

# Bare Printed Circuit Board Manufacturing: 2002

Issued January 2005

EC02-311-334412 (RV)

## 2002 Economic Census

*Manufacturing*

Industry Series



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Economics and Statistics Administration  
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## ACKNOWLEDGMENTS

This report was prepared in the Manufacturing and Construction Division under the direction of **Judy M. Dodds**, Assistant Division Chief for Census and Related Programs who was responsible for the overall planning, management, and coordination. **Kenneth Hansen**, Chief, Investment Goods Industries Branch, assisted by **Chris Blackburn**, **Mike Brown**, and **Jazmin Rose**, Section Chiefs, and **Raphael Corrado**, **Tom Flood**, **Robert Miller**, and **Robert Rosati**, Special Assistants, performed the planning and implementation. **Stephanie Angel**, **Larry Blumberg**, **Paul Corey**, **Vance Davis**, **Kellie Friedrich**, **Vera Harris-Bourne**, **Jennifer Lee**, **Allison Marin**, **Keith McKenzie**, **Blynda Metcalf**, **Philippe Morris**, **Betty Pannell**, **Deanna Pickerall**, **Shaquella Rhea**, **Keeley Voor**, and **Tempie Whittington**, provided primary staff assistance. **Mendel D. Gayle**, Chief, Census and Related Programs Support Branch, assisted by **Kimberly DePhillip**, Section Chief, performed overall coordination of the publication process. **Patrick Duck**, **Michael Flaherty**, **Taylor C. Murph**, **Wanda Sledd**, and **Veronica White** provided primary staff assistance.

Mathematical and statistical techniques, as well as the coverage operations, were provided by **Paul Hsen**, Assistant Division Chief for Research and Methodology Programs, assisted by **Stacey Cole**, Chief, Manufacturing Methodology Branch, and **Robert Struble**, Section Chief. **Jeffrey Dalzell** and **Cathy Gregor** provided primary staff assistance.

**Eddie J. Salyers**, Assistant Division Chief of Economic Planning and Coordination Division, was responsible for overseeing the editing and tabulation procedures and the interactive analytical software. **Dennis Shoemaker** and **Kim Wortman**, Special Assistants, **John D. Ward**, Chief, Analytical Branch, and **Brandy L. Yarbrough**, Chief, Edit Branch, were responsible for developing the systems and procedures for data collection, editing, review, and correction. **Donna L. Hambric**, Chief of the Economic Planning Staff, was responsible for overseeing the systems and information for dissemination. **Douglas J. Miller**, Chief, Tables and Dissemination Branch, assisted by **Lisa Aispuro**, **Jamie Fleming**, **Keith Fuller**, **Andrew W. Hait**, and **Kathy G. Padgett** were responsible for developing the data dissemination systems and procedures.

The Geography Division staff, **Robert LaMacchia**, Chief, developed geographic coding procedures and associated computer programs.

The Economic Statistical Methods and Programming Division, **Howard R. Hogan**, Chief, developed and coordinated the computer processing systems. **Barry F. Sessamen**, Assistant Division Chief for Post Collection, was responsible for design and implementation of the processing system and computer programs. **Gary T. Sheridan**, Chief, Macro Analytical Branch, assisted by **Apparao V. Katikineni** and **Edward F. Johnson** provided computer programming and implementation.

The Systems Support Division provided the table composition system. **Robert Joseph Brown**, Table Image Processing System (TIPS) Senior Software Engineer, was responsible for the design and development of the TIPS, under the supervision of **Robert J. Bateman**, Assistant Division Chief, Information Systems.

The staff of the National Processing Center performed mailout preparation and receipt operations, clerical and analytical review activities, and data entry.

**Margaret A. Smith**, **Bernadette J. Beasley**, **Michael T. Browne**, and **Alan R. Plisch** of the Administrative and Customer Services Division, **Walter C. Odom**, Chief, provided publication and printing management, graphics design and composition, and editorial review for print and electronic media. General direction and production management were provided by **James R. Clark**, Assistant Division Chief, and **Susan L. Rappa**, Chief, Publications Services Branch.

Special acknowledgment is also due the many businesses whose cooperation contributed to the publication of these data.

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-- Not applicable for this report.

# Introduction to the Economic Census

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## **PURPOSES AND USES OF THE ECONOMIC CENSUS**

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the United States Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in "2" and "7."

The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. Specific uses of economic census data include the following:

- Policymaking agencies of the federal government use the data to monitor economic activity and to assess the effectiveness of policies.
- State and local governments use the data to assess business activities and tax bases within their jurisdictions and to develop programs to attract business.
- Trade associations study trends in their own and competing industries, which allows them to keep their members informed of market changes.
- Individual businesses use the data to locate potential markets and to analyze their own production and sales performance relative to industry or area averages.

## **INDUSTRY CLASSIFICATIONS**

Data from the 2002 Economic Census are published primarily according to the 2002 North American Industry Classification System (NAICS). NAICS was first adopted in the United States, Canada, and Mexico in 1997. The 2002 Economic Census covers the following NAICS sectors:

21	Mining
22	Utilities
23	Construction
31-33	Manufacturing
42	Wholesale Trade
44-45	Retail Trade
48-49	Transportation and Warehousing
51	Information
52	Finance and Insurance
53	Real Estate and Rental and Leasing
54	Professional, Scientific, and Technical Services
55	Management of Companies and Enterprises
56	Administrative and Support and Waste Management and Remediation Services
61	Educational Services
62	Health Care and Social Assistance
71	Arts, Entertainment, and Recreation
72	Accommodation and Food Services
81	Other Services (except Public Administration)

(Not listed above are the Agriculture, Forestry, Fishing, and Hunting sector (NAICS 11), partially covered by the census of agriculture conducted by the U.S. Department of Agriculture, and the Public Administration sector (NAICS 92), largely covered by the census of governments conducted by the Census Bureau.)

The 20 NAICS sectors are subdivided into 100 subsectors (three-digit codes), 317 industry groups (four-digit codes), and, as implemented in the United States, 1,179 industries (six-digit codes).



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## **RELATIONSHIP TO HISTORICAL INDUSTRY CLASSIFICATIONS**

Prior to the 1997 Economic Census, data were published according to the Standard Industrial Classification (SIC) system. While many of the individual NAICS industries correspond directly to industries as defined under the SIC system, most of the higher level groupings do not. Particular care should be taken in comparing data for retail trade, wholesale trade, and manufacturing, which are sector titles used in both NAICS and SIC, but cover somewhat different groups of industries. The 1997 Economic Census *Bridge Between NAICS and SIC* demonstrates the relationships between NAICS and SIC industries. Where changes are significant, it may not be possible to construct time series that include data for points both before and after 1997.

Most industry classifications remained unchanged between 1997 and 2002, but NAICS 2002 includes substantial revisions within the construction and wholesale trade sectors, and a number of revisions for the retail trade and information sectors. These changes are noted in industry definitions and will be demonstrated in the *Bridge Between NAICS 2002 and NAICS 1997*.

For 2002, data for enterprise support establishments (those functioning primarily to support the activities of their company's operating establishments, such as a warehouse or a research and development laboratory) are included in the industry that reflects their activities (such as warehousing). For 1997, such establishments were termed auxiliaries and were excluded from industry totals.

## **BASIS OF REPORTING**

The economic census is conducted on an establishment basis. A company operating at more than one location is required to file a separate report for each store, factory, shop, or other location. Each establishment is assigned a separate industry classification based on its primary activity and not that of its parent company. (For selected industries, only payroll, employment, and classification are collected for individual establishments, while other data are collected on a consolidated basis.)

## **GEOGRAPHIC AREA CODING**

Accurate and complete information on the physical location of each establishment is required to tabulate the census data for states, metropolitan and micropolitan statistical areas, counties, and corporate municipalities (places) including cities, towns, townships, villages, and boroughs. Respondents were required to report their physical location (street address, municipality, county, and state) if it differed from their mailing address. For establishments not surveyed by mail (and those single-establishment companies that did not provide acceptable information on physical location), location information from administrative sources is used as a basis for coding.

## **AVAILABILITY OF ADDITIONAL DATA**

All results of the 2002 Economic Census are available on the Census Bureau Internet site ([www.census.gov](http://www.census.gov)) and on digital versatile discs (DVD-ROMs) for sale by the Census Bureau. The American FactFinder system at the Internet site allows selective retrieval and downloading of the data. For more information, including a description of reports being issued, see the Internet site, write to the U.S. Census Bureau, Washington, DC 20233-6100, or call Customer Services at 301-763-4100.

## **HISTORICAL INFORMATION**

The economic census has been taken as an integrated program at 5-year intervals since 1967 and before that for 1954, 1958, and 1963. Prior to that time, individual components of the economic census were taken separately at varying intervals.

The economic census traces its beginnings to the 1810 Decennial Census, when questions on manufacturing were included with those for population. Coverage of economic activities was expanded for the 1840 Decennial Census and subsequent censuses to include mining and some commercial activities. The 1905 Manufactures Census was the first time a census was taken apart

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from the regular decennial population census. Censuses covering retail and wholesale trade and construction industries were added in 1930, as were some service trades in 1933. Censuses of construction, manufacturing, and the other business censuses were suspended during World War II.

The 1954 Economic Census was the first census to be fully integrated, providing comparable census data across economic sectors and using consistent time periods, concepts, definitions, classifications, and reporting units. It was the first census to be taken by mail, using lists of firms provided by the administrative records of other federal agencies. Since 1963, administrative records also have been used to provide basic statistics for very small firms, reducing or eliminating the need to send them census report forms.

The range of industries covered in the economic census expanded between 1967 and 2002. The census of construction industries began on a regular basis in 1967, and the scope of service industries, introduced in 1933, was broadened in 1967, 1977, and 1987. While a few transportation industries were covered as early as 1963, it was not until 1992 that the census broadened to include all of transportation, communications, and utilities. Also new for 1992 was coverage of financial, insurance, and real estate industries. With these additions, the economic census and the separate census of governments and census of agriculture collectively covered roughly 98 percent of all economic activity. New for 2002 is coverage of four industries classified in the agriculture, forestry, and fishing sector under the SIC system: landscape architectural services, landscaping services, veterinary services, and pet care services.

Printed statistical reports from the 1992 and earlier censuses provide historical figures for the study of long-term time series and are available in some large libraries. Reports for 1997 were published primarily on the Internet and copies of 1992 reports are also available there. CD-ROMs issued from the 1987, 1992, and 1997 Economic Censuses contain databases that include all or nearly all data published in print, plus additional statistics, such as ZIP Code statistics, published only on CD-ROM.

#### **SOURCES FOR MORE INFORMATION**

More information about the scope, coverage, classification system, data items, and publications for the 2002 Economic Census and related surveys is published in the *Guide to the 2002 Economic Census* at [www.census.gov/econ/census02/guide](http://www.census.gov/econ/census02/guide). More information on the methodology, procedures, and history of the census will be published in the *History of the 2002 Economic Census* at [www.census.gov/econ/www/history.html](http://www.census.gov/econ/www/history.html).



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# Manufacturing

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## SCOPE

The Manufacturing sector (sector 31-33) comprises establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. The assembling of component parts of manufactured products is considered manufacturing, except in cases where the activity is appropriately classified in Sector 23, Construction.

Establishments in the manufacturing sector are often described as plants, factories, or mills and characteristically use power-driven machines and materials-handling equipment. However, establishments that transform materials or substances into new products by hand or in the worker's home and those engaged in selling to the general public products made on the same premises from which they are sold, such as bakeries, candy stores, and custom tailors, may also be included in this sector. Manufacturing establishments may process materials or may contract with other establishments to process their materials for them. Both types of establishments are included in manufacturing.

The materials, substances, or components transformed by manufacturing establishments are raw materials that are products of agriculture, forestry, fishing, mining, or quarrying, as well as products of other manufacturing establishments. The materials used may be purchased directly from producers, obtained through customary trade channels, or secured without recourse to the market by transferring the product from one establishment to another, under the same ownership. The new product of a manufacturing establishment may be finished in the sense that it is ready for utilization or consumption, or it may be semifinished to become an input for an establishment engaged in further manufacturing. For example, the product of the alumina refinery is the input used in the primary production of aluminum; primary aluminum is the input to an aluminum wire drawing plant; and aluminum wire is the input for a fabricated wire product manufacturing establishment.

The subsectors in the manufacturing sector generally reflect distinct production processes related to material inputs, production equipment, and employee skills. In the machinery area, where assembling is a key activity, parts and accessories for manufactured products are classified in the industry of the finished manufactured item when they are made for separate sale. For example, a replacement refrigerator door would be classified with refrigerators and an attachment for a piece of metal working machinery would be classified with metal working machinery. However, components, input from other manufacturing establishments, are classified based on the production function of the component manufacturer. For example, electronic components are classified in Subsector 334, Computer and Electronic Product Manufacturing; and stampings are classified in Subsector 332, Fabricated Metal Product Manufacturing.

Manufacturing establishments often perform one or more activities that are classified outside the manufacturing sector of NAICS. For instance, almost all manufacturing has some captive research and development or administrative operations, such as accounting, payroll, or management. These captive services are treated the same as captive manufacturing activities. When the services are provided by separate establishments, they are classified to the NAICS sector where such services are primary, not in manufacturing.

The boundaries of manufacturing and the other sectors of the classification system can be somewhat blurry. The establishments in the manufacturing sector are engaged in the transformation of materials into new products. Their output is a new product. However, the definition of what constitutes a new product can be somewhat subjective. As clarification, the following activities are

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considered manufacturing in NAICS: milk bottling and pasteurizing; water bottling and processing; fresh fish packaging (oyster shucking, fish filleting); apparel jobbing (assigning of materials to contract factories or shops for fabrication or other contract operations); as well as contracting on materials owned by others; printing and related activities; ready-mixed concrete production; leather converting; grinding of lenses to prescription; wood preserving; electroplating, plating, metal heat treating, and polishing for the trade; lapidary work for the trade; fabricating signs and advertising displays; rebuilding or remanufacturing machinery (i.e., automotive parts); ship repair and renovation; machine shops; and tire retreading.

