

# Product Profile: CRTs— Televisions

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## **Summary**

Cathode ray tubes (CRTs), including televisions, each contain from 3 to 8 lbs of lead, plus mercury, cadmium, and phosphorous. About one-third of all waste electrical and electronic equipment is from CRTs, yet they represent as much as 80% of the toxic metals in discarded electronics.

Except for the largest TVs, which are expensive to ship, most TVs are manufactured in Asia. Based on available data, annual TV shipments to Oregon are estimated to be more than 300,000. The existing stockpile of TVs is estimated to exceed 2.5 million. It is not known how many TVs are disposed in Oregon. National figures for television disposal are not collected. In Oregon's waste composition studies, TVs are included in Brown Goods. No data on the proportion of TVs in Brown Goods is available. It is expected, however, that at a minimum TV disposal exceeds 3,600 tons per year.

According to a major study of electronics recycling, only 29,000 TVs were recycled in the entire nation in 1998. The consultant team identified only one Oregon facility that will accept televisions for recycling—**Earth Protection Services**. This program began January 1, 2001, but has not received any televisions yet. Donation opportunities exist for working models through Goodwill Industries, Salvation Army, and St. Vincent DePaul.

# Introduction

The goal of this project was to collect data that would inform state decision-makers about the impacts and amount of specific products of interest on the state's environment in order to assist in the development of waste management policies to address these products.

The specific project objectives include:

- Collect specific information about the manufacture, distribution, use, and end-of-life management in Oregon of the specified products.
- Document information about the major companies involved in each stage of the product life cycle.
- Quantify the flow of each product at different stages in their life-cycle in Oregon.
- If possible, document the impact of current product life cycles on the environment in Oregon.

Several elements make cathode ray tubes (CRTs) a solid waste concern. A major component of CRTs is leaded glass, plus mercury, cadmium, and phosphorous. The glass in CRTs contains from 3 to 8 lbs of lead—as much as 25% of the total weight. The Massachusetts Department of Environmental Protection reports that about one-third of all waste electrical and electronic equipment is from CRTs, yet they represent as much as 80% of the toxic metals in discarded electronics. This explains why environmental management agencies have put special emphasis on recovery and recycling for CRTs.

Two of the major uses for CRTs are computer monitors and televisions. These two products occupy significant places in American homes and businesses. Televisions have been in major use for five decades, and sales of TVs throughout this period have increased. Computer monitor sales don't parallel computers exactly, but they have also increased rapidly during the past decade. An important issue in management of older "waste" monitors and TVs is the tendency of people to keep older units in storage (e.g., basements, attics, etc.) for extended periods. A related concern is that as television technology evolves from analog to digital high-definition television (HDTV) formats that vast numbers of older, stored analog sets will suddenly be disposed into the municipal solid waste (MSW) stream.

The consultant team's research about CRTs involved several strategies. The team investigated product and market information from recent industry and government resources. Numerous reports about computer waste and recycling were researched. Direct contact and interviews were conducted to get a better understanding of the industry and the flow of product into the state. The consultants sought information about the volumes of product flow from industry sources. The interview process worked most effectively to get information about end-of-life management practices. Specific Oregon sales data was not found from any sufficient number of businesses to be relevant.

As shown in the sections that follow, the consultant used national market data to establish estimates of the volumes of CRTs entering Oregon. Estimates of the amounts of computer waste (computers, monitors, and peripherals) generated and disposed have been established from published data and from waste composition studies completed by Oregon DEQ. The most recent waste data is from 1998. The consultant team investigated the wide array of management options for CRT waste.

Finally, the team prepared an industry profile that details the national and Oregon state companies involved in the manufacture, distribution, and sale of CRTs. The industry profile is summarized in a series of tables and in accompanying appendices.

The same problems that the consultant team found in researching CPUs—confusion about definitions of components and products and the worldwide complexity of the electronics industries—affected the research objectives regarding CRTs.

## Product flow

According to the Microelectronics and Computer Technology Corporation (MCC), there are three groups of electronic displays used in the consumer realm. “The largest displays (>40 inches) are generally in projection format, and thus consume relatively small material volumes; they are also produced in relatively small unit volumes. The smallest displays (<5 inches) are produced in large volumes (over 1.6 billion units in 1998), but tend to be part of larger systems (e.g., appliances, stereos) and so are a relatively small part of the overall material volume. It is in the middle sizes (5 to 40 inches) that the display material volume is a large fraction of the system, and unit volumes are significant.” These are the TVs and computer monitors.

According to the Census Bureau, 98% of all U.S. households (97 million households) have at least one TV; and more than a third have two or three TVs. Stanford Resources estimates that sales of TVs will reach nearly 28 million in 2001. The table that follows shows the estimated shipments of both direct view and projection TVs in the U.S. Note: each projection TV uses 3 CRTs

**TABLE CRT 4: U.S. CRT TV Shipments (millions of units)**

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Direct V	24.1	24.5	24.6	23.6	23.7	24.7	25.9	26.4	25.9	26.3
Projection	0.6	0.6	0.9	1.0	1.0	1.1	1.2	1.3	1.4	1.5

Source: Stanford Resources, Inc., *Television Systems*, 1998 (figures for 1999-2003 are forecasts).

CRT Table 5 applies Oregon population data to the U.S. shipments to estimate the number of CRT TVs shipped to Oregon.

**TABLE CRT 5: Oregon CRT TV Shipments (thousands of units)**

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Direct V	289	294	295	283	284	296	311	317	311	316
Projection	7.2	7.2	10.8	12.0	12.0	13.2	14.4	15.6	16.8	18.0

The stockpile of televisions in Oregon is likely very large. According to the Census Bureau, the number of Oregon households in 1990 equaled 1,105,362. A recent survey of household appliance ownership by homeowners in the United Kingdom found there were 2,382 televisions for every 1,000 UK households. Using this data, Oregonians would have a “stockpile” of about 2,633,000 televisions in their homes. This would not account for TVs in use in businesses. Hotels and motels and hospitals are major users of televisions.

