CHELSEA CENTER FOR RECYCLING AND ECONOMIC DEVELOPMENT

UNIVERSITY OF MASSACHUSETTS

Technical Report #7

University of Massachusetts Amherst
Scrap Electronics Processing

August 1998

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Chelsea Center for Recycling and Economic Development
Plastics Conversion Project

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1. Introduction

In March of 1998, the Office of Waste Management (OWM) at the University of Massachusetts – Amherst proposed a short research project on the scope, functioning and potential of the electronics de-manufacturing and recycling industry in the Northeast region. The overall purpose of the two-month project was to survey, assess and quantify the processing and consumption capacity of the region's scrap electronics processors and end-users, respectively.

One task in the three-part study called for the collection and presentation of quantitative data on the processing rates, labor times and market values of the products for of the University's electronics de-manufacturing program. Presented below is an explanation of the methodology employed for gathering and organizing the data, followed by a review of the results.

2. Methodology

The source of electronics processed by OWM was the University, area colleges and several non-University institutional/business entities. The total number of units dismantled was 1,157 - excluding parts that arrived in a dismantled state. The percentage from University sources is estimated to exceed 95%.

Each piece of electronic equipment was individually weighed prior to dismantling. This weight was recorded along with a description of the unit type and start time of dismantling. Dismantling staff would then break down the unit, sorting parts into the following categories: A Boards, Aluminum, Backplanes, CRT's, D Boards, Gold Chips, Gold Fingers, Disk Drives, Fans, Iron/Aluminum, Metal, Power Packs, Scrap Metal, Transistors, Trash (incl. plastic housings), Wire and Yolks. Once a unit was broken down, staff members recorded the finish time and moved on to the next piece of electronic equipment. Excluded from the processing time records were the following activities: break time, the weighing of individual units, the unloading of delivery vehicles, the moving or loading of full gaylords and the transfer of self-dumping hoppers containing plastic/trash or scrap metal for tipping to outdoor storage areas.

Due to the fact that gaylords used for the storage of outgoing parts may have been partially full at the outset of the record keeping period, OWM determined the initial weight of each gaylord as of May 5th. When record keeping for the study was terminated on June 30th, each outgoing parts gaylord as again weighed and the initial weights subtracted from this final weight. This procedure isolated the weight of parts generated by the dismantling process for the term of this study only. In addition, for scrap metal and trash (including plastic housings) the weights for each trip to the scrap metal pile or trash roll-off were recorded.

The 6,000 pound platform scale used to weigh gaylords and self-dumping hoppers was inspected and calibrated in January of 1998 and is accurate to within one pound. The 500 pound scale used to weigh incoming components was not calibrated but was compared (prior to the study commencement) to the platform scale and adjustments made to compensate for differences.

The data for Unit Types and Weights as well as Time Elapsed from the dismantling record sheets were then transferred to an Excel spreadsheet. Calculations were then made for pounds per minute, hours per ton, and cost per ton. Also entered in a spreadsheet were the gaylord and self-dumping hopper weights for broken down (outgoing) components.

3. Review and Analysis of Project Results

By weight, CPUs and Monitors comprised over 82% of the institutional electronics stream handled under this project. Pound for pound, these components required roughly the same amount of labor to dismantle as other smaller or less frequently encountered components. OWM's average direct labor cost for electronics dismantling was $119 per ton (19.1 hrs. per ton * $6.25/hr.) and the cost variation around that average for various component types was minimal. It is estimated that the measured dismantling time represents about 85% of the total labor involved in the operation. Total labor time would include time spent loading and unloading containers. If this additional labor were included in the total direct labor cost, the total cost would be approximately $140 per ton.

The revenue for the study period (net of CRT recycling and trash disposal costs) was $175 per ton of material processed. OWM estimates that contract administration, utility and supplies costs are under $35 per ton. If one combines $140/ton in direct labor costs with the above miscellaneous costs, it appears that program revenues offset expenses. As a result, the University is realizing the full benefit of avoided disposal/haul costs of $70 per ton. In addition, the dismantling and recycling of electronics provides roughly $5,000 in wages annually, whereas the same 30 tons disposed in the local landfill would generate insignificant wages. Finally, by dismantling and properly recycling its electronic waste stream, OWM minimizes potential environmental liability for the University stemming from disposal of the lead, mercury, cadmium, and certain other heavy metals found within electronics.

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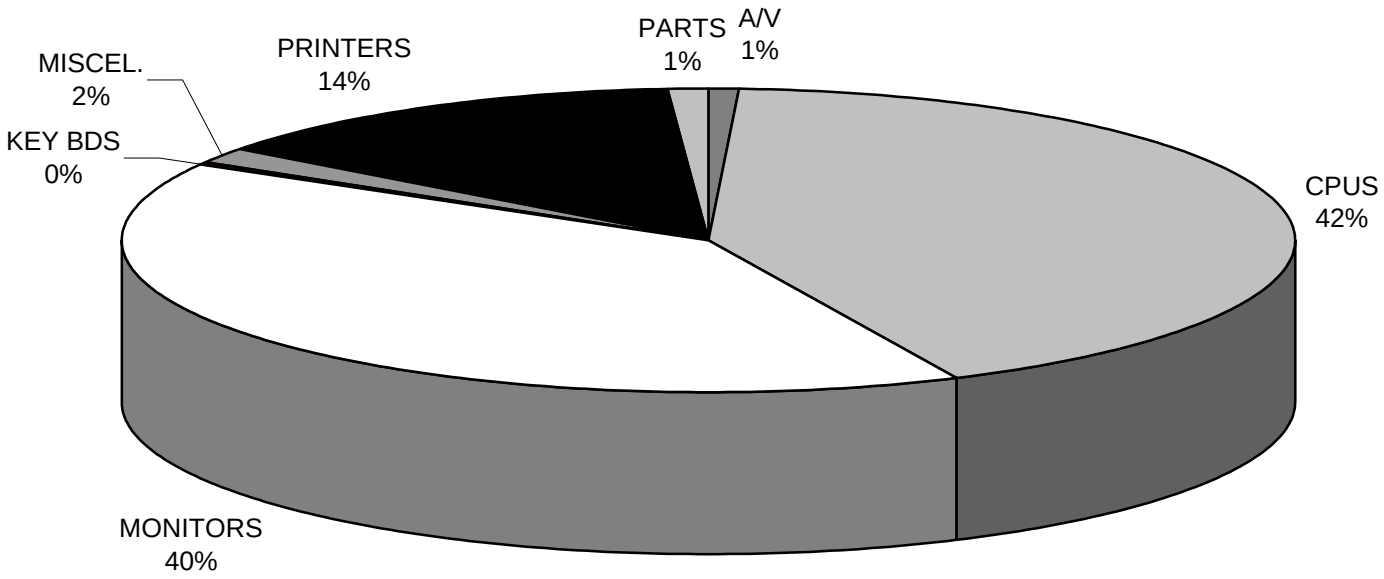
INCOMING ELECTRONICS PROCESSED: BY WEIGHT, TIME, AND COST

