


# Kozio Hardware Test Software ROI Calculator

[v3]

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- Overview:**
- ▶ This spreadsheet allows you to quickly evaluate the return on investment of using test software to verify your custom processor-based hardware design.
  - ▶ A number of assumptions have been made, with default values, such as the typical hourly wage paid to a person performing a given task, the time needed to complete a given task, and other such assumptions.
  - ▶ All assumptions can be modified on the second worksheet!
  - ▶ We filled in all assumptions based on our past experience but we suggest you use your last project as a guideline.

- Notes:**
- ▶ This spreadsheet contains four separate worksheets; namely: Instructions, Assumptions, Results, and Definitions.
  - ▶ The assumption values are divided into three columns based on: reusing existing test code, writing test code from scratch, or purchasing Kozio software.
  - ▶ All values are calculated using US Dollars.
  - ▶ **Prices are not actual but representative. Contact Kozio for full pricing details at [info@kozio.com](mailto:info@kozio.com), 303.776.1356, or [www.kozio.com](http://www.kozio.com).**

- Step 1:**
- ▶ Select the Assumptions tab to review the assumptions made.  
Three columns of assumptions are listed: one for reusing existing code, one for starting from scratch, and one for using Kozio.
  - ▶ The Definitions worksheet provides additional information for each assumption.
  - ▶ Modify any cell with a blue background. **Example:** 
  - ▶ Calculated values are show in red: **Example:** **123**

- Step 2:**
- ▶ Review the Results worksheet!
  - ▶ Calculated values are show in red: **Example:** **123**

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|  | Code Reuse | From Scratch | Using Kozio |
|--|------------|--------------|-------------|
| <b>General:</b>                                |            |              |             |
| Engineer wage (yearly):                        | \$130,000  | \$130,000    | \$130,000   |
| Engineer wage (hourly):                        | \$62.50    | \$62.50      | \$62.50     |
| Technician wage (yearly):                      | \$85,000   | \$85,000     | \$85,000    |
| Technician wage (hourly):                      | \$40.87    | \$40.87      | \$40.87     |
| Board spin cost:                               | \$4,000    | \$4,000      | \$4,000     |
| <b>Code Development:</b>                       |            |              |             |
| Diagnostic code effort (weeks):                | 7          | 28           | 0           |
| Manufacturing functional test effort (weeks):  | 8          | 32           | 0           |
| POST effort (weeks):                           | 4          | 12           | 0           |
| <b>Board Bring Up:</b>                         |            |              |             |
| First board testing (weeks):                   | 4          | 6            | 2           |
| Number of hardware defects found:              | 4          | 4            | 4           |
| Effort to isolate HW and reproduce (days):     | 2          | 3            | 1           |
| Time spent debugging software (days):          | 5          | 10           | 0           |
| Number of board spins:                         | 2          | 2            | 1           |
| <b>Application Development:</b>                |            |              |             |
| Hardware issues found:                         | 4          | 4            | 4           |
| Effort to isolate to HW and reproduce (hours): | 16         | 16           | 1           |
| <b>Manufacturing Test:</b>                     |            |              |             |
| Test integration and debug (weeks):            | 3          | 8            | 1           |
| Test & serialization time per board (minutes): | 4          | 5            | 2           |
| Boards manufactured (annually):                | 2,000      | 2,000        | 2,000       |
| <b>Returns:</b>                                |            |              |             |
| Number of returns (annually):                  | 100        | 100          | 100         |
| Effort to diagnose failure (hours):            | 2          | 2            | 2           |
| Effort to update manufacturing test (hours):   | 16         | 24           | 8           |

