



## Application Note #1232

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### Custom Daughter PCBs for the DMC-21x3

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This application note provides information for those Galil customers who wish to design their own daughter printed circuit board for the Galil DMC-21x3 controller. Be aware that Galil does provide standard daughter boards.

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## 1 PART NUMBERS AND CONNECTOR ORIENTATIONS

Figure 1 shows a DMC-21x3 controller with part number DMC-2143-V-UP-VP (or simply DMC-2143 since the connector orientations specified by -V-UP-VP are the default). Note that the 1-4 axes versions use this PCB footprint whereas the 5-8 axes versions have a larger footprint.

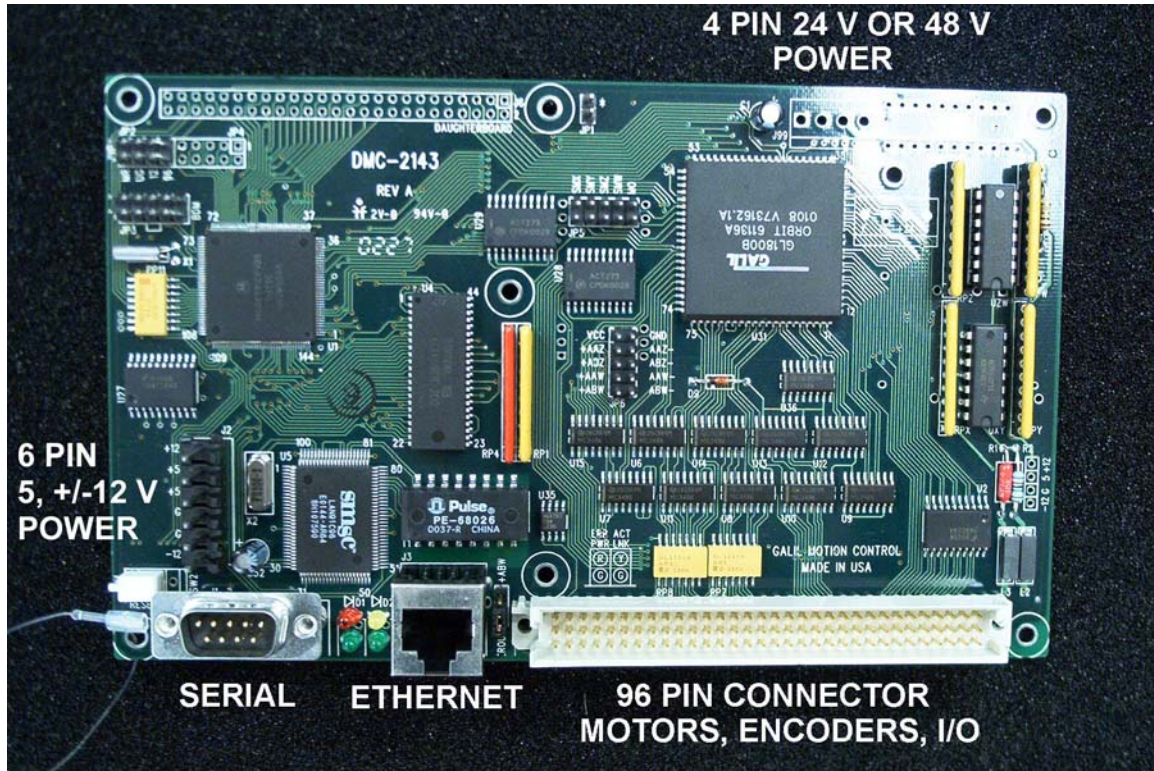


Figure 1. Galil DMC-2143-V-UP-VP (top view)

Each part number field is explained in the [DMC-21x3/x3 Specifications](#) under ORDERING INFORMATION, but the three fields that specify connector orientation can be clarified. The serial/Ethernet, 96-pin, and power connectors on the 21x3 may each be ordered in different orientations (unless the DIN rail option is ordered with -DIN, in which case the board will come with all connectors oriented exactly as in figure 1).

### 1.1 Serial/Ethernet Connectors

The serial port and Ethernet connectors may be ordered both in the vertical orientation (as shown in figure 1) with -V or in the horizontal orientation with -H (which would put these two connectors facing towards the bottom of the page).

### 1.2 96-pin Connector

This connector can be ordered in three orientations:

-UP: The 96-pin connector is mounted straight up on the top of the board exactly as shown in figure 1.

-DOWN: this puts the connector on the bottom side of the board (facing into the page). The same connector ([AMP: 650908-5](#)) is used for both –UP and –DOWN

-RA: right angle. This puts the connector facing towards the bottom of the page. A different connector ([Robinson Nugent: DIN-96CPC-SR1-TR](#)) is used for this configuration.

### 1.3 Power Connector

There are two possible locations for connection to input DC power. If you will be supplying all three board-level supply voltages (5V, +12V, and –12V) directly to the DMC-21x3, you will connect to the 6-pin header located in the lower left (figure 1) with a Molex [26-03-4061](#) mating connector.

