne elected not to recast the comparative periods presented in financial statements in the period of adoption. Teradyne adopted this guidance in January 2019; as a result it recorded between \$50 and \$60 million of operating lease right-of-use assets and operating lease liabilities. Adoption had an immaterial impact on Teradyne's results of operations.

D. ACQUISITIONS**Business*****Mobile Industrial Robots***

On April 25, 2018, Teradyne acquired all the issued and outstanding shares of MiR, a Danish limited liability company located in Odense, Denmark. MiR is the leading maker of collaborative autonomous mobile robots for industrial applications. MiR is part of Teradyne's Industrial Automation segment.

The total purchase price of \$197.8 million included \$145.2 million of cash paid and \$52.6 million of contingent consideration measured at fair value. The contingent consideration is payable in Euros upon the achievement of certain thresholds and targets for revenue and earnings before interest and taxes for periods from January 1, 2018 to December 31, 2018; January 1, 2018 to December 31, 2019; and January 1, 2018 to December 31, 2020. At December 31, 2018, the maximum amount of contingent consideration that could be paid is \$115 million. Contingent consideration for the period from January 1, 2018 to December 31, 2018 was \$31.0 million and is expected to be paid in March 2019.

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The valuation of the contingent consideration is dependent on the following assumptions: forecasted revenues, revenue volatility, earnings before interest and taxes, and discount rate. These assumptions were estimated based on a review of the historical and projected results.

The MiR acquisition was accounted for as a business combination and, accordingly, the results have been included in Teradyne's consolidated results of operations from the date of acquisition. MiR's products will help expand the Industrial Automation segment, which is a key component of our growth strategy. The allocation of the total purchase price to MiR's net tangible liabilities and identifiable intangible assets was based on their estimated fair values as of the acquisition date. The excess of the purchase price over the identifiable intangible assets and net tangible liabilities in the amount of \$136.0 million was allocated to goodwill, which is not deductible for tax purposes. MiR's results have been included in Teradyne's Industrial Automation segment from the date of acquisition.

The following table represents the final allocation of the purchase price:

	Purchase Price Allocation (in thousands)
Goodwill	\$ 135,976
Intangible assets	80,670
Tangible assets acquired and liabilities assumed:	
Current assets	6,039
Non-current assets	1,336
Accounts payable and current liabilities	(7,336)
Long-term deferred tax liabilities	(18,007)
Other long-term liabilities	(900)
Total purchase price	\$ 197,778

Teradyne estimated the fair value of intangible assets using the income and cost approaches. Acquired intangible assets are amortized on a straight-line basis over their estimated useful lives. Components of these intangible assets and their estimated useful lives at the acquisition date are as follows:

	Fair Value (in thousands)	Estimated Useful Life (in years)
Developed technology	\$ 58,900	7.0
Trademarks and tradenames	13,240	11.0
Customer relationships	8,500	2.5
Backlog	30	0.2
Total intangible assets	\$ 80,670	7.2

For the period from April 25, 2018 to December 31, 2018, MiR contributed \$24.1 million of revenues and had a \$(7.6) million loss before income taxes.

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The following unaudited pro forma information gives effect to the acquisition of MiR as if the acquisition occurred on January 1, 2017. The unaudited pro forma results are not necessarily indicative of what actually would have occurred had the acquisition been in effect for the periods presented:

	For the Year Ended	
	December 31, 2018	December 31, 2017
	(in thousands, except per share amounts)	
Revenues	\$ 2,107,600	\$ 2,148,320
Net income	\$ 450,559	\$ 243,399
Net income per common share:		
Basic	\$ 2.40	\$ 1.23
Diluted	\$ 2.34	\$ 1.21

Pro forma results for the year ended December 31, 2018 were adjusted to exclude \$2.9 million of acquisition related costs and \$0.4 million of non-recurring expense related to fair value adjustment to acquisition-date inventory.

Pro forma results for the year ended December 31, 2017 were adjusted to include \$2.9 million of acquisition related costs and \$0.4 million of non-recurring expense related to fair value adjustment to acquisition-date inventory.

Energid Technologies Corporation

On February 26, 2018, Teradyne acquired all of the issued and outstanding shares of Energid for a total purchase price of approximately \$27.6 million. Energid's technology enables and simplifies the programming of complex robotic motions used in a wide variety of end markets, ranging from heavy industry to healthcare, utilizing both traditional robots and collaborative robots. The Energid acquisition was accounted for as a business combination and, accordingly, Energid's results have been included in Teradyne's Industrial Automation segment from the date of acquisition. As of the acquisition date, Teradyne's purchase price allocation was goodwill of \$14.4 million which is deductible for tax purposes, acquired intangible assets of \$12.3 million with an average estimated useful life of 7.7 years, and \$1.0 million of net tangible assets. The acquisition was not material to Teradyne's condensed consolidated financial statements.

E. INVENTORIES

Inventories, net consisted of the following at December 31, 2018 and 2017:

	2018	2017
	(in thousands)	
Raw material	\$ 89,365	\$ 62,668
Work-in-process	31,014	19,464
Finished goods	33,162	25,393
	\$ 153,541	\$ 107,525

Inventory reserves for the years ended December 31, 2018 and 2017 were \$100.8 million and \$102.9 million, respectively.

Table of Contents**F. PROPERTY, PLANT AND EQUIPMENT**

Property, plant and equipment, net consisted of the following at December 31, 2018 and 2017:

	2018	2017
	(in thousands)	
Land	\$ 16,561	\$ 16,561
Buildings	105,935	98,369
Machinery and equipment	689,770	647,961
Furniture and fixtures, and software	90,384	88,539
Leasehold improvements	52,536	49,540
Construction in progress	6,276	13,522
	961,462	914,492
Less: accumulated depreciation	681,641	646,045
	\$ 279,821	\$ 268,447

Depreciation of property, plant and equipment for the years ended December 31, 2018, 2017, and 2016 was \$67.4 million, \$66.1 million, and \$64.8 million, respectively. As of December 31, 2018 and 2017, the gross book value included in machinery and equipment for internally manufactured test systems being leased by customers was \$5.5 million and \$18.1 million, respectively. As of December 31, 2018 and 2017, the accumulated depreciation on these test systems was \$5.2 million and \$13.7 million, respectively.

G. FINANCIAL INSTRUMENTS**Cash Equivalents**

Teradyne considers all highly liquid investments with maturities of three months or less at the date of acquisition to be cash equivalents.

Marketable Securities

Effective January 1, 2018, Teradyne adopted ASU 2016-01, *Financial Instruments Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities*, using the modified retrospective approach. This guidance requires that changes in fair value of equity securities be accounted for directly in earnings. Prior to 2018, the changes in fair value of equity securities were recorded in accumulated other comprehensive income (loss) on the balance sheet.

Teradyne's available-for-sale debt securities are classified as Level 2 and equity securities are classified as Level 1. Contingent consideration is classified as Level 3. The vast majority of Level 2 securities are fixed income securities priced by third party pricing vendors. These pricing vendors utilize the most recent observable market information in pricing these securities or, if specific prices are not available, use other observable inputs like market transactions involving identical or comparable securities.

During the years ended December 31, 2018 and 2017, there were no transfers in or out of Level 1, Level 2, or Level 3 financial instruments.

Realized gains recorded in 2018, 2017, and 2016 were \$4.0 million, \$1.1 million, and \$1.6 million, respectively. Realized losses recorded in 2018, 2017, and 2016 were \$1.6 million, \$0.3 million, and \$0.5 million, respectively. Realized gains are included in interest income and realized losses are included in interest expense. Unrealized gains and losses on available-for-sale debt securities are included in accumulated other comprehensive income (loss) on the balance sheet.

Unrealized gains related to equity securities are included in interest income and unrealized losses are included in interest expense. Unrealized losses related to equity securities recognized in 2018 were \$6.0 million.

The cost of securities sold is based on the specific identification method.

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The following table sets forth by fair value hierarchy Teradyne's financial assets and liabilities that were measured at fair value on a recurring basis as of December 31, 2018 and 2017:

	December 31, 2018			Total
	Quoted Prices	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	
	in Active Markets			
	for Identical Instruments (Level 1)			
Assets				
Cash	\$ 312,512	\$	\$	\$ 312,512
Cash equivalents	253,525	360,715		614,240
Available for sale securities:				
U.S. Treasury securities		109,721		109,721
Commercial paper		86,117		86,117
Corporate debt securities		40,020		40,020
U.S. government agency securities		9,611		9,611
Certificates of deposit and time deposits		7,604		7,604
Debt mutual funds	3,187			3,187
Non-U.S. government securities		376		376
Equity securities:				
Mutual funds	21,191			21,191
	590,415	614,164		1,204,579
Derivative assets		79		79
Total	\$ 590,415	\$ 614,243	\$	\$ 1,204,658
Liabilities				
Contingent consideration	\$	\$	\$ 70,543	\$ 70,543
Derivative liabilities		514		514
Total	\$	\$ 514	\$ 70,543	\$ 71,057

Reported as follows:

	Level 1	Level 2	Level 3	Total
	(in thousands)			
Assets				
Cash and cash equivalents	\$ 566,037	\$ 360,715	\$	\$ 926,752
Marketable securities		190,096		190,096
Long-term marketable securities	24,378	63,353		87,731
Prepayments		79		79
Total	\$ 590,415	\$ 614,243	\$	\$ 1,204,658
Liabilities				
Other current liabilities	\$	\$ 514	\$	\$ 514

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Contingent consideration			34,865	34,865		
Long-term contingent consideration			35,678	35,678		
Total	\$	\$	514	\$ 70,543	\$	71,057

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	December 31, 2017			
	Quoted Prices in Active Markets for Identical Instruments (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total
	(in thousands)			
Assets				
Cash	\$ 197,955	\$	\$	\$ 197,955
Cash equivalents	206,335	25,553		231,888
Available for sale securities:				
U.S. Treasury securities		855,795		855,795
Commercial paper		282,840		282,840
Certificates of deposit and time deposits		167,342		167,342
Corporate debt securities		133,186		133,186
Equity and debt mutual funds	23,430			23,430
U.S. government agency securities		10,726		10,726
Non-U.S. government securities		586		586
	427,720	1,476,028		1,903,748
Derivative assets		389		389
Total	\$ 427,720	\$ 1,476,417	\$	\$ 1,904,137
Liabilities				
Contingent consideration	\$	\$	\$ 45,102	\$ 45,102
Derivative liabilities		446		446
Total	\$	\$ 446	\$ 45,102	\$ 45,548

Reported as follows:

	Level 1	Level 2	Level 3	Total
	(in thousands)			
Assets				
Cash and cash equivalents	\$ 404,290	\$ 25,553	\$	\$ 429,843
Marketable securities		1,347,979		1,347,979
Long-term marketable securities	23,430	102,496		125,926
Prepayments		389		389
	\$ 427,720	\$ 1,476,417	\$	\$ 1,904,137
Liabilities				
Other current liabilities	\$	\$ 446	\$	\$ 446
Contingent consideration			24,497	24,497
Long-term contingent consideration			20,605	20,605
	\$	\$ 446	\$ 45,102	\$ 45,548

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Changes in the fair value of Level 3 contingent consideration for the years ended December 31, 2018 and 2017 were as follows:

	Contingent Consideration (in thousands)
Balance at December 31, 2016	\$ 38,332
Payments (1)	(1,050)
Fair value adjustment (2)	7,820
Balance at December 31, 2017	45,102
Acquisition of MiR	52,547
Foreign currency impact	(3,540)
Payments (3)	(24,553)
Fair value adjustment (4)	987
Balance at December 31, 2018	\$ 70,543

- (1) During the year ended December 31, 2017, Teradyne paid \$1.1 million of contingent consideration for the earn-out in connection with the acquisition of Avionics Interface Technologies, LLC (AIT).
- (2) During the year ended December 31, 2017, the fair value of contingent consideration for the earn-out in connection with the acquisition of Universal Robots was increased by \$7.8 million primarily due to an increase in forecasted revenues and decrease in discount rate.
- (3) During the year ended December 31, 2018, Teradyne paid \$24.6 million of contingent consideration for the earn-out in connection with the acquisition of Universal Robots.
- (4) During the year ended December 31, 2018, the fair value of contingent consideration for the earn-out in connection with the acquisition of MiR was increased by \$17.7 million primarily due to an increase in forecasted revenues. During the year ended December 31, 2018, the fair value of contingent consideration for the earn-out in connection with the acquisition of Universal Robots was decreased by \$16.7 million primarily due to a decrease in forecasted revenues.

The following table provides quantitative information associated with the fair value measurement of Teradyne's Level 3 financial instrument:

Liability	December 31,		Valuation Technique	Unobservable Inputs	Weighted Average
	2018 Fair Value (in thousands)				
Contingent consideration (MiR)	\$ 66,672(1)		Monte Carlo simulation	Revenue volatility	18.0%
				Discount rate	1.1%
Contingent consideration (Universal Robots)	\$3,871(1)				

- (1) Contingent consideration related to MiR and Universal Robots acquisitions of \$31.0 million and \$3.9 million, respectively, is expected to be paid in March 2019.

As of December 31, 2018, the significant unobservable inputs used in the Monte Carlo simulation to fair value the MiR contingent consideration include forecasted revenues, revenue volatility, earnings before interest and taxes and discount rate. Increases or decreases in the inputs would result in a higher or lower fair value measurement. As of December 31, 2018, the maximum amount of contingent consideration that could be paid in connection with the acquisition of MiR is \$115 million. The earn-out periods end on December 31, 2018, December 31, 2019, and December 31, 2020.

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The carrying amounts and fair values of Teradyne's financial instruments at December 31, 2018 and 2017 were as follows:

	December 31, 2018		December 31, 2017	
	Carrying Value	Fair Value	Carrying Value	Fair Value
	(in thousands)			
Assets				
Cash and cash equivalents	\$ 926,752	\$ 926,752	\$ 429,843	\$ 429,843
Marketable securities	277,827	277,827	1,473,905	1,473,905
Derivative assets	79	79	389	389
Liabilities				
Contingent consideration	70,543	70,543	45,102	45,102
Derivative liabilities	514	514	446	446
Convertible debt (1)	379,981	547,113	365,987	659,525

(1) The carrying value represents the bifurcated debt component only, while the fair value is based on quoted market prices for the convertible note which includes the equity conversion features.

The fair values of accounts receivable, net and accounts payable approximate the carrying amount due to the short term nature of these instruments.