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|  | Code Reuse      | From Scratch     |
|--|-----------------|------------------|
| <b>Development:</b>                      |                 |                  |
| Code development cost:                   | \$17,500        | \$70,000         |
| First board testing:                     | \$10,000        | \$15,000         |
| Effort to isolate HW and reproduce:      | \$4,000         | \$6,000          |
| Time spend debugging software:           | \$2,500         | \$5,000          |
| Board spins:                             | \$8,000         | \$8,000          |
| Isolate HW and reproduce during App dev. | \$4,000         | \$4,000          |
| <b>Total cost of doing it yourself:</b>  | <b>\$46,000</b> | <b>\$108,000</b> |
| Kozio software price (Note 1):           | \$11,000        | \$11,000         |
| Hours saved using Kozio software:        | 492             | 1,439            |
| Savings using Kozio software (Note 2):   | \$23,750        | \$85,750         |
| <b>ROI using Kozio:</b>                  | <b>107%</b>     | <b>385%</b>      |

|   |                 |                  |
|---|-----------------|------------------|
| <b>Manufacturing:</b>                   |                 |                  |
| Code development cost:                  | \$20,000        | \$80,000         |
| Test integration and debug:             | \$7,500         | \$20,000         |
| Test & serialization cost (annual):     | \$5,449         | \$6,811          |
| <b>Total cost of doing it yourself:</b> | <b>\$32,949</b> | <b>\$106,811</b> |
| Kozio software price (Note 1):          | \$11,000        | \$11,000         |
| Hours saved using Kozio software:       | 467             | 1,660            |
| Savings using Kozio software (Note 2):  | \$16,724        | \$90,587         |
| <b>ROI using Kozio:</b>                 | <b>103%</b>     | <b>558%</b>      |

|   |                 |                 |
|---|-----------------|-----------------|
| <b>Returns:</b>                         |                 |                 |
| POST code development cost:             | \$10,000        | \$30,000        |
| Effort to diagnose failure:             | \$8,173         | \$8,173         |
| Effort to update manufacturing test:    | \$1,000         | \$1,500         |
| <b>Total cost of doing it yourself:</b> | <b>\$19,173</b> | <b>\$39,673</b> |
| Kozio software price (Note 1):          | \$3,000         | \$3,000         |
| Hours saved using Kozio software:       | 168             | 496             |
| Savings using Kozio software (Note 2):  | \$7,500         | \$28,000        |
| <b>ROI using Kozio:</b>                 | <b>64%</b>      | <b>240%</b>     |

## Notes:

- (1) - Contact Kozio for actual pricing and multi-product discount.
- (2) - Cost savings using Kozio software adds in the cost of time spent debugging hardware using Kozio software. Time is still required to debug hardware although Kozio software speeds up all efforts.

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## General:

- Engineer wage (yearly): ▶ Senior level engineer annual salary, fully burdened
- Engineer wage (hourly): ▶ Calculated as (Yearly/52)/40
- Technician wage (yearly): ▶ Technician annual salary, fully burdened
- Technician wage (hourly): ▶ Calculated as (Yearly/52)/40
- Board spin cost: ▶ Cost of design, layout, and assembly of revised board

## Code Development:

- Diagnostic code effort (weeks): ▶ Effort to design, code, and test board bring-up diags
- Manufacturing functional test effort (weeks): ▶ Assumes the base diagnostic code is already done
- POST effort (weeks): ▶ Assumes the base diagnostic code is already done

## Board Bring Up:

- First board testing (weeks): ▶ How long to test the first board revision fully
- Number of hardware defects found: ▶ How many defects discovered by the HW team in time listed
- Effort to isolate HW and reproduce (days): ▶ Effort to modify SW, or script SW, to isolate HW issue
- Time spent debugging software (days): ▶ Time needed to debug SW used to test HW
- Number of board spins: ▶ Number of times the board is re-assembled after changes

## Application Development:

- Hardware issues found: ▶ Number of HW issues found by application developers
- Effort to isolate to HW and reproduce (hours): ▶ Kozio is proven OS and application-independent SW

## Manufacturing Test:

- Test integration and debug (weeks): ▶ Effort to integrate and debug reused or new MFG test code
- Test & serialization time per board (minutes): ▶ How long does it take to run the MFG test SW per board
- Boards manufactured (annually): ▶

## Returns:

- Number of returns (annually): ▶ Number of boards returned for fault analysis
- Effort to diagnose failure (hours): ▶ How good is the software at fault isolation
- Effort to update manufacturing test (hours): ▶ Assumes Kozio is updated via ASCII script file, no coding