From another perspective, the average total lifespan of CRT TVs is estimated to be 6 to 7 years. Using the data about shipments from the past decade, the potential stockpile of direct view CRT TVs in Oregon could be 2,052,000 units, and of projection CRT TVs could be 76,800 units. It appears clear that the stockpile of televisions well exceeds 2 million units.

Waste generation estimates for TVs are not well established. Some years ago, the Microelectronics and Computer Technology Corp., a trade research group, estimated that 300,000 tons per year of computers were disposed annually in the U.S., with “approximately the same amount of TVs.” On a per capita basis, using these estimates, Oregon’s generation of waste computers would be 3,600 tons. As reported earlier, however, current estimates of the rapidly increasing generation of computer and monitor waste in Oregon are reaching 10,000 to 18,000 tons per year. Massachusetts DEP predicts that television discards may increase by four times as the advent of HDTV formats takes hold in the marketplace.

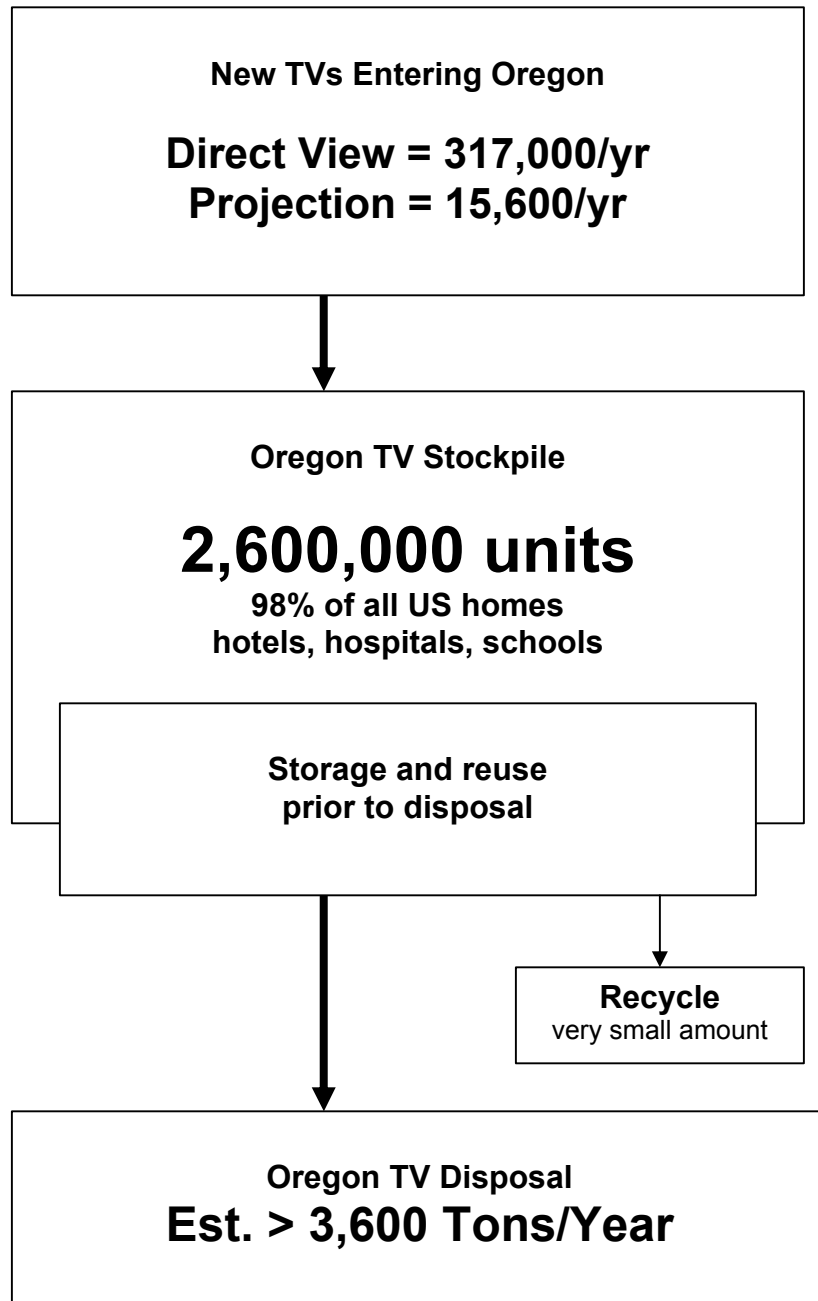
Televisions are included in the “Brown Goods” category in Oregon’s waste composition analysis. Brown Goods represented 0.30 to 0.62 percent of the waste stream (at the 90% confidence level). In 1998, Brown Goods would represent from 8,100 to 16,740 tons of waste. It is not known how much of that could be from televisions.

Few TVs are recovered for recycling. The Baseline Report indicates that in 1998, only 29,000 televisions were recycled. Compared with the number of sets shipped that same year, this category of electronic equipment has the largest discrepancy between shipments and recycling. “This discrepancy likely results from the long lifespan of televisions, the

lack of information available to consumers about recycling televisions, and the very low value of materials received from recycled CRT TVs.”

CRT Figure 2, on the following page, provides a simple diagram of the flow of television CRT products in the state, beginning with manufacturing, then through the wholesale and retail distribution chain to residents and businesses. The major end-of-life management methods are shown as well.

**CRT FIGURE 2: Estimated Television Flows in Oregon**



# End-of-life management

The consultant team identified one facility in the state of Oregon that will accept televisions for recycling—**Earth Protection Services** in Lake Oswego. They charge a weight-based fee for shipping and handling. The collected material is shipped to their material handling facility in Phoenix, then to another processor in the Phoenix area. This program began January 1, 2001, but has not received any televisions yet. Donation opportunities exist for working models through Goodwill Industries, Salvation Army, and St. Vincent DePaul.