The following tables summarize the composition of available-for-sale marketable securities at December 31, 2018 and 2017:

	December 31, 2018				Fair Market Value of Investments with Unrealized Losses
	Available-for-Sale				
	Cost	Unrealized Gain	Unrealized (Loss)	Fair Market Value	
	(in thousands)				
U.S. Treasury securities	\$ 110,969	\$ 112	\$ (1,360)	\$ 109,721	\$ 75,040
Commercial paper	86,130	13	(26)	86,117	85,094
Corporate debt securities	41,133	432	(1,545)	40,020	24,767
U.S. government agency securities	9,646	1	(36)	9,611	7,077
Certificates of deposit and time deposits	7,604			7,604	
Debt mutual funds	3,153	34		3,187	
Non-U.S. government securities	376			376	
	\$ 259,011	\$ 592	\$ (2,967)	\$ 256,636	\$ 191,978

Reported as follows:

	December 31, 2018				Fair Market Value of Investments with Unrealized Losses
	Available-for-Sale				
	Cost	Unrealized Gain	Unrealized (Loss)	Fair Market Value	
	(in thousands)				
Marketable securities	\$ 190,100	\$ 88	\$ (92)	\$ 190,096	\$ 140,262
Long-term marketable securities	68,911	504	(2,875)	66,540	51,716
	\$ 259,011	\$ 592	\$ (2,967)	\$ 256,636	\$ 191,978

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	December 31, 2017				Fair Market Value of Investments with Unrealized Losses
	Available-for-Sale				
	Cost	Unrealized Gain	Unrealized (Loss) (in thousands)	Fair Market Value	
U.S. Treasury securities	\$ 858,258	\$ 72	\$ (2,535)	\$ 855,795	\$ 850,163
Commercial paper	283,009	18	(187)	282,840	258,933
Certificates of deposit and time deposits	167,523	6	(187)	167,342	138,340
Corporate debt securities	131,179	2,380	(373)	133,186	91,010
Equity and debt mutual funds	19,403	4,102	(75)	23,430	1,723
U.S. government agency securities	10,775		(49)	10,726	10,727
Non-U.S. government securities	582	4		586	
	\$ 1,470,729	\$ 6,582	\$ (3,406)	\$ 1,473,905	\$ 1,350,896

Reported as follows:

	December 31, 2017				Fair Market Value of Investments with Unrealized Losses
	Available-for-Sale				
	Cost	Unrealized Gain	Unrealized (Loss) (in thousands)	Fair Market Value	
Marketable securities	\$ 1,349,970	\$ 38	\$ (2,029)	\$ 1,347,979	\$ 1,288,844
Long-term marketable securities	120,759	6,544	(1,377)	125,926	62,052
	\$ 1,470,729	\$ 6,582	\$ (3,406)	\$ 1,473,905	\$ 1,350,896

As of December 31, 2018, the fair market value of investments with unrealized losses totaled \$192.0 million. Of this value, \$28.5 million had unrealized losses of \$1.6 million greater than one year and \$163.5 million had unrealized losses of \$1.4 million for less than one year.

As of December 31, 2017, the fair market value of investments with unrealized losses totaled \$1,350.9 million. Of this value, \$141.0 million had unrealized losses of \$1.2 million greater than one year and \$1,209.9 million had unrealized losses of \$2.2 million for less than one year.

Teradyne reviews its investments to identify and evaluate investments that have an indication of possible impairment. Based on this review, Teradyne determined that the unrealized losses related to these investments at December 31, 2018 and 2017, were temporary.

The contractual maturities of investments in available-for-sale marketable securities held at December 31, 2018 were as follows:

	Cost (in thousands)	Fair Value (in thousands)
Due within one year	\$ 190,100	\$ 190,096
Due after 1 year through 5 years	9,199	9,144
Due after 5 years through 10 years	14,081	13,405
Due after 10 years	42,478	40,804
Total	\$ 255,858	\$ 253,449

Contractual maturities of investments in available-for-sale marketable securities held at December 31, 2018 exclude \$3.2 million of debt mutual funds as they do not have a contractual maturity date.

Table of Contents**Derivatives**

Teradyne conducts business in a number of foreign countries, with certain transactions denominated in local currencies. The purpose of Teradyne's foreign currency management is to minimize the effect of exchange rate fluctuations on certain foreign currency denominated monetary assets and liabilities. Teradyne does not use derivative financial instruments for trading or speculative purposes.

To minimize the effect of exchange rate fluctuations associated with the remeasurement of monetary assets and liabilities denominated in foreign currencies, Teradyne enters into foreign currency forward contracts. The change in fair value of these derivatives is recorded directly in earnings, and is used to offset the change in value of the monetary assets and liabilities denominated in foreign currencies.

At December 31, 2018 and 2017, Teradyne had the following contracts to buy and sell non-U.S. currencies for U.S. dollars and other non-U.S. currencies with the following notional amounts:

	December 31, 2018			December 31, 2017		
	Buy Position	Sell Position	Net Total	Buy Position	Sell Position	Net Total
	(in millions)					
Japanese Yen	\$ (35.0)	\$	\$ (35.0)	\$ (35.7)	\$	\$ (35.7)
Taiwan Dollar	(11.2)		(11.2)	(9.9)		(9.9)
Korean Won	(9.6)		(9.6)	(8.9)		(8.9)
British Pound Sterling	(1.4)		(1.4)	(1.4)		(1.4)
Euro		82.2	82.2		27.4	27.4
Singapore Dollar		15.7	15.7		33.5	33.5
Philippine Peso		5.2	5.2			
Chinese Yuan		2.8	2.8			
Total	\$ (57.2)	\$ 105.9	\$ 48.7	\$ (55.9)	\$ 60.9	\$ 5.0

The fair value of the outstanding contracts was a loss of \$0.4 million and \$0.1 million, respectively, at December 31, 2018 and 2017.

Gains and losses on foreign currency forward contracts and foreign currency remeasurement gains and losses on monetary assets and liabilities are included in other (income) expense, net.

The following table summarizes the fair value of derivative instruments as of December 31, 2018 and 2017:

Balance Sheet Location	December 31, 2018	December 31, 2017	
	(in thousands)		
Derivatives not designated as hedging instruments:			
Foreign exchange contracts	Prepayments	\$ 79	\$ 389
Foreign exchange contracts	Other current liabilities	(514)	(446)
Total derivatives		\$ (435)	\$ (57)

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The following table summarizes the effect of derivative instruments in the statements of operations recognized for the years ended December 31, 2018, 2017, and 2016.

	Location of (Gains) Losses	Recognized in Statement		
	of Operations	2018	2017	2016
(in thousands)				
Derivatives not designated as hedging instruments:				
Foreign exchange contracts	Other (income) expense, net	\$ 7,257	\$ (1,133)	\$ 8,671

- (1) The table does not reflect the corresponding gains and losses from the remeasurement of the monetary assets and liabilities denominated in foreign currencies.
- (2) For the years ended December 31, 2018 and 2016, net gains from the remeasurement of monetary assets and liabilities denominated in foreign currencies were \$2.4 million and \$8.0 million, respectively.
- (3) For the year ended December 31, 2017, net losses from the remeasurement of monetary assets and liabilities denominated in foreign currencies were \$2.9 million.

See Note H: Debt regarding derivatives related to the convertible senior notes.

Concentration of Credit Risk

Financial instruments which potentially subject Teradyne to concentrations of credit risk consist principally of cash equivalents, marketable securities, forward currency contracts and accounts receivable. Teradyne's cash equivalents consist primarily of money market funds invested in U.S. Treasuries and government agencies. Teradyne's fixed income available-for-sale marketable securities have a minimum rating of AA by one or more of the major credit rating agencies. Teradyne places foreign currency forward contracts with high credit-quality financial institutions in order to minimize credit risk exposure. Concentrations of credit risk with respect to accounts receivable are limited due to the large number of geographically dispersed customers. Teradyne performs ongoing credit evaluations of its customers' financial condition and from time to time may require customers to provide a letter of credit from a bank to secure accounts receivable. There were no customers who accounted for more than 10% of Teradyne's accounts receivable balance as of December 31, 2018 and December 31, 2017.

H. DEBT**Convertible Senior Notes**

On December 12, 2016, Teradyne completed a private offering of \$460.0 million aggregate principal amount of 1.25% convertible senior unsecured notes (the "Notes") due December 15, 2023 and received net proceeds, after issuance costs, of approximately \$450.8 million, \$33.0 million of which was used to pay the net cost of the convertible note hedge transactions and \$50.1 million of which was used to repurchase 2.0 million shares of Teradyne's common stock under its existing stock repurchase program from purchasers of the Notes in privately negotiated transactions effected through one of the initial purchasers or its affiliates conducted concurrently with the pricing of the Note offering. The Notes will mature on December 15, 2023, unless earlier repurchased or converted. The Notes bear interest from December 12, 2016 at a rate of 1.25% per year payable semiannually in arrears on June 15 and December 15 of each year, beginning on June 15, 2017. The Notes will be convertible at the option of the noteholders at any time prior to the close of business on the business day immediately preceding September 15, 2023, only under the following circumstances: (1) during any calendar quarter beginning after March 31, 2017 (and only during such calendar quarter), if the closing sale price of Teradyne's common stock, for at least 20 trading days (whether or not consecutive) during a period of 30 consecutive trading days ending on the last trading day of the immediately preceding calendar quarter is greater than 130% of the conversion price on each applicable trading day; (2) during the five business day period after any five consecutive trading day period (the "measurement period") in which the trading price (as defined in the Indenture) per \$1,000 principal amount of Notes for each trading day of the measurement period was less

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than 98% of the product of the closing sale price of the Teradyne's common stock and the conversion rate on each such trading day; and (3) upon the occurrence of specified corporate events. On or after September 15, 2023 until the close of business on the second scheduled trading day immediately preceding the maturity date, holders may convert their Notes at any time, regardless of the foregoing circumstances. Teradyne may satisfy its conversion obligation by paying or delivering cash, shares of its common stock or a combination of cash and shares of its common stock, at Teradyne's election. As of December 31, 2018, the conversion price was approximately \$31.70 per share of Teradyne's common stock. The conversion rate is subject to adjustment under certain circumstances.

Concurrent with the offering of the Notes, Teradyne entered into convertible note hedge transactions (the Note Hedge Transactions) with the initial purchasers or their affiliates (the Option Counterparties). The Note Hedge Transactions cover, subject to customary anti-dilution adjustments, the number of shares of the common stock that underlie the Notes, with a strike price equal to the conversion price of the Notes of \$31.70. The Note Hedge Transactions cover, subject to customary anti-dilution adjustments, approximately 14.5 million shares of Teradyne's common stock.

Separately and concurrent with the pricing of the Notes, Teradyne entered into warrant transactions with the Option Counterparties (the Warrant Transactions) in which it sold net-share-settled (or, at its election subject to certain conditions, cash-settled) warrants to the Option Counterparties. The Warrant Transactions cover, subject to customary anti-dilution adjustments, approximately 14.5 million shares of common stock. As of December 31, 2018, the strike price of the warrants was approximately \$39.78 per share. The strike price is subject to adjustment under certain circumstances. The Warrant Transactions could have a dilutive effect to Teradyne's common stock to the extent that the market price per share of Teradyne's common stock, as measured under the terms of the Warrant Transactions, exceeds the applicable strike price of the warrants.

The Note Hedge Transactions are expected to reduce the potential dilution to Teradyne's common stock upon any conversion of the Notes. However, the Warrant Transactions could separately have a dilutive effect to the extent that the market value per share of Teradyne's common stock exceeds the applicable strike price of the warrant. The net cost of the Note Hedge Transactions, after being partially offset by the proceeds from the sale of the warrants, was approximately \$33.0 million.

In connection with establishing their initial hedge of these convertible note hedge and warrant transactions, the Option Counterparties have entered into various derivative transactions with respect to Teradyne's common stock and/or purchased shares of Teradyne's common stock or other securities, including the Notes, concurrent with, or shortly after, the pricing of the Notes. In addition, the Option Counterparties may modify their hedge positions by entering into or unwinding various derivative transactions with respect to Teradyne's common stock or by selling Teradyne's common stock or other securities, including the Notes, in secondary market transactions (and may do so during any observation period related to the conversion of the Notes). These activities could adversely affect the value of Teradyne's common stock and the Notes.

Teradyne considered the guidance of ASC 815-40, *Derivatives and Hedging Contracts in Entity's Own Equity*, and concluded that the convertible note hedge is both indexed to Teradyne's stock and should be classified in stockholders' equity in its statements of financial position. The convertible note hedge is considered indexed to Teradyne's stock as the terms of the Note Hedge Transactions do not contain an exercise contingency and the settlement amount equals the difference between the fair value of a fixed number of Teradyne's shares and a fixed strike price. Because the only variable that can affect the settlement amount is Teradyne's stock price, which is an input to the fair value of a fixed-for-fixed option contract, the convertible note hedge is considered indexed to Teradyne's stock.

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Teradyne assessed whether the convertible note hedge should be classified as equity under ASC 815-40. In the Note Hedge Transactions contract the settlement terms permit net cash settlement or net share settlement, at the option of Teradyne. Therefore, the criteria as set forth in ASC 815-40 were evaluated by Teradyne. In reviewing the criteria, Teradyne noted the following: (1) the convertible note hedge does not require Teradyne to issue shares; (2) there is no requirement to net cash settle the convertible note hedge for failure to make timely filings with the SEC; (3) in the case of termination, the convertible note hedge is settled in the same consideration as the holders of the underlying stock; (4) the counterparty does not have rights that rank higher than those of a shareholder of the stock underlying the convertible note hedge; and (5) there is no requirement to post collateral. Based on its analysis of those criteria, Teradyne concluded that the convertible note hedge should be recorded in equity and no further adjustment should be made in future periods to adjust the value of the convertible note hedge.

Teradyne analyzed the Warrant Transactions under ASC 815-40, *Derivatives and Hedging Contracts in Entity's Own Equity*, and other relevant literature, and determined that it met the criteria for classification as an equity transaction and is considered indexed to Teradyne's stock. As a result, Teradyne recorded the proceeds from the warrants as an increase to additional paid-in capital. Teradyne does not recognize subsequent changes in fair value of the warrants in its financial statements.

The provisions of ASC 470-20, *Debt with Conversion and Other Options*, are applicable to the Notes. ASC 470-20 requires Teradyne to separately account for the liability (debt) and equity (conversion feature) components of the Notes in a manner that reflects Teradyne's nonconvertible debt borrowing rate at the date of issuance when interest cost is recognized in subsequent periods. Teradyne allocated \$100.8 million of the \$460.0 million principal amount of the Notes to the equity component, which represents a discount to the debt and will be amortized to interest expense using the effective interest method through December 2023. Accordingly, Teradyne's effective annual interest rate on the Notes will be approximately 5.0%. The Notes are classified as long-term debt in the balance sheet based on their December 15, 2023 maturity date. Debt issuance costs of approximately \$7.2 million are being amortized to interest expense using the effective interest method over the seven year term of the Notes. As of December 31, 2018, debt issuance costs were approximately \$5.3 million.

The below tables represents the key components of Teradyne's convertible senior notes:

	December 31, 2018	December 31, 2017
	(in thousands)	
Debt principal	\$ 460,000	\$ 460,000
Unamortized discount	80,019	94,013
Net carrying amount of convertible debt	\$ 379,981	\$ 365,987

	For the year ended	
	December 31, 2018	December 31, 2017
	(in thousands)	
Contractual interest expense on the coupon	\$ 5,750	\$ 5,734
Amortization of the discount component and debt issue fees recognized as interest expense	13,995	13,318
Total interest expense on the convertible debt	\$ 19,745	\$ 19,052

As of December 31, 2018, the unamortized discount was \$80.0 million, which will be amortized over five years using the effective interest rate method. The carrying amount of the equity component was \$100.8 million. As of December 31, 2018, the conversion price was approximately \$31.70 per share and if converted the value of the notes was \$455.4 million.

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Revolving Credit Facility

On April 27, 2015, Teradyne entered into a Credit Agreement (the "Credit Agreement") with Barclays Bank PLC, as administrative agent and collateral agent, and the lenders party thereto. The Credit Agreement provides for a five-year, senior secured revolving credit facility of up to \$350 million (the "Credit Facility"). The Credit Agreement further provides that, subject to customary conditions, Teradyne may seek to obtain from existing or new lenders incremental commitments under the Credit Facility in an aggregate principal amount not to exceed \$150 million.

