EuroSynth – FracRak Comparisons

A summation of the major differences between the EuroSynth and FracRak systems.

This documents attempts to cover the major differences between these 2 popular `mini' modular systems and the pros and cons of building a unit that incorporates modules from both systems.

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Mechanical Differences

Although both systems are designed to be compliant with the industry standard 3U rack height for Euro-Rack systems, there are some differences I the actual implementation between them.

While FracRak front panels utilise the full 3U height of the Euro-Rack, Euro-Synth front panels incorporate a protective lip in to the mounting rails which affords the front panels top and bottom edges from being damaged. As a result EuroSynth front panels are approximately 4mm shorter than FracRak panels. This also leads to the vertical separation of the mounting holes being different. Consequently, EuroSynth and FracRac front panels are not interchangeable

In this picture of a FracRak you can see the 2 mounting rails at the top and bottom of the case. The FracRak panel extends fully over these thus achieving the full 3U panel height.

In this picture of a EuroSynth you can see that the panel is bordered top and bottom by a small lip. This lip is actually part of the mounting rails and provides a `frame' in which the panel is mounted

As a result it is generally recommended that a mixed modular system employ multiple racks with each rack being assigned to one family. This results in a much neater solution and requires no mechanical modifications to any modules that are installed.

Electrical Differences

In general, EuroSynth systems use +/-12VDC power rails while FracRak uses +/-15VDC. In many cases you can mix modules on the different power rails. The main points to be aware of are:-

12V modules on 15V power rails

1. Any onboard regulators in the module may run slightly warmer. This should not normally be a problem as most module designs will ensure adequate cooling is provided for the regulators over a reasonably wide range of input voltages.
2. Some modules derive internal reference voltages/currents from the power rails. Increasing the power rails will also result in the reference signals being increased and this could affect the overall operation of the module. It may be necessary to re-calibrate the module or even modify the relevant components
3. If a module uses components that are rated to a maximum of 12V then their operation at higher voltages could cause a failure of that component.

15V modules on 12V power rails

1. Any onboard regulators will need to be checked to ensure that they are receiving adequate input voltage for the regulator to maintain correct and proper regulation. This should only really affect regulators providing outputs in excess of 9VDC.
2. Some modules derive internal reference voltages/currents from the power rails. Decreasing the power rails will also result in the reference signals being decreased and this could affect the overall operation of the module. It may be necessary to re-calibrate the module or even modify the relevant components.

As mentioned in the Mechanical Differences section, it is generally recommended to use separate racks for the different systems and this would also apply to the power supplies. Although this does increase the cost of the overall system, it does ensure that all modules remain completely unmodified and simplifies the management of modules when moving them around as you do not need to consider if the module is suitable and/or has been modified.

The range of control/signal voltages required both as inputs to and outputs from a module tend to vary slightly within the different systems. Some systems may require, say, a 0V to +5V control voltage to achieve full range control of a function whereas other systems may require 0V to +10V. In the case where 15V modules are run on 12V power rails, the maximum achievable output range may be attenuated slightly by the reduced power rails. It will depend upon the modules being used, what they are connected to and what adjustments are provided that will determine if this will be a problem. As many large systems utilise modules from 2 or more systems, they have, usually, already addressed the need to match signal levels and so this problem is usually controllable.

You should also check with the relevant module suppliers to determine if modifying them affects any warranty you may have on the module.

One final point here is that the different systems also tend to use different power connectors and cables. Again, this is easily addressed with system specific racks in a system. If you intend, however, to opt for mixed systems within a rack then you will also need to consider providing custom power-patch cables that will allow the different modules to be connected to common power supplies.

It is also worth mentioning that the PAiA series of modules are designed for +/18V power rails as they have onboard regulators that generate the required +/-12V. This does mean that (a) they will work quite happily in FracRak systems utilising +/-15V rails as the regulators only need a round 2.5V headroom for guaranteed regulation. Also, by bypassing the onboard regulators, the modules can be run directly from a system running on +/-12V rails. (Thanks to John McMillan for this tippet).

Interfacing Differences

In addition to the mechanical and electrical differences already discussed, there is the question of the connections between the various systems. The smaller modules tend to use either 3.5mm (1/8”) jacks or 4mm banana plugs. Patch cables can be made that allow signals from one system to be patched in to a different system but this does result in a reasonable increase in the number of cables that need to be carried.

This problem increases further when larger module formats are added which tend to use 6.35mm (1/4”) jacks.

Depending upon the type of patch cable used and the configuration of the module, most 3.5mm patch leads use a screened cable allowing the ‘ground’ conenction on one system to be automatically conencted to the ‘ground’ of another system when inter-patched (*).

4mm banana plugs only support a single wire, so when patching between multiple systems it is ncessary to provide a common ground connection between the systems.

