Modular Eurorack Newbie Buying Guide

Or: What to Expect When You're Expecting (A Modular Addiction)

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I'm writing this guide because it's what I needed when I started in modular and I couldn't find it in one complete source. This guide is intended to help new musicians getting into the hobby decide what to buy, and specifically in what order to buy those modules. It also goes over basic best practices and common wisdom the modular community has curated over the years. This guide contains no information on how to get started patching as many fantastic guides and videos already exist covering those topics.

Guiding Principles of this Guide

1. This guide will be *budget friendly*, or at the very least, budget conscience. If you had infinite income, you could buy every module available and wouldn't need this guide. Therefore, getting modules that are the most bang for your buck and at reasonable costs is entirely present here.
2. This guide will apply to nearly everyone. Modular is unique in that each rig is completely different, but also *used* completely different from user to user. It is not possible to cover everyone's individual buying needs, but it is possible to break it down into what everyone must have without exception. Therefore this guide will mainly focus on what you need to purchase to get started, after that, it's up to you.
3. I will do my best to separate my personal opinion from fact wherever possible.
4. This is a living document - opinions, additives and constructive criticism from the community is always welcome. This document has a master Google Drive location here.

Things You Need to Buy First

In order to get sound out of your modular and have a working instrument, you must have the following things purchased:

1. Case / Power Supply
2. Oscillator or Sound Source
3. Modulation Source
4. Sequencer
5. VCA

Everything else beyond these 5 things is going to be unique to you, but you must have these 5 things to start. If you are in the small minority of people building a specialty case like an FX or guitar rack, this guide may not suit you. Below this, I've also written a guide on what to buy after these 5, although it is almost entirely up to you. Bottom line, these are the **5 Golden Items** you must purchase in order to start your modular journey.

Choosing a Case / Power Supply:

When talking about cases, the modular community uses two measurements. The letter U is used to denote the height of a module. Eurorack modules are all 3U in size. It is far and away the most common size for modular. Other modular formats do exist but are less common. For example, Buchla modules are 4U in height, and there exists a 5U format that takes ¼ inch cables instead of ⅛ inch plugs. When referring to modular, all of these formats exist under the umbrella, but 3U eurorack modules are often what the user is speaking about as it is the most common and accessible format.

When speaking about a case's height, it is often abbreviated in U's as well. Saying a case is 6U would denote two rows, 9U would be referring to three rows. There is also a fairly new 1U row format where the modules are smaller in height and go sideways. These are most commonly utility modules and aren't necessary for your first case, but they are nice to have. A case with two rows and one 1U row would be called a 7U case.

It's worth noting the 1U format is new and therefore has two competing companies that use slightly different measurements for them. Intellijel's 1U format is slightly smaller, and Pulp Logic 1U modules are slightly bigger. If you are buying a case with a 1U row it is very important to note these are not compatible, and even have different power headers. It is possible to fit Intellijel 1U modules into Pulp Logic style cases, but it will leave a gap at the top or bottom and will not fit snug. Usually, people stick with either one format or the other. If designing a DIY case with 1U tiles in mind, further research beyond this document will be required.

A case or module's width is measured in HP. Modules go as small as 2HP and only go up from there. Common case measurements are 84HP and 104HP. Wider formats exist but are less common due to your cable length having to be much longer. The cases can also have a tendency to sag in the middle of the rack past 104HP. Over time, the modular community has settled on cases around 84 to 104HP as being desktop friendly.

Cases and power supplies can often be bought together in a bundle, but can be bought individually if you plan on making your own case.

Generally speaking, it is good practice to buy a larger case than you think you need for your first modular. A good starting point is a 6U 84HP or 104HP case. This will ensure you have room to grow into your case. If you can't afford something that big, a smaller 3U 84HP case will be fine. The modular community has a thriving used market and it is almost never a problem to sell old equipment online to upgrade in size.

Cases to research are the **TipTop Happy Ending**, **Arturia RackBrute**, **TipTop Mantis**, **Cre8Audio Nifty Case** and **Behringer Eurorack Go**. Most of these cases are 6U 84/104HP and cost around $300. The Happy Ending and Nifty Case are 3U and are a bit more budget friendly. There are many more cases out there to discover, though!

4MS also makes Pods - extremely small eurorack cases. These are generally not designed for beginners and are more geared to either supplement your rack or to hold a very small number of modules for someone who does not have the need to dive deeper. An example would be a guitar player who only wants one or two specific modular effects for their rig.

If you plan on playing live with your modular, your case needs are different, and your case cost will likely be much higher. Some of the best live cases are Intellijel's collection of rugged cases which are fantastic and feature packed, but you get much less bang for your buck than other cases. This isn't to say they aren't worth it if you have the coin!

