

ELECTRICAL AND ELECTRONICS REPAIRERS

A DEEP DIVE FOR SKILLS-BASED HIRING

REV: 04/04/16

Occupation Overview: Electrical and Electronics Repairers

Foundational Competencies

- **Critical Thinking:** Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
- **Quality Control Analysis:** Conducting tests and inspections of products, services, or processes to evaluate quality or performance.
- **Operation Monitoring:** Watching gauges, dials, or other indicators to make sure a machine is working properly.
- **Complex Problem Solving:** Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
- **Judgment and Decision Making:** Considering the relative costs and benefits of potential actions to choose the most appropriate one.
- **Troubleshooting:** Determining causes of operating errors and deciding what to do about it.
- **Mathematics:** Using mathematics to solve problems.
- **Systems Analysis:** Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.
- **Monitoring:** Monitoring/assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.
- **Active Learning:** Understanding the implications of new information for both current and future problem solving and decision making.

Occupation-Specific Competencies

- **Equipment Maintenance/Repair:** Proficiency with equipment assembly, maintenance, efficiency, repair, cleaning, installation, and inspection.
- **General Electrical Systems:** Experience with installation, identification and repair of wiring, transformers, and circuit breakers and use of voltmeters, ammeters, and wiring diagrams.
- **Signal Processing:** Ability to use power supplies, logical analyzers, oscilloscopes, multimeters, and signal generators for signal processing and DSP.
- **Brazing and Soldering:** Ability to use soldering irons for brazing and soldering.
- **Manufacturing Processes:** Understanding Six Sigma processes at a green or black belt levels, Kaizen, and lean manufacturing.
- **Administrative Functions:** Ability to provide administrative support with calendar maintenance and management, scheduling, travel arrangements, expense reports, and appointment setting.
- **Industrial Design:** Ability to create and/or use schematic diagrams, blueprints, and sketching when designing industrial products.
- **Validation:** Experience with cleaning validation, process validation, and Operational Qualification (OQ).
- **Microsoft Office:** Ability to create and utilize documents using programs such as Microsoft Word, Excel, PowerPoint, and Outlook.
- **Product Management:** Experience with concept and product development, management, and improvement.

Job Description (Example)

- Install, adjust, or maintain electronics equipment such as industrial controls, transmitters, and antennas.
- Performs basic routine test of circuit board assemblies, accessories, components, and mechanical assemblies.
 - Monitors test activities and records tests and repair results into the repair data repository.
 - Performs repairs on customer RMA equipment according to established procedures and standards. At times operates without supervision, with some latitude for independent judgment.
 - Ability to read and interpret repair instructions, assembly drawings, and work orders to determine work content.
 - Ability to utilize appropriate repair equipment and tools for assigned tasks.
 - Ensures that the final product meets customer configuration, original product specifications, update with the current applicable Engineering Change.
 - Notices and meets established quality requirements.

Activities (Example List)

- Test faulty equipment to diagnose malfunctions, using test equipment or software, and applying knowledge of the functional operation of electronic units and systems.
- Study blueprints, schematics, manuals, or other specifications to determine installation procedures.
- Repair or adjust equipment, machines, or defective components, replacing worn parts such as gaskets or seals in watertight electrical equipment.
- Maintain equipment logs that record performance problems, repairs, calibrations, or tests.
- Inspect components of industrial equipment for accurate assembly and installation or for defects such as loose connections or frayed wires.
- Perform scheduled preventive maintenance tasks such as checking, cleaning, or repairing equipment, to detect and prevent problems.
- Calibrate testing instruments and installed or repaired equipment to prescribed specifications.

Prioritized Foundational Competencies: Electrical and Electronics Repairers

Most Common Required Competencies	
1	Critical Thinking: Identifying problems, coming up with solutions and selecting the best one given the pros and cons; creating solutions when faced with unique or new production problems; considering safety in decisions; anticipating problems and precluding them (e.g., identifying flawed materials before use, preventative re-tooling, maintenance); coming up with ways to continuously improve.
2	Operation Monitoring: Watching gauges, dials, or other indicators to make sure a machine is working properly; able to maintain focus for the entire work period; following standard operating procedure (e.g., following a set route to monitor multiple machines, performing the right checks at each); watching for production flaws; identifying problems and resolving them properly given the relevant protocol.
3	Active Learning: Understanding the implications of new information for both current and future problem solving and decision making; seeking out knowledge proactively; having a learner's mindset – being open to continuously learn new information; able to learn from various different sources (e.g., formal learning, on-the-job training, coaching, and mentorship).

Most Preferred Competencies	
1	Critical Thinking: <i>See previous.</i>
2	Active Learning: <i>See previous.</i>
3	Troubleshooting: Determining causes of operating errors and deciding what to do about it; able to identify possible solutions to problems; knowing who to talk with about different types of problems (e.g., manager, co-worker); ideally, anticipating and precluding problems; recognizing variance in products or processes and, ideally, identifying the root causes of problems.