**Exclusions.** There are activities that are sometimes considered manufacturing, but for NAICS are classified in another sector. These activities include logging, classified in Sector 11, Agriculture, Forestry, Fishing and Hunting is considered a harvesting operation; the beneficiating of ores and other minerals, classified in Sector 21, Mining, is considered part of the activity of mining; the construction of structures and fabricating operations performed at the site of construction by contractors, is classified in Sector 23, Construction; establishments engaged in breaking of bulk and redistribution in smaller lots, including packaging, repackaging, or bottling products, such as liquors or chemicals; the customized assembly of computers; sorting of scrap; mixing paints to customer order; and cutting metals to customer order, classified in Sector 42, Wholesale Trade or Sector 44-45, Retail Trade, produce a modified version of the same product, not a new product; and publishing and the combined activity of publishing and printing, classified in Sector 51, Information, perform the transformation of information into a product where as the value of the product to the consumer lies in the information content, not in the format in which it is distributed (i.e., the book or software diskette).

The tabulations for this sector do not include central administrative offices, warehouses, or other establishments that serve manufacturing establishments within the same organization. Data for such establishments are classified according to the nature of the service they provide. For example, separate headquarters establishments are reported in NAICS Sector 55, Management of Companies and Enterprises.

The reports described below exclude establishments of firms with no paid employees. These “nonemployers,” typically self-employed individuals or partnerships operating businesses that they have not chosen to incorporate, are reported separately in Nonemployer Statistics. The contribution of nonemployers, relatively small for this sector, may be examined at [www.census.gov/nonemployerimpact](http://www.census.gov/nonemployerimpact).

The reports described below cover all manufacturing establishments with one or more paid employees.

**Definitions.** Industry categories are defined in Appendix B, NAICS Codes, Titles, and Descriptions. Other terms are defined in Appendix A, Explanation of Terms.

## REPORTS

The following reports provide statistics on this sector:

**Industry Series.** There are 473 reports, each covering a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change in the following reports.

**Geographic Area Series.** There are 51 separate reports, one for each state and the District of Columbia. Each state report presents similar statistics at the “all manufacturing” level for each state and its metropolitan and micropolitan areas with 250 employees or more, and for counties, consolidated cities, and places with 500 employees or more. The state reports also include six-digit NAICS level data for industries with 100 employees or more in the state.

### Subject Series:

x Manufacturing

2002 Economic Census

- **Industry-Product Analysis Summary.** This report presents value of shipments, value of product shipments, percentage of product shipments of the total value of shipments, and percentage of distribution of value of product shipments on the NAICS six-digit industry level and by the six- and seven-digit product code levels. It also includes miscellaneous receipts at the six- and seven-digit product code levels by NAICS six-digit industry levels.
- **General Summary.** This report contains industry and geographic area statistics summarized in one report. It includes higher levels of aggregation than the industry and state reports, as well as revisions to the data made after the release of the industry and state reports.
- **Product Summary.** This report summarizes the products data published in the industry reports. This report also includes a table with data for products that are primary to more than one industry, which are not in the industry reports.
- **Materials Summary.** This report summarizes the materials data published in the industry reports.
- **Concentration Ratio Summary.** This report publishes data on the percentage of value of shipments and value added accounted for by the 4-, 8-, 20-, and 50-largest companies for each manufacturing industry. Also shown in this report are Herfindahl-Herschmann indexes for each industry.
- **Location of Manufacturing Plants Summary.** This report contains statistics on the number of establishments for the three- and six-digit NAICS industry by state, county, place, and ZIP Code by employment-size of the establishment.

**ZIP Code Statistics.** This report contains statistics on the number of establishments for the three- and six-digit NAICS industry by employment-size of the establishment by ZIP Code.

**Other reports.** Data for this sector are also included in reports with multisector coverage, including Nonemployer Statistics, Comparative Statistics, Bridge Between 2002 NAICS and 1997 NAICS, Business Expenses, and the Survey of Business Owners reports.

## GEOGRAPHIC AREAS COVERED

The level of geographic detail varies by report. Maps are available at [www.census.gov/econ2002maps](http://www.census.gov/econ2002maps). Notes specific to areas in the state are included in Appendix D, Geographic Notes.

1. The United States as a whole.
2. States and the District of Columbia.
3. Metropolitan and micropolitan statistical areas with 250 employees or more. A core based statistical areas (CBSA) contains a core area with a substantial population nucleus, together with adjacent communities having a high degree of social and economic integration with that core. CBSAs are differentiated into metropolitan and micropolitan statistical areas based on size criteria. Both metropolitan and micropolitan areas are defined in terms of entire counties, and are listed in Appendix E, Metropolitan and Micropolitan Statistical Areas.
  - a. Metropolitan Statistical Areas (metro areas). Metro areas have at least one urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties.
  - b. Micropolitan Statistical Areas (micro areas). Micro areas have at least one urban cluster of at least 10,000 but less than 50,000 population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties.
  - c. Metropolitan Divisions (metro divisions). If specified criteria are met, a metro area containing a single core with a population of 2.5 million or more may be subdivided to form smaller groupings of counties referred to as Metropolitan Divisions.

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- d. Combined Statistical Areas (combined areas). If specified criteria are met, adjacent metro and micro areas, in various combinations, may become the components of a new set of areas called Combined Statistical Areas. The areas that combine retain their own designations as metro or micro areas within the larger combined area.
4. Counties and county equivalents defined as of January 1, 2002, with 500 employees or more. Counties are the primary divisions of states, except in Louisiana where they are called parishes and in Alaska where they are called boroughs, census areas, and city and boroughs. Maryland, Missouri, Nevada, and Virginia have one place or more that is independent of any county organization and constitutes primary divisions of their states. These places are treated as counties and as places.
  5. Economic places with 500 employees or more.
    - a. Municipalities of 2,500 inhabitants or more defined as of January 1, 2002. These are areas of significant population incorporated as cities, boroughs, villages, or towns according to the 2000 Census of Population. For the economic census, boroughs and census areas in Alaska and boroughs in New York are not included in this category.
    - b. Consolidated cities defined as of January 1, 2002. Consolidated cities are consolidated governments that consist of separately incorporated municipalities.
    - c. Townships in Michigan, New Jersey, and Pennsylvania, and towns in New York, Wisconsin, and the six New England states with 10,000 inhabitants or more (according to the 2000 Census of Population).
    - d. Balance of county. Areas outside the entities listed above, including incorporated municipalities with populations of fewer than 2,500, town and townships not qualifying as noted above, and the remainders of counties outside places are categorized as "Balance of county."

## **DOLLAR VALUES**

All dollar values presented are expressed in current dollars; i.e., 2002 data are expressed in 2002 dollars, and 1997 data, in 1997 dollars. Consequently, when making comparisons with prior years, users of the data should consider the changes in prices that have occurred.

All dollar values are shown in thousands of dollars.

## **COMPARABILITY OF THE 1997 AND 2002 ECONOMIC CENSUSES**

Both the 2002 Economic Census and the 1997 Economic Census present data based on the North American Industry Classification System (NAICS). While there were revisions to selected industries for 2002, this sector is not affected by those revisions.

For 2002, there have been several additional data tables added, which did not exist in 1997. These tables for 2002 include products primary to more than one industry, industry-product analysis, e-commerce value of shipments, and leased and nonleased detail employment statistics by subsectors.

## **RELIABILITY OF DATA**

All data compiled for this sector are subject to nonsampling errors. Nonsampling errors can be attributed to many sources: inability to identify all cases in the actual universe; definition and classification difficulties; differences in the interpretation of questions; errors in recording or coding the data obtained; and other errors of collection, response, coverage, processing, and estimation for missing or misreported data. Selected data in tables titled "Detailed Statistics" are based on the Annual Survey of Manufactures and are subject to sampling errors as well as nonsampling errors.

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No direct measurement of these effects has been obtained except for estimation for missing or misreported data, as by the percentages shown in the tables. Precautionary steps were taken in all phases of the collection, processing, and tabulation of the data in an effort to minimize the effects of nonsampling errors. More information on the reliability of the data is included in Appendix C, Methodology.

## **DISCLOSURE**

In accordance with federal law governing census reports (Title 13 of the United States Code), no data are published that would disclose the operations of an individual establishment or company. However, the number of establishments in a specific industry or geographic area is not considered a disclosure; therefore, this information may be released even though other information is withheld. Techniques employed to limit disclosure are discussed at [www.census.gov/epcd/ec02/disclosure.htm](http://www.census.gov/epcd/ec02/disclosure.htm).

The disclosure analysis for "industry statistics" files is based on the total value of shipments. When the total value of shipments cannot be shown without disclosing information for individual companies, the complete line is suppressed except for capital expenditures. Nonetheless, the suppressed data are included in higher-level totals. A separate disclosure analysis is performed for capital expenditures, which can be suppressed even though value of shipments data are published.

## **AVAILABILITY OF MORE FREQUENT ECONOMIC DATA**

The Census Bureau conducts the Annual Survey of Manufactures (ASM) in each of the 4 years between the economic censuses. The ASM is a probability-based sample of approximately 55,000 establishments and collects many of the same industry statistics (including employment, payroll, value of shipments, etc.) as the economic census. However, there are selected statistics not included in the ASM. Among these are the number of companies and establishments, detailed product and materials data, and substate geographic data. In addition to the ASM, the Census Bureau conducts the Current Industrial Reports (CIR) program. The CIR program publishes selected detailed product statistics for selected manufacturing industries at the U.S. level annually and, in some cases, monthly and/or quarterly. The Census Bureau also conducts the monthly Manufacturers' Shipments, Inventories, and Orders (M3) Program, which publishes detailed statistics for manufacturing industries at the U.S. level.

In addition, the County Business Patterns program offers annual statistics on the number of establishments, employment, and payroll classified by industry within each county, and Statistics of U.S. Businesses provides annual statistics classified by the employment size of the enterprise, further classified by industry for the United States, and by broader categories for states and metropolitan areas.

## **CONTACTS FOR DATA USERS**

Questions about these data may be directed to the U.S. Census Bureau, Manufacturing & Construction Division, Information Services Center, 301-763-4673 or [ask.census.gov](mailto:ask.census.gov).

## **ABBREVIATIONS AND SYMBOLS**

The following abbreviations and symbols are used with these data:

A	Standard error of 100 percent or more
D	Withheld to avoid disclosing data of individual companies; data are included in higher level totals
F	Exceeds 100 percent because data include establishments with payroll exceeding revenue
N	Not available or not comparable
S	Withheld because estimates did not meet publication standards
X	Not applicable
Z	Less than half the unit shown
a	0 to 19 employees
b	20 to 99 employees
c	100 to 249 employees



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e	250 to 499 employees
f	500 to 999 employees
g	1,000 to 2,499 employees
h	2,500 to 4,999 employees
i	5,000 to 9,999 employees
j	10,000 to 24,999 employees
k	25,000 to 49,999 employees
l	50,000 to 99,999 employees
m	100,000 employees or more
p	10 to 19 percent estimated
q	20 to 29 percent estimated
r	Revised
s	Sampling error exceeds 40 percent
nsk	Not specified by kind
-	Represents zero (page image/print only)
(CC)	Consolidated city
(IC)	Independent city

**Table 1. Historical Statistics for the Industry: 2002 and Earlier Years**

[Data based on the 2002 Economic Census and the 2002 Annual Survey of Manufactures (ASM). For information on confidentiality protection, sampling error, nonsampling error, and explanation of terms, see note at end of table. For meaning of abbreviations and symbols, see introductory text]

Industry and year <sup>1</sup>	Com- panies <sup>2</sup>	All estab- lish- ments <sup>3</sup>	All employees		Production workers			Value added (\$1,000)	Total cost of materials (\$1,000)	Total value of shipments (\$1,000)	Total capital expendi- tures (\$1,000)
			Number <sup>4</sup>	Payroll (\$1,000)	Number <sup>4</sup>	Hours (1,000)	Wages (\$1,000)				
334412, Bare printed circuit board manufacturing .....	2002.. 878	936	46 890	1 653 179	33 226	73 354	940 695	3 373 527	2 718 114	6 128 781	205 048
	2001.. N	N	72 333	2 359 198	55 644	107 567	1 522 882	4 729 574	4 484 395	9 413 636	575 807
	2000.. N	N	85 120	2 982 541	68 393	146 374	2 029 598	6 626 768	6 073 410	12 532 074	738 783
	1999.. N	N	81 416	2 661 239	65 239	137 886	1 798 136	5 557 074	4 413 171	9 832 103	687 556
	1998.. N	N	78 774	2 395 819	62 507	130 783	1 573 304	5 047 653	4 144 473	9 144 266	747 589
	1997.. 1 319	1 391	72 282	2 110 176	56 173	113 963	1 345 948	5 062 300	3 486 866	8 507 125	609 125

<sup>1</sup>Statistics presented for years ending in 2 and 7 are census data. Interim census years are derived in a representative sample of manufacturing establishments canvassed in the Annual Survey of Manufactures (ASM).

<sup>2</sup>For the census, a company is defined as a business organization consisting of one establishment or more under common ownership or control.

<sup>3</sup>Includes establishments with payroll at any time during the year.

<sup>4</sup>Number of employees figures represent average number of production workers for pay period that includes the 12th of March, May, August, and November plus other employees for payroll period that includes the 12th of March.