UNIT GROUPINGS	*WEIGHT IN LBS.*	*TIME IN MINUTES*	*LBS. PER MINUTE*	*HOURS PER TON*	*DOLLARS PER TON*
AUDIO VISUAL	284	162	1.8	19.0	$119
CPU	12,647	7,206	1.8	18.5	$116
MONITORS	12,002	6,934	1.7	19.3	$120
KEY BDS	70	33	2.1	15.7	$98
MISCEL.	507	299	1.7	19.7	$123
PARTS	325	185	1.8	19.0	$119
PRINTERS	4,036	2,259	1.8	18.7	$117
TOTALS	**29,871**	**17,078**	**1.7**	**19.1**	**$119**

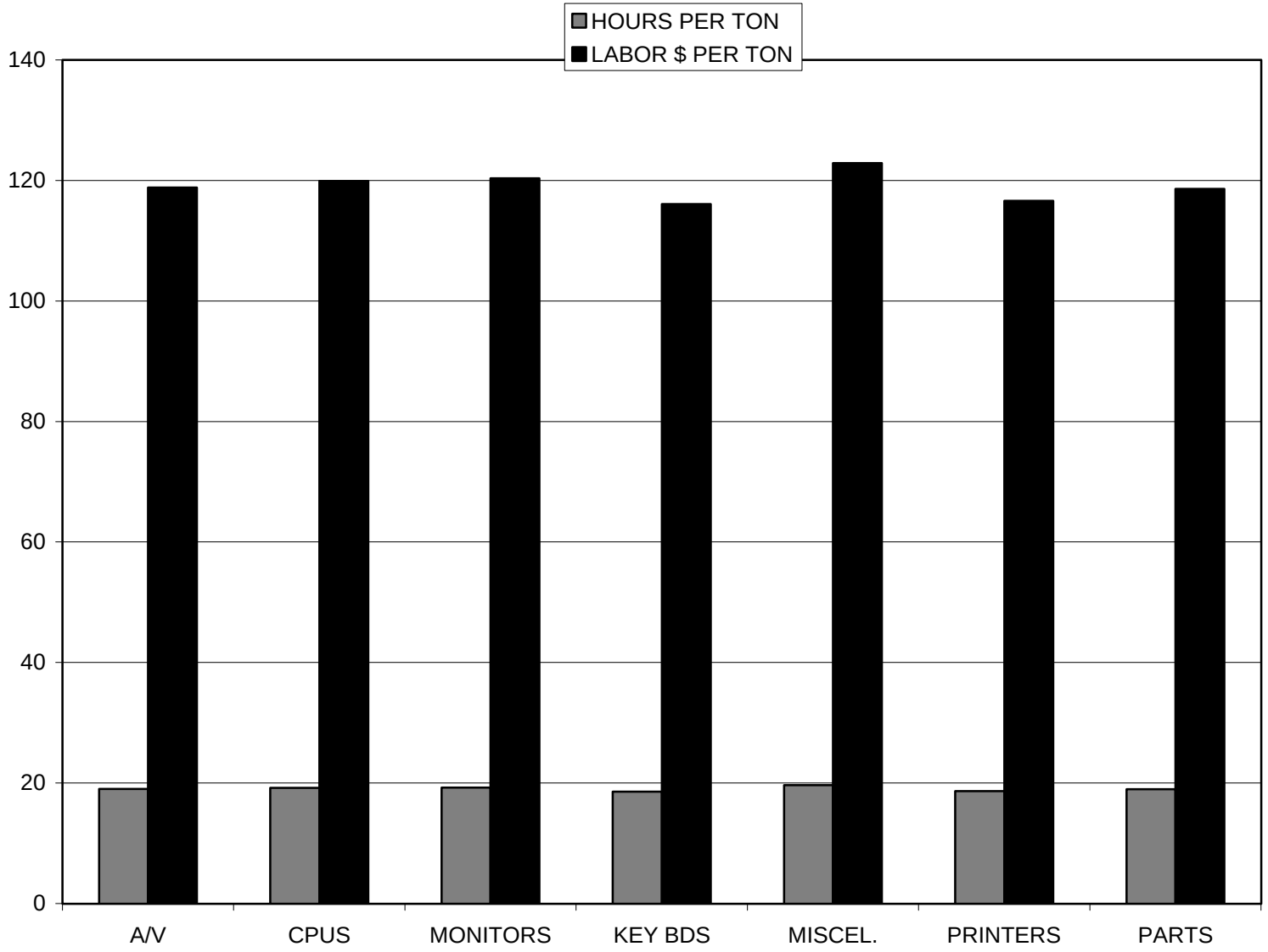
OUTGOING COMMODITIES: COMPOSITION & VALUE

Commodity Name	*Pounds of Product*	*% of Outgoing Commodities.*	*Rev./Expense Cents Per Pound*	*Dollar Revenue or Expense*
A Boards	1,475	6.0%	1	$1,475
Aluminum	494	2.0%	0.2	$99
Backplanes	229	0.9%	1.5	$344
CRT's	4,608	18.8%	0.1	-$461
D Boards	2,131	8.7%	0.055	$117
Disk Drives	430	1.8%	0.14	$60
Fans	93	0.4%	0.06	$6
Goldfingers	2	0.01%	16	$32
Goldchips	2	0.01%	21	$42
Iron/Aluminum	2,001	8.2%	0.09	$180
Scrap Metal	6,340	25.9%	0.0175	$111
Power Supplies	1,240	5.1%	0.04	$50
Wire	990	3.6%	0.15	$149
Transformers	623	2.5%	0.07	$44
Yokes	328	1.3%	0.05	$16
Plastic/Trash	3,503	14.3%	-0.035	-$123
Totals	**24,489**	**100%**	**8.74**	**$2,140**
			Dollars/Ton	**$174.8**

