

Ready to invest in automation? Discover a practical way to move from idea to a proven system with fewer surprises between concept and purchase to retire risk early, define scope, and stay within budget.



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Common Automation Pitfalls

15

Frequent issues to avoid: blind quoting, missing worst-case parts, fuzzy changeovers, deferred data needs, and underplanned maintenance and spares.

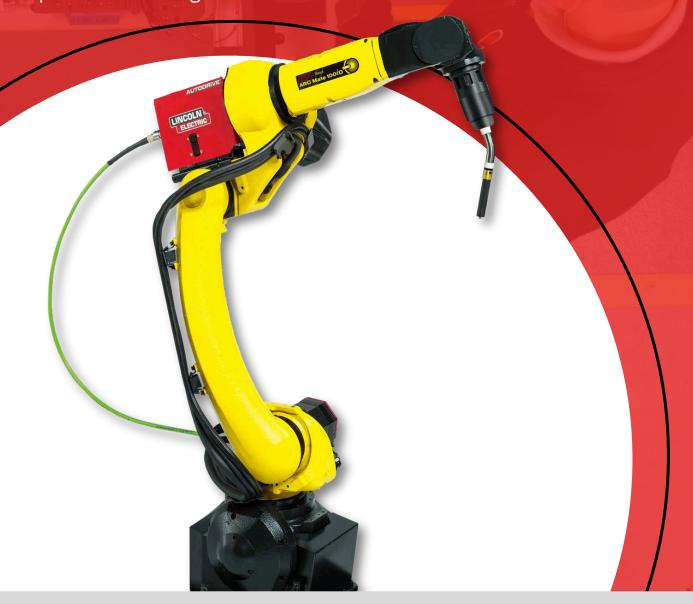
The approved design is engineered, procured, assembled, and tested at the builder; you receive as-builts, code backups, spares, and O&M information.

About Cardinal Machine Company 17 Who we are, what we build, and how our collaborative process helps firsttime buyers move from concept to proven systems with fewer surprises.

NEW TO AUTOMATION? **START HERE.**

The most expensive failures in automation aren't discovered at buy-off; they're embedded into the project at kickoff. Skipping straight to a quote or build forces vendors to price assumptions, not scope, which later surface as change orders, slippage, and underperforming cells.

The reliable remedy is a staged, evidence-driven design process that converts unknowns into decisions before detailed engineering or procurement begins.



WHY A PHASED APPROACH MATTERS

A structured sequence replaces guessing with evidence. Here's why the order works:

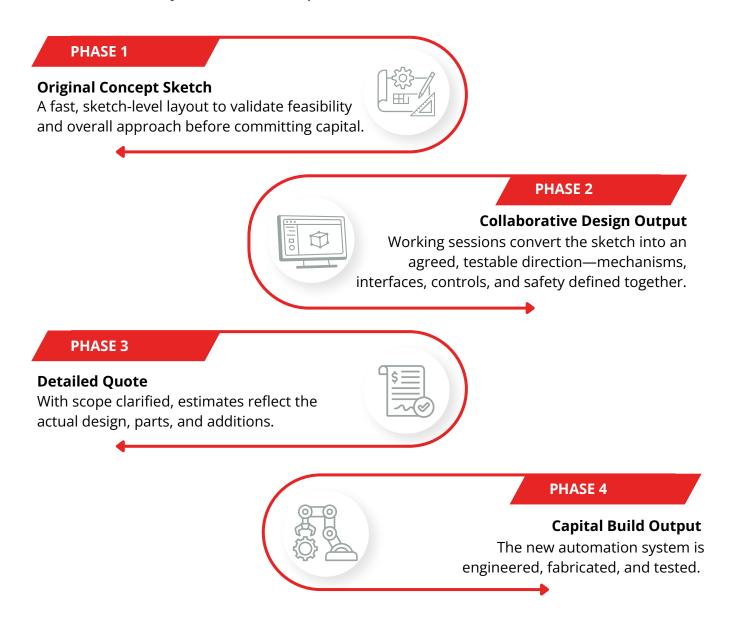
- **Avoid Blind Quoting.** Early "ballpark" numbers are rough because risks aren't known yet. A concept sketch gives direction, but it's not enough to lock in intrinsic vs. extrinsic costs.
- Expose Early Risks. In collaborative design, practical concepts and layouts surface issues with part handling, vision, fixturing, safety, and interfaces before engineering.
- **Build Shared Direction.** By the time you receive the detailed quote, both sides are aligned on scope, assumptions, and what the system must do.
- **Reduce Surprises Later.** Pricing after collaboration reflects the real work, so it's more likely to match the finished system.