Note: The data in this table are based on the 2002 Economic Census and the 2002 Annual Survey of Manufactures (ASM). To maintain confidentiality, the Census Bureau suppresses data to protect the identity of any business or individual. The census results in this table contain sampling errors and nonsampling errors. Data users who create their own estimates using data from American FactFinder tables should cite the Census Bureau as the source of the original data only. For explanation of terms, see Appendix A. For full technical documentation, see Appendix C.

**Table 2. Industry Statistics for Selected States: 2002**

[States that are a disclosure or with less than 100 employees are not shown. Data based on the 2002 Economic Census. For information on confidentiality protection, nonsampling error, explanation of terms, and geographical definitions, see note at end of table. For information on geographic areas followed by \*, see Appendix D. For meaning of abbreviations and symbols, see introductory text]

Industry and geographic area	E <sup>1</sup>	All establishments <sup>2</sup>		All employees		Production workers			Value added (\$1,000)	Total cost of materials (\$1,000)	Total value of shipments (\$1,000)	Total capital expenditures (\$1,000)
		Total	With 20 employees or more	Number <sup>3</sup>	Payroll (\$1,000)	Number <sup>3</sup>	Hours (1,000)	Wages (\$1,000)				
<b>334412, Bare printed circuit board manufacturing</b>												
United States .....	1	936	390	46 890	1 653 179	33 226	73 354	940 695	3 373 527	2 718 114	6 128 781	'205 048
Arkansas .....	1	5	1	318	9 174	190	355	4 021	21 184	22 873	45 328	'338
California .....	2	264	102	10 444	388 671	7 944	18 309	244 798	719 210	621 911	1 360 327	'51 003
Colorado .....	2	27	7	479	17 304	348	710	10 066	35 940	18 171	54 072	'6 013
Connecticut .....	2	18	7	1 105	42 773	900	2 347	33 935	93 507	66 449	162 224	'12 286
Florida .....	1	31	10	2 097	75 165	1 421	2 724	38 069	155 412	155 085	311 621	'9 547
Georgia .....	1	11	6	911	30 515	515	1 022	12 343	81 972	44 407	120 026	'1 056
Illinois .....	1	64	30	2 313	68 156	1 827	4 220	41 137	140 972	94 749	235 504	'13 219
Massachusetts .....	1	50	24	3 384	119 137	2 077	4 599	68 117	214 562	294 060	513 388	'9 204
Michigan .....	2	23	10	1 118	34 623	823	1 763	19 116	70 369	67 933	136 792	'3 377
Minnesota .....	1	44	25	2 687	87 907	1 833	3 942	44 453	208 486	139 140	352 041	'17 176
New Hampshire .....	—	14	11	2 930	124 580	1 734	4 073	56 381	118 811	311 786	426 910	'24 354
New Jersey .....	4	19	7	308	9 821	247	613	6 479	18 382	15 085	34 335	'758
New York .....	—	49	16	3 513	121 539	2 210	4 773	56 862	291 961	169 703	465 281	'4 254
North Carolina .....	4	15	1	194	6 050	160	259	4 227	10 705	6 282	17 293	'224
Oklahoma .....	2	9	3	176	5 219	136	406	3 024	9 774	6 166	15 967	'111
Oregon .....	—	15	5	1 585	61 645	1 125	1 601	31 600	115 626	67 192	177 430	'12 416
Pennsylvania .....	2	28	9	799	24 077	634	1 462	15 402	39 394	25 096	63 964	'739
Texas .....	3	57	17	1 259	44 804	909	2 279	25 795	96 619	54 245	147 709	'5 157
Utah .....	—	13	5	1 092	29 623	713	1 288	16 812	45 385	49 452	98 118	'1 097
Virginia .....	1	8	5	307	9 981	234	517	6 188	21 113	8 083	29 130	'1 045
Washington .....	1	22	12	976	34 264	849	1 778	27 151	61 610	39 125	102 312	'5 891
Wisconsin .....	6	14	9	1 523	53 087	1 139	2 272	32 925	100 126	64 796	163 888	'3 362

<sup>1</sup>Some payroll and sales data for small single-establishment companies with up to 20 employees (cutoff varied by industry) were obtained from administrative records of other government agencies rather than from census report forms. These data were then used in conjunction with industry averages to estimate statistics for these small establishments. This technique was also used for a small number of other establishments whose reports were not received at the time data were tabulated. The following symbols are shown where estimated data account for 10 percent or more of the figures shown: 1–10 to 19 percent; 2–20 to 29 percent; 3–30 to 39 percent; 4–40 to 49 percent; 5–50 to 59 percent; 6–60 to 69 percent; 7–70 to 79 percent; 8–80 to 89 percent; 9–90 percent or more.

<sup>2</sup>Includes establishments with payroll at any time during the year.

<sup>3</sup>Number of employees figures represent average number of production workers for pay period that includes the 12th of March, May, August, and November plus other employees for payroll period that includes the 12th of March.

Note: The data in this table are based on the 2002 Economic Census. To maintain confidentiality, the Census Bureau suppresses data to protect the identity of any business or individual. The census results in this table contain nonsampling errors. Data users who create their own estimates using data from American FactFinder tables should cite the Census Bureau as the source of the original data only. For explanation of terms, see Appendix A. For full technical documentation, see Appendix C. For geographical definitions, see Appendix D.

**Table 3. Detailed Statistics by Industry: 2002**

[Data based on the 2002 Economic Census and the 2002 Annual Survey of Manufactures (ASM). For information on confidentiality protection, sampling error, nonsampling error, and explanation of terms, see note 2 at end of table. For meaning of abbreviations and symbols, see introductory text]

Item	Value
<b>334412, Bare printed circuit board manufacturing</b>	
Companies <sup>1</sup> .....	number.. 878
All establishments <sup>2</sup> .....	number.. 936
Establishments with 1 to 19 employees .....	number.. 546
Establishments with 20 to 99 employees .....	number.. 290
Establishments with 100 employees or more .....	number.. 100
All employees <sup>3</sup> .....	number.. 46 890
Total compensation .....	\$1,000.. 2 009 260
Annual payroll .....	\$1,000.. 1 653 179
Total fringe benefits .....	\$1,000.. 356 081
Production workers, average for year .....	number.. 33 226
Production workers on March 12 .....	number.. 34 120
Production workers on May 12 .....	number.. 33 767
Production workers on August 12 .....	number.. 32 981
Production workers on November 12 .....	number.. 31 997
Production worker hours .....	1,000.. 73 354
Production worker wages .....	\$1,000.. 940 695
Total cost of materials .....	\$1,000.. 2 718 114
Materials, parts, containers, packaging, etc., used .....	\$1,000.. 2 431 736
Resales .....	\$1,000.. 86 313
Purchased fuels .....	\$1,000.. 22 047
Purchased electricity .....	\$1,000.. 100 220
Contract work .....	\$1,000.. 77 798
Quantity of electricity purchased for heat and power .....	1,000 kWh.. 1 349 655
Quantity of electricity generated less sold for heat and power .....	1,000 kWh.. -
Total value of shipments .....	\$1,000.. 6 128 781
Primary products value of shipments .....	\$1,000.. 5 659 584
Secondary products value of shipments .....	\$1,000.. 290 848
Total miscellaneous receipts .....	\$1,000.. 178 349
Value of resales .....	\$1,000.. 95 468
Contract receipts .....	\$1,000.. 67 852
Other miscellaneous receipts .....	\$1,000.. 15 029
Primary products specialization ratio .....	percent.. 95
Value of primary products shipments made in all industries .....	\$1,000.. 6 457 495
Value of primary products shipments made in this industry .....	\$1,000.. 5 659 584
Value of primary products shipments made in other industries .....	\$1,000.. 797 911
Coverage ratio .....	percent.. 88
Value added .....	\$1,000.. 3 373 527
Total inventories, beginning of year .....	\$1,000.. 748 029
Finished goods inventories .....	\$1,000.. 100 128
Work-in-process inventories .....	\$1,000.. 254 125
Materials and supplies inventories .....	\$1,000.. 393 776
Total inventories, end of year .....	\$1,000.. 634 517
Finished goods inventories .....	\$1,000.. 108 284
Work-in-process inventories .....	\$1,000.. 208 829
Materials and supplies inventories .....	\$1,000.. 317 404
Gross value of depreciable assets (acquisition costs) at beginning of year .....	\$1,000.. '3 875 891
Total capital expenditures (new and used) .....	\$1,000.. '205 048
Buildings and other structures (new and used) .....	\$1,000.. '20 658
Machinery and equipment (new and used) .....	\$1,000.. '184 390
Automobiles, trucks, etc., for highway use .....	\$1,000.. '9 164
Computers and peripheral data processing equipment .....	\$1,000.. '16 589
All other expenditures for machinery and equipment .....	\$1,000.. '158 637
Total retirements .....	\$1,000.. '314 607
Gross value of depreciable assets at end of year .....	\$1,000.. '3 766 332
Depreciation charges during year .....	\$1,000.. '355 168
Total rental payments .....	\$1,000.. 117 316
Buildings and other structures .....	\$1,000.. 74 218
Machinery and equipment .....	\$1,000.. 43 098
Total other expenses <sup>4</sup> .....	\$1,000.. 463 397
Response coverage ratio <sup>5</sup> .....	percent.. 68
Repair and maintenance services of buildings and/or machinery <sup>4</sup> .....	\$1,000.. 63 768
Communications services <sup>4</sup> .....	\$1,000.. 13 613
Legal services <sup>4</sup> .....	\$1,000.. 10 633
Accounting, auditing, and bookkeeping services <sup>4</sup> .....	\$1,000.. 5 087
Advertising and promotional services <sup>4</sup> .....	\$1,000.. 5 776
Expensed computer hardware and supplies and purchased computer services <sup>4</sup> .....	\$1,000.. 11 426
Refuse removal (including hazardous waste) services <sup>4</sup> .....	\$1,000.. 14 289
Management consulting and administrative services <sup>4</sup> .....	\$1,000.. 14 148
Taxes and license fees <sup>4</sup> .....	\$1,000.. 14 774
All other expenses <sup>4</sup> .....	\$1,000.. 309 883

<sup>1</sup>For the census, a company is defined as a business organization consisting of one establishment or more under common ownership or control.

<sup>2</sup>Includes establishments with payroll at any time during the year.

<sup>3</sup>Number of employees figures represent average number of production workers for pay period that includes the 12th of March, May, August, and November plus other employees for payroll period that includes the 12th of March.

<sup>4</sup>Based on 2002 Annual Survey of Manufactures (ASM) sample data.

<sup>5</sup>A response coverage ratio is derived for this item by calculating the ratio of the weighted employment (establishment data multiplied by sample weight) for those Annual Survey of Manufactures (ASM) establishments that reported to the weighted total employment for all ASM establishments classified in this industry.

Note 1: The amounts shown for other expenses reflect only those services that establishments purchase from other companies.

Note 2: The data in this table are based on the 2002 Economic Census and the 2002 Annual Survey of Manufactures (ASM). To maintain confidentiality, the Census Bureau suppresses data to protect the identity of any business or individual. The census results in this table contain sampling errors and nonsampling errors. Data users who create their own estimates using data from American FactFinder tables should cite the Census Bureau as the source of the original data only. For explanation of terms, see Appendix A. For full technical documentation, see Appendix C.

**Table 4. Industry Statistics by Employment Size: 2002**

[Data based on the 2002 Economic Census. For information on confidentiality protection, nonsampling error, and explanation of terms, see note at end of table. For meaning of abbreviations and symbols, see introductory text]

Employment size class	E <sup>1</sup>	All establishments <sup>2</sup>	All employees		Production workers			Value added (\$1,000)	Total cost of materials (\$1,000)	Total value of shipments (\$1,000)	Total capital expenditures (\$1,000)
			Number <sup>3</sup>	Payroll (\$1,000)	Number <sup>3</sup>	Hours (1,000)	Wages (\$1,000)				
<b>334412, Bare printed circuit board manufacturing</b>											
All establishments .....	1	936	46 890	1 653 179	33 226	73 354	940 695	3 373 527	2 718 114	6 128 781	'205 048
Establishments with—											
1 to 4 employees .....	9	263	550	18 012	436	871	11 094	37 925	24 792	62 713	'1 089
5 to 9 employees .....	6	152	1 015	37 589	798	1 924	23 332	96 009	65 240	165 652	'2 474
10 to 19 employees .....	5	131	1 853	68 083	1 332	2 971	36 853	157 040	91 055	248 350	'5 117
20 to 49 employees .....	3	182	5 702	193 119	4 333	10 695	117 356	430 853	294 802	722 876	'20 769
50 to 99 employees .....	1	108	7 678	249 964	5 561	13 080	143 970	481 452	376 920	856 335	'23 448
100 to 249 employees .....	—	59	8 874	321 155	6 365	14 153	181 132	628 524	428 866	1 062 028	'53 250
250 to 499 employees .....	—	27	9 426	345 574	6 649	14 836	218 243	566 133	666 783	1 267 989	'52 336
500 to 999 employees .....	1	12	i	D	D	D	D	D	D	D	D
1,000 to 2,499 employees .....	—	2	h	D	D	D	D	D	D	D	D
2,500 employees or more .....	—	—	—	—	—	—	—	—	—	—	—
Administrative records <sup>4</sup> .....	6	363	1 390	46 436	1 108	2 240	28 755	158 351	100 910	259 172	'2 952

<sup>1</sup>Some payroll and sales data for small single-establishment companies with up to 20 employees (cutoff varied by industry) were obtained from administrative records of other government agencies rather than from census report forms. These data were then used in conjunction with industry averages to estimate statistics for these small establishments. This technique was also used for a small number of other establishments whose reports were not received at the time data were tabulated. The following symbols are shown where estimated data account for 10 percent or more of the figures shown: 1—10 to 19 percent; 2—20 to 29 percent; 3—30 to 39 percent; 4—40 to 49 percent; 5—50 to 59 percent; 6—60 to 69 percent; 7—70 to 79 percent; 8—80 to 89 percent; 9—90 percent or more.

