Engineer – Electronics (Except Computer) (17-2072.00)

1. Greg's Comment

Just like in the case of Career Counselor, this one is cheating since we already know with the 65 year old Greg that he had a very successful 34 year career as an Electrical Engineer. However what is interesting is that, although Greg loved, and thoroughly enjoyed the technical aspects of this job including the problem solving and quiet, mostly indoor environment, the reality is that in large corporations this role has changed substantially since he started more than 40 years ago, mostly through intense structure, limiting creativity. So if he were entering the job market today a cautionary note would be to seek out a job at a company (probably a smaller company) where he could still express his creativity and problem solving skills in a way that is not overly encumbered by strict rules and guidelines.

2. What This Job Normally Is

Electronics Engineer (Except Computer) (17-2072.00)

Job Description

An Electronics Engineer designs, tests, improves, and maintains electronic systems and components that sense, process, transmit, or control electrical signals. This includes **analog and digital circuits, power electronics, sensors, instrumentation, communications hardware, and embedded electronics**—the physical layer beneath software.

This is not "coding with wires." It is applied engineering where math, physics, and standards turn into **real circuits that must work reliably under noise, heat, time, and manufacturing constraints**. The work emphasizes correctness, safety, signal integrity, and repeatability.

At its core, this role is about **making electrons behave predictably in the real world**.

What Most People in This Role Do (Day-to-Day)

Most working electronics engineers spend their time on practical, structured tasks such as:

- Designing circuits and subsystems (analog, digital, mixed-signal, RF, power)
- Selecting components and validating datasheets against requirements
- Simulating circuits and systems to verify performance before building
- Building prototypes; debugging with scopes, logic analyzers, spectrum analyzers, and meters
- Testing for noise, timing, thermal behavior, EMI/EMC, and reliability
- Working with PCB designers, firmware engineers, and manufacturing teams
- Troubleshooting field failures and performing root-cause analysis
- Documenting designs, test results, revisions, and compliance artifacts

Early-career roles emphasize **implementation and test**. With experience, the work shifts toward **architecture, design tradeoffs, standards compliance, and system ownership**.

Work-Life Balance

• Typically full-time, weekday schedules
• Deadline spikes around prototypes, test milestones, or production releases
• Most roles are home most nights; travel is usually limited and purposeful (labs, factories, installs)
• Generally more predictable than field-service or consulting engineering

Overall, this is a **stable, project-driven profession** with periodic intensity rather than constant crisis.

Why Employers Hire Electronics Engineers

Employers hire electronics engineers because:

• Hardware must work safely and reliably
• Failures are expensive, dangerous, or reputationally damaging
• Designs must meet standards (safety, EMC, regulatory)
• Someone must be accountable for signal integrity, power, timing, and correctness
• Software and AI cannot compensate for bad hardware

As systems become more automated, organizations place *more* value on engineers who can be trusted to get the physical layer right.

Typical Employers (By Name)

Electronics engineers work wherever hardware exists. Common employers include:

• Texas Instruments
• Analog Devices
• Intel
• Qualcomm
• Honeywell
• Raytheon
• Lockheed Martin
• Siemens
• Caterpillar

Many electronics engineers also work for regional manufacturers, medical device firms, utilities, labs, and industrial automation companies.

Typical Training Pathways

• Bachelor's degree in **Electrical Engineering** or **Electronics Engineering** (standard entry point)
• ABET-accredited programs strongly preferred
• Internships/co-ops with labs or manufacturers are extremely valuable
• Master's degree is optional; useful for RF, signal processing, power, or advanced design roles
• Professional licensure (PE) is situational; valuable in regulated industries

This is a rigorous but honest pathway: demanding coursework with a clear connection between theory and real hardware.

Projected Growth

Neutral

This is a mature profession. Demand fluctuates by industry (defense, energy, medical, industrial automation), but the core skill set remains broadly useful.