Proceeds from the Credit Facility may be used for general corporate purposes and working capital. Teradyne incurred \$2.3 million in costs related to the revolving credit facility. These costs are being amortized over the five-year term of the revolving credit facility and are included in interest expense in the statements of operations. As of March 1, 2019, Teradyne has not borrowed any funds under the Credit Facility.

The interest rates applicable to loans under the Credit Facility are, at Teradyne's option, equal to either a base rate plus a margin ranging from 0.00% to 1.00% per annum or LIBOR plus a margin ranging from 1.00% to 2.00% per annum, based on the Consolidated Leverage Ratio of Teradyne and its Restricted Subsidiaries. In addition, Teradyne will pay a commitment fee on the unused portion of the commitments under the Credit Facility ranging from 0.125% to 0.350% per annum, based on the then applicable Consolidated Leverage Ratio.

Teradyne is not required to repay any loans under the Credit Facility prior to maturity, subject to certain customary exceptions. Teradyne is permitted to prepay all or any portion of the loans under the Credit Facility prior to maturity without premium or penalty, other than customary LIBOR breakage costs.

The Credit Agreement contains customary events of default, representations, warranties and affirmative and negative covenants that, among other things, limit Teradyne's and its Restricted Subsidiaries' ability to sell assets, grant liens on assets, incur other secured indebtedness and make certain investments and restricted payments, all subject to exceptions set forth in the Credit Agreement. The Credit Agreement also requires Teradyne to satisfy two financial ratios measured as of the end of each fiscal quarter: a consolidated leverage ratio and an interest coverage ratio. As of December 31, 2018, Teradyne was in compliance with all covenants.

The Credit Facility is guaranteed by certain of Teradyne's domestic subsidiaries and collateralized by assets of Teradyne and such subsidiaries, including a pledge of 65% of the capital stock of certain foreign subsidiaries.

Table of Contents**I. ACCUMULATED OTHER COMPREHENSIVE (LOSS) INCOME**

Changes in accumulated other comprehensive (loss) income, which is presented net of tax, consist of the following:

	Foreign Currency Translation Adjustment	Unrealized Gains (Losses) on Marketable Securities (in thousands)	Retirement Plans Prior Service Credit	Total
Balance at December 31, 2016, net of tax of \$0, \$209, \$(778)	\$ (21,921)	\$ (60)	\$ 1,767	\$ (20,214)
Other comprehensive income before reclassifications, net of tax of \$0, \$1,903, \$0	37,840	1,863		39,703
Amounts reclassified from accumulated other comprehensive income, net of tax of \$0, \$(297), \$(154)		(441)	(272)	(713)
Net current period other comprehensive income, net of tax of \$0, \$1,606, \$(154)	37,840	1,422	(272)	38,990
Balance at December 31, 2017, net of tax of \$0, \$1,815, \$(932)	15,919	1,362	1,495	18,776
Other comprehensive loss before reclassifications, net of tax of \$0, \$(722), \$0	(28,442)	(2,110)		(30,552)
Amounts reclassified from accumulated other comprehensive income, net of tax of \$0, \$(21), \$(71)		1,337	(245)	1,092
Net current period other comprehensive loss, net of tax of \$0, \$(743), \$(71)	(28,442)	(773)	(245)	(29,460)
Reclassification of tax effects resulting from the Tax Reform Act, net of tax of \$0, \$(691), \$(78), respectively (a)		691	78	769
Reclassification of unrealized gains on equity securities, net of tax of \$0, \$(902), \$0, respectively, (b)		(3,125)		(3,125)
Balance at December 31, 2018, net of tax of \$0, \$(521), \$(1,081)	\$ (12,523)	\$ (1,845)	\$ 1,328	\$ (13,040)

- (a) In the year ended December 31, 2018, Teradyne early adopted ASU 2018-02, *Income Statement Reporting Comprehensive Income (Topic 220): Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income*. As a result, the stranded tax effects resulting from the Tax Reform Act enacted in December 2017 were reclassified from accumulated other comprehensive income to retained earnings.
- (b) In the year ended December 31, 2018, Teradyne adopted ASU 2016-01, *Financial Instruments Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities*. See Note B: Accounting Policies.

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Reclassifications out of accumulated other comprehensive income to the statements of operations for the years ended December 31, 2018, 2017, and 2016 were as follows:

Details about Accumulated**Other Comprehensive Income****Components**

	For the year ended			Affected Line Item in the Statements of Operations
	December 31, 2018	December 31, 2017 (in thousands)	December 31, 2016	
Available-for-sale marketable securities				
Unrealized (losses) gains, net of tax of \$21, \$297, \$255	\$ (1,337)	\$ 441	\$ 683	Interest income (expense)
Defined benefit pension and postretirement plans:				
Amortization of prior service benefit, net of tax of \$71, \$154, \$190	245	272	321	(a)
Total reclassifications, net of tax of \$92, \$451, \$445	\$ (1,092)	\$ 713	\$ 1,004	Net income

(a) The amortization of prior service credit is included in the computation of net periodic pension cost and postretirement benefit; see Note N: Retirement Plans.

J. GOODWILL AND INTANGIBLE ASSETS**Goodwill**

Teradyne performs its annual goodwill impairment test as required under the provisions of ASC 350-10, *Intangibles Goodwill and Other*, on December 31 of each fiscal year unless interim indicators of impairment exist. Goodwill is considered to be impaired when the net book value of a reporting unit exceeds its estimated fair value.

Teradyne has the option to perform a qualitative assessment (Step zero) to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying amount. If Teradyne determines this is the case, Teradyne is required to perform the two-step goodwill impairment test to identify potential goodwill impairment and measure the amount of goodwill impairment loss to be recognized. If Teradyne determines that it is more likely than not that the fair value of the reporting unit is greater than its carrying amounts, the two-step goodwill impairment test is not required. When performing the two-step process, the first step involves a comparison of the estimated fair value of a reporting unit to its carrying amount, including goodwill. In performing the first step, Teradyne determines the fair value of a reporting unit using the results derived from an income approach and a market approach. The income approach is estimated through the discounted cash flow (DCF) analysis. Determining fair value requires the exercise of significant judgment, including judgments about appropriate discount rates, perpetual growth rates, and the amount and timing of expected future cash flows. Discount rates are based on a weighted average cost of capital (WACC), which represents the average rate a business must pay its providers of debt and equity, plus a risk premium. The WACC used to test goodwill is derived from a group of comparable companies. The cash flows employed in the DCF analysis are derived from internal forecasts and external market forecasts. The market approach estimates the fair value of the reporting unit by utilizing the market comparable method which is based on revenue and earnings multiples from comparable companies. If the estimated fair value of a reporting unit exceeds its carrying amount, goodwill of the reporting unit is not impaired and the second step of the impairment test is not necessary. If the carrying amount of a reporting unit exceeds its estimated fair value, then the second step of the goodwill impairment test must be performed. The second step of the goodwill impairment test compares the implied fair value of the reporting unit's goodwill with its carrying amount of goodwill to measure the amount of impairment loss, if any. The implied fair value of goodwill is determined in the same manner as the amount of goodwill recognized in a business combination, whereby the estimated fair value of the reporting unit is allocated to all of the assets and

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liabilities of that unit (including any unrecognized intangible assets) as if the reporting unit had been acquired in a business combination and the fair value of the reporting unit was the purchase price paid. If the carrying amount of the reporting unit's goodwill exceeds the implied fair value of that goodwill, an impairment loss is recognized in an amount equal to that excess.

In the second quarter of 2016, the Wireless Test reporting unit (which is Teradyne's Wireless Test operating and reportable segment) reduced headcount by 11% as a result of a sharp decline in projected demand attributable to an estimated smaller future wireless test market. The decrease in projected demand was due to lower forecasted buying from Teradyne's largest Wireless Test segment customer (who has contributed between 51% and 73% of annual Wireless Test sales since the LitePoint acquisition in 2011 through 2015) as a result of the customer's numerous operational efficiencies; slower smartphone growth rates; and a slowdown of new wireless technology adoption. Teradyne considered the headcount reduction and sharp decline in projected demand to be a triggering event for an interim goodwill impairment test.

Teradyne allocated the fair value of the Wireless Test reporting unit to all of its assets and liabilities (including unrecognized intangible assets). The net book value of raw materials inventory was estimated as an approximation of current replacement costs. The fair value of finished goods inventory was estimated at the present value of selling price less direct selling costs and profit on the selling effort. The selling price used in the inventory fair values was based upon the product gross margins included in Teradyne's forecast. The fair value of the deferred revenue liability was estimated by assessing the costs required to service the obligation plus a reasonable profit margin. The fair value for personal property assets, which consisted of furniture and fixtures, machinery and equipment, computer equipment, software and leasehold improvements, was estimated using the replacement cost approach, which approximated carrying value. The fair value of intangible assets was estimated using the income approach and, in particular, developed technology and trademarks/trade names were valued using the relief-from-royalty method and customer relationships and customer backlog were valued using the discounted cash flow method. Royalty rates were estimated using rates applicable to wireless testing equipment and other similar technologies. Based upon this allocation, Teradyne determined that the Wireless Test reporting unit goodwill is valued at \$8.0 million and recorded an impairment loss of \$254.9 million in the second quarter of 2016.

In the fourth quarter of 2018, Teradyne performed the annual goodwill impairment test. Teradyne completed step one of the two-step impairment test for the Universal Robots reporting unit. Teradyne completed step zero for the Wireless Test, Defense/Aerospace, MiR, and Energid reporting units. There was no impairment as a result of the annual test performed in the fourth quarter of 2018.

In the fourth quarter of 2017, Teradyne performed the annual goodwill impairment test. Teradyne completed step one of the two-step impairment test for the Universal Robots reporting unit. Teradyne completed step zero for the Wireless Test and Defense/Aerospace reporting units. There was no impairment as a result of the annual test performed in the fourth quarter of 2017.

In the fourth quarter of 2016, Teradyne performed the annual goodwill impairment test. Teradyne completed step one of the two-step impairment test for the Universal Robots, Wireless Test and Defense/Aerospace reporting units. There was no impairment as a result of the annual test performed in the fourth quarter of 2016.

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The changes in the carrying amount of goodwill by reportable segments for the years ended December 31, 2018 and 2017 are as follows:

	Industrial Automation	System Test	Wireless Test	Semiconductor Test	Total
	(in thousands)				
Balance at December 31, 2016:					
Goodwill	\$ 204,851	\$ 158,699	\$ 361,819	\$ 260,540	\$ 985,909
Accumulated impairment losses		(148,183)	(353,843)	(260,540)	(762,566)
	204,851	10,516	7,976		223,343
Foreign currency translation adjustment	28,668				28,668
Balance at December 31, 2017:					
Goodwill	233,519	158,699	361,819	260,540	1,014,577
Accumulated impairment losses		(148,183)	(353,843)	(260,540)	(762,566)
	233,519	10,516	7,976		252,011
MiR acquisition	135,976				135,976
Energid acquisition	14,394				14,394
Foreign currency translation adjustment	(20,531)				(20,531)
Balance at December 31, 2018:					
Goodwill	363,358	158,699	361,819	260,540	1,144,416
Accumulated impairment losses		(148,183)	(353,843)	(260,540)	(762,566)
	\$ 363,358	\$ 10,516	\$ 7,976	\$	\$ 381,850

Intangible Assets

Teradyne reviews long-lived assets for impairment whenever events or changes in business circumstances indicate that the carrying amount of the assets may not be fully recoverable or that the useful lives of these assets are no longer appropriate. As a result of the Wireless Test segment goodwill impairment review in the second quarter of 2016, Teradyne performed an impairment test of the Wireless Test segment's intangible and long-lived assets. The impairment test is based on a comparison of the estimated undiscounted cash flows to the carrying value of the asset group. If undiscounted cash flows for the asset group are less than the carrying amount, the asset group is written down to its estimated fair value based on a discounted cash flow analysis. The cash flow estimates used to determine the impairment contain management's best estimates using appropriate assumptions and projections at that time. The fair value of intangible assets was estimated using the income approach and, in particular, developed technology and trademarks/trade names were valued using the relief-from-royalty method and customer relationships were valued using the discounted cash flow method. Royalty rates were estimated using rates applicable to wireless testing equipment and other similar technologies. As a result of the analysis, Teradyne recorded an \$83.3 million impairment charge in the second quarter of 2016 in acquired intangible assets impairment on the statements of operations, resulting in a remaining intangible assets balance of \$2.2 million at December 31, 2018 for the Wireless Test segment.

There were no events or circumstances indicating that the carrying value of intangible and long-lived assets may not be recoverable in 2018 and 2017.

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Amortizable intangible assets consist of the following and are included in intangible assets, net on the balance sheets:

	December 31, 2018			Net Carrying Amount
	Gross Carrying Amount (1)(2)	Accumulated Amortization (2)	Foreign Currency Translation Adjustment	
(in thousands)				
Developed technology	\$ 336,308	\$ (252,080)	\$ (4,079)	\$ 80,149
Customer relationships	97,153	(83,448)	(340)	13,365
Tradenames and trademarks	64,420	(31,653)	(799)	31,968
Non-compete agreement	320	(320)		
Backlog	30	(30)		
Total intangible assets	\$ 498,231	\$ (367,531)	\$ (5,218)	\$ 125,482

	December 31, 2017			Net Carrying Amount
	Gross Carrying Amount	Accumulated Amortization	Foreign Currency Translation Adjustment	
(in thousands)				
Developed technology	\$ 270,877	\$ (226,190)	\$ 1,618	\$ 46,305
Customer relationships	92,741	(83,585)	171	9,327
Tradenames and trademarks	50,100	(27,120)	416	23,396
Non-compete agreement	320	(260)		60
Total intangible assets	\$ 414,038	\$ (337,155)	\$ 2,205	\$ 79,088

(1) Includes intangible assets acquired in 2018, \$80.7 million from the MiR acquisition and \$12.3 million from the Energid acquisition.

(2) In 2018, \$8.8 million of amortizable intangible assets became fully amortized and have been eliminated from the gross carrying amount and accumulated amortization.

Aggregate intangible assets amortization expense for the years ended December 31, 2018, 2017, and 2016 was \$39.2 million, \$30.5 million, and \$52.6 million, respectively. Estimated intangible assets amortization expense for each of the five succeeding fiscal years is as follows:

Year	Amortization Expense (in thousands)
2019	\$ 38,496
2020	24,186
2021	13,945
2022	13,052
2023	12,785
Thereafter	23,018

K. COMMITMENTS AND CONTINGENCIES**Purchase Commitments**

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As of December 31, 2018, Teradyne had entered into non-cancelable purchase commitments for certain components and materials. The purchase commitments covered by the agreements aggregate to approximately \$242.1 million, of which \$232.5 million is for less than one year.

Table of Contents**Commitments**

Teradyne leases certain of its office buildings and other facilities under various operating lease arrangements that include renewal options and escalation clauses for adjusting rent payments to reflect changes in price indices. Rental expense for leases with fixed escalation clauses is recognized on a straight line basis over the lease term.

Rental expense for the years ended December 31, 2018, 2017, and 2016 was \$19.3 million, \$20.2 million, and \$19.1 million, respectively.