My personal takeaway: The TipTop Mantis is probably the best case for beginners. It is sturdy, well made, large and considerably more bang for your buck than many other cases. Its downsides are that it is made of plastic and doesn't have a cover for live use and transportation (although an aftermarket cover is available from Decksaver if you'd like to upgrade your Mantis in the future). For many beginners these limitations wouldn't be a problem. If you can't afford that, the TipTop Happy Ending and Cre8Audio Nifty Case are good starting points.

Choosing an Oscillator:

Oscillators will be divided in this section into four broad categories:

1. Simple Analog Oscillators
2. Digital Oscillators
3. Complex Analog Oscillators
4. Other (FM, Wavetable, Samplers)

Simple Analog Oscillators:

Examples: Intellijel Dixie 2, Make Noise STO, Frequency Central System X Osc, Dreadbox Hysteria

These oscillators are very common workhorse modules. They usually have 3-5 outputs of various shapes, PWM control, a pitch knob, and sometimes not much else! Optional features to look out for when picking a simple oscillator would be an octave switch, Lin/Exp FM, Hard/Soft Sync, and various shapes you desire.

Most of these oscillators are functionally identical. Unlike other modules in eurorack, simple oscillators tend to be more similar than they are different. They all do a very simple job and have mostly similar features. When picking one, decide if you need any of the extra features I listed and sort by those first.

Some oscillators are known for having a different sound. Roland style System X oscillators can be springy and loose, while Intellijel's Dixie 2 is known for its surgical precision. The amount that this matters depends on personal preference. Some claim a world of a difference, others don't care as much. Do your research and watch plenty of YouTube examples, but the bottom line is most any simple analog oscillator will do the job fine as long as it fits your feature requirements.

Important to note that many beginners look to purchase a simple analog oscillator for a starting system due to two alluring factors: cheap cost, and analog hardware. However, even your most basic subtractive synthesizer has two oscillators that interact with each other, and sometimes three. If this is the only oscillator in your system you will have a hard time creating interesting sounds. I recommend not buying one as your first oscillator, but instead down the road as a supplementary oscillator.

Digital Oscillators:

Examples: Mutable Instruments Plaits, Noise Engineering Basimilus Iteritas Alter, Intellijel Plonk, Erica Synths Pico VCO

Digital oscillators do not have a bad reputation in the modular world. Although at first glance most of these oscillators will be slightly more expensive than a simple analog oscillator, the benefit you get from going digital is in versatility. Many of these modules create entire worlds of sound within themselves and are much deeper than any simple analog oscillator.

These modules are often great first choices for a beginner system because of their cost effectiveness, extreme range of sounds, wide flexibility and CV control

over interesting parameters. Mutable Instruments Plaits is considered one of the best and easily most popular oscillators in eurorack, and contains 16 different algorithms for synthesis (32 if you count the Aux output!) It also has a built in VCA, LPG and envelope. For as little as $175, a wide range of synthesis sounds is at your fingertips.

Due to all these factors, I highly recommend looking into a digital VCO as a starting module for your system. You will have more flexibility and soundscape design options than if you go analog right away. Subsidizing one of these oscillators with a simple analog oscillator down the road is a popular choice.

Complex Analog Oscillators:

Examples: Endorphin.es Furtherrr Generator, Make Noise DPO, Frap Tools Brenso

These are the big daddies of the modular world. They are all loosely based on the famous Buchla 259 module containing two oscillators that interact with each other, and a waveshaper. These are some of the most fun and expressive modules in eurorack, but the price tag is always high. Expect to pay $400-$800 for a module like this. If you have the money they are amazing, but are usually not suited for a beginner system due to the high cost and amount of modulation needed to make them thrive.

You can also build your own complex oscillator over time by pairing two simple oscillators that have FM and sync capabilities with a waveshaper module.

Other Oscillators:

Examples: Make Noise Morphagene, Erica Synths Black Wavetable VCO, ALM Akemi's Taiko

It wouldn't be possible to cover the wide range of oscillators available to you, but the most common other oscillators you will find are wavetable, FM and sample based VCO's. Morphagene is an incredibly powerful and popular sample based VCO if you enjoy that, and ALM's Akemi's Taiko is a powerhouse of FM synthesis. These vary wildly in prices, but tend to be more on the expensive end and may or may not be suitable for your beginner system.