<sup>2</sup>Includes establishments with payroll at any time during the year.

<sup>3</sup>Number of employees figures represent average number of production workers for pay period that includes the 12th of March, May, August, and November plus other employees for payroll period that includes the 12th of March.

<sup>4</sup>Some payroll and sales data for small single-establishment companies with up to 20 employees (cutoff varied by industry) were obtained from administrative records of other government agencies rather than from census report forms. These data were then used in conjunction with industry averages to estimate statistics for these small establishments. Data are also included in respective size classes shown.

Note: The data in this table are based on the 2002 Economic Census. To maintain confidentiality, the Census Bureau suppresses data to protect the identity of any business or individual. The census results in this table contain nonsampling errors. Data users who create their own estimates using data from American FactFinder tables should cite the Census Bureau as the source of the original data only. For explanation of terms, see Appendix A. For full technical documentation, see Appendix C.

**Table 5. Industry Statistics by Primary Product Class Specialization: 2002**

[Data based on the 2002 Economic Census. For information on confidentiality protection, nonsampling error, and explanation of terms, see note at end of table. For meaning of abbreviations and symbols, see introductory text]

Industry or product class code	Industry or primary product class	All establishments <sup>1</sup>	All employees		Production workers			Value added (\$1,000)	Total cost of materials (\$1,000)	Total value of shipments (\$1,000)	Total capital expenditures (\$1,000)
			Number <sup>2</sup>	Payroll (\$1,000)	Number <sup>2</sup>	Hours (1,000)	Wages (\$1,000)				
334412	Bare printed circuit board manufacturing .....	936	46 890	1 653 179	33 226	73 354	940 695	3 373 527	2 718 114	6 128 781	'205 048
3344120	Bare printed circuit boards .....	936	46 890	1 653 179	33 226	73 354	940 695	3 373 527	2 718 114	6 128 781	'205 048

<sup>1</sup>Includes establishments with payroll at any time during the year.

<sup>2</sup>Number of employees figures represent average number of production workers for pay period that includes the 12th of March, May, August, and November plus other employees for payroll period that includes the 12th of March.

Note: The data in this table are based on the 2002 Economic Census. To maintain confidentiality, the Census Bureau suppresses data to protect the identity of any business or individual. The census results in this table contain nonsampling errors. Data users who create their own estimates using data from American FactFinder tables should cite the Census Bureau as the source of the original data only. For explanation of terms, see Appendix A. For full technical documentation, see Appendix C.



**Table 6a. Products Statistics: 2002 and 1997**

[Includes quantity and value of products of this industry produced by (1) establishments classified in this industry (primary) and (2) establishments classified in other industries (secondary). Transfers of products of this industry from one establishment of a company to another establishment of the same company (interplant transfers) are also included. Data based on the 2002 Economic Census. For information on confidentiality protection, nonsampling error, and explanation of terms, see note 2 at end of table. For meaning of abbreviations and symbols, see introductory text]

Product code	Product	Number of companies with shipments of \$100,000 or more	Quantity of production for all purposes	Product shipments		
				Quantity	Value (\$1,000)	
334412	Bare printed circuit board manufacturing .....	2002..	N	X	X	6 457 495
		1997..	N	X	X	8 724 756
3344120	Bare printed circuit boards .....	2002..	N	X	X	6 457 495
33441201	Bare printed circuit (wiring) boards .....	1997..	N	X	X	8 724 756
		2002..	N	X	X	5 794 762
3344120100	Bare printed circuit (wiring) boards <sup>1</sup> .....	1997..	N	X	X	7 827 892
		2002..	366	X	X	5 794 762
3344120Y	Bare printed circuit boards, nsk, total .....	1997..	534	X	X	7 827 892
		2002..	N	X	X	662 733
3344120YWW	Bare printed circuit boards, nsk, for nonadministrative-record establishments .....	1997..	N	X	X	896 864
		2002..	N	X	X	507 509
3344120YWY	Bare printed circuit boards, nsk, for administrative-record establishments .....	1997..	N	X	X	582 894
		2002..	N	X	X	155 224
		1997..	N	X	X	313 970

<sup>1</sup>For additional detail, see Current Industrial Report MA334Q, Semiconductors and Electronic Components.

Note 1: For some establishments, data have been estimated from central unit values that are based on quantity-value relationships of reported data. The following symbols are used when percentage of each quantity figure estimated in this manner equals or exceeds 10 percent of published figure: p-10 to 19 percent estimated; q-20 to 29 percent estimated. If 30 percent or more is estimated, figure is replaced by S.

Note 2: The data in this table are based on the 2002 Economic Census. To maintain confidentiality, the Census Bureau suppresses data to protect the identity of any business or individual. The census results in this table contain nonsampling errors. Data users who create their own estimates using data from American FactFinder tables should cite the Census Bureau as the source of the original data only. For explanation of terms, see Appendix A. For full technical documentation, see Appendix C.

Table 6b. **Product Class Shipments for Selected States: 2002 and 1997**

[Not applicable for this report.]

**Table 7. Materials Consumed by Kind: 2002 and 1997**

[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. Data based on the 2002 Economic Census. For information on confidentiality protection, nonsampling error, and explanation of terms, see note 2 at end of table. For meaning of abbreviations and symbols, see introductory text]

Material code	Material consumed	Quantity	Delivered cost (\$1,000)
334412	<b>Bare printed circuit board manufacturing</b>		
00900001	Total materials .....	2002.. X	2 431 736
		1997.. X	3 075 742
32721203	Tube blanks .....	2002.. X	D
		1997.. X	1 659
33441200	Printed circuit boards (without inserted components) for electronic circuitry .....	2002.. X	306 603
		1997.. X	522 536
001900C4	Printed circuit assemblies, loaded boards, and modules (printed circuit boards with inserted electronic components) .....	2002.. X	189 518
		1997.. X	104 155
33441300	Semiconductors (including transistors, diodes, rectifiers, and integrated circuits), for electronic circuitry .....	2002.. X	282 979
		1997.. X	122 456
33441400	Capacitors for electronic circuitry .....	2002.. X	81 932
		1997.. X	37 014
33441500	Resistors for electronic circuitry .....	2002.. X	74 148
		1997.. X	25 880
001900D3	All other miscellaneous components and accessories, for electronic circuitry (excluding tubes) .....	2002.. X	77 623
		1997.. X	117 694
32518835	Silicon, hyperpure .....	2002.. X	D
		1997.. X	D
33141911	Gold and other precious metals, all forms (including ingot, sheet, strip, solder, plating, electrodes, etc.) .....	2002.. X	62 534
		1997.. X	49 824
33141917	Doped chemicals and other doped materials for electronic use .....	2002.. X	31 740
		1997.. X	34 373
33111107	Ferrites (powder and paste) .....	2002.. X	D
		1997.. X	138
331000AA	Metal powders .....	2002.. X	826
		1997.. X	502
33411001	Electronic computer equipment .....	2002.. X	11 768
		1997.. X	N
33593101	Current-carrying wiring devices .....	2002.. X	5 953
		1997.. X	2 636
33422001	Electronic communication equipment .....	2002.. X	262
		1997.. X	D
33451501	Electrical instrument mechanisms and meter movements (including instrument relays) .....	2002.. X	3 983
		1997.. X	4 193
33451503	All other miscellaneous electrical measuring instruments and parts .....	2002.. X	1 671
		1997.. X	N
33531211	Fractional horsepower electric motors (less than 1 hp) .....	2002.. X	3 477
		1997.. X	N
001900B1	Electrical transmission, distribution, and control equipment .....	2002.. X	12 032
		1997.. X	N
33431005	Loudspeakers, microphones, and tuners (all types) .....	2002.. X	54
		1997.. X	N
32720003	Glass and glass products (excluding windows and mirrors) .....	2002.. X	80 697
		1997.. X	N
33331401	Optical instruments and lenses (excluding sighting, tracking, and fire control) .....	2002.. X	D
		1997.. X	D
32521105	Plastics resins consumed in the form of granules, pellets, powders, liquids, etc. ....	2002.. X	26 749
		1997.. X	15 768
32610011	Fabricated plastics products (excluding gaskets) .....	2002.. X	49 594
		1997.. X	80 640
332000A9	Sheet metal products (excluding stampings) .....	2002.. X	33 359
		1997.. X	10 911
332000AC	Metal stampings .....	2002.. X	2 025
		1997.. X	3 337
33272203	Metal bolts, nuts, screws, washers, rivets, and other screw machine products .....	2002.. X	9 036
		1997.. X	3 222
33200033	Other fabricated metal products (excluding forgings) .....	2002.. X	18 254
		1997.. X	16 668
33100035	Castings, rough and semifinished .....	2002.. X	D
		1997.. X	D
33120001	Steel shapes and forms (excluding castings, forgings, and fabricated metal products) .....	2002.. X	D
		1997.. X	D
33142111	Copper and copper-base alloy shapes and forms (excluding castings, forgings, and fabricated metal products) .....	2002.. X	60 810
		1997.. X	44 364
33100038	Aluminum and aluminum-base alloy shapes and forms (excluding castings, forgings, and fabricated metal products) .....	2002.. D	D
		1997.. X	N
33100082	Other nonferrous metal shapes and forms (excluding aluminum and aluminum-base alloy and copper and copper-base alloy castings, forgings, and fabricated metal products) .....	2002.. X	3 651
		1997.. X	N
331000A7	Insulated wire and cable (including magnet wire) .....	2002.. X	6 765
		1997.. X	10 025
32220017	Paper and paperboard containers (including shipping sacks and other paper packaging supplies) .....	2002.. X	12 126
		1997.. X	9 169
32611305	Resists (photosensitive resin films applied to the surface of a wafer) .....	2002.. X	45 410
		1997.. X	54 814
32512005	Commodity gases .....	2002.. X	2 803
		1997.. X	897
32518843	Specialty gases .....	2002.. X	1 239
		1997.. X	385
32599217	Masks .....	2002.. X	2 330
		1997.. X	6 719
33141957	Silicon chips .....	2002.. X	10 914
		1997.. X	D
32510074	Solvents .....	2002.. X	5 674
		1997.. X	N

See footnotes at end of table.

**Table 7. Materials Consumed by Kind: 2002 and 1997—Con.**

[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. Data based on the 2002 Economic Census. For information on confidentiality protection, nonsampling error, and explanation of terms, see note 2 at end of table. For meaning of abbreviations and symbols, see introductory text]

Material code	Material consumed	Quantity	Delivered cost (\$1,000)
334412	Bare printed circuit board manufacturing—Con.		
32561000	Cleaning compounds .....	X	1 336
	.....2002..	X	N
	.....1997..	X	
00970099	All other materials and components, parts, containers, and supplies .....	X	526 417
	.....2002..	X	850 444
	.....1997..	X	286 542
00971000	Materials, ingredients, containers, and supplies, nsk .....	X	920 456
	.....2002..	X	
	.....1997..	X	

Note 1: For some establishments, data have been estimated from central unit values that are based on quantity-value relationships of reported data. The following symbols are used when percentage of each quantity figure estimated in this manner equals or exceeds 10 percent of published figure: p-10 to 19 percent estimated; q-20 to 29 percent estimated. If 30 percent or more is estimated, figure is replaced by S.

Note 2: The data in this table are based on the 2002 Economic Census. To maintain confidentiality, the Census Bureau suppresses data to protect the identity of any business or individual. The census results in this table contain nonsampling errors. Data users who create their own estimates using data from American FactFinder tables should cite the Census Bureau as the source of the original data only. For explanation of terms, see Appendix A. For full technical documentation, see Appendix C.

# Appendix A.

## Explanation of Terms

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### **BEGINNING- AND END-OF-YEAR INVENTORIES**

Respondents were asked to report their beginning-of-year and end-of-year inventories at cost or market. Effective with the 1982 Economic Census, this change to a uniform instruction for reporting inventories was introduced for all sector reports. Prior to 1982, respondents were permitted to value inventories using any generally accepted accounting method (FIFO, LIFO, market, to name a few). Beginning in 1982, LIFO users were asked to first report inventory values prior to the LIFO adjustment and, then, to report the LIFO reserve and the LIFO value after adjustment for the reserve.

### **Inventory data by stage of fabrication**

Total inventories and three detailed components (1)finished goods, (2)work-in-process, and (3)materials, supplies, fuels, etc., were collected.

When using inventory data by stage of fabrication for “all industries” and at the three-digit subsector level, it should be noted that an item treated as a finished product by an establishment in one industry may be reported as a raw material by an establishment in a different industry. For example, the finished-product inventories of a steel mill would be reported as raw materials by a stamping plant. Such differences are present in the inventory figures by stage of fabrication shown for all publication levels.

### **COST OF MATERIALS**

This term refers to direct charges actually paid or payable for items consumed or put into production during the year, including freight charges and other direct charges incurred by the establishment in acquiring these materials. It includes the cost of materials or fuel consumed, whether purchased by the individual establishment from other companies, transferred to it from other establishments of the same company, or withdrawn from inventory during the year.

