This document provides a high level overview of the considerations when designing your openGear rear module hardware. It is intended as an introduction to designing a rear module for the openGear frames. Consult the ***openGear Hardware Development Guide*** for more information.

openGear Frame Overview

As the openGear frame evolves, some compatibility issues occur as new features and capabilities are added. While every attempt has been made to ensure forwards compatibility, there can be instances where rear module requirements are not compatible with all frame types (legacy and current).

Table 1 lists the different generations of rear modules (R1 to R4), the frames that they were first introduced with, and highlights communications and power capabilities.

✶ In all openGear frames, there is the CAN bus routed to each card slot, thus the CAN bus is not included in **Table 1**.

Table 1 openGear Frame Capabilities

Rear Module	Frame	Ethernet to Each Card Slot?	1 Slot Max. Power	2 Slot Max. Power	4 Slot Max. Power	Max. Frame Card Load
R1	DFR-8310-C[a]	No	12W	Not supported		120W
R2	DFR-8320 DFR-8321	No	6W	12W	24W	120W
R3	OG3-FR	Yes (optional)	15W	30W	60W	300W
R4	OGX-FR	Yes (optional)	15W[b]	30W (45W)[b]	60W (75W) / (90W)[b]	450W[b]

a. The DFR-8310 frames were also sold without cooling fans. If a frame does not have fans installed, de-rate appropriately. The DFR-8310 frames are long deprecated and are included here for historical context only.
b. Refer to the ***openGear Hardware Development Guide*** for power and cooling details.

Rear Module Keying System

To ensure that openGear cards can only be installed in the appropriate frames, a rear module keying system was devised that allowed for forward compatibility. **Table 2** summarizes the rear module compatibility with openGear frames. Notice that a rear module designed for the DFR-8320 frame will also fit the OG3-FR and OGX-FR frames. Conversely, a rear module designed specifically for the OGX-FR frame will not fit the earlier OG3-FR frames. The rear modules designed for the original DFR-8310 frame are not compatible with later frames.

Table 2 Rear Modules and openGear Frame Compatibility

Rear Module	DFR-8310	DFR-8320, DFR-8321	DFR-8322	OG3-FR	OGX-FR
R1	✓				
R2		✓	✓	✓	✓
R3				✓	✓
R4					✓

This rear module keying is accomplished via the notches on the bottom of the rear modules.