INCOMING ELECTRONICS COMPOSITION

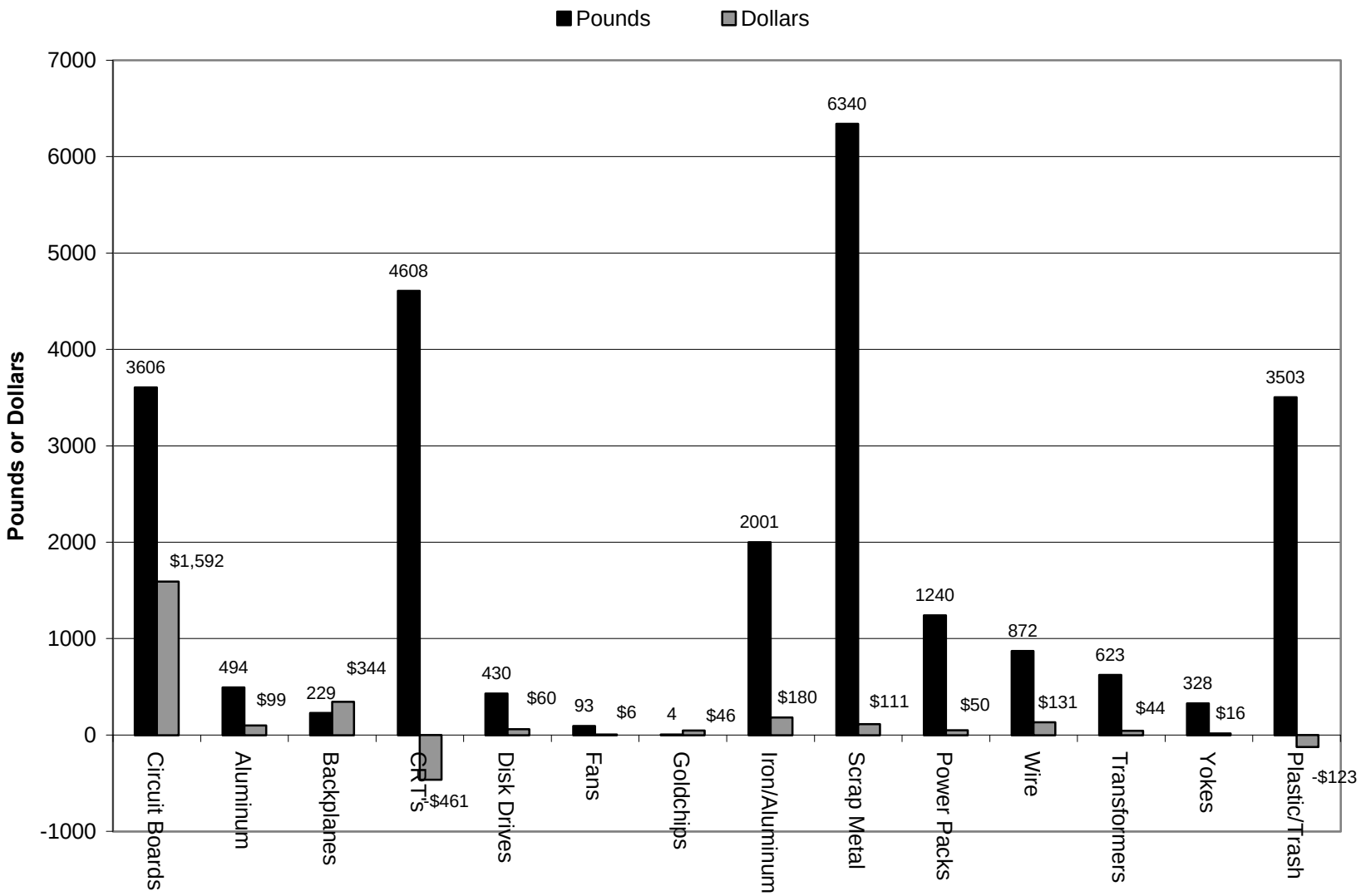


ELECTRONICS PROCESSING EFFICIENCY: UMASS LABOR TIME AND COST PER TON



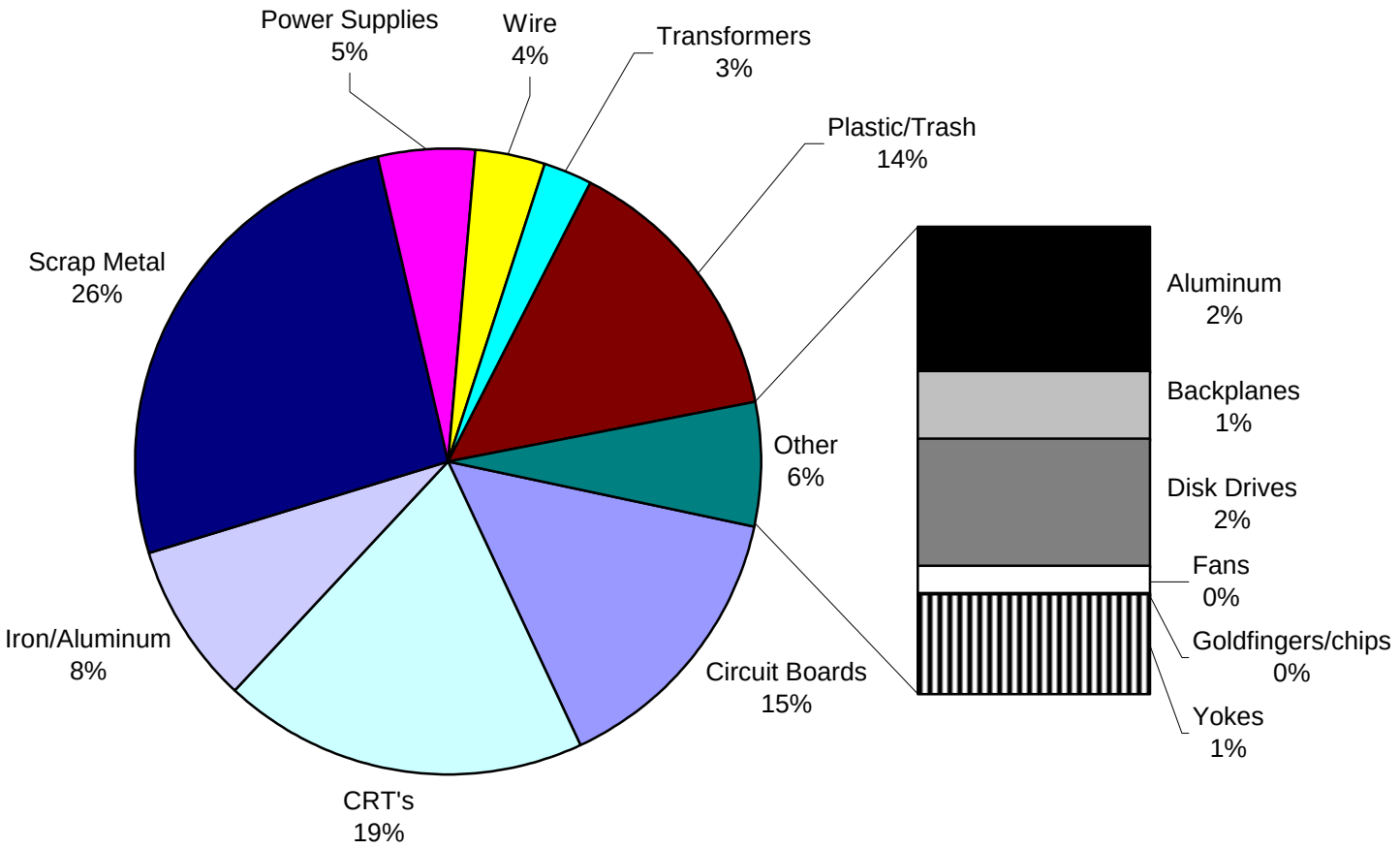
UMASS OFFICE OF WASTE MANAGEMENT: MAY 5 - JUNE 30, 1998