Impact of Technology

High (but increasing responsibility, not removing it)

a. Systems are increasingly mixed-signal and cyber-physical

Electronics engineers now design hardware that interacts with software, sensors, and networks. This raises the bar for correctness at the hardware level.

b. Simulation and EDA tools accelerate work—but don't replace judgment

Advanced tools allow rapid exploration and optimization. Bad assumptions, however, still produce confident but wrong results. Knowing **when not to trust the model** is a differentiator.

c. AI assists design exploration, not accountability

AI can suggest topologies or flag anomalies. It cannot:

- Guarantee safety
- Own compliance
- Take responsibility for failures

As complexity rises, **human accountability increases**.

d. Manufacturing feedback loops are tightening

Real-time test and field data increasingly inform design revisions. Electronics engineering becomes an ongoing stewardship role, not a one-off design task.

Similar Roles / Related Job Titles

- Electrical Design Engineer
- Analog / Mixed-Signal Design Engineer
- Power Electronics Engineer
- RF / Communications Engineer
- Controls / Instrumentation Engineer

Each stays grounded in real hardware with varying emphasis on analysis, testing, and system integration.

SOC Reference

This role aligns with the U.S. Bureau of Labor Statistics category:

Electrical and Electronics Engineers (Except Computer) (SOC 17-2072.00) — U.S. Bureau of Labor Statistics

3. Why This Role Is a Solid "Fit" (For Greg)

Electronics Engineer can be a strong fit for Greg **if** he genuinely enjoys the physical/measurable world of circuits and systems—not just the idea of "engineering." The fit hinges on whether Greg wants his math and structure expressed through **hardware problem-solving**.

Where the Fit Is Strong

a. Clear procedures, measurable correctness, and real "right vs wrong"

Greg is energized by:

- clear guidelines
- structured processes
- definite answers
- measurable outcomes

Electronics engineering delivers this more often than many white-collar careers because:

- circuits either meet specs or they don't
- signals either pass integrity thresholds or they don't
- hardware either survives temperature/noise/EMI or it fails

That creates a strong "effort → result" feedback loop, which fits Greg's cognitive style.

---

b. Deep alignment with detail orientation and disciplined thinking

Greg is naturally:

- methodical
- detail-first
- careful about micro-steps
- oriented toward completeness and correctness

Electronics engineering rewards exactly that, especially in:

- component selection and tolerance analysis
- debugging and root-cause
- test design and verification
- documenting revisions and compliance

In many engineering environments, the person who is carefully right is more valuable than the person who is quickly confident.

---

c. "Systems thinking" is core to the work

Greg's interests include AI, logistics, architecture, and "how things work."

Electronics engineering is essentially:

- understanding a system
- breaking it into subsystems
- designing interfaces
- validating behavior under constraints

That systems orientation is a real match for someone who enjoys invisible mechanisms and structured reasoning.

---

d. Fit with behind-the-scenes contribution

Greg prefers low public visibility and minimal performance pressure.

Electronics engineers often work in:

- labs
- engineering offices
- small cross-functional teams

The contribution is real but not performative. Credibility comes from:

- correct designs
- clean test results
- reliable documentation
- solved failures

That matches Greg's "quiet competence" style.

---

e. Stable environments and predictable routines are common

Many electronics engineers work in established organizations where:

- standards exist
- procedures exist
- schedules and milestones exist

This can align with Greg's desire for stability and predictable expectations—especially compared to sales, high-conflict roles, or customer-facing roles.

Honest Cautions (Important for Greg)

a. Some electronics roles are less "math clarity," more "debugging chaos"

Electronics engineering is not all clean equations.

Real world debugging can be:

- noisy signals
- intermittent failures
- "it works in the lab but fails in the field"
- unclear root causes

The job includes ambiguity—especially during bring-up and failure investigation.

Greg can handle ambiguity if it's structured and solvable, but he may find "mystery failures" draining if they become frequent.

---

b. Some roles involve pressure spikes and late-stage urgency

Many projects are calm until:

- prototype deadlines
- test milestones
- production release

Then urgency spikes:

- long lab nights
- rapid iteration
- compressed decision windows

Greg prefers planned deadlines and manageable pressure. He can likely tolerate periodic spikes, but should avoid environments where "always urgent" is normal.