Choosing a Modulation Source:

In order to modulate your oscillator and other modules, you need a source of modulation. These modules usually fall into one of three categories:

1. Envelope Generator
2. LFO
3. Function Generator

If you're new to modular, the most confusing of those three is a Function Generator. This is a modulation source that is powerful enough to act as an envelope, LFO, or even a slew limiter depending on its settings. These are often a bit more expensive, but are great choices for new systems due to their wide range of use.

There are many modulation sources to choose from, and some with alluring low price tags. It is important to consider how much the module does for its price, though! You can often find simple envelopes for under $100, but check to see if it has features like cycling (essentially turning it into an LFO), multiple outputs, inverted output, CV control over parameters and Lin / Exp modes. These optional features greatly expand the use of your envelope and not all envelopes contain them.

LFO modules also vary greatly in what they're capable of doing. When deciding on an LFO see if it has the capability of being clocked so you can have a tempo-synced LFO, not all do this! Of your three choices though, LFO should probably not be your first purchase. By itself, it won't provide as much utility to your system as a cycling envelope or function generator. You can also use many other things as an LFO in a pinch such as an oscillator, cycling envelope, even your phone or a filter! Down the line, you may find the LFO's are essential to your sound design enough to invest in a dedicated module for the job.

I recommend buying a modulation source that does nearly everything. This will likely set you back more than buying a simple envelope or LFO, but you will get much more out of it than either of those could provide. This also has the benefit of allowing you to see what modes you use it in most so you can buy a dedicated module for that job down the line.

Always the most popular recommendation is Make Noise Maths, a dual function generator that has a built in attenuverting mixer. It can be your main envelope, LFO, slew limiter and mixer all in one (plus so, so much more). It is the highest rated and most popular module in eurorack for a reason. An alternative is Befaco's Rampage. Something more budget friendly yet still functional would be a module like Dreadbox Ataxia. There are also hundreds of other function generators that are worth researching and buying.

Choosing a Sequencer:

Your sequencer is the heart of your modular in many ways. It is important to note some sequencers are Gate Sequencers only, such as TipTop Audio Circadian Rhythms, Intellijel's Steppy and a whole host of euclidean rhythm generators. Those are specialty sequencers mostly (but not always) designed for drums. We will focus on only sequencers that provide both Gate and CV pitch control as you need both to power your oscillators.

We will split the options into four main categories:

1. Cheap Sequencers
2. Mid-Range Sequencers
3. High End Sequencers
4. Midi to CV Modules

Cheap Sequencers:

I made the mistake of buying a cheap sequencer as my first sequencer. The Division 6 Dual Mini Sequencer. It's cheap price tag and my limited budget lured me in, only for me to outgrow it almost immediately. Cheap sequencers like this or the Korg SQ-1 are limited in function and have no ability to save patterns, and in the case of the Division 6, no ability to change the pattern while it's playing.

These can be useful and even really fun in a more developed modular system, but as a first sequencer you will find frustrations with their limitations very quickly. If you desire to play live or jam live, these are often not going to cut it. The Korg SQ-1 has a bit more functionality and is fairly popular in the community, but I think most will outgrow it or want for more pretty quickly.

I eventually found a lot of love for my Division 6, but I use it as a custom clock-synced LFO now. That's the joy of modular. The bottom line is I recommend a more substantial sequencer for your first one, even if you have to save up for it.

Mid-Range Sequencers:

This middle position is absolutely dominated by one company: Arturia. Their line of Keystep, Beatstep, Beatstep Pro and Keystep Pro sequencers have long been the favorites of many modular enthusiasts. The BeatStep Pro, for example, comes in at around $250 and can provide you with two sequencing tracks up to 64 steps, velocity CV control, internal clock, and 8 individual gate outputs for whatever else your heart desires.

There’s almost nothing else in the price range that competes with the bang for your buck these devices provide. They also have the added benefit of not taking up any rack space so you have more room for other modules. These are fantastic sequencers, with some quirky limitations at times, but they can easily power your first rack, perform well live, and are well worth looking into.

Alternatives in this price range are somewhat slim, but if you’re into random sequencing or more generative approaches, Make Noise Rene V1 can be had for as little as $250 used and is a fantastic generative/cartesian sequencer. Mutable Instruments Marbles is an extremely powerful generative sequencer for $350 that has a wide fan base. Last but not least, Noise Engineering Mimetic Digitalis is a 4-channel feature packed sequencer that is designed for live use that comes in around $260.

It is important to note that some sequencers do not have an internal clock, and therefore need a dedicated clock module to run them. This can add to your startup cost significantly and should be budgeted in.