If you instead wish to bring a single supply voltage to the board, you must specify either –DC24 or –DC48 in the part number and, instead of the 6-pin header, a four-pin header will be stuffed into the four holes on the upper right of the board (figure 1). Use a Molex [26-03-4041](#) to mate with this 4-pin header.

The 6-pin header may be ordered either in the vertical orientation (as in figure 1) with –VP or in a right-angle orientation with –HP. The 4-pin header always comes in the right-angle orientation (otherwise it would interfere with the daughter board).

## 2 MATING CONNECTOR SUMMARY

This section summarizes the part numbers for the connectors you need to use on your PCB which are necessary to mate with the DMC-21x3. Table 1 shows both the 96-pin connectors used on the 21x3 as well as mating connectors to be used on your daughter PCB and Table 2 shows the female connectors necessary to interface with the power headers. Click on a part number to bring up the manufacturer’s data sheet.

**Table 1. 96-pin motor, encoder, and I/O connectors**

<b>96-pin Connector Orientation</b>	<b>DMC-21x3 Connector (male) for Reference</b>	<b>Daughter PCB Mating Connector (Female)</b>
<b>RA</b>	<a href="#">Robinson Nugent: DIN-96CPC-SR1-TR</a>	<a href="#">3M: 7396-50C2TH</a>
<b>UP</b>	<a href="#">AMP: 650908-5</a>	<a href="#">AMP: 535090-4</a>
<b>DN</b>	<a href="#">AMP: 650908-5</a>	<a href="#">AMP: 535090-4</a>

**Table 2. Mating Power Connectors**

	<b>6-pin female 5, +/-12 V Connector</b>	<b>4-pin female Connector for DC-to-DC Converter</b>
<b>Connector</b>	<a href="#">Molex: 26-03-4061</a>	<a href="#">Molex: 26-03-4041</a>
<b>Female Terminal Pins</b>	<a href="#">Molex: 08-50-0189</a>	<a href="#">Molex: 08-50-0189</a>

### 3 PIN LOCATIONS (96-PIN CONNECTOR)

Keeping the pin numbering straight is somewhat challenging due to the various connector orientations and the fact that MATING CONNECTORS HAVE DIFFERENT PIN NUMBERING. Figure 2 shows the bottom side of the board where the pin numbering for the 96-pin connector has been silk-screened.

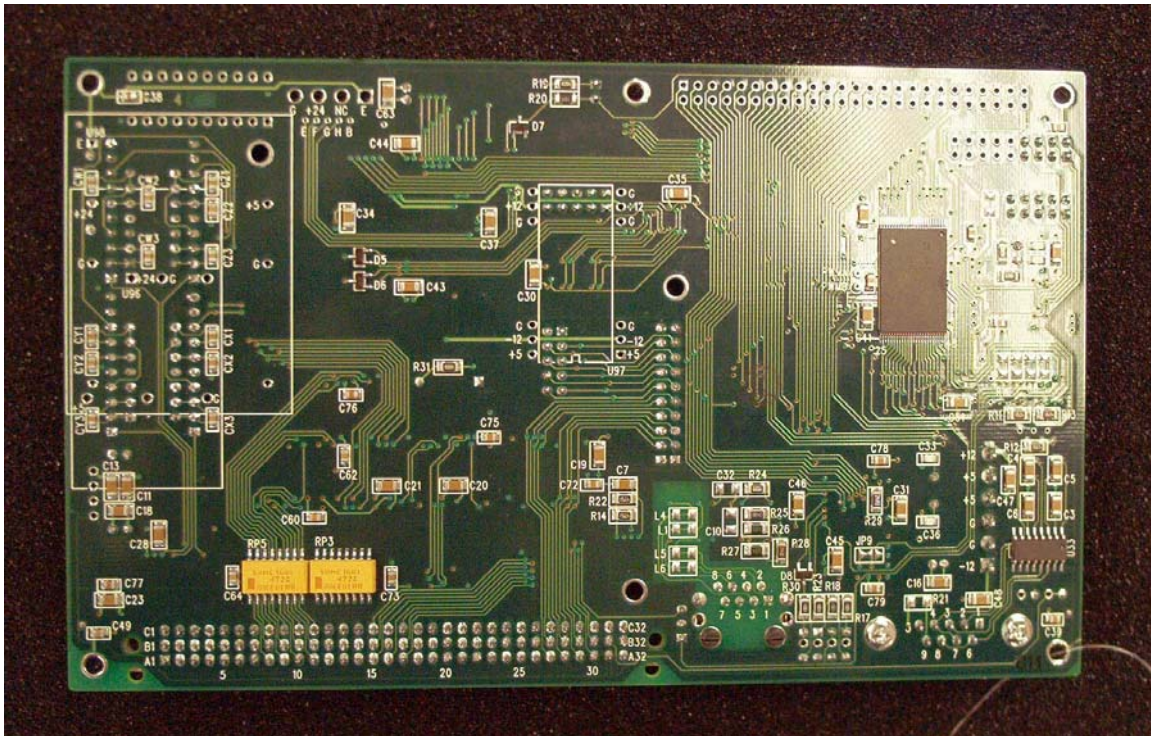


Figure 2. Galil DMC-2143-V-UP-VP (bottom view) with 96-pin connector silkscreen (lower left)