---

c. Cross-functional collaboration is unavoidable

Even if the role is not customer-facing, it is not solitary.

Electronics engineers routinely coordinate with:

- PCB designers
- firmware/software engineers
- manufacturing/test engineers
- quality and compliance teams

Greg can do this well if leadership is structured and goal-focused (which fits his profile), but he should not expect total independence.

---

d. Tech/AI increases capability, but also increases expectations

As tools improve (simulation, automation, AI-assisted design), the bar rises:

- faster iteration expected
- broader knowledge expected
- documentation and compliance rigor increases

This profession remains durable—but "average engineer" becomes less valuable than "engineer who can own systems, validate, and defend."

Greg's carefulness is an advantage if he embraces "ownership," not just task execution.

---

4. Breadth vs. Narrowness

(Reality Check — Not Fear)

"Electronics Engineer" is a broad umbrella. The day-to-day job can feel completely different depending on the specialization and industry.

How common is each specialization?

Very common

- **Embedded hardware / board-level design** (schematics, PCB coordination, bring-up, test)
- **Test and validation engineering** (verification, automated testing, reliability)
- **Industrial electronics / instrumentation** (sensors, measurement, controls interfaces)
- **Power electronics (moderately common)** (converters, motor drives, power supplies)

Common in specific industries

- **RF / communications** (more common in telecom/defense)
- **Signal integrity / high-speed design** (common where performance is extreme)
- **Safety/compliance engineering** (common in medical, automotive, industrial)

Less common but real (niche, high-skill)

- **Analog/mixed-signal IC design** (high barrier; specialized)
- **EMI/EMC specialist** (rare, but persistently needed)
- **Reliability/Failure analysis specialist** (rare but valuable)

Why rarity ≠ impossibility

Some niches are small because they require:

- deep expertise
- high accountability
- long learning curves

But they persist because failure is expensive or dangerous:

- medical devices
- automotive safety systems
- aerospace/defense electronics
- industrial automation

In electronics, rarity often signals:

- high consequence
- stable demand
- strong career leverage

How niches actually work in hiring

Most electronics engineers don't "pick" a niche at the start. Niches form like this:

1. You start in a general role (design/test/support)
2. You repeatedly touch one problem class (power issues, EMI, RF, reliability, bring-up)
3. You get good at it
4. People start routing those problems to you
5. Your niche becomes your identity and job security

Greg's strengths (reliability, detail, consistency) are exactly how this happens. People trust the engineer who:

- documents carefully
- doesn't hand-wave
- finds root causes
- produces repeatable fixes

Why interest + competence often beats volume

Electronics is not a career where "there are lots of jobs so you'll be fine" is the main story.

The main story is:

- competence creates trust
- trust creates ownership
- ownership creates stability

Even in a niche area, the engineer who is consistently correct and reliable becomes hard to replace.

Greg's "quiet competence" style fits this profession's real ladder.

Bottom Line of Chunk #2 (For Greg)

Electronics engineering fits Greg strongly when:

- he wants math and structure expressed through real physical systems
- he enjoys careful design + testing + problem-solving
- he prefers behind-the-scenes technical contribution in structured organizations

The main risks are:

- the ambiguity of real-world debugging
- pressure spikes near milestones
- the need for collaboration (not solitary work)

If Greg can accept "messy reality" as part of building real systems, this is one of the most naturally aligned engineering careers for his profile.

5. Who Actually Hires for These Roles

(Real organizations, real settings — so Greg can picture it)

Kinds of organizations (with names)

Semiconductors & electronic components (device makers, silicon, power, RF parts)

- Texas Instruments
- Analog Devices
- NXP Semiconductors
- Infineon Technologies
- Broadcom

BLS lists "semiconductor and other electronic component manufacturing" as one of the top employing industries for electronics engineers (except computer).

Telecommunications and communications hardware ecosystems

- Qualcomm
- Ericsson
- Nokia

BLS lists telecommunications as a top employer industry for electronics engineers (except computer).