Waste Management is planning to expand their E-Scrap system in the Portland area. This service of their Asset Recovery Group accepts televisions as well as other electronic equipment and has been implemented in other places throughout the country. Waste Management has seven processors for E-Scrap recovery nationwide.

Television repair shops in Oregon were interviewed to determine individual handling practices. These professionals report that most lower-cost electronic equipment, including many smaller televisions and VCRs, are not taken to repair shops. Because the repair costs can quickly equal the cost of a new unit, owners tend to treat these items as disposable. The majority of shop owners interviewed landfilled their material. One shop in the sampling donates some televisions to an entrepreneur who takes them to Mexico for repair. These sets are reportedly brought back to the U.S. for resale.

## Industry profile

### CRT Manufacturing

The majority of CRT display/monitors and small TV CRTs (less than 19 inches) manufacturing takes place outside of the United States. Due to the high cost to transport heavy displays, some 19-inch or larger TV CRTs are made in the U.S. According to a 1997 U.S. Census Bureau Report, electron tube manufacturing occurs in California, Florida, Massachusetts, New Jersey, New York, Ohio and Pennsylvania.

Data for 1997 show that Asia (excluding Japan) produced 54 percent of all color TVs and 79 percent of all CRT monitors. Taiwan has the highest concentration of CRT manufacturers, accounting for 33.6 percent of total world production in 1996. Japan supplies 10 – 15 percent of CRTs produced worldwide, primarily 17 inch and larger. Other major sites for CRT monitor production include Korea and China.

Table CRT 6 shows production figures per region for 1997 and projections for 1998 and 2000. In 1997, the United States accounted for 1.9% of CRT production. Microelectronics and Computer Technology Corporation (MCC) projected that in the year 2,000 the U.S. would increase to 2.5% of the total market.

According to the U.S. Census Bureau approximately 3,000,000 CRTs were manufactured in 1999 in the U.S. which is higher than 2000 projections shown in table CRT 6. Of those 3,000,000 CRTs manufactured in the U.S., about 850,000 were exported and an additional 38,000,000 were imported for consumption.

**TABLE CRT 6: Color CRT Monitor Production by Region (in thousand units)**

<b>Location</b>	<b>1997</b>	<b>1998*</b>	<b>2000*</b>
Europe	4,800	5,300	6,000
North America	1,500	1,800	2,400
Asia	60,000	65,000	75,000
Japan	8,000	9,000	10,000
So-Central America	1,900	2,500	3,200
<i>Total</i>	<i>76,200</i>	<i>83,600</i>	<i>96,600</i>

Note: \* are projected figures

CRT includes both computer CRTs and Television CRTs

**Source:** The Future of Liquid Crystal and Related Display Materials, Fuji Chimera Research, 1997 as shown in *Computer Display Industry and Technology Profile* by Microelectronics and Computer Technology Corporation (MCC) and EPA

CRT monitors are distributed by manufacturers through many routes. They may be sold under the manufacturer's name through retail stores, original equipment manufacturers (OEMs) or other system retailers, such as Compaq. The following manufacturers and retailers are major contributors to CRT production: Acer, Apple, Compaq, CTX, Dell, Digital, Eizo, Hitachi, Hewlett Packard, IBM, Iiyama, LG, MAG, Mitsubishi, NEC, Nokia, Panasonic, Samsung, Sharp, Siemens Nixxdorf, Sony, Toshiba and Viewsonic.

Table CRT 7 shows United States market share per CRT monitor brand name for 1997. Some companies are under-represented due to product end names (i.e. Sony monitors are manufactured for Dell, but called Dell monitors). Table CRT 8 shows the 1996 industry market share for main color CRT monitor-tube manufacturers.

**TABLE CRT 7: U.S. Market Share for CRTs by Top Brand Names**

<b>Company</b>	<b>Market Share</b>
Compaq	10-12%
Dell	8-10%
Packard Bell	6-8%
Gateway 2000	6-8%
IBM	4-6%
Viewsonic	4-6%
NEC	4-6%
CTX	4-6%
Sony	2-4%
Acer	2-4%

CRT includes both computer CRTs and Television CRTs

Source: Adapted from Stanford Resources, 1997 as shown in *Computer Display Industry and Technology Profile* by Microelectronics and Computer Technology Corporation (MCC) and EPA.

**TABLE CRT 8: World Market Share (Color CRTs) by Top Brand Names**

<b>Company</b>	<b>Market Share</b>
Hitachi	20%
Sony	10-15%
Samsung	10-15%
Chunghwa	10%
Matsushita	5-10%
Toshiba	5-10%
Philips	5-10%
Lucky Goldstar	5-10%

Source: Adapted from Stanford Resources, 1997 as shown in *Computer Display Industry and Technology Profile* by Microelectronics and Computer Technology Corporation (MCC) and EPA.

The U.S. has only a handful of manufacturers of color monitor tubes and a few companies that produce CRT parts (i.e., Thomson, Technoglas and Corning manufacture CRT glass).

Based on NAICS information, the consultant created table CRT 9. The NAICS code that includes the manufacturing of CRTs is 334411, "Electron Tube Manufacturing." This category includes the following items: cathode ray tubes, klystron tubes, magnetron tubes and traveling wave tubes. Note, there are no electron tube manufacturers in Oregon.

**TABLE CRT 9: Electron Tube Manufacturing for 1997**

NAICS code: 334411 / SIC code: 3671

	<i>U.S.</i>	<i>Oregon</i>
<b>Industry Sales – All Products</b>	\$3,825,058,000	ND
<b>Employees</b>	21,699	0-19
<b>Payroll</b>	\$730,071,000	ND
<b>Establishments</b>	158	2

Notes: ND = not disclosed to protect confidentiality of information on individual companies.