The silkscreen numbering corresponds to the numbering that Robinson Nugent assigned to the right angle connector used on the DMC-21x3 ([Robinson Nugent: DIN-96CPC-SR1-TR](#)). The silkscreen numbering DOES NOT correspond to the connector manufacturer's numbering for neither the -UP nor -DOWN connectors ([AMP: 650908-5](#)). (Note that the silkscreen numbering is the same regardless of which orientation is ordered.) The pin mapping of the DMC-21x3 BOARD CONNECTORS can be found in the [DMC-21x3/x3 Specifications](#) under CONNECTORS-DMC-21x3. The pin numberings there are those assigned to each connector by its manufacturer (note that only the first column, RA, corresponds to the silk screen).

A further complication is that the MATING CONNECTOR numbering does not correspond to the DMC-21x3 board connector numbering. Figure 3 is an aid in understanding the pin mapping between the two male connectors and two female connectors. Table 3 shows how pin A1 (which is electrical ground) maps from the silkscreen to the board connector through to the mating connector for all three connector orientations.

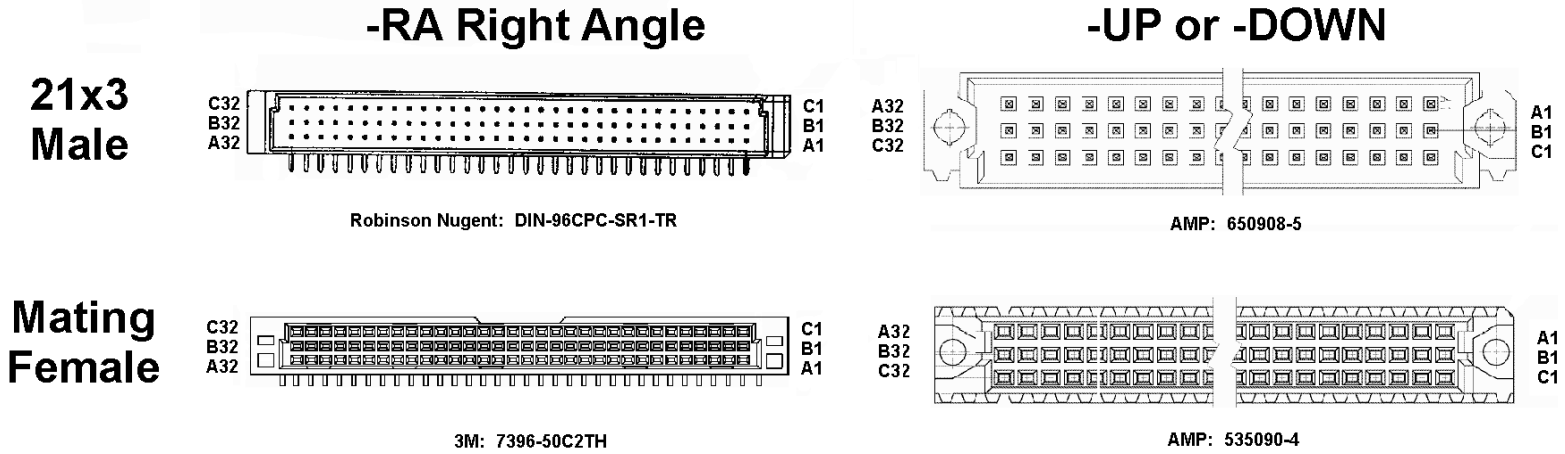


Figure 3. The four 96-pin connectors with pin numberings according to the manufacturers. All are shown looking into the connector. The two on the top are used on the DMC-21x3 and the bottom two are used on daughter boards.

Table 3. 96-pin connector pin mapping

96-Pin Connector Orientation	Function	Silk Screen Label	21x3 Board Connector Pin	Mating Connector Pin
-RA	Ground	A1	A1	A32
-UP	Ground	A1	A32	A1
-DOWN	Ground	A1	C32	C1

#### 4 MECHANICAL BOARD DIMENSIONS

Mechanical drawings for both the 1-4 axes and 5-8 axes PCB footprints can be found in [Application Note 1229](#). Here you can find dimensions and locations of mounting holes, standoff holes (one per four axes), and the two 96-pin connectors on the 5-8 axes version.

For reference, a mechanical drawing for Galil’s DMC-21x3 daughter board PCB footprint can be found in [Application Note 1231](#).