Defense / aerospace / mission-critical electronics

- Lockheed Martin
- RTX (Raytheon)
- Northrop Grumman
- Boeing

BLS includes aerospace product and parts manufacturing among top industries for electrical engineers, and many electronics engineers work in similar defense/aerospace ecosystems.

Instrumentation / medical / controls / sensing (high reliability, regulated testing)

- Medtronic
- Abbott
- Honeywell
- Emerson

BLS lists "navigational, measuring, electromedical, and control instruments manufacturing" among top employing industries for electronics engineers (except computer).

Engineering services / R&D labs (the "design office" employers)

- Engineering services firms and R&D organizations (often project-based, multi-industry)
  BLS lists engineering services and R&D as major contexts for these engineers.

Federal government (non-postal)

Electronics engineers are also employed directly in federal government roles.

Sectors (where the work clusters)

BLS shows major concentration for electronics engineers (except computer) in:

- Telecommunications
- Federal government
- Semiconductor and electronic component manufacturing
- Engineering services
- Instruments/control/electromedical manufacturing

Environments (what it *feels* like day-to-day)

For Greg, you can picture three common “textures”:

1) Product design / lab environment

- You own a board, a subsystem, or an instrument
- Work cycles: design → simulate → prototype → test → debug → revise → document
- Lots of focused bench time with scopes, analyzers, test fixtures

2) Manufacturing / production support

- You work near factories and test lines
- Your day includes failure analysis, yield improvement, test automation, supplier issues
- Less pure design, more real-world robustness and root-cause work

3) Systems / mission-critical programs

- More documentation, reviews, and standards compliance
- Emphasis on verification, qualification testing, and long-lifecycle reliability

Most roles are office + lab. BLS notes office settings are typical, with some travel to project sites as needed.

---

6. How People Actually Get These Jobs

(Sequence that replaces anxiety)

Preparation — even in high school

If Greg were building a runway early, the highest-leverage prep is:

- **Math and physics readiness** (algebra → trig → calculus track is the real gateway)
- **Hands-on electronics exposure** (basic circuits, Arduino/embedded kits, soldering, measurement tools)
- **"Signal thinking" habits**: noise, tolerance, error sources, "what changed?" logic
- **Documentation habit**: lab notebook mindset (what you tried, what failed, what worked, why)

This field rewards the person who can both *build* and *explain*.

Education / Training (type and years)

BLS describes the typical entry requirement as a **bachelor's degree in a related engineering field** and notes employers value internships/co-ops.

A realistic sequence:

1. **Bachelor's in Electrical Engineering (EE)** (4 years; ABET-accredited is the safest default)
2. **Internship/co-op** (often the difference between "I know theory" and "I can ship hardware")
3. First role: board-level, test, validation, or manufacturing support (varies by employer)
4. Optional: **Master's** for deeper specialization (RF, signal integrity, power electronics, control systems)

Building a resume (what actually matters)

Electronics hiring is unusually "proof-driven." The strongest signals are:

- **Internships/co-ops** where you touched real hardware deliverables
- **Project evidence** (not glossy): schematics, PCB involvement, test results, debug notes
- Comfort with tools: CAD/EDA, simulation, instrumentation, and a little scripting
- References from engineers who trust your carefulness under constraints

Unlike many business roles, a personal project that actually works (and is documented) can matter.

First job titles (realistic entry points)

- Electronics Engineer I / Associate Electronics Engineer
- Electrical Design Engineer
- Hardware Engineer (non-computer focus)
- Test/Validation Engineer (electronics-heavy)
- Manufacturing/Test Engineer (electronics products)

Stepping-stone roles (if you need a ramp)

If someone isn't ready for design ownership immediately:

- Engineering technician roles (lab/test-heavy) → then engineer
- Test engineering roles → then design
- Manufacturing support roles → then design or reliability

It's common to "enter through test" and migrate into design as competence and trust accumulate.

Certifications vs degrees (reality)

- The **degree** is the main gate for engineer roles.
- Licensure (PE) is situational—more relevant in regulated public-infrastructure contexts than in many product electronics roles.
- What matters most long-term is **ownership + shipped work + credibility**.