Source: U.S. Census Bureau Publications: *Manufacturing Industry Series* for U.S. and for Oregon and *County Business Patterns* for Oregon

Businesses that made up 80% of U.S. electron tube sales in 1998 are listed in table CRT 10. These businesses do not necessarily manufacture only CRTs since the SIC category of “Electron Tube Manufacturing” includes other types of electron tubes. The consultant could not determine how much of this business activity was specific to TVs versus computer monitors or other CRT displays. None of these businesses is located in Oregon.

**TABLE CRT 10: Electron Tube Manufacturers in U.S. for 1998**

NAICS code: 334411 / SIC code: 3671

<i>Company</i>	<i>City</i>	<i>State</i>	<i>Sales Volume (million \$)</i>	<i>Number of Employees</i>
Varian Associates Inc.	Palo Alto	CA	\$1,599	6,700
Zenith Electronics Corp.	Glenview	IL	\$1,288	15,900
Rauland Div	Melrose park	IL	\$450	3,000
Philips Display Components	Ann Arbor	MI	\$270	1,800
Richardson Electronics Ltd.	Lafox	IL	\$255	700
Toshiba Display Devices Inc.	Horseheads	NY	\$220	1,500

Source for National Data: *Wholesale and Retail Trade USA*, Second Edition

## **TV Wholesalers**

“Electrical Appliance, Television, and Radio Set Wholesalers”, SIC code 421620, comprises businesses involved in wholesaling household-type electrical appliances, room air-conditioners, gas clothes dryers, and/or household-type audio or video equipment. Examples of items wholesaled in this category include the following: television sets, electric water heaters, radios, refrigerators, sewing machines, video cameras.

In 1997, there were approximately 4,000 U.S. wholesalers included in the SIC code 421620. Oregon had approximately 40 businesses in this category as shown in table CRT 12.

**TABLE CRT 12: Electrical Appliance, Television and Radio Set Wholesalers for 1997**

NAICS code: 421620 / SIC code: 5064

	<i>U.S.</i>	<i>Oregon</i>
<b>Industry Sales – All Products</b>	\$54,683,947,000	\$282,433,000
<b>Employees</b>	50,922	663
<b>Payroll</b>	\$2,079,747,000	\$20,396,000
<b>Establishments</b>	3895	40

Source: U.S. Census Bureau Publications: *Manufacturing Industry Series* for U.S. and for Oregon and *County Business Patterns* for Oregon

The largest wholesalers in the TV category in the U.S. and the largest ones in Oregon are listed in table CRT 13. The U.S. manufacturers are included for comparative purposes. Also the large U.S. wholesalers likely do business in Oregon as well. Since this SIC category includes a variety of products, not all of these businesses can be assumed to be strictly television wholesalers. The U.S. information shows the top businesses comprising 80% of the total sales for 1997. The Oregon information shows the top sales wholesalers from a database obtained from Qwest. The complete list of all 75 businesses found by the Qwest web search are listed in TV Appendix 1.

**TABLE CRT 13: Electrical Appliance, Television, and Radio Set Wholesalers in 1997**

NAICS code: 421620 / SIC code: 5064

<i>Company</i>	<i>City</i>	<i>State</i>	<i>Sales Volume (million \$)</i>	<i>Number of Employees</i>
<b>Top U.S. Electrical Appliance, Television, and Radio Set Wholesalers</b>				
Tatung Company of America	Long Beach	CA	45,000	25,000
Matsushita Electric Corporations	Secaucus	NJ	7,400	20,000
Amway Corp.	Ada	MI	7,000	14,000
Mitsubishi Electronics America	Cypress	CA	4,400	3,000
<b>Electrical Appliance, Television and Radio Set Wholesalers in Oregon</b>				
North Pacific Supply	Clackamas	OR	100-500	100-249
W L May & Co	Portland	OR	100-500	50-99
Voice-Mail	Salem	OR	20-50	20-49
Northwest Wholesale	Portland	OR	20-50	10-19

Dist.				
G & C Distributing Co.	Portland	OR	10-20	50-99
Schetky Northwest Sales Inc.	Portland	OR	10-20	20-49
Mosee Brothers Appliance	Portland	OR	10-20	10-19
Reliable Parts Inc.	Portland	OR	10-20	10-19

Source for National Data: *Wholesale and Retail Trade USA*, Second Edition

Source for Oregon Data: Database from Qwest

## TV Retailers

Like computer monitors, TVs are sold by many methods, in small retail shops, at large retail chain stores, in department stores, in outlets specializing in electronics equipment, in “video only” stores, through catalogs, and on-line.

The consultant was able to obtain a list of Oregon Television Dealers (new and used) through the Qwest Dex website. This listing is included in TV Appendix 2.

## Product Trends

During the past two decades computer monitor CRTs have been replaced in increasing numbers by liquid crystal display (LCD) and flat panel display (FPD) monitors. According to the Microelectronics and Computer Technology Corp. (MCC), there are a number of flat panel display technologies, but most (about 85%) are liquid crystal displays. Of all the uses for LCDs, computer displays make up between 55% - 65%.

As mentioned previously, the advent of high-definition television (HDTV) threatens to create a flood of discarded analog televisions in a short period of time. According to Massachusetts’s CRT/Electronics Recycling Strategy, the impact could be enormous. “Waste volume will rise as the small business, institutional and residential sectors become less willing to repair or buy used electronics, and begin cleaning out the outmoded electronics from storage. As schools eventually discard their “donated” equipment and second-hand consumers are forced to buy “digital converter boxes” for used televisions, DEP expects several decades’ worth of stored equipment—an estimated 500,000 tons—to enter the waste stream in a relatively compressed period of time (between five and 15 years).”