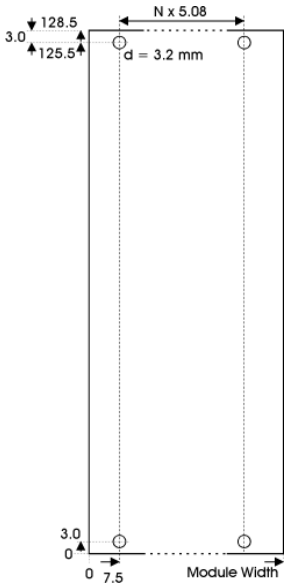
The use of screened or non-screened patch leads is generally of no importance when patching within a single system as, assuming compliant module and power supply design has been applied, a ground reference is alerady established within the system

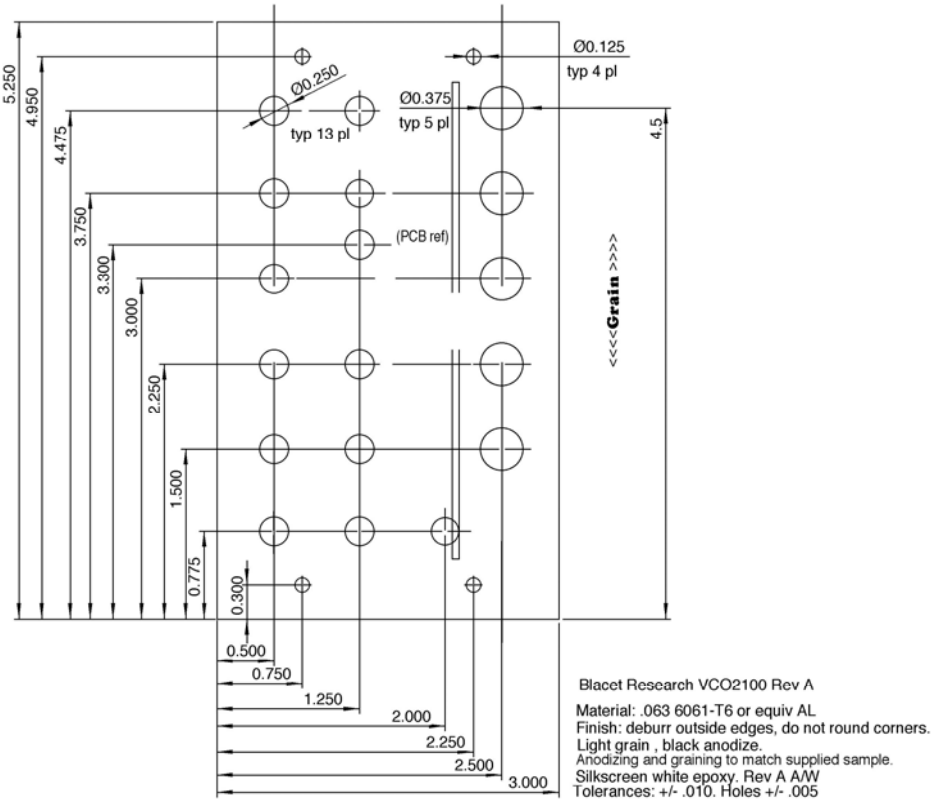
- Connecting multiple ‘grounded’ patch leads between 2 or more systems may lead to ground-loops

Mechanical Details

Both EuroSynth and FracRak utilize industry standard 19” racks as the basic frames for their systems. The structure of the mounting rails differs slightly between these systems with the FracRak system utilizing a flat-fronted mounting rail that allows the front panel to extend to the upper and lower limits of the rack.

The drawing to the right is from Blacet and details the basic dimensions for a typical FracRak module. The drawing below is from Doepfer and details the basic dimensions for a EuroSynth module





FracRak module front panels are all 3U high (1U = 1.75 inch = 1.75" = 44.45mm, 3U = 133.4 mm) while EuroSynth module front panels are 128.5 mm.

The width of the front panels is measured in HP (HP = horizontal pitch, 1 HP = 5.08 mm or 1/5 inch or 1/5"). The actual width of a front panel is usually a few tenths of a mm less than the calculated value to allow some tolerance to assemble the panels side-by-side.

The original rack system has a usable width of 84 HP (= 426.4 mm), however there is now a trend to go for wider systems allowing for more flexibilty in module layout and achieving, in general, a lower cost per HP for a system. Currently widths of 104HP, 126HP and 168HP are supported but in practise any desired width is achievable.

EuroSynth modules can come in any multiple of 1HP widths whereas FracRak modules tend to use just a few standard fixed widths.

EuroSynth – EuroRack

We have used the term EuroSynth when referring to ‘EuroRack’ modules because although EuroSynth modules are mechanically compliant with the EuroRack standard, EuroSynth modules use a 3mm fixing screw while EuroRack uses 2.5mm (as does FracRak).