High End Sequencers:

Many high end sequencers exist that are designed to completely replace your computer and act as the beating heart of your modular. Modules like Squarp Hermod, Winter Module Eloquencer, Orthagonal ER-101, and XOR NerdSeq exist as extremely powerful all-in-one solutions.

These devices are often beloved, but they come at a high cost of easily over $500, and sometimes much more than that. They also are known for having steep learning curves and being menu-dive heavy. They are designed for seriously dedicated enthusiasts and live performing musicians who want to leave the laptop behind at all costs. As powerful as they are, they are not for everyone. There are likely better and more affordable options for a beginner rack, but if you find the need to perform live and want to make music completely within your modular, these are the tools to do so.

Other specialty sequencers exist in this price range like Intellijel’s Metropolis and Transistor Sound Labs Acid Stepper, which are both fantastic sequencers with serious limitations. Both are designed for live use in mind, and both only have one track of sequencing and gate. These are very specific sequencers that should probably not be bought as a first step, but if you find their use lines up exactly with your needs they are worth looking into in the future as both are great at what they do.

Midi to CV Modules:

By far the most affordable and powerful sequencer you can purchase for a beginner rack is a Midi to CV module. These modules allow you to control your entire rack from either a computer or a midi keyboard, and sequence any possible note combination you can think of. Many, like Hexinverter's Mutant Brain or Intellijel's uMidi, are below $170.

The downside is, of course, you have to spend time in your DAW of choice instead of in your modular. But the upside is a completely open world of sequencing that could only be provided to you in the modular realm by spending 4 or 5 times as much money. The other great thing about a Midi to CV module is you will almost never outgrow it. There will always be a time, every now and again, you need to hook up your modular to your computer.

On top of sequencing, these modules can act as a master clock through your DAW, and can even provide a host of creative modulation capabilities through midi sequencing. As far as cost effectiveness goes, there's nothing better than going this route. You will spend the least, and have the most capabilities.

But, you'll have to spend time on the computer! This choice is yours.

Choosing a VCA:

Last, but certainly not least, is a VCA. VCA's provide your oscillators (which are always running and on) with a gate so you can create rhythm. They also provide a place in which you can effectively combine modulation sources into new ones, by triggering an LFO with an envelope for example. Last, they often provide a cheap way to mix signals together, both audio and CV, and can act as an output source in a pinch.

The amount of VCA's that exist in the market is too many to possibly write down. Instead, I'll provide you with some guidelines and best practice wisdom so you can pick your own.

The phrase goes, "You can never have too many VCA's". This is due to their high utility for low cost in the modular world, and being completely necessary in the act of creating sound and interesting modulation. As a general guideline, I recommend about 2 VCA's per row of modular to start with. If you have a 6U 84HP system, for example, 4 VCA's would be a good starting point. You may find that you need more than that, but it would probably be uncommon to need less than that.

VCA's all do basically the same job, and any one of them will usually do just fine. You should look out for features that add to its utility, though. Can the VCA act

as a mixer? Are there outputs for both individual outs, and a mix out? Does the VCA have knobs and control over Input, Gain and CV? Can the VCA be in both Exp and Lin mode? Does it have mute buttons for outputs? And most importantly, how many VCA's does it come with? Most VCA's come in groups of 2 or 4.

Some barebone VCA's have none of these, and are designed with minimal features to be compact and simple. The 2HP VCA, for example, has only one jack for in, out and CV - and only one knob to control CV amount. These VCA's are great for specific use cases where you don't need all the extra bells and whistles, but many new racks would benefit greatly over having a VCA that does many utilitarian things at once. They are often not the most expensive part of your rack, even if they have lots of bells and whistles, so for your first VCA you want something that has lots of features.

At the very least, I recommend a VCA with knob control over Input and CV amount. This will ensure you can use it to drive an oscillator, mix CV together, and use it as an output module by turning the volume down. If you can afford it, a VCA that doubles as a mixer is very nice to have and a VCA that does both Lin and Exp provides more sound design options.

A nice VCA coupled with a ⅛ to ¼ inch cable can easily be your output module to your recording device of choice. All you have to do is turn the volume down. No need to buy an output module at first!

I recommend a full featured VCA like Intellijel's Quad VCA or Doepfer's A-135-1 (or A-135-2) for your first VCA, and if you need more after that you'll probably be able to cut back on features for your second VCA. Doepfer also has many other VCA choices that are all well made, durable and cheap - they're one of the best manufacturers to research if you're on a budget.

Short Conclusion and Cost:

A good beginner rack would be something like a TipTop Mantis case, Mutable Instruments Plaits, Make Noise Maths, Doepfer A-135-2 VCA and either a Hexinverter Mutant Brain or Beatstep Pro to sequence and clock. Feel free to replace any of those with things that are either more affordable or preferable to you.