The following table reflects Teradyne's non-cancelable operating lease commitments:

	Non-cancelable Lease Commitments (in thousands)
2019	\$ 19,570
2020	18,293
2021	13,578
2022	9,693
2023	5,449
Beyond 2024	9,472
Total	\$ 76,055

Legal Claims

Teradyne is subject to legal proceedings, claims and investigations that arise in the ordinary course of business such as, but not limited to, patent, employment, commercial and environmental matters. Teradyne believes that it has meritorious defenses against all pending claims and intends to vigorously contest them. While it is not possible to predict or determine the outcomes of any pending claims or to provide possible ranges of losses that may arise, Teradyne believes the potential losses associated with all of these actions are unlikely to have a material adverse effect on its business, financial position or results of operations.

Guarantees and Indemnification Obligations

Teradyne provides indemnification, to the extent permitted by law, to its officers, directors, employees and agents for liabilities arising from certain events or occurrences while the officer, director, employee, or agent, is or was serving, at Teradyne's request in such capacity. Teradyne has entered into indemnification agreements with certain of its officers and directors. With respect to acquisitions, Teradyne provides indemnifications to or assumes indemnification obligations for the current and former directors, officers and employees of the acquired companies in accordance with the acquired companies' by-laws and charter. As a matter of practice, Teradyne has maintained directors' and officers' liability insurance coverage including coverage for directors and officers of acquired companies.

Teradyne enters into agreements in the ordinary course of business with customers, resellers, distributors, integrators and suppliers. Most of these agreements require Teradyne to defend and/or indemnify the other party against intellectual property infringement claims brought by a third party with respect to Teradyne's products. From time to time, Teradyne also indemnifies customers and business partners for damages, losses and liabilities they may suffer or incur relating to personal injury, personal property damage, product liability, breach of confidentiality obligations and environmental claims relating to the use of Teradyne's products and services or resulting from the acts or omissions of Teradyne, its employees, authorized agents or subcontractors. On occasion, Teradyne has also provided guarantees to customers regarding the delivery and performance of its products in addition to the warranty described below.

As a matter of ordinary business course, Teradyne warrants that its products will substantially perform in accordance with its standard published specifications in effect at the time of delivery. Most warranties have a one-year duration commencing from installation. A provision is recorded upon revenue recognition to cost of revenue for estimated warranty expense based upon historical experience. When Teradyne receives revenue for

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extended warranties beyond the standard duration, it is deferred and recognized on a straight line basis over the contract period. Related costs are expensed as incurred. As of December 31, 2018 and 2017, Teradyne had a product warranty accrual of \$7.9 million and \$8.2 million, respectively, included in other accrued liabilities, and revenue deferrals related to extended warranties of \$27.4 million and \$24.4 million, respectively, included in short and long-term deferred revenue and customer advances.

In addition, in the ordinary course of business, Teradyne provides minimum purchase guarantees to certain vendors to ensure continuity of supply against the market demand. Although some of these guarantees provide penalties for cancellations and/or modifications to the purchase commitments as the market demand decreases, most of the guarantees do not. Therefore, as the market demand decreases, Teradyne re-evaluates these guarantees and determines what charges, if any, should be recorded.

With respect to its agreements covering product, business or entity divestitures and acquisitions, Teradyne provides certain representations, warranties and covenants to purchasers and agrees to indemnify and hold such purchasers harmless against breaches of such representations, warranties and covenants. Many of the indemnification claims have a definite expiration date while some remain in force indefinitely. With respect to its acquisitions, Teradyne may, from time to time, assume the liability for certain events or occurrences that took place prior to the date of acquisition.

As a matter of ordinary course of business, Teradyne occasionally guarantees certain indebtedness obligations of its subsidiary companies, limited to the borrowings from financial institutions, purchase commitments to certain vendors, and lease commitments to landlords.

Based on historical experience and information known as of December 31, 2018 and 2017, except for product warranty, Teradyne has not recorded any liabilities for these guarantees and obligations because the amount would be immaterial.

L. NET INCOME (LOSS) PER COMMON SHARE

The following table sets forth the computation of basic and diluted net income (loss) per common share:

	2018	2017	2016
	(in thousands, except per share amounts)		
Net income (loss) for basic and diluted net income per share	\$ 451,779	\$ 257,692	\$ (43,421)
Weighted average common shares-basic	187,672	198,069	202,578
Effect of dilutive potential common shares:			
Incremental shares from assumed conversion of convertible notes (1)	2,749	1,298	
Convertible note hedge warrant shares (2)	485	112	
Restricted stock units	1,385	1,800	
Stock options	278	335	0
Employee stock purchase rights	36	27	0
Dilutive potential common shares	4,933	3,572	
Weighted average common shares-diluted	192,605	201,641	202,578
Net income (loss) per common share-basic	\$ 2.41	\$ 1.30	\$ (0.21)
Net income (loss) per common share-diluted	\$ 2.35	\$ 1.28	\$ (0.21)

- (1) Incremental shares from the assumed conversion of the convertible notes was calculated using the difference between the average Teradyne stock price for the period and the conversion price of \$31.70, multiplied by 14.5 million shares. The result of this calculation, representing the total intrinsic value of the convertible debt, was divided by the average Teradyne stock price for the period.
- (2) Convertible notes hedge warrant shares were calculated using the difference between the average Teradyne stock price for the period and the warrant price of \$39.78, multiplied by 14.5 million shares. The result of this calculation, representing the total intrinsic value of the

warrant, was divided by the average Teradyne stock price for the period.

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The computation of diluted net income per common share for 2018 excludes the effect of the potential exercise of stock options to purchase approximately 0.1 million shares and restricted stock units to purchase approximately 0.5 million shares because the effect would have been anti-dilutive.

The computation of diluted net income per common share for 2017 excludes the effect of the potential exercise of stock options to purchase approximately 0.1 million shares because the effect would have been anti-dilutive.

The computation of diluted net loss per common share for 2016 excludes the effect of the potential exercise of all outstanding stock options and restricted stock units because Teradyne had a net loss and inclusion would be anti-dilutive.

M. RESTRUCTURING AND OTHER

During the year ended December 31, 2018, Teradyne recorded an expense of \$17.7 million for the increase in the fair value of the MiR contingent consideration liability, \$8.7 million of severance charges related to headcount reductions primarily in Semiconductor Test, and \$4.5 million for acquisition related expenses and compensation, partially offset by a gain of \$16.7 million for the decrease in the fair value of the Universal Robots contingent consideration liability.

During the year ended December 31, 2017, Teradyne recorded an expense of \$7.8 million for the increase in the fair value of the Universal Robots contingent consideration liability, \$3.8 million of severance charges related to headcount reductions primarily in Semiconductor Test, \$1.1 million for an impairment of fixed assets in Semiconductor Test, \$1.0 million for a lease impairment of a Wireless Test facility in Sunnyvale, CA, which was terminated in September 2017, and \$0.8 million of expenses related to an earthquake in Kumamoto, Japan, partially offset by \$5.1 million of property insurance recovery related to the Japan earthquake.

During the year ended December 31, 2016, Teradyne recorded an expense of \$15.9 million for the increase in the fair value of the contingent consideration liability, of which \$15.3 million was related to Universal Robots and \$0.6 million was related to AIT, \$6.0 million of severance charges related to headcount reductions primarily in Wireless Test, \$4.2 million for an impairment of fixed assets, and \$0.9 million for expenses related to an earthquake in Kumamoto, Japan, partially offset by \$5.1 million of property insurance recovery related to the Japan earthquake.

N. RETIREMENT PLANS

ASC 715, *Compensation Retirement Benefits*, requires an employer with defined benefit plans or other postretirement benefit plans to recognize an asset or a liability on its balance sheet for the overfunded or underfunded status of the plans as defined by ASC 715. The pension asset or liability represents a difference between the fair value of the pension plan's assets and the projected benefit obligation at December 31. Teradyne uses a December 31 measurement date for all of its plans.

Defined Benefit Pension Plans

Teradyne has defined benefit pension plans covering a portion of domestic employees and employees of certain non-U.S. subsidiaries. Benefits under these plans are based on employees' years of service and compensation. Teradyne's funding policy is to make contributions to the plans in accordance with local laws and to the extent that such contributions are tax deductible. The assets of these plans consist primarily of fixed income and equity securities. In addition, Teradyne has an unfunded supplemental executive defined benefit plan in the United States to provide retirement benefits in excess of levels allowed by the Employment Retirement Income Security Act (ERISA) and the Internal Revenue Code (the IRC), as well as unfunded qualified foreign plans.

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During 2018, Teradyne purchased a group annuity contract for its retiree participants in the U.S. qualified pension plan. Under the group annuity, the accrued pension obligations for approximately 1,700 retiree participants were transferred to an insurance company. The reduction in the pension benefit obligation and pension assets was \$151.3 million. During 2018, Teradyne recorded a settlement loss of \$0.3 million related to the retiree group annuity transaction.

The December 31 balances of these defined benefit pension plans assets and obligations are shown below:

	2018		2017	
	United States	Foreign	United States	Foreign
	(in thousands)			
Assets and Obligations				
Change in benefit obligation:				
Projected benefit obligation:				
Beginning of year	\$ 363,026	\$ 39,353	\$ 353,616	\$ 60,738
Service cost	2,196	786	2,239	818
Interest cost	8,940	687	13,151	852
Actuarial (gain) loss	(30,136)	773	12,702	262
Benefits paid	(14,793)	(741)	(18,682)	(994)
Retiree annuity purchase	(151,341)			
Liability loss due to settlement	345			
Settlements				(28,560)
Admin expenses paid				(40)
Non-U.S. currency movement		(1,712)		6,277
End of year	178,237	39,146	363,026	39,353
Change in plan assets:				
Fair value of plan assets:				
Beginning of year	324,506	1,307	307,304	27,571
Company contributions	2,587	822	4,462	883
Actual return on plan assets	(16,658)	50	31,422	737
Benefits paid	(14,793)	(741)	(18,682)	(994)
Retiree annuity purchase	(151,341)			
Settlements				(28,560)
Admin expenses paid				(40)
Non-U.S. currency movement		(38)		1,710
End of year	144,301	1,400	324,506	1,307
Funded status	\$ (33,936)	\$ (37,746)	\$ (38,520)	\$ (38,046)

The following table provides amounts recorded within the account line items of the statements of financial position as of December 31:

	2018		2017	
	United States	Foreign	United States	Foreign
	(in thousands)			
Retirement plans assets	\$ 16,883	\$	\$ 17,491	\$
Accrued employees' compensation and withholdings	(2,676)	(852)	(2,524)	(863)
Retirement plans liabilities	(48,143)	(36,894)	(53,487)	(37,183)
Funded status	\$ (33,936)	\$ (37,746)	\$ (38,520)	\$ (38,046)

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The following table provides amounts recognized in accumulated other comprehensive income as of December 31:

	2018		2017	
	United States	Foreign	United States	Foreign
	(in thousands)			
Prior service cost, before tax	\$	\$	\$ 58	\$
Deferred taxes	560		539	
Total recognized in other comprehensive income, net of tax	\$ 560	\$	\$ 597	\$

The accumulated benefit obligation for the United States defined benefit pension plans was \$172.8 million and \$354.3 million at December 31, 2018 and 2017, respectively. The accumulated benefit obligation for foreign defined benefit pension plans was \$35.6 million and \$34.7 million at December 31, 2018 and 2017, respectively.

Information for pension plans with an accumulated benefit obligation in excess of plan assets as of December 31:

	2018		2017	
	United States	Foreign	United States	Foreign
	(in millions)			
Projected benefit obligation	\$ 50.8	\$ 39.1	\$ 56.0	\$ 39.4
Accumulated benefit obligation	48.6	35.6	51.6	34.7
Fair value of plan assets		1.4		1.3

Expense

For the years ended December 31, 2018, 2017, and 2016, Teradyne's net periodic pension (income) cost was comprised of the following:

	2018		2017		2016	
	United States	Foreign	United States	Foreign	United States	Foreign
	(in thousands)					
Components of Net Periodic Pension (Income) Cost:						
Service cost	\$ 2,196	\$ 786	\$ 2,239	\$ 818	\$ 2,302	\$ 761
Interest cost	8,940	687	13,151	852	13,630	1,185
Expected return on plan assets	(9,049)	(19)	(12,008)	(165)	(13,830)	(443)
Amortization of prior service cost	58		70		96	
Net actuarial (gain) loss	(4,429)	743	(6,712)	(310)	(4,013)	815
Settlement loss	345					
Total net periodic pension (income) cost	\$ (1,939)	\$ 2,197	\$ (3,260)	\$ 1,195	\$ (1,815)	\$ 2,318

Changes in Plan Assets and Benefit Obligations Recognized in Other Comprehensive Income:

Reversal of amortization items:						
Prior service cost	(58)		(70)		(96)	
Total recognized in other comprehensive income	(58)		(70)		(96)	
Total recognized in net periodic pension (income) cost and other comprehensive income	\$ (1,997)	\$ 2,197	\$ (3,330)	\$ 1,195	\$ (1,911)	\$ 2,318

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Weighted Average Assumptions to Determine Net Periodic Pension Cost at January 1:

	2018		2017		2016	
	United States	Foreign	United States	Foreign	United States	Foreign
Discount rate	3.4%	1.8%	3.9%	1.8%	4.0%	2.3%
Expected return on plan assets	4.3	1.5	4.0	2.0	4.8	2.0
Salary progression rate	2.3	2.7	2.6	2.7	2.7	3.2

Weighted Average Assumptions to Determine Pension Obligations at December 31:

	2018		2017	
	United States	Foreign	United States	Foreign
Discount rate	4.1%	1.8%	3.4%	1.8%
Salary progression rate	2.3	2.6	2.3	2.7

In developing the expected return on plan assets assumption, Teradyne evaluates input from its investment manager and pension consultants, including their forecast of asset class return expectations. Teradyne believes that 4.25% was an appropriate rate to use for fiscal 2018 for the U.S. Qualified Pension Plan (U.S. Plan).

Teradyne recognizes net actuarial gains and losses and the change in the fair value of the plan assets in its operating results in the year in which they occur or upon any interim remeasurement of the plans. Teradyne calculates the expected return on plan assets using the fair value of the plan assets. Actuarial gains and losses are generally measured annually as of December 31 and, accordingly, recorded during the fourth quarter of each year or upon any interim remeasurement of the plans.

The discount rate utilized to determine future pension obligations for the U.S. Plan is based on FTSE Pension Index adjusted for the plan s expected cash flows and was 4.15% at December 31, 2018, up from 3.4% at December 31, 2017.

Plan Assets

As of December 31, 2018, the fair value of Teradyne s pension plans assets totaled \$145.7 million of which \$144.3 million was related to the U.S. Plan and \$1.4 million was related to the Taiwan defined benefit pension plan. Substantially all of Teradyne s pension plans assets are held in individual trusts, which were established for the investment of assets of Teradyne s sponsored retirement plans.