Included in this item are:

1. Cost of parts, components, containers, etc. Includes all raw materials, semifinished goods, parts, containers, scrap, and supplies put into production or used as operating supplies and for repair and maintenance during the year.
2. Cost of products bought and sold in the same condition.
3. Cost of fuels consumed for heat and power. Includes the cost of materials or fuel consumed, whether purchased by the individual establishment from other companies, transferred to it from other establishments of the same company, or withdrawn from inventory during the year.
4. Cost of purchased electricity. The cost of purchased electric energy represents the amount actually used during the year for heat and power. In addition, information was collected on the quantity of electric energy generated by the establishment and the quantity of electric energy sold or transferred to other plants of the same company.
5. Cost of contract work. This term applies to work done by others on materials furnished by the manufacturing establishment. The actual cost of the material is to be reported on the cost of materials, parts, and containers line of this item. The term “Contract Work” refers to the fee a company pays to another company to perform a service.

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## **Specific materials consumed**

In addition to the total cost of materials, which every establishment was required to report, information also was collected for most manufacturing industries on the consumption of major materials used in manufacturing. The inquiries were restricted to those materials that were important parts of the cost of production in a particular industry and for which cost information was available from manufacturers' records. If less than \$25,000 of a listed material was consumed by an establishment, the cost data could be reported in the "Cost of all other materials" Census material code 00970099.

Also, the cost of materials for small establishments for which administrative records or short forms were used was imputed into the "Materials not specified by kind" Census materials code 00971000.

## **Duplication in cost of materials and value of shipment**

The aggregate of the cost of materials and value of shipments figures for industry groups and for all manufacturing industries includes large amounts of duplication since the products of some industries are used as materials by others. This duplication results, in part, from the addition of related industries representing successive stages in the production of a finished manufactured product. Examples are the addition of flour mills to bakeries in the food group and the addition of pulp mills to paper mills in the paper and allied products group of industries.

Estimates of the overall extent of this duplication indicate that the value of manufactured products exclusive of such duplication (the value of finished manufactures) tends to approximate two-thirds of the total value of products reported in the survey.

Duplication of products within individual industries is significant within a number of industry groups, e.g., machinery and transportation industries. These industries frequently include complete machinery and their parts. In this case, the parts made for original equipment are materials consumed for assembly plants in the same industry.

Even when no significant amount of duplication is involved, value of shipments figures are deficient as measures of the relative economic importance of individual manufacturing industries or geographic areas because of the wide variation in ratio of materials, labor, and other processing costs of value of shipments, both among industries and within the same industry.

Before 1962, cost of materials and value of shipments were not published for some industries which included considerable duplication. Since then, these data have been published for all industries at the U.S. level and beginning in 1964, for all geographic levels.

## **SELECTED PURCHASED SERVICES**

Annual Survey of Manufactures (ASM) establishments were requested to provide information on the cost of selected purchased services for the repair and maintenance services of buildings and/or machinery; communication services; legal services; accounting, auditing, and bookkeeping services; advertising and promotional services; expensed computer hardware and supplies and purchased computer services; refuse removal services; management consulting and administrative services; taxes and license fees; and all other expenses not previously stated. Each of these items reflects the costs paid directly by the establishment and excludes salaries paid to employees of the establishment for these services. These expenses are normally considered as nonproduction related costs purchased from other companies.

Included in the cost of selected purchased services for the repair and maintenance services of buildings and/or machinery are payments made for all maintenance and repair work on buildings and equipment. Payments made to other establishments of the same company and for repair and maintenance of any leased property also are included. Excluded from this item are extensive repairs or reconstruction that was capitalized, which is considered capital expenditures; costs incurred directly by the establishment in using its own work force to perform repairs and maintenance work; and repairs and maintenance provided by the building or machinery owner as part of the rental contract.



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Included in the cost of selected purchased services for communication is the actual expense incurred or payable during the year for any type of communication. Such types of communication include telephone, data transmission, telegraph, Internet, connectivity, FAX, telex, photo transmission, paging, cellular telephone, on-line access and related services, etc.

Included in the cost of selected purchased services for legal services are payments made to other companies for these services that were paid directly by the establishment. Excluded are the salaries paid to employees of the establishment for these services.

Included in the cost of selected accounting, auditing, and bookkeeping services are payments made to other companies for these services that were paid directly by the establishment. Excluded are the salaries paid to employees of this establishment for these services.

Included in the cost of selected advertising and promotional services are payments made to other companies for these services that were paid directly by the establishment. These include payments for printing, media coverage, and other services and materials. Excluded are the salaries paid to employees of this establishment for these services.

Included in the cost of selected expensed computer hardware and supplies and purchased computer services are actual expenses incurred or payable during the year for this item. Purchases for computer hardware and supplies, computer services (software, data transmission, processing services, Web design, etc.) are all included. Excluded are services provided by other establishments of the same company (such as a separate central data processing unit).

Included in the cost of selected purchased refuse removal services are payments made to other companies for these services that were paid directly by the establishment, including costs for hazardous waste removal or treatment. Excluded are all costs included in rental payments or as capital expenditures and the salaries paid to employees of the establishment for these services.

Included in the cost of selected purchased management consulting and administrative services are payments made to other companies for these services that were paid directly by the establishment. Excluded are the salaries paid to employees of this establishment for these services.

Included in the cost of selected purchased taxes and license fees are payments made to other companies for these services that were paid directly by the establishment, excluding income, sales, payroll, and excise taxes. Excluded are also the salaries paid to employees of this establishment for these services.

### **Response coverage ratio**

A response coverage ratio is a measure of the extent to which respondents report for an item. The estimate is made by calculating the ratio value of the weighted total employment data for all the ASM establishments that report the item to the weighted total employment data for all ASM establishments classified in an industry (reporters and nonreporters).

### **DEPRECIATION CHARGES FOR FIXED ASSETS**

This item includes depreciation and amortization charged during the year against assets. Depreciation charged against fixed assets acquired since the beginning of the year and against assets sold or retired during the year are components of this category. Respondents were requested to make certain that they did not report accumulated depreciation.

### **NUMBER OF EMPLOYEES**

This item includes all full-time and part-time employees on the payrolls of operating manufacturing establishments during any part of the pay period that included the 12th of the months specified on the report form. Included are employees on paid sick leave, paid holidays, and paid vacations; not included are proprietors and partners of unincorporated businesses.

These individuals comprise of all full-time and part-time employees who are on the payrolls of establishments who worked or received pay for any part of the pay period including the 12th of March, May, August, and November.

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The “all employees” number is the average number of production workers plus the number of other employees in mid-March. The number of production workers is the average for the payroll periods including the 12th of March, May, August, and November

### **Production Workers**

The “production workers” number includes workers (up through the line-supervisor level) engaged in fabricating, processing, assembling, inspecting, receiving, storing, handling, packing, warehousing, shipping (but not delivering), maintenance, repair, janitorial and guard services, product development, auxiliary production for plant’s own use (e.g., power plant), recordkeeping, and other services closely associated with these production operations at the establishment covered by the report. Employees above the working-supervisor level are excluded from this item.

### **All Other Employees**

The “other employees” covers nonproduction employees of the manufacturing establishment including those engaged in factory supervision above the line-supervisor level. It includes sales (including driver-salespersons), sales delivery (highway truck drivers and their helpers), advertising, credit, collection, installation and servicing of own products, clerical and routine office functions, executive, purchasing, financing, legal, personnel (including cafeteria, medical, etc.), professional, and technical employees. Also included are employees on the payroll of the manufacturing establishment engaged in the construction of major additions or alterations utilized as a separate work force.

### **TOTAL FRINGE BENEFITS**

This item is the employer’s costs for social security tax, unemployment tax, workmen’s compensation insurance, state disability insurance pension plans, stock purchase plans, union-negotiated benefits, life insurance premiums, and insurance premiums on hospital and medical plans for employees.

Fringe benefits are divided into legally required expenditures and payments for voluntary programs. The legally required portion consists primarily of federal old age and survivors’ insurance, unemployment compensation, and workers’ compensation. Payments for voluntary programs include all programs not specifically required by legislation, whether they were employer initiated or the result of collective bargaining. They include the employer portion of such plans as insurance premiums, premiums for supplemental accident and sickness insurance, pension plans, supplemental unemployment compensation, welfare plans, stock purchase plans on which the employer payment is not subject to withholding tax, and deferred profit-sharing plans. They exclude such items as company-operated cafeterias, in-plant medical services, free parking lots, discounts on employee purchases, and uniforms and work clothing for employees.

### **GROSS VALUE OF DEPRECIABLE ASSETS (ACQUISITION COSTS) AT BEGINNING OF YEAR (BOY) AND END OF YEAR (EOY)**

Total value of depreciable assets is collected on all census forms.

It shows the value of depreciable assets for the beginning of year (BOY) and end of year (EOY). The data encompass all fixed depreciable assets on the books of establishments. The values shown (book value) represent the actual cost of assets at the time they were acquired, including all costs incurred in making the assets usable (such as transportation and installation). Included are all buildings, structures, machinery, and equipment (production, office, and transportation equipment) for which depreciation reserves are maintained. Excluded are nondepreciable capital assets including inventories and intangible assets, such as timber and mineral rights.

The definition of fixed depreciable assets is consistent with the definition of capital expenditures. For example, expenditures include actual capital outlays during the year rather than the final value of equipment put in place and buildings completed during the year.

Accordingly, the value of assets at the end of the year includes the value of construction in progress.

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In addition, respondents were requested to make certain that assets at the beginning of the year plus capital expenditures, less retirements, equaled assets at the end of the year.

## **ESTABLISHMENT**

An establishment is a single physical location where business is conducted or where services or industrial operations are performed. Data in this sector includes those establishments where manufacturing is performed. A separate report was required for each manufacturing establishment (plant) with one employee or more that were in operation at any time during the year.

An establishment not in operation for any portion of the year was requested to return the report form with the proper notation in the "Operational Status" section of the form. In addition, the establishment was requested to report data on any employees, capital expenditures, inventories, or shipments from inventories during the year.

## **Company**

A company or ("enterprise") is comprised of all the establishments that operate under the ownership or control of a single organization. A company may be a business, service, or membership organization; consist of one or several establishments; and operate at one or several locations. It includes all subsidiary organizations, all establishments that are majority-owned by the company or any subsidiary, and all the establishments that can be directed or managed by the company or any subsidiary.

A company may have one or many establishments. Examples include product and service sales offices (retail and wholesale), industrial production plants, processing or assembly operations, mines or well sites, and support operations (such as an administrative office, warehouse, customer service center, or regional headquarters). Each establishment should receive, complete, and return a separate census form.

If the company operated at different physical locations, even if the individual locations were producing the same line of goods, a separate report was requested for each location. If the company operated in two or more distinct lines of manufacturing at the same location, a separate report was requested for each activity.

## **PAYROLL**

This item includes the gross earnings of all employees on the payrolls of operating manufacturing establishments paid in the calendar year. Respondents were told they could follow the definition of payrolls used for calculating the federal withholding tax. It includes all forms of compensation, such as salaries, wages, commissions, dismissal pay, bonuses, vacation and sick leave pay, and compensation in kind, prior to such deductions as employees' social security contributions, withholding taxes, group insurance, union dues, and savings bonds. The total includes salaries of officers of corporations; it excludes payments to proprietors or partners of unincorporated concerns. Also excluded are payments to members of Armed Forces and pensioners carried on the active payrolls of manufacturing establishments.

The census definition of payrolls is identical to that recommended to all federal statistical agencies by the Office of Management and Budget. It should be noted that this definition does not include employers' social security contributions or other nonpayroll labor costs, such as employees' pension plans, group insurance premiums, and workers' compensation.

The ASM provides estimates of employers' total supplemental labor costs (those required by federal and state laws and those incurred voluntarily or as part of collective bargaining agreements).

## **PRODUCT CODES AND CLASSES OF PRODUCTS**

NAICS United States industries are identified by a six-digit code. The longer code accommodates the large number of sectors and allows more flexibility in designing subsectors. Each product or service is assigned a ten-digit code. The product coding structure represents an extension by the Census Bureau of the six-digit industry classifications of the manufacturing and mining sectors. The classification system operates so that the industrial coverage is progressively narrower with the successive addition of digits.

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As in previous censuses, data were collected for most industries on the quantity and value of individual products shipped. Since the 1997 census programs, information is collected on the output of almost 10,000 individual product items.

In the manufacturing sector for 2002, there are 21 subsectors (three-digit NAICS), 86 industry groups (four-digit NAICS), 184 NAICS industries (five-digit NAICS) that are comparable with Canadian and Mexican classification, and 473 U.S. industries (six-digit NAICS). Product classes and products of the manufacturing industries have been assigned codes based on the industry from which they originate. There are 1,450 product classes (seven-digit codes), 5,674 census products, and an additional 3,746 ten-digit product codes. The ten-digit products are considered the primary products of the industry with the same first six digits.

The list of products for which separate information was collected was prepared after consultation with industry and government representatives.

Comparability with previous figures was given considerable weight in the selection of product categories, so that comparable 1992 information is presented for most products.

Typically, both quantity and value of shipments information were collected. However, if quantity was not significant or could not be reported by manufacturers, only value of shipments was collected.

Shipments include both commercial shipments and transfers of products to other plants of the same company. For industries in which a considerable portion of the total shipments is transferred to other plants of the same company, separate information on interplant transfers also was collected. Moreover, for products that are used to a large degree within the same establishment as materials or components in the fabrication of other products, total production and often consumption of the item within the plant (quantity produced and consumed) was collected. Typically, the information on production also was collected for products for which there are significant differences between total production and shipments in a given year because of wide fluctuations in finished goods inventories. Other measures of output of products with long production cycles were used as appropriate and feasible.

### **PRODUCTION-WORKER HOURS**

This item covers all hours worked or paid for at the manufacturing plant, including actual overtime hours (not straight-time equivalent hours). It excludes hours paid for vacations, holidays, or sick leave when the employee was not at the establishment.