OUTGOING COMMODITIES: POUNDS VS. DOLLARS



UMASS OFFICE OF WASTE MANAGEMENT: MAY 5 - JUNE 30, 1998

OUTGOING ELECTRONICS COMPOSITION



UMASS ELECTRONICS: FY95-FY98 VOLUMES AND REVENUES

	FY95			FY95			FY96			FY96			FY97			FY98		
	Price per	Pounds	Revenue	Price per	Pounds	Revenue	Price per	Pounds	Revenue	Price per	Pounds	Revenue	Price per	Pounds	Revenue	Price per	Pounds	Revenue
	Pound	Shipped		Pound	Shipped		Pound	Shipped		Pound	Shipped		Pound	Shipped		Pound	Shipped	
A Boards	$0.70	460	$322	$0.65	1,037	$674	$0.65	495	$322	$0.65	1,948	$1,266	$0.70	3,887	$2,721	$0.70	3,275	$2,292.50
Gold Finger	$18.00	0	$0	$15.00	0	$0	$15.00	5	$75	$15.00	0	$0	$15.00	0	$0	$15.00	0	$0.00
Backplanes	$1.35	0	$0	$1.50	0	$0	$1.50	132	$198	$1.50	0	$0	$1.50	188	$282	$1.50	439	$658.50
D Boards	$0.00	560	$0	$0.02	975	$20	$0.02	1,839	$37	$0.02	2,360	$47	$0.02	4,509	$90	$0.02	2,494	$49.88
Dirty Aluminum	$0.04	0	$0	$0.04	1,669	$67	$0.04	2,530	$101	$0.04	2,301	$92	$0.05	5,220	$261	$0.05	3,894	$194.70
Aluminum	$0.20	300	$60	$0.20	2,014	$403	$0.20	1,186	$237	$0.17	1,746	$297	$0.10	1,996	$200	$0.10	991	$99.10
Yokes	$0.11	320	$35	$0.09	0	$0	$0.00	0	$0	$0.12	848	$102	$0.10	931	$93	$0.10	0	$0.00
Power Supplies	$0.03	760	$23	$0.03	622	$19	$0.03	677	$20	$0.03	2,601	$78	$0.03	2,869	$86	$0.03	4,233	$126.99
Transformers	$0.07	2,560	$179	$0.08	1,504	$120	$0.08	2,098	$168	$0.08	2,176	$174	$0.07	3,219	$225	$0.07	7,121	$498.47
Wire	$0.17	0	$0	$0.17	1,002	$170	$0.17	1,338	$227	$0.17	2,350	$400	$0.17	3,766	$640	$0.17	2,056	$349.52
12 Volt Fans	$0.15	104	$16	$0.12	0	$0	$0.12	430	$52	$0.12	0	$0	$0.10	0	$0	$0.10	0	$0.00
115 Volt Fans	$0.15	0	$0	$0.12	0	$0	$0.12	0	$0	$0.12	0	$0	$0.10	0	$0	$0.10	0	$0.00
Gold Chips	$7.50	0	$0	$8.00	0	$0	$8.00	9	$72	$8.00	0	$0	$8.00	0	$0	$8.00	0	$0.00
Floppy Disk Drives	$0.04	680	$27	$0.04	0	$0	$0.04	316	$13	$0.04	0	$0	$0.09	1,703	$153	$0.09	1,035	$93.15
Hard Disk Drives	$0.04	0	$0	$0.04	0	$0	$0.04		$0	$0.04	0	$0	$0.09	0	$0	$0.09	0	$0.00
Gold Connectors	$2.00	0	$0	$2.00	0	$0	$1.50	21	$32	$1.50	0	$0	----	0	$0	----	0	$0.00
CRT	-$0.17	1,931	-$319	-$0.17	4,172	-$688	-$0.17	3,944	-$651	-$0.17	4,292	-$708	-$0.15	15,284	-$2,293	-$0.15	1,110	-$166.50
SHIPMENT TOTAL		7,675	$343		12,995	$784		15,020	$903		20,622	$1,747		43,572	$2,459		26,648	$4,196.31
FY TOTAL				**FY95 TOT**	**20,670**	**$1,127**				**FY96 TOTA**	**35,642**	**$2,650**	**FY97 TOTA**	**43,572**	**$2,459**	**FY98 TOTA**	**26,648**	**$4,196.31**

Total Pounds Shipped FY95-FY98	Total Revenue FY95-FY98	Average Revenue/Ton FY95-FY98
126,532	$10,432.79	$165

* Note: Plastic/trash and scrap metal volume were not tracked for this period. Net revenues, including estimated trash disposal expense and scrap metal revenue, would be $98.25 per ton.