This approach is especially helpful for teams new to automation because it replaces "we hope this will work" with a sequence designed to find problems early, when they're fastest and least expensive to fix, creating a clear win/win for your team and your budget.



THE FOUR PHASES THAT DE-RISK YOUR AUTOMATION PROJECT

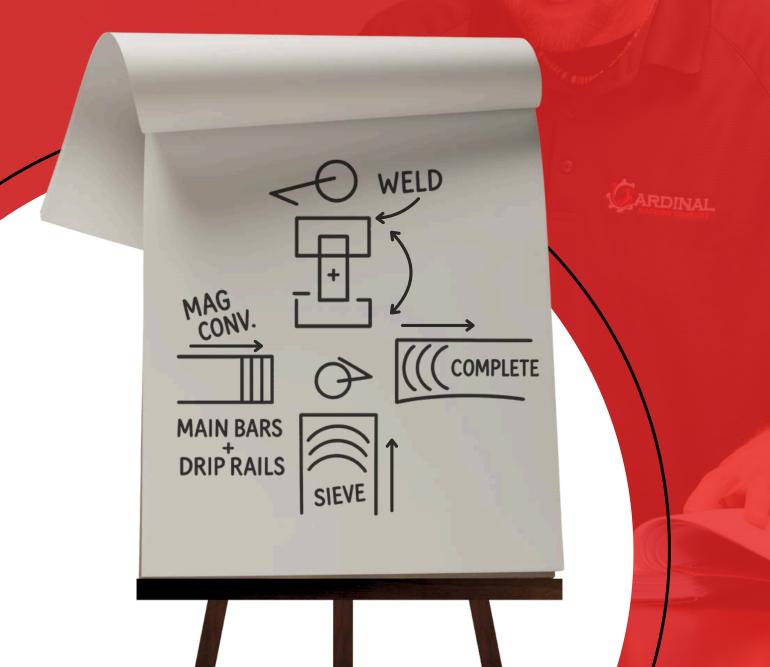
A new automation project works best when decisions are made in the correct order. The phases below turn a rough idea into a defined, test-backed plan so scope is clear, risk drops, and pricing becomes more accurate before you commit capital.



Expect a living number throughout the entire design process. Estimates should tighten phase by phase as the risk profile is optimized and scope boundaries are locked.

PHASE 1: CONCEPT SKETCH (PRE-ORDER)

Set direction with a simple layout and planning-only budget so everyone sees the same starting point.



Before any design is set in motion, you and the machine builder align on what the machine must do and how it could look. In the initial consult, the goal is to define the problem the automation will solve and what "good" looks like in plain terms.

You'll walk the current process step by step—what parts run, typical cycle times, where work backs up, and any variability in parts, fixtures, or materials. You'll also cover mix and volume expectations (minimum, typical, peak), how often product changes happen, and how fast changeovers need to be.

THE CONCEPT SKETCH IS THE ONLY HONEST BASIS FOR AN EARLY BUDGETARY CAPITAL ESTIMATE.

After the consult, Application Engineers draft a simple concept sketch showing how parts could move, where operations would sit, and how the concept fits your floor space. This turns discussion into something concrete you can react to.

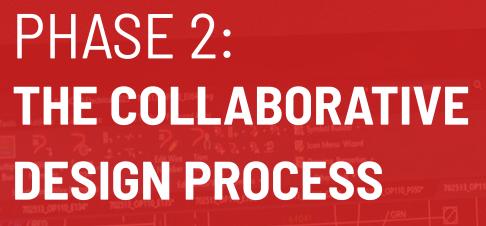
Uncertainty is still high; this figure is for planning only, but the consultation and sketch provide a visual direction and begin to define a general approach for your process.