---

7. What Makes Someone Competitive

(Differentiators, not buzzwords — with the AI reality included)

Early-career differentiators

1) Debug discipline

People who win early can:

- isolate variables
- form testable hypotheses
- instrument the problem
- prove root cause instead of guessing

2) "Specs-first" mindset

Strong juniors learn to think:

- requirements → constraints → interfaces → tests
  That's how you become trustworthy quickly.

3) Documentation quality

In hardware, "it worked once" isn't the win. The win is:

- repeatable behavior
- known margins
- recorded results
- clean revision control

4) Cross-functional clarity without drama

BLS explicitly calls out interpersonal skills and communication as important because engineers work with others to implement plans correctly.

For Greg: the advantage is not "being social"—it's being clear, calm, and precise.

Later-career differentiators

1) System ownership

The durable engineer becomes the one who can own:

- a subsystem architecture
- reliability strategy
- test strategy and coverage
- compliance and verification story

2) Judgment under tradeoffs

Hardware is tradeoffs:

- cost vs margin
- performance vs power
- time-to-market vs robustness
- manufacturability vs elegance

3) "Failure literacy"

Senior credibility comes from knowing how designs fail in the real world:

- EMI/EMC issues
- thermal drift
- component substitutions
- aging and tolerance stackups

Technology + AI impact (what changes and what doesn't)

Tooling (simulation, automated test, AI-assisted layout/design exploration) speeds iteration, but it also raises expectations for pace and breadth. The safe electronics engineer is the one who can do what tools can't fully guarantee:

- define correct requirements and test coverage
- interpret real signals and anomalies
- defend decisions with traceable evidence
- own safety/reliability/compliance consequences

In short: **tools accelerate output; accountability still sits with the engineer**.

---

8. Salary & Reality (Without Illusion)

National baseline (BLS)

BLS reports for May 2024:

- **Electronics engineers (except computer): median $127,590**
- With a wide range: lowest 10% under ~$79k; highest 10% over ~$199k

BLS also shows industry differences for electronics engineers (except computer), with higher medians in semiconductors and federal government than some other sectors.

Illinois grounding (since you're in Illinois)

Illinois wage publication for **17-2072** lists approximately:

- **Entry:** ~$92,692
- **Median:** ~$124,679
- **Experienced:** ~$145,489

(State tables aren't perfect predictors for any one person, but they're a solid reality anchor.)

Variability by specialization (why two electronics engineers can live different lives)

- **Semiconductors / high-end component design**: often higher pay, higher specialization expectations
- **Defense/aerospace**: stable, documentation-heavy, may involve clearance requirements
- **Industrial controls/instrumentation**: often steady, systems-focused, "reliability wins" culture
- **Manufacturing/test**: can be stable and valuable, but varies widely by company and product maturity

---

9. Built-In Safety Net

If the niche doesn't pan out…

Electronics engineering has strong internal pivots:

- design ↔ test/validation ↔ manufacturing support ↔ reliability/failure analysis
- RF ↔ instrumentation ↔ power ↔ embedded hardware
  If one specialty dries up locally, the underlying engineering discipline still travels.

If interests evolve…

Electronics can evolve toward:

- systems engineering (requirements/test ownership)
- controls/automation and instrumentation
- product engineering leadership
- hardware-adjacent data/AI work (test analytics, predictive maintenance, quality analytics)

If life intervenes…

Compared with many high-intensity careers, electronics engineering often offers:

- stable full-time roles (BLS notes most work full time)
- project-driven intensity rather than constant crises
- broad geographic footprint (manufacturing, telecom, defense, industrial)

NOTE: BLS category + SOC link

This role aligns with the U.S. Bureau of Labor Statistics category:

Electrical and Electronics Engineers (Except Computer) — SOC 17-2072.00.

BLS projects **about 6% growth for electronics engineers (except computer)** from 2024–2034, and **about 7% growth for the combined electrical/electronics engineer group**, with substantial annual openings driven by replacement needs