

ECU Buyer's Guide

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INTRODUCTION

Choosing the Right ECU Can Make or Break Your Project

An Electronic Control Unit (ECU) is more than just a piece of hardware. It has an incredibly complex and important job of being the control center or 'brain' for all of your vehicle's electrical systems and subsystems.

The ECU you choose can make or break your project. It affects your development process, your costs, time to market, and your ability to scale for production. For these reasons the partner you choose to supply your ECU is very important. The right partner can go beyond just 'providing parts.' An ideal partner will look for ways to save you time, money, and empower you to Take Control of your project.

And while many engineering teams tend to think 'software first', your ECU choice will ultimately inform your choices for software and other tools. Not the other way around.

With so much riding on your ECU (literally), it's important to understand basic selection criteria as well as the features and benefits of the products currently available. But first, a question...





CHAPTER 1

Build or Buy?

The first fork in the road for engineering teams developing complex control systems when considering their ECU choices: Do I custom-build my ECU in-house or buy an off-the-shelf unit?

Here's the test:

Are we producing very low-volume, highly-customized end products? (Think: space shuttle launch vehicle)

- Is this vehicle for personal use/Am I a hobbyist? Will this vehicle be used for educational purposes? (Are you trying to learn electronics or trying to build something?)
- Am I planning to make such a high volume of units that I am prepared to invest significantly upfront to cost-optimize down to small cost increments? (Can ECU design, manufacturing, tooling and validation be spread across a high number of units?)

If you answered yes to any or all, you might want to DIY your controller. (and if you're working on a space shuttle launch vehicle, congratulations and Godspeed!).



However, it makes sense to purchase your ECU if you meet any or all of the following criteria:

- Your goal is mass production
- You need to leverage economy of scale/control costs
- You need a true automotive-validated piece of hardware
- Your team lacks the desire, skill set or time to invest in custom-building an ECU

Bottom line: If your business focus is not “making ECUs”, then buying them is the answer. Let someone who specializes in building ECUs do that for you. You will spend considerable time, energy, and money trying to DIY... while your competition quickly brings their vehicle to market.





CHAPTER 2

ECU Selection Criteria

Most engineers find ECU selection one of the hardest parts of the development process. It can quickly get tricky to navigate the many options out there and to know what makes one ECU a better choice than another --or one supplier a better choice than another.

There are six key areas of consideration for selecting the right ECU for your project:

- Quality and Performance**
- Costs and Production**
- Software and Processes**
- IP Ownership and Maintenance**
- Supply Stability**
- Service and Support**

Each of these areas is equally important for production vehicles. The ECU you choose must be affordable at volume, be ruggedized to stand up to everyday use, be easy to update and obtain at scale, support your software processes, and be supported by an accessible, dedicated supplier. First and foremost, production vehicles must meet rigorous industry safety standards that require an ECU of superior quality and performance. This leads us to our first area of consideration.



1. Quality and Performance

Your vehicle or system (and its ECU) should be fully validated to meet industry safety standards and fully ruggedized to stand up to use in real life. Nothing is more damaging to your brand's reputation than a safety-related incident and/or quality failures and their subsequent recalls and warranty issues.

Large OEMs source their units from world-class suppliers such as Continental or BOSCH. Their units are validated by the most stringent performance standards in the industry. And they're proven in real life-- hundreds of thousands of vehicles on the road today are controlled by ECUs made by these manufacturers. Their business is based on producing a high volume of quality ECUs and they can spread costs for quality, validation, plant and equipment across a very high unit output to keep per-unit costs down. They can provide a cost/capability/quality trade-off not found at typical low volume ECU manufacturers. The difficulty is that these world-class suppliers have high system volume requirement minimums and/or require a significant upfront investment for development and tooling. Typically, there is significant lead time for these large, premier suppliers to produce an ECU and develop software specific to your custom application.