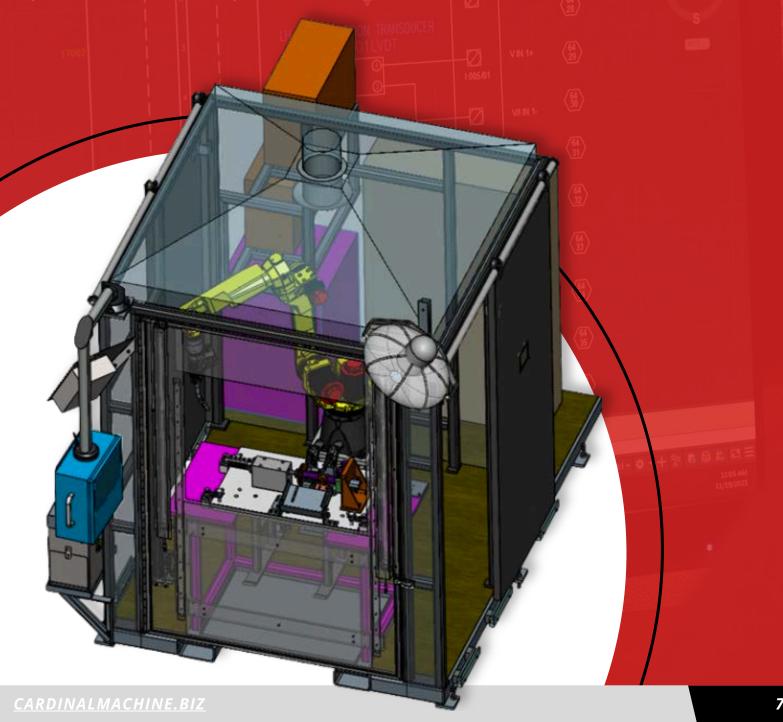
(tight clearances, awkward part handling, inspection needs).

Get a first look at a budgetary capital estimate.

Without this step, you're effectively blind-quoting without a shared picture, which invites wide price ranges and scope gaps. That's precisely why the next phase is crucial: it replaces guesswork with evidence before any major purchase is made.



Use real parts, quick trials, and CAD to convert the sketch into a test-backed plan with named components.



Collaborative design is the phase that turns a rough idea into a real, test-backed plan. With a modest purchase order, the team develops an accurate layout and creates 3D CAD models so everyone can see how the system will actually work and what parts will be included. The goal is to replace guesswork with evidence before making any major purchase.

In this phase, Project Engineers and Lead Mechanical Designers (machine-build experts) work side-by-side with your product and process to co-create the solution. Together, they trial actual—and "worst-case"—parts to prove the toughest steps first (handling, inspection, joining), then refine a practical layout that shows part flow, station placement, and operator/service access.

WHAT YOU RECEIVE:

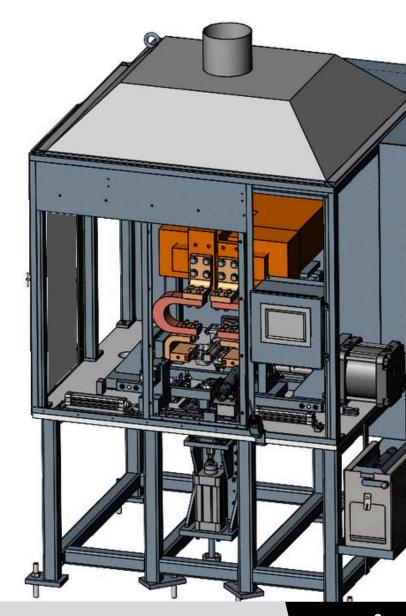
THE COLLABORATIVE DESIGN OUTPUT



A transferable design package: drawing PDFs and 3D drawings with the specific robots, conveyors, pivots, tooling, and controls identified.



All intellectual property created in this stage will be customer-owned at the resolution of the contract.



WHY IS THE COLLABORATIVE DESIGN PROCESS SO IMPORTANT?

Collaborative design changes pricing confidence. Early budgetary numbers are educated guesses.

AFTER COLLABORATIVE DESIGN, PRICING REFLECTS THE DEFINED COMPONENTS AND METHODS.

Without this, you're effectively moving from a sketch to a significant capital decision without evidence. That's where surprises, redesign loops, schedule slips, and change orders begin, because assumptions about parts, cycle times, changeovers, and safety weren't resolved up front.

Because the solution is now defined in clear terms with named components and a layout that fits your space, the detailed quote can mirror reality. Assumptions are spelled out, and builders can describe the path to proving performance (at the builder and on your floor) plainly.