Raw Data

Category	Unit Type	Weight	Time(min)		Category	Unit Type	Weight	Time(min)
Parts	32 A BOARDS	15	15		CPU	CPU	10	6
Parts	40 A BOARDS	18	16		CPU	CPU	10	7
Parts	A BOARDS	6	8		CPU	CPU	10	7
Parts	A BOARDS	10	8		CPU	CPU	10	8
Parts	A BOARDS	20	7		CPU	CPU	10	8
Parts	A BOARDS	42	18		CPU	CPU	10	8
		111	72		CPU	CPU	10	9
					CPU	CPU	10	9
A/V	CAMERA	12	2		CPU	CPU	10	9
A/V	CAMERA	12	4		CPU	CPU	10	9
		24	6		CPU	CPU	10	10
					CPU	CPU	10	10
Parts	CD ROM	8	4		CPU	CPU	10	14
Parts	CD ROM	8	5		CPU	CPU	10	15
		16	9		CPU	CPU	11	2
					CPU	CPU	11	3
Printer	COPIER	43	29		CPU	CPU	11	4
Printer	COPIER	60	75		CPU	CPU	11	5
		103	104		CPU	CPU	11	6
					CPU	CPU	11	7
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CPU	CPU	30	11		CPU	CPU	35	14
CPU	CPU	30	15		CPU	CPU	35	15
CPU	CPU	30	17		CPU	CPU	35	15
CPU	CPU	30	19		CPU	CPU	35	19
CPU	CPU	30	20		CPU	CPU	35	23
CPU	CPU	30	20		CPU	CPU	36	10
CPU	CPU	30	22		CPU	CPU	36	11
CPU	CPU	30	23		CPU	CPU	36	14
CPU	CPU	30	24		CPU	CPU	36	18
CPU	CPU	31	4		CPU	CPU	36	18
CPU	CPU	31	4		CPU	CPU	36	24
CPU	CPU	31	6		CPU	CPU	36	27
CPU	CPU	31	8		CPU	CPU	36	35
CPU	CPU	31	23		CPU	CPU	37	4
CPU	CPU	32	6		CPU	CPU	37	11
CPU	CPU	37	11		CPU	CPU	58	42
CPU	CPU	37	12		CPU	CPU	59	27
CPU	CPU	37	13		CPU	CPU	60	6
CPU	CPU	37	14		CPU	CPU	60	24

CPU	CPU	37	15		CPU	CPU	60	39
CPU	CPU	37	17		CPU	CPU	61	20
CPU	CPU	37	24		CPU	CPU	62	33
CPU	CPU	37	27		CPU	CPU	63	32
CPU	CPU	37	32		CPU	CPU	65	43
CPU	CPU	37	43		CPU	CPU	67	36
CPU	CPU	38	8		CPU	CPU	67	45
CPU	CPU	38	12		CPU	CPU	68	38
CPU	CPU	38	21		CPU	CPU	68	42
CPU	CPU	38	22		CPU	CPU	68	45
CPU	CPU	38	24		CPU	CPU	69	58
CPU	CPU	38	25		CPU	CPU	70	66
CPU	CPU	38	39		CPU	CPU	77	41
CPU	CPU	39	3		CPU	CPU	83	38
CPU	CPU	39	7		CPU	CPU	83	80
CPU	CPU	39	9		CPU	CPU	252	35
CPU	CPU	39	10				12469	6934
CPU	CPU	39	10					
CPU	CPU	39	11		CRT	CRT	8	7
CPU	CPU	39	14		CRT	CRT	12	6
CPU	CPU	39	15		CRT	CRT	12	12
CPU	CPU	39	22		CRT	CRT	13	5
CPU	CPU	39	25		CRT	CRT	13	6
CPU	CPU	40	20		CRT	CRT	13	7
CPU	CPU	40	20		CRT	CRT	13	8
CPU	CPU	41	16		CRT	CRT	13	13
CPU	CPU	41	35		CRT	CRT	13	14
CPU	CPU	42	19		CRT	CRT	13	26
CPU	CPU	42	21		CRT	CRT	14	3
CPU	CPU	42	23		CRT	CRT	14	12
CPU	CPU	42	25		CRT	CRT	14	12
CPU	CPU	42	31		CRT	CRT	14	13
CPU	CPU	43	33		CRT	CRT	14	17
CPU	CPU	46	28		CRT	CRT	14	25
CPU	CPU	46	28		CRT	CRT	15	3
CPU	CPU	47	15		CRT	CRT	15	4
CPU	CPU	48	20		CRT	CRT	15	4
CPU	CPU	48	24		CRT	CRT	15	5
CPU	CPU	48	30		CRT	CRT	15	5
CPU	CPU	49	23		CRT	CRT	15	5
CPU	CPU	49	29		CRT	CRT	15	6
CPU	CPU	49	33		CRT	CRT	15	6
CPU	CPU	50	15		CRT	CRT	15	8
CPU	CPU	51	29		CRT	CRT	15	9
CPU	CPU	52	27		CRT	CRT	15	9
CPU	CPU	52	33		CRT	CRT	15	10
CPU	CPU	54	32		CRT	CRT	15	10
CPU	CPU	56	20		CRT	CRT	15	10
CPU	CPU	56	22		CRT	CRT	15	11
CPU	CPU	56	29		CRT	CRT	15	11
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CRT	CRT	15	14		CRT	CRT	18	8
CRT	CRT	15	16		CRT	CRT	18	8
CRT	CRT	15	16		CRT	CRT	18	9

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CRT	CRT	16	2	CRT	CRT	18	11
CRT	CRT	16	5	CRT	CRT	18	11
CRT	CRT	16	6	CRT	CRT	18	12
CRT	CRT	16	7	CRT	CRT	18	12
CRT	CRT	16	7	CRT	CRT	18	12
CRT	CRT	16	7	CRT	CRT	18	12
CRT	CRT	16	9	CRT	CRT	18	12
CRT	CRT	16	10	CRT	CRT	18	12
CRT	CRT	16	11	CRT	CRT	18	13
CRT	CRT	16	12	CRT	CRT	18	13
CRT	CRT	16	13	CRT	CRT	18	13
CRT	CRT	16	13	CRT	CRT	18	13
CRT	CRT	16	13	CRT	CRT	18	13
CRT	CRT	16	15	CRT	CRT	18	13
CRT	CRT	16	15	CRT	CRT	18	14
CRT	CRT	16	15	CRT	CRT	18	14
CRT	CRT	16	17	CRT	CRT	18	14
CRT	CRT	16	21	CRT	CRT	18	15
CRT	CRT	17	5	CRT	CRT	18	16
CRT	CRT	17	6	CRT	CRT	18	17
CRT	CRT	17	7	CRT	CRT	18	17
CRT	CRT	17	7	CRT	CRT	18	18
CRT	CRT	17	8	CRT	CRT	18	18
CRT	CRT	17	8	CRT	CRT	18	18
CRT	CRT	17	9	CRT	CRT	18	19
CRT	CRT	17	10	CRT	CRT	18	19
CRT	CRT	17	10	CRT	CRT	18	19
CRT	CRT	17	10	CRT	CRT	18	20
CRT	CRT	17	11	CRT	CRT	18	21
CRT	CRT	17	11	CRT	CRT	19	6
CRT	CRT	17	12	CRT	CRT	19	6
CRT	CRT	17	12	CRT	CRT	19	8
CRT	CRT	17	13	CRT	CRT	19	9
CRT	CRT	17	13	CRT	CRT	19	10
CRT	CRT	17	14	CRT	CRT	19	13
CRT	CRT	17	15	CRT	CRT	19	14
CRT	CRT	17	15	CRT	CRT	19	15
CRT	CRT	17	15	CRT	CRT	19	16
CRT	CRT	17	16	CRT	CRT	19	21
CRT	CRT	18	3	CRT	CRT	20	5
CRT	CRT	18	4	CRT	CRT	20	6
CRT	CRT	18	5	CRT	CRT	20	6
CRT	CRT	18	5	CRT	CRT	20	6
CRT	CRT	18	5	CRT	CRT	20	7
CRT	CRT	18	5	CRT	CRT	20	9
CRT	CRT	18	6	CRT	CRT	20	10
CRT	CRT	18	6	CRT	CRT	20	10
CRT	CRT	18	6	CRT	CRT	20	10
CRT	CRT	20	12	CRT	CRT	23	10
CRT	CRT	20	12	CRT	CRT	23	10
CRT	CRT	20	13	CRT	CRT	23	11
CRT	CRT	20	14	CRT	CRT	23	12
CRT	CRT	20	15	CRT	CRT	23	13
CRT	CRT	20	16	CRT	CRT	23	14