### **QUANTITY OF ELECTRICITY PURCHASED FOR HEAT AND POWER**

Data on the cost of purchased electric energy were collected on all census forms. However, data on the quantity of purchased electric energy were collected only on the Annual Survey of Manufactures (ASM) form. In addition, information is collected on the quantity of electric energy generated by the establishment and the quantity of electric energy sold or transferred to other plants of the same company.

### **RENTAL PAYMENTS**

Total rental payments are collected on all census forms. However, the breakdown between rental payments for buildings and other structures and rental payments for machinery and equipment is collected only on the ASM forms. This item includes rental payments for the use of all items for which depreciation reserves would be maintained, if they were owned by the establishment, e.g., structures and buildings, and production, office, and transportation equipment. Excluded are royalties and other payments for the use of intangibles and depletable assets and land rents where separable.

When an establishment of a multiestablishment company was charged rent by another part of the same company for the use of assets owned by the company, it was instructed to exclude that cost from rental payments.

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However, the book value (original cost) of these company-owned assets was to be reported as assets of the establishment at the end of the year.

If there were assets at an establishment rented from another company and the rents were paid centrally by the head office of the establishment, the company was instructed to report these rental payments as if they were paid directly by the establishment.

### **RETIREMENTS OF DEPRECIABLE ASSETS**

Included in this item is the gross value of assets sold, retired, scrapped, destroyed, etc., during the calendar year. When a complete operation or establishment changed ownership, the respondent was instructed to report the value of the assets sold at the original cost as recorded in the books of the seller. The respondent also was requested to report retirements of equipment or structures owned by a parent company that the establishment was using as if it were a tenant.

### **CAPITAL EXPENDITURES FOR NEW AND USED PLANT AND EQUIPMENT**

Represents the total new and used capital expenditures reported by establishments in operation and any known plants under construction.

These data include expenditures for:

1. Permanent additions and major alterations to manufacturing and mining establishments.
2. New and used machinery and equipment used for replacement and additions to plant capacity, if they are of the type for which depreciation, depletion, or (for mining establishments) Office of Minerals Exploration accounts are ordinarily maintained. In addition, for mining establishments, these data include expenditures made during the year for development and exploration of mineral properties. For manufacturing establishments, these data are broken down into three types.
  - a. Automobiles, trucks, etc. for highway use. These include vehicles acquired under a lease-purchase agreement and excludes vehicles leased or normally designed to transport materials, property, or equipment on mining, construction, petroleum development, and similar projects. These vehicles are of such size or weight as to be normally restricted by state laws or regulations from operating on public highways. It also excludes purchases of vehicles that are purchased by a company for highway use.
  - b. Computers and peripheral data processing equipment. This item include all purchases of computers and related equipment.
  - c. All other expenditures for machinery and equipment excluding automobiles and computer equipment.

Capital expenditures include work done by contract, as well as by the establishment's own workforce.

These data exclude expenditures for land and mineral rights and cost of maintenance and repairs charged as current operating expenses.

### **VALUE ADDED**

This measure of manufacturing activity is derived by subtracting the cost of materials, supplies, containers, fuel, purchased electricity, and contract work from the value of shipments (products manufactured plus receipts for services rendered). The result of this calculation is adjusted by the addition of value added by merchandising operations (i.e., the difference between the sales value and the cost of merchandise sold without further manufacture, processing, or assembly) plus the net change in finished goods and work-in-process between the beginning- and end-of-year inventories.

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For those industries where value of production is collected instead of value of shipments, value added is adjusted only for the change in work-in-process inventories between the beginning and end of year. For those industries where value of work done is collected, the value added does not include an adjustment for the change in finished goods or work-in-process inventories.

“Value added” avoids the duplication in the figure for value of shipments that results from the use of products of some establishments as materials by others. Value added is considered to be the best value measure available for comparing the relative economic importance of manufacturing among industries and geographic areas.

### **VALUE OF SHIPMENTS**

This item covers the received or receivable net selling values, f.o.b. plant (exclusive of freight and taxes), of all products shipped, both primary and secondary, as well as all miscellaneous receipts, such as receipts for contract work performed for others, installation and repair, sales of scrap, and sales of products bought and sold without further processing. Included are all items made by or for the establishments from material owned by it, whether sold, transferred to other plants of the same company, or shipped on consignment. The net selling value of products made in one plant on a contract basis from materials owned by another was reported by the plant providing the materials.

In the case of multiunit companies, the manufacturer was requested to report the value of products transferred to other establishments of the same company at full economic or commercial value, including not only the direct cost of production but also a reasonable proportion of “all other costs” (including company overhead) and profit.

In addition to the value for NAICS defined products, aggregates of the following categories of miscellaneous receipts are reported as part of a total establishment’s value of product shipments: Reported contract work — receipts for work or services that a plant performed for others on their materials. Value of resales — sales of products brought and sold without further manufacture, processing, or assembly. Other miscellaneous receipts — such as repair work, installation, sales of scrap, etc.

Industry primary product value of shipments represents one of the three components of value of shipments. These components are: Primary products value of shipments. Secondary product value of shipments. Total miscellaneous receipts.

Primary product shipments is used in the calculations of industry specialization ratio and industry coverage ratio. The term “Value of primary products shipments made in this industry” is used in this publication and refers to the same data.

### **Duplication in cost of materials and value of shipment**

The aggregate of the cost of materials and value of shipments figures for industry groups and for all manufacturing industries includes large amounts of duplication since, the products of some industries are used as materials by others. This duplication results, in part, from the addition of related industries representing successive stages in the production of a finished manufactured product. Examples are the addition of flour mills to bakeries in the food group and the addition of pulp mills to paper mills in the paper and allied products group of industries.

Estimates of the overall extent of this duplication indicate that the value of manufactured products exclusive of such duplication (the value of finished manufactures) tends to approximate two-thirds of the total value of products reported in the annual survey.

Duplication of products within individual industries is significant within a number of industry groups, e.g., machinery and transportation industries. These industries frequently include complete machinery and their parts. In this case, the parts made for original equipment are materials consumed for assembly plants in the same industry.

Even when no significant amount of duplication is involved, value of shipments figures are deficient as measures of the relative economic importance of individual manufacturing industries or geographic areas because of the wide variation in ratio of materials, labor, and other processing costs of value of shipments, both among industries and within the same industry.

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Before 1962, cost of materials and value of shipments were not published for some industries that included considerable duplication. Since then, these data have been published for all industries at the U.S. level and beginning in 1964, for all geographic levels.

### **Specialization and coverage ratio**

These items are not collected on the report forms, but are derived from the data shown in Table 3. An establishment is classified in a particular industry, if its shipments of primary products of that industry exceed in value its shipments of the products of any other single industry.

An establishment's shipments include those products assigned to an industry (primary products), those considered primary to other industries (secondary products), and receipts for miscellaneous activities (merchandising, contract work, resales, etc.).

Specialization and coverage ratio have been developed to measure the relationship of primary product shipments to the data on shipments for the industry shown in Tables 1 through 5 and data on product shipments shown in Tables 6a and 6b.

Specialization ratio represents the ratio of primary product shipments to total product shipments (primary and secondary, excluding miscellaneous receipts) for the establishments classified in the industry.

Coverage ratio represents the ratio of primary products shipped by the establishments classified in the industry to the total shipments of such products that are shipped by all manufacturing establishments wherever classified.

## Appendix B. NAICS Codes, Titles, and Descriptions

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### **334412 BARE PRINTED CIRCUIT BOARD MANUFACTURING**

This U.S. industry comprises establishments primarily engaged in manufacturing bare (i.e., rigid or flexible) printed circuit boards without mounted electronic components. These establishments print, perforate, plate, screen, etch, or photoprint interconnecting pathways for electric current on laminates.



# Appendix C.

## Methodology

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### SOURCES OF THE DATA

The manufacturing sector includes approximately 350,000 establishments. This number includes those industries in the North American Industry Classification System (NAICS) definition of manufacturing. The amount of information requested from manufacturing establishments was dependent upon a number of factors. The more important considerations were the size of the company and whether it was included in the Annual Survey of Manufactures (ASM).

Establishments in the 2002 Economic Census are divided into those sent report forms and those not sent report forms. The coverage of and the method of obtaining census information from each are described below:

1. Establishments sent a report form:

- a. ASM sample establishments. This group accounts for approximately 15 percent of all manufacturing establishments. The ASM panel covers all the units of large manufacturing establishments, as well as a sample of the medium and smaller establishments. The probability of selection was proportionate to size. For more information, see the Description of the ASM Survey Sample.

In an economic census year, the ASM report form (MA-10000) replaces the first page of the regular census form for those establishments included in the ASM. In addition to information on employment, payroll, and other items normally requested on the regular census form, establishments in the ASM sample were requested to supply additional information on gross book value of assets and capital expenditures. ASM establishments were also requested to provide information on retirements, depreciation, rental payments, and supplemental labor costs. For establishments not included in the ASM, these additional items were estimated using relationships observed in the ASM establishment data. The census statistics for these variables are a sum of the ASM establishment data and the estimated data for non-ASM establishments. ASM establishments were also requested to provide information for selected purchased services. The census statistics for the purchased service items were derived solely from the ASM establishments. See Appendix A. Explanation of Terms, for an explanation of these items. The census part of the report form is 1 of 220 versions containing product, material, and special inquiries. The diversity of manufacturing activities necessitated the use of this many forms to canvass the 473 manufacturing industries. Each form was developed for a group of related industries.

Appearing on each form was a list of products primary to the group of related industries, as well as secondary products and miscellaneous services that establishments classified in these industries were likely to perform. Respondents were requested to identify the products, the value of each product, and, in certain cases, the quantity of the product shipped during the survey year. Space also was provided for the respondent to describe products not specifically identified on the form.

The report form also contained a materials-consumed inquiry, which varied from form to form depending on the industries being canvassed. The respondents were asked to review a list of materials generally used in their production processes. From this list, each establishment was requested to identify those materials consumed during the survey year, the cost of each, and, in certain cases, the quantity consumed. Once again, space was provided

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for the respondent to describe significant materials not listed on the form.

A wide variety of special inquiries were included to measure activities peculiar to a given industry, such as operations performed and equipment used.

- b. Large and medium establishments (non-ASM). Approximately 30 percent of all manufacturing establishments were included in this group. A variable cutoff, based on administrative-record payroll data and determined on an industry-by-industry basis, was used to select those establishments that were to receive 1 of the 220 economic census — manufacturing regular forms. The first page, requesting establishment data for items such as employment and payroll, was standard but did not contain the detailed statistics included on the ASM form. The product, material, and special inquiry sections supplied were based on the historical industry classification of the establishment.
- c. Small single-establishment companies (non-ASM). This group includes approximately 15 percent of all manufacturing establishments. For those industries where application of the variable cutoff for administrative-record cases resulted in a large number of small establishments being included in the mail canvass, an abbreviated “short form” was used. These establishments received 1 of the 31 versions of the short form, which requested summary product and material data and totals but no details on employment, payroll, cost of materials, inventories, and capital expenditures.

Use of the short form has no adverse effect on published totals for the industry statistics, because the same data were collected on the short form as on the long form. However, detailed information on products and materials consumed was not collected on the short form; thus, its use would increase the value of the “not specified by kind” (nsk) categories.

## 2. Establishments not sent a report form:

- a. Small single-establishment companies not sent a report form. Approximately 40 percent of the manufacturing establishments were small single-establishment companies that were excused from filing a census report. Selection of these establishments was based on two factors: annual payroll and the Census Bureau’s ability to assign the correct six-digit NAICS industry classification to the establishment. For each six-digit NAICS industry code, an annual payroll cutoff was determined. These cutoffs were derived so that the establishments with payroll less than the cutoff were expected to account for no more than 3 percent of the value of shipments for the industry. Generally, all single-establishment companies with less than 5 employees were excused, while all establishments with more than 20 employees were mailed forms. Establishments below the cutoff that could not be directly assigned a six-digit NAICS code were mailed a classification report that requested information for assigning NAICS industry codes. Establishments below the cutoff that could be directly assigned a six-digit NAICS code were excused from filing any report. For below cutoff establishments, information on the physical location, payroll, and receipts was obtained from the administrative records of other federal agencies under special arrangements that safeguarded their confidentiality.

Estimates of data for these small establishments were developed using industry averages in conjunction with the administrative information. The value of shipments and cost of materials were not distributed among specific products and materials for these establishments, but were included in the product and material “not specified by kind” (nsk) categories.

The industry classification codes included in the administrative-record files were assigned on the basis of brief descriptions of the general activity of the establishment. As a result, an indeterminate number of establishments were erroneously coded to a six-digit NAICS industry. This was especially true whenever there was a relatively fine line of demarcation between industries or between manufacturing and nonmanufacturing activity.

Sometimes the administrative-record cases had only two- or three-digit NAICS group classification codes available in the files. For manufacturing, these establishments were sent a

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separate classification form, which requested information on the products and services of the establishment. This form was used to code many of these establishments to the appropriate six-digit NAICS level. Establishments that did not return the classification form were coded later to those six-digit NAICS industries identified as “All other” industries within the given subsector.

As a result of these situations, a number of small establishments may have been misclassified by industry. However, such possible misclassification has no significant effect on the statistics, other than on the number of companies and establishments.

The total establishment count for individual industries should be viewed as an approximation rather than a precise measurement. The counts for establishments with 20 employees or more are far more reliable than the count of total number of establishments.

- b. All nonemployers, i.e., all firms subject to federal income tax, with no paid employees, during 2002 are excluded as in previous censuses. Data for nonemployers are not included in this report, but are released in the annual *Nonemployer Statistics* series.

The report forms used to collect information for establishments in this sector are available at [help.econ.census.gov/econhelp/resources/](http://help.econ.census.gov/econhelp/resources/).