You should expect to budget around $500 to $1,500 USD for your first case and set of modules. This is obviously a big range, and it's affected by whether you go for full featured modules you won't outgrow vs. cheaper "for now" options, whether you buy used or new, and whether you do any DIY.

The good news is that your rack can be purchased piece by piece if you're not ready to go all in at once. And after the initial batch is bought, many find modular gets a bit more affordable. At that point, buying a new module will generally cost $100-$300 (though some are of course more), and buying one every few months becomes a routine way to affordably expand your rack.

To give you an idea of initial startup cost, below are two example racks. The first has more expensive modules with quality features and emphasis on easy future expansion. The second is a more budget conscious rack that is entirely functional and still wonderful, but the owner may find themselves needing to sell and upgrade certain parts of it over time.

<u>Full featured, with room to grow:</u>
TipTop Mantis Case: $335
Mutable Instruments Plaits: $259
Make Noise Maths: $290
Intellijel Quad VCA: $189
Beatstep Pro: $259
Total Cost (new): $1,332
Total Cost (Used, 80%, Estimate): ~$1,065

<u>Less features, more budget friendly:</u>
TipTop Happy Ending Case: $159
Mutable Instruments Plaits (Third Party): $175
Dreadbox Ataxia Dual Modulator: $99
Doepfer A-130-2 Dual VCA: $99
Hexinverter Mutant Brain: $169
Total Cost (New): $701
Total Cost (Used, 80%, Estimate): ~$560

<u>Next Steps:</u>

After getting the 5 Golden Things figured out, you'll likely want to expand soon. These are some common things people would want to buy after they get started, but it's important to note at this point you are off to the races. The choice is yours.

Filters:

One of the benefits of buying a digital oscillator first is you often don't need a dedicated filter for it as they usually have tone control built in. But this is likely still

one of the first things you'll desire, especially if you purchase an analog oscillator at some point.

Filters are one of the most personal and widely varied modules in eurorack. They all sound completely different and everyone has personal tastes for the music they make. This is one of the most important modules to research before you buy. Make sure you watch tons of YouTube examples to make sure you get the sound you're looking for.

Also, make sure you look at features. Does the filter offer individual outputs for different filter types? Does it offer more than one CV input source? Does it offer any additional sound design options, like distortion/saturation? Getting a filter that does lots of things in one is a good pick for a smaller or beginner system. Other specialized filters offer a specific sound, but sometimes at the cost of utility.

For example, the System 80 Jove is a fantastic Jupiter-6 style filter, but it's large and only provides one output at a time. It may be better to get something like Bastl Cinnamon which provides multiple outputs at once for mix-and-match sound design. But the choice is up to you.

Choosing a filter is very personal. Do your research!

Additional Modulation Sources:

If you took my advice on getting a big function generator as a first modulation source, then by the time you're looking to expand you'll have a good idea of what you need. Depending on if you used it more as an envelope, LFO, or slew limiter, you'll know what kind of dedicated module you need to get.

One of the most common thoughts in eurorack is that it's often unpredictable how you're going to interact with your gear, and you won't know more until you actually get your hands on it. For me, I found that I used slew limiters and envelopes a lot, but almost never LFO's. This led to some heartbreak as I had to sell a lot of the first modules I bought to get new ones, but it's all part of the learning curve.

This is why it's important to get modules for your first rack that have lots of varied functionality - it will point you in the right direction over time.

As a basic need, small envelope generators are often extremely cheap and useful to have in your system. If you need lots of them, you can get the more expensive Intellijel Quadrax, or if you just need one or two to get the job done, a

$50 used Blue Lantern Simple ADSR envelope is a quick and effective addition. As stated before, envelopes that have cycling capability can double as an LFO in a pinch and provide a lot of utility to small systems.

For a dedicated LFO, two extremely popular choices are XAOC Batumi and DivKid Ochd.

For slew limiters, Doepfer's A-170 and WMD/SSF Mini Slew are great choices.

There are so many more choices than these, though!

Clock Source:

Over time you may find you need a dedicated clock source for your rack. My two sequencer recommendations, the Beatstep Pro and a Midi to CV module, both provide great tools for clocking your system. As your system grows you might want to invest in a dedicated module, though.

The most popular clock in eurorack is ALM's Pamela's New Workout. It provides much more than a clock - it also does divisions, interesting rhythms and LFO's.

A clock divider is also a great tool to also invest in if you're interested in creating varied rhythms quickly and on the fly.