CRT	CRT	20	17	CRT	CRT	23	15
CRT	CRT	20	18	CRT	CRT	23	15
CRT	CRT	20	26	CRT	CRT	23	15
CRT	CRT	20	29	CRT	CRT	23	15
CRT	CRT	20	40	CRT	CRT	23	15
CRT	CRT	21	2	CRT	CRT	23	16
CRT	CRT	21	3	CRT	CRT	23	16
CRT	CRT	21	3	CRT	CRT	23	16
CRT	CRT	21	4	CRT	CRT	23	17
CRT	CRT	21	6	CRT	CRT	23	17
CRT	CRT	21	7	CRT	CRT	23	18
CRT	CRT	21	7	CRT	CRT	23	18
CRT	CRT	21	7	CRT	CRT	23	19
CRT	CRT	21	8	CRT	CRT	23	19
CRT	CRT	21	10	CRT	CRT	23	19
CRT	CRT	21	11	CRT	CRT	23	19
CRT	CRT	21	11	CRT	CRT	23	21
CRT	CRT	21	12	CRT	CRT	23	21
CRT	CRT	21	12	CRT	CRT	24	8
CRT	CRT	21	14	CRT	CRT	24	10
CRT	CRT	21	15	CRT	CRT	24	11
CRT	CRT	21	17	CRT	CRT	24	15
CRT	CRT	21	17	CRT	CRT	24	15
CRT	CRT	21	17	CRT	CRT	24	16
CRT	CRT	21	18	CRT	CRT	24	17
CRT	CRT	21	22	CRT	CRT	24	20
CRT	CRT	22	8	CRT	CRT	25	9
CRT	CRT	22	8	CRT	CRT	25	12
CRT	CRT	22	9	CRT	CRT	25	16
CRT	CRT	22	9	CRT	CRT	25	17
CRT	CRT	22	12	CRT	CRT	25	17
CRT	CRT	22	14	CRT	CRT	26	8
CRT	CRT	22	14	CRT	CRT	26	9
CRT	CRT	22	16	CRT	CRT	26	10
CRT	CRT	22	16	CRT	CRT	26	10
CRT	CRT	22	16	CRT	CRT	26	11
CRT	CRT	22	17	CRT	CRT	26	11
CRT	CRT	22	18	CRT	CRT	26	12
CRT	CRT	22	18	CRT	CRT	26	12
CRT	CRT	22	18	CRT	CRT	26	12
CRT	CRT	22	20	CRT	CRT	26	13
CRT	CRT	22	20	CRT	CRT	26	16
CRT	CRT	23	6	CRT	CRT	26	17
CRT	CRT	23	6	CRT	CRT	26	17
CRT	CRT	23	6	CRT	CRT	26	20
CRT	CRT	23	8	CRT	CRT	26	21
CRT	CRT	23	8	CRT	CRT	26	26
CRT	CRT	23	9	CRT	CRT	27	4
CRT	CRT	27	4	CRT	CRT	28	33
CRT	CRT	27	5	CRT	CRT	29	7
CRT	CRT	27	5	CRT	CRT	29	16
CRT	CRT	27	6	CRT	CRT	29	16
CRT	CRT	27	7	CRT	CRT	29	20
CRT	CRT	27	8	CRT	CRT	29	20
CRT	CRT	27	8	CRT	CRT	30	11

CRT	CRT	27	9	CRT	CRT	30	12
CRT	CRT	27	10	CRT	CRT	30	14
CRT	CRT	27	10	CRT	CRT	30	17
CRT	CRT	27	11	CRT	CRT	30	19
CRT	CRT	27	14	CRT	CRT	30	19
CRT	CRT	27	14	CRT	CRT	30	21
CRT	CRT	27	14	CRT	CRT	30	23
CRT	CRT	27	15	CRT	CRT	30	28
CRT	CRT	27	17	CRT	CRT	30	30
CRT	CRT	27	18	CRT	CRT	31	2
CRT	CRT	27	19	CRT	CRT	31	9
CRT	CRT	27	20	CRT	CRT	31	10
CRT	CRT	27	21	CRT	CRT	31	10
CRT	CRT	27	22	CRT	CRT	31	13
CRT	CRT	27	27	CRT	CRT	31	21
CRT	CRT	28	5	CRT	CRT	31	22
CRT	CRT	28	5	CRT	CRT	31	23
CRT	CRT	28	5	CRT	CRT	32	11
CRT	CRT	28	6	CRT	CRT	32	12
CRT	CRT	28	7	CRT	CRT	32	13
CRT	CRT	28	8	CRT	CRT	32	16
CRT	CRT	28	8	CRT	CRT	32	16
CRT	CRT	28	8	CRT	CRT	32	18
CRT	CRT	28	8	CRT	CRT	32	20
CRT	CRT	28	11	CRT	CRT	32	21
CRT	CRT	28	11	CRT	CRT	32	22
CRT	CRT	28	12	CRT	CRT	32	22
CRT	CRT	28	12	CRT	CRT	32	25
CRT	CRT	28	13	CRT	CRT	32	28
CRT	CRT	28	13	CRT	CRT	32	28
CRT	CRT	28	14	CRT	CRT	32	28
CRT	CRT	28	14	CRT	CRT	33	8
CRT	CRT	28	14	CRT	CRT	33	13
CRT	CRT	28	14	CRT	CRT	33	15
CRT	CRT	28	14	CRT	CRT	33	19
CRT	CRT	28	17	CRT	CRT	33	22
CRT	CRT	28	17	CRT	CRT	34	4
CRT	CRT	28	18	CRT	CRT	34	7
CRT	CRT	28	18	CRT	CRT	34	13
CRT	CRT	28	18	CRT	CRT	34	14
CRT	CRT	28	19	CRT	CRT	34	17
CRT	CRT	28	19	CRT	CRT	34	19
CRT	CRT	28	19	CRT	CRT	34	19
CRT	CRT	28	19	CRT	CRT	34	20
CRT	CRT	28	19	CRT	CRT	34	21
CRT	CRT	28	21	CRT	CRT	34	22
CRT	CRT	28	25	CRT	CRT	34	22
CRT	CRT	35	10	CRT	CRT	56	36
CRT	CRT	35	24	CRT	CRT	57	39
CRT	CRT	35	27	CRT	CRT	57	45
CRT	CRT	36	13	CRT	CRT	60	12
CRT	CRT	36	16	CRT	CRT	60	24
CRT	CRT	36	17	CRT	CRT	66	39
CRT	CRT	36	17	CRT	CRT	70	45
CRT	CRT	36	18	CRT	CRT	70	49