Most Evolving Competencies	
1	Judgment and Decision Making: Evolution due to increased business pressure driven by market shifts and global competition; changes increase value of efficiency (“do more with less”), business acumen and continuous improvement – every worker needs to think about the business implications and have ideas on how to improve.
2	Complex Problem Solving: Evolution driven by new technology, which has resulted in rapid changes to machinery, processes, quality systems, and lean techniques; this environment puts a premium on being able to think about customer needs and business implications and how to improve core processes.
3	Systems Analysis: Evolution due to technology and increasingly-complex customer needs; changes result in many more ways of doing something; puts higher value on being able to think about operations “holistically”; increasingly critical to think about how to tie production equipment, staff, and process together in the best way to meet customer needs and create business value.

Most Common Break Point Competencies	
1	Active Learning: <i>See previous.</i>
2	Critical Thinking: <i>See previous.</i>
3	Operation Monitoring: <i>See previous.</i>

Most Hard-to-Find Competencies	
1	Complex Problem Solving: Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions; able to handle ambiguity; identifying root causes of problems, ideally including novel problems; some knowledge of Six Sigma and 5 Whys; able to think through how to change and improve processes; ideally, comes up with creative and valuable ideas.
2	Systems Analysis: Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes; specifically, able to think about process flow changes to address new needs or improve operations.
3	Judgment and Decision Making: Considering the relative costs and benefits of potential actions to choose the most appropriate one; exercising good judgment about safety (“safety should never be compromised”); ideally, able to demonstrate some business acumen by understanding how the work product helps the customer and delivers bottom line impact.

Prioritized Occupation-Specific Competencies: Electrical and Electronics Repairers

Most Common Required Competencies	
1	Equipment Maintenance/Repair: Proficiency with equipment assembly, maintenance, efficiency, repair, cleaning, installation, and inspection.
2	Manufacturing Processes: Able to understand the end-to-end process flow and how one part affects another; ideally, basic knowledge of Kaizen and lean manufacturing; basic understanding of schematics and blueprints; ideally, some familiarity with Six Sigma.
3	General Electrical Systems: Experience with installation, identification, and repair of wiring, transformers, and circuit breakers and use of voltmeters, ammeters, and wiring diagrams; basic knowledge of motors and simple controllers.

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3	General Electrical Systems: <i>See previous.</i>

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Most Evolving Competencies	
1	Equipment Maintenance/Repair: Evolution due to machinery changing – machines can now do more things but have more parts and more complicated internal systems making maintenance more challenging; IT systems can now track more information making basic skills operating and using computer systems more valuable.
2	Manufacturing Processes: Evolution driven by globally distributed teams all now providing input; products changing and adapting quickly often in smaller production batches; machinery and tooling changing often now; these changes make it more important to understand the fundamental, core processes, being open to adapt and constantly looking for ways to optimize.
3	Industrial Design: Evolution due to rapid changes in products, machinery, tooling, and production (companies will often produce in smaller batches); changes place more value on creating and/or using schematic diagrams, blueprints, and sketching when designing industrial products and being able to change those over time to meet evolving needs.

Occupation Deep Dive: Electrical and Electronics Repairers

Job Titles Within This Occupation

- Control Technician
- Electrical and Instrument Mechanic
- Electrical and Instrument (E&I) Technician
- Electrical Maintenance Technician
- Electrical Technician
- Instrument and Control (I&C) Technician
- Repair Technician
- Service Technician
- Technical Support Specialist
- Industrial Maintenance
- PLC Technician

- Automation Technician

Certification and Education Preferences (Example)

- Associate Electronics Technician (CETa)
- Electronics Modules (EM1-5)
- Journeyman Status
- J Standard
- Electrical Mechanical

Tools Used (Example List)

- Grounding Hardware
- Pipe-Bending Tools
- Safety Harnesses or Belts
- Voltage or Current Meters
- Enterprise Resource Planning (ERP) Software

Other Relevant Foundational Competencies

1	Reading Comprehension
2	Active Listening
3	Speaking
4	Equipment Selection
5	Repairing
6	Systems Evaluation
7	Equipment Maintenance
8	Writing
9	Coordination
10	Time Management
11	Operation and Control
12	Persuasion
13	Social Perceptiveness
14	Learning Strategies
15	Service Orientation
16	Science
17	Instructing
18	Installation
19	Negotiation
20	Management of Personnel Resources
21	Technology Design
22	Operations Analysis
23	Management of Material Resources
24	Management of Financial Resources
25	Programming

Other Relevant Occupation-Specific Competencies

1	Employee Training
2	General Research Methodology
3	Workplace Safety
4	Circuitry
5	Hand Tools
6	Power Tools
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