On the other hand, you can source controllers from small, local shops. There are software tool vendors who provide a solution to create custom software for ECUs produced by these boutique electronics fabrication shops. While these boutique-made ECUs may be well-engineered, it is difficult for them to be



produced with the level of quality and validation that premier suppliers provide due to the fact that the plant and equipment, and processes would not be feasible if spread over the small number of units. In this case, economies of scale are not working in the favor of this type of solution.

Choosing an ECU produced by a proven and reputable world-class manufacturer means that you will worry less about warranty costs and/or the possibility of compromising safety and your reputation.

This leads us to the next consideration: controlling costs.



2. Costs and Production

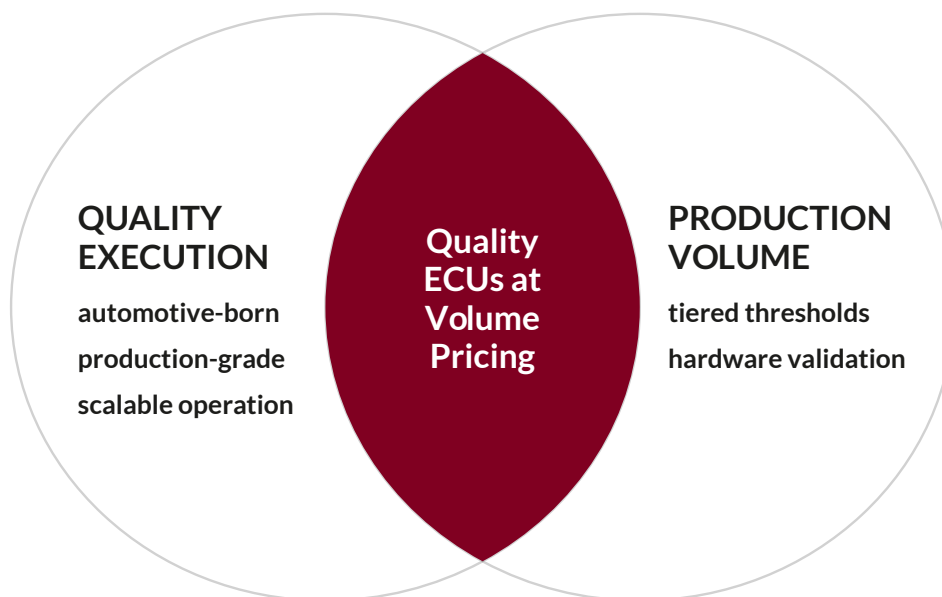
Sometimes the best-in-class ECU comes with a price tag that's out-of-reach. And sometimes a 'good deal' on an ECU isn't what it seems.

Look for an ECU supplier who can help you understand the differences between prototype pricing and pricing for production--and make sure that supplier can scale with you as your business changes.

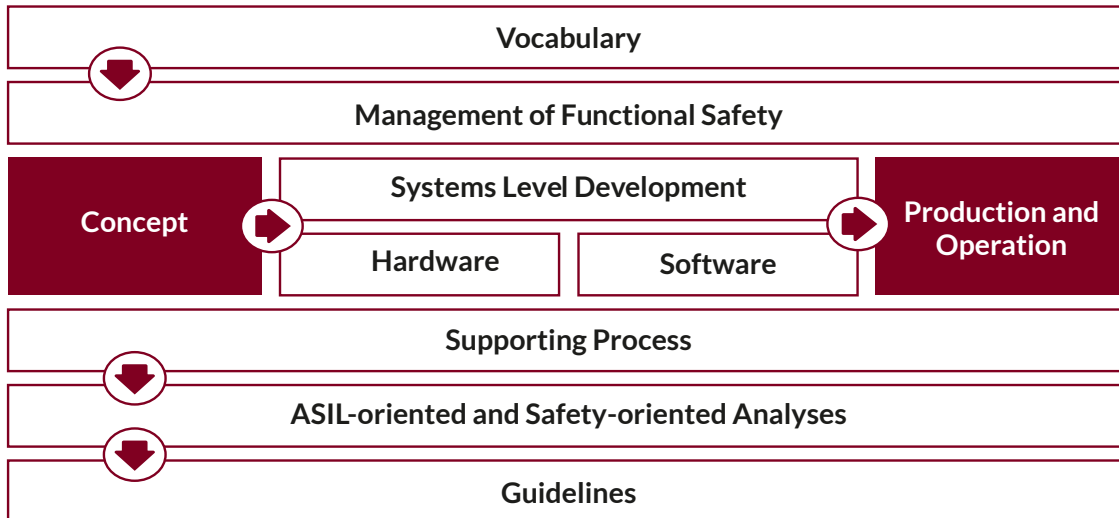
A true production ECU supplier builds production volume into their cost structure and can partner with you as your volumes increase.