# Sources

- *Electronic Product Recovery and Recycling Baseline Report: Recycling of Selected Electronic Products in the United States*, Stanford Resources, Inc., for National Safety Council's Environmental Health Center, May 1999.
- Computer Display Industry & Technology Profile, Colleen Mizuki and Gloria Schuldt, Microelectronics and Computer Technology Corporation, 1999.
- "DEP's 1998 CRT/Electronics Recycling Strategy, Infrastructure Development Plan," Massachusetts Department of Environmental Protection, May 1998
- "Florida's Strategy for the Management of End of Life Cathode Ray Tubes (CRTs), Computers and Other Electronic Equipment," discussion paper, September 2, 1999.
- "Reclaiming End-of-Life Cathode Ray Tubes (CRTs) and Electronics: A Florida Update, John L. (Jack) Price, Hazardous Waste Management Section, Florida Dept. of Environmental Protection, November 1999.
- "Used T.V. & Computer Recycling & Management in Florida: A Resource Guide," Southern Waste Information eXchange, Inc., September 1999.
- "Electrical & Electronic Equipment: Prospects for Household Appliances," The Warmer Bulletin, 2000
- "Old Computers now today's waste problem", by Trevor Maxwell, *Oregonian*, August 6, 2000
- "Our Legacy: Computer Junk", by John C. Dvorak, *PC Magazine*, February 6, 2001
- "High-tech trash causes waste worry", by Louise Knott Ahern, *The Detroit News*, September 13, 2000.
- "Rhode Island to Establish Nation's First Statewide Computer Recycling Program", by Brook Raflo, *Waste Age*, January 2001

Quantum Resource Recovery, 503-646-2427. Contact name: Kent Dunn

Computer Drive Connection, Inc., 503-992-0180. Contact name: Brad Franklin

Earth Protection Services, 503-620-2466.

Rhode Island Resource Recovery Corporation

Northeast Recycling Council, 802-254-3636

Waste Management Asset Recovery Group, 510-563-4214. Contact name: Kevin McCarthy

Lane County, 541-682-4339. Contact name: Tanya Baker

Bring Recycling, 541-746-3023. Contact name: Julie Daniel

Goldsmith Group, 317-710-0385. Contact name: Eric Goldsmith

StRUT, 503-251-3771. Contact name: Greg Sampson

BF-2 Metals, 541-683-2511. Contact name: Steve Root

Free Geek, 503-232-9350. Contact name: Phillip Santo

Northwest Microtechnics, 503-697-5010.

Oregon Public Networking, 541-484-9637. Contact name: John Crider

Share Technology—<http://sharetechnology.org/>  
IBM Computer Recycling—[www.ibm.com/ibm/environment/](http://www.ibm.com/ibm/environment/)  
Compaq Computer Recycling—[www.compaq.com](http://www.compaq.com)  
Dell Computer Recycling—[www.dell.com/us/en/hied/services/asset](http://www.dell.com/us/en/hied/services/asset)  
Micron PC Recycling—[www.micronpc.com/programs/mpower/ind\\_recycle.html](http://www.micronpc.com/programs/mpower/ind_recycle.html)  
Electronic Industries Alliance—[www.eia.org](http://www.eia.org)  
Northeast Recycling Council—[www.nerc.org/electpolicy](http://www.nerc.org/electpolicy)  
National Safety Council—[www.nsc.org/ehc/epr2](http://www.nsc.org/ehc/epr2)  
NRC Electronics Recycling Initiative—[www.nre-recycle.org/programs/electronics](http://www.nre-recycle.org/programs/electronics)  
EPA—[www.epa.gov](http://www.epa.gov)  
Minnesota—[www.moea.state.mn.us](http://www.moea.state.mn.us)  
King County—[www.metrokc.gov/swd/CRP.htm](http://www.metrokc.gov/swd/CRP.htm)  
Florida—[www.dep.state.fl.us](http://www.dep.state.fl.us)  
Northwest Product Stewardship Council—[www.govlink.org/nwpsc](http://www.govlink.org/nwpsc)  
International Association of Electronics Recyclers—[www.iaer.org](http://www.iaer.org)  
Institute of Electrical and Electronics Engineers, Inc.—[www.ieee.org](http://www.ieee.org)  
Electronic Industries Alliance Environment Consumer Education—[www.eiae.org](http://www.eiae.org)  
Oakland County, Michigan's recycling efforts—[www.detnews.com/2000/technology/0009/13/a01-119191.htm](http://www.detnews.com/2000/technology/0009/13/a01-119191.htm)

**Television repair shops**

PRO TV & Video Services, 503-643-8057  
Sylvan Electronics, 503-292-1244  
Martha Lake Electronics Inc, 503-648-2343  
Palmer Electronics, 503-288-5356  
Ace Electronics and Repairs, 503-772-9761

# TV Appendix 1

## Wholesalers: Electrical Appliances, Televisions and Radio Sets (includes TV sets)-5064

### National:

SIC Code	Company Name	Address	City	State	Phone	Sales (million \$)	Number of Employees
5064	Tatung Company of America	2850 El Presidio St.	Long Beach	CA	310-637-2105	45,000	25,000
5064	Matsushita Electric Corporation	1 Panasonic Way	Secaucus	NJ	201-348-7000	7,400	20,000
5064	Amway Corp.	7575 Fulton St. E.	Ada	MI	616-787-6000	7,000	14,000
5064	Mitsubishi Electronics America	PO Box 6007	Cypress	CA	714-220-2500	4,400	3,000