This is what makes the next phase's number the most realistic one you'll see in the project.

PHASE 3: DETAILED QUOTE WITH REAL NUMBERS

Built on the first two phases, this quote minimizes surprises and aligns price, schedule, and expectations with what will actually be built.



Think of this phase more as an outcome, a refined result of phases one and two. The concept sketch established direction; the collaborative design lowered the risk profile, named major components, and aligned with your space's layout. Without those phases, a quote is just an educated guess. With them, it becomes the most realistic, lowest-risk number in the project.

A proper, detailed quote translates the evidence you've already gathered into a clear plan: what the system will do, how it interfaces with existing equipment, and how results will be proven at the builder and on your floor. It also makes responsibilities explicit, so hand-offs or missing items don't slow installation and ramp-up.

WHAT IT SHOULD CAPTURE:

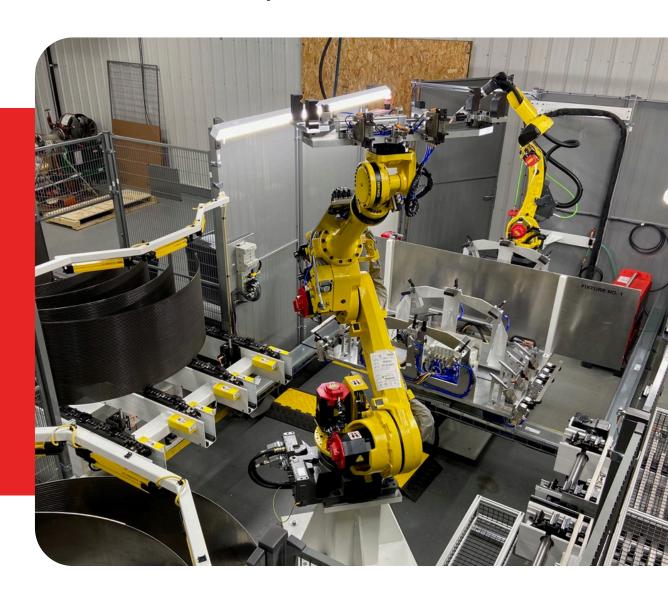
- The defined scope and boundaries (what's in, what's out, and key interfaces).
- Assumptions that drive performance (mix/volume ranges, cycle time, changeover method, inspection/marking needs, operating exceptions, and party responsibilities).
- Named components and quantities (robots, conveyors, pivots, tooling, and controls).
- How performance will be demonstrated (builder tests and on-site checks).
- Training, documentation to be delivered, and the support approach.



Convert scope to a working machine—tested, documented, and ready for performance on your floor.



The capital build is the execution phase, the final phase of your project. The defined design is engineered in detail, procured, assembled, and tested at the builder before it reaches your floor.



After the design is set and the capital build is purchased, mechanical, electrical, and controls work moves from drawings to hardware; long-lead items are ordered; stations come online; motions are tuned; and safety functions are verified.

The system is then run at the builder against the checks outlined in the detailed quote, ideally with representative (including borderline) parts, so issues are corrected.

PHASE 4 IS THE DIRECT CONTINUATION OF THE EARLIER WORK

PHASE 1

Set the overall approach and fit for the entire project; mapping flow, key mechanisms, and requirements.

PHASE 2

Resolved the hard questions with trials and CAD, and named the actual components—robots, conveyors, pivots, tooling, controls, and safety approach—that the build team now engineers, purchases, and assembles.

PHASE 3

Locked scope, interfaces, assumptions, and the "prove-it" plan; those items serve as the guardrails here: the design freeze reflects the quoted scope, the builder tests trace to the quoted acceptance checks, and the handoff materials match what the quote promised.

When the first three phases are done correctly, this final phase is predictable: assemble the defined components, verify performance against agreed checks, and prepare a clean handover.

END-OF-PHASE DELIVERABLES

- Built system tested by the builder to the agreed expectations
- As-built mechanical and electrical drawings
- Operation and maintenance information appropriate for your team

COMMON PITFALLS (AND HOW TO AVOID THEM)

Avoid blind quotes, fuzzy changeovers, and deferred data needs that drive the most common cost hikes and delays.