The following table provides weighted average pension asset allocation by asset category at December 31, 2018 and 2017:

	2018		2017	
	United States	Foreign	United States	Foreign
Fixed income securities	94.0%	%	88.1%	%
Equity securities	5.0		9.9	
Other	1.0	100.0	2.0	100.0
	100.0%	100.0%	100.0%	100.0%

The assets of the U.S. Plan are overseen by the Teradyne Fiduciary Committee which is comprised of members of senior management drawn from appropriate diversified levels of the management team. The Fiduciary Committee is responsible for setting the policy that provides the framework for management of the U.S. Plan assets. In accordance with its responsibilities, the Fiduciary Committee meets on a regular basis to review the performance of the U.S. Plan assets and compliance with the investment policy. The policy sets forth

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an investment structure for managing U.S. Plan assets, including setting the asset allocation ranges, which are expected to provide an appropriate level of overall diversification required to maximize the long-term return on plan assets for a prudent and reasonable level of risk given prevailing market conditions, total investment return over the long term, and preservation of capital, while maintaining sufficient liquidity to pay the benefits of the U.S. Plan. The investment portfolio will not, at any time, have a direct investment in Teradyne stock. It may have indirect investment in Teradyne stock, if one of the funds selected by the investment manager invests in Teradyne stock. In developing the asset allocation ranges, third party asset allocation studies are periodically performed that consider the current and expected positions of the plan assets and funded status. Based on this study and other appropriate information, the Fiduciary Committee establishes asset allocation ranges taking into account acceptable risk targets and associated returns. The investment return objectives are to avoid excessive volatility and produce a rate of return that at least matches the Policy Index identified below. The manager's investment performance is reviewed at least annually. Results for the total portfolio and for each major category of assets are evaluated in comparison with appropriate market indices and the Policy Index.

The target asset allocation and the index for each asset category for the U.S. Plan, per the investment policy, are as follows:

Asset Category:	Policy Index:	Target Allocation
U.S. corporate fixed income	Barclays U.S. Corporate A or Better Index	75%
Global equity	MSCI World Minimum Volatility Index	5
U.S. government fixed income	Barclays U.S. 20+ Year Treasury Strips Index	14
High yield fixed income	Barclays U.S. Corporate High Yield 2% Issuer Cap Index	5
Cash	Citigroup Three Month U.S. Treasury Bill Index	1

Teradyne's U.S. Plan invests primarily in common trust funds. Units held in the common trust funds are valued at the unit price as reported by the investment manager based on the asset value of the underlying investments; underlying investments in equity securities are valued at the last reported sales price, and underlying investments in fixed-income securities are generally valued using methods based upon market transactions for comparable securities.

In 2017, the U.K. defined benefit pension was terminated and the obligations and assets of the plan were transferred to an insurance company.

During the year ended December 31, 2018, \$2.7 million of pension assets were transferred out of Level 3 to Level 2. During the year ended December 31, 2017, there were no transfers of pension assets in or out of Level 1, Level 2 or Level 3.

The fair value of pension plan assets by asset category and by level at December 31, 2018 and December 31, 2017 were as follows:

	December 31, 2018							Total
	Level 1	United States		Total	Level 1	Level 2	Level 3	
		Level 2	Level 3	(in thousands)				
Fixed income securities:								
Corporate debt securities	\$	\$ 115,424	\$	\$ 115,424	\$	\$	\$	\$
U.S. government securities		20,176		20,176				
Global equity		7,252		7,252				
Other						1,400		1,400
Cash and cash equivalents	1,449			1,449				
Total	\$ 1,449	\$ 142,852	\$	\$ 144,301	\$	\$ 1,400	\$	\$ 1,400

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	December 31, 2017							
	Level 1	United States			Total	Level 1	Foreign	
		Level 2	Level 3	(in thousands)		Level 2	Level 3	
Fixed income securities:								
Corporate debt securities	\$	\$ 260,294	\$	\$ 260,294	\$	\$	\$	\$
U.S. government securities		25,709		25,709				
Global equity		32,120		32,120				
Group annuity insurance contracts			3,166	3,166				
Other						1,307		1,307
Cash and cash equivalents	3,217			3,217				
Total	\$ 3,217	\$ 318,123	\$ 3,166	\$ 324,506	\$	\$ 1,307	\$	\$ 1,307

The pension plan assets identified as Level 3 above are related to group annuity insurance contracts held by the U.S. Plan.

Changes in the fair value of Level 3 group annuity insurance contracts for the years ended December 31, 2018 and 2017 were as follows:

	Group Annuity Insurance Contracts (in thousands)	
Balance at December 31, 2016	\$	29,456
Settlements		(28,560)
Interest and market value adjustments		959
Benefits paid		(244)
Other		(61)
Non-U.S. currency movement		1,616
Balance at December 31, 2017		3,166
Transfer out of Level 3		(2,658)
Purchases of retiree annuity insurance contracts		(512)
Interest and market value adjustments		59
Benefits paid		(40)
Other		(15)
Balance at December 31, 2018	\$	

Contributions

Teradyne's funding policy is to make contributions to the plans in accordance with local laws and to the extent that such contributions are tax deductible. During 2018, Teradyne contributed \$2.6 million to the U.S. supplemental executive defined benefit pension plan and \$0.8 million to certain qualified plans for non-U.S. subsidiaries. During 2017, Teradyne contributed \$1.9 million to the U.S. Plan, \$2.6 million to the U.S. supplemental executive defined benefit pension plan and \$0.9 million to certain qualified plans for non-U.S. subsidiaries. In 2019, contributions to the U.S. supplemental executive defined benefit pension plan and certain qualified plans from non-U.S. subsidiaries will be approximately \$2.7 million and \$0.9 million, respectively.

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Expected Future Pension Benefit Payments

Future benefit payments are expected to be paid as follows:

	United States (in thousands)	Foreign
2019	\$ 6,903	\$ 874
2020	7,133	1,522
2021	8,026	905
2022	8,863	888
2023	9,584	1,199
2024-2028	57,120	5,921

Postretirement Benefit Plans

In addition to receiving pension benefits, U.S. Teradyne employees who meet early retirement eligibility requirements as of their termination dates may participate in Teradyne's Welfare Plan, which includes medical and dental benefits up to age 65. Death benefits provide a fixed sum to retirees' survivors and are available to all retirees. Substantially all of Teradyne's current U.S. employees could become eligible for these benefits, and the existing benefit obligation relates primarily to those employees.

The December 31 balances of the postretirement assets and obligations are shown below:

	2018 (in thousands)	2017
Assets and Obligations		
Change in benefit obligation:		
Projected benefit obligation:		
Beginning of year	\$ 6,177	\$ 5,510
Service cost	39	34
Interest cost	196	201
Actuarial loss	25	398
Special termination benefits	3,708	591
Benefits paid	(889)	(557)
End of year	9,256	6,177
Change in plan assets:		
Fair value of plan assets:		
Beginning of year		
Company contributions	889	557
Benefits paid	(889)	(557)
End of year		
Funded status	\$ (9,256)	\$ (6,177)

The following table provides amounts recorded within the account line items of financial position as of December 31:

2018
(in thousands) 2017

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Accrued employees' compensation and withholdings	\$ (1,310)	\$ (591)
Retirement plans liability	(7,946)	(5,586)
Funded status	\$ (9,256)	\$ (6,177)

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The following table provides amounts recognized in accumulated other comprehensive income as of December 31:

	2018 (in thousands)	2017 (in thousands)
Prior service credit, before tax	\$ (249)	\$ (622)
Deferred taxes	(1,641)	(1,472)
Total recognized in other comprehensive income, net of tax	\$ (1,890)	\$ (2,094)

The estimated portion of prior service credit remaining in accumulated other comprehensive income that is expected to be recognized as a component of net periodic postretirement benefit income in 2019 is \$(0.2) million.

Expense

For the years ended December 31, 2018, 2017, and 2016, Teradyne's net periodic postretirement benefit cost (income) was comprised of the following:

	2018	2017 (in thousands)	2016
Components of Net Periodic Postretirement Benefit Cost (income):			
Service cost	\$ 39	\$ 34	\$ 37
Interest cost	196	201	218
Amortization of prior service credit	(373)	(496)	(607)
Net actuarial loss	25	398	5
Special termination benefits	3,708	591	
Total net periodic postretirement benefit cost (income)	3,595	728	(347)

Changes in Plan Assets and Benefit Obligations Recognized in Other Comprehensive Income:

Prior service cost			(93)
Reversal of amortization items:			
Prior service credit	373	496	607
Total recognized in other comprehensive income	373	496	514
Total recognized in net periodic postretirement benefit cost (income) and other comprehensive income	\$ 3,968	\$ 1,224	\$ 167

Weighted Average Assumptions to Determine Net Periodic Postretirement Benefit Income as of January 1:

	2018	2017	2016
Discount rate	3.4%	3.9%	3.9%
Initial health care cost trend rate	7.9	7.3	7.5
Ultimate health care cost trend rate	4.5	5.0	5.0
Year in which ultimate health care cost trend rate is reached	2026	2023	2023

Weighted Average Assumptions to Determine Postretirement Benefit Obligation as of December 31:

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	2018	2017	2016
Discount rate	4.0%	3.4%	3.9%
Initial medical trend	7.5	7.9	7.3
Ultimate health care trend	4.5	4.5	5.0
Medical cost trend rate decrease to ultimate rate in year	2026	2026	2023

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Assumed health care trend rates could have a significant effect on the amounts reported for health care plans. A one percentage point change in the assumed health care cost trend rates for the year ended December 31, 2018 would have the following effects:

	1 Percentage Point Increase	1 Percentage Point Decrease
	(in thousands)	
Effect on total service and interest cost components	\$ 7	\$ (7)
Effect on postretirement benefit obligations	181	(171)
Expected Future Benefit Payments		

Future benefit payments are expected to be paid as follows:

	Benefit Payments (in thousands)
2019	\$ 1,310
2020	1,234
2021	1,181
2022	984
2023	811
2024-2028	2,364

O. STOCK-BASED COMPENSATION**Stock Compensation Plans**

Under Teradyne's stock compensation plans, Teradyne grants stock options, restricted stock units and performance-based restricted stock units, and employees are eligible to purchase Teradyne's common stock through its Employee Stock Purchase Plan (ESPP).

Stock options to purchase Teradyne's common stock at 100% of the fair market value on the grant date vest in equal annual installments over four years from the grant date and have a maximum term of seven years.

Time-based restricted stock unit awards granted to employees vest in equal annual installments over four years. Restricted stock unit awards granted to non-employee directors vest in full, on the earlier of (a) the first anniversary of the grant date or (b) the date of the following year's Annual Meeting of Shareholders. Teradyne expenses the cost of the restricted stock unit awards subject to time based vesting, which is determined to be the fair market value of the shares at the date of grant, ratably over the period during which the restrictions lapse.

Teradyne grants performance-based restricted stock units (PRSUs) to its executive officers with a performance metric based on relative total shareholder return (TSR). For TSR grants issued in 2018, 2017, and 2016, Teradyne's three-year TSR performance is measured against the New York Stock Exchange (NYSE) Composite Index. The final number of TSR PRSUs that vest will vary based upon the level of performance achieved from 200% to 0% of the target shares capped at four times the grant date value. The TSR PRSUs will vest upon the three-year anniversary of the grant date. The TSR PRSUs are valued using a Monte Carlo simulation model. The number of units expected to be earned, based upon the achievement of the TSR market condition, is factored into the grant date Monte Carlo valuation. Compensation expense is recognized on a straight-line basis over the shorter of the three-year service period or the period from the grant to the date described in the retirement provisions below. Compensation expense for employees meeting the retirement provisions prior to the grant date will be recognized in full on the date of the grant. Compensation expense is recognized regardless of the eventual number of units that are earned based upon the market condition, provided

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the executive officer remains an employee at the end of the three-year period. Compensation expense is reversed if at any time during the three-year service period the executive officer is no longer an employee, subject to the retirement and termination eligibility provisions noted below.

In January 2018, 2017, and 2016, Teradyne granted PRSUs to its executive officers with a performance metric based on three-year cumulative non-GAAP profit before interest and tax (PBIT) as a percent of Teradyne's revenue. Non-GAAP PBIT is a financial measure equal to GAAP income from operations less restructuring and other, net; amortization of acquired intangible assets; acquisition and divestiture related charges or credits; pension actuarial gains and losses; non-cash convertible debt interest expense; and other non-recurring gains and charges. The final number of PBIT PRSUs that vest will vary based upon the level of performance achieved from 200% to 0% of the target shares. The PBIT PRSUs will vest upon the three-year anniversary of the grant date. Compensation expense is recognized on a straight-line basis over the three-year service period. Compensation expense is recognized based on the number of units that are earned based upon the three-year Teradyne PBIT as a percent of Teradyne's revenue, provided the executive officer remains an employee at the end of the three-year period subject to the retirement and termination eligibility provisions noted below.

If a PRSU recipient's employment ends prior to the determination of the performance percentage due to (1) permanent disability or death or (2) retirement or termination other than for cause, after attaining both at least age sixty and at least ten years of service, then all or a portion of the recipient's PRSUs (based on the actual performance percentage achieved on the determination date) will vest on the date the performance percentage is determined. Except as set forth in the preceding sentence, no PRSUs will vest if the executive officer is no longer an employee at the end of the three-year period.

During 2018, 2017, and 2016, Teradyne granted 0.1 million TSR PRSUs, with a grant date fair value of \$54.85, \$35.66 and \$20.29, respectively. The fair value was estimated using the Monte Carlo simulation model with the following assumptions:

	2018	2017	2016
Risk-free interest rate	2.2%	1.5%	1.0%
Teradyne volatility-historical	26.8%	26.6%	27.0%
NYSE Composite Index volatility-historical	12.4%	13.4%	13.1%
Dividend yield	0.8%	1.0%	1.2%

Expected volatility was based on the historical volatility of Teradyne's stock and the NYSE Composite Index for the 2018, 2017 and 2016 grants, over the most recent three-year period. The risk-free interest rate was determined using the U.S. Treasury yield curve in effect at the time of grant. Dividend yield for 2018, 2017 and 2016 was based upon an estimated annual dividend amount of \$0.36 per share for 2018, \$0.28 per share for 2017 and \$0.24 per share for 2016 divided by Teradyne's stock price on the grant date of \$47.70 for the 2018 grant, \$28.56 for the 2017 grant, and \$19.43 for the 2016 grant.

During 2018, 2017, and 2016, Teradyne granted 0.1 million PBIT PRSUs with a grant date fair value of \$46.62, \$27.72 and \$18.71, respectively.

During 2018, 2017, and 2016, Teradyne granted 0.6 million, 0.8 million, and 1.2 million of service-based restricted stock unit awards to employees, respectively, at a weighted average grant date fair value of \$45.92, \$28.19, and \$18.88, respectively.

During 2018, 2017, and 2016, Teradyne granted 0.1 million of service-based restricted stock unit awards to non-employee directors at a weighted average grant date fair value of \$35.81, \$34.48, and \$18.71, respectively.

During 2018, 2017, and 2016, Teradyne granted 0.1 million of service-based stock options to executive officers at a weighted average grant date fair value of \$12.17, \$7.13, and \$5.30, respectively.

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The fair value of the stock options at grant date was estimated using the Black-Scholes option-pricing model with the following assumptions:

	2018	2017	2016
Expected life (years)	5.0	5.0	5.0
Risk-free interest rate	2.4%	2.0%	1.4%
Volatility-historical	26.4%	27.8%	32.9%
Dividend yield	0.80%	1.00%	1.20%

Teradyne determined the stock option's expected life based upon historical exercise data for executive officers, the age of executives and the terms of the stock option award. Volatility was determined using historical volatility for a period equal to the expected life. The interest rate was determined using the U.S. Treasury yield curve in effect at the time of grant. Dividend yield was based upon an estimated annual dividend amount of \$0.36 per share for 2018, \$0.28 per share for 2017, and \$0.24 per share for 2016 divided by Teradyne's stock price on the grant date of \$47.70 for the 2018 grants, \$28.56 for the 2017 grants, and \$19.43 for the 2016 grants.