### Oregon:

SIC Code	Company Name	Address	City	Zip Code	Phone	Sales (million \$)	Number of Employees
506404	NORTH PACIFIC SUPPLY	16250 SE EVELYN ST	CLACKAMAS	97015	503/656-2940	100 - 500	100 - 249
506401	W L MAY & CO	1120 SE MADISON ST	PORTLAND	97214	503/231-7000	100 - 500	50 - 99
506438	VOICE-MAIL	660 HIGH ST NE	SALEM	97301	503/370-2861	20 - 50	20 - 49
506418	NORTHWEST WHOLESALE DISTR	11427 SE FOSTER RD	PORTLAND	97266	503/232-7114	20 - 50	10 - 19
506404	G & C DISTRIBUTING CO	5010 NE OREGON ST	PORTLAND	97213	503/288-0221	10 - 20	50 - 99
506406	ALBANY LEBANON SANITATION	PO BOX 1929	ALBANY	97321	541/928-2551	10 - 20	50 - 99
506406	SCHETKY NORTHWEST SALES INC	6435 NE COLWOOD WAY	PORTLAND	97218	503/287-4141	10 - 20	20 - 49
506401	MOSEE BROTHERS APPLIANCE	1134 SE STARK ST	PORTLAND	97214	503/771-6792	10 - 20	10 - 19
506401	RELIABLE PARTS INC	3103 SE DIVISION ST	PORTLAND	97202	503/239-6050	10 - 20	10 - 19
506401	OLDFIELD'S	1465 W 7TH AVE	EUGENE	97402	541/343-2066	5 - 10	20 - 49

506411	SELECTRON INC	7225 SW BONITA RD	TIGARD	97224	503/639-9988	5 - 10	20 - 49
506401	MERIT'S SERVICE CTR	1407 OWENS ST	KLAMATH FALLS	97601	541/882-3429	5 - 10	5 - 9
506401	NOR-MON DISTRIBUTING INC	1134 SE STARK ST	PORTLAND	97214	503/234-6215	5 - 10	5 - 9
506401	SPENCER'S APPLIANCES	7115 NE GLISAN ST	PORTLAND	97213	503/254-7977	5 - 10	5 - 9
506404	ROTH DISTRIBUTING CO	6777 SW BONITA RD # D100	TIGARD	97224	503/968-1793	5 - 10	5 - 9
506401	RIEGELMANN'S APPLIANCE	301 E POWELL BLVD	GRESHAM	97030	503/665-4158	2.5 - 5	20 - 49
506406	DEWALD NORTHWEST CO	33710 OAKVILLE RD SW	ALBANY	97321	541/926-5578	2.5 - 5	20 - 49
506404	NORTHWEST VIDEO & ELECTRONICS	12035 SE STARK ST	PORTLAND	97216	503/655-6754	2.5 - 5	10 - 19
506406	PCI WASTE & RECYCLING SYSTS	9180 SE 74TH AVE	PORTLAND	97206	503/777-5548	2.5 - 5	10 - 19
506438	NEHALEM TELEPHONE & TELEGRAPH	PO BOX 100	NEHALEM	97131	503/368-5116	2.5 - 5	10 - 19
506401	APPLIANCE PARTS OF CENTRAL OR	62920 N HIGHWAY 97	BEND	97701	541/385-5418	2.5 - 5	1 - 4
506401	AUTHORIZED SERVICE CTR	7215 NE SANDY BLVD	PORTLAND	97213	503/287-1230	2.5 - 5	1 - 4
506401	HOWE'S APPLIANCE	19630 MCLOUGHLIN BLVD	GLADSTONE	97027	503/657-4170	2.5 - 5	1 - 4
506401	PERFECT FOR U TV & APPLIANCE	800 N MAIN ST	PRINEVILLE	97754	541/447-8140	2.5 - 5	1 - 4
506401	UNIVERSAL APPLIANCE PARTS	4655 SW WATSON AVE	BEAVERTON	97005	503/646-3703	2.5 - 5	1 - 4
506407	DWIPCO	PO BOX 68888	OAK GROVE	97268	503/654-8639	2.5 - 5	1 - 4
506415	MICHAEL COGLEY'S SHAVER REPAIR	1033 MAIN ST	KLAMATH FALLS	97601	541/884-8924	2.5 - 5	1 - 4
506417	GKM MARKETING CORP	PO BOX 1713	LAKE OSWEGO	97035	503/635-3531	2.5 - 5	1 - 4
506438	PAGE ONE NORTHWEST	2655 COMMERCIAL ST SE	SALEM	97302	503/364-6109	2.5 - 5	1 - 4
506401	DIVISION APPLIANCE SVC	4035 SE DIVISION ST	PORTLAND	97202	503/234-0873	1 - 2.5	10 - 19
506401	FLETCHER & SMARTT APPLIANCE	1351 WILLAMETTE ST	EUGENE	97401	541/343-8873	1 - 2.5	10 - 19
506406	WESSCO	211 NE COLUMBIA BLVD	PORTLAND	97211	503/225-5913	1 - 2.5	10 - 19