A more detailed examination of census methodology is presented in the *History of the Economic Census* at [www.census.gov/econ/www/history.html](http://www.census.gov/econ/www/history.html).

## **INDUSTRY CLASSIFICATION OF ESTABLISHMENTS**

The classifications for all establishments covered in the 2002 Economic Census — Manufacturing are classified in 1 of 473 industries in accordance with the industry definitions in the *North American Industry Classification System (NAICS), United States, 2002* manual. There were no changes between the 2002 edition and the 1997 edition affecting this sector. When applicable, Appendix F of this report shows the product class and product comparability between the two systems for data in this report.

In the NAICS system, an industry is generally defined as a group of establishments that have similar production processes. To the extent practical, the system uses supply-based or production-oriented concepts in defining industries. The resulting group of establishments must be significant in terms of number, value added by manufacture, value of shipments, and number of employees.

The coding system works in such a way that the definitions progressively become narrower with successive additions of numerical digits. In the manufacturing sector for 2002, there are 21 subsectors (three-digit NAICS), 86 industry groups (four-digit NAICS), 184 NAICS industries (five-digit NAICS) that are comparable with Canadian and Mexican classification, and 473 U.S. industries (six-digit NAICS). Product classes and products of the manufacturing industries have been assigned codes based on the industry from which they originate. There are 1,450 product classes (seven-digit codes), 5,674 census products, and an additional 3,746 ten-digit product codes. The ten-digit products are considered the primary products of the industry with the same first six digits.

For the 2002 Economic Census — Manufacturing, all establishments were classified in particular industries based on the products they produced. If an establishment made products of more than one industry, it was classified in the industry with the largest product value. For 2002, there were no “resistance rules” or “frozen industries.”

In ASM years, establishments included in the ASM sample with certainty weights are reclassified by industry only if the change in the primary activity from the prior year is significant or if the change has occurred for 2 successive years. This procedure prevents reclassification when there are minor shifts in product mix.

In ASM years, establishments included in the ASM sample with noncertainty weight are not shifted from one industry classification to another. They are retained in the industry where they were classified in the base census year. However, in the following census year, these ASM plants are allowed to shift from one industry to another.

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The results of these rules covering the switching of plants from one industry classification to another are that some industries comprise different mixes of establishments in different survey years. Hence, comparisons between prior-year and current-year published totals, particularly at the six-digit NAICS level, should be viewed with caution. This is particularly true for the comparison between the data shown for a census year versus the data shown for the previous ASM year.

As previously noted, the small establishments that may have been misclassified by industry are usually administrative-record cases whose industry codes were assigned on the basis of incomplete descriptions of the general activity of the establishment. Such possible misclassifications have no significant effect on the statistics other than on the number of companies and establishments.

Establishments frequently make products classified both in their industry (primary products) and other industries (secondary products). Industry statistics (employment, payroll, value added by manufacture, value of shipments, etc.) reflect the activities of the establishments that may make both primary and secondary products. Product statistics, however, represent the output of all establishments without regard for the classification of the producing establishment. For this reason, when relating the industry statistics, especially the value of shipments, to the product statistics, the composition of the industry's output should be considered.

The extent to which industry and product statistics may be matched with each other is measured by the primary product specialization ratio and the coverage ratio. The primary product specialization ratio is the proportion of industry shipments accounted for by the primary products of establishments classified in the industry. The coverage ratio is the proportion of product shipments accounted for by establishments classified in the industry.

#### **ESTABLISHMENT BASIS OF REPORTING**

The 2002 Economic Census — Manufacturing is conducted on an establishment basis. A company operating at more than one location is required to file a separate report for each location or establishment. The ASM also is conducted on an establishment basis, but separate reports are filed for just those establishments selected in the sample. Companies engaged in distinctly different lines of activity at one location are requested to submit separate reports, if the plant records permit such a separation and if the activities are substantial in size.

In 2002, as in earlier years, a minimum size limit was set for inclusion of establishments in the census. All establishments employing one person or more at any time during the census year are included. The same size limitation has applied since 1947 in censuses and annual surveys of manufactures. In the 1939 and earlier censuses, establishments with less than \$5,000 value of products were excluded. The change in the minimum size limit in 1947 does not appreciably affect the historical comparability of the census figures, except for data on number of establishments for a few industries.

The 2002 Economic Census — Manufacturing excludes data for central administrative offices (CAOs). These would include separately operated administrative offices, warehouses, garages, and other auxiliary units that service manufacturing establishments of the same company. These data are published in a separate report series.

#### **DESCRIPTION OF THE ASM SURVEY SAMPLE**

The ASM sample is drawn for the second survey year after a census. The most recent sample was drawn for the 1999 survey year based on the 1997 Economic Census — Manufacturing. This sample will be in place through the 2003 ASM.

In 1997, there were approximately 370,000 individual manufacturing establishments. For sample efficiency and cost considerations, the establishments in the 1997 manufacturing population were partitioned into two components for developing estimates within the ASM. The details of each are described below:

1. Mail stratum. The mail stratum of the survey is comprised of larger single-location manufacturing companies and all manufacturing establishments of multiunit companies (companies

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that operate at more than one physical location). Approximately 200,000 of the 370,000 establishments in the 1997 census were assigned to the mail stratum. On an annual basis, the mail stratum is supplemented with larger, newly active single-location companies identified from a list provided by the Internal Revenue Service (IRS) and new manufacturing locations of multiunit companies identified from the Census Bureau's Company Organization Survey (COS).

For the 1999 survey, a new sample of approximately 58,000 individual establishments was selected from the mail stratum assembled from the 1997 census. Supplemental samples representing both 1998 and 1999 births (newly active establishments that were not included in the 1997 census) were also selected. Establishments selected for the sample are mailed an ASM survey questionnaire for each year through 2003.

The 1999-2003 ASM sample design is similar to the one used since 1984. Companies in the 1997 Economic Census — Manufacturing with manufacturing shipments of at least \$500 million were defined as company certainties. For these large companies, each manufacturing establishment is included in the mail sample. For the 1999-2003 sample, there are approximately 500 certainty companies collectively accounting for over 18,000 establishments.

For the remaining portion of the mail component of the survey, the establishment was defined as the sample unit. All establishments with 250 employees or more were defined as employment certainties. Across these arbitrary certainty classes, there were approximately 25,000 establishments included in the sample with certainty. Collectively, these certainty establishments accounted for approximately 80 percent of the total value of shipments in the 1997 Economic Census — Manufacturing.

Smaller establishments in the remaining portion of the mail stratum were sampled with probabilities ranging from .02 to 1.00. The initial probabilities of selection assigned to these establishments were proportionate to a measure-of-size determined for each establishment. The measure-of-size was a function of the establishment's 1997 industry classification and its 1997 product class data. For each product class (1,755) and six-digit industry (473), a desired reliability constraint was specified. Using a technique developed by Dr. James R. Chromy of the Research Triangle Institute, the initial establishment probabilities were optimized such that the expected sample satisfied all industry and product class reliability constraints, while the sample size was minimized. This technique reduces the likelihood of selecting nonrepresentative samples for individual product classes or industries.

This method of assigning probabilities based on product class shipments is motivated by the Census Bureau's primary desire to produce reliable estimates of both product class and industry shipments. The high correlation between shipments and employment, value-added, and other general statistics assures that these variables will also be well represented by the sample. The actual sample selection procedure uses an independent chance of selection method (Poisson sampling) that permits us to prevent small establishments from being selected in consecutive samples without introducing a bias into the survey estimates.

2. Nonmail stratum. The initial nonmail component of the survey was comprised of approximately 170,000 small, single-establishment companies that were tabulated as administrative records in the 1997 Economic Census — Manufacturing. The nonmail stratum is also supplemented annually using the list of newly active single-location companies provided by the Internal Revenue Service (IRS) and payroll cutoffs. Companies with payroll below the payroll cutoff are added to the nonmail stratum. For this portion of the population, sampling is not used. The data for this group are estimated based on selected information obtained annually from the administrative records of the IRS and Social Security Administration (SSA). This administrative information, which includes payroll, total employment, industry classification, and physical location, is obtained under conditions which safeguard the confidentiality of both tax and census records.

## **RELIABILITY OF DATA**

All data compiled in the economic census are subject to nonsampling errors. Nonsampling errors can be attributed to many sources during the development or execution of the census. The following are two ways that further explain this method: ASM Estimating Procedure. Most of the ASM

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estimates derived for the mail stratum are computed using a difference estimator. At the establishment level, there is a strong correlation between the current-year data values and the corresponding 1997 (base) data values. Therefore, within the mailed stratum, for each item at each level of aggregation, an estimate of the “difference” between the current year and the base year is computed from sample cases and added to the corresponding base-year values. For the 1998-2002 ASM estimates, the 1997 Economic Census — Manufacturing values serve as the base year. For the 2003 ASM, the base will be updated to be the 2002 Economic Census — Manufacturing.

Due to the positive year-to-year correlation, estimates derived using this methodology are generally more reliable than comparable estimates developed from the current sample data alone. Estimates for the capital expenditures variables are not generated using the difference estimator because the year-to-year correlations are considerably weaker. The standard linear estimator is used for these variables.

For the nonmail stratum, estimates for payroll and employment are directly tabulated from the administrative-record data provided by IRS and SSA. Estimates of data other than payroll and employment are developed from industry averages. Although the nonmail stratum contained approximately 170,000 individual establishments in 1999, it accounts for less than 2 percent of the estimate for total value of shipments at the total manufacturing level.

Corresponding estimates for the mail and nonmail components are combined to produce the estimates included in this publication. ASM Data Qualifications. The estimates developed from the sample are apt to differ somewhat from the results of a survey covering all companies in the sample lists, but otherwise conducted under essentially the same conditions as the actual sample survey. The estimates of the magnitude of the sampling errors (the difference between the estimates obtained and the results theoretically obtained from a comparable, complete-coverage survey) are provided by the standard errors of estimates.

The particular sample selected for the ASM is one of many similar probability samples that, by chance, might have been selected under the same specifications. Each of the possible samples would yield somewhat different sets of results, and the standard errors are measures of the variation of all the possible sample estimates around the theoretically comparable, complete-coverage values.

Estimates of the standard errors have been computed from the sample data for selected ASM statistics in this report. They are represented in the form of relative standard errors (the standard errors divided by the estimated values to which they refer).

In conjunction with its associated estimate, the relative standard error may be used to define confidence intervals (ranges that would include the comparable, complete-coverage value for specified percentages of all the possible samples).

The complete-coverage value would be included in the range:

- From one standard error below to one standard error above the derived estimate for about two-thirds of all possible samples.
- From two standard errors below to two standard errors above the derived estimate for about 19 out of 20 of all possible samples.
- From three standard errors below to three standard errors above the derived estimate for nearly all samples.

An inference that the comparable, complete-survey result would be within the indicated ranges would be correct in approximately the relative frequencies shown. Those proportions, therefore, may be interpreted as defining the confidence that the estimates from a particular sample would differ from complete-coverage results by as much as one, two, or three standard errors, respectively.



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For example, suppose an estimated total is shown at 50,000 with an associated relative standard error of 2 percent, that is, a standard error of 1,000 (2 percent of 50,000). There is approximately 67 percent confidence that the interval 49,000 to 51,000 includes the complete-coverage total, about 95 percent confidence that the interval 48,000 to 52,000 includes the complete-coverage total, and almost certain confidence that the interval 47,000 to 53,000 includes the complete-coverage total.

In addition to the sample errors, the estimates are subject to various response and operational errors: errors of collection, reporting, coding, transcription, imputation for nonresponse, etc. These operational errors also would occur if a complete canvass were to be conducted under the same conditions as the survey. Explicit measures of their effects generally are not available. However, it is believed that most of the important operational errors were detected and corrected during the Census Bureau's review of the data for reasonableness and consistency. The small operational errors usually remain. To some extent, they are compensating in the aggregated totals shown. When important operational errors were detected too late to correct the estimates, the data were suppressed or were specifically qualified in the tables.

As derived, the estimated standard errors included part of the effect of the operational errors. The total errors, which depend upon the joint effect of the sampling and operational errors, are usually of the order of size indicated by the standard error, or moderately higher. However, for particular estimates, the total error may considerably exceed the standard errors shown. Any figures shown in the tables in this publication having an associated standard error exceeding 15 percent may be combined with higher level totals, creating a broader aggregate, which then may be of acceptable reliability.

#### **DUPLICATION IN COST OF MATERIALS AND VALUE OF SHIPMENTS**

Data for cost of materials and value of shipments include varying amounts of duplication, especially at higher levels of aggregation. This is because the products of one establishment may be the materials of another. The value added statistics avoid this duplication and are, for most purposes, the best measure for comparing the relative economic importance of industries and geographic areas.

#### **VALUE OF INDUSTRY SHIPMENTS COMPARED WITH VALUE OF PRODUCT SHIPMENTS**

The 2002 Economic Census — Manufacturing shows value of shipments data for industries and products. In the industry statistics tables and files, these data represent the total value of shipments of all establishments classified in a particular industry. The data include the shipments of the products classified in the industry (primary to the industry), products classified in other industries (secondary to the industry), and miscellaneous receipts (repair work, sale of scrap, research and development, installation receipts, and resales). Value of product shipments shown in the products statistics tables and files represent the total value of all products shipped that are classified as primary to an industry regardless of the classification of the producing establishment.

#### **DISCLOSURE**

In accordance with federal law governing census reports (Title 13 of the United States Code), no data are published that would disclose the operations of an individual establishment or company. However, the number of establishments in a specific industry or geographic area is not considered a disclosure; therefore, this information may be released even though other information is withheld. Techniques employed to limit disclosure are discussed at [www.census.gov/epcd/ec02/disclosure.htm](http://www.census.gov/epcd/ec02/disclosure.htm).