Multi-Modules:

These modules are a loosely related collection that consist of modules that offer a many-in-one functionality. These are often popular modules for new racks for two reasons. One, they offer a lot of bang for your buck and instantly expand your rack's capabilities substantially. And two, they teach you what holes you're missing in your rack and help identify next buying steps over time.

These modules are known for their extreme cost effectiveness and wide range of uses for comparatively low price tag, but often suffer from menu-diving, confusing interfaces and inadequate user experience. Everyone has their own preference on whether they are worth the hassle, while some claim they are indispensable swiss army knives, others find the experience to be less than worth it.

To be clear, all these modules vary wildly in their abilities and menu systems and should be researched thoroughly before purchasing. Some may have a better use case and menu experience for you specifically than others!

Modules in this category include MXMXMX Ornament and Crime, MXMXMX Temps Utile, ALM's Pamela's New Workout, and Expert Sleepers Disting (all versions).

Choosing Utilities:

Mults:

When you first start your system, it's easy to get around not having any dedicated mults. You can use headphone splitters, stackable cables and ninja-star style splitters to achieve the same thing for very low cost.

When it's time to invest in a dedicated mult, think of your use case. If you need it for mostly modulation, you can get away with having a cheap unpowered mult. If you need it for pitch CV, you need a buffered mult. A popular choice is Mutable Instruments Links, which provide lots of utility options as well as a buffered mult.

Some people don't have any mults in their system at all! It saves rack space to only use splitters and stackable cables. Others find it more neat and organized to have a mult in the rack.

Output Modules:

A common misconception is that you need a dedicated output module in your first rack. You do not. A simple 1/8th to 1/4th cable out of your VCA can easily provide output in your home studio. Down the line, if you want a nice output module that converts your modular into the 1/4th cable domain, there are many fine options to choose from.

If you only want an output for your headphones, there are cheaper options that get the job done like ALM's HPO.

Mixers / Attenuverters:

Many find the need to mix their signals at one point or another. This can be to mix audio signals together, or even CV modulation sources. Mixers that do this basic job are often very cheap and affordable, but when starting you may not need this if your VCA doubles as a mixer. That's one reason I recommend getting a VCA that has that capability.

Down the line you can consider a simple mixer like Intellijel's Unity mixer which is great for mixing pitch CV, or something like Happy Nerding's 6xMIX which provides a powerhouse of mixing and routing options for only $100 new.

Attenuverters are an essential sound design tool in modular synthesis. This is one reason I recommend Maths to beginners as it has a few extra thrown in. Having a dedicated attenuverter module is particularly useful if you acquire lots of modules that have CV control over parameters, but no CV knob adjustment. As such, you may not need it right away.

Logic Modules:

Logic modules offer a unique way to mix and combine signals that doesn't exist much in conventional synthesis outside of the modular world. These modules offer inputs that compare two signals in various ways, and then create a new output that depends on the logical function used.

The common logic functions AND, OR and XOR can be visually explained by Reddit user /u/lurkmcgirk's image here: http://i.imgur.com/cfoxYiZ.jpg

These modules are sometimes fairly cheap and provide interesting ways to create new rhythms, sequences, CV modulation and even audio by combining two inputs. They will also help teach you about programming logic gates and the interaction of signals in your rack. If you're into experimenting, these are well worth looking into!

Common logic modules include Make Noise Maths, Doepfer A-166, Mannequins Cold Mac and Mutable Instruments Kinks.

Be Cautious When Buying:

For newer systems, there are two modules I caution people against buying. Those are **drum modules**, and **FX modules**. These seem to be really popular choices for newcomers, so I'll explain my reasoning thoroughly.

Drum modules are difficult in the modular world mostly due to their very high cost. If this guide is about getting the most bang for your buck, drum modules are the opposite of that. A full drum machine style modular system can easily cost thousands of dollars. Not only are the modules themselves often expensive, but you also need to invest in the rack space for them, a mixer slot for each drum sound, and a sequencer channel for each one. Each channel of the drum is its own complete mono synth in a way. This adds up.

The downside of modular having no presets or saving points is especially frustrating when it comes to drum sounds. Combine that with the often very limited set of sounds some drum modules provide (like the 808 and 909 drum sound clones), and you can easily spend thousands on a drum rack that simply isn't as usable as a drum machine would be.

Cautionary inside, many people use drums inside eurorack and they can be incredibly fun and creative instruments. So when should you invest in drum modules? Usually it's due to one of three things.

1. You want a very specific analog drum sound that can't be easily recreated digitally or with samples.
2. You want CV control over your drum sounds.
3. You want to sequence random or euclidean style drums.

