# Report Methodology

The labor and overhead rates applied in this report reflect our latest information on labor costs in the manufacturing country. (See the Labor Summary for location and rates) Some parts may be manufactured elsewhere, if so the location is reflected in the individual part cost estimates. These reports are normalized to represent a company large enough to function profitably in the highly competitive computer and peripheral industry on a worldwide basis. This company is considered able to afford the level of tooling and purchasing power required for very high volume and low manufacturing costs. It is believed that this normalization process results in a cost estimate which fairly represents a typical world class manufacturer of products.

Since components must be able to compete on a worldwide basis, they are manufactured wherever it makes the best economic sense for the manufacturer. Component costs are therefore similar whether purchased in the US, Asia or Europe. Tooling and factory equipment are also competing on a worldwide basis, which tends to level the overhead costs of product manufacturing.

The major differences in manufacturing cost from one country to another are in the cost of labor. Direct labor costs, however, are very small numbers when compared to the cost of the tooling required for high volume fabrication and manufacturing of the piece parts, components, and product subassemblies. As much as is possible, the labor rates and overhead rates used in these reports intend to reflect the location of the manufacturing effort.

## *Manufacturing Labor Cost*

The hourly labor costs for mechanical assembly and electronics assembly for this MCA Report are noted on the Labor Summary sheet. The basic hourly rate is determined by the manufacturing geographical location. The more comprehensive overhead rate is a function of the location as well as the estimated annual production volume for the product. The sum of these two amounts determines the hourly manufacturing assembly cost for both, the mechanical and electronics assemblies, taking into account the location and estimated production volume of the subject report.

A very important part of Cypress Lab's research effort is dedicated to tracking the labor costs in various countries that manufacture for the hi-tech industries. Currently, the labor costs for 23 countries are tracked in the Cypress Labs database. A change in either the manufacturing location or the estimated production volume can dramatically affect the product cost estimates.

In many cases major assemblies are made in various locations other than the location noted on the Labor Summary sheet. When that occurs, the actual location is noted on the data sheet detailing that assembly and the associated labor cost is used for that specific estimate.

## *Overhead Costs*

The overhead (OH) rate estimate shown on the LABOR SUMMARY sheet is applied to the ASSY and PCB labor hourly rates. This estimate includes factors for most elements of overhead costs such as: employee benefits, facilities, factory capital expense, product specific tooling, production engineering expense (test, methods, sustaining), and all material support including purchasing, receiving, warehouse, and shipping & receiving expenses.

These same overhead cost elements are included for fabricated parts as described in EACH above. Also included is the depreciation of capital equipment such as presses, general case shears, brakes, dies, fixtures, jigs, test systems, test computers and software, and Etc.

Overhead costs not included are license fees, management allocation, dead time on the assembly line, and scrap costs.

Specific costs for molds, dies, and progressive tooling used only on the part being estimated is listed in the tooling column.

### *Component Costs*

Some components and subassemblies are custom made for a specific manufacturer and quotes are not obtainable since they are proprietary to that manufacturer. In these cases, estimates on devices with similar functional specifications are used to estimate the cost of the custom part. In most of these cases, it is assumed that the use of a custom part either is less expensive or allows a much greater functionality. Sometimes it does both.

For these reports, we cannot ask vendors for price quotes on parts. A price quote is a contractual process, which results in a binding price with all of the legal conditions attached. These reports use budgetary engineering cost estimates, which are non-binding quotes, relieving the vendor of the formalities of a real quote. Engineers that make choices between competing components or architectures early on in the design process usually use budgetary engineering estimates.

The purchasing power of a large corporation should also be considered in estimation of competitive component costing quotes. Frequently the purchasing group, in these large companies, can negotiate parts costs based on much higher quantities by lumping the parts volumes for all product purchased from a given vendor. No estimates are included in this report for the cost of licensing fees, or royalties. For all of these reasons, in these reports, for any given component the lowest conceivable price is used.