506413	WYNN'S REFRIGERATION & HEATING	3730 N SUTTLE RD # D	PORTLAND	97217	503/240-6941	1 - 2.5	10 - 19
506401	DAN MARTIN'S APPLIANCE SALES	2135 FAIRGROUNDS RD NE	SALEM	97303	503/581-7873	1 - 2.5	5 - 9
506401	DEWHITT APPLIANCE DIRECT	17405 SE STARK ST	PORTLAND	97233	503/256-2856	1 - 2.5	5 - 9
506401	DICK'S APPLIANCE CTR	3707 STATE ST	SALEM	97301	503/362-5463	1 - 2.5	5 - 9
506404	KIE SUPPLY CORP	80484 N HIGHWAY 395	HERMISTON	97838	541/567-3317	1 - 2.5	5 - 9
506422	PARAMOUNT VACUUM & SEWING CTR	1056 GREEN ACRES RD # 104	EUGENE	97408	541/345-2100	1 - 2.5	5 - 9
506422	VALUE PLUS VACUUM & SEWING CTR	987 GARFIELD ST # 1	EUGENE	97402	541/686-1510	1 - 2.5	5 - 9
506422	VIKING SEWING & VACUUM CTR	1963 W 6TH AVE	EUGENE	97402	541/484-6006	1 - 2.5	5 - 9
506401	APPLIANCE PARTS OF CENTRAL OR	115 W 2ND ST	PRINEVILLE	97754	541/447-2404	1 - 2.5	1 - 4
506401	OREGON CITY APPLIANCE PARTS	1630 S BEAVERCREEK RD # E	OREGON CITY	97045	503/655-5594	1 - 2.5	1 - 4
506401	RODER APPLIANCE PARTS	2060 VINE ST	GRANTS PASS	97526	541/479-7007	1 - 2.5	1 - 4
506404	MARK RICHARDS CABINET CO	PO BOX 1847	BEND	97709	541/389-7282	1 - 2.5	1 - 4
506406	GENERAL EQUIPMENT CO	6767 NE COLUMBIA BLVD	PORTLAND	97218	503/288-7447	1 - 2.5	1 - 4
506413	EQUIPMENT WHOLESALERS	PO BOX 301276	PORTLAND	97294	503/251-1247	1 - 2.5	1 - 4
506421	ALTERNATIVE ACOUSTICS	8269 SW WILSONVILLE RD # 1	WILSONVILLE	97070	503/803-7778	1 - 2.5	1 - 4
506438	RECORD-A-CALL TELEPHONE	45 COBURG RD	EUGENE	97401	541/343-4261	1 - 2.5	1 - 4
506401	SEARS REPAIR SVC	PO BOX 1348	COOS BAY	97420	541/267-5350	.5 - 1	10 - 19
506401	AAA APPLIANCE SVC	6601 SE FOSTER RD	PORTLAND	97206	503/777-6450	.5 - 1	5 - 9
506401	CASCADE ELECTRONICS MICROWAVE	1601 SE 11TH AVE	PORTLAND	97214	503/233-7739	.5 - 1	5 - 9
506401	PINEWOOD APPLIANCE REPAIR	833 SE 2ND ST	BEND	97702	541/389-2112	.5 - 1	5 - 9
506401	STAN'S REFRIGERATION & APPL	58481 OLD PORTLAND RD	ST HELENS	97051	503/397-5510	.5 - 1	5 - 9
506401	DEWHITTS APPLIANCES	11701 SE 82ND AVE	PORTLAND	97266	503/654-5454	.5 - 1	1 - 4
506401	GLENWOOD APPLIANCE	3629 FRANKLIN BLVD	EUGENE	97403	541/726-7696	.5 - 1	1 - 4

506401	MOLES APPLIANCE	3926 RIVER RD N	SALEM	97303	503/390-0161	.5 - 1	1 - 4
506401	SAV-MOR HOME CTR	1101 TUCKER RD	HOOD RIVER	97031	541/386-1277	.5 - 1	1 - 4
506411	DON'S MAYTAG HOME APPLIANCE	818 HIGHWAY 99 N	EUGENE	97402	541/688-4817	.5 - 1	1 - 4
506415	PEARL TRADING CO	1420 LLOYD CTR	PORTLAND	97232	503/284-2472	.5 - 1	1 - 4
506421	SWEET SOUND INC	4444 SW MULTNOMAH BLVD	PORTLAND	97219	503/293-9466	.5 - 1	1 - 4
506401	A & P APPLIANCE	12625 SW BROADWAY ST	BEAVERTON	97005	503/644-0382	< .5	1 - 4
506401	A BEST APPLIANCE	127 SE BASELINE ST	HILLSBORO	97123	503/640-5784	< .5	1 - 4
506401	ASSOCIATED APPLIANCE REPAIR	195 N ALDER AVE	BURNS	97720	541/573-2499	< .5	1 - 4
506401	BEN'S REFRIGERATION & APPL RPR	PO BOX 2019	CAVE JUNCTION	97523	541/592-2542	< .5	1 - 4
506401	DICK'S APPLIANCE & FURNITURE	1108 BROADWAY ST NE	SALEM	97301	503/364-7611	< .5	1 - 4
506401	E & M APPLIANCE REFRIG & AC	7441 N LOMBARD ST	PORTLAND	97203	503/286-4616	< .5	1 - 4
506401	ERNIE TUMA APPLIANCE REPAIR	1940 S 2ND ST	LEBANON	97355	541/258-6779	< .5	1 - 4
506401	GLEN WEBSTER APPLIANCES	PO BOX 66841	PORTLAND	97290	503/775-3763	< .5	1 - 4
506401	GRESHAM APPLIANCE SVC	21755 SE STARK ST	GRESHAM	97030	503/665-3018	< .5	1 - 4
506401	HUNT'S APPLIANCE SALES & SVC	255 SE 2ND AVE	ONTARIO	97914	541/889-4253	< .5	1 - 4
506401	MASTER APPLIANCE SVC	145 KNOX ST N	MONMOUTH	97361	503/838-1667	< .5	1 - 4
506401	SOUTH SIDE APPLIANCE	615 NE LAFAYETTE AVE	MC MINNVILLE	97128	503/434-5085	< .5	1 - 4
506422	SPRINGFIELD VACUUM & SEWING	129 14TH ST	SPRINGFIELD	97477	541/726-9963	< .5	1 - 4
506438	A-1 TELEPHONE ANSWERING MACHS	45 COBURG RD	EUGENE	97401	541/484-9560	< .5	1 - 4
506401	STANDARD TV & APPLIANCE	5240 SE 82ND AVE	PORTLAND	97266	503/777-3377		100 - 249