Instead of creating a full drum eurorack, it's a popular choice to instead supplement your rack with a dedicated drum machine (or three). It's more cost effective, and in some ways a better user experience. Drum machines like Roland's TR8-S, Arturia's DrumBrute, Digitakt Elektron and many others, provide a full experience and wide range of drum sounds for a fraction of the cost of modular equipment. However, if one of the three scenarios above apply to you, you may want to look into buying eurorack drum modules.

A sort of middling approach would be to buy drum modules that function as other things, too. Noise Engineering's Basimilus Iteratus Alter, Mutable Instruments Plaits and ALM's Akemi's Taiko can all be both drum sound generators and regular oscillators. This can often be a good compromise as you get your fix of drum sounds without losing any functionality or rack space.

FX modules have some commonality with drums. The question you should be asking yourself is - why modular? Many FX can simply be substituted for guitar pedals, or FX you can add later in your DAW. Having those same effects inside your rack can often be harder to mix and more expensive for little benefit.

As a general rule of thumb, if your FX is going to remain static, it does not necessarily need to be in your modular. Many FX like reverb and chorus are "set and forget" FX that don't need CV control, and as such work just fine as a guitar pedal (which are popular choices) or a plugin in your DAW.

Some people prefer FX in the rack simply because they enjoy messing with the knobs live, which is a perfectly valid reason to purchase them for in rack use. There are also FX that offer stereo inputs and outputs, which is becoming a more popular trend in eurorack. These FX often can't be substituted for guitar pedals, as

they are generally only mono. Other times you may find an effect that simply isn't available outside of the modular world, so you'll have to buy it for your rack.

FX can be very useful if you're going to be playing live, modulating the parameters with CV, or simply enjoy messing with knobs live. But if this doesn't apply to you, guitar pedals and DAW plugins are cheaper, often more versatile and should at least be considered!

FAQ:

DIY or Why Not?:

When building your first rack, many look to DIY their own things. The most common reason people do this is they believe it to be a cheaper alternative. This can sometimes be true, and sometimes not. This depends entirely on your skill level and the tools you have available to you.

For a beginner to intermediate soldering skill level, you can expect to be able to make many DIY modules yourself at home through kits. However, you need to factor in the cost of messing up a module you buy. Even skilled makers have a dead module at the end of building every now and then. As a personal example, of the five modules I've made three of them worked immediately, one eventually worked after a frustrating few weeks, and one never worked. I had to rebuy the kit. Rebuying just that one kit offset a lot of the savings I had made by going DIY.

If your experience level with soldering kits is low, you should look to do DIY only because it's fun and fulfilling. It's a great hobby to get into, and it's not that hard. There are tons of resources online. However, if you're doing it to save money, you sometimes can. But sometimes you don't. It's not as simple as saying it's always going to be a net gain. The choice is yours.

When it comes to cases, it gets even more complicated. This really depends on your skill level and tools you have available. Assuming you have experience in woodworking and all of the tools you need already at home, the cases you make would often be the same cost as buying off the shelf.

Rails and power supplies are expensive, and these are the biggest barriers to entry when making your own case. You can easily spend $200 on just those alone for a small case (if not more!), then you still need at least $50 in wood and hardware. Best case scenario is $250 for a case that would cost $300 off the shelf.

When making cases, DIY goes a lot further when you're building a bigger case. As a general rule of thumb you would probably save money if your case is 9U or bigger, and you may or may not save anything if your case is 6U or smaller.

It's also worth noting DIY cases are often heavier and suited mostly for in-home studio use, not for transport or for live shows.

Building things is an absolute joy, and you should do it because it's fulfilling and fun. In order to save money though, it's often on a case by case basis, and sometimes doesn't equate to the savings you would hope for. Other times, it does! It's a risk you will have to calculate for yourself.

Semi-Modular, Should I?:

Many semi-modular synths are great starting points for newbies in the modular world. The big three are Behringer Neutron, Make Noise 0-Coast and Moog Mother-32, but there are many others such as Behringer Crave, Arturia MiniBrute 2(S) and Pittsburgh Modular Microvolt 3900.

Compared to the rest of the modular world, semi-modular synths offer a bigger bang for your buck than almost anything else you can get. The Behringer Neutron starts at only $250 and provides you with two oscillators, two envelopes, an LFO, multimode filter, distortion, delay, S&H, slew limiter, mults… the list goes on. You won't find anything in the $250 range in modular world that does all that!

These can be great alternatives to starting your modular journey. From personal experience, I would say the only downside is patching can sometimes get tricky because everything is normalled inside the synth. Following the signal path can be harder, and if you're learning, that can be frustrating.