THE MOST COMMON OVERSIGHTS INCLUDE:

- Treating Early Numbers as Final. Budgetary quotes serve to shape direction; only detailed quotes, developed after collaboration, reflect the final scope.
- Skipping Worst-Case Parts in Trials. Systems should be proven with the full range of real parts, not just perfect samples.
- Fuzzy Changeovers. Define what changes, how often, and how long it should take; confirm the method during design.
- Leaving Data and Labeling to "Later." Decide what must be recorded or marked early so the system can support it.
- Underplanning Maintenance. Plan for routine upkeep, critical spares, and clear access to service points.

CARDINAL MACHINE COMPANY MEETING MANUFACTURING

REQUIREMENTS WORLDWIDE

Meet the team that guides automation buyers from concept to proven machines with a collaborative, low-risk process.





WHY CHOOSE CARDINAL MACHINE?

Cardinal Machine Company is a Michigan-based designer and builder of custom automation systems. We help manufacturers plan, engineer, and integrate equipment that improves throughput, quality, and safety.

Our work spans concept engineering, collaborative design, detailed build, and long-term support.

HOW WE ENGAGE (OUR PHASED PROCESS)

- **Initial Consult:** We start with a one-hour conversation about your process, parts, volumes, and constraints. From that, we produce a concept sketch and a budgetary capital estimate for planning.
- Collaborative Design (small PO): A focused, paid design engagement that
 replaces guesswork with evidence. Using your actual parts, we trial the tricky
 steps, refine the cell layout, and specify the components—robots, conveyors,
 pivots, tooling, controls, and safety. You stay in the driver's seat through
 weekly design reviews, questioning, redirecting, and approving decisions.
 This keeps scope transparent, validates progress against hours, and builds
 trust before major capital is committed.
 - **Transferable Design Package:** PDF drawings and 3D views naming the actual components and explaining the approach. You own this output.
 - **Note:** as the scope is clarified, price accuracy improves.
- Quote (detailed scope, low risk): Based on the collaborative output, we issue a detailed quote that mirrors the defined layout, components, interfaces, assumptions, and the plan to prove performance. If you proceed with Cardinal Machine, the design PO is applied to the project total and supports initial design/purchasing.
- Capital Build: We complete mechanical/electrical/controls engineering, procure components, assemble, and test the system at Cardinal in accordance with the agreed expectations.

WE'RE AUTHORIZED SERVICE INTEGRATORS

Whether you're taking your first step into automation or managing an extensive program with a niche requirement, Cardinal Machine meets you where you are, hands-on, adaptable, and reliable.

We bring the expertise of a large corporation with the attentiveness of a family-owned company, pairing deep engineering capability with genuine responsiveness.

FANUC

Cardinal Machine is a FANUC Authorized System Integrator, which means our customers get FANUC's proven robotic technology combined with Cardinal's custom engineering and machine-building expertise. We design robotic systems around your exact parts and processes to boost quality, throughput, and uptime—delivering automation that's reliable, maintainable, and built for strong ROI.



FANUC

As a Flexiv robotics system integrator, Cardinal has full access to the Rizon 4, Rizon 4s, and Rizon 10 robotic arms and the Moonlight parallel robot. They can be integrated into existing production lines or used for stand-alone applications. Combining adaptive force control technology with a robot that can work collaboratively with a human operator offers even more potential solutions to complex tasks.



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WORLDWIDE SOLUTIONS

RELIABLE SOLUTIONS FOR COMPLEX MANUFACTURING CHALLENGES



ENGINEERING & MACHINE DESIGN

Cardinal can provide a complete design package, including mechanical, electrical, fluid power, and software design.



ROBOTIC MACHINE SOLUTIONS

Cardinal Machine Company routinely integrates robotic equipment in a wide variety of manufacturing applications.



CUSTOM MACHINE BUILDING

Our custom machine design and engineering teams have leveraged advanced technology to build world-class machines.



SPECIALTY MACHINE PROCESSES

Cardinal Machine offers a fully staffed special machines team with expertise in designing, building, and validating custom automation solutions.



SYSTEMS INTEGRATION

From stand-alone machines and fixtures, to complete automation lines, Cardinal Machine Company has the experience to fill your manufacturing needs.



REBUILDING COMISSIONING

Services provide you with like-new machines and performance, with the latest technology, at a fraction of the cost of new.