Stock compensation plan activity for the years 2018, 2017, and 2016 is as follows:

	2018	2017	2016
	(in thousands)		
Restricted Stock Units:			
Non-vested at January 1	3,174	3,778	4,070
Awarded	790	939	1,471
Vested	(1,382)	(1,434)	(1,530)
Forfeited	(128)	(109)	(233)
Non-vested at December 31	2,454	3,174	3,778
Stock Options:			
Outstanding at January 1	531	926	1,121
Granted	69	111	130
Exercised	(94)	(501)	(324)
Expired		(5)	(2)
Outstanding at December 31	506	531	926
Vested and expected to vest at December 31	506	531	926
Exercisable at December 31	256	233	598

Total shares available for the years 2018, 2017, and 2016:

	2018	2017	2016
	(in thousands)		
Shares available:			
Available for grant at January 1	8,605	9,546	10,914
Options granted	(69)	(111)	(130)
Restricted stock units awarded	(790)	(939)	(1,471)
Restricted stock units forfeited	128	109	233
Available for grant at December 31	7,874	8,605	9,546

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Weighted average restricted stock unit award date fair value information for the years 2018, 2017, and 2016 is as follows:

	2018	2017	2016
Non-vested at January 1	\$ 21.71	\$ 18.27	\$ 17.66
Awarded	45.99	28.91	18.95
Vested	20.20	17.90	17.36
Forfeited	24.67	20.35	17.80
Non-vested at December 31	\$ 29.22	\$ 21.71	\$ 18.27

Restricted stock unit awards aggregate intrinsic value information at December 31 for the years 2018, 2017, and 2016 is as follows:

	2018	2017 (in thousands)	2016
Vested	\$ 63,688	\$ 40,649	\$ 30,008
Outstanding	77,015	132,875	95,952
Expected to vest	77,187	130,594	91,871

Restricted stock units weighted average remaining contractual terms (in years) information at December 31, for the years 2018, 2017, and 2016 is as follows:

	2018	2017	2016
Outstanding	0.92	1.00	1.04
Expected to vest	0.91	0.99	1.03

Weighted average stock options exercise price information for the year ended December 31, 2018 is as follows:

	2018
Outstanding at January 1	\$ 13.92
Options granted	47.70
Options exercised	10.89
Outstanding at December 31	19.06
Exercisable at December 31	8.31

The total cash received from employees as a result of employee stock options exercises during the years ended December 31, 2018, 2017, and 2016, was \$1.0 million, \$6.8 million and \$2.9 million, respectively. In connection with these exercises, the tax benefit realized by Teradyne for the years ended December 31, 2018, 2017, and 2016, was \$0.4 million, \$2.5 million, and \$0.8 million, respectively.

Stock option aggregate intrinsic value information for the years ended December 31, 2018, 2017, and 2016 is as follows:

	2018	2017 (in thousands)	2016
Exercised	\$ 2,960	\$ 8,035	\$ 3,729
Outstanding	7,359	14,831	12,468
Vested and expected to vest	7,359	14,831	12,468
Exercisable	5,905	9,076	10,217

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Stock options weighted average remaining contractual terms (in years) information at December 31, for the years 2018, 2017, and 2016 is as follows:

	2018	2017	2016
Outstanding	3.6	4.1	3.9
Vested and expected to vest	3.6	4.1	3.9
Exercisable	2.4	2.8	3.2

Significant option groups outstanding at December 31, 2018 and related weighted average price and remaining contractual life information follow:

Range Of Exercise Prices	Options Outstanding		Options Exercisable		
	Weighted-Average Remaining Contractual Life (Years)	Shares	Weighted-Average Exercise Price (shares in thousands)	Shares	Weighted-Average Exercise Price
\$1.48 \$2.58	1.23	67	\$ 1.83	67	\$ 1.83
\$2.67 \$3.28	2.20	103	2.69	103	2.69
\$7.71 \$19.43	3.41	166	18.59	68	18.02
\$28.56 \$47.70	5.62	170	36.30	18	28.56
		506	\$ 19.06	256	\$ 8.31

As of December 31, 2018, total unrecognized expense related to non-vested restricted stock unit awards and stock options was \$44 million, and is expected to be recognized over a weighted average period of 2.4 years.

Employee Stock Purchase Plan

Under the ESPP, eligible employees may purchase shares of common stock through regular payroll deductions of up to 10% of their compensation, to a maximum of shares with a fair market value of \$25,000 per calendar year, not to exceed 6,000 shares. Under the plan, the price paid for the common stock is equal to 85% of the stock price on the last business day of the six-month purchase period.

In July 2018, 0.3 million shares of common stock were issued to employees who participated in the plan during the first half of 2018 at the price of \$32.36 per share. In January 2019, Teradyne issued 0.4 million shares of common stock to employees who participated in the plan during the second half of 2018 at the price of \$26.67 per share.

In July 2017, 0.3 million shares of common stock were issued to employees who participated in the plan during the first half of 2017 at the price of \$25.53 per share. In January 2018, Teradyne issued 0.3 million shares of common stock to employees who participated in the plan during the second half of 2017 at the price of \$35.59 per share.

In July 2016, 0.5 million shares of common stock were issued to employees who participated in the plan during the first half of 2016 at the price of \$16.74 per share. In January 2017, Teradyne issued 0.4 million shares of common stock to employees who participated in the plan during the second half of 2016 at the price of \$21.59 per share.

As of December 31, 2018, there were 2.5 million shares available for grant under the ESPP.

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The following table provides the effect to income from operations for recording stock-based compensation for the years ended December 31, 2018, 2017, and 2016:

	2018	2017 (in thousands)	2016
Cost of revenues	\$ 3,129	\$ 3,212	\$ 3,153
Engineering and development	9,181	9,370	9,458
Selling and administrative	21,267	21,515	18,139
Stock-based compensation	33,577	34,097	30,750
Income tax benefit	(12,036)	(10,462)	(8,752)
Total stock-based compensation expense after income taxes	\$ 21,541	\$ 23,635	\$ 21,998

P. SAVINGS PLAN

Teradyne sponsors a defined contribution employee retirement savings plan (Savings Plan) covering substantially all U.S. employees. Under the Savings Plan, employees may contribute up to 20% of their compensation (subject to Internal Revenue Service limitations). The Savings Plan provides for a discretionary employer match that is determined each year. In 2018, 2017 and 2016, Teradyne matched 100% of eligible employee contributions up to 4% of their compensation for employees not accruing benefits in the U.S. Qualified Pension Plan. There was no match for employees still actively accruing benefits in the U.S. Qualified Pension Plan. Teradyne's contributions vest 25% per year for the first four years of employment, and contributions for those employees with four years of service vest immediately.

In addition, Teradyne established an unfunded U.S. Supplemental Savings Plan to provide savings benefits in excess of those allowed by the Employee Retirement Income Security Act of 1974 and the Internal Revenue Code. The provisions of this plan are the same as the Savings Plan. The liability for the U.S. Supplemental Savings Plan at December 31, 2018 and 2017, was \$24.4 million and \$23.4 million, respectively, and is included in retirement plan liabilities. Teradyne also established defined contribution savings plans for its foreign employees. Under Teradyne's savings plans, amounts charged to the statements of operations for the years ended December 31, 2018, 2017, and 2016 were \$17.2 million, \$15.3 million, and \$14.5 million, respectively.

Q. INCOME TAXES

The components of income (loss) before income taxes and the provision (benefit) for income taxes as shown in the consolidated statements of operations were as follows:

	2018	2017 (in thousands)	2016
Income (loss) before income taxes:			
U.S.	\$ 189,691	\$ 76,699	\$ (341,018)
Non-U.S.	278,110	447,713	285,958
	\$ 467,801	\$ 524,412	\$ (55,060)
Provision (benefit) for income taxes:			
Current:			
U.S. Federal	\$ (59,122)	\$ 162,679	\$ 7,750
Non-U.S.	45,083	64,313	41,579
State	1,721	2,623	1,968
	(12,318)	229,615	51,297

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Deferred:			
U.S. Federal	29,252	43,687	(51,482)
Non-U.S.	(1,243)	(6,476)	(9,240)
State	331	(106)	(2,214)
	28,340	37,105	(62,936)
Total provision (benefit) for income taxes:	\$ 16,022	\$ 266,720	\$ (11,639)

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Income tax expense for 2018 and 2017 totaled \$16.0 and \$266.7 million, respectively. Income tax benefit for 2016 totaled \$11.6 million. The effective tax rate for 2018, 2017 and 2016 was 3.4%, 50.9%, and 21.1%, respectively.

On December 22, 2017, the U.S. enacted the Tax Cuts and Jobs Act of 2017 (the Tax Reform Act), making significant changes to the Internal Revenue Code. The Tax Reform Act has significant direct and indirect implications for accounting for income taxes under ASC 740, Accounting for Income Taxes some of which could not be calculated with precision until further clarification and guidance was made available from tax authorities, regulatory bodies or the FASB. In light of this uncertainty, on December 22, 2017 the SEC issued Staff Accounting Bulletin (SAB) No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act, to address uncertainty in the application of U.S. GAAP when the registrant does not have the necessary information available, prepared, or analyzed (including computations) in reasonable detail to complete the accounting for certain income tax effects of the Tax Reform Act. In accordance with SAB 118, Teradyne recorded a provisional amount of \$186.0 million of additional income tax expense in the fourth quarter of 2017 which represented Teradyne's best estimate of the impact of the Tax Reform Act in accordance with Teradyne's understanding of the Tax Reform Act and available guidance as of that date. The \$186.0 million was primarily composed of expense of \$161.0 million related to the one-time transition tax on the mandatory deemed repatriation of foreign earnings, \$33.6 million of expense related to the remeasurement of certain deferred tax assets and liabilities based on the rates at which they are expected to reverse in the future, and a benefit of \$10.3 million associated with the impact of correlative adjustments on uncertain tax positions. In accordance with the requirements of SAB 118, in the fourth quarter of 2018 Teradyne completed its analysis of the effect of the Tax Reform Act based on the application of the most recently available guidance as of December 31, 2018 and recorded \$49.5 million of net income tax benefit. The net benefit consisted of \$51.7 million of benefit resulting from a reduction in the estimate of the one-time transition tax on the mandatory deemed repatriation of foreign earnings and an expense of \$2.2 million associated with the impact of correlative adjustments on uncertain tax positions.

The Tax Reform Act also includes a new U.S. tax base erosion provision, the global intangible low-taxed income (GILTI) provision, which imposes a tax on foreign income in excess of a deemed return on tangible assets of foreign corporations. Teradyne has made an accounting policy election to account for GILTI as a component of tax expense in the period in which Teradyne is subject to the rules and therefore did not provide any deferred tax impacts of GILTI in its consolidated financial statements.

The decrease in the effective tax rate from 2017 to 2018 was primarily attributable to the \$186.0 million of income tax expense recorded in the fourth quarter of 2017 as a provisional estimate of the impact of the Tax Reform Act and the \$51.7 million of income tax benefit recorded in the fourth quarter of 2018 resulting from a reduction in the estimate of the one-time transition tax on the mandatory deemed repatriation of foreign earnings and an expense of \$2.2 million associated with the impact of correlative adjustments on uncertain tax positions. The change in the effective tax rate from 2017 to 2018 was also impacted by a shift in the geographic distribution of income which increased income subject to taxation in the U.S. relative to lower tax rate jurisdictions, the benefit of the U.S. foreign derived intangible income deduction and increases in discrete benefit from non-taxable foreign exchange gains and losses.

The increase in the effective tax rate from 2016 to 2017 was primarily attributable to the \$186.0 million of income tax expense recorded in the fourth quarter of 2017 as a provisional estimate of the impact of the Tax Reform Act. The change in the effective rate from 2016 to 2017 was also impacted by the U.S. non-deductible goodwill impairment charge recorded in 2016, a shift in the geographic distribution of income which increased income subject to taxation in the U.S. relative to lower tax rate jurisdictions, decreases in the discrete benefits from tax reserve releases, increases in discrete expense from non-taxable foreign exchange gains and losses and an increase in the discrete benefit from stock-based compensation.

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A reconciliation of the effective tax rate for the years 2018, 2017, and 2016 is as follows:

	2018	2017	2016
U.S. statutory federal tax rate	21.0%	35.0%	35.0%
U.S. transition tax	(10.5)	28.7	
U.S. foreign derived intangible income	(1.8)		
Impact of rate change on deferred tax	0.3	6.9	
Uncertain tax positions	1.0	1.7	(2.6)
Foreign taxes	(2.0)	(16.3)	78.0
Foreign tax credits	(2.2)	(2.2)	49.1
U.S. research and development credit	(2.2)	(1.6)	15.8
Equity compensation	(1.2)	(0.8)	(2.7)
State income taxes, net of federal tax benefit	0.1	(0.4)	2.3
Domestic production activities deduction		(0.3)	2.3
Goodwill impairment			(162.1)
U.S. alternative minimum tax credit			3.7
Inventory cost capitalization			1.8
Other, net	0.9	0.2	0.5
	3.4%	50.9%	21.1%

Teradyne qualifies for a tax holiday in Singapore by fulfilling the requirements of an agreement with the Singapore Economic Development Board under which certain headcount and spending requirements must be met. The tax savings attributable to the Singapore tax holiday for the years ended December 31, 2018, 2017 and 2016 were \$11.9 million or \$0.06 per diluted share, \$24.8 million or \$0.12 per diluted share and \$17.0 million or \$0.08 per diluted share, respectively. The tax holiday is scheduled to expire on December 31, 2020.

Significant components of Teradyne's deferred tax assets (liabilities) as of December 31, 2018 and 2017 were as follows:

	2018	2017
	(in thousands)	
Deferred tax assets:		
Tax credits	\$ 69,091	\$ 76,083
Accruals	23,449	27,508
Pension liabilities	20,826	22,602
Inventory valuations	18,514	17,793
Deferred revenue	9,130	9,016
Equity compensation	7,190	6,861
Vacation accrual	4,772	4,747
Net operating loss carryforwards	3,658	5,440
Marketable securities	962	
Other	685	713
Gross deferred tax assets	158,277	170,763
Less: valuation allowance	(69,852)	(63,919)
Total deferred tax assets	\$ 88,425	\$ 106,844
Deferred tax liabilities:		
Intangible assets	\$ (24,211)	\$ (16,120)
Depreciation	(14,028)	(12,293)
Marketable securities		(1,125)

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Total deferred tax liabilities	\$ (38,239)	\$ (29,538)
Net deferred assets	\$ 50,186	\$ 77,306

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As of December 31, 2018 and 2017, Teradyne evaluated the likelihood that it would realize the deferred income taxes to offset future taxable income and concluded that it is more likely than not that a substantial majority of its deferred tax assets will be realized through consideration of both the positive and negative evidence. At December 31, 2018 and 2017, Teradyne maintained a valuation allowance for certain deferred tax assets of \$69.9 million and \$63.9 million, respectively, primarily related to state net operating losses and state tax credit carryforwards, due to the uncertainty regarding their realization. Adjustments could be required in the future if Teradyne estimates that the amount of deferred tax assets to be realized is more or less than the net amount recorded.