# TV Appendix 2

## Television Retailers (New and Used) in Oregon

<b>Company</b>	<b>Address</b>	<b>City</b>	<b>Phone</b>
A&L Distributing Co.	13970 SW 72nd Ave.	Portland	503-684-9384
ABG Buyers	1880 SW 3rd St.	Corvallis	541-757-9591
Advanced Cable Concepts Inc.			541-474-7701
Audio Video Environments	19470 SW 89th	Tualatin	503-691-6025
Barkley's Of Roseburg - Fast Cash	1771 NE Stephens St.		541-957-0429
Bates Electronics	268 NE 3rd St.	Prineville	541-447-7081
Bert's Radio & TV	125 Main Street SE	Albany	541-928-7353
Best Buy	11703 NE Glen Widing Dr.	Portland	503-253-1177
Cash Connection	327 E Pine St	Cent Pt.	541-664-5204
Charles' TV	645 Manzanita Ave.	Manzanita	503-368-6411
Cityview TV & Computer Inc.	2352 W. 11th	Eugene	541-683-3518
Competition The	320 S Oregon St.	Ontario	541-889-3606
Courtesy Rent to Own	1655 E Harbor St.	Warrenton	503-861-3363
Crazy Bruce's Appliance Center	2976 NE Diamond Lake Blvd	Roseburg	541-673-1921
Custom Electronics	1065 River Rd.	Eugene	541-688-4814
Dallas TV	988 SE Jefferson	Dallas	503-623-4770
Denny Willams Sylvania TV Sales	Corner Broadway and Market		503-362-0531
Flomer Furniture and Appliance	607 N Front St.	Woodburn	503-981-7291
Garden Valley TV Repair	800 NW Black Ave.	Roseburg	541-672-4544
Good Guys	1024 Green Acres Rd.	Eugene	541-302-1300
Good Guys Clackamas	12405 SE 82d Ave.	Portland	503-794-4000
Good Guys Portland Airport Ave	11549 NE Glen Widing	Portland	503-261-8000
Good Vibrations	1092 NE Stephens St.	Roseburg	541-673-4764

Hear No Evil	2290 Commercial NE	Salem	503-363-3633
Home Video Library	16544 SE Division	Portland	360-695-7691
Hunt's Home Furnishings	1535 Commercial St.	Astoria	503-325-4947
Hutley TV Service	5420 SW Philomath Blvd.	Corvallis	541-752-2976
IV Video	210 N Redwood Hwy	Cave Junction	541-592-4300
Jerry's Appliances and TV	155 NE Webster Ave	Bend	541-388-2009
Johnson Brothers TV & Appliance Downtown	571 B NE Azur	Bend	541-382-6223
Kay's Radio and TV	1350 E Grant St.	Lebanon	541-258-6524
Kelly's Home Center	3625 Portland Rd NE	Salem	503-378-1793
Let George Do It	2936 NE Diamond Lake Blvd	Roseburg	541-673-4332
Lewis and Audio Video	2112 Portland Rd.	Newberg	503-375-3137
Masingill Furniture and Appliances	189 S. Oregon Street	Ontario	541-881-0211
McMahan's Furniture and Appliances	2455 W Harvard Ave.	Roseburg	541-672-6166
McMahan's Furniture and Appliances	6320 S 6th St	Klamath Falls	541-882-8811
Mosier's Home Furnishings	101 E. Main	John Day	541-575-0649
Music Shop The	413 SE 6th	Grants Pass	541-476-3389
Nelson's TV	3004 Altamont Dr	Klamath Falls	541-882-3479
Newport Electronics	2029 N Coast Hwy	Newport	541-265-3674
Northwest Home Electronics		Lake Oswego	503-675-1791
Parrott's Home Furnishings	Highway 34 and Riverside Drive		541-754-1776
Perfect For U TV Appliance and Home Furnishings	1040 SW Highway Ave	Redmond	541-923-3779
Photo Den Vision & Sound	315 SE 7th St.		541-479-1833
Progressive Communications	111 E Main	John Day	541-575-2854
Radio Shack - Dealer At Lumbermen's	3515 Pocahontas Rd.	Baker City	541-523-6404
Ralph's TV & Furniture	525 SE 5th	MDRS	541-475-2578
Reception Center	900 SE Wilson Ave. Suite A	Bend	541-389-2833
Redmond TV & Appliance	2145 S Highway 97	Redmond	541-923-8644
Rentown USA	1162 Highway 99N		541-688-2121
Salem Sound Center Inc.	3996 Portland Rd. NE	Salem	503-364-7235
Saunders TV & Satellite Sales & Service	2120 Broadway	Baker City	541-523-7344

Schumacher Sales & Service	7987 Boedigheimer Rd. SE	Sublimity	503-769-2451
Sears Roebuck and Co.	1580 Mt. Hood Ave.	Woodburn	503-982-5640
Sears Roebuck and Co.	144 SW G Street	Grants Pass	541-471-9489
Sears Roebuck and Co.	2017 Main St.	Baker City	541-524-9715
Sears Roebuck and Co.	80487 N Hwy 385		541-567-2454
Sears Roebuck and Co.	1480 West Park Plaza	Ontario	541-889-4525
Standard TV & Appliance	5240 SE82d	Portland	503-777-3377
Star Computer & Communications Inc.	1844 Columbia Bv. Ste. N St.	St Helens	503-397-7827
Stereo Planet			541-382-9062
Stereo Store! The	1079 Valley River Wy.	Eugene	541-345-3000
TV Specialty Shop	1445 River Rd	Eugene	541-688-5061
Video Audio Connection	3317 3rd St	Tillamook	503-842-9200
Video Only	441 Lancaster Dr. NE	Salem	503-581-7441
Video Only	2823 Chad Dr.	Eugene	541-342-4444
Video Only Clackamas	8200 SE Sunnyside	Clackamas	503-653-8200
Video Only Jantzen Beach	1860 N Hayden Island Dr	Portland	503-283-3400
Wagner's Furniture & Sleep Center Inc.	180 Hines Bv.	Burns	541-573-5234
Wagner's Furniture Gallery	138 E Main	John Day	541-575-0755
Western Auto Assoc. Store	1912 Main St	Baker City	541-523-6284
Western Auto Home Store	202 SW Redwood Hy	Grants Pass	541-479-2691
Western Auto Home Store	51429 Huntington Rd.	Lap	541-536-5922