CRT	CRT	36	20	CRT	CRT	72	37
CRT	CRT	36	21	CRT	CRT	72	52
CRT	CRT	36	29	CRT	CRT	78	57
CRT	CRT	36	29	CRT	CRT	79	17
CRT	CRT	36	29	CRT	CRT	80	60
CRT	CRT	37	15			11149	6464
CRT	CRT	37	16				
CRT	CRT	37	23	Parts	D BOARDS	30	16
CRT	CRT	37	25				
CRT	CRT	38	27	Parts	DISK DR	38	23
CRT	CRT	40	19	Parts	DISK DR.	32	15
CRT	CRT	40	25			70	38
CRT	CRT	40	28				
CRT	CRT	40	30	Misc.	ELECTROME	26	11
CRT	CRT	41	10				
CRT	CRT	41	20	Parts	HARD DR	10	4
CRT	CRT	42	15	Parts	HARD DR.	14	7
CRT	CRT	42	23	Parts	HARD DR.	20	8
CRT	CRT	42	31	Parts	HARD DR.	20	17
CRT	CRT	42	32	Parts	HARD DR.	22	12
CRT	CRT	42	32	Parts	HARD DR.	12	2
CRT	CRT	43	7			98	50
CRT	CRT	43	17				
CRT	CRT	43	22	CPU	IN. SYS.	8	5
CRT	CRT	43	26	CPU	IN. SYS.	10	7
CRT	CRT	43	29	CPU	IN. SYS.	10	10
CRT	CRT	43	29			28	22
CRT	CRT	43	36				
CRT	CRT	43	39	KEY BD	KEY BD	3	1
CRT	CRT	44	10	KEY BD	KEY BD	3	1
CRT	CRT	44	19	KEY BD	KEY BD	4	1
CRT	CRT	44	24	KEY BD	KEY BD	4	2
CRT	CRT	45	8	KEY BD	KEY BD	4	2
CRT	CRT	45	23	KEY BD	KEY BD	6	7
CRT	CRT	46	31	KEY BD	KEY BD	6	7
CRT	CRT	47	23	KEY BDS	KEY BDS	10	4
CRT	CRT	48	35	KEY BDS	KEY BDS	10	11
CRT	CRT	49	28	KEY BDS	KEY BDS	20	3
CRT	CRT	49	29			70	39
CRT	CRT	49	41				
CRT	CRT	50	15	Main Fr.	MAIN FRAME	127	240
CRT	CRT	50	17				
CRT	CRT	51	26	Misc.	MISC	4	3
CRT	CRT	52	18	Misc.	MISC	4	3
CRT	CRT	52	30	Misc.	MISC	4	3
CRT	CRT	55	29	Misc.	MISC	4	4
Misc.	MISC	4	4	PRINTER	PRINTER	12	7
Misc.	MISC	4	7	PRINTER	PRINTER	12	7
Misc.	MISC	4	8	PRINTER	PRINTER	12	7
Misc.	MISC	4	10	PRINTER	PRINTER	12	8
Misc.	MISC	4	13	PRINTER	PRINTER	12	10
Misc.	MISC	5	11	PRINTER	PRINTER	12	11
Misc.	MISC	8	5	PRINTER	PRINTER	12	15
Misc.	MISC	8	12	PRINTER	PRINTER	13	5
Misc.	MISC	10	4	PRINTER	PRINTER	13	6