At December 31, 2018, Teradyne had operating loss carryforwards that expire in the following years:

	State Operating Loss Carryforwards (in thousands)	Foreign Operating Loss Carryforwards
2019	\$ 258	\$
2020	269	
2021	2,977	
2022	5,749	
2023	6,241	
2024-2028	4,672	
2029-2033	22,724	44
Beyond 2033	5,305	72
Non-expiring		4,389
Total	\$ 48,195	\$ 4,505

Teradyne has approximately \$98.4 million of tax credit carryforwards including federal business tax credits of approximately \$0.9 million which expire in 2028, and state tax credits of \$97.5 million, of which \$55.6 million do not expire and the remainder expires in the years 2019 through 2038.

Teradyne's gross unrecognized tax benefits for the years ended December 31, 2018, 2017, and 2016 were as follows:

	2018	2017 (in thousands)	2016
Beginning balance, as of January 1	\$ 36,263	\$ 38,958	\$ 36,792
Additions:			
Tax positions for current year	4,716	8,208	9,766
Tax positions for prior years	2,626	199	187
Reductions:			
Tax positions for prior years	(153)	(10,573)	(1,960)
Expiration of statutes	(57)	(325)	(3,532)
Settlements with tax authorities		(204)	(2,295)
Ending balance as of December 31	\$ 43,395	\$ 36,263	\$ 38,958

Current year and prior year additions include assessment of potential transfer pricing issues worldwide, federal and state tax credits and incentives, capitalization rules, domestic production activities deductions and correlative effects of the transition tax charge. Of the \$43.4 million of unrecognized tax benefits as of December 31, 2018, \$30.7 million would impact the consolidated income tax rate if ultimately recognized. The remaining \$12.6 million would impact deferred taxes if recognized.

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On February 4, 2019, the IRS issued a closing audit letter related to the U.S. Federal income tax return for the year ended December 31, 2015 indicating that there was no change to the reported tax. As a result of the completion of the 2015 audit, Teradyne anticipates recording a \$33.8 million reduction in the balance of unrecognized tax benefits in the first quarter of 2019 primarily composed of federal and state reserves related to transfer pricing and research credits. Of the \$33.8 million reduction in the balance of unrecognized tax benefits, \$5.9 million will be offset by valuation allowance. The remaining \$27.9 million, net of a \$2.0 million reduction for the federal benefit of state reserves, will be recognized as an income tax benefit. Teradyne estimates that it is reasonably possible that the balance of unrecognized tax benefits as of December 31, 2018 may decrease an additional \$0.2 million in the next twelve months, as a result of the lapse of statutes of limitation.

Teradyne records all interest and penalties related to income taxes as a component of income tax expense. Accrued interest and penalties related to income tax items at December 31, 2018 and 2017 amounted to \$0.3 million and \$0.3 million, respectively. For the years ended December 31, 2018, 2017, and 2016, expense of \$0.1 million, benefit of \$0.1 million and benefit of \$0.1 million, respectively, was recorded for interest and penalties related to income tax items.

Teradyne is subject to U.S. federal income tax, as well as income tax in multiple state, local and foreign jurisdictions. As of December 31, 2018, all material state and local income tax matters have been concluded through 2013, all material federal income tax matters have been concluded through 2014 and all material foreign income tax matters have been concluded through 2012. However, in some jurisdictions, including the United States, operating losses and tax credits may be subject to adjustment until such time as they are utilized and the year of utilization is closed to adjustment.

As of December 31, 2018, Teradyne is not permanently reinvested with respect to the unremitted earnings of non-U.S. subsidiaries to the extent that those earnings exceed local statutory and operational requirements. Remittance of those earnings is not expected to result in material income tax.

R. OPERATING SEGMENT, GEOGRAPHIC AND SIGNIFICANT CUSTOMER INFORMATION

Teradyne has four reportable segments (Semiconductor Test, System Test, Industrial Automation and Wireless Test). Each of the Semiconductor Test, System Test, and Wireless Test segments is also an individual operating segment. The Industrial Automation reportable segment consists of operating segments with discrete financial information, which have been combined into one reportable segment as they share similar economic characteristics, types of products, production processes, distribution channels, and currency risks. The Semiconductor Test segment includes operations related to the design, manufacturing and marketing of semiconductor test products and services. The System Test segment includes operations related to the design, manufacturing and marketing of products and services for defense/aerospace instrumentation test, storage test and circuit-board test. The Industrial Automation segment includes operations related to the design, manufacturing and marketing of collaborative robotic arms, autonomous mobile robots and advanced robotic control software. The Wireless Test segment includes operations related to the design, manufacturing and marketing of wireless test products and services.

Teradyne evaluates performance based on several factors, of which the primary financial measure is business segment income (loss) before income taxes. The accounting policies of the business segments are the same as those described in Note B: Accounting Policies.

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Segment information for the years ended December 31, 2018, 2017, and 2016 is as follows:

	Semiconductor Test	System Test	Industrial Automation	Wireless Test	Corporate And Other	Consolidated
	(in thousands)					
2018						
Revenues	\$ 1,492,417	\$ 216,132	\$ 261,452	\$ 132,006	\$ (1,205)	\$ 2,100,802
Income (loss) before taxes (1)(2)	397,645	48,857	7,670	29,052	(15,423)	467,801
Total assets (3)	669,452	88,098	607,502	77,570	1,263,984	2,706,606
Property additions	94,496	3,469	11,188	5,226		114,379
Depreciation and amortization expense	58,095	6,430	36,755	5,328	6,616	113,224
2017						
Revenues	\$ 1,662,549	\$ 192,135	\$ 170,056	\$ 111,866	\$	\$ 2,136,606
Income (loss) before taxes (1)(2)	491,361	10,305	8,763	17,350	(3,368)	524,411
Total assets (3)	597,480	97,018	368,037	59,912	1,987,098	3,109,545
Property additions	87,920	5,976	7,044	4,435		105,375
Depreciation and amortization expense	58,901	6,646	25,711	5,392	11,425	108,075
2016						
Revenues	\$ 1,368,169	\$ 189,846	\$ 99,031	\$ 96,204	\$	\$ 1,753,250
Income (loss) before taxes (1)(2)	311,939	28,916	(16,783)	(371,409)	(7,723)	(55,060)
Total assets (3)	557,546	110,361	317,635	62,366	1,714,585	2,762,493
Property additions	70,543	3,788	6,755	4,186		85,272
Depreciation and amortization expense	58,087	6,551	26,869	25,921	2,581	120,009

- (1) Included in Corporate and Other are: contingent consideration adjustments, pension and postretirement plans actuarial gains (losses), severance charges, impairment of fixed assets and expenses related to the Japan earthquake, property insurance recovery, interest income, interest expense, net foreign exchange gains (losses), intercompany eliminations and acquisition related charges.
- (2) Included in income (loss) before taxes are charges and credits related to restructuring and other, and inventory charges. In 2016, loss before income taxes in Wireless Test also included charges related to goodwill and acquired intangible assets impairment.
- (3) Total assets are attributable to each segment. Corporate assets consist of cash and cash equivalents, marketable securities and certain other assets.

Included in the Semiconductor Test segment are charges in the following accounts:

	For the Year Ended December 31,		
	2018	2017	2016
	(in thousands)		
Restructuring and other employee severance	\$ 8,429	\$ 1,779	\$ 2,860
Cost of revenues inventory charge	6,822	4,606	9,656
Restructuring and other impairment of fixed assets		1,124	

Included in the System Test segment are charges in the following accounts:

	For the Year Ended December 31,		
	2018	2017	2016
	(in thousands)		
Cost of revenues inventory charge	\$ 1,175	\$ 1,918	\$ 630

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Included in the Industrial Automation segment are charges in the following accounts:

	For the Year Ended December 31,		
	2018	2017	2016
	(in thousands)		
Restructuring and other acquisition related expenses and compensation	\$ 1,163	\$	\$
Cost of revenues inventory charge	680		
Restructuring and other employee severance		1,414	585

Included in the Wireless Test segment are charges in the following accounts:

	For the Year Ended December 31,		
	2018	2017	2016
	(in thousands)		
Cost of revenues inventory charge	\$ 2,565	\$ 2,190	\$ 7,207
Restructuring and other lease impairment		972	
Restructuring and other employee severance			2,650
Goodwill impairment charge			254,946
Intangible assets impairment charge			83,339

Included in Corporate and Other are charges and credits in the following accounts:

	For the Year Ended December 31,		
	2018	2017	2016
	(in thousands)		
Restructuring and other MiR contingent consideration adjustment	\$ 17,666	\$	\$
Restructuring and other Universal Robots contingent consideration adjustment	(16,679)	7,820	15,346
Restructuring and other acquisition related expenses	3,422		
Restructuring and other	872		
Restructuring and other expense related to Japan earthquake and impairment of fixed assets		755	5,051
Restructuring and other property insurance recovery		(5,064)	(5,051)

Information as to Teradyne's revenues by country is as follows:

	2018	2017	2016
	(in thousands)		
Revenues from customers (1):			
Taiwan	\$ 516,322	\$ 687,031	\$ 653,076
China	348,942	260,451	174,876
United States	282,869	252,516	221,948
Europe	223,207	163,715	117,671
Korea	163,224	206,819	147,882
Japan	158,281	169,093	135,978
Malaysia	122,797	124,048	103,472
Singapore	108,618	101,085	73,172
Philippines	77,996	105,850	54,705
Thailand	59,184	29,566	43,097
Rest of the World	39,362	36,432	27,373
	\$ 2,100,802	\$ 2,136,606	\$ 1,753,250

- (1) Revenues attributable to a country are based on location of customer site.

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In 2018, no single customer accounted for more than 10% of total consolidated revenue. In 2017 and 2016, one customer of Teradyne's Semiconductor Test segment accounted for 13% and 12%, respectively, of total consolidated revenues. In 2016, a different customer of Teradyne's Semiconductor Test segment accounted for 12% of total consolidated revenues. Teradyne estimates consolidated revenues driven by a single OEM customer, combining direct sales to that customer with sales to the customer's outsourced semiconductor assembly and test providers (OSATs), accounted for approximately 13%, 22%, and 26% of Teradyne's consolidated revenues in 2018, 2017, and 2016, respectively.

Long-lived assets by geographic area:

	United States	Foreign(1) (in thousands)	Total
December 31, 2018	\$ 209,368	\$ 70,453	\$ 279,821
December 31, 2017	\$ 198,855	\$ 69,592	\$ 268,447

(1) As of December 31, 2018 and 2017, long-lived assets attributable to Singapore were \$19.4 million and \$23.6 million, respectively.

S. STOCK REPURCHASE PROGRAM

In January 2015, Teradyne's Board of Directors authorized a stock repurchase program for up to \$500 million of common stock. In 2016, Teradyne repurchased 6.8 million shares of common stock at an average price of \$21.39, for a total cost of \$146 million. The cumulative repurchases as of December 31, 2016 totaled 22.5 million shares of common stock for \$446 million at an average price per share of \$19.87.

In December 2016, Teradyne's Board of Directors cancelled the January 2015 stock repurchase program and approved a new \$500 million share repurchase authorization which commenced on January 1, 2017. The cumulative repurchases as of December 31, 2017 totaled 5.8 million shares of common stock for \$200 million at an average price per share of \$34.30.

In January 2018, Teradyne's Board of Directors cancelled the December 2016 stock repurchase program and authorized a new stock repurchase program for up to \$1.5 billion of common stock. The cumulative repurchases as of December 31, 2018 totaled 21.6 million shares of common stock for \$823.5 million at an average price per share of \$38.06. Teradyne intends to repurchase \$500 million in 2019.

T. SUBSEQUENT EVENTS

In January 2019, Teradyne's Board of Directors declared a quarterly cash dividend of \$0.09 per share to be paid on March 22, 2019 to shareholders of record as of February 22, 2019.

While Teradyne declared a quarterly cash dividend and authorized a share repurchase program, it may reduce or eliminate the cash dividend or share repurchase program in the future. Future cash dividends and stock repurchases are subject to the discretion of Teradyne's Board of Directors which will consider, among other things, Teradyne's earnings, capital requirements and financial condition.

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The following sets forth certain unaudited consolidated quarterly statements of operations data for each of Teradyne's last eight quarters. In management's opinion, this quarterly information reflects all adjustments, consisting only of normal recurring adjustments, necessary for a fair statement for the periods presented. Such quarterly results are not necessarily indicative of future results of operations and should be read in conjunction with the audited consolidated financial statements of Teradyne and the notes thereto included elsewhere herein.

	2018			
	1st Quarter (1)	2nd Quarter (2)(5)	3rd Quarter (3)(5)	4th Quarter (4)(5)
	(in thousands, except per share amounts)			
Revenues:				
Products	\$ 403,925	\$ 434,051	\$ 470,994	\$ 420,652
Services	83,542	92,878	95,854	98,906
Total revenues	487,467	526,929	566,848	519,558
Cost of revenues:				
Cost of products	180,958	180,777	195,339	170,064
Cost of services	36,677	38,818	37,816	39,959
Total cost of revenues (exclusive of acquired intangible assets amortization shown separately below)	217,635	219,595	233,155	210,023
Gross profit	269,832	307,334	333,693	309,535
Operating expenses:				
Selling and administrative	90,505	99,410	100,202	100,552
Engineering and development	74,408	75,342	77,049	74,706
Acquired intangible assets amortization	7,698	9,793	11,142	10,558
Restructuring and other	(313)	2,389	1,710	11,446
Total operating expenses	172,298	186,934	190,103	197,262
Income (loss) from operations	97,534	120,400	143,590	112,273
Non-operating (income) expense:				
Interest income	(5,981)	(5,427)	(6,213)	(9,083)
Interest expense	6,890	5,639	5,557	13,182
Other (income) expense, net	805	176	3,405	(2,954)
Income (loss) before income taxes	95,820	120,012	140,841	111,128
Income tax provision (benefit)	8,846	18,975	20,863	(32,662)
Net income (loss)	\$ 86,974	\$ 101,037	\$ 119,978	\$ 143,790
Net income (loss) per common share - basic	\$ 0.45	\$ 0.53	\$ 0.65	\$ 0.80
Net income (loss) per common share - diluted	\$ 0.43	\$ 0.52	\$ 0.63	\$ 0.79
Cash dividend declared per common share	\$ 0.09	\$ 0.09	\$ 0.09	\$ 0.09

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- (1) Restructuring and other includes a \$3.5 million gain for the decrease in the fair value of the Universal Robots contingent consideration liability, partially offset by \$2.5 million of acquisition related expenses and compensation and \$2.4 million of employee severance charges.
- (2) Restructuring and other includes a \$5.0 million gain for the decrease in the fair value of the Universal Robots contingent consideration liability, partially offset by \$3.9 million of employee severance charges and \$0.8 million of acquisition related expenses and compensation.

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- (3) Restructuring and other includes \$1.7 million of employee severance charges, \$0.8 million of acquisition related expenses and compensation, partially offset by a \$0.8 million gain for the decrease in the fair value of the Universal Robots contingent consideration liability.
- (4) Restructuring and other includes a \$17.7 million fair value adjustment to increase the MiR acquisition contingent consideration, \$0.8 million of employee severance charges, and \$0.5 million acquisition related expenses and compensation, partially offset by a \$7.4 million gain for the decrease in the fair value of the Universal Robots contingent consideration liability.
- (5) Teradyne recorded pension and post retirement net actuarial (gains) losses of \$(0.1) million, \$0.3 million and \$(3.5) million for the second, third and fourth quarter in 2018, respectively. See Note B: Accounting Policies for a discussion of Teradyne's accounting policy.