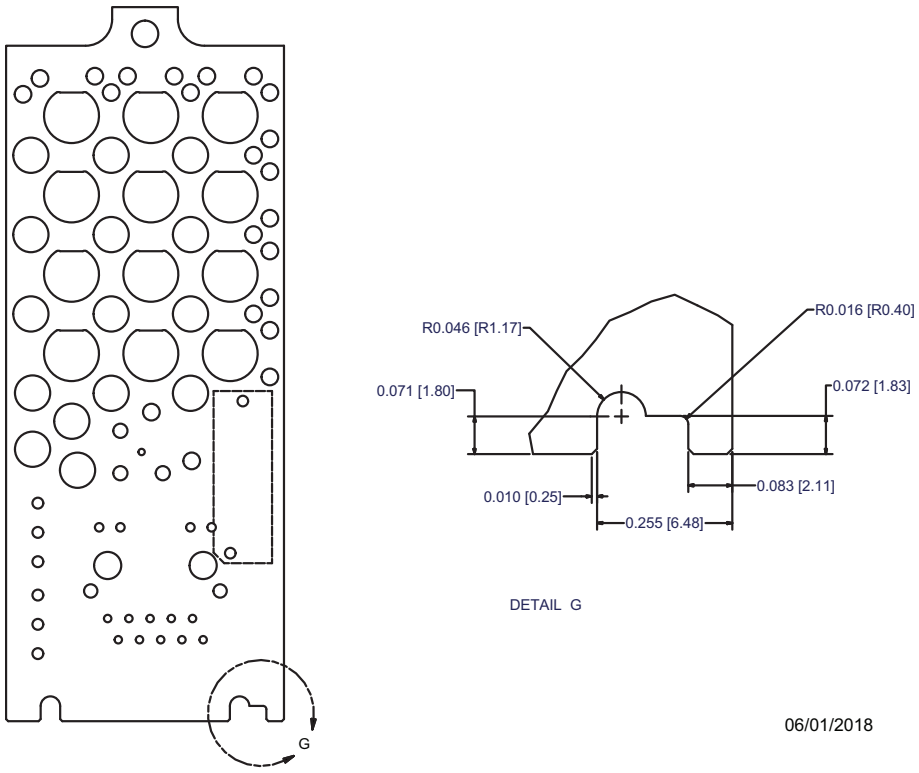

Figure 1 OGX-FR Rear Module Components

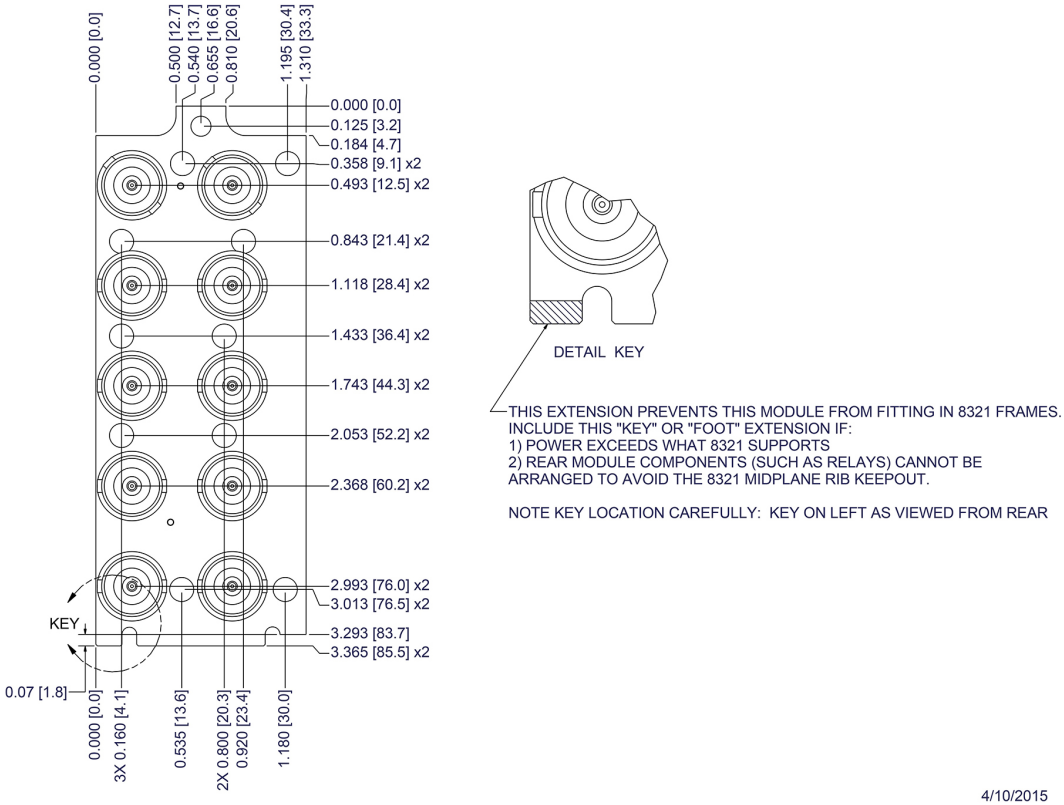

Figure 2 OG3-FR Rear Module Components

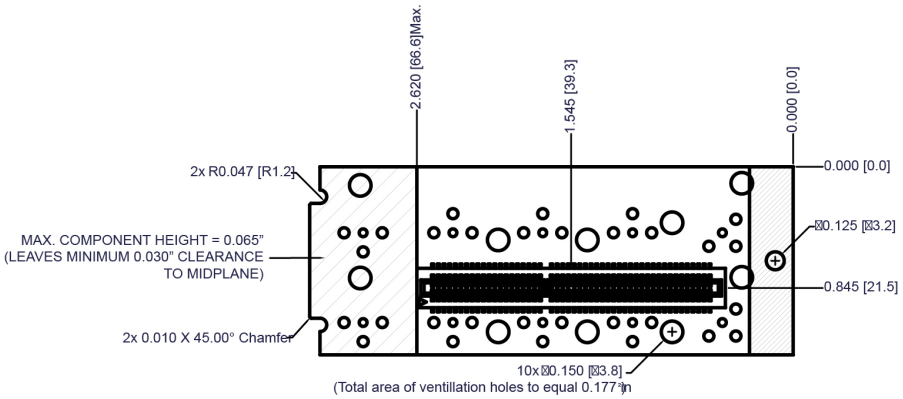

Figure 3 DFR-8321 Full Rear Module — Solder Side

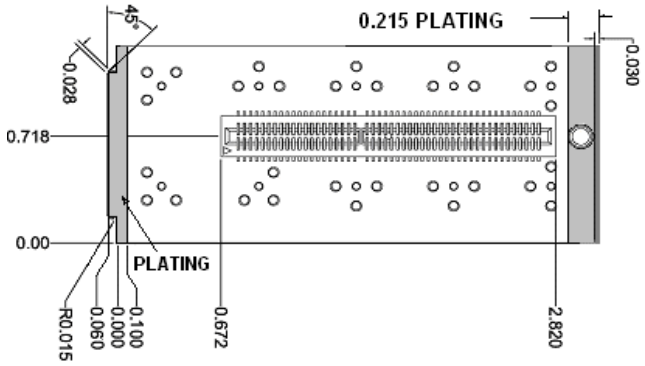

Figure 4 DFR-8310 Rear Module — Solder Side

Rear Module to Frame Compatibility Considerations

Consider the following when selecting which rear module keying type to design:

1. **What are the communications requirements?** Only some frames support optional ethernet communication to each slot. Some cards do require this ethernet connection and are advertised by the vendors as such. It is not uncommon to have an openGear module that requires a frame with the MFC-OGX-N controller card to provide ethernet to each slot.
2. **What are the power and cooling requirements?** The latest generation frames provide more power and cooling capability.
3. **What are your product goals?** The more frames your module can work in, the more open slots are available. The long life of the openGear frame ecosystem means that there are a substantial number of legacy frames installed, many which may have available slots. The desire to be compatible with as many frames as possible must be tempered with staying within the power and cooling profiles for each generation of frame.

✶ The DFR-8310 information in this document is provided for historical context. This frame should not be a consideration for a modern openGear rear module design.

Rear Module Identification

A rear module identification system was designed to allow various partners to use the same design but be able to determine whose rear module was attached. The methodology used a pair of pins to connect the module ADC to a pair of resistors on the rear module. This ID methodology unofficially grew into the concept that all rear modules needed a unique rear module resistor pair.

As openGear became more popular, with more partners and more products, the need to expand the rear module identification system became apparent. As a result, the ***openGear Hardware Development Guide*** was updated to suggest that while the original resistor pair be retained, it could now be used to identify the partner, not the specific rear module. The partner would be free to choose a methodology to uniquely identify their rear modules. An example of using a third pin for a third identification resistor was presented as a possibility.

To be clear, the need for a standard methodology of identifying rear modules is only of practical use when using the standard rear module card edge connector. If the partner chooses to use a different type of connector, or a custom size, then that choice of rear module identification lies solely within their discretion.

Even using a standard card edge connector, once the partner has used their partner ID resistor pair to declare the manufacturer of the rear module, the exact method of identifying the exact type of rear module lies with them. A partner may wish to ensure that the method they choose fits with other standard rear module pinouts as shown in the ***openGear Hardware Development Guide*** (e.g. a Microchip 2 pin EEPROM like the AT21CS01 on the AN_BMID3 pin). See **Figure 5** for a typical resistor identification, and **Figure 6** for a theoretical 1 wire (2 pin) EEPROM interface.

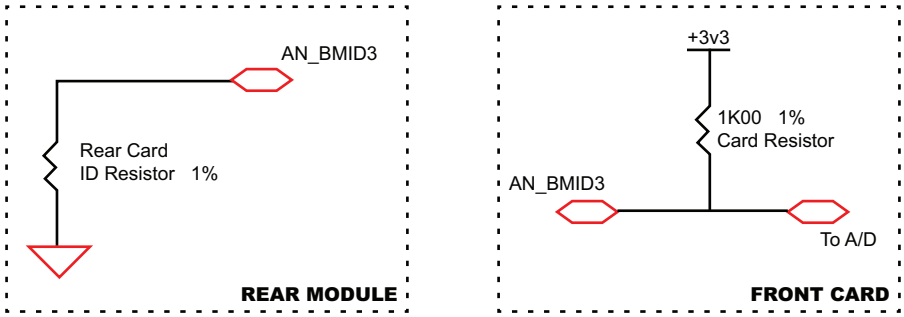

Figure 5 AN_BMID3 Circuit

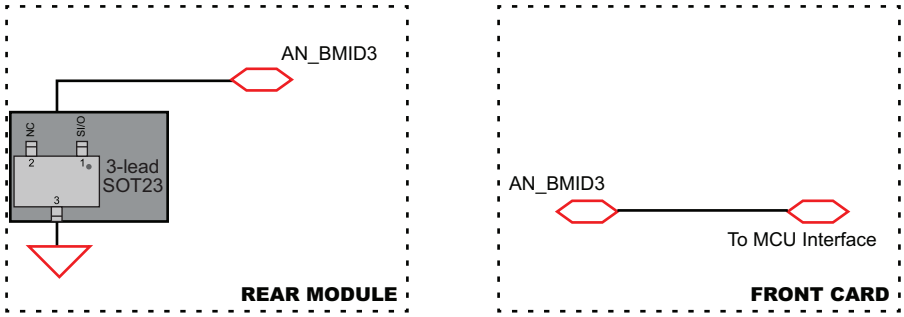

Figure 6 AN_BMID3 EEPROM Circuit

✶ To re-iterate, other methods as devised by the partner would also be acceptable.