The sweet spot: A supplier who offers high-quality ECUs at volume pricing.

Look for automotive-born, production-grade ECUs. If you're scaling to production, look for an option to do your development on the production units. This will help you to avoid the cost and time to re-validate your application on different hardware.



3. Safety Standards



In November 2011, the standard ISO 26262 for functional safety in automotive systems was published. It consists of the 10 parts shown above.

ISO 26262, the international standard for road vehicles that provides a framework for functional safety throughout the progression of electrical and electronic (E/E) systems development, is critical for anyone with a vehicle heading to production.

While some requirements are product-specific, others focus on the safety regulations throughout the development lifecycle. These standards demonstrate how companies should integrate functional safety into their development process, providing regulations and recommendations on how to achieve appropriate functional safety measures. To put it simply, this is a common standard that assesses and verifies the safety of a system before it is put into service.

Select an ECU that supports software and development processes that are production capable and compatible such as the ISO 26262 standard.

In addition to selecting an ECU that is compatible with your software and development processes - consider the team of people who support it. (We'll dig into this more in #6).



Your ECU supplier should have the engineering capabilities to help provide a clear path to production that incorporates the necessary safety standards that are required for today's various industries. Ideally, they should be able to assist your company in clarifying whether the updated ISO 26262 standard applies to your project, conduct a risk assessment of your product and development cycle, provide you with functional safety capable hardware, and assist your team with how to incorporate their product into your system development and safety lifecycles.

4. IP Ownership and Maintenance

If you're not careful with this one, you'll be held hostage by your ECU supplier.

Some engineering teams have been burned by relinquishing their IP to their suppliers. Anytime a development change is required, or the following year's revisions need to be implemented, they have to go through the supplier to make the changes. This not only slows the process, makes innovation difficult, and adds new project costs, but it also possibly leaves their IP exposed to nefarious individuals within the supplier's organization. It's a loss of control that frustrates many engineers.

Ideally, an ECU supplier can offer more than the ECU.

Look for an ECU supplier that 'gets out of the way' and lets you control your IP and your development process by providing you with an end-to-end toolchain that allows you to make the updates yourself.

As we say at New Eagle: 'Take Control'.



5. Supply Stability

Nothing is more frustrating than waiting on parts, or finding out that a part you need is out of stock or worse - out of production.

Always vet the longevity, efficiency, and stability of your ECU partner's supply chain. Can they guarantee that the part they sold you will be available for the duration of your vehicle's lifespan? This timeframe should include production and service parts.

Supplying electronics into the automotive supply chain requires continuity and guarantee of supply for 10+ years for production and aftermarket service. Is the aftermarket pricing in line with production.

You should vet any potential supplier to assure they guarantee the volume of units you need in the time you need them? How are their relationships with suppliers?

Find an ECU supplier that provides quick turn-around times for the volumes you may need and has a stable reputation.

Look for an ECU production provider who carefully selects suppliers like the major OEMs, producers like BOSCH, Continental Automotive and Visteon, to provide mass quantities of reliable ECUs.



6. Service and Support

Your ECU supplier should understand the challenges of your unique project and offer ways to accelerate time-to-market and set you up for continued success.

Ask your prospective suppliers about application templates, engineering resources, onboarding for new engineering team members and continuous training for everyone.

That said, all the tools, engineering power and training classes in the world are useless if your supplier won't pick up the phone.