It's also worth noting these can be extremely good additions to starter systems as they add a lot of functionality for cheap. In the case of the Mother-32 and Neutron, they can even be put inside your rack.

If you are extremely budget conscious, these are great choices to look into. Even if you're not, they provide a lot of utility for cheap while you grow your rack and are very popular choices for a reason.

Should I buy used?:

The short answer is yes. Eurorack modules are generally very durable and last a long time. The most common defect you'll find is some cosmetic rack rash. Other than that, buying used is often little different than buying new. The modular

world has a thriving, huge used market online that's easy to use and save money on.

This is also a great reason why no module is ever wasted when buying - you can always resell it online. And you'll want to get accustomed to that because every modular synth owner has almost certainly done it at one point or another, especially when learning.

Get acquainted with Reverb, eBay, ModularGrid, MuffWiggler, /r/modular, and the various facebook modular groups.

What companies are known for affordable gear?:

While modular can be quite expensive, some companies have a great reputation for cheap and reliable gear.

Doepfer modules are some of the most high quality, utilitarian and affordable modules in eurorack. They also invented the eurorack format, so they're the OG's! Their modules are usually cheaper than competitors and have a high bar of consistency and quality. They also have one of the biggest selections of modules available in all of eurorack.

Behringer offers many affordable options for cases, modules and semi-modulars, but their reputation is hit and miss. Some claim they unrightfully steal from previous designers and historical gear, others find it to be fair use. While their gear is generally chinese manufactured and therefore cheaper quality than others, this cost is passed down to you the consumer. I will refrain from expressing personal opinion as to let the reader make their own educated choice on whether or not this company is the right one for you to support.

Both 2HP and Erica Synths offer smaller format modules that are trimmed from features, but are much more affordable than alternatives. These are often used to fill a rack or for a module you simply don't need bells and whistles on. Many are fantastic!

Mutable Instruments is an open source company and an absolute treasure to the modular world. Because she leaves her designs open-source, many companies have popped up to reproduce her modules in both smaller and cheaper capacity. I leave it up to the reader to do their research and choose to either go this cheaper route, or buy directly from Mutable Instruments and support the maker.

Dreadbox is a high quality and well liked company that offers a wide range of modules in the $100 range that are well reviewed and packed full of features.

Bastl Instruments is a Czech Republic based modular company that is known for extremely high quality and creative eurorack modules that are generally under market cost. They also offer DIY kits for almost all of their modules to save even more money on them.

Happy Nerding is a Ukrainian based modular company known for utilitarian and straightforward modules that are well designed and cost effective. Most of his modules are under $200 and many are under $100, all with a large fan base and many positive reviews particularly noting his experience in great module design.

2HP Modules is a company dedicated to making only 2HP width gear. They have a specific well loved niche of providing a wide variety of modules that are affordable and case friendly. Often these modules are stripped of bells and whistles in order to accommodate their small size, but many are more feature packed than you'd think! These are great choices for small cases and modules you only need the minimum out of. One thing people commonly report is due to their small size the knobs can sometimes be bothersome or finicky, and it's important not to put more than one 2HP module next to each other to mitigate this.

How do I ask for help?:

The modular world is big and friendly and always welcomes questions! Feel free to post any question to one of the various forums and there's almost always someone willing to help.

As a general rule, you're going to get a lot more out of your question if it's specific rather than general. A question like, "Who has these two modules and how do they compare?" is much more informative for you than, "This is my entire rack, what should I fill the last 4HP with?" The latter question is a very common one, and isn't frowned upon, but you'll find that every modular user has such varied taste, preference and musical style that the answers given will likely be all over the place and may or may not help you out.

Muffwiggler, /r/modular and the various facebook groups are the best places to ask and hang out.

Why does everyone say to start small?:

I touched upon this earlier, but the reason is you don't really know what you're going to use and how you're going to use it until you get your hands on the gear. Even if you're experienced in synthesizers, modular is just a different beast.

It’s a unique experience and process for everyone, but it’s almost a universal experience to be surprised at how your gear interacts.

Once you get your initial batch of modules, you’ll quickly find where the holes are and what you wish you had. You also quickly find out all the fun uses for your modules you would have never thought of, and how they interact with each other in weird and wonderful ways.

Going big with your first modular almost always means one thing - you’re going to sell a lot of it off. For two reasons. One, you bought stuff you thought you’d love that you didn’t. And two, you discovered what you really needed was this other module, not the one you bought.

You can avoid that mistake by starting small and adding modules one at a time.

Start slow and small and discover where the cracks in your workflow are, then build to eliminate them.