The disclosure analysis for the industry statistics files is based on the total value of shipments. When the total value of shipments cannot be shown without disclosing information for individual companies, the complete line is suppressed except for capital expenditures. Nonetheless, the suppressed data are included in higher-level totals. A separate disclosure analysis is performed for capital expenditures, which can be suppressed even though value of shipments data are published.

# Appendix D. Geographic Notes

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Not applicable for this report.



# Appendix E. Metropolitan Areas and Micropolitan Statistical Areas

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Not applicable for this report.

# Appendix F. Comparability of Product Classes and Product Codes: 2002 to 1997

2002 published	2002 collected	1997 published	2002 published	2002 collected	1997 published	2002 published	2002 collected	1997 published
3341111	3341111	3341111	3343105 pt.	3343103	3343103	3344191	3344191	3344191
334111100	334111100	334111000	3343105 pt.	334419E pt.	334419D pt	3344191100	3344191100	3344191000
3341117	3341117	3341117	3343105100 pt	3343103100	3343103000	3344194	3344194	3344194
3341117100	3341117100	3341117000	3343105100 pt	334419E101	334419D101	3344194100	3344194100	3344194000
334111D	334111D	334111D	334310W pt.	334310W	334310W	3344197	3344197	3344197
334111D100	334111D100	334111D000	334310W pt.	334419W pt.	334419W pt	3344197100	3344197100	3344197000
334111W	334111W	334111W	334310WYWW pt.	334310WYWW	334310WYWW	334419A	3342207	3342207
334111WYWW	334111WYWW	334111WYWW	334310WYWW pt.	334419WYWW pt.	334419WYWW pt	334419A100	3342207100	3342207000
334111WYWY	334111WYWY	334111WYWY	334310WYWY pt	334310WYWY	334310WYWY	334419E pt	3342202 pt	3342203 pt
3341121	3341121	3341121	334310WYWY pt	334419WYWY pt.	334419WYWY pt	334419E pt	3342202 pt	334419D pt
3341121100	3341121100	3341121000	3344111	3344111	3344111	334419E100 pt	3342202100	3342203000 pt
3341124	3341124	3341124	3344111100	3344111100	3344111000	334419E100 pt	33419E110	334419D106 pt
3341124100	3341124100	3341124000	3344114	3344114	3344114	334419E100 pt	334419EYVW	334419DYVW
334112W	334112W	334112W	3344114100	3344114100	3344114000	334419W pt.	334220W pt	334220W pt
334112WYWW	334112WYWW	334112WYWW	3344117	3344117	3344117	334419W pt.	334220W pt	334220W pt
334112WYWY	334112WYWY	334112WYWY	3344117100	3344117100	3344117000	334419WYWW pt.	334220WYWW pt.	334220WYWW pt
3341131	3341131	3341131	334411W	334411W	334411W	334419WYWW pt.	334220WYWW pt.	334220WYWW pt
3341131100	3341131100	3341131000	334411WYWW	334411WYWW	334411WYWW	334419WYWW pt.	334419WYWW pt.	334419WYWW pt
3341134	3341134	3341134	334411WYWY	334411WYWY	334411WYWY	334419WYWY pt.	334419WYWY pt.	334419WYWY pt
3341134100	3341134100	3341134000	3344120	3344120	3344120	334419WYWY pt.	334419WYWY pt.	334419WYWY pt
334113W	334113W	334113W	3344120100	3344120100	3344120000	3345101	3345101	3345101
334113WYWW	334113WYWW	334113WYWW	3344120YWW	3344120YWW	3344120YWW	3345101100	3345101100	3345101000
334113WYWY	334113WYWY	334113WYWY	3344120YWY	3344120YWY	3344120YWY	3345103	3345103	3345103
3341191	3341191	3341191	3344131	3344131	3344131	3345103100	3345103100	3345103100
3341191100	3341191100	3341191000	3344131100	3344131100	3344131000	334510W	334510W	334510W
3341194	3341194	3341194	3344134	3344134	3344134	334510WYWW	334510WYWW	334510WYWW
3341194100	3341194100	3341194000	3344134100	3344134100	3344134000	334510WYWY	334510WYWY	334510WYWY
3341197	3341197	3341197	3344137	3344137	3344137	3345111	3345111	3345111
3341197100	3341197100	3341197000	3344137100	3344137100	3344137000	3345111100	3345111100	3345111000
334119D	334119D	334119D	334413A	334413A	334413A	3345113	3345113	3345113
334119D100	334119D100	334119D000	334413A100	334413A100	334413A000	3345113100	3345113100	3345113000
334119W	334119W	334119W	334413W	334413W	334413W	334511W	334511W	334511W
334119WYWW	334119WYWW	334119WYWW	334413WYWW	334413WYWW	334413WYWW	334511WYWW	334511WYWW	334511WYWW
334119WYWY	334119WYWY	334119WYWY	334413WYWY	334413WYWY	334413WYWY	334511WYWY	334511WYWY	334511WYWY
3342101	3342101	3342101	3344140	3344140	3344140	3345120	3345120	3345120
3342101100	3342101100	3342101000	3344140100	3344140100	3344140000	3345120100	3345120100	3345120000
3342104	3342104	3342104	3344140YWW	3344140YWW	3344140YWW	3345120YWW	3345120YWW	3345120YWW
3342104100	3342104100	3342104000	3344140YWY	3344140YWY	3344140YWY	3345120YWY	3345120YWY	3345120YWY
3342107	3342107	3342107	3344150	3344150	3344150	3345130	3345130	3345130
3342107100	3342107100	3342107000	3344150100	3344150100	3344150000	3345130100	3345130100	3345130000
334210W	334210W	334210W	3344150YWW	3344150YWW	3344150YWW	3345130YWW	3345130YWW	3345130YWW
334210WYWW	334210WYWW	334210WYWW	3344150YWY	3344150YWY	3344150YWY	3345130YWY	3345130YWY	3345130YWY
334210WYWY	334210WYWY	334210WYWY	3344160	3344160	3344160	3345141	3345141	3345141
3342201	3342201	3342201	3344160100	3344160100	3344160000	3345141100	3345141100	3345141000
3342201100	3342201100	3342201000	3344160YWW	3344160YWW	3344160YWW	3345143	3345143	3345143
3342202 pt.	3342202 pt.	3342203 pt	3344160YWY	3344160YWY	3344160YWY	3345143100	3345143100	3345143000
3342202 pt.	334419E pt.	334419D pt	3344171	3344171	3344171	3345145	3345145	3345145
3342202100 pt	3342202110	3342203000 pt	3344171100	3344171100	3344171000	3345145100	3345145100	3345145000
3342202100 pt	3342202YWV	3342203000 pt	3344174	3344174	3344174000	334514W	334514W	334514W
3342202100 pt	334419E120	334419D106 pt	3344177	3344177	3344177	334514WYWW	334514WYWW	334514WYWW
334220W pt.	334220W pt.	334220W pt	3344177100	3344177100	3344177000	334514WYWY	334514WYWY	334514WYWY
334220W pt.	334419W pt.	334419W pt	334417A	334417A	334417A	3345151	3345151	3345151
334220WYWW pt.	334220WYWW pt.	334220WYWW pt	334417A100	334417A100	334417A000	3345151100	3345151100	3345151000
334220WYWW pt.	334419WYWW pt.	334419WYWW pt	334417D	334417D	334417D	3345153	3345153	3345153
334220WYWY pt.	334220WYWY pt.	334220WYWY pt	334417D100	334417D100	334417D000	3345153100	3345153100	3345153000
334220WYWY pt.	334419WYWY pt.	334419WYWY pt	334417W	334417W	334417W	3345155	3345155	3345155
3342901	3342901	3342901	334417WYWW	334417WYWW	334417WYWW	3345155100	3345155100	3345155000
3342901100	3342901100	3342901000	334417WYWY	334417WYWY	334417WYWY	334515W	334515W	334515W
3342902	3342902	3342902	3344184	3344184	3344184	334515WYWW	334515WYWW	334515WYWW
3342902100	3342902100	3342902000	3344184100	3344184100	3344184000	334515WYWY	334515WYWY	334515WYWY
3342903	3342903	3342903	334418B pt	334418A	334418A	3345160	3345160	3345160
3342903100	3342903100	3342903000	334418B pt.	334419E pt.	334419D pt	3345160100	3345160100	3345160000
334290W	334290W	334290W	334418B100 pt	334418A100	334418A000	3345160YWW	3345160YWW	3345160YWW
334290WYWW	334290WYWW	334290WYWW	334418B100 pt	334419E130	334419D106 pt	3345160YWY	3345160YWY	3345160YWY
334290WYWY	334290WYWY	334290WYWY	334418W pt.	334418W	334418W	3345170	3345170	3345170
3343101	3343101	3343101	334418W pt.	334418W	334418W	3345170100	3345170100	3345170000
3343101100	3343101100	3343101000	334418WYWW pt.	334418WYWW	334418WYWW	3345170YWW	3345170YWW	3345170YWW
3343102	3343102	3343102	334418WYWW pt.	334418WYWW	334418WYWW	3345170YWY	3345170YWY	3345170YWY
3343102100	3343102100	3343102000	334418WYWW pt.	334418WYWW	334418WYWW	3345182 pt.	3345181	3345181
3343104	3343104	3343104	334418WYWW pt.	334418WYWW	334418WYWW			
3343104100	3343104100	3343104000	334418WYWY pt.	334418WYWY	334418WYWY			

2002 published	2002 collected	1997 published	2002 published	2002 collected	1997 published	2002 published	2002 collected	1997 published
3345182 pt.....	3399132 pt.....	3399131 pt	334518WYWW pt...	334518WYWW ...	334518WYWW	334519W pt.....	334519W pt.....	334519W pt
3345182101 .....	3345181101.....	3345181101	334518WYWW pt...	334519WYWW pt..	334519WYWW pt	334519WYWW pt...	333999WYWW pt..	333999WYWW pt
3345182106 .....	3345181106.....	3345181106	334518WYWW pt...	339913WYWW pt..	339913WYWW pt	334519WYWW pt...	334519WYWW pt..	334519WYWW pt
3345182108 .....	3399132111.....	3399131100 pt	334518WYWY pt...	334518WYWY .....	334518WYWY	334519WYWY pt...	333999WYWY pt...	333999WYWY pt
3345182YVV pt....	3345181YWV.....	3345181YWV	334518WYWY pt...	334519WYWY pt...	334519WYWY pt	334519WYWY pt...	334519WYWY pt...	334519WYWY pt
3345182YVV pt....	3399132YVV pt...	3399131100 pt	334518WYWY pt...	339913WYWY pt...	339913WYWY pt	3346110 .....	3346110 .....	3346110
3345184 pt.....	3345183 .....	3345183	3345192 .....	3345191 pt.....	3345191 pt	33461101000 .....	33461101000 .....	3346110000
3345184 pt.....	3345191 pt.....	3345191 pt	3345192100 pt .....	3345191110 .....	3345191000 pt	3346110YWW .....	3346110YWW .....	3346110YWW
3345184101 .....	3345183101.....	3345183101	3345192100 pt .....	3345191YWV pt...	3345191000 pt	3346110YWY .....	3346110YWY .....	3346110YWY
3345184106 .....	3345183106.....	3345183106	3345194 pt.....	3339998 pt .....	3339998 pt	3346120 .....	3346120 .....	3346120
3345184111 .....	3345183111.....	3345183111	3345194 pt.....	3339998 pt .....	3339998 pt	3346120101 .....	3346120101 .....	3346120101
3345184116 .....	3345183116.....	3345183116	3345194 pt.....	3345193 .....	3345193	3346120201 .....	3346120201 .....	3346120201
3345184121 .....	3345183121.....	3345183121	3345194100 pt .....	3339998992 .....	3339998995 pt	3346120301 .....	3346120301 .....	3346120301
3345184126 .....	3345183126.....	3345183126	3345194100 pt .....	3339998YWV pt...	3339998YWV pt	3346120303 .....	3346120303 .....	3346120303
3345184131 .....	3345183131.....	3345183131	3345194100 pt .....	3339998YWV pt...	3339998YWV pt	3346120501 .....	3346120501 .....	3346120501
3345184136 .....	3345183136.....	3345183136	3345194100 pt .....	3345193100 .....	3345193000	3346120504 .....	3346120504 .....	3346120504
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3345184146 .....	3345183146.....	3345183146	3345195 .....	3345195 .....	3345195	3346120511 .....	3346120511 .....	3346120511
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3345184151 .....	3345183151.....	3345183151	3345197 .....	3345197 .....	3345197	3346120YWW .....	3346120YWW .....	3346120YWW
3345184YVV pt....	3345183YWV.....	3345183YWV	3345197100 .....	3345197100 .....	3345197000	3346120YWY .....	3346120YWY .....	3346120YWY
3345184YVV pt....	3345191YWV pt...	3345191000 pt	3345199 .....	3345199 .....	3345199	3346130 .....	3346130 .....	3346130
334518W pt.....	334518W .....	334518W	3345199100 .....	3345199100 .....	3345199000	3346130110 .....	3346130110 .....	3346130110
334518W pt.....	334519W pt.....	334519W pt	3345199 .....	3345199 .....	3345199	3346130410 .....	3346130410 .....	3346130410
334518W pt.....	339913W pt.....	339913W pt	3345199100 .....	3345199100 .....	3345199000	3346130610 .....	3346130610 .....	3346130610
334518W pt.....	339913W pt.....	339913W pt	334519W pt.....	333999W pt .....	333999W pt	3346130YWW .....	3346130YWW .....	3346130YWW
			334519W pt.....	333999W pt .....	333999W pt	3346130YWY .....	3346130YWY .....	3346130YWY

