



# Reverse Engineering

Design, Qualification & Manufacturing Services for  
Reliable Replacement of Obsolete Equipment



If a legacy manufacturer could still supply an obsolete item to the original quality level, would you buy it from them?

**The answer is often yes—and that is who Kinectrics wants to be—your industry source for reliable replacement components that look, function, and perform like the originals installed many years ago.**

## THE KINETRICS APPROACH TO REVERSE ENGINEERING (RE)

Kinectrics uses an integrated approach to reverse engineering. The component's safety function is defined based on customer technical specifications, station wiring diagrams, OEM literature, and legacy component walk-down. Critical design characteristics based on FMEA analysis of the safety function are then derived. This rigorous process ensures that the replacement component not only meets the customer's technical specification but is fit for system use.

The replacement component is based on legacy design where possible to avoid introducing new failure mechanisms into the system.

We apply an approach based on a Timeless Design Principle, which takes into account, and effectively addresses, the potential for eventual product obsolescence in even the best product designs.

Kinectrics uses basic circuit-building components such as resistors, capacitors, op-amps and avoids microprocessors, multiplexers and all-in-one integrated circuits, enabling Kinectrics' designs to be readily updated if a discrete component becomes obsolete.

We protect the customer's investment in Kinectrics branded products. For instance, if packaging becomes obsolete, Kinectrics can easily re-design the Printed Circuit Board (PCB) with the new footprint and continue future manufacturing of the product with only minor qualification reconciliation.

Kinectrics RE specialists understand maintenance and calibration requirements of legacy components and improve designs where possible to reduce the effort required to maintain components. For example:

- Selecting tantalum capacitors in place of wetted aluminum electrolytic, so they do not require replacement over useful component life
- Using low drift military grade operation amplifiers to reduce calibration frequency
- Arranging mechanical design so components do not have to be completely disassembled for routine maintenance

We ensure the replacement component can be installed in the existing locations and, be connected to electrical / mechanical process connections with the same terminal labeling to avoid the need to update existing system wiring diagrams.

Knowing how the design requirements delta and component OPEX affect the replacement component and, providing the required integration of material experts, EMC design and Human Factors engineering specialists can evaluate and implement modifications from the legacy design to meet the new requirements.



## REVERSE ENGINEERING CENTRE OF EXCELLENCE

Kinectrics has expanded its services with a new Centre of Excellence for RE. The new facility features 3,200 square foot lab and office space as well as a large separate, secure area for inventory, Project Management Engineering, and dedicated areas for Prototype Design and Production/Testing.

Kinectrics' rigorous RE process ensures replacement components look, function and perform like the originals and, are fit for system use.

Utilizing services, from material testing in our analytical labs to consulting with our polymer and metallurgy experts, Kinectrics can analyze properties and select the best materials.

In addition, Kinectrics has in-house equipment, including high current and high voltage labs, seismic tables, LOCA chambers, temperature and humidity ovens, and electronics and mechanical test labs to fully support product testing. Other capabilities, from our in-house machine shop to electronic soldering stations, enable the RE team to efficiently assemble products under the control of Kinectrics' QA program.

## OUR CAPABILITIES

### Power Supplies

- Linear power supplies
- Switching power supplies
- Dual redundant power supplies

### Neutron Based Amplifiers

- Ion chamber amplifiers
- In-core flux detector amplifiers
- Neutron over power amplifiers

### Digital Signal Processing

- Input signal processing PCB
- Output signal processing PCB
- Digital signal multiplexes
- CPU modules
- Fibre optic transmitter and receivers

### Control Panels – Design, Build & Qualification

- Power distribution
- Uninterrupted power supplies
- Automatic transfer switches
- Process monitoring & control

### Indicating Meters

- Analog indicating meters
- Analog indicating alarm meters
- Digital indicating meter (software free)

### Comparator / Alarm Units

- Shut-off rod logic units
- Current / voltage alarms

### Analog Controllers

- Analog based PID controllers
- Square root extractors

### Electromechanical Relays & Timers

- Telephone type electromechanical relays
- High power relays
- Solid state timers
- Liquid level controllers

### Other

- Liquid level controllers
- Contacting conductivity cells
- Custom fabricated connectors

## PLANT DESIGN ENGINEERING SUPPORT FOR OBSOLESCENCE ISSUES

- Perform Equipment Replacement Studies and System Assessments to determine options for replacing equipment with an alternate manufacturer or model
- Develop Technical Requirements Specifications identifying the Critical Characteristics of the component
- Perform Equivalency Evaluations to determine if selected replacement meets the Critical Characteristics identified in the Technical Requirements Specification
- Perform Modifications for replacing and/or upgrading components to ensure that the appropriate configuration control documents (drawings, calculations, etc.) are revised accordingly.
- Evaluate and approve vendor qualification and testing data for replacement parts
- Provide EQ, Seismic and 50.59 evaluations if required

*Kinectrics Reverse Engineering specialists can develop and produce the reliable cost-effective solutions for nuclear components utilities need, but are not available because the manufacturer no longer exists, no longer operates under a Nuclear QA program, or no longer supports the legacy piece of equipment required.*

## COMPLETE IN-HOUSE PRODUCT TESTING FACILITIES

- Dedicated Reverse Engineering Facility
- Mechanical Testing Lab
- Seismic tables
- Steam facility / LOCA chambers
- Thermal aging ovens
- Machining and prototyping shop
- Materials characterization, analysis & selection
- Electrical Testing – HV & HC Labs



## THE KINECTRICS TEAM

The Kinectrics dedicated reverse engineering team is comprised not only of designers capable of producing electronic circuits, schematics and PCB layouts, it also includes mechanical engineers capable of designing enclosures to meet seismic requirements, and system-based engineers who understand device interconnectivity.

Our RE team has extensive experience in the design, qualification and forensic analysis of high reliability and precision electrical and mechanical components. All projects are managed by dedicated project managers and supported by Kinectrics' industry-leading facilities and technical experts.

### Our Documentation

With unrivalled in-depth experience in creating precision replacements for obsolete products—often from limited, incomplete information—our design team has a heightened appreciation of the need to provide full product support documentation.

Kinectrics' detailed documentation comprises qualification reports traceable to procedures, technical specifications, training records and calibrated measurement and test equipment. Kinectrics recognizes the importance of creating a detailed paper trail to facilitate the maintenance, troubleshooting and forensic analysis of our design throughout its full life cycle.

We provide an accurate and complete documentation package, from the installation drawings needed to install the component, to the assembly drawings, bills of material, data sheets, and fabrication drawings required to procure replacement components and perform item equivalency evaluations.



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