	2017			
	1st Quarter (1)	2nd Quarter (2)(5)	3rd Quarter (3)	4th Quarter (4)(5)
	(in thousands, except per share amounts)			
Revenues:				
Products	\$ 373,204	\$ 610,356	\$ 412,854	\$ 388,282
Services	83,709	86,545	90,524	91,133
Total revenues	456,913	696,901	503,378	479,415
Cost of revenues:				
Cost of products	154,883	267,752	169,661	168,672
Cost of services	37,014	38,511	38,848	39,813
Total cost of revenues (exclusive of acquired intangible assets amortization shown separately below)	191,897	306,263	208,509	208,485
Gross profit	265,016	390,638	294,869	270,930
Operating expenses:				
Selling and administrative	84,792	90,111	86,130	87,880
Engineering and development	75,978	82,270	76,986	72,070
Acquired intangible assets amortization	7,952	8,166	7,028	7,384
Restructuring and other	2,511	2,288	(4,407)	8,970
Total operating expenses	171,233	182,835	165,737	176,304
Income from operations	93,783	207,803	129,132	94,626
Non-operating (income) expense:				
Interest income	(3,520)	(3,292)	(4,517)	(6,476)
Interest expense	5,402	5,509	5,372	5,380
Other (income) expense, net	(115)	(1,291)	840	(2,362)
Income before income taxes	92,016	206,877	127,437	98,084
Income tax provision	6,795	31,901	24,017	204,007
Net income (loss)	\$ 85,221	\$ 174,976	\$ 103,420	\$ (105,923)
Net income (loss) per common share - basic	\$ 0.43	\$ 0.88	\$ 0.52	\$ (0.54)
Net income (loss) per common share - diluted	\$ 0.42	\$ 0.87	\$ 0.52	\$ (0.54)
Cash dividend declared per common share	\$ 0.07	\$ 0.07	\$ 0.07	\$ 0.07

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- (1) Restructuring and other includes a \$1.3 million charge for a lease impairment of a Wireless Test facility in Sunnyvale, CA, a \$0.6 million fair value adjustment to increase the Universal Robots acquisition contingent consideration, and \$0.6 million of employee severance charges.

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- (2) Restructuring and other includes a \$1.5 million charge for a fair value adjustment to increase the Universal Robots acquisition contingent consideration, and \$0.8 million of employee severance charges.
- (3) Restructuring and other includes \$5.1 million of property insurance recovery related to the Japan earthquake, a \$0.4 million credit related to previously impaired lease termination of a Wireless Test facility in Sunnyvale, CA, and a \$0.3 million credit for the decrease in the fair value of the Universal Robots contingent consideration liability, partially offset by \$0.8 million of Japan earthquake related expenses and \$0.6 million of employee severance charges.
- (4) Restructuring and other includes a \$6.0 million fair value adjustment to increase the Universal Robots acquisition contingent consideration, \$1.8 million of employee severance charges, and \$1.1 million of charges for impairment of fixed assets.
- (5) Teradyne recorded pension and post retirement net actuarial gains of \$2.8 million and \$3.8 million for the second and fourth quarter in 2017, respectively. See Note B: Accounting Policies for a discussion of Teradyne's accounting policy.

Item 9: *Changes in and disagreements with accountants on accounting and financial disclosure*
None.

Item 9A: *Controls and procedures*
Disclosure Controls and Procedures

As of the end of the period covered by this report, our management, with the participation of our CEO and CFO, evaluated the effectiveness of our disclosure controls and procedures pursuant to Rule 13a-15(b) promulgated under the Exchange Act. Based upon that evaluation, our CEO and CFO concluded that, as of the end of the period covered by this report, our disclosure controls and procedures were effective in ensuring that material information required to be disclosed by us in the reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms, including ensuring that such material information is accumulated and communicated to our management, including our CEO and CFO, as appropriate to allow timely decisions regarding required disclosure.

Changes in Internal Control over Financial Reporting

There was no change in our internal control over financial reporting during the fourth fiscal quarter ended December 31, 2018 that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

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 Exchange Act Rule 13a-15(f). Under the supervision and with the participation of our management, including our CEO and CFO, we conducted an evaluation of the effectiveness of our internal control over financial reporting based on the framework in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based on our evaluation under the framework in *Internal Control - Integrated Framework* (2013), our management concluded that our internal control over financial reporting was effective as of December 31, 2018.

The effectiveness of our internal control over financial reporting as of December 31, 2018 has been audited by PricewaterhouseCoopers LLP, our independent registered public accounting firm, as stated in their report which is included under Item 8 of this Annual Report.

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Inherent Limitations on Effectiveness of Controls

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.

Item 9B: *Other Information*

None.

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PART III

Item 10: *Directors, Executive Officers and Corporate Governance*

Certain information relating to our directors and executive officers, committee information, reports and charters, executive compensation, security ownership of certain beneficial owners and management and related stockholder matters, and certain relationships and related transactions is incorporated by reference herein from our definitive proxy statement in connection with our Annual Meeting of Shareholders to be held on May 7, 2019. The proxy statement will be filed with the SEC not later than 120 days after the close of the fiscal year. For this purpose, the Compensation Committee Report included in such proxy statement is specifically not incorporated herein. Also see Item 1: Business Our Executive Officers.

Item 11: *Executive Compensation*

Certain information relating to our directors and executive officers, executive compensation, security ownership of certain beneficial owners and management and related stockholder matters, and certain relationships and related transactions is incorporated by reference herein from our definitive proxy statement in connection with our Annual Meeting of Shareholders to be held on May 7, 2019. The proxy statement will be filed with the SEC not later than 120 days after the close of the fiscal year. For this purpose, the Compensation Committee Report included in such proxy statement is specifically not incorporated herein.

Item 12: *Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters*

Certain information relating to our directors and executive officers, executive compensation, security ownership of certain beneficial owners and management and related stockholder matters, and certain relationships and related transactions is incorporated by reference herein from our definitive proxy statement in connection with our Annual Meeting of Shareholders to be held May 7, 2019. The proxy statement will be filed with the SEC not later than 120 days after the close of the fiscal year. For this purpose, the Compensation Committee Report included in such proxy statement is specifically not incorporated herein. Also see Item 7: Management's Discussion and Analysis of Financial Condition and Results of Operations Equity Compensation Plans.

Item 13: *Certain Relationships and Related Transactions, and Director Independence*

Certain information relating to our directors and executive officers, executive compensation, security ownership of certain beneficial owners and management and related stockholder matters, and certain relationships and related transactions is incorporated by reference herein from our definitive proxy statement in connection with our Annual Meeting of Shareholders to be held on May 7, 2019. The proxy statement will be filed with the SEC not later than 120 days after the close of the fiscal year. For this purpose, the Compensation Committee Report included in such proxy statement is specifically not incorporated herein.

Item 14: *Principal Accountant Fees and Services*

Certain information relating to audit fees and other of Teradyne's independent registered public accounting firm is incorporated by reference herein from our definitive proxy statement in connection with our Annual Meeting of Shareholders to be held on May 7, 2019. The proxy statement will be filed with the SEC not later than 120 days after the close of the fiscal year. For this purpose, the Audit Committee Report included in such proxy statement is specifically not incorporated herein.

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PART IV

Item 15: Exhibits and Financial Statement Schedule.

15(a)(1) Financial Statements

The following consolidated financial statements are included in Item 8:

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<u>Report of Independent Registered Public Accounting Firm</u>	44
<u>Consolidated Balance Sheets as of December 31, 2018 and 2017</u>	46
<u>Consolidated Statements of Operations for the years ended December 31, 2018, 2017 and 2016</u>	47
<u>Consolidated Statements of Comprehensive Income (Loss) for the years ended December 31, 2018, 2017 and 2016</u>	48
<u>Consolidated Statements of Shareholders' Equity for the years ended December 31, 2018, 2017 and 2016</u>	49
<u>Consolidated Statements of Cash Flows for the years ended December 31, 2018, 2017 and 2016</u>	50

15(a)(2) Financial Statement Schedule

The following consolidated financial statement schedule is included in Item 15(c):

Schedule II Valuation and Qualifying Accounts

Schedules other than those listed above have been omitted since they are either not required or information is otherwise included.

15(a)(3) Listing of Exhibits

The Exhibits which are filed with this report or which are incorporated by reference herein are set forth in the Exhibit Index.

15(c) Financial Statement Schedules

Table of Contents**TERADYNE, INC.****SCHEDULE II VALUATION AND QUALIFYING ACCOUNTS**

Column A	Column B	Column C	Column D	Column E	Column F
Description	Balance at Beginning of Period	Additions Charged to Cost and Expenses	Other (in thousands)	Deductions	Balance at End of Period
Valuation reserve deducted in the balance sheet from the asset to which it applies:					
Accounts receivable:					
2018 Allowance for doubtful accounts	\$ 2,219	\$	\$ 20	\$ 566	\$ 1,673
2017 Allowance for doubtful accounts	\$ 2,356	\$ 4	\$	\$ 141	\$ 2,219
2016 Allowance for doubtful accounts	\$ 2,407	\$	\$	\$ 51	\$ 2,356

Column A	Column B	Column C	Column D	Column E	Column F
Description	Balance at Beginning of Period	Additions Charged to Cost and Expenses	Other (in thousands)	Deductions	Balance at End of Period
Valuation reserve deducted in the balance sheet from the asset to which it applies:					
Inventory:					
2018 Inventory reserve	\$ 102,896	\$ 11,242	\$ 368	\$ 13,727	\$ 100,779
2017 Inventory reserve	\$ 116,016	\$ 8,844	\$ (126)	\$ 21,838	\$ 102,896
2016 Inventory reserve	\$ 119,376	\$ 17,493	\$ 4,417	\$ 25,270	\$ 116,016

Column A	Column B	Column C	Column D	Column E	Column F
Description	Balance at Beginning of Period	Additions Charged to Cost and Expenses	Other (in thousands)	Deductions	Balance at End of Period
Valuation reserve deducted in the balance sheet from the asset to which it applies:					
Deferred taxes:					
2018 Valuation allowance	\$ 63,919	\$ 6,333	\$	\$ 400	\$ 69,852
2017 Valuation allowance	\$ 48,369	\$ 15,571	\$	\$ 21	\$ 63,919
2016 Valuation allowance	\$ 43,039	\$ 5,413	\$	\$ 83	\$ 48,369

Item 16: *Form 10-K Summary*
Not applicable.

Table of Contents**EXHIBIT INDEX**

The following designated exhibits are, as indicated below, either filed herewith or have heretofore been filed with the Securities and Exchange Commission and are referred to and incorporated by reference to such filings.

Exhibit

No.	Description	SEC Document Reference
2.1	Share Sale and Purchase Agreement by and among Teradyne Holdings Denmark ApS, Teradyne Inc. and the shareholders of Universal Robots A/S dated May 13, 2015.	<u>Exhibit 2.1 to Teradyne's Quarterly Report on Form 10-Q for the quarter ended July 5, 2015.</u>
2.2	Share Sale and Purchase Agreement to and among Teradyne Robotics Holdings Denmark ApS, Teradyne, Inc. and the shareholders of Mobile Industrial Robots ApS dated April 25, 2018.	<u>Exhibit 2.1 to Teradyne's Quarterly Report on Form 10-Q for the quarter ended April 1, 2018.</u>
3.1	Restated Articles of Organization.	<u>Filed herewith.</u>
3.2	Amended and Restated By-laws, as amended.	<u>Exhibit 3.1 to Teradyne's Quarterly Report on Form 10-Q for the quarter ended September 30, 2007.</u>
4.1	Indenture dated as of December 12, 2016, between Teradyne Inc and Wilmington Trust, National Association, as trustee	<u>Exhibit 4.1 to Teradyne's Current Report on Form 8-K filed on December 12, 2016.</u>
10.1	Standard Manufacturing Agreement entered into as of November 24, 2003 by and between Teradyne and Solectron.	<u>Exhibit 10.1 to Teradyne's Quarterly Report on Form 10-Q for the quarter ended September 30, 2007.</u>
10.2	Amendment 1 to Standard Manufacturing Agreement, dated as of January 18, 2007, by and between Teradyne and Solectron.	<u>Exhibit 10.2 to Teradyne's Quarterly Report on Form 10-Q for the quarter ended September 30, 2007.</u>
10.3	Second Amendment to Standard Manufacturing Agreement, dated as of August 27, 2007, by and between Teradyne and Solectron.	<u>Exhibit 10.3 to Teradyne's Quarterly Report on Form 10-Q for the quarter ended September 30, 2007.</u>
10.4	Fifth Amendment to Standard Manufacturing Agreement, dated as of July 17, 2009, by and between Teradyne and Flextronics Corporation.	<u>Exhibit 10.4 to Teradyne's Annual Report on Form 10-K for the fiscal year ended December 31, 2009.</u>
10.5	Sixth Amendment to Standard Manufacturing Agreement, dated as of July 27, 2009, by and between Teradyne and Flextronics Corporation.	<u>Exhibit 10.5 to Teradyne's Annual Report on Form 10-K for the fiscal year ended December 31, 2009.</u>
10.6	Addendum to Standard Manufacturing Agreement (Authorized Purchase Agreement) Revised July 1, 2010.	<u>Exhibit 10.6 to Teradyne's Annual Report on Form 10-K for the fiscal year ended December 31, 2010.</u>
10.7	Eighth Amendment to Standard Manufacturing Agreement, dated as of April 13, 2012, by and between Teradyne and Flextronics Sales & Marketing North Asia (L) LTD.	<u>Exhibit 10.7 to Teradyne's Annual Report on Form 10-K for the fiscal year ended December 31, 2012.</u>

Table of Contents**Exhibit**

No.	Description	SEC Document Reference
10.8	Ninth Amendment to Standard Manufacturing Agreement, dated as of September 17, 2012, by and between Teradyne and Flextronics Sales & Marketing North Asia (L) LTD.	<u>Exhibit 10.8 to Teradyne's Annual Report on Form 10-K for the fiscal year ended December 31, 2012.</u>
10.9	2006 Equity and Cash Compensation Incentive Plan, as amended.*	<u>Filed herewith.</u>
10.10	Danish Sub-Plan to the 2006 Equity and Cash Compensation Incentive Plan.	<u>Filed herewith.</u>
10.11	Form of Performance-Based Restricted Stock Unit Agreement for Executive Officers under 2006 Equity and Cash Compensation Incentive Plan.*	<u>Exhibit 10.10 to Teradyne's Annual Report on Form 10-K for the fiscal year ended December 31, 2017.</u>
10.12	Form of Time-Based Restricted Stock Unit Agreement for Executive Officers under 2006 Equity and Cash Compensation Incentive Plan.*	<u>Exhibit 10.11 to Teradyne's Annual Report on Form 10-K for the fiscal year ended December 31, 2017.</u>
10.13	Form of Executive Officer Stock Option Agreement under 2006 Equity and Cash Compensation Incentive Plan, as amended.*	<u>Exhibit 10.15 to Teradyne's Annual Report on Form 10-K for the fiscal year ended December 31, 2017.</u>
10.14	Form of Restricted Stock Unit Agreement for Directors under 2006 Equity and Cash Compensation Incentive Plan.*	<u>Exhibit 10.12 to Teradyne's Annual Report on Form 10-K for the fiscal year ended December 31, 2016.</u>
10.15	1996 Employee Stock Purcha	