Misc.	MISC	10	5		PRINTER	PRINTER	14	1
Misc.	MISC	10	15		PRINTER	PRINTER	14	4
Misc.	MISC	12	9		PRINTER	PRINTER	14	4
Misc.	MISC	19	20		PRINTER	PRINTER	14	5
Misc.	MISC	20	5		PRINTER	PRINTER	14	9
Misc.	MISC	20	13		PRINTER	PRINTER	14	10
Misc.	MISC	21	23		PRINTER	PRINTER	14	11
Misc.	MISC	25	14		PRINTER	PRINTER	14	13
Misc.	MISC	26	16		PRINTER	PRINTER	15	2
Misc.	MISC	33	11		PRINTER	PRINTER	15	4
Misc.	MISC	52	8		PRINTER	PRINTER	15	6
Misc.	MISC	53	16		PRINTER	PRINTER	15	7
		368	242		PRINTER	PRINTER	15	8
					PRINTER	PRINTER	15	9
CPU	MODEM	3	1		PRINTER	PRINTER	15	13
CPU	MODEM	5	3		PRINTER	PRINTER	15	13
CPU	MODEM	7	3		PRINTER	PRINTER	15	15
CPU	MODEM	8	3		PRINTER	PRINTER	16	6
		23	10		PRINTER	PRINTER	16	9
					PRINTER	PRINTER	16	9
A/V	OVERHEAD	5	1		PRINTER	PRINTER	16	16
A/V	OVERHEAD	5	2		PRINTER	PRINTER	16	19
A/V	OVERHEAD	5	2		PRINTER	PRINTER	17	6
A/V	OVERHEAD	5	2		PRINTER	PRINTER	17	7
A/V	OVERHEAD	5	3		PRINTER	PRINTER	17	8
A/V	OVERHEAD	5	3		PRINTER	PRINTER	17	17
A/V	OVERHEAD	12	16		PRINTER	PRINTER	18	4
		42	24		PRINTER	PRINTER	18	4
					PRINTER	PRINTER	18	4
Misc.	PHYSIOGRAPH	45	11		PRINTER	PRINTER	18	5
					PRINTER	PRINTER	18	6
PRINTER	PRINTER	9	11		PRINTER	PRINTER	18	6
PRINTER	PRINTER	10	4		PRINTER	PRINTER	18	6
PRINTER	PRINTER	10	4		PRINTER	PRINTER	18	7
PRINTER	PRINTER	10	5		PRINTER	PRINTER	18	7
PRINTER	PRINTER	10	5		PRINTER	PRINTER	18	7
PRINTER	PRINTER	11	2		PRINTER	PRINTER	18	8
PRINTER	PRINTER	11	3		PRINTER	PRINTER	18	9
PRINTER	PRINTER	11	4		PRINTER	PRINTER	18	10
PRINTER	PRINTER	11	8		PRINTER	PRINTER	18	10
PRINTER	PRINTER	12	3		PRINTER	PRINTER	18	12
PRINTER	PRINTER	12	4		PRINTER	PRINTER	18	13
PRINTER	PRINTER	12	4		PRINTER	PRINTER	19	7
PRINTER	PRINTER	12	4		PRINTER	PRINTER	19	11
PRINTER	PRINTER	12	5		PRINTER	PRINTER	19	21
PRINTER	PRINTER	20	4		PRINTER	PRINTER	27	24
PRINTER	PRINTER	20	6		PRINTER	PRINTER	28	5
PRINTER	PRINTER	20	8		PRINTER	PRINTER	28	8
PRINTER	PRINTER	20	9		PRINTER	PRINTER	28	9
PRINTER	PRINTER	20	10		PRINTER	PRINTER	29	6
PRINTER	PRINTER	20	11		PRINTER	PRINTER	29	9
PRINTER	PRINTER	20	12		PRINTER	PRINTER	30	8
PRINTER	PRINTER	20	12		PRINTER	PRINTER	32	11
PRINTER	PRINTER	20	14		PRINTER	PRINTER	34	22
PRINTER	PRINTER	20	20		PRINTER	PRINTER	38	5

PRINTER	PRINTER	21	3		PRINTER	PRINTER	40	26
PRINTER	PRINTER	21	4		PRINTER	PRINTER	41	24
PRINTER	PRINTER	21	6		PRINTER	PRINTER	47	24
PRINTER	PRINTER	21	7		PRINTER	PRINTER	49	36
PRINTER	PRINTER	21	8		PRINTER	PRINTER	50	25
PRINTER	PRINTER	21	8		PRINTER	PRINTER	52	34
PRINTER	PRINTER	21	9		PRINTER	PRINTER	53	41
PRINTER	PRINTER	21	13		PRINTER	PRINTER	54	36
PRINTER	PRINTER	21	18		PRINTER	PRINTER	58	19
PRINTER	PRINTER	21	18		PRINTER	PRINTER	58	37
PRINTER	PRINTER	22	4		PRINTER	PRINTER	58	47
PRINTER	PRINTER	22	4		PRINTER	PRINTER	60	65
PRINTER	PRINTER	22	4		PRINTER	PRINTER	62	50
PRINTER	PRINTER	22	5		PRINTER	PRINTER	63	48
PRINTER	PRINTER	22	9		PRINTER	PRINTER	68	45
PRINTER	PRINTER	22	10		PRINTER	PRINTER	69	46
PRINTER	PRINTER	22	10		PRINTER	PRINTER	69	89
PRINTER	PRINTER	22	11		PRINTER	PRINTER	69	89
PRINTER	PRINTER	22	13		PRINTER	PRINTER	70	63
PRINTER	PRINTER	22	13		PRINTER	PRINTER	72	21
PRINTER	PRINTER	22	13		PRINTER	PRINTER	78	25
PRINTER	PRINTER	23	3		PRINTER	PRINTER	90	28
PRINTER	PRINTER	23	5		PRINTER	PRINTER	93	40
PRINTER	PRINTER	23	5				3933	2155
PRINTER	PRINTER	23	6					
PRINTER	PRINTER	23	9		A/V	PROJECTOR	5	4
PRINTER	PRINTER	23	9		A/V	PROJECTOR	5	4
PRINTER	PRINTER	23	11		A/V	PROJECTOR	6	3
PRINTER	PRINTER	23	11		A/V	PROJECTOR	12	2
PRINTER	PRINTER	23	12		A/V	PROJECTOR	14	2
PRINTER	PRINTER	23	12		A/V	PROJECTOR	42	14
PRINTER	PRINTER	23	15				84	29
PRINTER	PRINTER	23	16					
PRINTER	PRINTER	23	25		Misc.	READER	16	2
PRINTER	PRINTER	24	6					
PRINTER	PRINTER	24	8		Misc.	SCALE	14	6
PRINTER	PRINTER	24	13					
PRINTER	PRINTER	24	15		Misc.	SCOPE	10	22
PRINTER	PRINTER	25	12					
PRINTER	PRINTER	26	13		A/V	STEREO	12	6
PRINTER	PRINTER	26	14		A/V	STEREO	12	25
PRINTER	PRINTER	26	25		A/V	STEREO	26	23
PRINTER	PRINTER	27	6				50	54
PRINTER	PRINTER	27	13					
A/V	TAPE REC	8	10					
A/V	TAPE REC	16	8					
		24	18					
CRT	TV	17	6					
CRT	TV	18	45					
CRT	TV	26	15					
CRT	TV	30	15					
CRT	TV	40	8					
CRT	TV	41	13					
CRT	TV	41	22					

CRT	TV	42	22					
CRT	TV	42	23					
CRT	TV	42	24					
CRT	TV	46	21					
CRT	TV	46	28					
CRT	TV	55	18					
CRT	TV	55	27					
CRT	T.V.	57	72					
CRT	TV	60	26					
CRT	TV	62	20					
CRT	TV	65	40					
CRT	TV	68	25					
		853	470					
Misc.	TYPEWRITER	28	5					
A/V	VCR	13	1					
A/V	VCR	15	7					
A/V	VCR	15	11					
A/V	VCR	17	7					
		60	26					
	Totals	29694	16880					