Ask them, and observe for yourself during your interactions with them:

- What happens when there's a problem?
- How can we get a hold of you?
- Who can we call?
- How quick are your response times?

ECUs are highly-engineered products. You'll want the dedicated support of the people who built them throughout your project and long afterward.





CHAPTER 3

Partner Selection Checklist

Most engineers find ECU selection to be one of the hardest parts of the development process. Ask yourself these questions before selecting a vendor:

Questions About Quality

- Can the partner deliver validated, automotive-born units that are on par with world-class manufacturing industry standards? ISO 9000 / ISO 9001
- What type of environment will it be operating in? For instance, does the partner provide ruggedized, validated units?

Questions About Timing & Cost

- Is the pricing economical at volume?
- How many units are we producing?
- What is our project timing and will the partner be able to meet our schedule?
- What is the lead time needed for the partner's ECU?



Questions About Scaling, Safety & IP

- What are our safety requirements? Do we require support from the partner to meet safety process requirements or regulations? (ISO 26262)
- Can the partner scale with our business needs?
- Who will have control over our IP?
- Can we make minor tweaks to the functionality on our own, or will we need to re-engage the partner for help?

Questions About Service & Support

- What is the partner's turn-around time for repairs/replacement help?
- Is the partner's business stable/do they have a stable supply chain?
- Does the partner have templates, intellectual property and training to help our team get started quickly?
- What can the partner offer us beyond the ECU? (do they have a toolchain?)
- Will we have access to engineering and product support?
- Will the people who built my ECU be the same people supporting it?
- How accessible will our partner be for troubleshooting/repairs/replacement?
- Will we be assigned to a specific point-of-contact that we can call for quick help?
- Can the partner supply testimonials or proof of success from working organizations/projects similar to yours?





CHAPTER 4

Comparing ECU Suppliers Available on the Market

At New Eagle, our dedicated engineers can provide the specialized engineering services your team needs to solve difficult mechatronic control challenges, including those for your ECU. We provide training and onboarding for your team, as well as continued engineering support as needed.

We serve as your supply chain partner by providing you with the production-ready hardware you need to sustain your machine's development from concept through production.

To prevent control problems down the road, we offer a variety of trusted ECUs that range in pin count, input, output, memory, and processor configuration. If you need an ECU customized with embedded software for your machine, our embedded software engineers can develop a fully customized ECU for you.

The grid on the following page illustrates our capabilities as compared to typical suppliers on the market today.



New Eagle Capabilities

	Variables To Consider By Category	Typical Supplier	New Eagle
Budget	Volume-based pricing		✓
	Lower upfront cost (NRE)		✓
Supply Chain	Short lead times		✓
	Robust selection of complementary products		✓
	Automotive-grade supply stability (10+ Years)		✓
IP & Development	IP to enable efficient development (templates, protocols, technology)		✓
	IP ownership flexibility		✓
	System development platform for: software, calibration, testing, end of line, remote monitoring, and service	✓	✓
	Supplier supports suite of ECUs with ease of reuse to leverage software development efforts		✓
Support & Service	Engineering and development support including ongoing training	✓	✓
	Service agreement	✓	✓
	Onboarding process to help you get started effectively	✓	✓
Compliance	ISO 9001:2015, ISO 13485:206	✓	✓
	AS9100:2016	✓	✓
	FDA 21 CFR 820 compliant	✓	✓
	Nadcap accredited	✓	✓
	ITAR registered for defense and aerospace manufacturing	✓	✓



Start A Conversation

For developers navigating the early stages of machine development, selecting a production ECU is one of the most important decisions in this process. Unfortunately, it's not an easy one to make.

We encourage you to use this guide as a starting point in your conversations with potential suppliers. If you have questions for us, please get in touch using the contact info below.

For more information:

Call us at 734-929-4557

Or email us at sales@neweagle.net

Visit us at neweagle.net



More resources for developers:

Our Raptor toolchain helps you design, develop, test and control your complex systems seamlessly. Download our “Developing Control Systems Faster With Raptor” eBook to learn more.

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