### *Commodity Components*

These are the staple components of the electronics industry. Capacitors, resistors, diodes, power transistors, zeners, connectors, are examples. Even fans and stepper motors can fall into the commodity category. These components can be categorized by voltage, power, packaging, or some other parameter and lumped together for estimating purposes.

Many of the microprocessors and memory components are also commodity components. However, special effort is generally made to obtain prices since these are typically among the higher priced items.

An effort is made to identify all major components by reference to IC master parts guides, vendors' data sheets, distributor catalogs, and advertising in current technical periodicals. Many times, however, the part cannot be identified by the component markings. In this case, the functional area is identified and an estimate based on the required functionality is used.

### *Proprietary Integrated Circuits*

Custom integrated circuits, such as ASIC's and programmable gate array's (PGA), are among the more difficult parts to estimate. The packaging and pin count provide clues, but the silicon content (number of gates, process, etc.) is not easily identifiable. In most cases, a cost based on the circuit functionality and the known cost of a similar part is used. A large portion of the electronics cost can be comprised of these custom integrated circuits due to their immense complexity. This is an important part of the estimation process.

A proprietary algorithm is used in very difficult cases as the costing method. This algorithm uses whatever information is available to calculate the estimated cost. Information, such as, pin count, package type, material type, chip dimension, technology level, power dissipation, yield, and/or operation frequency is entered, the missing data is estimated and the algorithm calculates a cost estimate.

### *Printed Circuit Boards*

# REPORT METHODOLOGY

PCBs costs are estimated using the size and number of layers approach. An algorithm that computes the largest number of boards per panel is used to arrive at the PCB cost, with adders for gold tabs, solder masking, silk screening or other special processing.

It is assumed that high-volume assembly methods are used using pick and place machines and SMT machinery to populate and flow solder the board. Some boards require hand assembly of some components and these are estimated accordingly. Computerized test of all completed printed wiring boards is assumed and incorporated into the estimating model.

## *Plastic Parts*

All molded plastic parts are weighed and the material is identified if possible (frequently marked on larger parts due to recycling efforts). This information is used along with assumptions about cycle time, number of cavities in the mold, rejected parts percentage, and the cost per hour of running the assumed press. In very large parts, the material cost is a significant part of the cost, in very small ones, the material is very small and the machine costs dominate.

## *Optical parts*

The costs of optical parts made from glass or quartz crystal optical parts costs are dominated by the time required for grinding in the optical specifications, which are assumed in these reports. These parts costs are typically estimated by a time and material method derived from traditional optical manufacturing processes.

## *Molded Optical Parts*

Very complex molded plastic optical parts are being used very effectively in modern products. The cost of these parts is just somewhat higher than any similar sized plastic part, since the complexity has been incorporated into the mold. These parts are estimated by the plastic algorithm method with an adjustment factor for optical grade plastic.

## *Metal parts*

Highly automated extremely accurate stamping processes manufacture steel, aluminum, brass, beryllium copper, and other metal parts today. Stamped parts and parts made with other processes such as sintering, casting, welding, machining, and combinations of these processes are always found in contemporary products. The costs for these parts are estimated by use of proprietary algorithms using material type, weight, and other factors to calculate an estimated cost.

## *Assembly methods*

Many plastic parts are designed to use snap together assembly techniques. This applies to gears and other small parts as well as the ‘skins’ of the device. This leads to very rapid assembly. However, screws are still the major fasteners used for both metal and plastic assembly. It is assumed that automated fastener assembly drivers are available. Assembly is always estimated to be laboring intensive and not fully automated unless so noted.

## *OEM subassemblies*

Frequently, certain subassemblies are purchased on an OEM basis from vendors specializing in these subassemblies. Power supplies, modem modules, memory sims, and display panels are typical examples. If such an OEM subassembly is identified as a standard commodity part, it is estimated as a purchased part and noted as such. If such a part is in unique form factor, it is estimated as a manufactured assembly.